Final Environmental Impact Statement for Proposed Habitat Conservation Plan and Incidental Take Permit

Fowler Ridge Wind Farm
Benton County, Indiana

December 2013

U.S. Fish and Wildlife Service
Bloomington, Indiana Field Office
621 South Walker Street
Bloomington, Indiana 47403

COVER SHEET

a. Title: Proposed Habitat Conservation Plan and Incidental Take Permit for the Fowler Ridge Wind Farm, Benton County, Indiana

b. Subject: Final Environmental Impact Statement

c. Lead Agency: United States Fish and Wildlife Service (Service)

d. Abstract:

The permit applicant, Fowler Ridge Wind Farm LLC; Fowler Ridge II Wind Farm LLC; Fowler Ridge III Wind Farm LLC; and Fowler Ridge IV Wind Farm LLC., collectively Fowler Ridge, is seeking an Incidental Take Permit (ITP) for the Fowler Ridge Wind Farm (FRWF or Project) in Benton County, Indiana.. The FRWF currently consists of 355 wind turbines and associated access roads and infrastructure constructed in three phases with a total energy capacity of 600 megawatts (MW). Construction of Phase IV, owned by Fowler Ridge IV Wind Farm LLC, is currently planned for 2014. Phase IV would consist of up to 94 turbines for a total capacity of 150.4 MW. The total build-out for all four phases of Fowler Ridge will be up to 449 turbines (750 MW)

The FRWF is located in an area through which the federally endangered Indiana bat (*Myotis sodalis*) migrates. Fowler Ridge has developed a Habitat Conservation Plan (HCP) to ensure that impacts to the federally listed Indiana bat are adequately minimized and mitigated in accordance with the requirements of Section 10 of the Endangered Species Act (ESA). The Service received an application for an ITP from Fowler Ridge for the FRWF on January 15, 2013.

On April 5, 2013, the Service published a notice in the Federal Register stating the availability of the Draft Environmental Impact Statement (DEIS), Draft Habitat Conservation Plan (DHCP), and Draft Implementing Agreement (DIA). The public comment period for the above mentioned documents expired on June 4, 2013. Comments received during the public comment period and Service responses to those comments are included in Appendix I of this Final Environmental Impact Statement (FEIS).

Since release of the DEIS, the ITP term length changed from 22 years to 21 years. Substantive changes to the DEIS resulting from the reduction in permit term length are included in Appendix J of this FEIS.

Key issues associated with the construction of Phase IV and the operation of the four phases of the FRWF include impacts to

wildlife (including migratory birds and bats) and impacts to the federally endangered Indiana bat.

The Service has selected the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) as the preferred alternative. Of the alternatives evaluated in this FEIS, this alternative best fulfills the agency's statutory mission and responsibilities while meeting the purpose and need.

e. Contact:

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f. Transmittal:

This FEIS prepared by Service staff on the proposed HCP and ITP for the Indiana Bat (*Myotis sodalis*) for the Fowler Ridge Wind Farm located in Benton County, Indiana is being made available to the public in January 2014.

The Service's decision on issuance of the permit will occur no sooner than 30 days after the publication of the Environmental Protection Agency notice of the FEIS in the Federal Register and will be documented in a Record of Decision.

You may obtain copies of the FEIS and related documents on the Internet at *http://www.regulations.gov* (**Docket Number FWS-R3-ES-2013-0032)**.

You may obtain the documents by mail from the Bloomington Indiana Field Office (see contact information above**)** or the Midwest Regional Office.

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ACRONYMS AND ABBREVIATIONS

ABC	American Bird Conservancy
AIRFA	American Indian Religious Freedom Act
ALTA	American Land Title Association
APE	Area of Potential Effect
BA	Biological Assessment
BBCS	Bird and Bat Conservation Strategy
BFO	Bloomington Field Office
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon dioxide
CRP	Conservation Reserve Program
CUP	Conditional Use Permit
CWA	Clean Water Act
CWS	Canadian Wildlife Service
dB	Decibel
dBA	A-weighted decibel
DEIS	Draft Environmental Impact Assessment
ECP	Eagle Conservation Plans
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
FSA	Farm Service Agency
FEIS	Final Environmental Impact Statement
FEMA	Federal Environmental Management Agency
FPPA	Farmland Protection Policy Act
FRWF	Fowler Ridge Wind Farm
GHA	Gamebird Habitat Areas
GHG	Greenhouse gases
HCP	Habitat Conservation Plan
HFCs	Hydrofluorocarbons
Hz	Hertz
HUC	Hydrological Unit Codes
IBA	Important Bird Areas
IC	Indiana Code
IDEM	Indiana Department of Environmental Management
IDNR	Indian Department of Natural Resources
INDOT	Indiana Department of Transportation
ITP	Incidental Take Permit

kHz	Kilohertz
kV	Kilovolt
Leq	Equivalent Energy Sound Level
m/s	Meters per second
MBTA	Migratory Bird Treaty Act
MET	Meteorological Tower
MRU	Midwest Recovery Unit
MW	Megawatt
N_2O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NHPA	National Historic Preservation Act
NLCD	National Landcover Data
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O&M	Operations and Maintenance
PA	Programmatic Agreement
PFCs	Perfluorocarbons
PIF	Partners in Flight
RGP	Regional General Permit
ROW	Right-of-way
SCADA	Supervisory Control and Data Acquisition
SF_6	Sulfur hexafluoride
SHAARD	State Historic Architectural and Archaeological Research Database
SHPO	State Historic Preservation Office
SGCN	Species of Greatest Conservation Need
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Loads
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
WECS	Wind Energy Conversion Systems
WEST	Western EcoSystems Technologies, Inc.
WNS	White Nose Syndrome
WTG	Wind Turbine Generators

1.0 PROJECT OVERVIEW AND BACKGROUND

1.1 INTRODUCTION

The U.S. Fish and Wildlife Service (Service or USFWS) received an application for an Incidental Take Permit (ITP), pursuant to the provisions of Section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA or Act),16 U.S.C. 1531, *et seq*., 1539(a)(1)(B), for the Fowler Ridge Wind Farm (FRWF). The FRWF consists of four project phases owned by four separate Companies: Fowler Ridge Wind Farm LLC; Fowler Ridge II Wind Farm LLC; Fowler Ridge III Wind Farm LLC; and Fowler Ridge IV Wind Farm LLC. The four Companies, hereinafter referred to as Fowler Ridge or Applicant, will jointly serve as permittees under the ITP, and are jointly and severally liable for all obligations assigned to them under the ITP, Habitat Conservation Plan (HCP) and associated documents such as the Implementing Agreement (IA) and Programmatic Agreement (PA).

The ITP would authorize the incidental take of the federally-endangered Indiana bat (*Myotis sodalis)* during the operation of the FRWF Phases I, II, III and IV in Benton County, Indiana (Figure 1.1). This Final Environmental Impact Statement (FEIS) evaluates the effects of construction of Phase IV and operation and decommissioning of all four phases of FRWF.

The Indiana bat was listed as endangered by the Service on March 11, 1967 (32 Fed. Reg. 4001). An Indiana Bat Recovery Plan was first developed and signed on October 14, 1983 (USFWS 1983). An agency draft of the Revised Recovery Plan was released in March 1999 (USFWS 1999). The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision was made available for public comment on April 16, 2007 (72 Fed. Reg. 19015-19016) (USFWS 2007).

1.2 FOWLER RIDGE WIND FARM PROJECT DESCRIPTION

1.2.1 Project Components

The FRWF currently consists of 355 wind turbines constructed in three phases with a total energy capacity of 600 megawatts (MW) (Table 1.1):

(1) The 301.3 MW Fowler Phase I was constructed in 2008 and consists of 40 Clipper Liberty wind turbine generators (WTG) with a capacity of 2.5 MW per turbine and 122 Vestas V82 WTGs with a capacity of 1.65 MW per turbine. The site is owned by Fowler Ridge Wind Farm LLC and began operating in 2009.

(2) The 199.5 MW Fowler Phase II was constructed in 2009 and began operating later that year. The site is owned by Fowler Ridge II Wind Farm LLC and consists of 133 GE WTGs, each with a 1.5 MW capacity.

(3) The 99 MW Fowler Phase III was constructed in 2008 and began operating in 2009. The site is owned by Fowler Ridge III Wind Farm LLC and consists of 60 Vestas V82 WTGs, each with a 1.65 MW capacity per turbine.

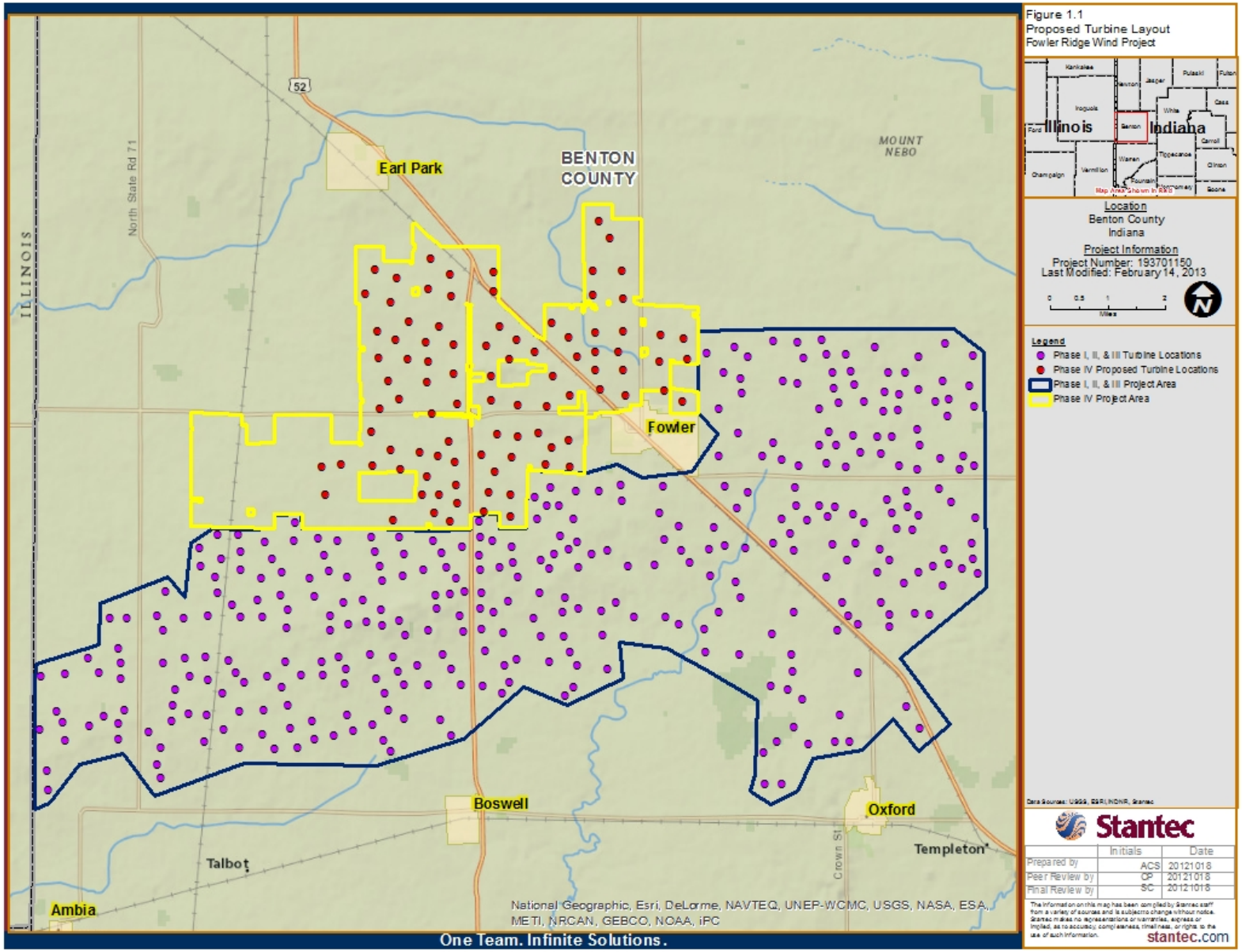


Figure 1.1
Proposed Turbine Layout
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: February 14, 2013
Miles
Legend
Phase I, II, & III Turbine Locations
Phase IV Proposed Turbine Locations
Phase I, II, & III Project Area
Phase IV Project Area
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
52
Earl Park
BENTON COUNTY
MOUNT NEBO
North State Rd 71
ILLINOIS
Fowler
Boswell
Oxford
Templeton
Talbot
Ambia
Crown St
National Geographic, Esri, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, iPC
One Team. Infinite Solutions.

The turbine towers at the first three phases are approximately 262 feet in height with a rotor blade path ranging from 253 to 314 feet. Therefore, the maximum height of the turbines from tower base to highest blade tip (i.e., 12 o'clock position) is 416 feet. The turbines are arranged throughout the project area, which is bisected by U.S. Highway 52 running north and south (Figure 1.1).

Seven permanent, un-guyed meteorological (MET) towers, 262 feet tall, are located within the FRWF project area. Each permanent MET tower and associated electrical components are situated within a 46-foot by 46-foot chain link fence that is graveled and accessible from project roads.

The project currently includes three substations, one for each phase of the wind farm. One additional substation will be constructed for Phase IV of the project. The substations collectively contain six transformers that feed electricity into an existing 345 kilovolt (kV) electrical tie-in line. Electrical power generated by the WTGs is transformed and collected through a network of underground collection circuits. The underground collection cables total approximately 160 miles and are buried four feet deep.

Overhead generation tie-in lines were constructed as part of the first three phases. Tie-in and collection lines are owned and maintained by the Applicant. The tie-in line for the project consists of roughly 200 poles, and carries electricity approximately 31 miles within the project area and ultimately to the Dequine Substation, located in Tippecanoe County, near Lafayette, Indiana.

Construction of the first three phases was completed in December, 2009, and included 355 turbines, the generation tie-in lines, substations, operations and maintenance (O&M) building, access roads, and collection and communications lines.

Construction of Phase IV, owned by Fowler Ridge IV Wind Farm LLC, is currently planned for 2014. Phase IV would consist of up to 94 GE 1.6 MW turbines for a total capacity of 150.4 MW. The total build-out for all four phases of FRWF will be up to 449 turbines (750 MW) (Table 1.1).

Table 1.1 Fowler Ridge Wind Farm Turbines and Capacity

Phase	Operational Date	Capacity (MW)	Turbines	Number of Turbines
I	3/1/2009	301.3 MW	Vestas V82 1.65 MW	122
			Clipper C96 2.5 MW	40
II	12/16/2009	199.5 MW	GE SLE 1.5 MW	133
III	2/27/2009	99 MW	Vestas V82 1.65 MW	60
IV	expected 2014	150.4 MW	GE TC3+ 1.6 MW	94

1.2.2 Construction of Fowler IV

All of the alternatives described in Section 3.1.3 would include the construction of Phase IV. Phase IV will consist of up to 94 GE TC3+ 1.6 MW turbines for a total capacity of 150.4 MW. Currently, Phase IV is planned for construction in 2014. The turbine towers in Phase IV will be

262 feet in height with a rotor diameter 253 feet; the maximum height of the turbines from tower base to highest blade tip (12 o'clock position) is 389 feet.

Turbine construction may take up to 12 months to complete after issuance of applicable construction permits. Prior to construction of Phase IV, the Applicant will: 1) order all necessary components, including wind turbine generators, foundation materials, electrical cable, and transformers; 2) complete micrositing of final turbine locations[1]; 3) complete an American Land Title Association (ALTA) survey to establish locations of structures and roadways; and 4) complete soil borings, testing, and analysis for proper foundation design and materials.

Turbines will be constructed using standard wind farm construction procedures and equipment and will entail the following activities:

- Road and pad construction
- Generation tie-in line construction
- Foundation construction for turbine towers, MET towers, and transformers
- Trenching and placement of underground collection and communications cables
- Tower erection
- Nacelle and rotor installation
- Turbine commissioning
- Final road preparation, erosion control, and site restoration

A construction staging and laydown area, including project offices, equipment, and employee parking areas, will be developed and will be utilized throughout construction of Phase IV. A temporary concrete batch plant may be located adjacent to the staging area and laydown area.

1.2.2.1 *Road and Pad Construction*

Existing roads may be upgraded and new roads will be constructed in accordance with wind industry standards for roads and local building requirements. The roads will accommodate all-weather access by heavy equipment during construction and long-term use during operations and maintenance. New roads will be located in consultation with the landowner to minimize disturbance, maximize transportation efficiency, and avoid cropland to the extent feasible. All new roads will be constructed for the specific purpose of project construction, operation, and maintenance. Surface disturbance will be contained within road right-of-way (ROW), which will average a width of 36 feet along turbine/crane access roads. The permanent width of access roads will be approximately 16 feet. All roads will include road base, gravel surface materials, appropriate drainage, and culverts where necessary.

All FRWF wind turbines are anchored to an inverted tee concrete foundation that is approximately 50 feet in diameter at the base and 15 feet in diameter at the top and extends approximately 12 feet below the ground. Surrounding this concrete area at the surface is a circular area (the pad) that is approximately 50 feet in diameter. The pad is constructed much

[1] Although proposed locations of up to 94 turbines have been determined, minor modifications to their locations may occur prior to finalization of construction. Turbine locations will not change by more than 95 feet from their currently proposed locations (see Figure 1.1).

like the access roads with a base overlaid by gravel. The diameter of the constructed surface (foundation and pad) immediately around each turbine is approximately 50 feet.

Topsoil removed during road construction will be stockpiled in elongated rows within road ROWs. Topsoil will be re-spread on areas that will be re-vegetated as soon as possible after road construction is complete.

Construction of Phase IV will necessitate construction of temporary crane pads at each turbine site, temporary travel roads for the cranes, temporary turning areas for oversized equipment at certain county and local road intersections, temporary laydown areas around each turbine, trenches for the underground electrical collection and communication system, and temporary storage/stockpile areas. Construction of each turbine will result in temporary impacts of:

(1) Approximately 10 feet on either side of the permanent roadway width;

(2) A 60-foot by 80-foot gravel crane pad extending from the roadway to the turbine foundation; and

(3) A 150-foot radius rotor laydown area centered on the turbine foundation (i.e., turbine pad).

1.2.2.2 *Generation Tie-In Line Construction*

The 4.5-mile tie-in line will be constructed on approximately 34 poles spaced approximately 650 to 800 feet apart. The typical construction sequence includes pole erection, insulator installation, conductor installation, and testing.

1.2.2.3 *Foundation Construction*

Foundations for turbine towers, MET towers and transformers will be constructed by excavating the area, installing forms, and pouring concrete. Anchor bolts will be embedded in the concrete, and the foundations will be allowed to cure prior to tower erection.

Up to three additional permanent, unguyed MET towers will be erected for Phase IV. Permanent MET towers will be 262 feet tall and installed on a 3-foot diameter pier foundation.

Transformer foundations will be constructed using standard procedures by pouring concrete in a shallow slab or using a precast structure set on structural fill.

1.2.2.4 *Underground Electrical and Communication Cables*

Underground collection lines and communications cables will be placed in approximately 4-foot deep trenches located between turbines and along access roads. Electrical collection lines will be installed first, and the trench partially backfilled prior to placement of the communications cables. Trenches will be backfilled and the area revegetated with excess soil from other construction areas, if needed.

1.2.2.5 *Turbine Tower Erection*

Turbine towers will be anchor-bolted to the concrete foundations. Tower bottom sections will be lifted with a crane and bolted to the foundation. The middle and top sections will be lifted into place with a crane and bolted to the section below.

1.2.2.6 *Nacelle and Rotor Installation*

Rotor construction will occur within the laydown area at each turbine site. Once the tower has been erected, the nacelle is lifted into place and bolted to the top tower section. Following the nacelle, the rotor will be hoisted into place and bolted to the nacelle.

1.2.2.7 *Turbine Commissioning*

Turbine commissioning involves mechanical, electrical, and communications inspections to ensure systems are installed and functioning properly. Turbine testing will include checks of each wind turbine and the Supervisory Control and Data Acquisitions (SCADA) system prior to turbine commissioning. Electrical tests of the turbines, transformers, collection system, and transmission system will be performed by qualified electricians to ensure that all electrical equipment is installed in accordance to design specification and is operating within industry and manufacturer standards. Since turbines will be spinning during turbine testing, minimization measures will be taken to avoid take of Indiana bats, including conducting turbine testing during the period when Indiana bats are not expected to be in the project area (between October 16 and July 14); or conducting testing during daylight hours if testing needs to occur during the period from July 15 to October 15; or implementing other minimization measures approved for operations.

1.2.2.8 *Final Road Preparation, Erosion Control, and Reclamation*

The existing land use will be restored following construction. Once construction is complete, all disturbed areas will be graded to the approximate original contour. Areas disturbed during construction will be stabilized and restored using appropriate erosion control measures, including site-specific contouring, reseeding, or other measures agreed to by the landowner and designed and implemented in compliance with the project Storm Water Pollution Prevention Plan (SWPPP). As previously discussed an approximate 50 foot diameter circular area around each turbine (foundation and pad) is concrete and gravel. This is maintained throughout the period the turbines are in place. Outside of this 50 foot diameter area, land use is controlled by the landowner. In the case of FRWF, these areas will revert to the original land use, which is typically row crop agriculture.

Final road grading and preparation will include reducing the construction road width to the final 16 feet. Adjacent areas will be reclaimed to current landcover types and surface contours will be directed away from any cut-and-fill slopes and into ditches that discharge to natural drainages as necessary. Typically SWPPPs include standard sediment control devices to minimize soil erosion during and after construction. Following construction, all unused construction materials and waste will be picked up and removed from the project area and waste materials will be disposed of at approved and appropriate landfills. The Applicant has agreed that all materials from the construction process will be removed from the project site, recycled, or disposed of appropriately.

1.2.3 Operations and Maintenance (O&M)

The FRWF is designed to be operated both locally from the control room in the O&M building and remotely from Houston, Texas, through a remote operations center. A permanent staff of approximately 60 on-site personnel provides all O&M support activities to the FRWF. Each turbine includes a SCADA operations and communications system that allows automated independent and remote operation of the turbine. The SCADA data provide detailed operating and performance information for each turbine, allowing real-time control and continuous monitoring to ensure optimal operation and identification of potential problems. A local wind technician is either on-site or available on-call to respond in the event of an emergency or critical outage.

A preventative maintenance and inspection schedule has been implemented for the project. Typical O&M activities include WTG inspections and routine maintenance activities on WTGs, as required. Some repair activities may require the use of heavy equipment, such as cranes, to assist in the repairs of components such as the rotor, turbine blades, and nacelle components.

Maintenance activities consist of periodic mowing to maintain previously-cleared areas associated with project infrastructure (e.g., roads, transmission lines) and ROW. Mowing maintains cleared areas in an herbaceous or scrub-shrub condition. The need for mowing is evaluated by site operations staff periodically during the growing season and occurs on an as-needed basis during daytime hours.

Maintenance consists of building inspection and repairs, as needed; periodic grading of roads to restore the road surface or repair of culverts, as needed; and annual inspection and removal of hazards (e.g., downed trees or encroaching branches) on transmission lines.

The WTGs are lit with required Federal Aviation Administration (FAA) lighting on the nacelle of select WTGs. The O&M facility has outside safety lights that may be operated manually or via motion detectors.

1.2.4 Decommissioning

The projected operational life of each phase of the FRWF is 20 years. After the useful life of the turbines is complete, FRWF will assess the viability of either repowering the project by installing new or refurbished turbines, or completely decommissioning the project.

In the event that the FRWF will be decommissioned after 20 years, the turbines, infrastructure, and facilities will be removed. All turbines, concrete foundations, and other facilities, with the exception of the underground collection systems, will be removed to a depth of four feet below grade. In some instances, the landowners may wish to maintain certain facilities, such as access roads. The decommissioning process will be similar in scope and duration to the construction process. Most components and materials will be removed, recycled, or disposed of in an approved and appropriate waste management facility. Decommissioning activities for Phases I, II and III could begin as early as 2029 and decommissioning of Phase IV would begin as early as 2034 (see Table 1.1 in the HCP).

1.2.4.1 *Decommissioning Process*

The decommissioning process includes removal of above-ground structures and concrete foundations to a depth of four feet below the surface; removal of access roads if required by the

landowner; restoration of topsoil, re-vegetation and seeding; and a three-year monitoring and remediation period. Turbine blades will be permanently pitched into the wind and braked to prevent spinning and the potential take of Indiana bats during the period between when the WTGs stop producing electricity and when the turbines are taken down.

Above-ground structures include the turbines, transformers, substations, maintenance buildings, MET towers, transmission lines, and communications equipment. Below-ground structures include turbine foundations, the collection and communication system, drainage structures, and access road sub-base material. The process of removing structures involves evaluating components and materials for reuse, salvage, recycling, and/or disposal. Components and material may be stored on-site in a pre-approved location until ready for transport to appropriate facilities for reconditioning, salvage, recycling or disposal.

Access roads will be widened as necessary to accommodate movement of cranes or other machinery required for the disassembly and removal of the turbines. Turbine components, control cabinets, electronic systems, and internal cables will be de-energized and removed. The blades, hub, and nacelle will be lowered to the ground for disassembly. The tower sections will be disconnected and lowered to the ground where they will be further disassembled as needed into transportable sections.

Foundations (e.g., turbines, transformers, MET towers) will be excavated to a depth sufficient to remove anchor bolts, rebar, conduits, cable, and concrete to a depth of four feet below grade. The excavation will be filled and compacted with clean sub-grade material of quality and density comparable to the surrounding area. All unexcavated areas compacted by equipment used in decommissioning will be de-compacted to adequately restore the topsoil and sub-grade material to the proper quality and density comparable to the surrounding area.

The collector and communications cables and conduits will be cut back to a depth no greater than four feet. All cable and conduit buried deeper than four feet will be left in place and abandoned.

Decommissioning of the substation will include removal of fencing, conductors, switches, transformers, and foundations. Substation material and equipment disposal, reconditioning, or reuse will be dependent on condition and market value. Foundations and underground components will be removed to a depth of four feet and the excavation filled, contoured, and re-vegetated.

After turbine decommissioning is completed, access roads and construction pads will be removed, unless the landowner requests that access roads remain in place. Gravel will be removed from access roads and turbine pads and transported to a disposal location or approved stockpile site, or as requested by the landowner. Drainage structures integrated with the access roads will be removed and backfilled with sub-grade material, the topsoil replaced, and the surface contoured and re-vegetated. Improvements to local and county roads that were not removed after construction at the request of Benton County will remain in place. The Applicant has agreed that all materials from the decommissioning process will be removed from the project site, recycled, or disposed of appropriately.

1.2.4.2 *Site Restoration*

Areas requiring restoration or reclamation will be leveled or re-contoured to match the surrounding area, covered with topsoil, and re-seeded, if needed. Other steps necessary to prevent soil erosion, ensure establishment of native vegetation cover, and/or control for noxious weeds and pests will be conducted as necessary. A monitoring and remediation period of approximately three years will follow completion of decommissioning and restoration activities.

1.3 REGULATORY AND LEGAL FRAMEWORK

The protection of federally-listed threatened and endangered species is the responsibility of numerous federal agencies that operate under various statutory and regulatory authorities. The following section provides information regarding the governing legal authorities and the overlap with this National Environmental Policy Act (NEPA) document and the HCP process.

1.3.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act of 1969, as amended (NEPA), 42 U.S.C. 4321, *et seq*., requires Federal agencies to evaluate and disclose the effects of their proposed actions on the natural and human environment. The NEPA process is intended to help federal agencies make decisions that are based on an understanding of potential environmental consequences, and take actions that protect, restore, and enhance the environment. NEPA regulations provide the direction to achieve that purpose.

NEPA and the Council for Environmental Quality (CEQ) *Regulations for Implementing NEPA* (40 C.F.R. Parts 1500 - 1508) contain "action-forcing" provisions to ensure that all federal agencies act according to the letter and spirit of NEPA.

NEPA procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.

NEPA implementation requires that every federal agency prepare an Environmental Impact Statement (EIS) for proposed legislation or other federal actions “significantly affecting the quality of the human environment” (40 C.F.R. 1501). The Service, as the Lead Federal Agency, has determined that an EIS is appropriate to analyze the effects of the proposed action on the natural and human environment. This EIS addresses potential effects associated with the construction of Phase IV, operation of the Fowler Phases I – IV, and proposed issuance of an ITP. In accordance with NEPA, this EIS also addresses a “no-action” alternative, which provides an assessment of future conditions in the absence of the proposed federal action (i.e., issuance of the ITP).

1.3.2 Federal Endangered Species Act (ESA)

The purpose of the ESA is to provide a means whereby the ecosystems upon which threatened and endangered (T&E) species depend may be conserved, and to provide a program for the conservation of such T&E species.

Section 9 of the ESA prohibits the “take” of any fish or wildlife species listed under the ESA as endangered (16 U.S.C.1538). Under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation (50 C.F.R.

17.31). "Take", as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1532(19)).

Section 9 also prohibits the removal and reduction to possession of any listed plant species "under federal jurisdiction," as well as the removal, damage, or destruction of such plants on any other areas in knowing violation of any state law or regulation or in violation of state trespass law (16 U.S.C. 1538). The Service's implementing regulations further define the term "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 C.F.R. 17.3.) They also define harass as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 C.F.R. 17.3.).

The 1982 amendments to the ESA established a provision in Section 10 that allows for "incidental take" of endangered and threatened species of wildlife by non-Federal entities (16 U.S.C. 1539.) Incidental take is defined by the ESA regulations as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 C.F.R. 17.3.). Under Section 10 of the ESA, the Secretary of the Interior and Secretary of Commerce may, where appropriate, authorize the taking of federally-listed fish or wildlife if such taking occurs incidentally to otherwise legal activities. The Service is charged with regulating the incidental taking of listed species under its jurisdiction.

Section 10 of the ESA establishes a program whereby persons seeking to pursue activities that otherwise could give rise to liability for unlawful "take" of federally-protected species as defined in Section 9, may receive an ITP, which exempts them from such liability. Under Section 10, applicants may be authorized, through issuance of an ITP, to conduct activities that may result in take of a listed species, as long as the take is incidental to, and not the purpose of, otherwise lawful activities.

The submission of the ESA Section 10(a)(1)(B) permit application requires the development of a HCP (16 U.S.C. 1539(a)(1)(B) and 1539(a)(2)(A)) designed to ensure the continued existence and aid in the recovery of the listed species, while allowing for any limited, incidental take of the species that might occur during the construction and operation of the project, or during mitigation activities. The implementing regulations for Section 10(a)(1)(B) of the ESA, as provided in 50 C.F.R. 17.22, specify the requirements for obtaining a permit allowing the incidental take of listed species pursuant to otherwise lawful activities.

Since it was originally made available in December 1996, the Service also considers the *Habitat Conservation Planning Handbook* (USFWS and NMFS 1996) (Handbook) during HCP development, review, and implementation processes. Its purpose is to provide policy and guidance for Section 10(a)(1)(B) procedures to promote efficiency and nationwide consistency within and between the Service and National Marine Fisheries Service (NMFS). However, all species which would be the subject of the Proposed Action are under the sole jurisdiction of the Service.

An addendum to the Handbook was published in the Federal Register on June 1, 2000 (65 Fed. Reg. 35241-35257). This addendum, also known as the "Five Point Policy", provides additional guidance on HCPs, specifically regarding: (1) biological goals; (2) adaptive management; (3) monitoring; (4) permit duration; and (5) public participation. The addendum was created to

incorporate lessons learned, recommendations received, and methods the Service and NMFS were using to strengthen the HCP process since original issuance of the Handbook.

Section 7 of the ESA requires all federal agencies, in consultation with the Service, to ensure that any action "authorized, funded, or carried out" by any such agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat (16 U.S.C. 1536.) Because the "action" in this case is issuance of an ITP, the action agency is the Service and the consultation is referred to as an intra-agency consultation, since the Service is essentially consulting on its own action. Before initiating an action, the federal action agency must determine whether or not the proposed project may affect listed or proposed species and/or their critical habitat. If so, further consultation is required.

Since in the case of the FRWF, issuance of an ITP for the take of Indiana bat is likely to adversely affect a listed species, the consultation cannot be concluded informally and formal consultation on the effects to the Indiana bat is required. During formal consultation, the Service prepares a biological opinion (BO) in response to the information in the form of a biological assessment (BA) typically provided by the federal agency. In the case of an intra-agency consultation on issuance of an ITP, this information is usually the HCP (in place of a BA).

The BO analyzes the implementation of the HCP and other relevant information for the effects on the listed species and analyzes whether the Proposed Action would be likely to jeopardize the continued existence of the species or destroy or adversely modify designated critical habitat. If the BO reaches a jeopardy or adverse modification conclusion, the opinion must suggest "reasonable and prudent alternatives" that would avoid that result (16 U.S.C. 1536(b)(3)(A)). If the BO concludes that the project as proposed would involve the take of a listed species, but not to an extent that would jeopardize the species' continued existence, the BO must include an incidental take statement and specify reasonable and prudent measures to minimize the impact of the take (16 U.S.C. 1536(b)(4)).

The incidental take statement specifies an amount of take that the Service believes may occur as a result of the action. The Service may also make conservation recommendations, which are non-binding suggestions, such as identifying additional discretionary measures to reduce take, identifying additional needed studies, monitoring or research, and recommending how the action agency may assist species conservation in furtherance of ESA Section 7(a)(1). If a proposed action is carried out in compliance with the BO and the incidental take statement, it may be implemented without violation of the ESA, and the take is thereby exempted. The resulting BO will encompass the issuance of the ITP and implementation of the HCP.

1.3.3 Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act of 1918 (MBTA), 16 U.S.C. 703, *et seq*., prohibits the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts and nests, except when specifically authorized by the Department of the Interior. Although the MBTA has no provision for allowing unauthorized take of migratory bird species, the Service recognizes that some birds may be taken during the operation of a wind facility even if all reasonable measures to avoid take are implemented. .

1.3.4 Bald and Golden Eagle Protection Act (BGEPA)

The Bald and Golden Eagle Protection Act of 1940 (BGEPA), 16 U.S.C. 668, *et seq*., provides additional protection to bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) such that it is unlawful to take an eagle. In this statute the definition of "take" is to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (16 U.S.C. 668c.). On September 11, 2009, the Service published a final rule (Eagle Permit Rule) under BGEPA authorizing limited issuance of permits to take bald eagles and golden eagles ''for the protection of . . .other interests in any particular locality'' where the take is compatible with the preservation of the bald eagle and the golden eagle, is associated with and not the purpose of an otherwise lawful activity, and cannot practicably be avoided (74 Fed. Reg. 46836-46879).

On May 2, 2013, the Service announced the availability of the Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2[2] (the "Guidance")(78 Fed. Reg. 25758). The Guidance provides a means of compliance with the BGEPA by providing recommendations and in-depth guidance for:

(1) Conducting early pre-construction assessments to identify important eagle use areas;

(2) Avoiding, minimizing, and/or compensating for potential adverse effects to eagles; and

(3) Monitoring for impacts to eagles during construction and operation.

The Guidance interprets and clarifies the permit requirements in the regulations at 50 CFR 22.26 and 22.27, and does not impose any binding requirements beyond those specified in the regulations.

1.3.5 Clean Water Act (CWA)

Section 404 of the Clean Water Act (CWA), 33 U.S.C. 1251, *et seq*., 1344, which is administered by the U.S. Army Corps of Engineers (USACE), regulates the placement of fill or dredged material into wetlands and other Waters of the United States.

1.3.6 National Historic Preservation Act (NHPA)

According to the National Historic Preservation Act (NHPA) of 1966, as amended, 16 U.S.C. 470, *et seq*., "the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people"(16 U.S.C 470(b)(2)). Further, the Federal government has a responsibility to "foster conditions under which our modern society and our prehistoric and historic resources can exist in productive harmony" (16 U.S.C. 470-1(1)). As a result of Section 106 of the NHPA and its implementing regulations, federal agencies are required to take into account the impact of federal undertakings upon historic properties in the area of the undertaking (16 U.S.C. 470f; 36 C.F.R. Part 800) (Revised January 2001).

[2] http://www.fws.gov/windenergy/PDF/Eagle%20Conservation%20Plan%20Guidance-Module%201.pdf

1.3.7 Clean Air Act

The Clean Air Act (CAA) 42 U.S.C. §7401 *et seq.* (1970) is a comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants.

1.3.8 Farmland Protection Policy Act (FPPA)

The Farmland Protection Policy Act of 1981 (FPPA), 7 U.S.C. 4201, *et seq*., purpose is "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that Federal programs are…compatible with…policies to protect farmland" (7 U.S.C. 4201(b)).

1.3.9 Executive Order 11990 – Wetlands Protection

The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, it requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

1.3.10 Executive Order 11988 – Floodplain Management

Executive Order 11988, signed on May 24, 1977, requires federal agencies to avoid, to the extent possible, the long-term and short-term adverse impacts associated with the occupancy and modifications of floodplains, and to avoid the direct or indirect support of floodplain development whenever there is a practicable alternative. The preferred method for satisfying this requirement is to avoid sites within the floodplain. If an action must be located within the floodplain, the executive order requires that agencies minimize potential harm to people and property and to natural and beneficial floodplain values by incorporating current floodplain management standards into the project.

1.3.11 Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations." It also requires that representatives of any low-income or minority populations that could be affected by the project be given the opportunity to be included in the impact assessment and public involvement process.

1.3.12 State Regulations

1.3.12.1 *Indiana Nongame and Endangered Species Conservation Act*

The Indiana Nongame and Endangered Species Conservation Act (IC 14-22-34) is maintained by the Office of Code Revision Indiana Legislative Services Agency. Any species or subspecies of wildlife whose survival or reproductive parameters are in jeopardy or are likely to be within the

foreseeable future and any species or subspecies designated under the federal ESA are deemed endangered species under the Indiana Nongame and Endangered Species Conservation Act (IC 14-22-34-1).

According to 312 IAC 9-10-18, "(a) The department may issue a permit under this section to an individual, organization, corporation, or government agency to take a state endangered species. This permit may only be issued for state endangered species that are either federal proposed species or federal listed species. (b) The permit application under this section shall be made as follows: (1) The applicant must submit a Habitat Conservation Plan. (2) The division of fish and wildlife will supply an outline of information sections that must be included in the Habitat Conservation Plan. This outline will include, but not necessarily be limited to, the following sections: (A) Current status of the endangered species. (B) Description of area of impact. (C) Specific impacts to the species' habitat. (D) Conservation actions to be undertaken to ensure no detrimental effect to the endangered species. (E) Schedule for enacting the conservation actions. (F) Guarantees to ensure the enactment of conservation actions. (c) The permit application has to be available for a minimum of thirty (30) days for public review and comment. The director shall determine whether the permit will be issued after review of comments received during the review and comment period. (d) The permit may be revoked at any time if the provisions of the Habitat Conservation Plan are not enacted according to the schedule in the plan."

To be in compliance with IC 14-22-34, a limited take permit must be sought and obtained from the Indiana Department of Natural Resources (IDNR) for the proposed project. Under this law, the IDNR may issue a permit authorizing the take of a state-listed species that is either federally-proposed or federally-listed as threatened or endangered. This administrative rule was specifically designed to complement the federal HCP/limited-take-permit.

1.3.12.2 *Indiana Flood Control Act (IC 14-28-1)*

In 1945, the Indiana General Assembly determined that it was in the best interest of the citizens of the state to prevent and limit the damaging effects of floods by regulating, supervising, and coordinating the construction, operation, and design of flood control works and alteration of streams and by keeping floodways free and clear. The Natural Resources Commission has been given primary authority concerning flood control activities in the state.

This act provides that it is illegal to construct a permanent abode or place of residence in a floodway. Any other structure, obstruction, deposit, or excavation in the floodway of any stream in the state must first be approved by the Commission. The IDNR Division of Water has been given authority from the Commission to act on its behalf concerning flood control activities in the state. Proposed construction activities in a floodway are reviewed by the IDNR to determine if the work will:

(1) Adversely affect the efficiency of or unduly restrict the capacity of the floodway;

(2) Create an unreasonable hazard to the safety of life or property; or

(3) Result in unreasonably detrimental effects upon the fish, wildlife or botanical resources.

1.3.13 County Regulations

1.3.13.1 *Ordinance for Regulating Energy Generation Using Wind Power in Benton County, Indiana.*

Benton County, Indiana has prepared an extensive Wind Energy Siting Ordinance[3]. Prior to construction, the developer must obtain three permits, including:

(1) A Conditional Use Permit (CUP) for any Wind Energy Conversion Systems (WECS) in any Zone other than R-1, R-2, R-3 or R-4;

(2) A Request for Variance for any variances anticipated from the ordinance; and

(3) An Improvement Location Permit from the Benton County Building Commissioner.

Site plans to be submitted for the CUP must show location of recognized historic or heritage sites as noted by the Division of Historic Preservation and Archaeology of the IDNR and any wetlands based upon a delineation prepared in accordance with the applicable USACE requirements and guidelines.

For setbacks, no turbine may be installed within 350 feet, or 1.1 times the height of the turbine, whichever is greatest, from any property lines, dedicated roadway, railroad right-of-way, or overhead electrical transmission or distribution lines. In addition, turbines shall be at least 1,000 feet from any occupied residence and 1,500 feet from any platted community. The Wind Energy Siting Ordinance also includes several specifications for the turbines related to safety, color, lighting, and noise; requires that use of public roads be approved by the Benton County Highway Supervisor; requires several maintenance items; and requests a decommissioning plan[4].

1.3.14 Consultation and Regulatory Compliance History

Consultation with appropriate federal, state, and local agencies is being conducted as part of development of Phase IV and all applicable federal, state, and local permits will be obtained as required. Table 1.2 summarizes permits that may be needed prior to construction.

Table 1.2 Federal and State Permits

Permitting Agency	Permit Needed	Trigger
USACE	Clean Water Act §404 Permit for Impacts to Waters of the United States (Regional General Permit 1).	Impact less than 1 acre of wetlands or Waters of the U.S.
IDNR – Division of Water	Construction in a Floodway (if applicable)	Presence of streams/ floodplains on subject property

[3] http://www.in.gov/oed/files/Benton_County_Wind_Ordinance.pdf
[4] Ibid, Benton County

Permitting Agency	Permit Needed	Trigger
IDNR – Division of Fish and Wildlife	State endangered species incidental take permit	Presence of state listed endangered species on site with the possibility of incidental take.
Indiana Department of Environmental Management (IDEM)	Stormwater Runoff Permit (Rule 5)	Required for construction activities that disturb 1 acre or more of land (e.g., clearing, grading, and excavating)
IDEM – Office of Air Quality	Approval for Fugitive Dust emissions of more than 25 tons per year in a non-attainment area	Fugitive Dust emissions of more than 25 tons/year with a location in a "nonattainment" area.
IDEM – Office of Water Quality, Wetlands and TMDLs Program	Regional General Permit (RGP 1) Regulation of Discharges of Dredged or Fill Material to Waters of the State and State Isolated Wetlands.	Impact less than 1 acre of wetlands or Waters of the US.
Benton County Building Commissioner	Three Permit Approvals must be obtained before construction: 1) Conditional Use Permit 2) Request for Variances (where appropriate) 3) Improvement Location Permit	Construction of a wind farm in Benton County, Indiana.

1.4 SCOPING AND PUBLIC INTERACTION

Scoping is a crucial step in the early planning stage of an environmental document. The objectives of scoping are to identify issues and to translate these into the purpose of the action, the needs for the action, the action or actions to be taken, the alternatives to be considered in detail, the alternatives not to be considered in detail, and the impacts to be addressed. Scoping is used to design the EIS, and, if effective, should reduce paperwork, delays, and costs and improve the effectiveness of the NEPA process. Scoping is a public participation process that begins with the publication in the Federal Register of the Notice of Intent (NOI) to prepare an EIS.

On May 25, 2011, the Service published a NOI in the Federal Register to solicit feedback from potentially affected federal, state, and local agencies, tribes, and the public in determining the scope of this EIS (76 Fed. Reg. 30384-30386). Publication and distribution of the NOI initiated the process of public scoping for this EIS (Appendix A). A public scoping meeting was held on

June 7, 2011, in Benton County and a Service website[5] was created to provide agencies and the public with information related to the project. The scoping period extended until June 23, 2011.

On June 2, 2011, a letter was sent via e-mail to state and federal agencies and non-governmental organizations (NGOs) informing them that the Service was initiating scoping for development of this EIS. In addition, a public notice was published in the Indianapolis Star newspaper, press releases were issued to local radio stations, and flyers announcing the public meeting were posted at public gathering sites (e.g., grocery stores, gas stations/convenience stores, public library). Notification was given that comments could be submitted through the U.S. Postal Service, by facsimile, or on the Service website.

The scoping meeting provided an opportunity for the attendees to learn about the Proposed Action and comment on environmental issues of concern and the alternatives that should be discussed in the EIS. Scoping comments are summarized below.

1.4.1 Issues Raised During Public Scoping Period

Ten written responses were received during the scoping period, all of which were from the public or NGOs (Appendix B). No written comments were received from federal, state, or local agencies as part of the public scoping period.

Comments received generally fell into the following categories:

- Five comments indicated a preference for the maximally restrictive alternative.
- Two comments requested that the ITP be denied.
- One comment voiced opposition to the project in general.
- One comment outlined the legal considerations that must be taken into account as part of the NEPA process. Various comments from this letter are addressed in this FEIS.
- One written comment requested to be added to the project mailing list. This letter requested paper copies of project materials, including scoping documents.

1.5 DRAFT EIS (DEIS) PUBLIC REVIEW

The DEIS was published in the Federal Register for public review on April 5, 2013 (78 Fed. Reg. 20690-20692) in accordance with requirements set forth in the NEPA and its' implementing regulations (40 CFR 1500-1508). Public comments were accepted during a 60-day period following publication of the Federal Register Notice of Availability. One public information meeting was held during the comment period, on April 18, 2013 in Fowler, Indiana. Comments received during the comment period were taken into account in assessing Project impacts and potential mitigation and resulted in some modifications in this FEIS. Responses to substantive comments on the DEIS and Draft HCP can be found in Appendix I of this FEIS.

Following issuance of this FEIS, the Service will publish the Record of Decision (ROD) documenting its decision on whether to issue the ITP no earlier than 30 days after the FEIS is published. The Service does not have a formal administrative appeal procedure for NEPA decisions. Judicial review of a Service NEPA decision can be accomplished in Federal court under the Administrative Procedure Act (5 U.S.C. §500 *et seq*).

[5] http://www.fws.gov/midwest/Endangered/permits/hcp/r3hcps.html

2.0 PURPOSE AND NEED

2.1 PURPOSE OF THE EIS

The purpose for which this EIS is being prepared is to:

- Respond to an application from Fowler Ridge requesting an ITP for the incidental take of the federally endangered Indiana bat (*Myotis sodalis)*, pursuant to the ESA Section 10(a)(1)(B) and its implementing regulations and policies
- Protect, conserve, and enhance the Indiana bat and its habitat for the continuing benefit of the people of the United States
- Provide a means to conserve the ecosystems depended upon by the Indiana bat
- Ensure that FRWF will not appreciably reduce the likelihood of the survival and recovery of the Indiana bat in the wild through protection and management of the species and its habitat within the context of the project
- Ensure compliance with the ESA, NEPA and other applicable federal laws and regulations

2.2 PROPOSED ACTION

The proposed action is issuance of an ITP by the U.S. Fish and Wildlife Service (Service) pursuant to the provisions of Section 10(a)(1)(B) of the ESA, which would authorize the incidental take of the federally endangered Indiana bat resulting from the operation of Fowler Phases I, II, III and IV.

Under Section 10 of the ESA, applicants may be authorized, through issuance of an ITP, to conduct activities that may result in take of a listed species, as long as the take is incidental to, and not the purpose of, otherwise lawful activities.

The purpose of the section 10(a)(1)(B) permit is to ensure that any incidental taking that might occur will be minimized and mitigated to the maximum extent practicable and will not appreciably reduce the likelihood of the survival and recovery of this species in the wild. The proposed permit term is 22 years[6].

The submission of the ESA section 10(a)(1)(B) permit application requires the development of an HCP designed to ensure the continued existence and aid in the recovery of the listed species, while allowing for any limited, incidental take of the species that might occur during the operation of the project. The implementing regulations for section 10(a)(1)(B) of the ESA, as provided at 50 C.F.R. 17.22, specify the requirements and issuance criteria for obtaining an ITP.

The Service will analyze the impacts of the proposed covered activities on all elements of the natural and human environment that could be affected, including other wildlife species that occur within the covered lands. Consistent with Service guidance, it will also consider among

[6] Since release of the DEIS, the ITP term length changed from 22 years to 21 years. Substantive changes to the DEIS resulting from the reduction in permit term length are included in Appendix J of this FEIS.

other things, the effectiveness of the adaptive management strategy in reducing impacts to migratory birds and other bat species.

2.3 NEED FOR THE PROPOSED ACTION

Section 9 of the ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered (16 U.S.C. 1538). Under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation (50 C.F.R. 17.31). Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1532(19)).

The 1982 amendments to the ESA established a provision in Section 10 that allows for "incidental take" of endangered and threatened species or wildlife by non-Federal entities (16 U.S.C. 1539). Incidental take is defined by the ESA regulations as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 CFR 17.3). Under Section 10 of the ESA, the Secretary of the Interior and Secretary of Commerce may, where appropriate, authorize the taking of federally listed fish or wildlife if such taking occurs incidentally to otherwise legal activities. The Service was charged with regulating the incidental taking of listed species under its jurisdiction.

The need for the proposed action (i.e., issuance of an ITP) is based on the finding of two dead Indiana bats at the facility in 2009 and 2010, and the potential that future operation of the FRWF could result in take of the Indiana bat.

2.4 DECISIONS TO BE MADE BY RESPONSIBLE OFFICIALS

The Service must decide whether to issue or deny the proposed ITP. The issuance criteria for an ITP are contained in Section 10(a)(2)(B) of the ESA and the implementing regulations for the ESA (50 C.F.R. 17.22(b)(2) and 17.32(b)(2)). The four Companies identified in Section 1.1 as the Applicant will jointly serve as permittees under the ITP, and are jointly and severally liable for all obligations assigned to them under the ITP, HCP and associated documents. An ITP shall be issued to Fowler Ridge if the Service makes the following determination with respect to Fowler Ridge's ITP application (USFWS and NMFS 1996):

(1) The take will be incidental to otherwise lawful activities.

(2) The Applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.

(3) The Applicant will ensure that adequate funding for the HCP and procedures to deal with unforeseen circumstances will be provided.

(4) The taking will not appreciably reduce the likelihood of the survival and recovery of the Indiana bat in the wild.

(5) The Applicant will ensure that other measures that the Service may require as being necessary or appropriate will be provided.

(6) The Service has received such other assurances as may be required that the HCP will be implemented.

In addition to these necessary HCP elements, the Five-Point Policy (65 Fed. Reg. 35241-35257; June 1, 2000), an addendum to the *Habitat Conservation Planning Handbook* (USFWS and NMFS 1996), describes five clarifying components that should be included in an HCP:

(1) Biological Goals and Objectives – Biological goals are the broad guiding principles for the operating conservation program of the HCP and provide the rationale behind the minimization and mitigation strategies. Objectives describe the desired outcome of the plan and are described in terms of measurable targets for achieving the biological goals.

(2) Adaptive Management – Adaptive management is an integrated method of addressing uncertainty over time. Adaptive management provides flexibility in the conservation program to examine alternative strategies for achieving the goals and objectives.

(3) Monitoring – Monitoring is a mandatory element of an HCP under the Five-Point Policy. The monitoring plan must identify how compliance with the HCP will be evaluated, identify how biological goals and objectives will be met, and provide information that will inform the adaptive management strategy.

(4) Permit Duration – HCPs should clearly define the desired duration the permit will be in effect and discuss the factors considered in determining the length of the permit.

(5) Public Participation – The Five-Point Policy expanded the public comment period for most HCPs from 30 days to 60 days, with the exception of large-scale, regional, or exceptionally complex HCP's where the comment period was extended to 90 days.

Further, the Service's regulations require that, "Upon receiving an application completed in accordance with paragraph (a)(1) of this section, the Director will decide whether or not a permit should be issued. In making this decision, the Director shall consider, in addition to the general criteria in §13.21(b) of this subchapter, the following factors: (i) Whether the purpose for which the permit is required is adequate to justify removing from the wild or otherwise changing the status of the wildlife sought to be covered by the permit; (ii) The probable direct and indirect effect which issuing the permit would have on the wild populations of the wildlife sought to be covered by the permit; (iii) Whether the permit, if issued, would in any way, directly or indirectly, conflict with any known program intended to enhance the survival probabilities of the population from which the wildlife sought to be covered by the permit was or would be removed; (iv) Whether the purpose for which the permit is required would be likely to reduce the threat of extinction facing the species of wildlife sought to be covered by the permit; (v) The opinions or views of scientists or other persons or organizations having expertise concerning the wildlife or other matters germane to the application; and (vi) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application" (50 C.F.R. 17.22, 17.32).

3.0 ALTERNATIVES

NEPA requires that the environmental documents prepared for a proposed action discuss alternatives. Therefore, this chapter describes the alternatives considered in the EIS relevant to the proposed action (i.e., issuance of an ITP by the Service pursuant to the provisions of Section 10(a)(1)(B) of the ESA). The alternatives were developed to address the potential for take of Indiana bats, and as such, are primarily operational alternatives relating to the dates and times of operation and changes in cut-in speed (i.e., the wind speed at which turbines begin generating power and sending it to the grid). The alternatives do not address other aspects of Fowler Ridge Wind Farm (FRWF) Phase IV, such as turbine siting, because:

(1) No suitable Indiana bat summer habitat is found within the FRWF Phase IV project area; and,

(2) At present, the only proven mechanism to reduce mortality of migrating bats is operational adjustment of wind turbines.

3.1 ALTERNATIVES

3.1.1 Development of Alternatives

On May 25, 2011, the Service published a NOI to prepare a draft EIS for the Fowler Ridge Project in the Federal Register to solicit participation of responsible federal, state, and local agencies, Tribes, and the public in determining the scope of this EIS. Publication and distribution of the NOI initiated the process of public scoping for this EIS (Appendix A). A public scoping meeting was held on June 7, 2011, in Fowler, Indiana, and a Service website[7] was created to provide agencies and the public with information related to the project. The scoping period extended until June 23, 2011.

On June 2, 2011, a scoping letter was sent via e-mail to state and federal agencies and NGOs. In addition, a public notice was published in the Indianapolis Star newspaper, press releases were issued to local radio stations and flyers announcing the public scoping meeting were posted at public gathering sites in Benton County (e.g., grocery stores, gas stations/convenience stores, public library). Notification was given that comments could be submitted through the U.S. Postal Service, by facsimile, or through the Service website. No additional alternatives were developed as a result of comments received during the scoping period.

The Service developed eight action alternatives and a No Action Alternative. Five action alternatives were dismissed and not carried forward for detailed analysis. These alternatives, along with the reasons for dismissal, are discussed in Section 3.1.3. Four alternatives were carried forward for detailed analysis, including a 3.5 m/s Cut-in Speed (Feathered) Alternative, a 5.0 m/s Cut-in Speed Alternative (Applicant Proposed Action), a 6.5 m/s Cut-In Speed Alternative, and a No Action Alternative.

[7] http://www.fws.gov/midwest/Endangered/permits/hcp/r3hcps.html

Each alternative carried forward for detailed analysis is evaluated in the EIS to determine:

(1) If the alternative meets the purpose and need identified in Chapter 2 of this EIS;

(2) The impacts to the natural and human environment; and

(3) That implementation of the alternative is feasible from a legal, regulatory, and project financial standpoint.

3.1.2 Alternatives Carried Forward for Detailed Analysis

Each of the alternatives discussed below would include construction of Phase IV (see Section 1.2.2) and operation of Phases I through IV of the FRWF. Available land use and land cover indicate that the FRWF project area is more than 95% agriculture and rural development, and therefore does not contain winter or summer habitat for Indiana bats. Based on an assessment of the project by the Service (see Service letter dated August 5, 2011; Appendix C), the Indiana bat is considered absent from the project area during the winter and the project area has a very low potential for spring and summer occurrence of Indiana bat.

Following the useful life of project facilities and infrastructure under any of the four alternatives discussed below, Fowler Ridge has the option to decommission the assets (see Section 1.2.4). While decommissioning actions are not likely to affect the Indiana bat, decommissioning of the project minimizes long term impacts (when compared with re-commissioning or re-powering the project) by removing turbines from the site and restoring the site to the existing land use and vegetation communities.

The Applicant will generate sufficient income each year through its routine operations over the 22-year life of the ITP to ensure that all costs associated with funding the conservation plan are included in its annual budget. The Applicant will provide funding assurance for an HCP in the form of a Surety acceptable to the Service (e.g., an escrow account, bond, or cash). Although the Applicant will have the ability to directly undertake all required actions described in an HCP, FRWF will establish a Surety into which the Applicant has indicated that it will make scheduled payments to reflect the levels of assurance. According to the Applicant, the Surety will be funded through a reduction and/or expenditure of a portion of the Applicant's' earned revenue. The Surety will provide funds for monitoring, mitigation, annual meetings, reporting, and contingencies for adaptive management and changed circumstances in advance of the time at which they are needed. The Surety will be administered by an independent financial institution and will contain sufficient funds to assure the Applicant's performance under an HCP.

3.1.2.1 *No Action Alternative*

Under the No Action Alternative, the Applicant would construct Phase IV and all 449 turbines would be shut down (i.e., non-operational) from sunset to sunrise from August 1 through October 15, the primary fall migratory period of the Indiana bat, each year during the operational life (22 years) of the FRWF.

Implementation of this alternative would be expected to result in complete avoidance of impacts to Indiana bats; therefore, an ITP pursuant to Section 10(a)(1)(B) of the ESA would not be necessary and no permit would be issued for the existing phases of the FRWF or the future Fowler IV. In addition, no HCP would be prepared and the Indiana bat would not have the conservation benefits (e.g., mitigation) afforded to it through development and implementation of an HCP. Fowler Ridge would commit to implementing the FRWF Bird and Bat Conservation

Strategy (BBCS) as part of this alternative to reduce the potential for impacts to migratory birds and bat species (Appendix D).

3.1.2.2 *3.5 m/s Cut-In Speed (Feathered) Alternative*

Under the 3.5 m/s Cut-In Speed (Feathered)[8] Alternative, an HCP would be prepared and an ITP pursuant to Section 10(a)(1)(B) of the ESA would be issued for the take of Indiana bat during the fall season (August 1 to October 15) at the three existing phases of the FRWF and the future Fowler IV. Fowler Ridge would commit to implementing the FRWF BBCS as part of this alternative to reduce the potential for impacts to migratory birds and bat species (Appendix D).

The 3.5 m/s Cut-In Speed (Feathered) Alternative includes implementation of an HCP to avoid, minimize, mitigate, and monitor take of Indiana bats, in accordance with Section 10 of the ESA. The HCP would contain the following measures designed to avoid, minimize, mitigate, and monitor take of Indiana bats as a result of the FRWF project:

(1) Minimization through Project Operations – Fowler Ridge would minimize potential take of Indiana bats from operations of the project by adjusting the turbine operational parameters so that the rotation of the turbine rotors below the 3.5 m/s cut-in wind speed is minimized (i.e., the blades are "feathered"). Feathering of turbine blades below the 3.5 m/s cut-in wind speed would be implemented on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise time weekly, from August 1 to October 15 annually.

    In addition to feathering turbines below 3.5 m/s, Fowler Ridge would implement an adaptive management plan that includes adjusting cut-in speeds in 0.5 m/s increments, if needed, to assure compliance with authorized take limits.

(2) Measures to Mitigate the Impact of Taking – Although feathering blades below the 3.5 m/s cut-in speed is anticipated to reduce take of Indiana bats, some level of unavoidable, incidental take may still occur. Therefore, Fowler Ridge would mitigate for the unavoidable impacts of the taking of Indiana bats by coordinating, funding, and monitoring the protection and restoration of both summer habitat and winter habitat (USFWS 2012a).

    Specifically, Fowler Ridge would:

    a. Preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County;

    b. Protect winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana.

    All mitigation measures follow guidance outlined in the *Bloomington Field Office Draft Indiana Bat (Myotis sodalis) Mitigation Guidance for Wind Energy Habitat Conservation Plans* provided by the USFWS Bloomington Field Office (BFO) (hereafter USFWS BFO Draft Mitigation Framework; USFWS 2012a). All proposed

[8] Feathering reduces the blade angle to the wind in order to slow or stop the turbine from spinning during wind conditions below the cut-in wind speed.

mitigation measures can be found in Chapter 5 of the HCP prepared for the 5.0 m/s Alternative.

(3) Monitoring and Adaptive Management – The monitoring program that would be implemented as part of the HCP would provide the information necessary to:

a. Assess ITP compliance

b. Assess project impacts

The monitoring program consists of two components: take limit compliance monitoring and mitigation effectiveness monitoring. The goal of take limit compliance monitoring is to ensure compliance with the terms of the ITP; whereas, the goal of mitigation effectiveness monitoring is to ensure the success of mitigation efforts at offsetting the impacts of unavoidable take of Indiana bats from the FRWF. Based on information derived from monitoring, adaptive management would be used to make modifications to the proposed minimization and mitigation measures, if they have been ineffective at meeting the biological goals and objectives of the HCP.

Details of the monitoring program, including a detailed discussion of the monitoring program and adaptive management, are found in Chapter 5 of the HCP prepared for the 5.0 m/s Alternative.

3.1.2.3 *5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)*

Under the 5.0 m/s Cut-In Speed Alternative, seasonal operational adjustments would be implemented, an HCP would be prepared, and an ITP pursuant to Section 10(a)(1)(B) of the ESA would be issued for the take of Indiana bat during the fall season (August 1 to October 15) at the three existing phases of the FRWF and the future Fowler IV. Fowler Ridge would commit to implementing the FRWF BBCS as part of this alternative to reduce the potential for impacts to migratory birds and bat species (Appendix D).

The 5.0 m/s Cut-In Speed Alternative includes implementation of an HCP to avoid, minimize, mitigate, and monitor take of Indiana bats, in accordance with Section 10 of the ESA. The HCP contains the following measures designed to avoid, minimize, mitigate, and monitor take of Indiana bats as a result of the FRWF project:

(1) Minimization through Project Operations – Fowler Ridge would minimize potential take of Indiana bats from operations of the project by implementing seasonal turbine operational adjustments. Based on the reduced number of overall bat fatalities and lack of Indiana bat fatalities found during the spring and summer compared to the fall during three years of monitoring, the Service has determined the risk to Indiana bats at the FRWF occurs during the fall. Because take of Indiana bats is expected to occur only during the fall migration season and Indiana bat fatalities are not expected during the spring migration, summer maternity, or winter seasons (see Section 4.1.1.2 in HCP), no operational adjustments would be made during the spring migration, the summer maternity season or after October 15.

For the term of the ITP (22 years), Fowler Ridge will:

a. Raise the turbine cut-in speed to 5.0 m/s on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually. As discussed in Chapter 4 of the HCP and documented in

Appendix A and D of the HCP, Indiana bat fatalities are not expected during spring migration, summer or after October 15.

b. Adjust the turbine operations parameters so that the rotation of the turbine rotors below cut-in wind speed is minimized (i.e., the blades are "feathered"). Feathering of turbine blades below cut-in wind speed would be implemented on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually. Turbines will be monitored and controlled based on wind speed on an individual basis (i.e., the entire facility will not alter cut-in speed at the same time, rather operational changes will be based on wind speed conditions specific to each turbine). It is expected that turbines will begin operating under normal conditions when the 5 to 10 minute rolling average wind speed is above 5.0 m/s; turbines will be feathered again if the 5 to 10 minute rolling average wind speed goes below 5.0 m/s during the course of the night.

The only exception to feathering turbines below a cut-in speed of 5.0 m/s would occur on nights when temperatures are below 50˚ F from August 1 to October 15. Turbines would be allowed to operate at full capacity when temperatures are below 50˚ F. Turbines would be monitored and controlled based on temperature on an individual basis (i.e., the entire facility would not alter cut-in speed at the same time, rather operational changes would be based on temperature conditions specific to each turbine). It is expected that turbines would begin operating under normal conditions when the 5 to 10 minute rolling average temperature drops below 50˚ F; raised cut-in speeds would be resumed if the 5 to 10 minute rolling average temperature goes to 50˚ F or above during the course of the night.

In addition to raising cut-in speeds to 5.0 m/s and feathering turbines below this cut-in speed, Fowler Ridge would implement an adaptive management plan that includes adjusting cut-in speeds in 0.5 m/s increments, if needed, to assure compliance with authorized take limits. The adaptive management plan is described in detail in Section 5.5.1.1 of the HCP.

(2) Measures to Mitigate the Impact of Taking - As described above, Fowler Ridge would implement operational practices that are expected to reduce take of Indiana bats. However, some level of unavoidable, incidental take may still occur. Therefore, Fowler Ridge would mitigate for the unavoidable impacts of the taking of Indiana bats by coordinating, funding, and monitoring the protection and restoration of both summer habitat and winter habitat (USFWS 2012a).

Specifically, Fowler Ridge would:

a. Preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County;

b. Protect winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana.

Mitigation measures follow guidance outlined in the USFWS BFO Draft Mitigation Framework (USFWS 2012a). All proposed mitigation measures can be found in Chapter 5 of the HCP.

(3) Monitoring and Adaptive Management – The monitoring program that would be implemented as part of the HCP would provide the information necessary to:

a. Assess ITP compliance

b. Assess project impacts

c. Verify progress towards meeting the biological goals and objectives identified in Section 5.1 of the HCP.

The monitoring program consists of two components: take limit compliance monitoring and mitigation effectiveness monitoring. The goal of take limit compliance monitoring is to ensure compliance with the terms of the ITP; whereas, the goal of mitigation effectiveness monitoring is to ensure the success of mitigation efforts at offsetting the impacts of unavoidable take of Indiana bats from the FRWF. Based on information derived from monitoring, adaptive management would be used to make modifications to the proposed minimization and mitigation measures, if they have been ineffective at meeting the biological goals and objectives of the HCP.

Details of the monitoring program, including a detailed discussion of the monitoring program and adaptive management, are found in Chapter 5 of the HCP.

3.1.2.4 *6.5 m/s Cut-In Speed Alternative*

Under the 6.5 m/s Cut-In Speed Alternative, seasonal operational adjustments would be implemented, an HCP would be prepared, and an ITP pursuant to Section 10(a)(1)(B) of the ESA would be issued for the existing phases of the FRWF and the future Fowler IV. Fowler Ridge would commit to implementing the FRWF BBCS as part of this alternative to reduce the potential for impacts to migratory birds and bat species (Appendix D).

The 6.5 m/s Cut-In Speed Alternative includes implementation of an HCP to avoid, minimize, mitigate, and monitor take of Indiana bats, in accordance with Section 10 of the ESA. The HCP contains the following types of measures designed to avoid, minimize, mitigate, and monitor take of Indiana bats as a result of the FRWF project:

(1) Minimization through Project Operations – Fowler Ridge would minimize potential take of Indiana bats from operations of the project by implementing seasonal turbine operational adjustments. Based on the reduced number of overall bat fatalities and lack of Indiana bat fatalities found during the spring and summer compared to the fall during three years of monitoring, the Service has determined the risk to Indiana bats at the FRWF occurs during the fall. Because take of Indiana bats is expected to occur only during the fall migration season and Indiana bat fatalities are not expected during the spring migration, summer maternity, or winter seasons (see Section 4.1.1.2 in HCP), no operational adjustments would be made during the spring migration, the summer maternity season or after October 15.

For the term of the ITP (22 years), Fowler Ridge would:

a. Raise the turbine cut-in speed to 6.5 m/s on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually. As discussed in Chapter 4 of the HCP and documented in Appendix A and D of the HCP, Indiana bat fatalities are not expected during spring migration, summer or after October 15.

b. Adjust the turbine operations parameters so that the rotation of the turbine rotors below cut-in wind speed is minimized (i.e., the blades are "feathered"). Feathering of turbine blades below cut-in wind speed would be implemented on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually. Turbines would be monitored and controlled based on wind speed on an individual basis (i.e., the entire facility will not alter cut-in speed at the same time, rather operational changes would be based on wind speed conditions specific to each turbine). It is expected that turbines would begin operating under normal conditions when the 5 to 10 minute rolling average wind speed is above 6.5 m/s; turbines would be feathered again if the 5 to 10 minute rolling average wind speed goes below 6.5 m/s during the course of the night.

The only exception to feathering turbines below a cut-in speed of 6.5 m/s would occur on nights when temperatures are below 50˚ F from August 1 to October 15. Turbines would be allowed to operate at full capacity when temperatures are below 50˚ F. Turbines would be monitored and controlled based on temperature on an individual basis (i.e., the entire facility would not alter cut-in speed at the same time, rather operational changes would be based on temperature conditions specific to each turbine). It is expected that turbines would begin operating under normal conditions when the 5 to 10 minute rolling average temperature drops below 50˚ F; raised cut-in speeds would be resumed if the 5 to 10 minute rolling average temperature goes to 50˚ F or above during the course of the night.

In addition to raising cut-in speeds to 6.5 m/s and feathering turbines below this cut-in speed, FRWF would implement an adaptive management plan that includes adjusting cut-in speeds in 0.5 m/s increments, if needed, to assure compliance with authorized take limits.

(2) Measures to Mitigate the Impact of Taking - As described above, Fowler Ridge would implement operational practices that are expected to reduce take of Indiana bats. However, some level of unavoidable, incidental take may still occur. Therefore, Fowler Ridge would mitigate for the unavoidable impacts of the taking of Indiana bats by coordinating, funding, and monitoring the protection and restoration of both summer habitat and winter habitat (USFWS 2012a).

Specifically, Fowler Ridge would:

a. Preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County;

b. Protect winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana.

Mitigation measures follow guidance outlined in the USFWS BFO Draft Mitigation Framework (USFWS 2012a). All proposed mitigation measures can be found in Chapter 5 of the HCP prepared for the 5.0 m/s Alternative.

(3) Monitoring and Adaptive Management – The monitoring program that would be implemented as part of the HCP would provide the information necessary to:

a. Assess ITP compliance

b. Assess project impacts

The monitoring program consists of two components: take limit compliance monitoring and mitigation effectiveness monitoring. The goal of take limit compliance monitoring is to ensure compliance with the terms of the ITP; whereas, the goal of mitigation effectiveness monitoring is to ensure the success of mitigation efforts at offsetting the impacts of unavoidable take of Indiana bats from the FRWF. Based on information derived from monitoring, adaptive management would be used to make modifications to the proposed minimization and mitigation measures, if they have been ineffective at meeting the biological goals and objectives of the HCP.

Details of the monitoring program, including a detailed discussion of the monitoring program and adaptive management, are found in Chapter 5 of the HCP prepared for the 5.0 m/s Alternative.

3.1.3 Alternatives Considered and Dismissed

The following alternatives were considered but dismissed from consideration:

3.1.3.1 *No Operational Adjustment Alternative*

Under the No Operational Adjustment Alternative, all four phases of the FRWF project would operate year-round without restriction (i.e., no curtailment or time-of-year restrictions). An ITP would not be issued for the existing three phases of the FRWF or the future Fowler IV. Under this alternative, the Applicant would not have coverage for incidental take of the Indiana bat and would be at risk of violation of Section 9 of the ESA. No HCP would be prepared; therefore, the Indiana bat would not have the protections or the conservation benefits (e.g., mitigation) afforded to it through development and implementation of an HCP. In addition, the FRWF BBCS would not be implemented.

The No Operational Adjustment Alternative was dismissed from consideration because it does not meet the purpose and need identified in Chapter 2 for the following reasons:

(1) It would not protect, conserve, or enhance the Indiana bat and its habitat in the FRWF project area for the continuing benefit of the people of the United States.

(2) It would not provide a means, nor does it take steps, to conserve the ecosystems depended upon by the Indiana bat.

(3) Because the Indiana bat would not be protected under the measures set forth in an HCP, this alternative would not ensure that the project will not appreciably reduce the likelihood of the survival and recovery of the Indiana bat in the wild through protection and management of the species and its habitat within the context of the FRWF.

In addition, because take of two Indiana bats has already occurred at the FRWF and future take is likely to occur, the No Operational Adjustment Alternative was determined by the Service to not be a feasible alternative from a legal and regulatory standpoint for FRWF even though other commercial wind facilities in Indiana, which have not documented take of Indiana bats, continue to operate without an ITP.

3.1.3.2 *Reduced Incidental Take Permit Length Alternative*

Under the Reduced Incidental Take Permit Length Alternative, seasonal operational adjustments would be the same as described for the 5.0 m/s Cut-In Speed Alternative (see Section 3.1.2.3), an HCP would be prepared as described in Section 3.1.2.3, and an ITP pursuant to Section 10(a)(1)(B) of the ESA would be issued for the existing phases of the FRWF and the future Fowler IV. However, under this alternative, the ITP permit term would be reduced to five years to allow the Service to review the effectiveness of operational adjustments and mitigation measures at five year intervals and to make necessary changes if circumstances warrant.

This alternative was dismissed from consideration because the conservation benefits of a longer permit term length were determined by the Service in the case of FRWF to outweigh the additional certainty provided by shorter permit length. Specifically, those conservation benefits are more mitigation, and more certainty regarding the outcome of the mitigation because FRWF is committed to longer term monitoring of required mitigation projects.

The Service recognizes that there can be significant uncertainty, particularly with respect to the effects of White Nose Syndrome (WNS) and climate change on Indiana bats under longer term permits. In the case of FRWF, however, the requested permit term is 22 years, which is at the shorter end of the continuum of the life of wind development projects. More important, however, are the provisions built into the HCP that are based on data collected during three years of intensive on-site, post-construction monitoring and research at FRWF Phases I - III. During Years 2010 and 2011, this research was conducted in close cooperation with the Service under a scientific research permit. In cooperation with the Service, the Applicant tested and replicated multiple parameters at FRWF Phases I – III including various cut-in speed treatments, monitoring protocols, atmospheric variables, and others (see Appendix A of the HCP for post-construction monitoring reports). Data from post-construction monitoring in 2009, 2010, and 2011 were utilized during preparation of the HCP. The Service concluded that collection and analysis of these data have limited the uncertainty associated with a longer permit term.

Related to the collection of multiple years of post-construction data are the components built into the HCP using these data and designed specifically to address uncertainty over a longer permit term. These fall into three categories: the monitoring program (evaluated and refined between 2009 and 2011); adaptive management (informed by post-construction monitoring, particularly with respect to weather variables and their effect on migrating bats); and changed circumstances, which addresses both WNS and the potential effects of climate change on Indiana bats. The Service expects these aspects of the HCP to allow the Applicant and the Service to quickly identify when changes to the conservation program are needed, and to respond to new data that may become available regarding Indiana bat populations or new mechanisms for reducing bat mortality, should they be developed.

3.1.3.3 *Reduced Number of Turbines Alternative*

Under the Reduced Number of Turbines Alternative, an HCP would be prepared and an ITP would be issued for FRWF Phases I – III (355 turbines), but would not include the proposed Phase IV (up to 94 turbines). It is assumed that the Applicant would still construct FRWF Phase IV; however, a separate HCP would be prepared for Phase IV and a separate ITP would be issued.

This alternative was dismissed from consideration because the Service believes the effects of Phases I - III and Phase IV are most efficiently and effectively analyzed within the context of a single HCP. Phase IV has been planned since Fowler Ridge initiated the HCP process, so the Applicant and the Service have had adequate time to consider it as part of an HCP encompassing all four phases of the FRWF. Because the proposed FRWF Phase IV is immediately adjacent to Phases I - III (see Figure 1.1) and the turbine types and sizes overlap with Phases I - III, the analytical process used to assess impacts for both are the same. The Service believes that the aforementioned data collected during post-construction monitoring of Phases I - III are also directly applicable to Phase IV and the Service concluded that there would be no qualitative difference in the conservation program relative to Phase IV. Finally, the cost of preparing a separate HCP for Phase IV concurrent with preparation of an HCP covering Phases I – III (Phase IV is scheduled for construction in 2014) would be burdensome to the Applicant and the Service. The Service therefore made the decision to consider all four phases a single complete project.

3.1.3.4 *Migratory Season Shutdown Alternative*

Under the Migratory Season Shutdown Alternative, all 449 turbines would be shut down (or curtailed) from sunset to sunrise from April 1 through May 15 in addition to curtailment during the fall migratory period from August 1 through October 15.

The Migratory Season Shutdown Alternative was dismissed from consideration because the Service concluded, based on post-construction mortality monitoring studies conducted at Fowler Phases I – III from 2009 – 2011, that operational adjustments (i.e., complete shutdowns or changes in cut-in speed) during the spring migratory period (April 1 – May 15) were not necessary because Indiana bat fatalities are not expected to occur during spring migration (see Service letter dated August 5, 2011 in Appendix C of the EIS and post-construction monitoring reports found in Appendix A of the HCP).

3.1.3.5 *Complete Shutdown Alternative*

Under the Complete Shutdown Alternative all 449 turbines would be shut down from sunset to sunrise from April 1 through October 15.

The Complete Shutdown Alternative was dismissed from consideration because the Service concluded, based on post-construction mortality monitoring studies conducted at Fowler Phases I – III from 2009 – 2011, and the absence of suitable Indiana bat summer habitat within the Fowler Ridge project area, that operational adjustments (i.e., complete shutdowns or changes in cut-in speed) during the spring migratory period (April 1 – May 15) and summer breeding period (May 16 – July 31) were not necessary because Indiana bat fatalities are not expected to occur during spring migration (see Service letter dated August 5, 2011; Appendix C), or the summer maternity season.

4.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions within the FRWF project area (Phases I, II, III and IV) and within Benton County where applicable. For the purposes of this chapter and Chapter 5 (Environmental Consequences), resources were assessed using different spatial extents depending on the character of the resource and the extent to which construction of Phase IV and operation of FRWF Phases I through IV may potentially affect the resource. This approach is consistent with the Service's regulations for implementing NEPA, which indicate that the scope of analysis is dependent on the extent of reasonably foreseeable Project-related impacts (USFWS 2003). The spatial extent used for the analysis of each resource in this chapter is noted at the beginning of the discussion of each resource. For the purposes of this EIS, "Project Area" refers to FRWF Phases I – IV, and "Phase IV" refers only to the proposed FRWF Phase IV project.

4.1 GEOLOGY AND SOILS

4.1.1 Scope of Analysis

This section describes the existing soil and geologic resources in the Project Area, including topography, bedrock features, and seismicity. The soils and geology analysis is based on information from online databases and documents produced by the following federal and state agencies: United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), United States Geological Survey (USGS), and IDNR.

4.1.2 Existing Conditions

4.1.2.1 *Geographical Setting*

The Project Area is a relatively homogeneous region in terms of its geographic characteristics. The region is relatively flat with open agricultural land interspersed with occasional intermittent drainage features and small population centers. There are no significant hills, ridges, or other areas of prominently elevated topography (Figure 4.1.2.1). Elevations in the Project Area range from approximately 725 feet to 900 feet.

The physiography and geology of the Project Area is the result of the most recent glacial period known as the Wisconsin Age that began about 70,000 years ago. Prior to the Wisconsin Age, Indiana had been glaciated twice, though the Wisconsin glacier can be credited with building topography in the northern region of Indiana. During the main advance about 21,000 years ago, the Wisconsin glacier covered two-thirds of the state. Numerous glacial advances and retreats resulted in moraine deposition and the formation of Indiana topography as it is known today. Benton County is part of the Tipton Till Plain. This till plain is an almost completely flat to gently rolling glacial plain. Although most of the till plain is featureless, several low, poorly developed, end moraines cross it. The glacial topography of the area is underlain by shale bedrock formed during the Devonian and Mississippian Ages about 20 to 60 million years ago (Gutschick 1966). Before glaciers deposited drift over the area, the landscape consisted of shale, sandstone, limestone, and dolomite bedrock. This bedrock is now covered by glacial deposits that are as much as 260 feet thick in places (Barnes 1989). No karst features are located in the Project Area.

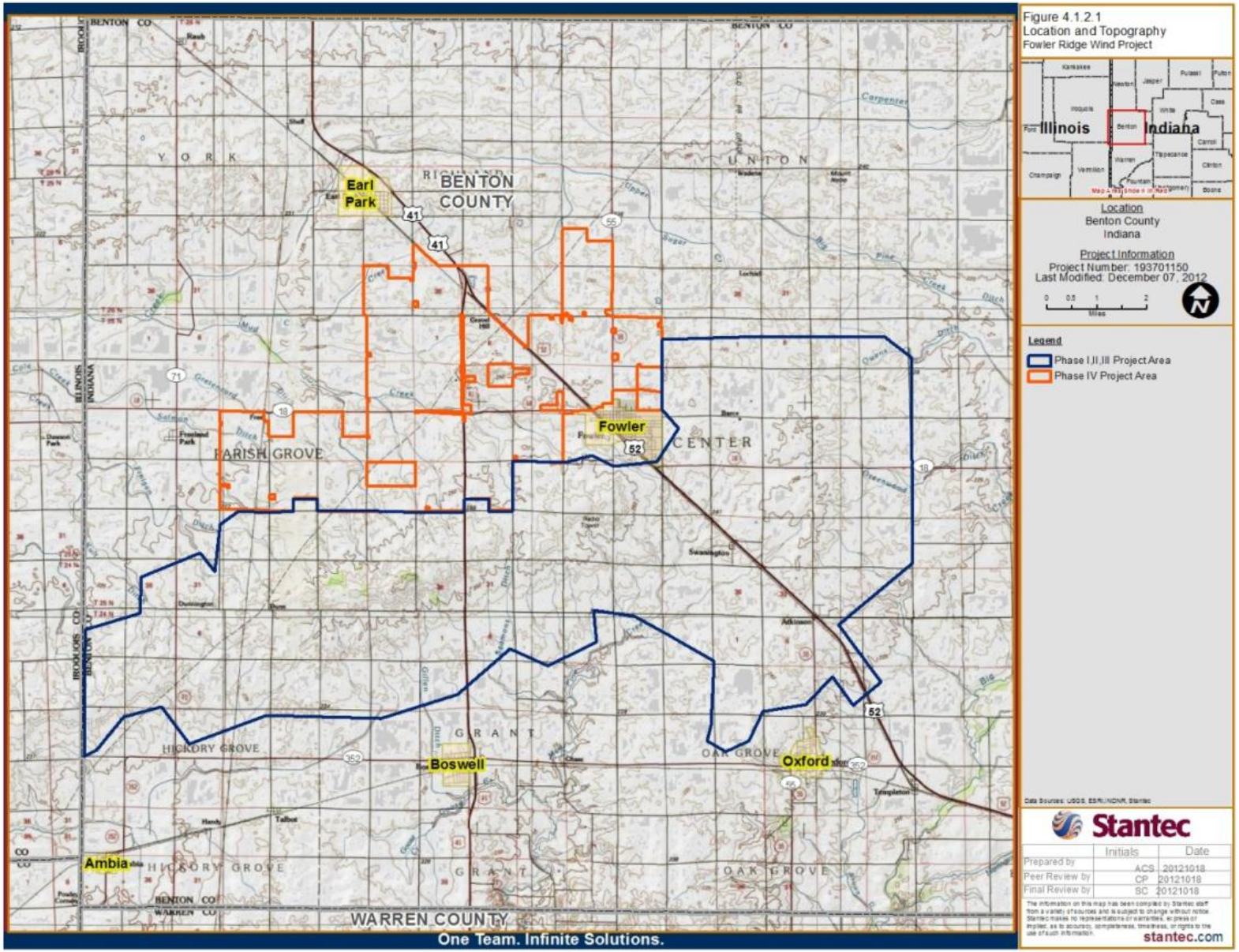


Figure 4.1.2.1
Location and Topography
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Miles
Legend
Phase I,II,III Project Area
Phase IV Project Area
Data Sources: USGS, ESRI/NDNR, Stantec
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
BENTON COUNTY
Earl Park
Fowler
Boswell
Oxford
Ambia
PARISH GROVE
CENTER
HICKORY GROVE
OAK GROVE
GRANT
WARREN COUNTY
One Team. Infinite Solutions.

According to the 2007 U.S. Census of Agriculture (the most recent data available), total farmland area in Benton County is approximately 270,810 acres, an increase of 9% from the total farmland area estimated in 2002. Natural habitats (i.e., not farmed), including woodlands, wetlands, streams and ponds, are also present. National Landcover Data (NCLD 2006) indicate cropland comprises approximately 93% of landcover within Benton County. Table 4.1 summarizes landcover within Benton County in comparison to the FRWF.

Table 4.1 Landcover type and amount as determined through analysis of National Landcover Data (NLCD 2006)

Landcover Type	Total Acreage (% of Total)		
	Benton County	FRWF Phases I, II and III	FRWF Phase IV
Agriculture (Cultivated Crops)	238,059 (91.6)	44,887.8.8 (92.8)	15,453.6 (93.7)
Developed/Barren Land	13,658.3 (5.3)	2,515.5 (5.2)	794.9 (4.8)
Pasture/Hay	4.604.4 (1.8)	694 (1.4)	202.4 (1.2)
Deciduous Forest	3,046.7 (1.2)	243.8 (0.5)	24.4 (0.15)
Grassland/Herbaceous	170.5 (0.07)	16.9 (0.3)	2.48 (0.02)
Wetland/Open Water	322.4 (0.12)	18.3 (0.04)	21.65 (0.13)
Total	**259,861.1**	**48,276.2**	**16499.5**

Four incorporated communities, Fowler, Boswell, Earl Park, and Oxford, are located within close proximity to the FRWF.

4.1.2.2 *Soils*

Benton County is found within the Grand Prairie Region of Indiana. According to the Soil Survey of Benton County (Barnes 1989), there are six soil associations in Benton County: Gilboa-Chalmers-Selma, Chalmers-Lisbon-Drummer, Drummer-Comfrey-Tippecanoe, Corwin-Odell-Chalmers, Montmorenci-Miami-Chalmers, and Odell-Montmorenci-Chalmers.

The soil types found in the Project Area are a product of the original parent materials deposited by the glaciers that covered the area 15,000 to 20,000 years ago. The main parent materials found in the county are glacier outwash and till, lacustrine material, alluvium, and organic materials that were left as the glaciers receded. The soils are a result of the interaction of physical and mineralogical composition of the parent materials with the physical, chemical, and biological variables found in the area (climate, plant and animal life) over time.

Table 4.2 contains information on these general soil associations and where within the general topography they may be found.

Table 4.2 Characteristics of General Soil Association Found within Benton County

Association	Description	Texture	Formation Process	Location
Drummer-Comfrey-Tippecanoe	Silt loam, silty clay loam, and clay loam	Fine	In silty deposits, outwash, and alluvium	On floodplains, outwash terraces, and outwash plains
Corwin-Odell-Chalmers	Silt loam, silty clay loam, and clay loam	Fine	In glacial till and in silty deposits	On end moraines
Gilboa-Chalmers-Selma	Silt loam, silty clay loam, and clay loam	Fine	In silty deposits, outwash, and glacial till	On end moraines and ground moraines
Chalmers-Lisbon-Drummer	Silty clay loam, silt loam	Fine	In loess and the underlying till and outwash	On till plains, moraines, outwash plains and stream terraces
Montmorenci-Miami-Chalmers	Silty clay loam, silt loam	Fine	In loess, silty material and the underlying loam till	On till plains, moraines,
Odell-Montmorenci-Chalmers	Silty clay loam, silt loam	Fine	In loess, silty material and the underlying loam till	On till plains, swells, moraines,

Source: Soil Survey of Benton County, Indiana [Barnes 1989)

4.2 LAND USE

4.2.1 Scope of Analysis

This section provides a discussion of current and future land use; state, regional, county, and municipal comprehensive plans and regulations; residential structures; agricultural programming; and recreation within Phase IV and the immediate surrounding area. The land use analysis in this EIS is based on publicly available state, regional, county, and municipal-level planning documents, as well as U.S. Census Bureau and USDA data.

4.2.2 Existing Conditions

4.2.2.1 *Land Use Planning and Zoning*

Benton County has drafted a Comprehensive Land Use Plan dated December 2006[9]. The plan is advisory in nature and outlines a vision for the County and the incorporated communities as expressed by the citizens through its vision statement, goals and objectives. The land use plan ensures that development is planned and serves local goals and objectives and future land resources and needs. Additionally, the plan aims to promote the health, safety, and general welfare of its citizens. The existing Comprehensive Land Use Plan map is shown on Figure 4.2.2.1.

A CUP is required and will be obtained prior to construction of Phase IV per Benton County's Wind Energy Siting Ordinance (See Section 1.3.13.1). A CUP is given to those projects that are not likely to be injurious to the use and enjoyment of other property in the immediate vicinity or impede the normal and orderly development and improvement of surrounding property for permitted uses (Benton County Zoning Code § 8-10(d)).

[9] http://ldm.agriculture.purdue.edu/Pages/Resources/PlanIN.html#LinksAdams

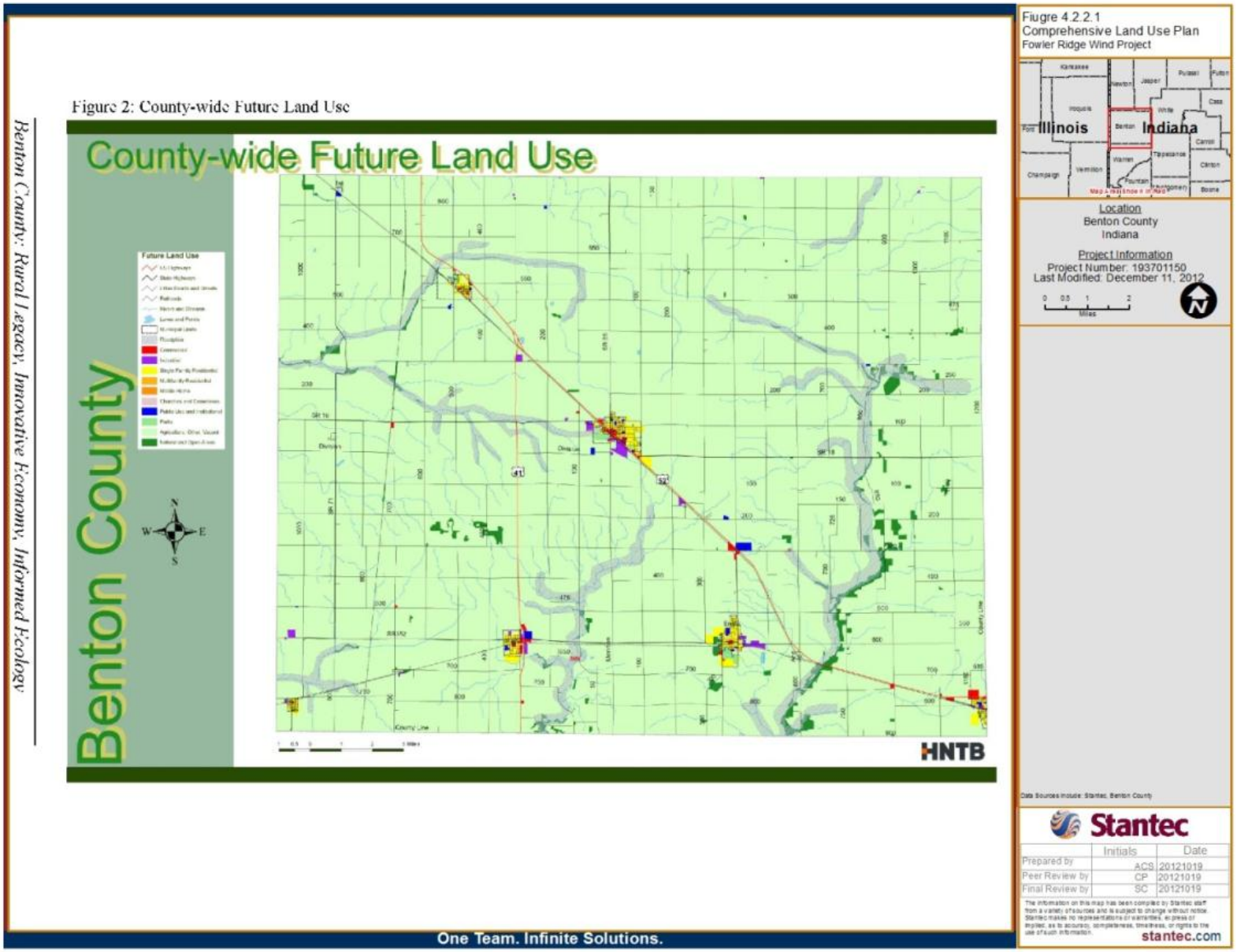


Figure 2: County-wide Future Land Use
County-wide Future Land Use
Benton County
Benton County: Rural Legacy, Innovative Economy, Informed Ecology
Future Land Use
N
W
E
S
HNTB
One Team. Infinite Solutions.
Figure 4.2.2.1
Comprehensive Land Use Plan
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 11, 2012
Miles
Data Sources include: Stantec, Benton County
Stantec
Initials
Date
Prepared by
ACS
20121019
Peer Review by
CP
20121019
Final Review by
SC
20121019
stantec.com

4.2.2.2 *Agricultural Land Use*

Agricultural land use dominates the Project Area and is mainly comprised of corn and soybeans with minimal land devoted to large livestock (i.e., cattle and hogs). According to the 2007 U.S. Census of Agriculture[10], 97% of farm land in Benton County is used as cropland, with dominant crops being corn and soybeans.

Table 4.3 provides an agricultural profile of Benton County. From 2002 to 2007, the total number of farms remained relatively consistent, while the land in farms and the average farm size increased slightly. Substantial increases were seen with the estimated market value of the products sold and government payments received.

Prime farmland is one of several land types classified and recognized by the USDA. Prime farmland is land that is best suited for crops. The land is used for cultivation, pasture, woodland or other production, but it is not urban land or water areas. This type of land produces the highest yields with minimal inputs of energy and economic resources. Therefore, when possible, the optimal land use strategy places industrial and residential development on the marginal lands while keeping prime farmland available for production. Approximately 253,550 acres (greater than 97%) of farmland in Benton County meets prime farmland requirements (Barnes 1989).

Table 4.3 Benton County Agricultural Profile

	2002	2007	% Change
Number of Farms	394	399	+1
Land in Farms (acres)	247,998	270,810	+9
Average Size of Farm (acres)	629	679	+8
Crop Sales	N/A	$130,249,000 (94%)	--
Livestock Sales	N/A	$8,164,000 (6%)	--
Total Market Value of Products Sold	**$69,582,000**	**$138,413,000**	+99
Average Per Farm	$176,604	$346,900	+96
Government Payments	$3,236,000	$5,606,000	+73
Average Per Farm Receiving Payments	$10,858	$15,358	+41

Source: U.S. Census of Agriculture (2007)

Agricultural Preservation

Benton County contains land enrolled in the Conservation Reserve Program (CRP), managed by the Farm Service Agency (FSA) of the USDA. Farmers with land enrolled in the CRP can receive financial reimbursements for the withdrawal of farmland from production for conservation purposes. For Benton County, the average CRP rental payment was $174.94 per acre in fiscal year (FY) 2010, with 2,925 acres enrolled.[11]

[10] http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Indiana/index.asp
[11] http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-st

CRP's national policy allows the construction and operation of wind turbines on formally enrolled properties. County CRP Committees may approve up to 5 acres of wind-powered generation devices per CRP contract. Table 4.4 indicates the number of acres under contract in Benton County during the period from 2008 – 2011 and the average crop rental payments per acre for FY 2008 through 2010.[12]

Table 4.4 Conservation Reserve Program, Benton County, Indiana

	Acres within the Conservation Reserve Program[1]	Average Program Rental Payments ($ per Acre)[1]
FY 2008	2,956	163.24
FY 2009	2,850	170.12
FY 2010	2,925	173.94
FY 2011[2]	2,865	Not provided

[1] http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-st
[2] Average Rental Payments for FY 2011 (ending September 2012) were not available as of October 2012.

4.2.2.3 *Institutional Land Use*

Institutional development is predominately located in Fowler and typically includes schools, police and fire stations, and county government offices.

Two elementary schools are located in Fowler. Sacred Heart Elementary is a private elementary school located on Washington Avenue. Fowler Elementary School is a public school located on East 2nd Street. Two facilities serve preschool aged children: Steps in Faith Preschool located at the Ministry of Hope Wesleyan Church on North Grant Avenue and Sacred Heart Elementary (see above).

No additional pre-kindergarten through high school facilities are located within the Project Area. Additional preschool and elementary schools are located in the adjacent towns of Oxford and Boswell. Middle school and high school aged children in the county attend Benton Central located in Oxford.

The Fowler/Center Township fire department is a volunteer force of 24 personnel. The fire department is located on North Washington Avenue. The Fowler/Center Township department works in cooperation with other area fire departments within Fowler and surrounding countryside. The Benton County Sheriff is located on South Lincoln Avenue in Fowler.

The Benton County Courthouse is located in Fowler, which has been the county seat of Benton County since 1874.

[12] http://www.fsa.usda.gov/Internet/FSA_File/su41county.pdf

The Purdue Cooperative Extension Service, which offers educational material and programs in agriculture, horticulture, consumer and family science, is located on East Second Street in Fowler. The Benton County Public Library is located on North Van Buren Avenue in Fowler.

No hospitals are located in Fowler or within the project boundaries. The closest hospitals include: St. Vincent Williamsport Hospital, Inc. located approximately 27 miles south of Fowler in Williamsport, Indiana and Hoopeston Community Memorial Hospital located approximately 30 miles southwest of Fowler in Hoopeston, Illinois.

4.2.2.4 *Commercial/Industrial Land Use*

Commercial and industrial development in Benton County is generally found concentrated in Fowler's downtown central business district and surrounded by established residential neighborhoods. Business types in the central business district and throughout Fowler are generally mixed and include retail stores, service stores, grocery stores, manufacturing companies, health care providers, gas stations and convenience stores, restaurants, and agricultural service shops.

Major manufacturing employers include: Altivity Packaging (150 employees), Holscher Products (35 employees), Powell Systems (30 employees) and Slon Inc. (10 employees). Fowler's economy is based largely on manufacturing, retail trade, and educational services[13].

In addition to the manufacturing employers in Fowler, three wind farms have been, or are being, constructed in Benton County[14] (.2.2.4):

(1) FRWF Phases I, II and III currently employ 44 fulltime staff and 10 part-time staff. Start of construction for Phase IV is planned for 2014 with an estimated completion during the last quarter of 2014.

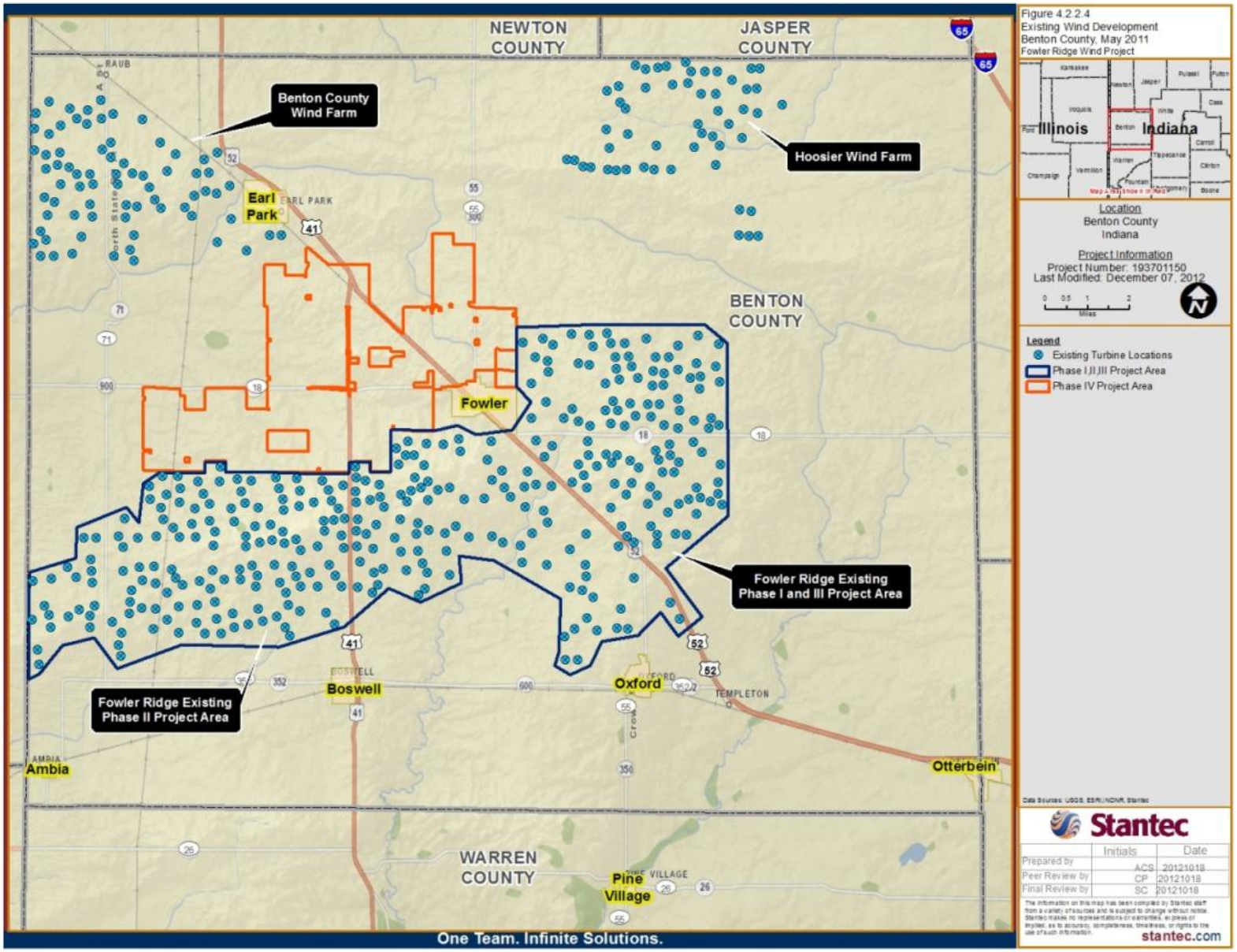
(2) Located approximately 1 mile north of Phase IV, the Benton County Wind Farm, developed by Orion Energy, has been approved for construction of up to 130 turbines. As of May 2011, 87 turbines (130 megawatt (MW)) were constructed. Thirteen people are employed at this site. No ITP was issued for operation of the Benton County Wind Farm.

(3) Located approximately 3 miles northeast of the FRWF, the Hoosier Wind Farm, developed by enXco, has been approved for 63 turbines (106 MW). As of December 2011, 53 turbines had been constructed. Eight people are employed at this site. No ITP was issued for the operation of the Hoosier Wind Farm.

4.2.2.5 *Residential Land Use*

Residential development is found primarily within and surrounding the incorporated towns in the county. This development is primarily single-family residential with scattered pockets of multi-family residential. Rural residential developments are located in various parts of the Project Area.

[13] http://www.city-data.com/city/Fowler-Indiana.html
[14] http://www.bentoncounty.in.gov/windfacts.php


NEWTON COUNTY
JASPER COUNTY
BENTON COUNTY
WARREN COUNTY
Benton County Wind Farm
Hoosier Wind Farm
Earl Park
Fowler
Boswell
Oxford
Ambia
Otterbein
Pine Village
Fowler Ridge Existing Phase I and III Project Area
Fowler Ridge Existing Phase II Project Area
One Team. Infinite Solutions.
Figure 4.2.2.4
Existing Wind Development
Benton County, May 2011
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Legend
Existing Turbine Locations
Phase I,II,III Project Area
Phase IV Project Area
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com

4.2.2.6 *Cemeteries*

There are no cemeteries within Phase IV; however, 3 cemeteries are located within one mile of the outermost project boundary. Two cemeteries are located within the town of Fowler, including: the Fowler Cemetery, located at 465 West Division Road and the Sacred Heart Cemetery, located at 480 West Division Road in Fowler. The Earl Park Cemetery is located south of the town of Earl Park and is approximately 1 mile north of the Phase IV Project Area.

4.2.2.7 *Public Use Lands*

Benton County offers a variety of recreational opportunities, including parks, golf courses, shopping and historic homes, buildings and small towns. Fowler Park, located within the city limits of Fowler, is owned by the town and managed by the Fowler Park Board. The 7.4 acre park is located on the west side of town and includes a four-acre man-made pond, park shelters, 250,000 gallon swimming pool, walking paths, sports fields, playground area and a skate park.

There are no federal, state, or county parks within the Project Area; however, other state lands are present (see Section 4.5.2.7).

4.2.2.8 *Wild and Scenic Rivers*

At present, no federally-designated Wild and Scenic Rivers are located in Indiana[15].

4.3 VEGETATION

4.3.1 Scope of Analysis

This section of the EIS describes vegetation within the Project Area. The description includes a spatial layout of cover types and details on botanical character and composition of habitats found in the Project Area. This section does not discuss rare, threatened, or endangered plant species: these species are discussed in Section 4.6 of this EIS. The vegetation analysis in this EIS is based on information from publicly available databases and documents through credible internet sources (e.g., USGS, USDA and IDNR).

4.3.2 Existing Conditions

A summary of landcover types within the Project Area is found in Table 4.1. North-central Indiana is within the mixed, mesophytic deciduous forest region of North America. In the 1800s, the forests in this area were predominantly oak/hickory and beech/maple associations. During the past century, most of the beech/maple associations have been converted to farmland because the soils that supported this forest community were among Indiana's better agricultural soils. In addition, when drainage lowered the water table, many lowland communities were cleared and cultivated.

Benton County is within the historic range of the Prairie Peninsula (Transeau 1935). Prior to 1860, prairies in the historic Peninsula were dominated by grass species such as big bluestem (*Andropogon gerardii)* and Indian grass (*Sorghastrum nutans)*, and included diverse layers of forbs, flowering shrubs, and other grasses (Williams 1981). Some grasses grew to more than 10

[15] http://www.rivers.gov/wildriverslist.html

feet (3 m) tall. The ecosystem was characterized by an annual fire regime, a thick topsoil layer rich in nitrogen, and sharp fluctuations in surface water and soil moisture content (Williams 1981). Farming and urban development, soil drainage, and introduction of non-native species have destroyed most of the historic tallgrass prairies in the Peninsula.

Common tree species in the region currently include white oak (*Quercus alba)*, shingle oak (*Quercus imbricaria)*, black oak (Quercus velutina), bur oak (*Quercus macrocarpa)*, northern red oak (*Quercus rubra)*, pignut hickory (*Carya glabra)*, shagbark hickory (*Carya ovate)*, shellbark hickory (*Carya laciniosa)*, mockernut hickory (*Carya tomentosa)*, American sycamore (*Platanus occidentalis)*, American elm (*Ulmus americana)*, hackberry (*Celtis occidentalis)*, green ash (*Fraxinus pennsylvanica)*, black gum (*Nyssa sylvatica)*, black cherry (*Prunus serotina)*, black walnut (*Juglans nigra)*, black willow (*Salix nigra)*, eastern cottonwood (*Populus deltoides)*, river birch (*Betula nigra)* and yellow-poplar (*Liriodendron tulipifera)*. Understory species found in the region include dogwood (*Cornus* sp.), sassafras (*Sassafras albidum)*, box elder (*Acer negundo)*, red mulberry (*Morus rubra*), and a variety of herbaceous species.

Some of the more common shrubs, herbaceous, weed and grass species found in the forest understory and along field edges and drainageways include the following: blackberry (*Rubus allegheniensis)*, honeysuckle (*Lonicera* sp.), clearweed (*Pilea pumila*), stinging nettle (*Urtica dioica*), foxtail (*Setaria* sp.), quackgrass (*Agropyron repens*), multiflora rose (*Rosa multiflora*), sedge species (*Carex* spp.), goldenrods (*Solidago* spp.), smartweed species (*Polygonum* spp.), buttonbush (*Cephalanthus occidentalis*), jewelweed (Impatiens pallida), ironweed (*Vernonia fasciculata*), annual and giant ragweed (*Ambrosia artemisiifolia* and *A. trifida*), bulrush (*Scirpus* sp.), rice cutgrass (*Leersia oryzoides*), moneywort (*Lysimachia nummularia*), cattail (*Typha* sp.), fescue (*Festuca* sp.), Joe-pye weed (*Eupatorium purpureum*), grape (*Vitis* sp.), boneset (*Eupatorium perfoliatum*), evening primrose (*Oenothera* sp), fleabane (*Erigeron* sp.), pokeweed (*Phytolacca americana*), Virginia creeper (*Parthenocissus quinquefolia*), poison-ivy (*Toxicodendron radicans*), broomsedge (*Andropogon virginicus*), Christmas fern (*Polystichum acrostichoides*), elderberry (*Sambucus canadensis*), and pawpaw (*Asimina triloba*).

4.4 WATER RESOURCES

4.4.1 Scope of Analysis

This section of the EIS describes the water resources within Phase IV; only construction of Phase IV would impact these resources. Water resources include groundwater and surface water. Groundwater is the subsurface hydrologic resource that is used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater is described in terms of depth to aquifer, aquifer or well capacity, and surrounding geologic composition. Surface water resources include watersheds, streams, wetlands, and floodplains.

The water resources analysis is based on information from publicly available online databases and/or documents produced by the following federal, state, and local agencies: USGS, Federal Environmental Management Agency (FEMA), USFWS, IDNR, and IDEM.

4.4.2 Existing Conditions

4.4.2.1 *Surface Water Resources*

Rivers and Streams

The USGS classifies watersheds by Hydrological Unit Codes (HUC), which include both a name and a series of numbers that are standardized based on the size of the stream. The Project Area lies within three HUC 8 watersheds (Figure 4.4.2.1-1):

(1) Iroquois Watershed HUC 07120002

(2) Middle Wabash-Little Vermilion Watershed HUC 05120108; and

(3) Vermilion Watershed HUC 05120109

Land use within each of these watersheds is predominantly agriculture (i.e., rowcrops).

Gretencord Ditch, Salmon Ditch, Minier Lateral, Sugar Creek, Mud Creek, Coon Creek, and their tributaries are found within Phase IV (Figure 4.4.2.1-2).

The natural hydrology of Phase IV has been drastically altered by extensive drainage tile systems and the construction of large regulated ditches to quickly and efficiently transport water away from agricultural fields. Many of the perennial and intermittent waterways are channelized agricultural ditches with grassed banks and few meanders. Some of the mapped intermittent waterways contain water only during rain events and are classified as grassy swales with no defined bed or bank, or are directed into an underground field tile system. The dominant substrates within these channels are mud, silt, and sand with a small amount of gravel.

The IDEM has not identified any waterbodies in Benton County as those having outstanding ecological, recreational, or scenic importance, and this includes those waterbodies in Phase IV[16].

Sugar Creek, located within Phase IV, is identified as a Category 5B on the IDEM 2008 303(d) List of Impaired Waterbodies approved by the U.S. EPA in 2008[17] (Figure 4.4.2.1-2). Category 5B indicates the water quality standard set forth by the U.S. EPA has not been attained due to the presence of mercury or PCBs, or both, in the edible tissue of fish collected from them at levels exceeding Indiana's human health criteria for these contaminants and due to the presence of *E. coli*.

[16] http://www.in.gov/dnr/water/2452.htm
[17] http://www.in.gov/idem/nps/2647.htm

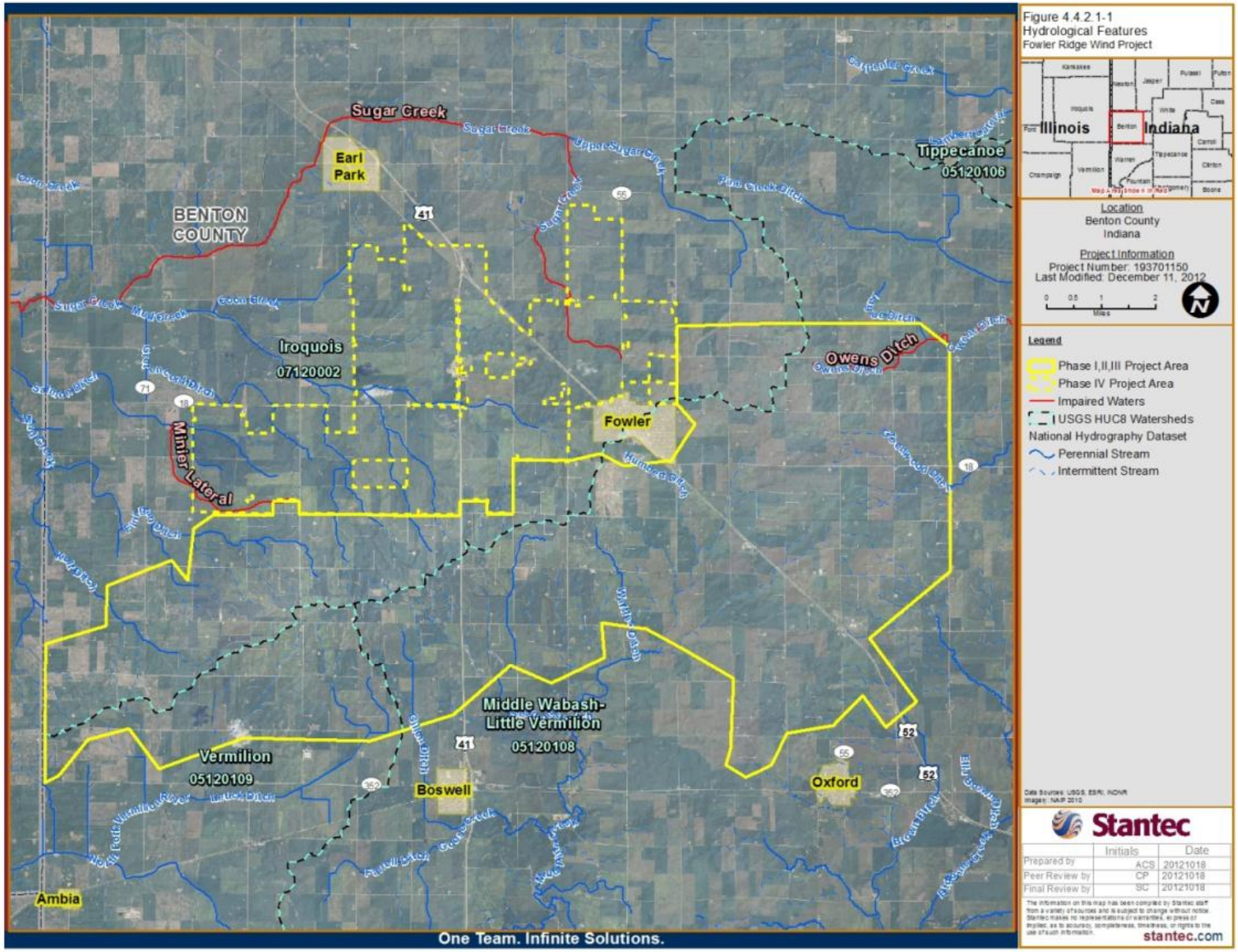
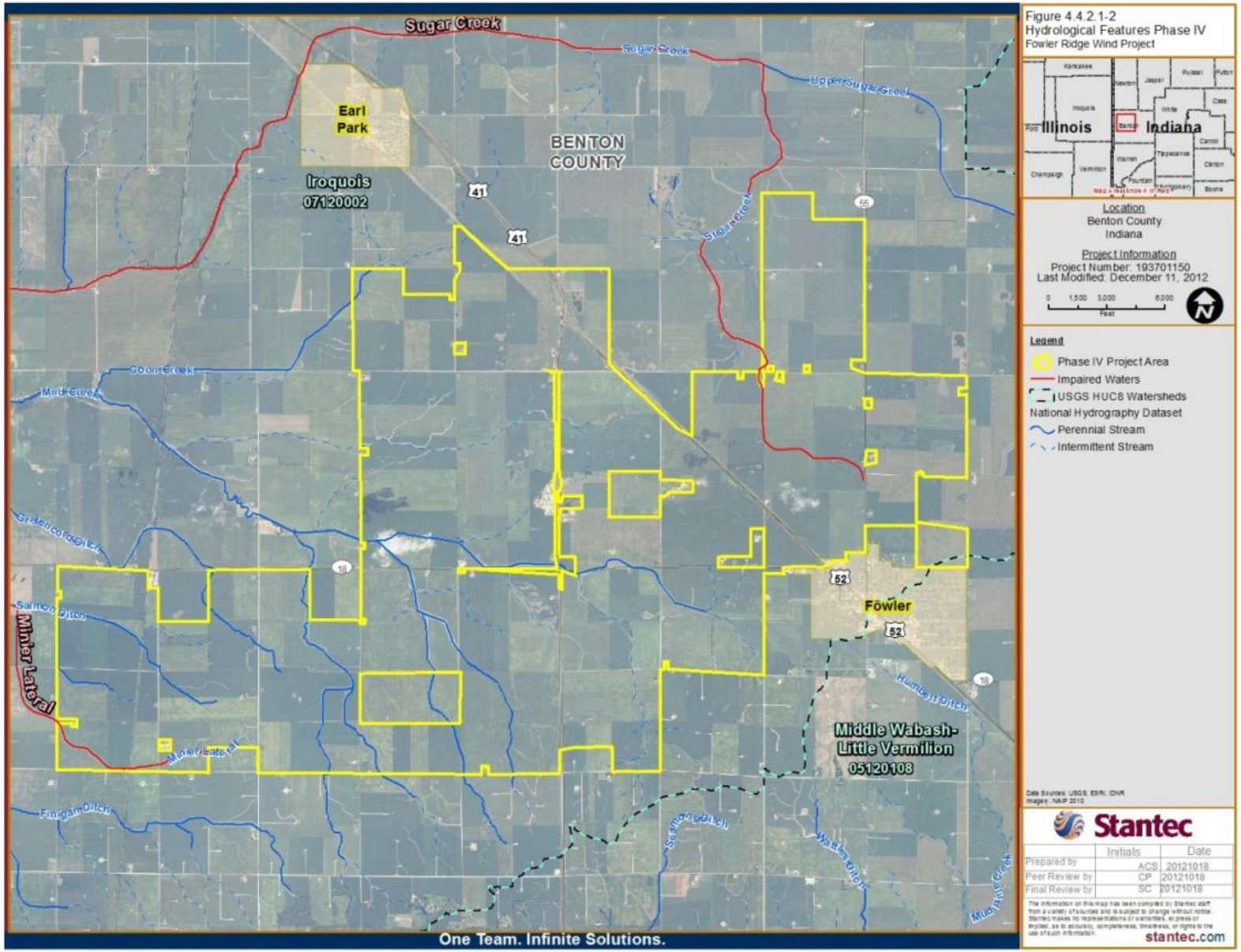


Figure 4.4.2.1-1
Hydrological Features
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 11, 2012
Legend
Phase I,II,III Project Area
Phase IV Project Area
Impaired Waters
USGS HUC8 Watersheds
National Hydrography Dataset
Perennial Stream
Intermittent Stream
Stantec
Prepared by
Peer Review by
Final Review by
stantec.com
Sugar Creek
Earl Park
BENTON COUNTY
Iroquois
07120002
Tippecanoe
05120106
Owens Ditch
Fowler
Miller Lateral
Middle Wabash-Little Vermilion
05120108
Vermilion
05120109
Boswell
Oxford
Ambia
One Team. Infinite Solutions.


Sugar Creek
Sugar Creek
Upper Sugar Creek
Earl Park
BENTON COUNTY
Iroquois
07120002
41
41
55
Sugar Creek
Coon Creek
Mud Creek
Greencorn Ditch
18
52
52
Fowler
18
Salmon Ditch
Miner Lateral
Miner Lateral
Humbert Ditch
Middle Wabash-Little Vermilion
05120108
Finigan Ditch
Sugar Creek Ditch
Watts Ditch
Mud Creek
One Team. Infinite Solutions.
Figure 4.4.2.1-2
Hydrological Features Phase IV
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 11, 2012
0 1,500 3,000 6,000
Feet
Legend
Phase IV Project Area
Impaired Waters
USGS HUC8 Watersheds
National Hydrography Dataset
Perennial Stream
Intermittent Stream
Stantec
Initials
Date
Prepared by ACS 20121018
Peer Review by CP 20121018
Final Review by SC 20121018
stantec.com

Lakes and Ponds

There are no named lakes or ponds within Phase IV. A large excavated pond, used for watershed management, is located east of the US Interstate 52/41 interchange. Fowler has a 4-acre man made pond located in Fowler Park on the west side of town. Farm ponds are found throughout Phase IV. These ponds are typically excavated, diked, or impounded shallow ponds used for livestock watering, recreational activities, or watershed management purposes, such as flood control and sediment retention. They occur in natural or excavated depressions, or as impoundments behind dikes near the headwaters of small streams, and may negatively impact these streams.

The ponds provide substantial watershed management functions both in and well beyond Phase IV. The ponds mitigate downstream flooding by catching and slowly releasing runoff from rainstorms. This controlled release also reduces soil erosion caused by high flows scouring drainageways. The ponds also improve water quality downstream by acting as retention ponds and settling basins for surface runoff from livestock operations and soil eroded from farmfields located upslope. In addition, they reduce nutrients, suspended solids and biological oxygen demand generated by livestock operations and agricultural runoff.

The ponds provide limited use for wildlife due to their highly managed condition and lack of vegetation for food and cover. The ponds may provide a drinking water source for upland species, such as white-tailed deer (*Odocoileus virginianus*), harbor fish populations, and provide habitat for certain common species of reptiles and amphibians.

4.4.2.2 *Wetlands*

Wetlands are found throughout Indiana. Historically, approximately 24% of the state was covered by wetlands[18]. Installation of subsurface tile drain networks, excavation of drainage channels, and straightening of streams has resulted in conversion of prairies and wetlands to agriculture. Today, only about 3.5% of wetlands remain[19]. Approximately 60 acres of wetland are identified on USFWS National Wetlands Inventory (NWI) maps within Phase IV ().

In 2011, Stantec Consulting Services conducted a desktop review and windshield survey to locate potential wetlands within Phase IV. This review and survey identified approximately 48.1 acres of potential wetland within the Phase IV area (Figure 4.4.2.2).

Classifications

A number of wetland classification systems exist. For regulatory purposes, the system most often used is the system developed by Cowardin et al. (1979) for the Service's NWI program. The typical wetland community types found within Phase IV include palustrine emergent, palustrine scrub-shrub/emergent, and palustrine forested wetlands. Cowardin et al. (1979) define these wetland plant communities as follows:

[18] http://www.in.gov/idem/4406.htm
[19] Ibid

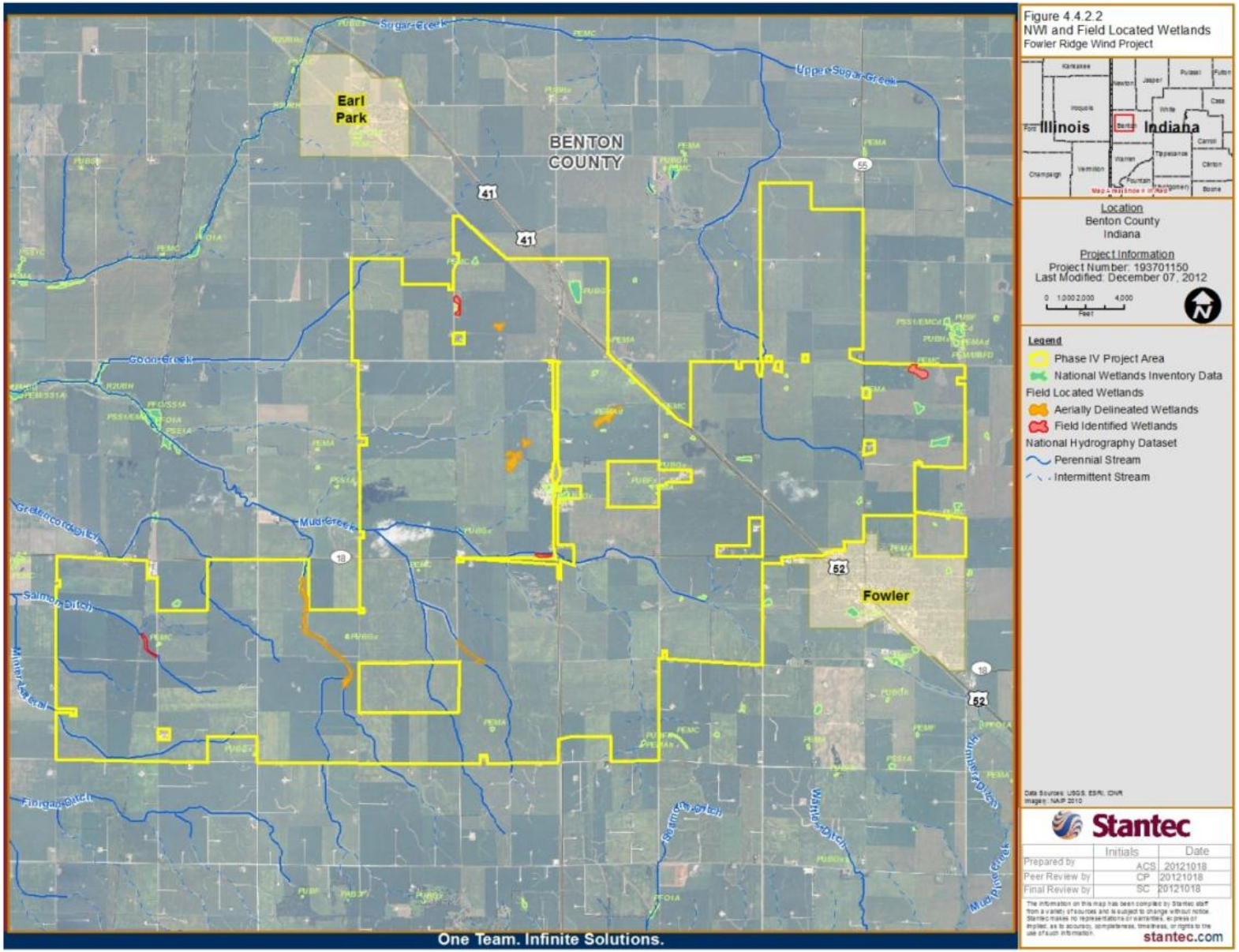


Figure 4.4.2.2
NWI and Field Located Wetlands
Fowler Ridge Wind Project
Earl Park
BENTON COUNTY
Fowler
Sugar Creek
Upper Sugar Creek
Coon Creek
Mud Creek
Salmon Ditch
Finnigan Ditch
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Legend
Phase IV Project Area
National Wetlands Inventory Data
Field Located Wetlands
Aerially Delineated Wetlands
Field Identified Wetlands
National Hydrography Dataset
Perennial Stream
Intermittent Stream
Stantec
Prepared by
Peer Review by
Final Review by
Initials
Date
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CP 20121018
SC 20121018
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Palustrine Emergent Wetlands – These wetlands are characterized by erect, rooted, herbaceous hydrophytic plants, such as cattails, bulrushes, and arrowhead (*Sagittaria latifolia).* The vegetation is present for most of the growing season in most years and dominated by perennial plants. Emergent wetlands may include shallow marshes, wet meadows, swales, and pond edges and are often found in the floodplain of larger streams and rivers. They provide water quality, erosion control, shoreline stability, wildlife habitat, recreation, hunting, food chain support, and ecosystem integrity functions.

Palustrine Scrub/Shrub Wetlands – These wetlands are dominated by woody vegetation less than 20 feet tall. Plants characteristic of scrub/shrub wetlands include: willows (*Salix* spp.), buttonbush, rose mallow (*Hibiscus laevis*), and spicebush (*Lindera benzoin)*. Scrub/shrub wetlands function primarily as wildlife habitat and are often associated with emergent wetlands.

Palustrine Forest Wetlands – Forested wetlands are dominated by trees that are more than 20 feet tall. Typically, forested wetlands include an understory of young trees or shrubs and an herbaceous layer. In Phase IV, these wetlands often are commonly located along the banks and within the floodplain of rivers and streams. These forested wetlands provide habitat and travel corridors for wildlife. In some areas, forested wetlands are the only remaining woodlands of substantial size. Forested wetlands primarily function as flood storage, bank stabilization, wildlife habitat and travel corridors, food chain support, recreation, and hunting.

Functions

Wetlands provide many important functions, including storm water retention, water quality improvement, aesthetics, recreation, shoreline protection, and habitat for wildlife. Specifically wetlands:

- Intercept runoff and store storm waters, thereby ameliorating sharp runoff peaks into slower discharges over a long period. In this way, wetlands reduce the damage that flooding may do to stream banks, farm fields and residences (Mitsch and Gosselink 2000).
- Remove organic and inorganic nutrients and toxic materials from the water that flows through them by reducing the velocity of runoff entering the wetland, allowing sediments to settle. This allows wetland vegetation to take up chemicals (e.g., fertilizer or livestock waste) from the sediments before the chemicals can enter the stream. When the wetland vegetation dies, the accumulated organic material may immobilize the chemicals (Mitsch and Gosselink 2000).
- Provide breeding and rearing grounds for fish, reptiles and amphibians; nesting areas for birds; and forage and cover for many species of wildlife.
- Provide protection for river and stream banks by reducing wave action produced by boat traffic, wind or currents.
- Serve as groundwater recharge and discharge locations.
- May be a valuable resource in meeting the demand for recreational uses such as hunting, camping, canoeing, hiking and nature study.

4.4.2.3 *Floodplain*

Phase IV consists of numerous small to large drainage basins. Large or small, every drainageway has a floodplain. However, not all floodplains are identified in available floodplain mapping for the local government. Where such studies have been completed, the focus of study

and mapping efforts is generally on the larger watersheds that have greater flooding impacts. For the majority of the Phase IV project area, floodplains have been significantly disturbed and converted to agricultural use.

FEMA has sponsored Flood Hazard Boundary maps for Benton County. These maps provide approximate floodplain boundaries on select reaches of the county's rivers and streams. Approximate floodplain limits do not provide detail as to specific flood elevations or discharge values along the mapped reach. Approximate floodplain delineations generally are created using historical information or empirical discharge/channel capacity ratings. Channel elevations and measurements are taken from the USGS 7.5-minute quadrangle topographic mapping or the best available mapping.

Floodplain designation generally is regarded as the natural limits of runoff inundation resultant from a designated 100-year flood. This is the area around streams and rivers that will be under water whenever a 100-year storm event occurs. The 100-year flood event is used to map floodplains for regulatory purposes. For floodplain conditions and impacts references in the EIS, the 100-year flood event is the referenced flood. No mapped 100-year floodplain is located within the FRWF Phase IV boundary (Figure 4.4.2.3).

"Floodway" is defined as the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to efficiently carry and discharge the peak flow of the regulatory flood of any river or stream. The floodway is the portion of the floodplain where the IDNR has jurisdiction based on the Indiana Flood Control Act. Many of these floodways have been delineated through studies performed for the National Flood Insurance Program. The floodway represents a part of the total floodplain or possibly the entire floodplain limit that must be kept free of encroachment so that the 100-year regulatory flood can be conveyed without substantial increase to flood heights. No mapped regulatory floodways are located within the FRWF Phase IV boundary (Figure 4.4.2.3).

4.4.2.4 *Groundwater and Drinking Water Supply*

Residents of Benton County are entirely dependent on groundwater for their water supply. The regional hydrogeology in the Project Area consists of two bedrock aquifer systems and five unconsolidated aquifer systems.

Bedrock wells represent approximately 50% of all wells completed in the county. The bedrock aquifer system consists of the Borden Group of Mississippian age and New Albany Shale of Devonian and Mississippian age. The Mississippian age Borden Group Aquifer System is composed mostly of siltstone and shale, but fine-grained sandstones are common. The New Albany Shale consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone.

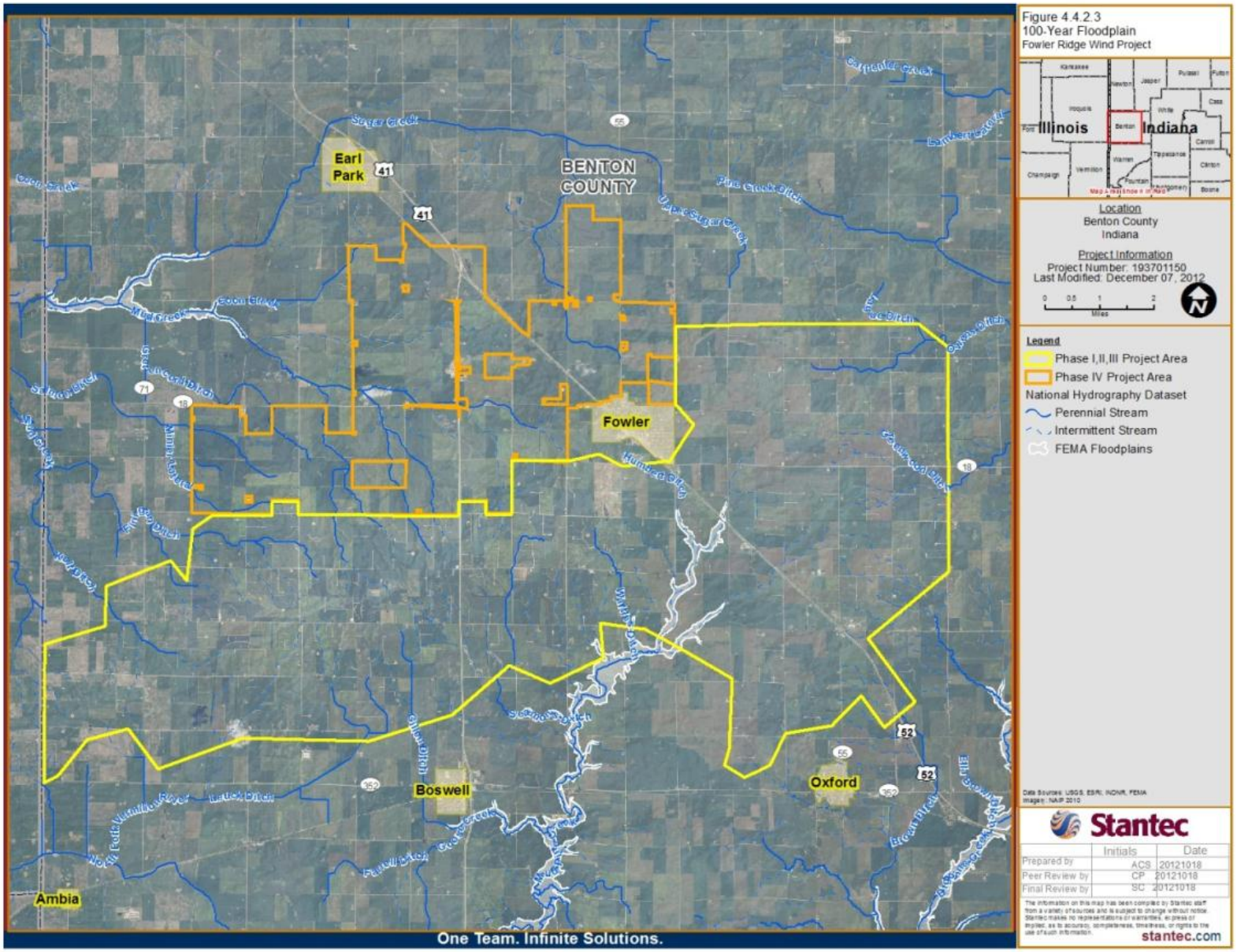
Figure 4.4.2.3
100-Year Floodplain
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Miles
Legend
Phase I,II,III Project Area
Phase IV Project Area
National Hydrography Dataset
Perennial Stream
Intermittent Stream
FEMA Floodplains
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
Earl Park
BENTON COUNTY
Fowler
Boswell
Oxford
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According to Fleming et al. (1995) five unconsolidated aquifer systems are mapped in Benton County: Till Veneer; Iroquois Basin; Iroquois Till; Iroquois Till Subsystem; and Iroquois Complex. The Till Veneer Aquifer System consists of areas where the unconsolidated material is predominantly thin till overlying bedrock. Along some of the major streams, this system also includes thin alluvium and surficial sand and gravel outwash deposits overlying shallow bedrock. The Till Veneer Aquifer System in Benton County is mapped in portions of the eastern half of the county. This system has the most limited ground-water resources of the unconsolidated aquifer systems in the county. There is little potential for ground-water production in this system in Benton County.

The Iroquois Basin Aquifer System in Benton County is mapped along most of the northwestern quarter of the county. Characteristics of this system generally consist of either thick clay deposits with thin intermittent sands and gravels that overlie shallow bedrock, or isolated surface sands with thin to no clay that directly overlie bedrock. Total thickness of these deposits ranges from about 10 feet to over 120 feet. This system is capable of meeting the needs of most domestic users and some high-capacity users in the county.

The Iroquois Till Aquifer System ranges from approximately 100 to 400 feet in thickness. Wells completed in this system are capable of meeting the needs of most domestic users in Benton County. However, approximately 40% of wells started in this system utilize the underlying bedrock aquifer. Saturated aquifer materials include sand and/or gravel deposits that are commonly 2 to 10 feet thick and are generally overlain by 40 to 100 feet of till. The Iroquois Till Aquifer Subsystem is mapped similar to the Iroquois Till Aquifer System; however, potential aquifer materials are typically thinner and potential yield is generally less in the subsystem. The unconsolidated material in the Iroquois Till Aquifer Subsystem ranges from about 50 to 200 feet thick. Potential aquifer materials include thin intratill sand and gravel deposits. This subsystem is capable of meeting the needs of some domestic users in the county.

The Iroquois Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Aquifers within the system range from thin to thick and include single or multiple intratill sands and gravels. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. The total unconsolidated thickness of the Iroquois Complex Aquifer System generally ranges from about 150 to 300 feet in Benton County. This system is capable of meeting the needs of domestic and most high-capacity users in the county.

The only sole-source aquifer in Indiana, the St. Joseph Aquifer at South Bend in northern Indiana, is not located within the Project Area.

4.5 WILDLIFE AND AQUATIC RESOURCES

4.5.1 Scope of Analysis

This section describes the existing wildlife and aquatic resources within the Project Area. This section does not discuss rare, threatened, or endangered wildlife species: these species are discussed in Section 4.6 of this EIS. The wildlife and aquatic resources analysis is based on data from site-specific biological surveys and standard biological literature for the region. In order to establish baseline information regarding wildlife use of the Project Area and to evaluate the potential impacts from construction and operation of FRWR, a number of wildlife studies were conducted (Johnson and Bay 2008; Carder et al. 2010; Johnson et al. 2010a, b; Good et al. 2011a, b, 2012) according to survey plans that were developed in coordination with IDNR

and USFWS, which are summarized in the following sections. A summary of the results of preconstruction bird and bat studies can be found in the FRWF BBCS (Appendix D), and detailed descriptions of post construction survey methods, results, and discussion can be found in the BBCS and HCP.

4.5.2 Existing Conditions

4.5.2.1 *Terrestrial Wildlife*

Greater than 90% of land within the Project Area is used for the production of cultivated crops. Less than 1% of the Project Area consists of woodlands. Therefore, the majority of the terrestrial wildlife found in the Project Area consists of generalist, edge species adapted to surviving in a highly agricultural environment. Although limited, woodlands may be used by common mammal species, such as white-tailed deer, raccoons (*Procyon lotor*) and squirrels (*Sciurus* spp.), for food and cover. Birds also may use the woodlots. Likely bird species include wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), hawks such as the red-tailed hawk (*Buteo jamaicensis*), owls such as the great horned owl (*Bubo virginianus*) and barred owl (*Strix varia*), American crow (*Corvus brachyrhynchos),* northern cardinal (*Cardinal cardinalis*), and red-winged blackbird (*Agelaius phoeniceus*). Other potential wildlife habitats include road ditches, edges of agricultural fields, and fencerows and hedgerows, all which provide more varied sources for food, cover, and nesting.

Wetlands and streams, although limited in the Project Area, are used by amphibians such as the American toad (*Anaxyrus americanus*) and northern leopard frog (*Lithobates pipiens*); reptiles such as the northern painted turtle (*Chrysemys picta*) and garter snake (*Thamnophis sirtalis*); and, waterfowl such as mallard (*Anas platyrhynchos*) and Canada goose (*Branta canadensis).* These species use these areas for breeding, food and cover, and serve as a water source for many species. Mammals, such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*) and mink (*Mustela vison*), may also use wetlands and streams for food and cover.

4.5.2.2 *Birds*

Neotropical migratory birds are those species in the Western Hemisphere that migrate north of the Tropic of Cancer (i.e., Nearctic or United States and Canada) to breed during the summer months and migrate south of that latitude to winter in Mexico, Central America, South America, or the Caribbean (Stangel 1992 as cited in Koford et al. 1994). Nearctic migrant birds migrate entirely within the Nearctic (Hayes 1995), often referred to as short-distance migrants.

Migratory birds are protected by the MBTA. Species protected under the MBTA include all species listed within 50 CFR 10.13. These include songbirds, raptors, ducks, waterbirds, and others[20]. The MBTA generally prohibits the taking (both intentional and unintentional) of migratory birds, the destruction or disturbance of migratory bird nests, or the disturbance of any eggs or young of migratory birds without prior authorization from the Service.

The Indiana Chapter of the Audubon Society designates Important Bird Areas (IBA) that provide essential habitat for one or more bird species. Audubon designated an IBA for migrating American golden-plovers (*Pluvialis dominica*) in Benton County in 2006 (Figure 4.Figure 4.5.2.2). The site is located immediately northeast of Phase IV and consists primarily of

[20] For a complete list of the birds protected, refer to http://www.fws.gov/migratorybirds/RegulationsPolicies /mbta/mbtintro.htm

the plovers use as migratory resting and feeding grounds. The American golden-plover is not currently listed as state- or federally threatened or endangered but is protected under the MBTA.

Birds Within the FRWF Project Area

Spring and fall fixed point avian use surveys, raptor nest surveys, and American golden-plover surveys were conducted in 2007, 2008 and 2009 within the Project Area (Johnson and Bay 2008; Carder et al. 2010). No federally-listed bird species were observed as part of the surveys (Johnson and Bay 2008; Carder et al. 2010). Two state-endangered bird species, northern harrier (*Circus cyaneus)* and upland sandpiper (*Bartramia longicauda)*, were observed as part of the avian use surveys.

A total of 46 species of birds, including a variety of shorebirds, passerines, doves and pigeons, waterfowl, raptors and other birds were identified during fixed point avian use surveys (Johnson and Bay 2008; Carder et al. 2010). Shorebirds observed included: American golden-plover, killdeer (*Charadrius vociferus*), least sandpiper (*Calidris minutilla)*, Wilson's snipe (*Gallinago delicata*), and white-rumped sandpiper (*Calidris fuscicollis)*. Passerines observed included: American crow, American goldfinch (*Carduelis tristis)*, American robin (*Turdus migratorius)*, barn swallow (*Hirundo rustica)*, blue jay (*Cyanocitta cristata)*, brown-headed cowbird (*Molothrus ater)*, chipping sparrow (*Spizella passerina)*, eastern meadowlark (*Sturnella magna)*, eastern phoebe (*Sayornis pheoebe)*, horned lark (*Eremophila alpestris)*, house finch (*Carpodacus mexicanus)*, indigo bunting (*Passerina cyanea)*, northern cardinal, red-winged blackbird, song sparrow (*Melospiza melodia*), and American tree sparrow (*Spizella arborea*).

A single bald eagle was observed during regular point-count surveys conducted in 2008 (Carder et al. 2010). In addition, two bald eagles were observed incidentally to post-construction surveys conducted at the site in 2011 (Good et al. 2012). Other raptors observed on-site included: Cooper's hawk (*Accipiter cooperii)*, sharp-shinned hawk (*Accipiter striatus*), red-tailed hawk, northern harrier, American kestrel (*Falco sparverius*), and osprey (*Pandion haliaetus)*. Waterfowl observed included: Canada goose, blue-winged teal (*Anas discors*), and mallard. Other birds observed included: American coot (*Fulica americana)*, turkey vulture (*Cathartes arua)*, mourning dove (*Zenaida macroura)*, belted kingfisher (*Ceryle alcyon)*, chimney swift (*Chaetura pelagica)*, northern flicker (*Colaptes auratus*), and northern flicker (*Colaptes auratus*).

A total of 18 additional species were observed incidentally within the Project Area: ring-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola)*, green-winged teal (*Anas crecca)*, wood duck (*Aix sponsa)*, pied-billed grebe (*Podilymbus podiceps)*, ruddy duck (*Oxyura jamaicensis)*, merlin (*Falco columbarius)*, northern shoveler (*Anas clypeata*), lesser yellowlegs (*Tringa flavipes)*, greater yellowlegs (*Tringa melanoleuca)*, great blue heron (*Ardea herodias)*, upland sandpiper, sandhill crane (*Grus canadensis)*, solitary sandpiper (*Tringa solitaria)*, spotted sandpiper (*Actitis macularia)*, black-bellied plover (*Pluvialis squatarola)*, rough-legged hawk (*Buteo lagopus)*, and common yellowthroat (*Geothlypis trichas)* (Johnson and Bay 2008; Carder et al. 2010).

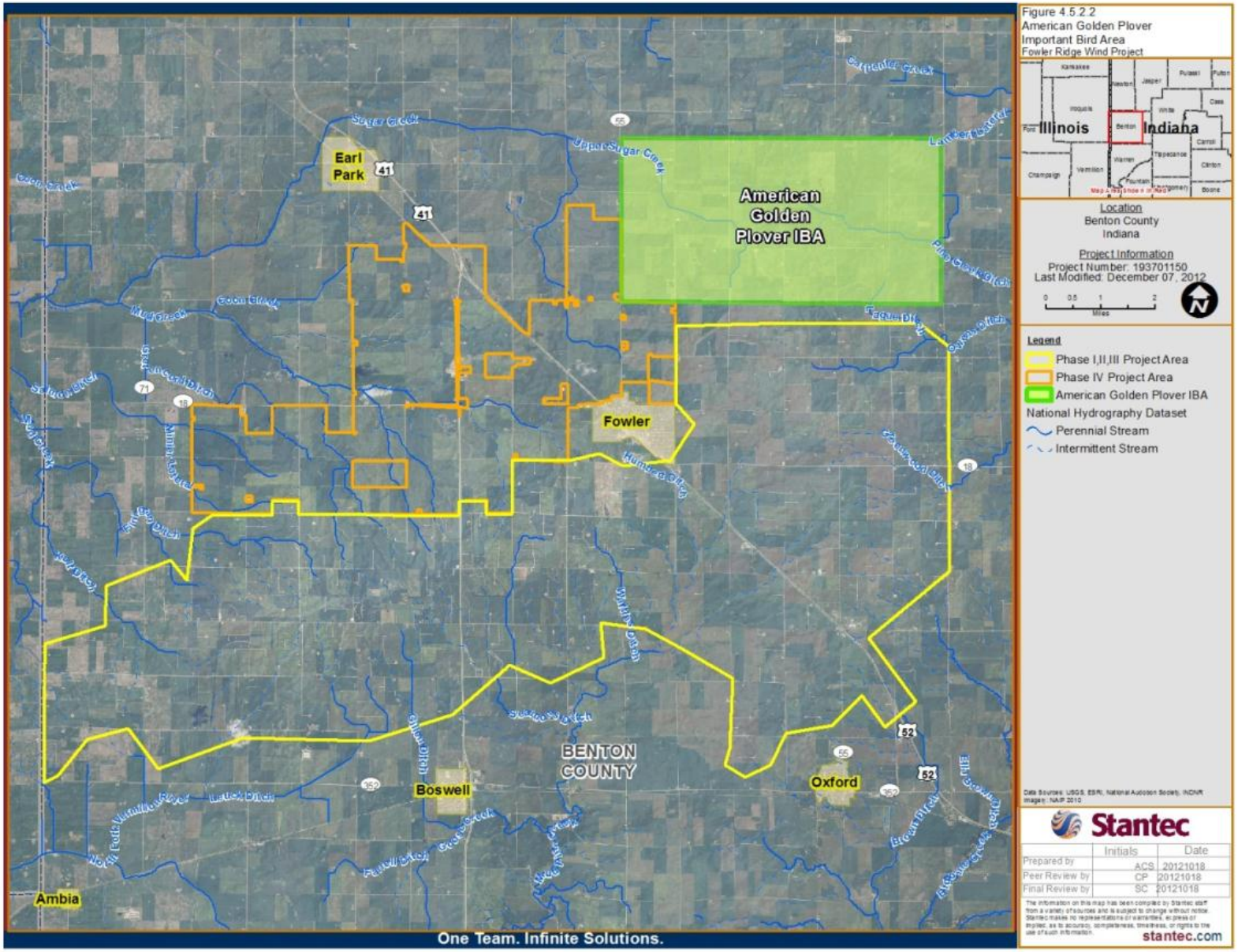
Figure 4.5.2.2
American Golden Plover
Important Bird Area
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Miles
Legend
Phase I,II,III Project Area
Phase IV Project Area
American Golden Plover IBA
National Hydrography Dataset
Perennial Stream
Intermittent Stream
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Final Review by
SC
20121018
stantec.com
American Golden Plover IBA
Earl Park
Fowler
Boswell
Oxford
Ambia
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The Project Area is located within the migration range of an experimental population of whooping cranes (*Rhus americana)*. This population, which currently consists of approximately 100 cranes, was reintroduced to the Midwest in 2001 and is listed as a non-essential, experimental population under the ESA. This designation relaxes the restrictions of the ESA and lessens possible conflicts between people and whooping crane conservation. The flock is still protected under the MBTA.

The Service listed the whooping crane as endangered June 2, 1970 (35 FR 8495). The Service's Whooping Crane Recovery Plan was developed and signed on January 23, 1980 (USFWS 1980). Revisions to the recovery plan were approved in 1986 and 1994. The third revision was approved on May 29, 2007 (72 FR 29544) (Canadian Wildlife Service (CWS) and USFWS 2007). Final ruling for designated critical habitat for the whooping crane was published on August 17, 1978 (43 FR 36588-36590). No critical habitat for the whooping crane is found within the Project Area.

Whooping cranes migrate twice annually, usually in small groups of one to three individuals (Armbruster 1990). Whooping cranes are diurnal (daytime) migrants and make temporary stopovers nightly, during periods of inclement weather, and for short periods of resting or foraging (Armbruster 1990). Temporary stopover habitat for whooping cranes consists primarily of palustrine wetlands (i.e., water depth < 6.6 feet) and riverine systems (Austin and Richert 2001). During migration, whooping cranes generally fly at altitudes between 1,000 and 6,000 feet; cranes fly at lower altitudes when starting or ending a migration flight, especially when thermal currents are minimal or when making brief mid-day stops to forage (USFWS 2009).

An ultralight aircraft was used to imprint birds of the reintroduced eastern population to migrate annually between breeding grounds at Necedah National Wildlife Refuge (NWR) in central Wisconsin and wintering grounds in west-central Florida. One of the stopover sites on this route was in Benton County until 2008. Although juvenile cranes are no longer being led through Indiana during migration, whooping cranes that were trained to fly through the state may continue to maintain their route. Whooping cranes migrating on their own have the potential to occur anywhere in Indiana and eastern Illinois (Johnson and Tidhar 2007).

Bird Mortality at the FRWF

FRWF has been conducting post-construction mortality surveys at FRWF since 2009. The survey data have provided information on the circumstances surrounding bird mortality at FRWF. The survey reports provide detailed discussions of the results of the post-construction mortality surveys (Johnson et al. 2010 a, b, Good et al. 2011a, 2012).

Three years of post-construction mortality surveys conducted from 2009 to 2011 found 168 bird carcasses of 34 identified species (Table 4.5).

Table 4.5 Bird carcasses found at FRWF during mortality surveys from 2009 to 2011, by species.

Species	Scientific Name	Total Carcasses
Killdeer	*Charadrius vociferus*	34
European starling	*Sturnus vulgaris*	12
Mourning dove	*Zenaida macroura*	10
Red-tailed hawk	*Buteo jamaicensis*	9
Golden-crowned kinglet	*Regulus satrapa*	7
Tennessee warbler	*Oreothlypis peregrina*	7
Cliff swallow	*Petrochelidon pyrrhonota*	5
Horned lark	*Eremophila alpestris*	5
Chimney swift	*Chaetura pelagica*	4
Nashville warbler	*Oreothlypis ruficapilla*	4
Red-eyed vireo	*Vireo olivaceus*	3
Rock pigeon	*Columbia livia*	3
Ruby-crowned kinglet	*Regulus calendula*	3
Tree swallow	*Tachycineta bicolor*	3
American redstart	*Setophaga ruticilla*	2
American robin	*Turdus migratorius*	2
Common yellowthroat	*Geothlypis trichas*	2
Ring-necked pheasant	*Phasianus colchicus*	2
Rough-legged hawk	*Buteo lagopus*	2
Ruby-throated hummingbird	*Archilochus colubris*	2
Yellow-throated vireo	*Vireo flavifrons*	2
Black-throated green warbler	*Setophaga virens*	1
Blue-winged teal	*Anas discors*	1
Brown-headed cowbird	*Molothrus ater*	1
Canada warbler	*Cardellina canadensis*	1
Common grackle	*Quiscalus quiscula*	1
Eastern kingbird	*Tyrannus tyrannus*	1
Green-winged teal	*Anas carolinensis*	1
House sparrow	*Passer domesticus*	1
House wren	*Troglodytes aedon*	1
Indigo bunting	*Passerina cyanea*	1
Pine warbler	*Setophaga pinus*	1
Red-winged blackbird	*Agelaius phoeniceus*	1
Yellow-rumped warbler	*Setophaga coronata*	1
Unidentified large bird		8
Unidentified bird		6
Unidentified duck		4
Unidentified passerine		3
Unidentified waterfowl		3
Unidentified bird (small)		2
Unidentified dove		2
Unidentified warbler		2
Unidentified kinglet		1
Unidentified sparrow		1
Total		**168**

During the three years of mortality surveys, no Indiana state listed or federally listed bird species were found. Additionally, no American golden plover fatalities were found.

4.5.2.3 *Bald and Golden Eagle*

On July 9, 2007, the Service announced that the bald eagle would be removed in the lower 48 states from the Federal List of Endangered and Threatened Wildlife (72 Fed.Reg. 37346-37372). The rule became effective on August 8, 2007. The bald eagle remains protected under the BGEPA.

Bald eagles are typically found associated with large, permanent water sources such as lakes, reservoirs, and major rivers. Important habitat components for bald eagles include an adequate food supply (primarily fish, but also waterfowl and other waterbirds, small mammals, and carrion), perching sites in large shoreline trees, and nesting sites in large, mature old-growth trees, dead trees, cliffs, and rock promontories.

Based on the 2011 draft guidance from the Service regarding Eagle Conservation Plans (ECP) (USFWS 2011a), Western EcoSystems Technologies, Inc. (WEST) conducted an eagle use assessment to identify the risk category most appropriate for the FRWF (Good and Simon 2011). The eagle use assessment included a review of data from pre-construction and post-construction bird surveys, as well as carcass monitoring studies conducted at the FRWF, a landscape-level summary of potential habitat for bald and golden eagles, proximity of known important eagle use areas as provided by the Service, and an overall summary of Risk Factors and Assignment of Risk Category in accordance with the 2011 draft guidance from the Service regarding ECPs (USFWS 2011a).

The Service defines important eagle use areas as “an eagle nest, foraging area or communal roost site that eagles rely on for breeding, sheltering or feeding and the landscape features surrounding such nests, foraging area or roost site that are essential for the continued viability of the site for breeding, feeding or sheltering eagles” (USFWS 2011a).

Bald eagles typically nest in forested areas adjacent to large bodies of water for foraging opportunities (Buehler 2000). The FRWF lacks primary bald eagle habitat in the form of mature forest and large, fish-bearing waters. Potential sites for bald eagles to nest and hunt are located outside of the FRWF along forested corridors of major rivers such as the Tippecanoe River (located approximately 25 miles east of the FRWF) and the Wabash River (located approximately 12 miles southeast of the FRWF). Some potential also exists for bald eagles to nest and hunt along Big Pine Creek (located approximately 5 miles east of the FRWF), which is a smaller creek with a forested riparian corridor and fish populations. No large, fish-bearing waters are present within the Project Area.

A single bald eagle was observed at the FRWF during regular point count surveys conducted in 2008 (Carder et al. 2010). In addition, two bald eagles were incidentally observed during post-construction surveys conducted at the site in 2011 (Good et al. 2012).

A database search for known bald eagle nests located within 10 miles of the FRWF boundary identified one nest within the 10-mile search area, but outside of the Project Area. This nest was recorded as active in 2009 and 2010 (Matt Stuber, USFWS, personal communication (March 4, 2011)). No bald eagle nests are known to occur within the FRWF Project Area (Matt

Stuber, USFWS, personal communication (March 4, 2011)). The Indiana nest information provided by the USFWS is current as of the end of the 2010 nesting season.

FRWF also lacks primary golden eagle habitat in the form of grasslands and other native habitats. No records of nesting golden eagles are known within the state of Indiana (Brock 2006). In addition, the project lacks potential winter and foraging habitat for golden eagles (Good and Simon 2011).

On April 25, 2011, Matt Sailor from the Service stated that there are no records of bald or golden eagle use within the FRWF or within the Illinois portion of the 10-mile buffer as of the 2009 nesting season, which is the most current data set the Service has for Illinois. The Service has records of bald eagle nests located along the Wabash River within 20 miles of the FRWF, with the closest nest reported as 12 miles away from the FRWF boundary.

4.5.2.4 *Bats*

Bats Within the FRWF Project Area

There are 12 species of bats that can occur in Indiana. Nine species, all members of the family Vespertilionidae, have geographic distributions that include Benton County (Simon et al. 2002; Whitaker and Mumford 2008). Of these, the Indiana bat is federally endangered and state endangered, and the evening bat (*Nycticeius humeralis)* is listed as state endangered. Six species, the little brown bat (*Myotis lucifugus)*, northern *myotis (Myotis septentrionalis)*, silver-haired bat (*Lasionycteris noctivagans*), red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and tri-colored bat (*Perimyotis subflavus)*, are listed as special concern species by the IDNR[21]. Of the nine species with potential to occur in the Project Area, only the big brown bat (*Eptesicus fuscus)* is not listed as either endangered or special concern.

All nine bat species use woodland habitat for feeding or roosting at some time during the year. In addition, many species of bats feed along stream corridors or over water. A limited number of narrow, linear tracts of woodland associated with stream corridors and small woodlots associated with farmsteads are found within the Project Area. These areas may, at times, provide potentially suitable foraging and roosting habitat for bats.

Limited information is available on how bats use agricultural areas in the Midwest; however, species such as the big brown and little brown bat will roost, and even overwinter, in attics or large buildings. The farmsteads located in the Project Area, with their farmhouses and large outbuildings, likely provide suitable roosting locations for species such as these. Likewise, buildings in the towns of Fowler, Oxford, Boswell, and Earl Park also likely provide suitable roosting and possibly overwintering sites for species such as the big brown and little brown bat.

WEST conducted pre-construction, ground-based bat acoustical surveys at the FRWF from August 15 through October 19, 2007 and from July 17 through October 15, 2008 (Gruver et al. 2007, Carder et al. 2009). The survey periods cover the time frame during which most bat mortality occurs at wind energy facilities throughout North America (Arnett et al. 2008). WEST installed three AnaBat® II bat detectors (Titley Electronics Pty Ltd., NSW, Australia) approximately 3.2 feet above the ground in habitat in the Project Area similar to that found at the

[21] http://www.in.gov/dnr/fishwild/files/fw-Indiana_Species_of_Greatest_Conservation_Need.pdf

turbine locations and programmed the detectors to record from 0.5 hour before sunset to 0.5 hour after sunrise. The results of these studies are presented in Table 4.6, below.

Table 4.6 Results of acoustic studies conducted at FRWF in 2007 and 2008

	Total calls	Calls/detector night	Percentage of calls		
2007	648	4.7	LF (<35 kHz)	HF (>35 kHz)	
			51%	49%	
2008	851	6.45	LF (<30 kHz)	MF (30-40 kHz)	HF (>40 kHz)
			47.4%	18.4%	34.2%

In 2007, bat activity peaked in late September and early October (Gruver et al. 2007). In 2008, bat activity was highest in early August with a second peak occurring from mid-August through early September (Carder et al. 2009). The high frequency (>35 kHz) calls recorded in 2007 may have included *Myotis* species but may also have consisted of several other bat species, including the common red bat, due to the broad classification. The high frequency (>40 kHz) calls recorded in 2008 were likely attributable to tri-colored bats and several *Myotis* bat species.

In 2010 and 2011, WEST conducted acoustic monitoring simultaneously with carcass searches to research the relationship between bat-use rates and mortality levels in the Project Area (Good et al. 2011a, 2012). WEST monitored bat activity at the base of four turbines that were searched daily from April 9 through May 14, 2010 (spring) and at reference sites. Bat activity was also monitored at turbine bases from August 1 through October 18, 2010 (fall). Bat activity was monitored at nacelle units on the four daily search turbines from August 17 through October 18, 2010 (fall). In 2011, bat activity was monitored at the base and the nacelle of four turbines from March 31 through May 15 (spring), and again at four turbines and two reference locations from July 14 through October 31 (fall). The three call frequency categories were defined using the same frequencies as were used in the 2008 study. The results of these studies are presented in Table 4.7 and Table 4.8, below.

Table 4.7 Average calls recorded during acoustic studies at FRWF in 2010 and 2011, by season and detector type

	Calls/detector night			
	Spring		Fall	
	Ground	Nacelle	Ground	Nacelle
2010	1.34 ± 0.29	-	11.46 ±1.29	3.10 ± 0.42
2011	2.57 ± 0.06	0.56 ± 0.02	16.72 ± 1.52	5.19 ± 0.59

Table 4.8 Percent composition by frequency category of calls recorded during acoustic studies at FRWF in 2010 and 2011, by season and detector type

	Percentage of calls								
	Spring			Fall					
				Ground			Nacelle		
	LF	MF	HF	LF	MF	HF	LF	MF	HF
2010	46.5%	28.1%	25.4%	52.9%	22.7%	24.3%	71.6 %	19.4%	9.0%
				LF		MF		HF	
2011	38.5%	39.8%	21.7%	45.5%		29.9%		24.6%	

In 2010, the highest periods of bat use occurred during the first two weeks of August, before the nacelle detectors were active. The highest period of bat use at the nacelle detectors occurred during the third and fourth weeks of August (the first weeks the detectors were active). In 2011, the highest period of bat use occurred during mid to late August.

Very few *Myotis* calls (15.6% of identifiable calls) were recorded during the course of the 2010 study; most of the 30 calls potentially resembling Indiana bat calls were recorded on August 9-10, at a reference station located away from the turbines. Observed bat casualty rates were found to be positively correlated with bat activity in WEST's analysis of the data, although other factors were also associated with increases in observed casualty rates, including lower mean wind speeds, higher mean temperatures, increasing variance in temperature, and increasing barometric pressure (Good et al. 2011a).

In 2011, *Myotis* species composed 0.2% of calls identified to species group, and no calls were identified as Indiana bat calls by WEST biologists. Assessment of the relationship between bat casualty rates, bat activity, and weather indicated that about 77% of all bat fatalities and 73% of all bat activity recorded by detectors on nacelles occurred when wind speeds were below 12.3 mph (5.5 m/s). WEST's study report concluded that wind speeds above certain thresholds greatly reduce the ability of bats to fly near nacelle height (Good et al. 2012).

Bat Mortality at the FRWF

The Applicant has been conducting post-construction mortality surveys at FRWF since 2009. The survey data have provided information on the circumstances surrounding bat activity in Benton County and bat mortality at FRWF and wind facilities in general. A detailed discussion of the results of the post-construction mortality surveys is found in the FRWF HCP.

Three years of post-construction mortality surveys conducted from 2009 to 2011, found 1,543 bat carcasses of 10 identified species (Table 4.9).

Table 4.9 Bat carcasses found at FRWF during mortality surveys from 2009 to 2011, by species

Species	Total Carcasses	Status
Eastern red bat	877	Special Concern
Silver-haired bat	235	Special Concern
Hoary bat	355	Special Concern
Big brown bat	52	--
Little brown bat	5	Special Concern
Tri-colored bat	3	Special Concern
Evening bat	4	State Endangered
Seminole bat	3	--
Indiana bat	2	Federal Endangered State Endangered
Northern Myotis	1	Special Concern
Unknown	6	N/A
Total	**1,543**	**--**

The FRWF is outside of the known range of the Seminole bat, which is typically a resident of the southern U.S. While few records of Seminole bats exist in Indiana, the species has occasionally been found outside of its range in other states, as well.

4.5.2.5 *Aquatic Wildlife*

There are no major rivers or lakes within or near the Project Area. There are a few perennial, intermittent, and ephemeral streams and several farm ponds in the Project Area. Common fish species found in some of the larger streams and farms ponds include largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), bluegill (*Lepomis macrochirus*), and crappie (*Pomoxis* spp.).

4.5.2.6 *State Wildlife Action Plan*

The Indiana Wildlife Diversity Section is responsible for the conservation and management of over 750 species of non-game and endangered wildlife across Indiana, representing more than 90% of the state's mammals, birds, fish, mussels, reptiles, and amphibians. According to the Indiana Comprehensive Wildlife Strategy, over 270 species are listed as Species of Greatest Conservation Need (SGCN)[22], including 22 mammals, 40 birds, 28 reptiles and amphibians, and 25 fish. Some of these species include badger (*Taxidea taxus)*, bobcat (*Lynx rufus),* barn owl (*Tyto alba)*, common nighthawk (*Chordeiles minor)*, hoary bat, eastern red bat, silver-haired bat, northern leopard frog, river otter (*Lontra canadensis)*, and sandhill crane.

4.5.2.7 *Natural and Conservancy Areas*

Four natural and conservancy areas, including privately-owned lands where known, are found within the Project Area. According to IDNR Division of Fish and Wildlife, three Gamebird Habitat Areas (GHA) are located within the Project Area[23] (Figure 4.5.2.7). These areas are owned and managed by IDNR to maintain gamebird habitat for bobwhite quail (*Colinus*

[22] http://www.in.gov/dnr/fishwild/files/fw-Indiana_Species_of_Greatest_Conservation_Need.pdf
[23] http://www.indianamap.org/data.html

virginianus), ring-necked pheasant, ruffed grouse (*Bonasa umbellus*), and wild turkey. Properties under this program are open to the public but contain certain restrictions. The Watland Gamebird Habitat Area is approximately 142 acres and located in the central portion of the Phase IV (Figure 4.5.2.7).

4.6 RARE, THREATENED AND ENDANGERED SPECIES

4.6.1 Scope of Analysis

This section considers plant and animal species that are federally-listed as threatened, endangered, candidate, proposed, and species of concern or state-listed as threatened, endangered or special concern. Because most wildlife is mobile and would be able to move around within and outside the four project phases, this analysis includes those species that could potentially occur within the Project Area and the surrounding vicinity. Information collected or reviewed for this analysis includes USFWS correspondence with FRWF and the IDNR's Natural Heritage Database[24].

4.6.2 Existing Conditions

4.6.2.1 *Federally-Listed Species*

The Service, in their letter dated October 13, 2006 (Appendix C), indicated the proposed project is within the known range of the following species:

- Indiana Bat (*Myotis sodalis)* – Endangered (also Indiana state-listed Endangered)
- Bald Eagle (*Haliaeetus leucocephalus)* – Not Currently Listed[25] (see Section 4.5.2.3)
- Whooping Crane (*Rhus americana)* – Non-Essential, Experimental Population

Indiana Bat

The Service listed the Indiana bat as endangered on March 11, 1967 (32 FR 4001). The Service's Indiana Bat Recovery Plan was first developed and signed on October 14, 1983 (USFWS 1983). An agency draft of the Revised Recovery Plan was released in March 1999 (USFWS 1999). The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision was made available for public comment on April 16, 2007 (72 FR 19015-19016; USFWS 2007).

The Applicant coordinated with the Service prior to construction of Phases I, II, and III. In a letter dated September 10, 2007 (Appendix C), the Service indicated there was very little habitat for the Indiana bat within the Project Area. However, the Service indicated several summer records of Indiana bats were known from Tippecanoe and Warren counties, located immediately adjacent to Benton County, along Mud Pine Creek, Big Pine Creek, and Little Pine Creek. Of these areas, the Service was most concerned about Big Pine Creek, where there are Indiana bat records within three miles downstream of a transmission line (Appendix C) that was constructed concurrent with the first three phases of the FRWF. Additionally, it was noted in an October 13, 2006 letter from the Service that spring and fall migration routes for Indiana bats could include areas of Benton County (Appendix C).

[24] http://www.in.gov/dnr/naturepreserve/files/np_benton.pdf
[25] Listed as threatened at the time of the October 13, 2006 letter; however, this species was removed from the federal list in 2007.

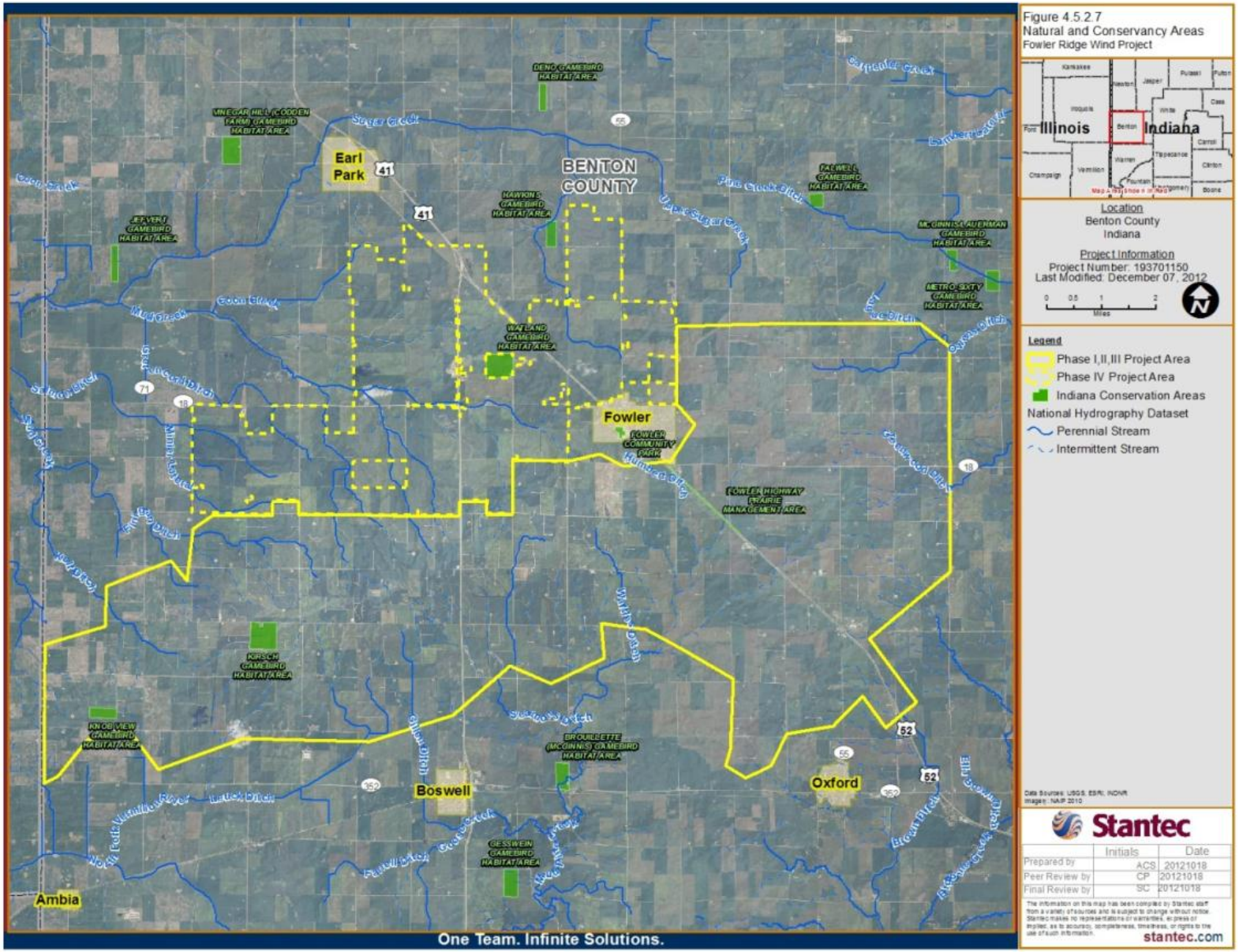
Figure 4.5.2.7
Natural and Conservancy Areas
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Miles
Legend
Phase I,II,III Project Area
Phase IV Project Area
Indiana Conservation Areas
National Hydrography Dataset
Perennial Stream
Intermittent Stream
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
BENTON COUNTY
Earl Park
Fowler
Boswell
Oxford
Ambia
VINEGAR HILL (CODDEN FARM) GAMEBIRD HABITAT AREA
DENO GAMEBIRD HABITAT AREA
JEFVERT GAMEBIRD HABITAT AREA
HAWKINS GAMEBIRD HABITAT AREA
PALWELL GAMEBIRD HABITAT AREA
MCGINNIS (AUERMAN) GAMEBIRD HABITAT AREA
METRO SIXTY GAMEBIRD HABITAT AREA
WATLAND GAMEBIRD HABITAT AREA
FOWLER COMMUNITY PARK
FOWLER HIGHWAY PRAIRIE MANAGEMENT AREA
KIRSCH GAMEBIRD HABITAT AREA
KNOB VIEW GAMEBIRD HABITAT AREA
BROUILLETTE (MCGINNIS) GAMEBIRD HABITAT AREA
GESSWEIN GAMEBIRD HABITAT AREA
One Team. Infinite Solutions.

The Service has designated 11 caves and two mines as critical habitat for the Indiana bat. Final ruling for critical habitat for the Indiana bat was published on September 24, 1976 (41 FR 41914). There is no designated critical habitat for the Indiana bat in the Project Area (USFWS 2007). The closest known Indiana bat hibernacula are located in Greene and Monroe counties in southern Indiana and in LaSalle County, Illinois (USFWS 2007). Based on known migration distances, it is possible that Indiana bats from caves within a 350-mile radius could travel through the Project Area. Although there are no known maternity colonies in Benton County, maternity colonies have been documented in counties adjacent to Benton County (USFWS 2007), the closest of which is found in Warren County where the estimated distance to the edge of the maternity colony is 1.5 miles from the FRWF project boundary. Therefore, potential does exist for migrating/dispersing Indiana bats to occur within the Project Area.

In September 2009, the first documented take of an Indiana bat at a wind facility occurred at the FRWF; this was also the first record of an Indiana bat in Benton County. The second documented take also occurred at the FRWF in September 2010. Since then, Indiana bat mortality has been reported at three additional wind facilities:

(1) A single Indiana bat was taken at Duke Energy Corporation's North Allegheny Wind Farm located in Cambria and Blair counties, Pennsylvania in September 2011 (USFWS 2011b).

(2) A single Indiana bat was taken at The AES Corporation's Laurel Mountain Wind Power Facility located in Preston, Tucker, Barbour, and Randolph counties, West Virginia in July 2012 (USFWS 2012b).

(3) A single Indiana bat was taken at Iberdrola Renewable's Blue Creek Wind Farm located in Van Wert and Paulding counties, Ohio in 2012 (USFWS 2012c).

Mortality monitoring studies conducted under the FRWF's Scientific Research and Recovery Permit indicate that Indiana bat mortalities are not frequent or widespread at the FRWF (Good et al. 2011a). Fall bat mortality studies at the FRWF have verified that Indiana bats are taken at the FRWF during the fall migration period. Therefore, the Applicant has prepared an HCP and is applying for an ITP to ensure ESA coverage for operation of all four phases of the FRWF.

The two Indiana bat fatalities found at the FRWF were both determined to be fall-migrating individuals, based on the timing of the fatalities and the environmental characteristics of the Project Area (February 24, 2010 meeting minutes summary, Good et al. 2011a). The first fatality, collected September 11, 2009, was an intact, partially decomposed female found near Turbine 240. The second fatality, an adult female, was documented on September 18, 2010 at Turbine 640. At the time of the documented fatality, this turbine was being curtailed at a cut-in speed of 5.0 m/s (without a "feathering" strategy). No Indiana bat fatalities were documented at the site in 2011.

Species Description

Indiana bats are medium-sized, grayish brown bats with a forearm length of 1.4-1.6 inches and a total length of 2.8-3.8 inches. The tragus is short and blunt and measures slightly less than half the height of the ear. The tail is approximately 80% of the length of the head and body. The skull has a small sagittal crest and a small, narrow braincase. Indiana bats may be distinguished from the similar little brown bat and the northern long-eared bat by the presence of a keeled calcar and toe hairs that are shorter than the claws.

The distribution of Indiana bats is associated with the major cave regions of the Midwestern and eastern U.S. The range extends from Oklahoma, Iowa and Wisconsin east to Vermont and south to northwestern Florida. The bats migrate seasonally between winter and summer roosts. Hibernation typically occurs from October through April.

Indiana bats are relatively long-lived and produce few young per year (Barclay and Harder 2005). Similar to most temperate *Myotis* species, female Indiana bats give birth to one offspring per year (Humphrey et al. 1977; Kurta and Rice 2002). Mating occurs in the vicinity of the hibernacula in late summer and early fall during what is termed the swarming period, and fertilization is delayed until the spring (Guthrie 1933).

Indiana bats feed exclusively on flying insects, with both terrestrial and aquatic insects being consumed. Diet varies seasonally and variation is seen between different ages, sexes and reproductive status groups (USFWS 2007). A number of studies conducted on the diet of Indiana bats have found the major prey groups to include moths (Lepidoptera), caddisflies (Trichoptera), flies, mosquitoes and midges (Diptera), bees, wasps, and flying ants (Hymenoptera), beetles (Coleoptera), stoneflies (Plecoptera), leafhoppers and treehoppers (Homoptera) and lacewings (Neuroptera) (USFWS 2007).

Habitat Requirements

Indiana bats have two distinct habitat requirements; (1) a stable environment in which to hibernate during the winter, and (2) deciduous woodland habitat for maternity roosts in the summer.

Indiana bats generally hibernate between October and April, although this may be extended from September to May in northern parts of their range (USFWS 2007). The majority of hibernacula are located in karst areas of the east-central U.S.; however, they are known to hibernate in other cave-like structures such as abandoned mines, buildings, a railroad tunnel in Pennsylvania, and a hydroelectric dam in Michigan (Kurta and Teramino 1994; Hicks and Novak 2002; Butchkoski and Hassinger 2002; USFWS 2007). Indiana bats typically require low, stable temperatures (below 50°F) for successful hibernation (Brack 2004; Tuttle and Kennedy 2002). Caves with the highest Indiana bat populations are typically large, complex systems that allow air flow, but their volume and complexity often buffer or slow changes in temperature (Brack 2004). These caves often have large rooms or vertical passages below the lowest entrance that allow entrapment of cold air that is stored throughout the summer, providing bats with relatively low temperatures in early fall (Tuttle and Kennedy 2002). Indiana bats tend to hibernate in large, dense clusters ranging from 300 to 500 bats per square foot (USFWS 2007; Boyles et al. 2008).

Following hibernation, female Indiana bats may travel up to 350 miles to their summer habitat where they form maternity colonies (Winhold and Kurta 2006); though individuals radio-tracked in the northeastern U.S. appear to travel much shorter distances (< 42 miles; Butchkoski et al. 2008; USFWS 2007). Habitat requirements during migration are not known. Roosting may occur at multiple locations while bats are migrating, or bats may fly directly to summer habitat, rarely stopping to roost along the way (Butchkoski and Turner 2006; Britzke et al. 2006; Hicks et al. 2005). Some male and non-reproductive female Indiana bats do not migrate as far as reproductive females and instead remain in the vicinity of their hibernaculum throughout the summer (Gardner and Cook 2002; Whitaker and Brack 2002).

The summer habitat requirements of Indiana bats are not fully understood. Until recently, it was believed that floodplain and riparian forests were the preferred habitats for roosting and foraging (Humphrey et al. 1977); however, recent studies have shown that upland forests are also used by Indiana bats for roosting and that suitable foraging habitats may include upland forests, old fields (clearings with early successional vegetation), edges of croplands, wooded fencerows, and pastures with scattered trees and/or farm ponds (USFWS 2007).

In the summer, female Indiana bats predominantly roost under slabs of exfoliating bark, preferring not to use tree cavities, such as those created by rot or woodpeckers, but occasionally using narrow cracks in trees (Kurta 2004). Due to their cryptic nature, the first Indiana bat maternity colony was not located until 1971 (Cope et al. 1974; Gardner and Cook 2002); however, since that time, much of the work pertaining to summer Indiana bat habitat has concentrated on identifying and describing maternity colonies. Maternity colonies vary greatly in size in terms of number of individuals and number of roost trees used, with members of the same colony utilizing over 20 trees during one season (Kurta 2004). Roosts are usually located in dead trees, though partly dead or live trees (for example, if the species has naturally peeling bark) may also be used (USFWS 2007).

The presence of Indiana bats in a particular area during the summer appears to be determined largely by the availability of suitable, natural roost structures. The suitability of a particular tree as a roost site is determined by its condition (live or dead), the amount of exfoliating bark, the tree's exposure to solar radiation, its relative location to other trees, as well as a permanent water source and foraging areas (USFWS 2007).

At least 33 species of trees have been used as roost trees, including various ash, elm, hickory, maple, poplar, and oak (USFWS 2007). Documented roost trees most frequently used include northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), and shagbark hickory (*Carya ovata*) and typically have been located within 1,600 feet of a perennial or intermittent stream (Hoffman 1996). However, the species of the roost tree appears to be less of a factor than the tree's structure (i.e., the availability of exfoliating bark with roost space underneath) (USFWS 2007). Studies show that Indiana bats have strong fidelity to summer habitats. Females have been documented returning to the same roosts from one year to the next (Humphrey et al. 1977; Gardner et al. 1991; Callahan et al. 1997) and males have been recaptured when foraging in habitat occupied during previous summers (Gardner et al. 1991).

Maternity colonies generally have several separate roost areas located near one another that collectively provide the colony with the necessary roosting resources (including cover and correct temperature provided by exfoliating bark) needed during different environmental conditions. These colonies typically utilize one to a few primary roost trees (Callahan et al. 1997) that provide the proper roosting conditions most of the time and are normally large, dead trees with exfoliating bark that are exposed to abundant sunlight (Miller et al. 2002).

Indiana bats return to the vicinity of the hibernaculum in late summer and early fall where they exhibit a behavior known as "swarming". This involves large numbers of bats flying in and out of the cave entrances from dusk to dawn, though relatively few of the bats roost in the cave during the day (Humphrey and Cope 1977). During the swarming period most Indiana bats roost within approximately 1.5 miles of the cave, suggesting that the forests around the caves provide important habitat prior to hibernation (USFWS 2007). It is at this time that bats gain fat stores vital not only for winter survival, but also for when mating occurs. While females enter the

hibernaculum soon after arrival at the site, males remain active for a longer period and may also travel between hibernacula - both of which may increase mating opportunities (USFWS 2007). Spring emergence from the hibernacula generally occurs from mid-April to the end of May and varies across the range, depending on latitude and weather conditions. Females typically emerge before males, traveling sometimes hundreds of miles to their summer habitat (Winhold and Kurta 2006).

Demographics

Very little is known about annual survival rates and background mortality for Indiana bats, either for adults or juveniles (USFWS 2007). It is expected however, that, similar to many other species, survival of Indiana bats is lowest during the first year of life and threats and sources of mortality vary during the annual cycle. During summer months, sources of mortality may include loss of occupied forested habitat, predation, human disturbance, and other man-made disturbances (Kurta et al. 2002; USFWS 2007). Sources of winter mortality may include natural predation, natural disasters that impact hibernacula, disturbance or modifications at the hibernacula and surrounding areas that physically disturb the bats or change the microclimate within the hibernacula, and direct human disturbance during hibernation that leads to disruption of normal hibernation patterns (USFWS 2007). More recently, WNS is impacting hibernating bats more than any other disturbance.[26]

In a study in Indiana, survival rates among male and female Indiana bats ranged from 66% to 76% for six to ten years after marking, with female longevity approximately 12 to 15 years and males 14 years (Humphrey and Cope 1977). The oldest known Indiana bat was captured 20 years after the first capture (LaVal and LaVal 1980). Research from banding studies during the 1970's suggests that adult Indiana bat survival during the first six years varies from approximately 70-76% annually (Humphrey and Cope 1977; O'Shea et al. 2004; USFWS 2007). After this period, annual survival varied from 36-66% and after 10 years dropped to approximately 4% (Humphrey and Cope 1977). There is less information available on neonatal survival, with one published study suggesting a neonatal survival rate of 92% based on observations at a maternal colony over a single season (Humphrey et al. 1977). More research is needed to accurately define annual survival rates of Indiana bats; however, available information suggests that annual mortality is likely to be between 8% and 64% during the first 10 years of life (USFWS 2007).

O'Shea et al. (2004) summarize survival rates for a number of species, including little brown bat, which is considered a similar species in terms of life history. The range of survival rates cited varies considerably from approximately 13-86% (O'Shea et al. 2004). Other *Myotis* species also had variable survival rates, ranging from 6-89%; however, general studies indicated that survival for first year juveniles was generally lower than for adults.

As with mortality or survival rates for Indiana bats, little is known about recruitment rates for the species; however, female Indiana bats typically give birth to one young per year (Mumford and Calvert 1960; Humphrey et al. 1977; Thomson 1982). The proportion of females in a population that produce young in a year is thought to be fairly high (USFWS 2007). In one study, greater than 90% of the females produced young each year (Humphrey et al. 1977) and in another it was estimated that 89% of adult females were annually reproductively active (Kurta and Rice 2002). Location and environmental factors likely influence reproductive rates and there is

[26] http://www.fws.gov/WhiteNoseSyndrome/

concern that environmental threats such as WNS may lead to lower reproduction rates (USFWS 2011c). Recruitment in the total Indiana bat population over the past five-year period has been variable by region with the Ozark-Central, Midwest, and Northeast Recovery Units showing decreasing trends from approximately 4 - 36% between 2007 and 2009; between 2009 and 2011, the Northeast Recovery Unit decreased approximately 54% with all other Recovery Units showing increasing trends from approximately 3 - 8% (USFWS 2012d). All Recovery Units except the Northeast demonstrated longer term increases from approximately 11 - 65% between 2003 and 2011; the Northeast Recovery Unit increased by 60% between 2003 and 2007 but has shown a decreasing trend since 2007 due to WNS (USFWS 2012d).

Range and Distribution

The range of the Indiana bat extends throughout much of the eastern U.S. and includes 22 States (Gardner and Cook 2002; USFWS 2007). Before the onset of WNS, the general population trends of Indiana bats over the past 40 years appeared to be decreasing in the southern and increasing in the northern regions of its range (USFWS 2007, 2012e).

Historically, Indiana bat winter range was restricted to areas of cavernous limestone in the karst regions of the east-central U.S., apparently concentrated in a relatively small number of large, complex cave systems, including Wyandotte Cave in Indiana; Bat, Coach, and Mammoth Caves in Kentucky; Great Scott Cave in Missouri; and Rocky Hollow Cave in Virginia. More recently, increasing numbers of Indiana bats have been found extending their winter range into some caveless parts of the country using man-made structures such as mines, tunnels, and buildings for hibernation (Kurta and Teramino 1994). For example, they have been found hibernating in several man-made tunnels and a church in Pennsylvania (Butchkoski and Hassinger 2002); and in 1993, an Indiana bat was discovered hibernating in a hydroelectric dam in Manistee County, Michigan 281 miles from the closest recorded hibernaculum located in LaSalle County, Illinois (Kurta and Teramino 1994). In 2005, approximately 30% of the population hibernated in man-made structures (predominantly mines) with the rest using natural caves (USFWS 2007).

Migration

According to the Draft Recovery Plan, the primary spring migration season is from the end of March to late-May and the primary fall migration period is from the end of July to mid-October. The actual migration periods may vary by latitude and weather with spring emergence occurring earlier in more southern areas and fall migration occurring earlier in more northern areas (USFWS 2007). Little is known about behavior of Indiana bats during migration such as flight heights, echolocation frequency, influence of weather, or whether they migrate singularly or in groups.

Data regarding the height at which Indiana bats fly during migration are severely lacking. However, it is clear that at least a portion of myotid bats are flying well above the tree canopy at rotor-swept height during migration, based on the five Indiana bat fatalities documented at wind facilities (two at FRWF; one each at the North Allegheny, Laurel Mountain and Blue Creek wind facilities), and the documented mortality of many other myotids at other wind facilities primarily during late summer and fall (USFWS unpublished data, as cited in USFWS 2011c). However, data indicate that these species are probably not flying within the rotor-swept zone as frequently as long-distance migrating tree bats; of all bat mortalities detected at wind power facilities, myotids and tri-color bats comprise only about 10% of total bat fatalities within the range of the Indiana bat (USFWS unpublished data, as cited in USFWS 2011c). This assumption is

supported by anecdotal and empirical data that suggest that Indiana bats primarily migrate at the tree canopy level (Turner 2006; Robbins, Missouri State Univ., pers comm. 2010; Butchkoski pers. comm. 2010; Herzog NY Dept. of Env. Conserv., pers. comm. 2011; as cited in USFWS 2011c). It is unknown whether flight heights during spring and fall migration are similar.

Evidence from radio-tracking studies in New York and Pennsylvania indicate that Indiana bats are capable of migrating at least 30-40 miles in one night (Sanders et al. 2001; Hicks 2004; Butchkoski and Turner 2006). Studies reviewed in the Draft Recovery Plan appear to indicate that Indiana bat migration from winter to summer habitat is fairly linear and short-term, while in the fall it may be more dispersed and varied, with some studies showing that individuals may travel between 9-17 miles from a roost site to a swarming site (hibernaculum cave) (USFWS 2007). In addition, males and females appear to display different dispersal behavior, with females moving quickly between the hibernacula and maternal colonies, while males commonly remain in the proximity of the hibernacula or travel between hibernacula (USFWS 2007).

Species Status

Nationwide - A key component to the survival and recovery of the Indiana bat is maintenance of suitable hibernacula that ensure the over-winter survival of sufficient individuals to maintain population viability. The Draft Indiana Bat Recovery Plan (USFWS 2007) categorizes hibernacula into four groups based on the priority to the species population and distribution. Priority 1 hibernacula are essential to the recovery and long-term conservation of the species and have a current or historically observed winter population of ≥10,000 individuals. Priority 2 hibernacula contribute to the recovery and long-term conservation of the species and have a current or historical population of >1,000 but <10,000 individuals. Priority 3 sites have a current or historical population of 50-1,000 bats and Priority 4 sites have a current or historical population of fewer than 50 bats.

Since the release of the first Indiana Bat Recovery Plan (USFWS 1983), the USFWS implemented a biennial monitoring program at Priority 1 and 2 hibernacula (USFWS 2007). In 1965, the overall population was estimated to be over 880,000 individuals; however, while variation in the data collection apparently has led to variable estimates, in general, there has been a long-term declining population trend to approximately 380,000 individuals in 2001.

As of 2005, the estimated total population of Indiana bats, based upon a census of hibernacula, was approximately 457,000 bats, down from approximately 883,000 bats in 1965 (USFWS 2007), representing a decline of approximately 52%. In November 2006, there were 281 known extant Indiana bat hibernacula in 19 states (USFWS 2007). Over 90% of the population hibernated in just five states: Indiana (45.2%), Missouri (14.2%), Kentucky (13.6%), Illinois (9.7%), and New York (9.1 %); with 71.6% hibernating in just 10 caves. Overall, approximately 82% of the estimated total population in 2006 hibernated in 22 of the 23 Priority 1 hibernacula (USFWS 2007).

In 2007, the population showed a gradual increase to 467,947; however fell to an estimated 415,512 in 2009, a decrease of 11.2% in two years. The population had increased by 2.2% to 424,708 by 2011 (USFWS 2012d).

General patterns in the overall population estimates have shown a decreasing trend through the core range of the species in the Midwest and increasing trends on the periphery and more northern states (USFWS 2007). The causes of these population changes are unknown;

however, climate change may play a role by negatively affecting hibernacula temperature (USFWS 2007). More recently, populations across eastern North America have been affected by WNS which is having a dramatic effect on some populations, such as in Vermont (Frick et al. 2010). WNS is caused by the fungus *Geomyces destructans* and has caused the deaths of an estimated 5.7 million to 6.7 million bats, including Indiana bats (USFWS 2012e). The condition is associated with loss of winter fat stores, pneumonia, and the disruption of hibernation and feeding cycles. Mortality rates have been shown to exceed 90% over two years in infected caves (Frick et al. 2010).

Midwest Recovery Unit - The Draft Indiana Bat Recovery Plan divides the species range into four recovery units based on several factors, such as traditional taxonomic studies, banding returns, and genetic variation (USFWS 2007). The FRWF falls within the Midwest Recovery Unit (MRU) which includes the states of Indiana, Kentucky, Ohio, Tennessee, Alabama, southwestern Virginia, and Michigan (USFWS 2007). According to the Draft Indiana Bat Recovery Plan (USFWS 2007), the Revised 2007 Rangewide Population Estimate (USFWS 2008), and the 2011 Rangewide Population Estimate (USFWS 2012d), the overall population within the MRU was approximately 320,342 in 2007 and 281,909 in 2009 - a decrease of 12.0%; the 2011 population was approximately 305,297 – an increase of 8.3% from 2009 levels (Table 4.10; USFWS 2007, 2008, 2011d, 2012e). The MRU represents approximately 71.9% of the 2011 rangewide population of Indiana bats (USFWS 2012d). According to the Draft Recovery Plan, there are 190 known Indiana bat hibernacula within the MRU, with 116 being classified as extant (at least one record since 2000; USFWS 2007). There are 12 Priority 1 hibernacula in the MRU – seven in Indiana and five in Kentucky.

Table 4.10 Indiana Bat Population Estimates for the Midwest Recovery Unit (USFWS 2011d, 2012e)

State	2001	2003	2005	2007	2009	2011
Indiana	173,111	183,337	206,610	238,068	213,170	222,820
Kentucky	51,053	49,544	65,611	71,250	57,325	70,329
Ohio	9,817	9,831	9,769	7,629	9,261	9,870
Tennessee	4,192	3,246	3,221	2,929	1,663	1,690
Alabama	173	265	296	258	253	261
SW Virginia	272	430	202	188	217	307
Michigan	20	20	20	20	20	20
Total	**238,739**	**246,673**	**285,729**	**320,342**	**281,909**	**305,297**

Indiana - In 2007, approximately 50.8% of the estimated range-wide population of Indiana bats hibernated in Indiana (USFWS 2008). This increased to approximately 51.3% in 2009 and further to 52.5% in 2011 (USFWS 2012d). The long term trend since 2001 has been an increase in the numbers of Indiana bats in Indiana from approximately 173,111 to 222,280 (Table 4.10; USFWS 2011d, 2012e).

There are 37 known Indiana bat hibernacula in the state and of these, 32 have extant winter populations (at least one record since 2000; USFWS 2007). Of the extant Indiana hibernacula, seven are classified as Priority 1 (≥ 10,000), one is Priority 2 (1,000-9,999), 15 are Priority 3 (50-999), nine are Priority 4 (1-49) hibernacula, and two are unclassified (USFWS 2007). The Priority 1 hibernaculum, Wyandotte Complex in Crawford County, was estimated to have

126,448 Indiana bats in 2007 (USFWS 2008). All of the hibernacula in Indiana are found in the south central part of the state within the Interior Plateau ecoregion (USFWS 2007). All of Indiana is located in the Midwest Recovery Unit for Indiana bat (USFWS 2007).

The summer range of Indiana bats in Indiana is fairly ubiquitous. As of the 2007 Draft Indiana Bat Recovery Plan (USFWS 2007), 51 counties in Indiana (out of 92 total counties) had records of summer maternity colonies and an additional 14 counties had other summer records of Indiana bats (USFWS 2007).

Project Site / Local Population - Prior to the FRWF monitoring studies in 2009, there were no Indiana bat records from Benton County (USFWS 2007). The nearest known winter population is a Priority 2 hibernacula located approximately 105 miles away in La Salle County, Illinois (USFWS 2007).

Pre-and post-construction acoustic and mortality surveys conducted at the FRWF indicate that late summer mating and/or seasonal swarming do not occur within the Project Area. The Service concluded, based on spring bat mortality studies conducted at FRWF in 2009, 2010, and 2011, that operation of the project during spring migration is not likely to result in the mortality of Indiana bats. Consequently, the Service indicated that an ITP is not necessary for operation of the FRWF during the spring bat migration period (see letter dated August 5, 2011 in Appendix C). Based on the lack of potentially suitable summer habitat, no Indiana bats are expected to be in the FRWF area during the summer maternity season, approximately May to July. The two Indiana bat casualties were found in September, suggesting that fall migration is the period of highest risk for Indiana bats at the FRWF.

4.6.2.2 *Indiana State-Listed Species*

As part of coordination for FRWF Phases I – III, the IDNR indicated that 13 rare, threatened or endangered wildlife species had been documented in the vicinity of the FRWF (see IDNR letter dated September 22, 2006, Appendix C). As part of coordination for Phase IV, the IDNR indicated that 14 rare, threatened or endangered wildlife species had been documented in the vicinity of the FRWF (see IDNR letter dated July 5, 2013, Appendix C). Currently, the IDNR lists 23 wildlife species and 10 plants species as being documented in Benton County that are classified as endangered, threatened, rare or of special concern[27], including:

- Three Mollusks
  - Purple Lilliput (*Toxolasma lividus)* – Special Concern
  - Ellipse (*Venustaconcha ellipsiformis*) – Special Concern
  - Little Spectaclecase (*Villosa lienosa)* – Special Concern
- Two Insects
  - Beer's Blazing Star Borer Moth (*Papaipema beeriana)* – Threatened
  - A Noctuid Moth (*Macrochilo hypocritalis)* – Rare
- One Fish
  - Variegate Darter (*Etheostoma variatum)* – Endangered
- Two Reptiles
  - Blanding's Turtle (*Emydoidea blandingii)* – Endangered
  - Smooth Green Snake (*Liochlorophis vernalis)* – Endangered
- Eight Birds

[27] http://www.in.gov/dnr/naturepreserve/files/np_benton.pdf accessed August 15, 2012.

  - Short-eared Owl (*Asio flammeus*) – Endangered
  - Upland Sandpiper (*Bartramia longicauda)* – Endangered
  - Northern Harrier (*Circus cyaneus)* – Endangered
  - Sedge Wren (*Cistothorus platensis)* – Endangered
  - Least Bittern (*Ixobrychus exilis*) – Endangered
  - King Rail (*Rallus elegans)* – Endangered
  - Barn Owl (*Tyto alba)* – Endangered
  - Western Meadowlark (*Sturnella neglecta)* – Special Concern
- Seven Mammals[28]
  - Franklin's Ground Squirrel (*Spermophilus franklinii)* – Endangered
  - Plains Pocket Gopher (*Geomys bursarius)* – Special Concern
  - Eastern Red Bat (*Lasiurus borealis)* – Special Concern
  - Hoary Bat (*Lasiurus cinereus)* – Special Concern
  - Least Weasel (*Mustela nivalis)* – Special Concern
  - Northern Myotis (*Myotis septentrionalis)* – Special Concern
  - American Badger (*Taxidea taxus)* – Special Concern
- Ten Vascular Plants
  - Wild Hyacinth (*Camassia angusta)* - Endangered
  - Heavy Sedge (*Carex gravida)* – Endangered
  - Hill's Thistle (*Cirsium hillii)* – Endangered
  - Earleaf Foxglove (*Agalinis auriculata)* – Threatened
  - Downy Gentian (*Gentiana puberulenta)* – Threatened
  - Cattail Gay-feather (*Liatris pycnostachya)* – Threatened
  - Leiberg's Witchgrass (*Panicum leibergii)* – Threatened
  - Prairie Violet (*Viola pedatifida)* – Threatened
  - Western Silvery Aster (*Aster sericeus)* – Rare
  - Rough Rattlesnake-Root (*Prenanthes aspera)* – Rare

Many of these species have specific habitat requirements and little or no habitat for these species is present within the Project Area, and any habitat that may be present is generally marginal. To date, no mortality of threatened or endangered species is known from the FRWF, with the exception of the evening bat (see Section 4.5.2.4) and the Indiana bat (see Section 4.6.2.2.1).

4.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.7.1 Scope of Analysis

This section of the EIS describes the socioeconomic characteristics of Indiana, Benton County and the incorporated towns of Fowler, Boswell, Earl Park, and Oxford, all of which are within close proximity to the Project Area. U.S. Census 2000 and 2010 data (as available) were obtained for these areas; however, census data for unincorporated communities are not available and are not included in this section.

[28] Indiana bat and evening bat were recorded at the FRWF during post-construction surveys; however, neither species is currently included on the IDNR list for Benton County.

4.7.2 Existing Conditions

4.7.2.1 *Population Levels and Trends*

Population growth trends based on U.S. Census Bureau data (2000 and 2010) are summarized in Table 4.11.

Table 4.11 Historical Population Growth

Community	2000	2010	% Growth/Decline
Indiana	6,080,645	6,483,802	6.2%
Benton County	9,421	8,854	-6.0%
Fowler	2,415	2,317	-4.1%
Oxford	1,271	1,162	-8.6%
Boswell	827	778	-5.9%
Earl Park	485	348	-28.2%

Source: U.S. Census Bureau[29]

4.7.2.2 *Population Characteristics – Age and Racial Composition*

Population characteristics for the study area are presented in Table 4.12. Census data indicate the population of the study area is very homogeneous with respect to age. The median age of Fowler and Oxford residents is 38 years, compared to 36 years in Boswell and Earl Park. The median age in Benton County is 37 years.

A total of three census tracts are located within Benton County (Figure 4.7.2.2). Census tract data show that some areas of the county contain slightly higher minority populations than the county as a whole (Table 4.13).

Table 4.12 Population Characteristics

	2000 Population	Persons Under 19	Persons 20 through 64	Persons 65 and Older	Median Age
Indiana	6,080,645	1,763,386	3,564,268	752,831	35.2
Benton County	9,421	2,861	5,083	1,477	36.7
Fowler	2,415	709	1,270	436	37.6
Oxford	1,271	370	703	198	37.5
Boswell	827	254	407	166	36.1
Earl Park	485	150	241	94	35.5

Source: U.S. Census Data (2000)[30]

[29] http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
[30] Ibid., U.S. Census

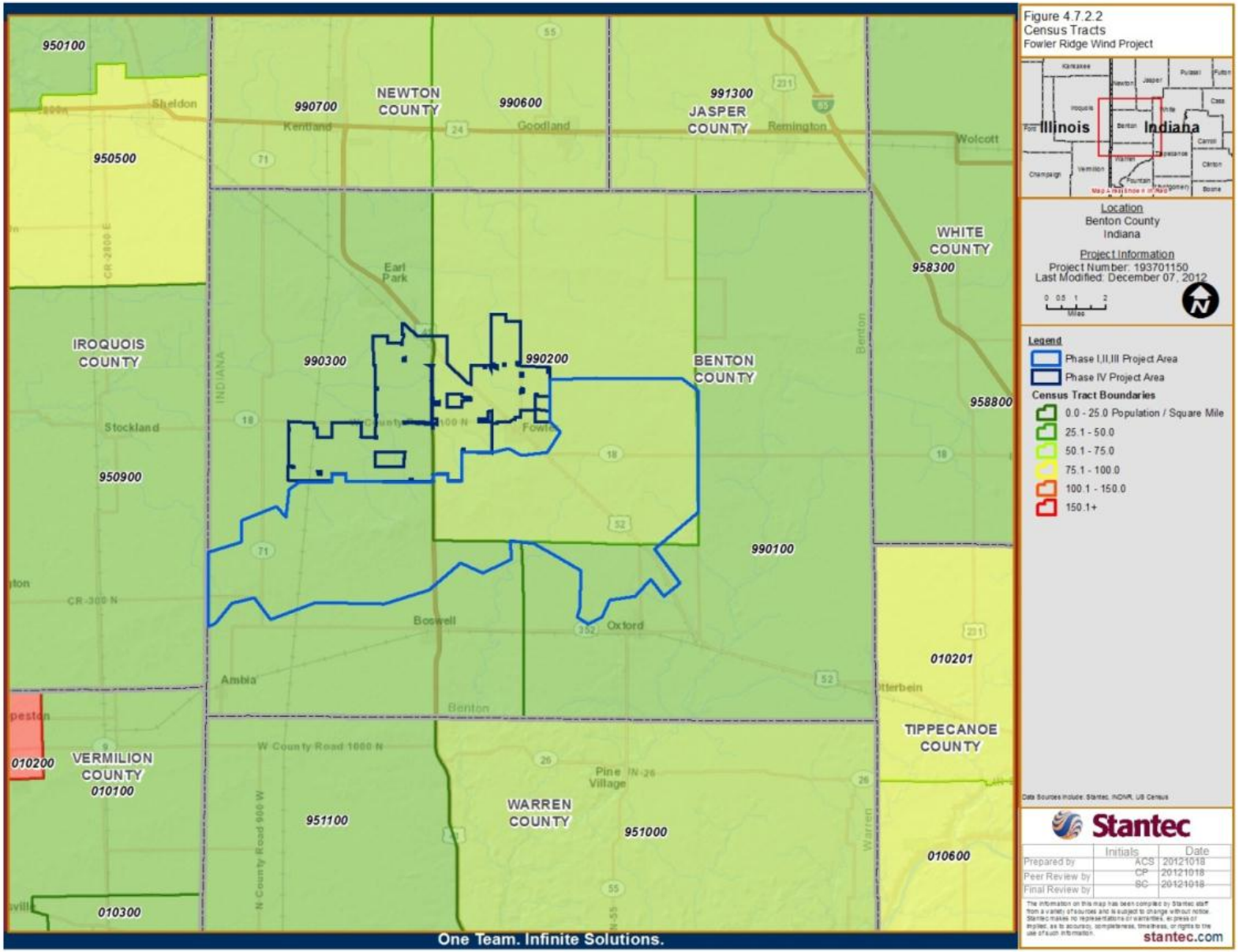
Figure 4.7.2.2
Census Tracts
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Legend
Phase I,II,III Project Area
Phase IV Project Area
Census Tract Boundaries
0.0 - 25.0 Population / Square Mile
25.1 - 50.0
50.1 - 75.0
75.1 - 100.0
100.1 - 150.0
150.1+
Stantec
Prepared by
Peer Review by
Final Review by
stantec.com
NEWTON COUNTY
JASPER COUNTY
WHITE COUNTY
IROQUOIS COUNTY
BENTON COUNTY
VERMILION COUNTY
WARREN COUNTY
TIPPECANOE COUNTY
950100
950500
950900
990700
990600
991300
990300
990200
990100
958300
958800
010201
010200
010100
010300
951100
951000
010600
Sheldon
Kentland
Goodland
Remington
Wolcott
Earl Park
Stockland
Fowler
Boswell
Oxford
Ambia
Benton
Pine Village
One Team. Infinite Solutions.

Table 4.13 Racial Composition

	White	Black	American Indian	Asian	Native Hawaiian	Other[a]	Hispanic[b]	Total[c]	% Minority
Indiana	5,320,022	510,034	15,815	59,126	2,005	173,483	214,536	6,080,645	12.5
Benton County	9,129	20	13	8	0	251	245	9,421	3.1
Fowler	2,370	7	0	2	0	36	21	2,415	1.9
Oxford	1,244	2	1	1	0	23	13	1,271	2.1
Boswell	762	2	2	2	0	59	81	827	7.8
Earl Park	480	1	0	0	0	4	5	485	1.0
Census Tracts[d]									
9901	3,452	2	4	2	0	66	29	3,526	2.1
9902	3,175	12	0	3	0	60	39	3,250	2.3
9903	2,502	6	9	3	0	125	177	2,645	5.4

[a] Other indicates some other race or those persons of mixed descent.
[b] Hispanic can be of any race.
[c] Total does not include Hispanic
[d] See Figure 4.7.2.2
Source: U.S. Census Data (2000)[31]

4.7.2.3 *Environmental Justice*

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations."

Environmental justice requirements were assessed by identifying and analyzing minority and low-income populations within the Project Area. Minority and low-income populations exist within Benton County and within the Project Area (Table 4.13). Census data indicate these populations are concentrated in certain census tracts (Figure 4.7.2.2) and within incorporated towns within the Project Area.

Economic Setting

Overall Economy

The major economic centers in the project vicinity are the towns of Fowler, Oxford, Boswell, and Earl Park. Income data for the study area is presented in Table 4.14 and is based on 2000 U.S. Census data which were created using economic data from 1999. The median household income for the state of Indiana was $41,567, while the median family income for the state was $50,261. The median household income and the median family income for Benton County were both lower than the state values and were $39,813 and $46,869 respectively.

Of the four incorporated towns near the Project Area, all had median household and median family incomes below the state levels, and only Fowler had median family income levels higher than the median county levels. Census tract data show that Tracts 9901 and 9902

[31] Ibid., U.S. Census

(Figure 4.7.2.2) had higher median household income and median family income than the county values, while Tract 9903 had lower median incomes.

The 2000 U.S. Census data indicate the percentage of people below the poverty level in Benton County (5.5%) and in the towns of Boswell (8.3%), Fowler (5.8%) and Oxford (5.1%) is below that of the state of Indiana (9.5%). The town of Earl Park had higher poverty levels than the state at 10.4%. Census tracts 9901 and 9902 have lower poverty levels than Benton County, while Tract 9903 had a higher poverty rate of 6.3%.

Table 4.14 Income

	Median Household Income	Median Family Income	Persons Below Poverty Level (%)
Indiana	$41,567	$50,261	559,484 (9.5%)
Benton County	$39,813	$46,869	505 (5.5%)
Fowler	$40,396	$50,586	132 (5.8%)
Oxford	$39,375	$45,966	63 (5.1%)
Boswell	$33,224	$36,136	70 (8.3%)
Earl Park	$32,981	$37,188	45 (10.4%)
Census Tracts			
9901	$42,193	$50,339	176 (5.1%)
9902	$40,368	$50,609	165 (5.3%)
9903	$35,349	$40,405	164 (6.3%)

Source: U.S. Census Data (2000)[32]

Housing

Table 4.15 shows the 2000 Census data for housing types in Benton County as well as the four incorporated towns in the study area. Census data indicate the majority of housing in the county, as well as incorporated towns, is single-family detached units. Single-family attached units were not common in the study area and generally make-up less than 1% of the housing units. Fowler had a higher percentage of multi-family attached units when compared to the other towns and Earl Park had the highest percentage of mobile homes.

Table 4.15 Housing Types

	Total Dwelling Units	Single-Family Detached Units (% of total)	Single-Family Attached Units (% of total)	Multi-Family Attached Units (% of total)	Mobile Homes (% of total)	Boat, RV, Van, etc. (% of total)
Benton County	3818	3340 (87.5)	42 (1.1)	287 (7.5)	145 (3.8)	4 (0.1)
Fowler	1014	848 (83.6)	9 (0.9)	153 (15.1)	0 (0)	4 (0.4)
Oxford	521	454 (87.1)	5 (1.0)	40 (7.7)	22 (4.2)	0 (0)
Boswell	365	322 (88.2)	2 (0.6)	28 (7.7)	13 (3.6)	0 (0)
Earl Park	177	155(87.6)	0(0)	8 (4.5)	14 (7.9)	0 (0)

Source: U.S. Census Data (2000)[33]

[32] Ibid., U.S. Census
[33] Ibid., U.S. Census

Table 4.16 shows the 2000 Census data household characteristics by county as well as by town. According to the 2000 Census data, the entire county of Benton is considered rural; therefore, all households in the county are considered rural. About 70% of households are located within incorporated towns in Benton County. The median owner occupied home value for the county is $75,000. The towns of Boswell and Earl Park have significantly lower median home values, while the towns of Fowler and Oxford have median home values that are comparable to those of the county. The median contract rent for the county is $341 and the median contract rent for each of the towns varies no more than 6.4% from the county value.

Table 4.16 Household Characteristics

	Number of Households	Average Persons Per Household Owner Occupied/Renter Occupied	Persons in Group Quarters	Median Value of Owner Occupied Housing	Median Contract Rent
Benton County	3558	2.62 / 2.51	202	$75,000	$341
Fowler	948	2.49 / 2.26	110	$77,100	$330
Oxford	485	2.60 / 2.35	40	$72,200	$319
Boswell	329	2.60 / 2.19	0	$59,300	$353
Earl Park	168	2.54 / 2.67	53	$57,300	$364

Source: U.S. Census Data (2000)[34]

4.7.2.4 *Work Force*

The following overview includes work force profiles for Benton County. Between 2000 and 2009, the population of Benton County decreased by 8.6% from 9,421 to 8,613. According to the U.S. Census Bureau, the 2009 population comprises approximately 0.1% of the state. A total of 3,771 people who live in Benton County are employed. This is a 60% decrease from the 6,335 people who lived in Benton County and were employed in 2000. As of March 2011 the unemployment rate for Benton County and Indiana as a whole was 8.8%, compared to 9.2% for the United States as a whole[35].

The industries which employed the greatest number of people in 2009 included educational services, manufacturing and wholesale trade. In 2009, these industries provided about 46% of the jobs in Benton County. Retail trade and federal, state and local governments also employed relatively large numbers of people, comprising 19% of the jobs in the county[36].

4.7.2.5 *Community Services*

This section discusses some of the community services provided by the county, towns and the incorporated population centers in the Project Area. Community facilities are located primarily within Fowler, which provides a full complement of municipal services to meet the community's needs.

[34] Ibid., U.S. Census
[35] http://www.stats.indiana.edu/profiles/profiles.asp?scope_choice=a&county_changer=18007
[36] Ibid., STATS Indiana

Fowler offers municipal water and wastewater and has a town water supply system that includes two high capacity municipal wells and a water supply plant incorporating the latest in water treatment technology, all of which is regulated by the city. A water storage facility has been constructed to provide water by gravity for balancing pressures, fire protection, and an emergency reserve. Fowler Sewer Department provides sewage treatment for residents and industry with a modern, fully certified water pollution control plant[37].

Fowler's police force offers resident security and traffic control. Fowler has dispatch capability through the Benton County Sheriff's Department, and also participates in area 911 service which provides for backup by county and state law enforcement personnel. The Fowler/Center Township fire department is a volunteer force of 24 personnel that work in cooperation with other area fire departments for mutual support and backup in Fowler and surrounding countryside.

4.8 CULTURAL AND HISTORIC RESOURCES

4.8.1 Scope of Analysis

For the purposes of this EIS, the assessments of cultural resources are focused on historic properties and archaeological data and properties found within Phase IV, particularly as they relate to the requirements of Section 106 of the of the NHPA, eligibility for inclusion on the National Register of Historic Places (NRHP), and requiring consideration of potential effects by federal agencies as per the NHPA (36 CFR 800) (see Section 1.3.6).

The standard methodology for assessment of cultural resources uses two distinct study areas:

(1) Direct Area of Potential Effect (APE), which includes any areas of ground disturbance caused by project-related activities; and

(2) Visual APE, which includes the viewshed of a project or the area within which project facilities can be viewed.

APE is the standard terminology used by cultural resources agencies and professionals to describe impacts on archaeological and architectural resources. For this Project, the direct APE is considered to be the Phase IV project area and the Indiana bat mitigation areas because it is only construction of Phase IV and restoration activities at the mitigation areas that have potential to directly impact cultural resources. Specifically, the direct APE includes the up to 94 turbine locations, access roads and buried interconnect lines, construction staging areas, and the substation location; and, Indiana bat mitigation sites including Wyandotte Cave and sites selected by FRWF and approved by the Service within a 2.5 mile radius circle around known maternity colonies in Indiana. At the request of the Indiana State Historic Preservation Office (SHPO), the visual APE includes the area within 1 mile of Phase IV turbine locations.

Cultural resources studies that have been completed to date for Phase IV include examination of the records of the IDNR Division of Historic Preservation & Archaeology's State Historic Architectural and Archaeological Research Database (SHAARD), the Indiana Register of Historic Sites and Structures, and the NRHP Database for previously recorded historic resources located within a one-mile radius of the Phase IV project area (Stantec 2012a, Stantec 2012b).

[37] Ibid., Town of Fowler

4.8.2 Existing Conditions

4.8.2.1 *Archaeological Resources*

In October 2012, Stantec Consulting Services conducted a desktop review of previously identified archaeological sites and searched SHAARD records for previously recorded archaeological resources within a one-mile radius of Phase IV.

Results of the review indicate that no known archaeological sites are located within Phase IV. Seven sites are located outside, but within one mile, of Phase IV.

Specific sites for the summer habitat mitigation have not yet been identified. Once sites have been identified, a search for previously identified archaeological sites on the selected properties would be conducted as per the PA described in Section 5.8.2.1.

4.8.2.2 *Historic Structures*

In September 2012, Stantec Consulting searched the SHAARD, Indiana Register of Historic Sites and Structures, and NRHP Database for previously recorded historic resources located within a one-mile radius of the Project.

A total of 262 historic resources are located within a one-mile radius of a proposed Phase IV wind turbine. Of the 262, 186 resources are rated as Non-contributing (i.e., not eligible for inclusion to the NRHP) or Contributing (i.e., not eligible for inclusion to the NRHP except if located in a historic district).

The remaining 76 resources are rated as Notable (i.e., potentially eligible for inclusion to the NRHP) or Outstanding (i.e., eligible for inclusion to the NRHP), including three NRHP listed resources:

(1) Fraser & Isham Law Office

(2) Fowler Theater

(3) Benton County Courthouse

All three NRHP listed resources are located within the town of Fowler and outside of Phase IV.

The remaining 73 resources, all but three of which are located within the town of Fowler and outside of Phase IV, include 17 Outstanding (i.e., eligible for inclusion to the NRHP) and 56 Notable (i.e., potentially eligible for inclusion) resources. The majority of these resources are historic houses but also include a smaller number of commercial buildings, places of worship, and a school.

Only three of the structures, all listed as Notable (i.e., potentially eligible for inclusion to the NRHP), are located within Phase IV:

(1) Windler Farm – located near the intersection of N 200 W and W Division Road

(2) Fowler Farm – located near the intersection of S 500 W and W 100 S

(3) Farm Building – located near the intersection of N 500 W and State Highway 18

All three structures have an area of significance listed as “Agriculture, Architecture”. Two of the structures are located within one mile of several existing turbines constructed during earlier phases of the Fowler Ridge project.

4.8.2.3 *Tribal Resources*

Pursuant to the NHPA and American Indian Religious Freedom Act (AIRFA) and in an effort to identify other significant cultural resources that may be affected by a project or FWS action, the Service’s Region 3 has developed interim guidance regarding consulting with federally-recognized Tribes based on the type of project or FWS action. No Tribal lands are located within or near the FRWF project area. The Service followed Region 3's interim guidance and determined that no further Tribal coordination was required.

4.9 TRANSPORTATION

4.9.1 Scope of Analysis

This section of the EIS describes the existing transportation facilities within and adjacent to the Project Area. This analysis area was used to account for the potential regional effects of the Project on transportation infrastructure. The transportation analysis is based on review of maps and satellite imagery and publicly available information from Indiana Department of Transportation (INDOT) and Benton County.

4.9.2 Existing Conditions

Roadways provide the primary source of transportation in this region. Roadways are used to reach major, commercial airports, such as the Indianapolis International Airport (approximately 100 miles southeast of the Project Area) and O’Hare International Airport in Chicago, Illinois (approximately 100 miles northwest of the Project Area).

U.S. Highway 52, which consists of a four-lane roadway through Fowler, U.S. Highway 41, located approximately three miles west of Fowler, and Interstate 65, located approximately 15 miles east of Fowler, connect the Project Area to the Chicago area to the north and Indianapolis to the south.

Two railroad lines traverse the Project Area: one runs north to south along the west side of the Project Area, and a second line runs northwest to southeast through the middle of the Project Area (Figure 4.9.2). Both lines are owned and operated by the Kankakee, Beaverville and Southern Railroad.

Limited air service in the Project Area is provided by the Kentland Airport, located approximately 12 miles north of Fowler. Charter service is available at the airport; however, no scheduled passenger service is provided.

There are no designated bikeways, scheduled public transit routes, or state-designated public recreational trails in the Action Area.

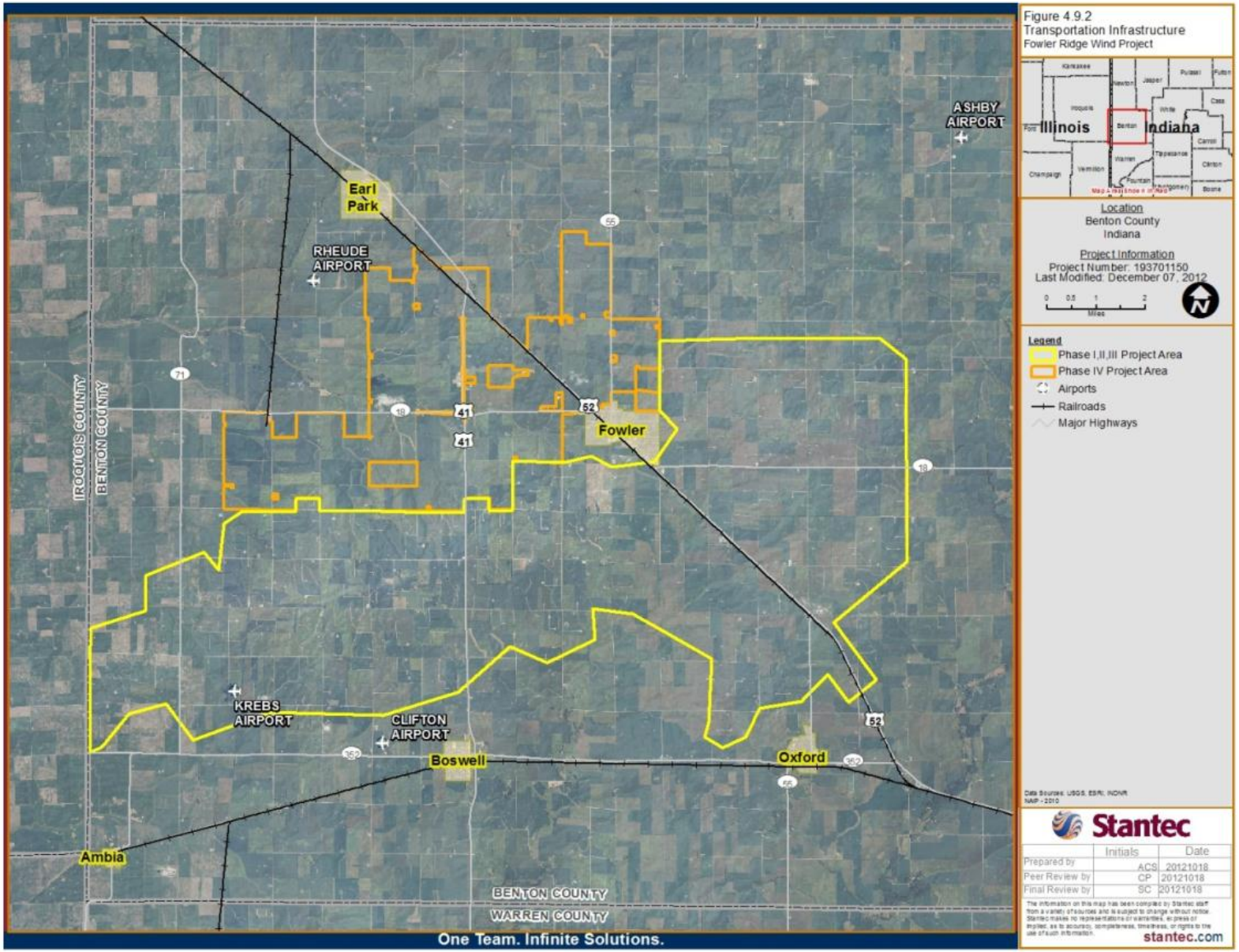
Figure 4.9.2
Transportation Infrastructure
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Miles
Legend
Phase I,II,III Project Area
Phase IV Project Area
Airports
Railroads
Major Highways
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
ASHBY AIRPORT
Earl Park
RHEUDE AIRPORT
Fowler
KREBS AIRPORT
CLIFTON AIRPORT
Boswell
Oxford
Ambia
IROQUOIS COUNTY
BENTON COUNTY
BENTON COUNTY
WARREN COUNTY
One Team. Infinite Solutions.

4.10 NOISE

4.10.1 Scope of Analysis

The noise analysis presented in this EIS covers Phase IV where up to 94 additional turbines would be constructed, with focus on the nearest potentially sensitive receptors to the wind turbine generators. The noise analysis is based on information from scientific literature, a background sound level survey that was conducted within and around Phase IV (TetraTech 2007), and a sound modeling program (Stantec 2011).

4.10.2 Existing Conditions

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that interferes or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. Reaction of individuals to similar noise events is diverse and influenced by numerous factors, such as the type of noise, its perceived importance, the time of day during which the noise occurs, its duration, frequency, level, and community attitudes towards the source of noise.

Sound level measurements are often reported using the 'A-weighting' scale of a sound level meter. Since the human ear does not respond equally to all frequencies (or pitches), measured sound levels are often adjusted or weighted to correspond to the frequency response of human hearing and the human perception of loudness. A-weighting slightly boosts high frequency sound, while reducing low frequency components providing a better indicator of perceived loudness at relatively modest volumes. These measurements are called A-weighted levels, (abbreviated dBA). Ambient noise rarely occurs at a constant sound pressure. The concept of equivalent continuous sound pressure level (L_{eq}) is used to establish a measurement for average noise exposure in a given period to account for both high-level single events (bursts of noise) and relatively steady background sounds (quieter events). The L_{eq} quantifies the entire ambient noise as a single value for a specified period, i.e., an average sound level. Table 4.17 illustrates ranges of A-weighted levels for common noise sources.

Table 4.17 Common Sound Levels/Sources and Subjective Responses

Thresholds/Noise Sources	Noise Level (dBA)	Subjective Evaluations
Human Threshold of Pain Carrier jet takeoff (50 ft)	140	Deafening
Siren (100 ft) Loud rock band	130	
Jet takeoff (200 ft) Auto horn (3 ft)	120	
Chain saw Noisy snowmobile	110	Very Loud
Lawn mower (3 ft) Noisy motorcycle (50 ft)	100	
Heavy truck (50 ft)	90	
Pneumatic drill (50 ft) Busy urban street, daytime	80	Loud
Normal automobile at 50 mph Vacuum cleaner (3 ft)	70	
Large air conditioning unit (20 ft) Conversation (3 ft)	60	Moderate
Quiet residential area Light auto traffic (100 ft)	50	
Library Quiet home	40	Faint
Soft whisper	30	
Slight rustling of leaves	20	Very Faint
Broadcasting Studio	10	
Threshold of Human Hearing	0	

Noise standards applicable to WECS in Benton County are contained in Chapter 8, Zoning, Subdivision, Comprehensive Plan, Article 1. Zoning Code of Benton County, Section 8-7, Paragraph 7.B. Noise and Vibration Standards that Apply to WECS. The zoning regulations limit octave band sound levels to a maximum level in each of the eight standard octave bands from 63 Hertz (Hz) to 8 kilohertz (kHz) as measured at a distance of 200 feet from any primary residence as shown in Table 4.18.

The existing levels of background noise in Phase IV were determined by an ambient noise survey performed within the Project Area in August 2007 (TetraTech 2007). The ambient noise survey was conducted at three locations in the Project Area to determine the levels of ambient noise that correlate with different wind speeds related to the full operating range of the turbines from cut-in to fully operational. Noise levels ranged from a low of about 32 dBA to a high of 50 to 60 dBA for the L90 level. L50 levels were typically about 3 to 5 dBA higher (Figure 4.10.2).

Table 4.18 Benton County Noise Standards for WECS

Octave Band Center Frequency (Hz)	Maximum Permitted Level at 200 feet (dB)
63	75
125	70
250	65
500	59
1000	53
2000	48
4000	44
8000	41

4.11 VISUAL RESOURCES

4.11.1 Scope of Analysis

For the purposes of this EIS, the assessments of visual resources are focused on characterizing the visual environment of the visual APE, which consists of Phase IV and a one-mile buffer around the up to 94 Phase IV turbines, and on identifying existing and potential visual and aesthetic effects of wind turbines. Phases I – III are not included in the visual APE because the turbines in those phases were constructed in 2008 and 2009 and are now part of the visual landscape. The visual analysis is based on information gathered from review of aerial photography and site photographs, windshield surveys of Phase IV and the surrounding area, and photo simulations from various points within the APE.

4.11.2 Existing Conditions

Several basic land uses make up the landscape of Phase IV, including agricultural lands, rural farmsteads and residences, wetlands and waterways, and woodlands. Approximately 93% of landcover within Phase IV consists of agricultural land used for row crop production. The topography in Phase IV is generally flat with gently rolling slopes. The highest elevation of the study area is found within the town of Fowler, with the elevation gradually decreasing to the east, west, and north at an average slope of approximately 0.75%. There is a small natural increase in grade immediately south of the city center, rising only approximately 70 feet within one mile. These gradual slopes create wide, open views in both a north/south and east/west direction from the center of the city. There are currently 355 wind turbines in operation as part of FRWF Phases I through III, in addition to several wind farms operated by others in the county. These turbines are visible from Fowler and other communities within Benton County.

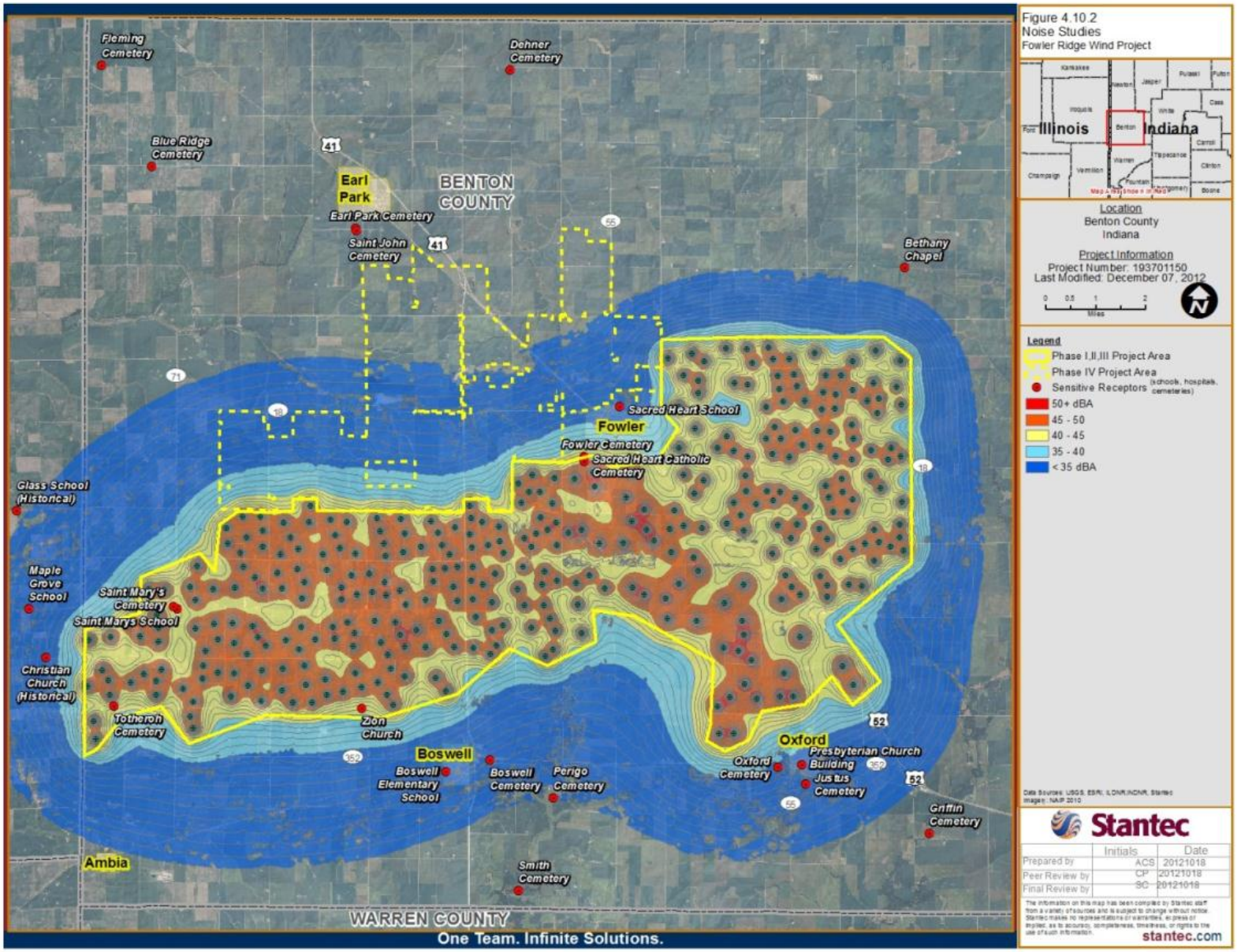
Figure 4.10.2
Noise Studies
Fowler Ridge Wind Project
Illinois
Indiana
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
Legend
Phase I,II,III Project Area
Phase IV Project Area
Sensitive Receptors (schools, hospitals, cemeteries)
50+ dBA
45 - 50
40 - 45
35 - 40
< 35 dBA
Stantec
Initials
Date
Prepared by
ACS
20121018
Peer Review by
CP
20121018
Final Review by
SC
20121018
stantec.com
Fleming Cemetery
Dehner Cemetery
Blue Ridge Cemetery
Earl Park
BENTON COUNTY
Earl Park Cemetery
Saint John Cemetery
Bethany Chapel
Sacred Heart School
Fowler
Fowler Cemetery
Sacred Heart Catholic Cemetery
Glass School (Historical)
Maple Grove School
Saint Mary's Cemetery
Saint Marys School
Christian Church (Historical)
Totheroh Cemetery
Zion Church
Boswell
Boswell Elementary School
Boswell Cemetery
Perigo Cemetery
Oxford
Presbyterian Church Building
Oxford Cemetery
Justus Cemetery
Griffin Cemetery
Ambia
Smith Cemetery
WARREN COUNTY
One Team. Infinite Solutions.

The towns of Fowler and Earl Park are located within the visual APE. These towns are characterized by residential and commercial development. Buildings (typically 2-3 stories tall or less) and other man-made features dominate the landscape. These structures are highly variable in their size, architectural style, and arrangement. Views within the towns are typically focused on the roadways and adjacent structures. Outward views occur most often at open road corridors, across yards and adjacent fields, and at the edges of the towns.

Currently, 355 wind turbines are in operation as part of Phases I through III, and there are 150 turbines associated with two other wind farms operated by others that are adjacent to FRWF. Turbines from all of these existing wind farms are visible from many locations within Phase IV and from locations within Fowler and Earl Park.

The Visual APE includes resources (sites and locations) that are potentially sensitive to changes in the visual landscape:

(1) Historic Sites: Three NRHP listed resources (see Section 4.8.2.2). All three are located within the town of Fowler.

(2) Resources that are regionally or locally significant, such as schools, churches, and cemeteries

Viewer groups within the visual APE can be classified into two general groups: 1) local residents which view the wind farm on a daily basis; and, 2) those groups which view the wind farm while traveling through Benton County and the Project Area.

4.12 AIR QUALITY AND CLIMATE

4.12.1 Scope of Analysis

No air monitoring sites are located in Benton County. Therefore, the air quality analysis presented in this EIS is based on the closest air monitoring station to the Project Area. The land use type in Benton County and these adjacent counties are similar (i.e., mostly rural and small town); therefore, ambient concentrations obtained from these stations were assumed to be representative of the ambient concentrations in the Project Area. The air quality analysis in this EIS is based on the air quality data described above and information from publicly available online databases and/or documents produced by the USEPA, the primary federal agency mandated with protecting and regulating air quality in the U.S.

4.12.2 Existing Conditions

Data presented in this section were obtained using the USEPA AirData website.[38] The closest active air-quality monitoring station, located approximately 28 miles southeast of Phase IV, is the Lafayette Cinergy Substation located in the town of Lafayette in Tippecanoe County.

The Lafayette Cinergy Substation monitoring station monitors carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide levels, in addition to particulate matter greater than 2.5 micrometers in size. All levels monitored at the station are within air quality standards set forth by the USEPA.[39] Based on the available air quality information[40], the air quality in the Project area is in attainment for all monitored criteria pollutants[41].

[38] http://www.epa.gov/airdata/
[39] Ibid. USEPA Air Data

4.12.3 Greenhouse Gases

Greenhouse gases (GHGs) are gases that warm the earth's atmosphere by absorbing solar radiation reflected from the earth's surface. The most common greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). According to USEPA (2009), scientists know with virtual certainty that increasing greenhouse gas concentrations are warming the planet and that rising temperatures may, in turn, produce changes in precipitation patterns, storm severity, and sea level, commonly referred to as "climate change."

The atmospheric buildup of carbon dioxide and other greenhouse gases is largely the result of human (anthropogenic) activities, such as the burning of fossil fuels (USEPA 2000). Of the total amount of U.S. greenhouse gases emitted in 2010, approximately 87% were energy-related, and 91% of those energy-related gases were carbon dioxide from the combustion of fossil fuels[42]. Global carbon emissions from fossil fuels have significantly increased since 1900. In addition to carbon, combustion of fossil fuels also produces other air pollutants, such as nitrogen oxides, sulfur dioxide, volatile organic compounds and heavy metals, which negatively affect human health, along with air and water quality.

Electric power generation is the largest source of energy-related CO_2 emissions in the U.S., accounting for 40% of the nation's total energy-related CO_2 emissions in 2011[43]. Nationwide, the U.S. currently obtains 72% of its electricity from fossil fuels, with 49.6% coming from coal[44]. Coal has the highest carbon dioxide content per unit of electricity produced of all fossil fuels used to provide electricity in the U.S.[45]. Emissions from coal-fired power plants account for approximately 80% of carbon dioxide emissions by electric power plants[46]. Indiana relies heavily upon coal for its electrical generation, with 83% of electricity generated in 2011 produced from coal[47], and Indiana ranks sixth in terms of tons of carbon dioxide emissions produced annually, following California, Florida, Ohio, Pennsylvania, and Texas.

4.13 COMMUNICATIONS

4.13.1 Scope of Analysis

This section of the EIS describes the communication facilities that may be present within Phase IV, including radio and television broadcast signals, microwave, cellular and two-way radio signals, and wireless internet. The existing conditions presented here are based on publically available information sources.

[40] http://www.epa.gov/airdata/
[41] http://www.in.gov/idem/6785.htm
[42] http://www.eia.gov/energy_in_brief/greenhouse_gas.cfm
[43] Ibid
[44] http://www.epa.gov/cleanenergy/energy-and-you/index.html
[45] http://www.eia.gov/tools/faqs/faq.cfm?id=73&t=11
[46] http://www.eia.gov/oiaf/1605/ggrpt/carbon.html
[47] http://www.eia.gov/state/state-energy-profiles.cfm?sid=IN

4.13.3 Existing Conditions

4.13.3.1 *Microwave Paths*

Microwave telecommunications systems transmit and receive line-of-sight signals across Phase IV. The microwave band beam range is generally 960 megahertz to 23 gigahertz frequency band range.

4.13.3.2 *Television*

Television broadcast signals pass through and are received within Phase IV.

4.13.3.3 *Cellular and Two-Way Radio*

Cellular and two-way radio signals are transmitted through Phase IV.

4.13.3.4 *Wireless Internet*

Wireless internet connections are influenced by the strength of incoming signals which rely on line-of-sight between antennae for maximum signal strength. Wireless internet systems within Phase IV are unknown.

4.14 HEALTH AND SAFETY

4.14.1 Scope of Analysis

This section describes the issues related to public health and safety as they relate to a wind power facility located in a rural agricultural setting. The safety issues described in this section are primarily related to operation and/or failure of one or more FRWF components and are limited to the Project Area. The health and safely analysis is based on information from scientific studies and data generated from wind projects currently operating in the U.S.

Public safety concerns associated with a wind facility may arise during project construction, operation, or decommissioning, and are largely due to the potential for falling overhead objects. Examples include ice shedding, tower collapse and blade failure. Other health and safety concerns may include stray voltage, fire, lightning strikes, and shadow flicker. Wind turbine noise is also a concern and is discussed in Section 4.10.

To date, FRWF has not experienced any catastrophic failure of Project components. The entire facility operates under a Health and Safety Plan which addresses, among other things, conducting daily job safety evaluations prior to the start of any work activities, safely approaching potential icing situations, emergency response, working at heights, energy isolation, ground disturbance and driving safety. FRWF restricts access to the substation and O&M building, which are fenced as required for public safety.

4.14.2 Existing Conditions

4.14.2.1 *Structural Failure and Ice Shedding*

Turbine structural failure includes turbine collapse and blade shear. Blade shear occurs when a turbine blade detaches and is thrown due to the spinning motion. Ice shedding occurs when ice builds up on a turbine blade and either sheds straight to the ground or is thrown by the spinning

motion. Under such conditions, ice would build up on the rotor blades and/or sensors, slowing its rotational speed and potentially creating an imbalance in the weights of the blades. Turbine control systems are designed to sense such effects of ice accumulation and to shut down the turbine until the ice melts. Threats to public safety are expected to be minimal due to required setbacks from residential structures and roads. Turbines in FRWF Phases I – III are a minimum of 1,320 feet from residences, a minimum of 1.5 times the turbine height (turbine height is defined as maximum blade tip height) from 4-lane highways and a minimum of 1.1 times the turbine height from all other roads.

4.14.2.2 *Lightning Strikes*

Wind turbines are susceptible to lightning strikes due to their height and metal/carbon components. The energy discharged during a lightning strike can cause severe damage to blades, which may lead to complete blade failure, although blade failure from lightning strikes is uncommon. All modern wind turbines include lightning protection systems which are designed to prevent catastrophic blade failure. To protect wind turbines from damage caused by lightning strikes and to provide grounding for the electrical components of the turbine, each turbine is equipped with an electrical grounding system.

4.14.2.3 *Shadow Flicker*

Shadow flicker from wind turbines can occur when moving turbine blades pass in front of the sun, creating alternating changes in light intensity or shadows. These flickering shadows can cause an annoyance when cast on nearby residences (“receptors”). The distance between a wind turbine and a receptor, along with weather characteristics such as wind direction and sunshine probability are key factors related to shadow-flicker impacts. Shadow flicker becomes much less noticeable at distances beyond about 305 m (1,000 ft), except at sunrise and sunset when shadows are long (NRC 2007). The effects of shadow flicker are expected to be minimal due to setbacks from residential structures and roads. Turbines in FRWF Phases I – III are a minimum of 1,320 feet from residences and a minimum of 1.5 times the turbine height (turbine height is defined as maximum blade tip height) from 4-lane highways and a minimum of 1.1 times the turbine height from all other roads

4.14.2.4 *Fire and Fuels*

Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with storage and use of various oils, including diesel fuels, lubricating oils, and hydraulic fluids, can create the potential for fire or medical emergencies within the tower or the nacelle, or in places where these oils may be stored such as the substation, electrical transmission structures, staging area(s), and the operations and maintenance building.

The fire risk associated with FRWF operations and maintenance is similar to risk associated with other industrial and storage facilities. Wind turbine operations and maintenance personnel are trained in fire safety and response.

5.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental effects of each of the four alternatives in Chapter 3 that were retained for detailed analysis and are summarized in Table 5.1. The chapter is organized by resource as in Chapter 4. Each of the alternatives would include construction of Phase IV (i.e., the same number and location of turbines and other Project-related facilities) and operation of Phases I through IV of the FRWF. The four alternatives differ from each other only with respect to operational adjustments. As such, resources that are not affected by operational adjustments (e.g., soils, water resources, vegetation, cultural resources, etc.), and are only affected by construction or the physical footprint of Phase IV, would be affected in the same manner under any of the four alternatives. Therefore, in order to avoid redundancy and streamline the chapter, within each resource section, the environmental effects of each alternative are discussed by impact type:

(1) Construction impacts

(2) Operations impacts

(3) Maintenance impacts

(4) Decommissioning impacts

The Applicant has determined preliminary locations for up to 94 turbines (Figure 1.1, Chapter 1), and minor modifications to the locations may occur prior to finalization of construction. The up to 94 Phase IV turbines would be sited entirely in agricultural fields within Phase IV, and all regulations, requirements, and minimization and avoidance measures described in this chapter would be implemented for up to 94 additional turbines.

This chapter describes the effects of construction of up to 94 Phase IV turbines and the operation of 449 (355 Phase I – III and 94 Phase IV) turbines. For the purposes of the EIS, “Project” refers to FRWF Phases I – IV, and “Phase IV” refers only to the proposed FRWF Phase IV project. Phase IV Project Area refers to an area including all Phase IV turbines bounded by a one-mile buffer. The direct and indirect effects of each alternative are described in each resource section. Each resource section concludes with a summary of effects each alternative would have on that resource. These sections are followed by a cumulative effects analysis.

Table 5.1 Summary of Alternatives

Alternative	Facility	Operations	HCP Implemented	BBCS[1] Implemented
No Action Alternative	449 (355 Phase I – III and up to 94 Phase IV) turbines and associated facilities and infrastructure	All 449 turbines would be shut down (i.e., non-operational) from sunset to sunrise from August 1 - October 15	No	Yes
3.5 m/s Cut-In Speed (Feathered) Alternative	Same as No Action Alternative	Cut-in speed on all 449 turbines would be set to 3.5 m/s from sunset to sunrise from August 1 - October 15 each year of the operational life of the Project. Blades feathered below cut-in wind speed	Yes	Yes
5.0 m/s Cut-In Speed Alternative	Same as No Action Alternative	Cut-in speed on all 449 turbines would be raised to 5.0 m/s when nightly air temperatures are 50° F or above from sunset to sunrise between August 1 and October 15 each year during the operational life of the Project. Blades feathered below cut-in wind speed	Yes	Yes
6.5 m/s Cut-In Speed Alternative	Same as No Action Alternative	Cut-in speed on all 449 turbines would be raised to 6.5 m/s when nightly air temperatures are 50° F or above from sunset to sunrise from August 1 – October 15 each year of the operational life of the Project. Blades feathered below cut-in wind speed	Yes	Yes

[1] Bird and Bat Conservation Strategy, Appendix D

5.1 GEOLOGY AND SOILS

5.1.1 Impact Criteria

There are no specific regulations regarding soils or geology that are applicable to this analysis. Impacts to soils and geologic resources may, however, have indirect and secondary effects on other resources. NEPA and CEQ guidelines indicate that unique geologic resource features should be protected and soil erosion minimized. In addition, project siting should avoid potential geologic and landslide hazards, including known earthquake faults, and other such hazards that may pose high risk loss or damage to people, structures, plants, or animals. No concerns related to geology and soils were identified during the scoping period.

5.1.2 Construction Effects

All four alternatives under consideration include using the following measures to avoid or minimize impacts to geology and soils during construction of Phase IV. For a full list of best management practices (BMP), see Appendix E.

(1) A SWPPP, including an Erosion and Sediment Control Plan, would be implemented, consisting of stabilization of steep slopes with geotextiles or other similar devices (particularly during rain events), silt fences, hay bale dikes, or other suitable methods of slowing sheet flow and retaining sediment onsite.

(2) The National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water permit would include restoration measures to ensure that disturbed ground is stabilized, preventing ongoing erosion and sedimentation of storm water run-off. These restoration measures consist of revegetation (preferably using native species, but exceptions may be made based on land use), regrading, and permanent swales or catch basins as needed.

(3) Topsoil removed from disturbed areas would be stockpiled and retained for reapplication once site disturbance is complete.

(4) Construction access outside of roads would be minimized in order to limit soil compaction.

(5) Compacted soils would be restored through manual or mechanical cultivation to re-aerate the soil and promote seed germination.

(6) Areas subject to temporary disturbance (outside the permanent Project footprint but disturbed during construction) would be revegetated in accordance with the Erosion and Sediment Control Plan. In areas that are currently under active agricultural use, revegetation would likely consist of resuming existing agricultural production. In non-cultivated areas, revegetation would involve reseeding with native vegetation or other suitable seed mix[48] made based on land use and mulching to encourage new growth.

Construction activities for up to 94 Phase IV turbines would take place over a period of 12 months. Under any of the four alternatives, the effects of construction of Phase IV would be

[48] http://www.wfyi.org/NaturalHeritage/participate/INPAWS2.pdf

limited largely to surface soil disturbance. Construction would not impact karst formations or caves. The Project is located in a low-level earthquake risk zone[49].

Although the preliminary locations for up to 94 turbines have been determined (Figure 1.1, Chapter 1), minor modifications to the locations may occur prior to finalization of construction. Turbine locations will not change by more than 95 feet from the currently proposed locations. These preliminary locations are necessary to allow modifications should sensitive resources be discovered at a turbine site at the start of construction. Nonetheless, final turbine sites will remain within the delineated Phase IV Project Area and within active agricultural land.

Most of the impacts resulting from turbine construction would occur on land that is currently used for row crop production and is regularly disturbed through cultivation. Phase IV would necessitate construction of temporary crane pads at each turbine site, temporary travel roads for the cranes, temporary turning areas for oversized equipment at certain county and local road intersections, temporary laydown areas around each turbine, trenching for the underground electrical collection and communication system, substation construction, and temporary storage/stockpile areas. Construction of each turbine would result in temporary impacts of approximately 10 feet on either side of the permanent roadway width, a 60-foot x 80-foot gravel crane pad extending from the roadway to the turbine foundation, and a 150-feet radius rotor laydown area centered on the turbine foundation. Construction of the substation would require a 5-acre parcel currently in row-crop production.

Construction of the up to 94 turbines, associated infrastructure and the substation would affect no more than 554 acres of soil; 475.8 acres would be temporarily disturbed during construction and would be restored to pre-construction conditions at the end of construction, and approximately 78.2 acres would be permanently impacted and covered with impervious surfaces and/or gravel which would remain in place for at least the life of the Project.

Restored sites would be returned to the original land uses following construction. All disturbed areas would be graded to the approximate original contour. Restored areas would be stabilized using appropriate erosion control measures, including site-specific contouring, reseeding, or other measures agreed to by the landowner and designed and implemented in compliance with the Project's SWPPP. Disturbed areas around each turbine (outside of the foundation and pad) would be left to passively re-vegetate or be returned to crops.

Surface disturbance would be contained within road ROWs, which would average a width of 36 feet along turbine/crane access roads. Final road grading and preparation would include reducing the construction road width to the final 16 feet. Adjacent areas would be reclaimed to current landcover types, and surface contours would be directed away from any cut-and-fill slopes and into ditches that discharge to natural drainages as necessary. SWPPPs include standard sediment control devices to minimize soil erosion during and after construction. Following construction, all unused construction materials and waste would be picked up and removed from the Phase IV area and waste materials would be disposed of at approved and appropriate landfills.

Under any of the four alternatives, there would be periodic and localized soil disturbance resulting from construction of Phase IV. None of the alternatives is expected to result in

[49] http://earthquake.usgs.gov/earthquakes/states/indiana/hazards.php

significant soil erosion during construction provided that BMPs are effectively implemented. Construction of Phase IV under any of the four alternatives would not result in significant adverse effects to geologic features or soils. Phase IV construction includes the measures 1-6 listed above. The Applicant is committed to maintaining site soil integrity so that temporarily disturbed lands continue to serve as prime farmland and high-quality agricultural land.

5.1.3 Operations Effects

No effects to site soils or geological resources are anticipated from the operation of Phase IV under any of the four alternatives.

5.1.4 Maintenance Effects

No impacts to site soils or geological resources are anticipated from the maintenance of Phase IV under any of the four alternatives.

5.1.5 Decommissioning Effects

Impacts on soils and geology associated with decommissioning activities under any of the four alternatives would be related to removal of the turbines, concrete foundations, and other facilities, with the exception of the underground collection systems or other landowner requests. Concrete foundations would be removed to a depth of at least four feet below the surface. Removal of access roads would occur if required by the landowner. The impact of road removal (i.e., ground disturbance) would be generally equivalent to that of the construction phase. In general, the impacts of decommissioning would be temporary and comparable to construction-related impacts. As with construction, the Applicant is committed to restoring site soil integrity so that disturbed lands serve as high-quality agricultural land following reclamation.

5.1.6 Mitigation for Impacts to Geology and Soils

No adverse impacts on soils and geologic resources would occur during Phase IV construction or Project operations, maintenance, and decommissioning under any of the four alternatives. During construction of Phase IV, impacts would be primarily temporary and localized, and BMPs (Appendix E) would be implemented to minimize soil erosion. Therefore, no specific mitigation measures for geology and soils in addition to the avoidance and minimization measures listed above would be implemented for any of the four alternatives.

5.1.7 Summary of Effects to Geology and Soils

- No concerns related to geology and soils were identified during the scoping period.
- Construction and decommissioning of Phase IV under any of the four alternatives would result in short-term and localized effects on soils and geologic resources.
- Implementation of a SWPPP is expected to minimize soil erosion during construction, maintenance, and decommissioning.
- No effects on soils and geologic resources would occur as a result of operation of the FRWF.
- Effects to soils and geologic resources are expected to be minor, and none of the four alternatives would result in significant adverse effect to soils and geologic resources.

- No specific mitigation measures for geology and soils in addition to the avoidance and minimization measures listed above would be implemented under any of the four alternatives.

5.2 LAND USE

5.2.1 Impact Criteria

NEPA analysis must consider the effects of the alternatives on land use and recreation. Effects of an alternative would be considered significant if they result in elimination of current land uses within Phase IV. This analysis evaluates the Project's compatibility with local land use, planning, zoning, planned development, and the positive or negative effects on existing recreational areas and resources. In addition, because the purpose of the FPPA is to minimize the extent to which Federal programs contribute to unnecessary conversion of farmland to non-agricultural uses, this analysis also includes effects on farmland preservation programs. No issues related to land use were identified during the scoping period.

5.2.2 Construction Effects

The effects on land use associated with the construction of Phase IV would be the same under any of the four alternatives and are anticipated to be largely temporary. Phase IV would be sited and constructed in compliance with Benton County's Wind Energy Siting Ordinance[50] (see Section 1.3.13.1), and all required permits would be obtained. All turbines would be sited to meet the required setbacks as per the ordinance and meet all specifications related to safety, color, lighting, and noise.

Construction of Phase IV would be consistent with the goals set forth in Benton County's draft Comprehensive Land Use Plan[51], which states that Benton County was chosen as the site for Indiana's first wind farm and lists as one of the plan's goals to "support wind farms and renewable energy projects". The plan identifies future land use in the Phase IV area as agricultural. Phase IV is consistent with this planned future use, would provide income to local farmers through lease payments, and provide incentive for conserving agricultural land. In addition, construction of Phase IV would make economic contributions to the local communities through tax payments (see Section 5.7, Socioeconomics and Environmental Justice).

Multiple BMPs will be implemented at the project (Appendix E), and significant impacts to agricultural land will specifically be avoided through efforts to:

(1) Coordinate with landowners on Phase IV design, including using existing field entrances and farm lanes and locating infrastructure along field edges;

(2) Avoid disturbance of surface and subsurface drainage features and repair all inadvertently damaged tile lines;

(3) Maintain access roads throughout construction to allow continued use/crossing by farmers and farm machinery; and,

(4) Confine construction access to roads in order to minimize soil compaction.

[50] http://www.in.gov/oed/files/Benton_County_Wind_Ordinance.pdf
[51] http://ldm.agriculture.purdue.edu/Pages/Resources/PlanIN.html#LinksAdams

The Phase IV footprint would affect a small amount of land relative to the size of the project area. Construction of Phase IV would not alter the predominantly agricultural land use in the Phase IV area or the surrounding area. Furthermore, Phase IV construction would not have adverse effects to recreation resources found on public lands.

In accordance with the FPPA, a Farmland Conversion Impact Rating Form, AD-1006, was completed to determine impacts to prime and unique farmland as a result of construction of Phase IV (Appendix F). Approximately 97% of the farmable land in Benton County is considered prime and unique farmland (Appendix F). Construction of Phase IV would permanently impact only 78.2 acres of prime and unique farmland (0.03% of the prime and unique farmland in the county). Therefore, construction of Phase IV under any of the four alternatives would not result in significant effects to prime and unique farmland.

The presence of heavy construction equipment, workers, and increased traffic are not typically associated with rural-agricultural areas; however, dust, noise, and large farm machinery on public roads are common at certain times of the year. These impacts are not anticipated to occur in areas used for recreation, such as golf courses or parks, and any such effects would be short-term and last only until construction activities were completed.

5.2.3 Operations Effects

Operation of all Phases of the Project would not directly impact local land use categorizations (i.e., agricultural land). Additionally, neither the current nor future designation would be altered by the operation of Project. Landowners whose property is directly impacted by the project would be compensated through lease payments throughout the life of the project. Aside from land utilized for turbine pads and access roads, land surrounding each turbine would remain in agricultural use. Based on the local plans analyzed, Project operations would be consistent and compatible with the goal set forth by Benton County's draft Comprehensive Land Use Plan of supporting wind farms and renewable energy projects.

5.2.4 Maintenance Effects

Maintenance activities associated with Project operations under any of the four alternatives would not result in significant adverse effects to overall land use within any Phase of the Project area.

5.2.5 Decommissioning Effects

Decommissioning of the Project would not immediately affect the land use or recreational resources of the area. Similar to construction, impacts would be minimized through planning and implementation of avoidance and minimization measures (see Section 5.2.2 above). It is anticipated that as Project facilities are removed, affected areas would be returned to row crop production.

5.2.6 Mitigation for Impacts to Land Use

Construction and operation of Phase IV would not have a significant effect on land use or recreation, therefore, no specific mitigation measures are proposed in addition to the avoidance and minimization measures discussed above.

5.2.7 Summary of Effects to Land Use

- No issues related to land use were identified during the scoping period.
- None of the four alternatives under consideration includes actions that are inconsistent with local land use, zoning or future planned development.
- No significant adverse effects to land uses are anticipated as a result of construction of Phase IV, or operation, maintenance, and decommissioning of all four phases under any of the four alternatives.
- No specific mitigation measures are proposed in addition to the avoidance and minimization measures discussed above under any of the four alternatives.

5.3 VEGETATION

5.3.1 Impact Criteria

The State of Indiana monitors the introduction and spread of invasive plants and protects State-listed plants, potential impacts to which are included in the discussion below. Executive Order 13112 addresses federal coordination and response to the problems associated with invasive species. No other State or Federal rules pertinent to this Project regulate non-listed plants.

Plant impacts can occur at the individual, population, or community level. For purposes of this EIS, the Service considers impacts to vegetation resources to be significant should implementation of an alternative result in:

(1) Naturally occurring population reduced in numbers to levels below viable local or regional levels;

(2) Substantial loss of soil stabilization services;

(3) Substantial loss of habitat for rare, threatened or endangered species;

(4) Introduction of invasive species that results in substantial loss of native species.

No concerns related to vegetation were identified during the scoping period.

5.3.2 Construction Effects

Agricultural land comprises more than 95% of the Phase IV Project area. The area impacted and thus potential vegetation loss associated with construction of up to 94 Phase IV turbines is 554 acres and would be entirely in cultivated cropland, with the exception of where access roads and collector lines would cross road ditches. It is anticipated that no CRP land would be affected by the construction. No plant species occurring in Phase IV would be extirpated and no populations would be significantly reduced as a result of construction activities. Disturbed areas around each turbine (outside of the foundation and pad area) would be left to passively re-vegetate or be returned to crops.

Construction activities have the potential to introduce invasive species into the Phase IV project area which could spread outside of the Project area. If such infestations occur, they are not anticipated to be severe enough to result in substantial loss of native species. For the most

part, there are only small patches of native vegetation remaining in the Project area and they have already been affected by invasive plant species. Most of the land is agricultural; it is unlikely that any new invasive plants not already present would be introduced or have significant effects. The Applicant would monitor around the substation and turbine locations for invasive plant species and take the steps necessary for control of noxious weeds and pests. For a full list of BMPs refer to Appendix E.

Areas requiring restoration or reclamation would be leveled or re-contoured to match the surrounding area, covered with topsoil, and re-seeded, if needed, as per the NPDES permit and Erosion and Sediment Control Plan.

5.3.3 Operations Effects

No impacts to site vegetation are anticipated from the operation of Phases I-IV under any of the four alternatives. No additional vegetation clearing would be required during Project operations.

5.3.4 Maintenance Effects

Maintenance under any of the four alternatives would have minor effects on vegetation. Maintenance activities would consist of periodic mowing to retain previously cleared areas associated with Project infrastructure (roads, transmission lines) and ROWs. The need for mowing would be evaluated by site operations staff periodically during the growing season and would occur on an as-needed basis. Maintenance would also consist of building inspection and repairs, as needed; periodic grading of roads to restore the road surface or repair of culverts, as needed; and annual inspection and removal of hazards (e.g., downed trees or encroaching branches) on transmission lines. This level of maintenance would be routine along county roads and farms and, in general, would be consistent with the level currently occurring in the Project area.

5.3.5 Decommissioning Effects

Impacts on vegetation associated with decommissioning activities would be related to removal of the turbines, foundations, and roads (see Section 1.2.4.1). Some roads would not be removed, per landowner request. Foundations (e.g., of turbines, transformers, MET towers) would be excavated to a depth sufficient to remove anchor bolts, rebar, conduits, cable, and concrete to a depth of four feet below grade. Hence, some roads and concrete material would remain in place. The collector and communications cables and conduits would be cut back to a depth no greater than four feet. All cable and conduit buried greater than four feet would be left in place and abandoned. Generally speaking, decommissioning impacts would be similar to those associated with construction activities and occur in areas previously disturbed by construction.

Access roads would be widened as necessary to accommodate movement of cranes or other machinery required for the disassembly and removal of the turbines. After decommissioning of the turbines is completed, access roads and construction pads would be removed, unless the landowner requests that access roads remain in place. The physical impacts of road widening and removal on vegetation (equipment footprints, ground disturbance, etc.) would be generally equivalent to the impacts incurred during the construction phase.

Areas requiring restoration or reclamation would be leveled or re-contoured to match the surrounding area, covered with topsoil, and re-seeded, if needed. Other steps necessary to

prevent soil erosion, establish vegetation cover, and control noxious weeds and pests would be conducted as necessary. A monitoring and remediation period of approximately three years would follow the completion of decommissioning and restoration activities. Where practical, restoration measures would reclaim disturbed areas to original or similar vegetation types for all areas impacted by Phases I - IV. This would include restoring row-crop production lands. For a full list of BMPs which will be implemented, refer to Appendix E.

5.3.6 Mitigation for Impacts to Vegetation

The construction of Phase IV and decommissioning of Phases I - IV would impact vegetation. However, impacts on vegetation that would occur as a result of the Project would not be inconsistent with the level of vegetation disturbance already present in an intensively farmed landscape. Other than the avoidance, minimization, and site restoration measures discussed above, no specific mitigation measures for vegetation would be implemented for any of the four alternatives under consideration.

5.3.7 Summary of Effects to Vegetation

- No concerns related to vegetation were identified during the scoping period.
- Vegetation loss associated with construction of Phase IV under any of the four alternatives under consideration would be entirely in cultivated cropland, with the exception of where access roads and collector lines would cross road ditches.
- The Project is not expected to cause reductions in the numbers of any naturally occurring State-listed or non-listed plant population or result in the loss or degradation of habitat for any rare, State-threatened or endangered plant species, community, or population.
- Removal of vegetation as a result of construction of Phase IV would result in minor effects to soil stabilization services during construction and decommissioning; however, these effects would be minimized through implementation of an Erosion and Sediment Control Plan.
- Implementation of BMP's (Appendix E) would attempt to avoid and control noxious plant invasions in the Phase IV area.
- Effects to vegetation resources are expected to be minor, and none of the four alternatives would result in significant adverse effects to vegetation resources.
- Other than the avoidance, minimization, and site restoration measures discussed above, no specific mitigation measures for vegetation would be implemented under any of the four alternatives.

5.4 WATER RESOURCES

5.4.1 Impact Criteria

This analysis evaluates how the four alternatives under consideration would potentially affect existing water resources. Water resources evaluated include surface waters (i.e., rivers,

streams, lakes, and ponds), wetlands, floodplain, and groundwater and drinking supply. Project effects to water resources would be considered significant should any of the following result:

(1) Lost function of wetlands or floodplain;

(2) Compromised safety or quantity of any water supplies;

(3) Degraded aquatic resources that result in losses in biodiversity or degraded water quality or quantity; or

(4) Dramatic changes to other resources, such as flora or fauna, related to affected water resources conditions.

At the Federal level, water resource impacts are regulated by the Federal Water Pollution Control Act (Clean Water Act) of 1972, Executive Order 11988: Floodplain Management (1977), Wild and Scenic Rivers Act of 1968, and the Safe Drinking Water Act of 1974. In addition, state and local agencies, including the Indiana Natural Resources Commission (Indiana Flood Control Act (IC 14-28-1)), have developed legislation that regulate floodplain development.

No concerns related to water resources were identified during the scoping period.

5.4.2 Construction Effects

All four alternatives under consideration would include construction of Phase IV; therefore, potential effects to water resources would be the same for any of the alternatives. Potential effects to water resources as a result of construction are discussed below.

5.4.2.1 *Surface Waters*

Gretencord Ditch, Salmon Ditch, Minier Lateral, in addition to Sugar Creek, Mud Creek, Coon Creek, and their tributaries are found within Phase IV (Figure 4.4.2.1-2, Chapter 4). Phase IV contains no streams identified by IDEM as having outstanding ecological, recreational, or scenic importance. No waterbodies within Benton County as a whole have been designated as having outstanding ecological, recreational or scenic importance[52]. Sugar Creek, located within the Phase IV project limits, is identified on the IDEM 2008 303(d) List of Impaired Waterbodies approved by the U.S. EPA in 2008[53] (Figure 4.4.2.1-2, Chapter 4).

No permanent stream crossings (i.e., access roads) or temporary stream crossings for collector lines (i.e., open trench) would occur as a result of construction of Phase IV. Directional boring would be implemented at all collector line crossings of regulated streams, and no permanent fill would be placed below the ordinary high water mark at any stream crossing. Therefore, no impacts to regulated streams would occur as a result of construction of access roads or collector lines. In the event that any intermittent or ephemeral streams have active flow at the time of construction, the Applicant would hold off construction until the stream is no longer flowing or directionally bore, rather than open-trench through open stream flow. If construction equipment must cross a stream, temporary crossings will be constructed using standard BMPs (Appendix E). If temporary crossings are needed, prior to construction, the Applicant will consult with appropriate state and federal agencies regarding any permit requirements or other

[52] http://www.in.gov/dnr/water/2452.htm
[53] http://www.in.gov/idem/nps/2647.htm

authorizations that may be required. Once construction is complete, any temporary crossings would be removed and the streambanks restored and revegetated.

Surface water runoff from unpaved roads or accidental spills that could occur during construction activities has the potential to contribute sediments and/or pollutants to streams in the Phase IV area. However, construction activities would be performed using standard construction BMPs so as to minimize the potential for accidental spills of solid material, contaminants, debris, and other pollutants. For project-specific BMPs, refer to Appendix E. In addition, a SWPPP, including an Erosion and Sediment Control Plan, would be implemented consisting of measures such as stabilization of steep slopes (particularly during rain events), silt fences, hay bale dike or other suitable methods for slowing sedimentation into waterways.

The NPDES General Construction Storm Water permit obtained for Phase IV would also include restoration measures to ensure that disturbed ground is stabilized, preventing ongoing erosion and sedimentation of storm water runoff. These restoration measures may include, as appropriate, revegetation (preferably using native species, but exceptions may be made based on land use), regrading, and permanent swales or catch basins. Following construction, areas disturbed by construction would be restored as per the SWPPP and NPDES permit.

No named lakes or ponds are located within Phase IV; however, farm ponds are scattered throughout the area. While these ponds may provide a drinking water source for some wildlife species, their suitability for providing wildlife habitat is likely limited based on water quality and the seasonal nature of some of the ponds (i.e., natural drawdown during dry conditions). The Applicant has committed to complete avoidance of these ponds; therefore, no adverse effect to these resources would occur as a result of construction.

5.4.2.2 *Wetlands*

Landcover data (NLCD 2006) indicate approximately 21.65 acres of wetland and open water occur within Phase IV, accounting for approximately 0.13% of total landcover within Phase IV (see Section 4.1.2.1). USFWS NWI maps identify approximately 60 acres of wetland within Phase IV (Figure 4.4.2.2, Chapter 4). During windshield surveys in 2011, Stantec Consulting Services identified approximately 48.1 acres of potential wetland within the Phase IV project area (Figure 4.4.2.2, Chapter 4). The Applicant has committed to complete avoidance of all wetland impacts during construction of Phase IV (see Project Specific BMPs in Appendix E). No turbines would be located in wetlands, and no access roads would be constructed within potential wetland boundaries. In addition, if collector lines cannot completely avoid wetlands, directional boring would be implemented to avoid impacting wetlands.

Surface water runoff from unpaved roads or accidental spills that could occur during construction activities has the potential to contribute sediments and/or pollutants to wetlands in the Phase IV area. However, construction activities would implement standard BMPs to avoid impacting wetlands (Appendix E). As per a pending NPDES permit, the Applicant would implement a SWPPP, including an Erosion and Sediment Control Plan, to ensure that all ground disturbance is stabilized to prevent erosion and sedimentation into wetlands. Following construction, areas disturbed by construction would be restored as per the SWPPP and NPDES permit.

No adverse effect to wetlands would occur as a result of construction of Phase IV under any of the alternatives under consideration for the following reasons:

1. Potential wetlands within Phase IV were located and mapped (see Section 4.4.3.2).
2. Comparison of the locations of the wetlands with the locations of the 94 proposed Phase IV turbines, which would not change more than 95 feet from the currently proposed locations (see Section 5.1.2), indicates no turbines or access roads would be placed in wetlands.
3. Collector lines will avoid wetlands where possible. If collector lines cannot completely avoid wetlands, directional boring would be implemented to avoid impacting wetlands.

Prior to construction, the Applicant will consult with the appropriate state and federal agencies regarding any permit requirements or other authorizations that may be required.

5.4.2.3 *Floodplain*

No mapped 100-year floodplain or floodways are located within the Phase IV boundary (Figure 4.4.2.3, Chapter 4). Therefore, no effects to mapped 100-year floodplains or floodways or significant effects to floodwater attenuation would occur as a result of construction of Phase IV under any of the alternatives under consideration.

5.4.2.4 *Groundwater and Drinking Water Supply*

The regional hydrogeology consists of two bedrock aquifer systems and five unconsolidated aquifer systems. The only sole-source aquifer in Indiana, the St. Joseph Aquifer at South Bend in northern Indiana, is not located within Phase IV (see Section 4.4.2.4). No discharge of water or materials into the groundwater system would occur as a result of construction of Phase IV.

Construction of Phase IV would include excavation to approximately 12 feet below the surface at all turbine tower locations to install turbine foundations. Excavation activities would not be expected to affect any aquifer system because of the shallow depth of excavation. In addition, no new groundwater wells would be drilled as a result of Phase IV construction; therefore, no large ground water withdrawals would occur that may affect groundwater supplies.

No significant adverse effect to groundwater would occur as a result of Phase IV construction under any of the four alternatives under consideration.

5.4.3 Operation Effects

No significant effects to water resources would occur as a result of operation of the Project under any of the four alternatives under consideration.

Operating the Project could result in minor oil spills from leaking transformers or gear boxes which could cause localized effects to water quality should these spills enter surface waters; however, significant effects would be unlikely due to the small volume of oil that could potentially spill. Any potential oil spills would be addressed in the Applicant's Spill Prevention, Control and Countermeasure (SPCC) Plan.

5.4.4 Maintenance Effects

No significant effects to water resources would occur as a result of Project maintenance under any of the four alternatives under consideration.

Maintaining Project electrical or turbine components could result in minor oil spills from leaking transformers or gear boxes installed at Phase IV, which could cause localized effects to water quality should these spills enter surface waters; however, significant effects would be unlikely due to the small volume of oil that could potentially spill. Any potential oil spills would be addressed in the Applicant's SPCC Plan.

5.4.5 Decommissioning Effects

Potential effects to water resources as a result of decommissioning would be similar to those of construction. The Applicant has committed to complete avoidance of all streams and potential wetland areas; therefore, no significant effects would occur as a result of decommissioning activities.

5.4.6 Mitigation for Impacts to Water Resources

No significant adverse effects to surface waters, wetlands, floodplain or groundwater are anticipated as a result of the Project under any of the four alternatives under consideration. Based on this, no mitigation is proposed.

5.4.7 Summary of Effects to Water Resources

- No concerns related to water resources were identified during the scoping period.
- No significant adverse effects to surface waters, wetlands, floodplain or groundwater are anticipated as a result of construction of Phase IV, or operation, maintenance, and decommissioning of all four phases under any of the four alternatives.
- The Applicant has committed to avoidance of all stream and wetland impacts within the Phase IV area. No designated 100-year floodplain or floodways are found within Phase IV, and no impacts to groundwater aquifers would occur.
- No specific mitigation measures for water resources would be implemented under any of the four alternatives.

5.5 WILDLIFE AND AQUATIC RESOURCES

5.5.1 Impact Criteria

Most regulations associated with fish and wildlife impacts are concerned with effects to rare, threatened, and endangered species, which are discussed in Section 5.6. In addition, the MBTA protects non-listed birds, and BGEPA protects bald and golden eagles.

Significant impacts to wildlife and aquatic resources are those that substantially affect a species' population (locally, regionally, or range-wide) or significantly reduce its habitat quality or quantity. Impacts to species can be both direct and indirect. Disturbance, injury, mortality, and habitat alteration are examples of potential direct effects. Examples of indirect effects include habitat loss or degradation over time or in another place in association with another impacted resource, such as surface water or groundwater alterations, modification or creation of habitat edges and openings that favor a different mix of species, and changes in plant species

composition. Animal displacement or avoidance due to changed or increased traffic patterns can also be termed indirect or secondary effects.

The analysis in this section considers construction effects, operation effects, maintenance effects, and decommissioning effects on four categories of wildlife:

(1) Terrestrial wildlife

(2) Aquatic resources

(3) Bats not listed under the ESA

(4) Birds, including some species or groups of particular concern

The analysis considers the Project's potential to affect species distribution and life history with respect to an effect's intensity, duration, and frequency. BMPs and mitigation measures to minimize and reduce impacts are incorporated into the following evaluation of potential effects. The effects of construction, operation, maintenance, and decommissioning are summarized for all species of Wildlife and Aquatic Resources in Section 5.5.7.

5.5.2 Construction Effects

5.5.2.1 *Construction Effects on Terrestrial Wildlife*

Incidental injury and mortality from construction of Phase IV under any of the four alternatives under consideration would be limited to sedentary/slow-moving/burrowing species, such as small mammals, reptiles, and amphibians that are unable to move away from the active construction area. A few bird species will nest in the early stages of crop growth, such as horned lark and killdeer. Construction activities conducted during the early growing season may adversely affect nests and young birds that nest in early crops. No significant areas of woodland or grassland are found within the Phase IV project area (see Table 4.1), and as such, none would be cleared as part of the project. For the most part, construction activities are not anticipated to kill or harm a significant number of animals. Mobile species and mature individuals present in the vicinity of construction activities should be able to move away from the areas being disturbed. All of the Phase IV components are sited in cultivated cropland, with the exception of where access roads and collector lines would cross road ditches, that has limited wildlife habitat value for those species that require grassland, woodland, open water and other natural communities. Mortality of terrestrial wildlife may occur as a result of road kills during construction of Phase IV, but these impacts are expected to be minor under any of the four alternatives, given the relatively low levels of primarily daytime traffic on-site and the site-wide 25 mph speed limit.

Increased noise and human activity associated with construction may result in some short-term displacement of wildlife species that use cropland and field edges, such as white-tailed deer, ring-necked pheasant, raccoon and skunk. However, due to the existing disturbance from tractors, plows, and other agricultural equipment, most wildlife in the Phase IV area are likely accustomed to a certain amount of acoustic disturbance. Phase IV related noise impacts would be minor and temporary.

For a full list of the BMPs which will be employed, refer to Appendix E. For the reasons discussed above, effects on terrestrial wildlife associated with construction of Phase IV under any of the four alternatives under consideration are anticipated to be minor.

Population Level Effects of Construction on Terrestrial Wildlife

Little available natural habitat for terrestrial animals is found in the Phase IV project area and impacts across all potentially affected species are anticipated to be minor; consequently, population level effects from construction of Phase IV are not expected to occur under any of the four alternatives for any species of terrestrial wildlife.

5.5.2.2 *Construction Effects on Aquatic Resources*

Aquatic habitats are limited in Phase IV, and those present have been altered considerably by intensive agriculture. There are no major rivers or lakes within or near the Phase IV area. The majority of the historical streams that remain have been channelized and converted to deep drainage ditches. There are a limited number of perennial, intermittent and ephemeral streams, along with farm ponds; however, none would be directly affected by construction of Phase IV (see Section 5.4). Indirect impacts on aquatic wildlife could occur if sediment loads in runoff from disturbed areas decrease water quality. However, these effects would be minimized or avoided through implementation of an Erosion and Sediment Control Plan, horizontal directional boring, implementation of BMPs (Appendix E), and other measures that would result in minor, if any, impacts to aquatic wildlife. Effects to aquatic resources associated with construction of Phase IV are anticipated to be minor under any of the four alternatives under consideration.

Population Level Effects of Construction on Aquatic Species

Because of the limited amount and poor quality of aquatic resources in the Phase IV project area, and because of the measures FRWF will implement to avoid and minimize impacts, population level effects from construction of Phase IV under any of the four alternatives are not expected for any aquatic species.

5.5.2.3 *Construction Effects on Bats Not Listed Under the ESA*

Habitat Loss

During the micro-siting process for Phase IV, the results of a habitat mapping study were used to site turbines or access roads away from areas deemed potentially suitable for roosting and foraging bats (e.g., woodlot habitats and open water). Phase IV turbines and access roads have been sited entirely in cultivated croplands with the exception of where access roads would cross road ditches. Consequently, no maternity, roosting, or native foraging habitat for bats would be lost due to Phase IV construction under any of the four alternatives. Additionally, construction of Phase IV would not impact fall swarming habitat for bats or hibernacula for cave-dwelling species under any of the four alternatives. Due to their demonstrated preference for forested, forest edge, and wetland (e.g., farm ponds, emergent wetlands, streams) habitat, most bat species that may occur within the Project area are unlikely to be affected by the loss of disturbed, agricultural habitat. In addition, disturbed, agricultural habitat is abundant in the area and available for bat species, such as the big brown bat, that may occasionally forage over croplands.

Disturbance/Displacement

Several of the more common species, such as the little brown bat and big brown bat, are known to roost in attics or the peaks of other large buildings. Natural habitat features or resource areas that typically attract bats are limited within the Phase IV area. However, large outbuildings

associated with agricultural settings may provide suitable roosting/maternity locations for some of the more common bat species (e.g., little brown and big brown bats). A limited amount of marginally suitable summer foraging habitat is present; however, no swarming/staging habitat or bat hibernacula are present. Although some bat species may forage within the Phase IV area at night, nighttime construction activities would be minimal. Additionally, bat use of Phase IV is expected to occur primarily over open water and forested habitat (see Section 4.5.2.4), and these areas would be avoided during construction. For a full list of BMPs refer to Appendix E. Construction activities and associated increases in noise, light, vibration, human activity, and/or traffic are not expected to disturb or displace bat species under any of the four alternatives.

Mortality

Construction of Phase IV is not expected to result in mortality or loss of reproductive fitness for bat species due to the lack of suitable summer maternity habitat and the absence of hibernacula in the Project area and vicinity. Construction is not expected to cause mortality of roosting bats because activities would not impact any potentially suitable roosting habitat associated with man-made structures or limited woodlots within Phase IV. Foraging bats are not expected to be at risk of mortality from Phase IV construction because nighttime construction activities would be minimal and areas of marginally suitable foraging habitat would be avoided. Therefore, mortality of bats is not expected to occur as a result of Phase IV construction under any of the four alternatives.

Population Level Effects of Construction on Bats Not Listed Under the ESA

Virtually no habitat for non-ESA listed bats is found in the Phase IV project area; therefore, any impacts to bat habitat as a result of construction of Phase IV would be minor, and essentially no potential exists for direct take or displacement of bats not listed under the ESA. Consequently, population level effects from construction of Phase IV under any of the four alternatives are not expected for any bats not listed under the ESA.

5.5.2.4 *Construction Effects on Birds*

Habitat Loss

During the micro-siting process for Phase IV, results from an avian use and habitat mapping study were used to site turbines or access roads away from habitat for sensitive species and potential areas of high bird-use (e.g., riparian, grassland, woodlot habitats, and gamebird areas). Phase IV turbines and access roads have been sited entirely in agricultural fields and consequently, no native bird habitat would be lost due to Phase IV construction. The loss of disturbed, agricultural habitat is likely to be inconsequential for the local bird community under any of the four alternatives due to the large amounts of similar habitat available adjacent to all permanently disturbed areas.

Disturbance/Displacement

Potential disturbance or displacement impacts to birds during construction of Phase IV are likely to be minimal under any of the four alternatives. Certain bird species may be temporarily displaced due to noise and increased human presence during construction; however, due to the existing disturbance from tractors, plows, and other agricultural equipment, most birds in the Phase IV area are likely accustomed to a certain amount of disturbance. Grassland birds have the potential to be particularly susceptible to displacement; however, grassland and pasture

habitat within Phase IV is limited to that of small fragments with little core habitat. The majority of birds detected during surveys within and near Phase IV were common species adapted to human disturbance (Johnson and Bay 2008, Carder et al. 2010); these species are less likely to be displaced due to Phase IV construction activities (Shaffer and Johnson 2008, Kerlinger 2002). The potential displacement of American golden-plovers and other birds from the presence of Phase IV turbines on the landscape is discussed below in Section 5.5.3.4.

Mortality

Adult mortality is not expected to occur during construction activities due to the alertness and mobility of avian species. Mortality of juvenile birds could occur if construction activities occur in non-tilled areas during the breeding season. However, nesting habitat for ground- and shrub-nesting birds is limited within the Phase IV, due to the predominance of active agriculture (>95%). Horned larks, killdeer, and a handful of other disturbance-tolerant bird species may nest in areas used for row crop production. Of the thousands of acres of agricultural nesting habitat available for these species within and adjacent to Phase IV, construction of Phase IV would impact no more than 554 acres, with 475.8 acres consisting of temporary impacts that would affect at most only one nesting season. The construction schedule and location of proposed construction activities would be evaluated against habitat mapping results to determine the potential for construction to occur within areas of potentially-suitable habitat for state-listed bird species or nesting raptors. Should this evaluation indicate that state-listed birds or nesting raptors may be affected by construction activities, the Applicant would contract biologists to monitor for birds during those times when construction would overlap with the breeding season (approximately late April to mid-July). The biologist would be present on-site several days per week and would conduct surveys within the proposed construction footprint at least once per week during the breeding season in order to identify and prevent disturbance of newly established bird nests. Additionally, sensitive species training would be part of the standard construction orientation for all Phase IV staff. Therefore, bird mortality due to Phase IV construction is anticipated to be minor under all four alternatives.

Population Level Effects of Construction on Birds

Phase IV contains little nesting habitat for any species of bird; therefore, direct take of birds as a result of construction of Phase IV is not expected to occur and any impacts to avian habitat that might occur are expected to be minor. Consequently, population level effects from construction of Phase IV are not expected for any bird species under any of the four alternatives.

5.5.3 Operation Effects

5.5.3.1 *Operation Effects on Terrestrial Wildlife*

There are limited data available addressing impacts to mammals, reptiles, and amphibians associated with habitat loss due to displacement from operating wind farm developments in the U.S.; the majority of studies have focused on bird and bat collision mortality. Because the affected habitat, cropland, is of such low value for wildlife, the habitat loss impacts under any of the four alternatives are expected to be minor.

It is possible that some animals would avoid the Project, especially in the Phase IV project area as it becomes added to the landscape. However, common species, such as white-tailed deer, raccoon, and skunk, tend to become habituated to human activity and habitat modification. While habituation may not be immediate, species likely to occur in the Phase IV project area

would adapt quickly to the presence of man-made features in their habitat, as evidenced by the abundance of these species in suburban settings. Deer have been observed at recently constructed wind power projects (Stantec 2010a, 2010b). Significant displacement of common mammals from a wind power site has not been reported.

Terrestrial wildlife mortality is not expected to occur as a result of Project operations under any of the four alternatives because the risk of turbine collision is confined to the rotor-swept zone of each turbine.

Population Level Effects of Operation on Terrestrial Wildlife

Little available natural habitat for terrestrial animals is found in the Project Area; therefore, avoidance or displacement effects, should they occur, are expected to be minor. All species of terrestrial wildlife inhabit an area below the rotor-swept zone and no direct morality of these species is expected to occur. Consequently, population level effects from operation of the Project under any of the four alternatives are not expected for any species of terrestrial wildlife.

5.5.3.2 *Operation Effects on Aquatic Resources*

There would be no effect on aquatic resources associated with operation of the Project under any of the four alternatives, as operational impacts are primarily confined to the rotor-swept zone of each turbine.

Population Level Effects of Operation on Aquatic Resources

Operation of the Project is not expected to impact aquatic resources; consequently, population level effects from operation of the project under any of the four alternatives are not expected for any aquatic species.

5.5.3.3 *Operation Effects on Bats Not Listed Under the ESA*

Operating commercial wind facilities have been found to affect many bat species (Arnett et al. 2008). These impacts may include the displacement of individuals, fragmentation of habitat, and direct mortality from turbine interaction (Kunz et al. 2007a).

Disturbance/Displacement

Limited information is available regarding the disturbance/displacement of bats at wind facilities (Kunz et al. 2007a). The Service provided guidance specific to the disturbance and displacement of bats and has indicated that it is reasonable to assume that bats would shift away from human disturbances (e.g., habitat modifications, loud activities, etc.) (USFWS 2011c).

However, based on the number and frequency of documented deaths of bat species observed at wind energy facilities throughout North America, there appears to be no active avoidance of wind facilities by bat species (USFWS 2011c). Indeed, many recent studies suggest that wind turbines may attract bats.

Some researchers have suggested that migratory tree bats (i.e., hoary bats, eastern red bats, and silver-haired bats) may be attracted to wind turbines because of their migratory and mating behavior patterns (Kunz et al. 2007b; Cryan 2008). At dawn, these tree bats may mistake wind

turbines for roost trees, thereby increasing the risk of mortality (Kunz et al. 2007b). Cryan (2008) suggested that male tree bats may be using tall trees as lekking sites, calling from these sites to passing females. If this is the case, then tree bats may be more attracted to wind turbine sites after the turbines are erected. Migrating tree bats are also thought to navigate across large landscapes using vision rather than echolocation, possibly resulting in the bats being attracted to visual landscape features, such as wind turbines (Cryan and Brown 2007). Migrating bats may also fly higher to maximize efficiency. As further support for these hypotheses, the majority of bat fatalities occur mid-summer through fall, approximately the same time frame as southward migration of tree bats (Arnett et al. 2008).

Therefore, bats are not expected to be disturbed or displaced from the Project area as a result of Project operation under any of the four alternatives.

Mortality

Whether bats are attracted to turbines and the exact mechanisms by which turbines cause mortality are unclear (reviewed in Kunz et al. 2007b). Recently, researchers have hypothesized and tested various elements potentially connected to bat-turbine interactions. These elements include the role of land cover and environmental conditions in attracting bats to turbine sites, behavioral factors that might make turbines attractive to bats, pressure changes from rotating blades causing “barotrauma”, or direct impact of unsuspecting migrant bats (Baerwald et al. 2008; Horn et al. 2008; Johnson et al. 2004; Kerns et al. 2005; reviewed in Kunz et al. 2007b). Determining the effects of wind farms on bats is of critical importance to the future conservation of these poorly understood mammals.

Post-construction mortality studies that were well-executed and are publicly available are uncommon. Further, it is difficult to make direct comparisons among post-construction studies due to differences in study length, metrics used for searches and calculations for compensating bias (Arnett et al. 2008). In general, however, the number of bat fatalities recorded at wind facilities has varied regionally; reports of mortality have been highest along forested ridgetops in the eastern U.S. and lowest in open landscapes of Midwestern and western states (Kunz et al. 2007b). In the Midwestern U.S., bat fatalities range from 0.1 to 50.5 bats killed/turbine, but higher fatality rates (up to 69.6 bats/turbine) have been reported in the eastern U.S. (Poulton 2010 and Arnett et al. 2008). Estimates based on mortality studies conducted within USFWS Region 3 (Ohio, Michigan, Indiana, Illinois, Wisconsin, Missouri, Iowa, and Minnesota[54]) suggest that fatalities range from 2.37 to 27.59 bats killed/MW (mean, 10.07) (Marissa Reed, USFWS, personal communication (May 30, 2012)). Estimated bat fatality at the Project, without operational mitigation strategies in place, is expected to average 33.73 bats/turbine/year (19.84 bats/MW/year), of which, bats not listed under the ESA are expected to comprise 33.68 bats/turbine/year, based on two years of intensive monitoring (Good et al. 2011a, 2012).

The influence of small-scale landcover differences on bat mortality at turbine sites within a project site is unclear (Arnett et al. 2008). Johnson et al. (2004), for example, found no significant relationship between bat fatalities and landcover type within 328 feet of turbines. They also found no significant relationship between bat mortality and distance to wetlands or woodlands (Johnson et al. 2004). Weather conditions, such as wind speed, rainfall, and temperature, have a significant impact on bat mortalities (Arnett et al. 2008, Good et al. 2012).

[54] Mortality study data not available for Michigan and Ohio. Missouri data limited to one mortality study.

Bat mortality and insect activity are both high on nights with low wind speed and bat fatalities drop with increases in wind speed and precipitation intensity (Kerns et al. 2005).

The primary bat species affected by wind facilities are believed to be migratory tree bat species (i.e., hoary bats, eastern red bats, and silver-haired bats) that mostly emit low-frequency calls (Johnson et al. 2004; reviewed by Kunz et al. 2007b). Bats that use low frequency calls may be more inclined to forage above the treeline where there are few obstructions. Thus, tree bats may be more likely to fly in the rotor swept zone of turbines when compared to smaller bat species that have different foraging and migration strategies. Arnett et al. (2008) compiled data from 21 studies at 19 wind facilities in the United States and Canada and found that mortality has been reported for 11 of the 45 bat species known to occur north of Mexico. Of the 11 species, hoary bat, eastern red bat, and silver-haired bat have contributed nearly 75% of the total documented fatality at wind facilities (Kunz 2007a). Two bat species, Indiana bat and evening bat, not listed by Arnett et al. (2008) have since been found as fatalities at the Project; nevertheless, migratory tree bats have comprised 95% of the documented fatalities at FRWF.

Studies at FRWF and several other wind energy facilities demonstrated that turbine operational protocols (i.e., adjusting the wind speed at which turbines are allowed to begin generating power and/or feathering turbine blades to prevent free-wheeling below that speed) significantly influence bat mortality (Fiedler 2004, Kerns et al. 2005, Arnett et al. 2008, Baerwald et al. 2008, Good et al. 2011a and 2012). Therefore, it is expected that impacts to bat species at the FWRF would vary greatly depending on the alternative under which the Project turbines are operated.

Under all three of the alternatives under consideration, migratory tree bats are expected to account for the majority of bat fatalities at the Project as eastern red bats have comprised 57%, hoary bats 23%, and silver-haired bats 15% of the fatalities documented during post-construction monitoring at FRWF from 2009 to 2011. Other bat species documented as fatalities at FRWF to-date include: big brown bat, little brown bat, evening bat, Seminole bat, tri-colored bat, northern myotis, and Indiana bat (see Section 4.5.2.4) (Johnson et al. 2010 a, b : Good et al. 2011a, 2012).

Without turbine operational adjustments during the fall season, approximately 89.4% (30.17 bats/turbine) of the total annual bat mortality (33.73 bats/turbine) expected at the Project would be expected to occur during the fall migratory season (August 1 – October 15) based on two years of intensive post-construction mortality studies at FRWF (Good et al. 2011a, 2012). Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bats are expected to comprise approximately 0.16% of the fall mortality at FRWF. Therefore, bats not listed under the ESA are expected to average 30.12 bats/turbine during the fall without turbine operational adjustments; this mortality rate is expected to vary greatly across the alternatives under consideration, as described below. The remaining 10.6% (3.56 bats/turbine[55]) of the total annual bat mortality that is predicted to occur during the spring and summer months would not be affected by the protocol under which the turbines are operated during the fall migration season, and therefore is consistent across the alternatives. Because Indiana bat mortality is not expected to occur during the spring and summer, it is assumed that mortality of bats not listed under the ESA would average 3.56 bats/turbine during the spring and summer.

[55] Spring rate = 0.66 bats/turbine, summer rate = 2.90 bats/turbine (Good et al. 2012). Summer rate may have been affected by short duration and late schedule (July 15-31, 2011) of search effort.

No Action Alternative

Under the No Action Alternative, all FRWF turbines would be shut off from sunset to sunrise between August 1 and October 15, the primary fall migratory period for all bats in the Project area, each year during the operational life (22 years) of the FRWF. Therefore, it is expected that bat mortality would not occur during the fall migration season under this alternative. Mortality during the spring and summer would still occur and is expected to be similar to the bat mortality observed during spring and summer in the 2010 and 2011 post-construction mortality studies.

Spring and summer bat mortality rates combined at FRWF have been calculated to average 3.56 bats/turbine/year, or 1,264 total bats per year when Phases I - III are operating (355 turbines), 1,598 total bats per year when Phases I - IV are operating (449 turbines), and 335 total bats per year when only Phase IV is operating (94 turbines) (Table 5.2). Because Indiana bat take is not expected to occur during the spring and summer, it is assumed that other bat species would comprise 100% of the mortality at FRWF under this alternative. Over the 22-year life of the Project, it is estimated that approximately 28,173 bats not listed under the ESA ([1,264 bats x 2 years] + [1,598 bats x 15 years] + [335 bats x 5 years]) would be killed under the No Action Alternative (
Table 5.3).

Mortality monitoring would be conducted according to the FRWF BBCS (Appendix D) under the No Action Alternative. The BBCS includes an adaptive management framework through which FRWF would respond to high levels of bat mortality. However, bats would not receive the habitat enhancement and protection benefits inherently associated with the Indiana bat take mitigation and conservation measures that would be implemented as part of the HCP.

Table 5.2 Predicted Fatalities of Bats Not Listed Under the ESA per Year by EIS Alternative

Alternative	Bat Fatalities			
	Bats/Turbine/Year (spring/summer + fall =total)	355 Turbines[4] (bats/yr)	449 Turbines[5] (bats/yr)	94 Turbines[6] (bats/yr)
No Operational Adjustment Scenario[1]	(3.56[3] + 30.12) = 33.68	11,956	15,122	3,166
No Action Alternative[2]	(3.56 + 0.00) = 3.56	1,264	1,598	335
3.5m/s Cut-In Speed (Feathered) Alternative	(3.56 + 19.28) = 22.84	8,108	10,255	2,147
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	(3.56 + 15.07) =18.63	6,614	8,365	1,751
6.5m/s Cut-In Speed Alternative	(3.56 + 6.63) = 10.19	3,617	4,575	958

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Spring rate=0.66 bats/turbine, summer rate=2.90 bats/turbine (Good et al. 2012). Summer rate may have been affected by short duration and late schedule (July 15-31, 2011) of search effort.
[4]Phases I - III in operation; 2 years of the 22-year life of the Project
[5]Phases I - IV in operation; 15 years of the 22-year life of the Project
[6]Phase IV only in operation; 5 years of the 22-year life of the Project

Table 5.3 Predicted Fatalities of Bats Not Listed Under the ESA over the 22-Year Life of Fowler Ridge Wind Farm by EIS Alternative

Alternative	Bat Fatalities[1]
No Operational Adjustment Scenario[2]	266,572
No Action Alternative[3]	28,173
3.5m/s Cut-In Speed (Feathered) Alternative	180,776
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	147,458
6.5m/s Cut-In Speed Alternative	80,649

[1]Fatalities = (total bats killed per year Phases I - III (355 turbines) x 2 years) + (total bats killed per year Phases I - IV (449 turbines) x 15 years) + (total bats killed per year Phase IV x 5 years)
[2]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes
[3]No nightly operation during the fall migration period (August 1-October 15).

3.5 m/s Cut-In Speed (Feathered) Alternative

Under the 3.5 m/s Cut-In Speed (Feathered) Alternative, FRWF turbines would be feathered[56] under wind speeds of 3.5 m/s from sunset to sunrise between August 1 and October 15. Based on the results of post-construction curtailment studies at FRWF (Good et al. 2012), it is expected that fall bat mortality under this alternative would be reduced by 36% from the levels of fall bat mortality observed at un-curtailed turbines during the 2010 and 2011 post-construction mortality studies. Therefore, bat mortality during the fall migration season is expected to average 19.31 bats/turbine under this alternative. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bats are expected to comprise approximately 0.16% of the fall mortality at FRWF, leaving other bat species to average 19.28 bats/turbine during fall under this alternative. Mortality during the spring and summer would still occur and is expected to be similar to the bat mortality observed during spring and summer in the 2010 and 2011 post-construction mortality studies (3.56 bats/turbine). Because Indiana bat take is not expected to occur during the spring and summer, it is assumed that other bat species would comprise 100% of the spring and summer mortality at FRWF under this alternative.

Overall, mortality of bats not listed under the ESA is predicted to average 22.84 bats/turbine under the 3.5 m/s Cut-In Speed (Feathered) Alternative, or 8,108 total bats per year when Phases I - III are operating (355 turbines), 10,255 total bats per year when Phases I - IV are operating (449 turbines), and 2,147 total bats per year when only Phase IV is operating (94 turbines) (Table 5.2). Over the 22-year life of the Project, it is estimated that approximately 180,776 bats not listed under the ESA ([8,108 bats x 2 years] + [10,255 bats x 15 years] + [2,147 bats x 5 years]) would be killed under the 3.5 m/s Cut-In Speed (Feathered) Alternative (Table 5.3).

Mortality monitoring would be conducted according to the Project HCP under the 3.5 m/s Cut-In Speed (Feathered) Alternative. The HCP includes an adaptive management framework through which FRWF would respond to high levels of bat mortality. Additionally, bats would receive the habitat enhancement and protection benefits inherently associated with the Indiana bat take mitigation and conservation measures that would be implemented as part of the HCP.

5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)

Under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), FRWF turbines would be feathered under wind speeds of 5.0 m/s when the ambient temperature is 50° F or above from sunset to sunrise between August 1 and October 15. It is expected that fall bat mortality under this alternative would be reduced by 50% from the levels of fall bat mortality observed at un-curtailed turbines during the 2010 and 2011 post-construction mortality studies (see Section 4.1.1.3 of the HCP). Therefore, bat mortality during the fall migration season is expected to average 15.09 bats/turbine under this alternative. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bats are expected to comprise approximately 0.16% of the fall mortality at FRWF, leaving other bat species to average 15.07 bats/turbine during fall under this alternative. Mortality during the spring and summer would still occur and is expected to be similar to the bat mortality observed during spring and summer in the 2010 and 2011 post-construction mortality studies (3.56 bats/turbine). Because Indiana bat take is not

[56] Adjust the turbine operational parameters so that the rotation of the turbine rotors below cut-in wind speed is minimized. Feathering reduces the blade angle to the wind in order to slow or stop the turbine from spinning.

expected to occur during the spring and summer, it is assumed that other bat species would comprise 100% of the spring and summer mortality at FRWF under this alternative.

Overall, mortality of bats not listed under the ESA is predicted to average 18.63 bats/turbine under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), or 6,614 total bats per year when Phases I - III are operating (355 turbines), 8,365 total bats per year when Phases I - IV are operating (449 turbines), and 1,751 total bats per year when only Phase IV is operating (94 turbines) (Table 5.2). Over the 22-year life of the Project, it is estimated that approximately 147,458 bats not listed under the ESA ([6,614 bats x 2 years] + [8,365 bats x 15 years] + [1,751 bats x 5 years]) would be killed under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (
Table 5.3).

Mortality monitoring would be conducted according to the Applicant Proposed HCP under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). The HCP includes an adaptive management framework through which FRWF would respond to high levels of bat mortality. Additionally, bats would receive the habitat enhancement and protection benefits inherently associated with the Indiana bat take mitigation and conservation measures that would be implemented as part of the HCP.

6.5 m/s Cut-In Speed Alternative

Under the 6.5 m/s Cut-In Speed Alternative, FRWF turbines would be feathered under wind speeds of 6.5 m/s when the ambient temperature is 50° or above from sunset to sunrise between August 1 and October 15. Based on the results of post-construction curtailment studies at FRWF (Good et al. 2011a), it is expected that fall bat mortality under this alternative would be reduced by 78% from the levels of fall bat mortality observed at un-curtailed turbines during the 2010 and 2011 post-construction mortality studies. Therefore, bat mortality during the fall migration season is expected to average 6.64 bats/turbine under this alternative. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bats are expected to comprise approximately 0.16% of the fall mortality at FRWF, leaving other bat species to average 6.63 bats/turbine during fall under this alternative. Mortality during the spring and summer would still occur and is expected to be similar to the bat mortality observed during spring and summer in the 2010 and 2011 post-construction mortality studies (3.56 bats/turbine). Because Indiana bat take is not expected to occur during the spring and summer, it is assumed that other bat species would comprise 100% of the spring and summer mortality at FRWF under this alternative.

Overall, mortality of bats not listed under the ESA is predicted to average 10.19 bats/turbine under the 6.5 m/s Cut-In Speed Alternative, or 3,617 total bats per year when Phases I - III are operating (355 turbines), 4,575 total bats per year when Phases I - IV are operating (449 turbines), and 958 total bats per year when only Phase IV is operating (94 turbines) (Table 5.2). Over the 22-year life of the Project, it is estimated that approximately 80,649 bats not listed under the ESA ([3,617 bats x 2 years] + [4,575 bats x 15 years] + [958 bats x 5 years]) would be killed under the 6.5 m/s Cut-In Speed Alternative (
Table 5.3).

Mortality monitoring would be conducted according to the Project HCP under the 6.5 m/s Cut-In Speed Alternative. The HCP includes an adaptive management framework through which FRWF would respond to high levels of bat mortality. Additionally, bats would receive the habitat

enhancement and protection benefits inherently associated with the Indiana bat take mitigation and conservation measures that would be implemented as part of the HCP.

Population Level Effects of Operation on Bats Not Listed Under ESA

It is almost certain that all of the four alternatives under consideration will kill bats not listed under the ESA. Based on the results of post-construction monitoring conducted at the existing three phases of the Project, the majority of the bats killed will be migratory tree bats (e.g., eastern red bat, silver-haired bat and hoary bat). The impact of between 28,173 (No Action Alternative) and 180,776 (3.5 Cut-In Alternative) primarily tree bat fatalities over the course of 22 years at FRWF (
Table 5.3) is unknown, in part because accurate estimates of most bat populations do not exist. It is known that migratory tree bats, and the other bat species that are likely to be killed at FRWF, are comparatively long-lived organisms that produce few (1-3) offspring per year, although details on demographics (e.g., age at which females first reproduce, how long they reproduce, and what percentage of females breed) are not fully known. There remains insufficient information to understand the population level effects of this magnitude of loss to the various bat species that will be killed at the Project. The ongoing monitoring required at FRWF and other facilities will allow tracking of impacts, including the proportions of fatalities among the various species.

5.5.3.4 *Operation Effects on Birds*

FRWF has been sited and will be operated throughout the life of the Project to avoid and minimize, when possible, impacts to birds. Measures for reducing impacts to birds were developed based on the results of pre-construction avian habitat and use surveys within the Project area, patterns of bird mortality reported at other wind energy facilities in the Midwest, and recommendations obtained through consultation with the Service and the IDNR. These data and conservation measures (including turbine siting, phased development, avian-safe design factors, adaptive management, etc.) are discussed in detail in the FRWF BBCS (Appendix D) and demonstrate FRWF's good faith effort to avoid and reduce potential impacts to birds throughout the life of the Project.

Operational impacts of wind facilities on birds include varying degrees of displacement from the wind turbines and surrounding habitat as well as mortalities resulting from collisions with turbines, transmission lines, and other project-related structures (Winegrad 2004). The four alternatives under consideration vary only in nighttime operational adjustments (i.e., adjusting cut-in speed between sunset and sunrise). Nighttime turbine operations are not known to affect avian use in the vicinity of turbines, and the few documented nighttime impacts (primarily to migrating passerines) are episodic and appear to be related to weather events and not turbine operation. Therefore, potential disturbance impacts to birds are not expected to differ among the four alternatives. The potential effects of wind turbines on birds in general and the effects documented at FRWF are discussed in detail below.

Disturbance/Displacement

Wind turbines may displace birds from an area due to the creation of edge habitat, introduction of vertical structures, and disturbances directly associated with turbine operation (e.g., noise, shadow flicker). Disturbance impacts are often complex, involving shifts in abundance, species composition, and behavioral patterns. The magnitudes of these impacts vary across species, habitats, and regions. Concerns have been raised that displacement from habitat may

significantly affect certain avian populations (The Ornithological Council 2007). Although most research to-date has focused on collision mortality associated with wind energy facilities, the limited data available indicate that avoidance impacts to birds generally extend 246 feet to 2,624 feet from a turbine, depending on the environment and the bird species affected (Strickland 2004). Little research has been done on the displacement impacts of wind development on birds in the eastern U.S. However, studies in the western and Midwestern U.S. consistently show small-scale (<330 feet) impacts on birds (Strickland 2004). Because there is very little grassland, forest, or wetland habitat on the Project site, and no large blocks of any of these habitat types that might support area-sensitive species, few disturbance and displacement impacts to birds are expected.

Grassland birds appear to exhibit particularly high levels of avoidance behavior (e.g., grasshopper sparrow (*Ammodramus savannarum*); Strickland 2004, Shaffer and Johnson 2008). Other bird groups, such as forest birds, may not be as strongly affected by displacement/disturbances from wind turbines. Studies by Shaffer and Johnson (2008) and Kerlinger (2002) have concluded that, in general, bird species adapted to human disturbances or agricultural or edge habitat (e.g., killdeer) are less likely to exhibit avoidance behavior near turbines. Only one report of raptor avoidance of wind energy facilities has been published; based on area of available habitat, raptor nest densities at the Buffalo Ridge site were lower than expected (Strickland 2004).

Population level consequences of displacement/disturbances from wind turbines are not yet understood. Initial studies indicate that when considered on a regional scale, reductions in habitat use by songbirds have been observed to be relatively minor and are not expected to have population consequences (Strickland 2004). However, displacement of breeding birds has varied across sites, leaving the impact of turbines on breeding success unclear (The Ornithological Council 2007). Additional studies are needed to assess the broad-scale, population level consequences of displacement impacts on other avian groups, as well as the cumulative effects that time and increased wind energy development may have on avian population dynamics.

Although Project operation has the potential to cause displacement of birds from the Project area due to noise, lights, or tall structures (i.e., turbines), bird species sensitive to disturbance currently exhibit low use of the Project area and minimal grassland or forest habitat is present. The majority of birds occurring within the Project area are common, disturbance-tolerant species; it is therefore unlikely that displacement impacts from the turbines would greatly alter the composition of the area's avian community. The exception is the American golden plover, which uses the agricultural fields in the project area and surrounding agricultural landscape.

Displacement and disturbance impacts to American golden-plovers from the Project may be likely under any of the four alternatives, based on surveys conducted in 2007, 2008, and 2009 by WEST (Johnson et al. 2009). No plovers were observed near the newly-erected turbines during the 2009 surveys, despite plovers using these areas in 2007 and 2008 prior to the erection of the turbines. It is possible that plovers could have shown an especially pronounced avoidance of wind turbines in 2009, as this was the first year that turbines were encountered within areas historically used by the plovers. In addition, differences in plover-use between 2007 and 2008, before turbines were constructed, showed that weather can greatly influence use of the Project area between years, regardless of the presence of turbines (Johnson et al. 2009). However, if the plovers continue to avoid areas near Project turbines, they may be displaced from much of the Project area (Figure 4.5.2.2, Chapter 4). Displacement impacts are

not expected to extend into the IBA located north of the Project, as all turbines have been sited at least 1,760 feet from the IBA border (Figure 4.5.2.2, Chapter 4). Therefore, the effect of potential displacement of plovers from the Project area is expected to be minor, given that both protected and comparably large areas of other suitable habitat are available adjacent to the Project area.

Turbine Related Mortality

Concerns expressed by the Service and IDNR regarding avian resources within the Project area focused primarily on collision risks during the migration season to listed species and a few other birds. The Service and IDNR both expressed concern for migrating American golden-plover, a species protected by the MBTA and listed as a species of special interest by the IDNR, and whooping cranes, a federally endangered species with a population (listed under the ESA only as experimental, non-essential) that migrates across Indiana. The IDNR also expressed concern for several state-listed species that are known or have the potential to occur near or within the Project area: least bittern, northern harrier, barn owl, short-eared owl, upland sandpiper, king rail, and western meadowlark. Four of these species, American golden-plover, upland sandpiper, northern harrier, and western meadowlark, were observed within the Project area during pre-construction surveys (Johnson and Bay 2008, Carder et al. 2010) (see Section 4.5.2.2 in Chapter 4). With the exception of American golden-plover and northern harrier, all sensitive species observed were low in number. Given the small number of individuals observed and limited available habitat, many of these species are therefore considered to be at low collision risk. Initial post-construction surveys recorded no fatalities of state or federally threatened or endangered bird species (Johnson et al. 2010a, b, Good et al. 2011a).

Under all four of the alternatives under consideration, the operating turbines would pose a risk of mortalities from collisions for birds within the Project area. Collision with various man-made structures is a significant source of bird mortality (Trapp 1998, Kerlinger 2000, Shire et al. 2000, and many others). Nationally, Erickson et al. (2002) estimated wind turbines are responsible for 0.01-0.02% of all avian fatalities due to human structures. An estimated 20,000 to 37,000 birds were killed by approximately 17,500 wind turbines in the United States in 2003 (Erickson et al. 2005). Fatalities ranged from zero to about 9 birds/turbine/year (b/t/y), yielding an average of 2.1 b/t/y (Erickson et al. 2005). Studies have shown avian mortality rates to be very consistent across wind energy facilities, both nationally and within regional ranges. The number of avian fatalities at wind energy facilities is generally low when compared to the total number of birds detected at these sites (Erickson et al. 2002). However, recent post-construction studies at the Blue Sky Green Field (Gruver et al. 2009) and Cedar Ridge (BHE Environmental, Inc. 2010) facilities in Wisconsin have demonstrated that avian mortality rates at the high end of this range may result at facilities sited in agricultural habitats.

The estimated avian mortality during the 7-month 2009 study at Phase I, the only FRWF study in which avian mortality was estimated, was 5.26 birds/turbine (Johnson et al. 2010b). Based on this estimate, the Project may kill approximately 1,867 total birds per year when Phases I - III are operating (355 turbines), 2,362 total birds per year when Phases I-IV are operating (449 turbines), and 494 birds per year when only Phase IV is operating (94 turbines). Over the 22-year life of the Project, it is estimated that approximately 41,634 birds ([1,867 birds x 2 years] + [2,362 birds x 15 years] + [494 birds x 5 years]) would be killed. Total bird carcasses by species found at Phases I – III during mortality surveys from 2009 to 2011 are shown in Chapter 4. With the exception of the 2009 study at Phase I, fatality rate estimates were not calculated for birds in

most of these studies because the monitoring efforts were focused on estimating impacts to bats.

Avian collision mortality can occur during both the breeding and migration seasons; however, patterns in avian mortality at tall towers, buildings, wind turbines, and other man-made structures suggest that the majority of fatalities occur during the spring and fall migration periods (NRC 2007). Limited data from existing wind facilities suggest that migrant species represent roughly half of documented fatalities, while resident species represent the other half (NRC 2007). Bird fatality rates at the Project area are likely to peak during the spring and fall migration seasons, as has been observed at most wind energy facilities (Johnson et al. 2002) and as indicated by the results of initial post-construction monitoring studies at the FRWF (Johnson et al. 2010b).

Given the high numbers of American golden-plovers which occur within the Project area and adjacent IBA during the spring migration period (58,943 individuals were observed during the 2007 plover surveys), it is likely that some plovers will collide with Project turbines or the Project transmission line. Flocks of plovers will fly at altitudes within the rotor-swept area as they migrate into and out of the IBA and Project area, and this behavior may increase their risk of turbine collision. During all three years of plover surveys within the Project area, plovers were observed to spend the majority of time flying at their typical foraging altitudes below blade height (Johnson et al. 2009). During the 2009 surveys, no plovers were observed within 1,312 feet of the newly-erected turbines; plovers continued to use the IBA and croplands within the Project area that were not in the vicinity of the turbines (Johnson et al. 2009). Based on their observed flight patterns and the apparent avoidance of newly-constructed turbines by plovers during the 2009 surveys, it was concluded that plovers may not be especially susceptible to collisions with wind turbines (Johnson et al. 2009). Initial post-construction monitoring studies conducted during the spring migration season for two years at both Phase I and Phase III and one year at Phase II of the Project did not detect any plover carcasses (Johnson et al. 2010a, b, Good et al. 2011a).

Raptor mortality at wind energy facilities has been a high-profile issue in the past, largely due to the high levels of mortality observed at the Altamont Wind Resource Area (Altamont) in California. New wind energy facilities, however, have greatly lessened their impacts to raptors, mostly based on the new turbine design. New generation turbines have tubular support structures instead of lattice structures, which eliminate perching by raptors. Newer turbines also have larger blades, which reduces motion blur. Outside of California, where rates are greatly influenced by the Altamont site, nation-wide raptor mortality rates average 0.006 birds/turbine/year (Erickson et al. 2002). Studies have documented high raptor avoidance behaviors at modern wind facilities (Whitfield and Madders 2006, Chamberlain et al. 2006). Raptors' mechanism for turbine avoidance is unknown; however, most raptors are diurnal and have good eyesight, suggesting they may be able to detect turbines visually as well as acoustically. Raptor use of the Project area was observed to be moderate during the pre-construction surveys. The most frequently observed raptor species were red-tailed hawk, American kestrel, and northern harrier (Johnson and Bay 2008, Carder et al. 2010). Initial post-construction monitoring studies recorded seven raptor fatalities over two seasons of studies at both Phase I and Phase III and one study season at Phase II of the Project, six of which were red-tailed hawks (Johnson et al. 2010b, Good et al. 2011a). During three years of monitoring between 2009 and 2011 at Phases I - III, no harriers and no kestrels were found as fatalities (Johnson et al. 2010a, b, Good et al. 2011a.

Resident and migrating songbirds (passerines) are likely to constitute the greatest number of fatalities in the Project area, as this avian group represents the majority (75%) of mortalities at wind turbines nation-wide and was by far the group most frequently observed during pre-construction surveys within and near the Project area (Johnson and Bay 2008, Carder et al. 2010). Night-migrating passerines may be at a higher risk than other bird types, as this group has accounted for over 50% of avian fatalities at most sites, but no particular species or group of species has been identified as incurring greater numbers of fatalities (Erickson et al. 2002). During initial post-construction monitoring studies at the Project, killdeer were the most frequently-found species of all bird mortalities. However, as a group, passerines constituted the majority of bird fatalities recorded (Johnson et al. 2010b, Good et al. 2011a). It is likely birds taking off at dusk or landing at dawn or birds traveling in low cloud or fog conditions (which lower the flight altitude of most migrants) are at the greatest risk of collision (Kerlinger 1995). Nationally, it has not been determined that these mortalities have resulted in a significant population level impact to any one species, mainly because the migratory species with relatively high collision mortality are regionally abundant (Erickson et al. 2002).

Other Sources of Mortality during Operation

Power lines, including those at wind energy facilities, can pose an electrocution risk to raptors due to their larger body sizes and broader wing spans. To avoid the risk of avian electrocution at the Project, FWRF has minimized the amount of aboveground collection and transmission lines across Phases I, II, and III as a best practice; this best practice would also be applied to Phase IV. All aboveground lines have been designed in accordance with recommendations in Avian Power Line Interaction Committee's (APLIC) Suggested Practices for Avian Protection on Power Lines (APLIC 2006). Any aboveground lines constructed for Phase IV would also be designed to the APLIC spacing recommendations.

Other possible risks to birds may result from collisions with the MET towers at wind energy facilities. Data on MET tower impacts to birds are currently limited to two post-construction monitoring surveys. Over a four-year study at the Foote Creek Rim Wind Plant in Wyoming, avian fatalities were found at all five MET towers (Young et al. 2003). Habitat in the project area consisted primarily of mixed grass prairie and sagebrush shrubland. An average of 8.09 birds were killed per MET tower per year; fatalities comprised resident and migrant species. On average, avian mortality was three times greater at MET towers than at the turbines (Young et al. 2003). Over a one-year study at the Klondike Wind Project in Oregon, no avian fatalities were found at the single MET tower (Johnson et al. 2003). Habitat at this wind energy facility consisted of grazed shrub-steppe, cultivated wheat fields, and other agricultural fields (Johnson et al. 2003). The difference in these study results may be due to differences in location, habitat, and structural characteristics between the two projects. There are not enough data to support conclusions about potential impacts to different avian groups.

Impacts to birds from MET towers may be comparable to impacts caused by similar communications towers, for which more data are available. Direct avian mortality appears to be the primary impact associated with these structures. Avian mortality at communications towers varies greatly depending on tower height, lighting, color, structure, and the presence of guy wires (The Ornithological Council 2007). Although variable across habitats, the majority of collision fatalities at communications towers consist of passerines, particularly night migrants. Guyed towers of similar height to the typical MET tower (377 - 479 feet) may have mortality rates ranging from one per tower per 20 days to 12.3 per tower per 20 days, depending on the type of lighting on the tower – white strobe lighting typically results in the lowest mortality rate

(The Ornithological Council 2007). In addition to baseline mortality rates, single-night mass mortality events periodically occur at lighted communications towers on cloudy nights; it would be possible for such events to also occur at MET towers. MET towers may therefore have the potential to result in single and small-scale bird fatality events; however, the number of fatalities may be reduced through the use of bird flight diverters on the guy wires or the use of unguyed towers, and white strobe lighting on the towers. The FRWF MET towers are unguyed and fitted with red strobe lighting.

Of particular concern relative to bird collisions with all types of structures are episodic events involving large numbers of one or a few bird species during migration. These have been recorded at multiple locations, and are associated with lighting that attracts or disorients birds. The first documented episodic mortality event at a wind facility occurred in heavy fog during spring migration in May 2003 at Mountaineer Wind Energy Center in West Virginia and consisted of 33 passerine fatalities. Weather conditions and the location of the carcasses suggested that the birds were attracted to bright sodium vapor lights present at a substation located adjacent to three turbines. After these lights were extinguished, no other episodic events occurred at the substation or adjacent turbines (Kerns and Kerlinger 2004). Two additional episodic mortality events were observed in West Virginia during 2011. In October 2011, a total of 484 bird carcasses were found at the Laurel Mountain Substation, near a wind facility, after several days of fog, cold weather, and winds. Eight 250-watt high pressure sodium lamps were on at night during the event and were assumed to have attracted birds during adverse weather conditions.

Similarly in September 2011 at the Mount Storm Wind Energy Facility in WV, 59 bird carcasses were found on one day, 31 of which were found at one turbine whose internal nacelle light had been inadvertently left on overnight. The previous night's weather had been foggy, and the nacelle light was thought to have attracted the birds to the turbine.

The Applicant has incorporated many measures to avoid and minimize impacts to birds, including: siting the Project in an area of moderate avian use; developing the Project in phases to observe the effect of the Project on American golden-plover use of the area prior to development of phases located closer to the plover IBA; micro-siting all Phase IV turbines in cultivated croplands and locating all Phase I - III turbines and facilities to avoid native bird habitat and IDNR Gamebird Habitat Areas including re-routing the Project's transmission line to avoid a Gamebird Habitat Area; building the transmission line to APLIC's avian-safe standards (2006); burying collection lines underground; equipping the Project substation with downward facing shields on all lights; and, providing sensitive species awareness training for all on-site workers. All operators and technicians on site are required to turn off internal lights in turbines at night when lights are not required for safety or compliance purposes. However, nighttime modified turbine operational protocols have not been demonstrated to significantly or consistently reduce the risk of bird collisions at wind turbines. Therefore, impacts to birds from operation of the Project are expected to be generally similar regardless of the alternative under which the Project operates.

Population Level Effects of Operation on Birds

No population level disturbance or displacement impacts to bird species would occur under any of the four alternatives. The location of the Project is a landscape that is over 90% agricultural row crop, with very limited natural habitat of any other kind present in the project area. Specifically, there is not sufficient forest, grassland, or aquatic habitat to support forest interior

or grassland sensitive species, or large numbers of wetland species. Although there will likely be some displacement of American golden plover from their spring stopover habitat, there is sufficient other habitat in the area, including the IBA, that the presence of FRWF is not expected to cause population level displacement or disturbance impacts.

The operation of FRWF will result in bird mortality, primarily from collisions with turbines, and although FRWF has taken steps to avoid it, episodic bird mortality from collision with other structures (e.g., met towers) is possible. The Project does not exhibit any characteristics indicating a high level of collision risk, but turbines are expected to regularly kill a small number of birds each year, based on the results of post-construction mortality studies at FRWF and similar facilities. Bird mortality across all species was estimated at 5.26 birds/turbine during the 7-month 2009 study for Phase I (Johnson et al. 2010b).

Because large numbers of golden plovers use the agricultural fields in the vicinity of the FRWF as stopover habitat during spring migration, they have the potential to be disproportionately impacted. Plover mortality, however, at the Project is expected to be low relative to the number of individuals present and unlikely to have significant population level impacts, considering the flight patterns and turbine avoidance observed during surveys.

Impacts to raptors are frequently a concern at commercial wind facilities. Given the lack of major raptor migration lines through the Project area, low expected prey densities, and lack of raptor nesting habitat observed during surveys (Johnson and Bay 2008, Carder et al. 2010), raptor fatality rates at the Project site are expected to be similar to those at other sites outside of California. The documented level of red-tailed hawk mortality (six known fatalities) at FRWF likely represents in part, the abundance of this habitat-generalist species versus other raptors in the Project area. While not a particular concern in terms of red-tailed hawk populations, impacts to this species will continue to be monitored at FRWF.

Given the moderate levels of avian abundance and species richness, the lack of native habitats, and the low observed flight patterns of most birds in the Project area (see Section 4.5.2.2), mortality rates are likely to remain within the 0.00 to 11.83 birds/turbine/year range reported from other Midwestern sites (Barclay et al. 2007 and Poulton 2010). The Project is also not expected to disproportionately affect any vulnerable species. Bird populations are generally large compared to the number of birds killed, and bird reproductive rates are expected to withstand the level of loss at the Project. Therefore, operation of the Project under any of the four alternatives under consideration is not expected to have population level effects on any avian species.

5.5.3.5 *Operation Effects on Bald and Golden Eagles*

Golden eagles are rare migrants in the project area. No effects are anticipated to golden eagles from FRWF.

Although bald eagles are no longer listed under the ESA and are not listed by the IDNR, they remain protected under the BGEPA and are considered by the Service to be a species of concern at wind energy facilities. An eagle risk assessment was conducted in 2011 for the Project using the 2011 draft ECP guidance (USFWS 2011a) (see Section 4.5.2.3). Potential risks to eagles from the Project are discussed specifically below.

In February 2012, the Service provided additional comments regarding bald eagle risk at the Project area in accordance with BGEPA and the MBTA based on the eagle use assessment conducted and other data. The Initial Assessment of Eagle Risk, developed as outlined in the 2011 Draft ECP Guidance, for the Fowler Ridge Wind Energy Development concluded that risk to eagles from the Project may be relatively low (see Appendix B of the BBCS [Appendix D of this document]). The eagle risk assessment indicates that the FRWF a.) does not appear to overlap with any "important eagle use areas," b.) does appear to overlap only limited amounts of suitable eagle habitat, c.) may have low risk to eagles during the breeding and winter seasons, and d.) may have relatively limited eagle use during spring and fall migration (based on 2007-2009 survey results). However, based on sources of uncertainty associated with eagle use of the Project area and the relatively large size of the Project, the Service noted that risk to eagles is difficult to predict for the FRWF and may be underestimated. The Service's predictive model arrived at a fatality estimate of 0.201 bald eagles per year for the Project, with a 95% confidence interval between 0 and 0.604 bald eagles per year. Extrapolated over the 22-year life of the Project, the fatality estimate adds up to 4 bald eagles; however, total take over the life of the Project could be as low as zero, given the confidence intervals associated with the calculation of risk. As with other bird species, modified nighttime turbine operational protocols are not known to significantly or consistently reduce the risk of eagle collisions at wind turbines. Therefore, impacts to eagles from operation of the Project are expected to be similar regardless of the alternative under which the Project operates. At the recommendation of the Service, FRWF has developed an eagle management plan for evaluating risk to eagles and outlined a management strategy. The Project's eagle management plan is included in Section 5.3.3 of the BBCS (Appendix D).

Service (2011a) guidance, as currently written, states that any wind energy facility with important eagle use areas (e.g., nests) within 10 miles of turbines should fall within Category 2—moderate to high risk to eagles. However, the eagle use assessment conducted for the Project (Good and Simon 2011; see Section 4.5.2.3) contends that the FRWF should be considered a Category 3 — minimal risk site for eagles, due to site characteristics, known eagle distributions, and survey results indicating low use of the Project area by eagles and consequently low risk to eagles from the FRWF. In a letter dated September 7, 2007 (Appendix C), the Service came to a similar conclusion, and stated "the distribution of eagle nests with respect to the project study area has not changed since our previous review of the project, and there are currently no anticipated impacts on eagles." The Service documented in their September 2007 letter (Appendix C) that there were no anticipated impacts to the bald eagle from the Project based on the location of the Project area and the distribution of eagles in the area (Good and Simon 2011).

Population Level Effects of Operation on Bald and Golden Eagles

No population level effects are expected for bald or golden eagles under any of the four alternatives under consideration.

5.5.4 Maintenance Effects on Wildlife and Aquatic Resources

Maintenance activities would be required to ensure the safety and operability of FRWF under all four of the alternatives under consideration, and consequently, maintenance impacts to wildlife, including bats and birds, are the same for all of the alternatives. Maintenance may include changing oil in the turbine nacelle, maintaining electrical equipment inside the turbine tower, etc. Additionally, approximately every three years, or on an as-needed basis, tree branches

identified as hazardous to the continued operation of the generation tie-in lines (that connect all phases of the Project to the Dequine Substation) would be trimmed.

The impacts on wildlife in general from noise, vibration, and/or increased human activity and traffic associated with maintenance activities would be similar in character as those for construction activities, but they would occur intermittently and in shorter periods of time. Avoidance and minimization measures implemented for maintenance would be similar to those prescribed for construction activities. Trimming of tree branches may occasionally displace bats or birds from roosting or foraging habitat, but this impact would be intermittent, short-term, localized, and minor. No impacts to aquatic species would occur as a result of maintenance activities.

Population Level Effects of Maintenance on Wildlife and Aquatic Resources

No population level effects of maintenance are expected for any species of wildlife or any aquatic species.

5.5.5 Decommissioning Effects on Wildlife and Aquatic Resources

Decommissioning of FRWF would occur under all four of the alternatives under consideration and consequently, decommissioning impacts to wildlife, including bat species and bird species, are the same for all of the alternatives. Decommissioning of the Project would minimize the long-term impacts (when compared with re-commissioning or re-powering the Project) by removing turbines from the Project area and restoring the area to the pre-existing land use and vegetation communities. Impacts on wildlife from decommissioning activities would be similar in character as those for construction activities, but they would occur intermittently and in shorter periods of time. Avoidance and minimization measures implemented for decommissioning would be similar to those prescribed for construction activities. Effects to aquatic species as a result of decommissioning are expected to be similar to those of construction and would result in minor, if any, impacts to aquatic wildlife.

Population Level Effects of Decommissioning on Wildlife and Aquatic Resources

No population level effects of decommissioning are expected for any species of wildlife or any aquatic species.

5.5.6 Mitigation for Impacts to Wildlife and Aquatic Resources

No specific mitigation is proposed for terrestrial wildlife, aquatic resources, birds, or bats not listed under the ESA.

5.5.7 Summary of Effects to Wildlife and Aquatic Resources

5.5.7.1 *Terrestrial Wildlife and Aquatic Resources*

- No substantial changes to wildlife habitat or populations of terrestrial or aquatic wildlife would occur under any of the four alternatives.
- Mortality of terrestrial wildlife may occur as a result of road kills during construction of Phase IV, but these impacts are expected to be minor under any of the four alternatives.

- Population level effects from construction of Phase IV are not expected to occur under any of the four alternatives for any species of terrestrial wildlife.
- Terrestrial wildlife mortality is not expected to occur as a result of Project operations under any of the four alternatives. Likewise, population level effects from operation of the Project under any of the four alternatives are not expected for any species of terrestrial wildlife.
- Effects to aquatic resources associated with construction of Phase IV are anticipated to be minor under any of the four alternatives. Population level effects from construction of Phase IV are not expected for any aquatic species under any of the four alternatives.
- No effect on aquatic resources would occur as a result of operation of the Project under any of the four alternatives. Likewise, population level effects from operation of the project under any of the four alternatives are not expected for any aquatic species.
- No effects as a result of maintenance or decommissioning are expected for any species of terrestrial wildlife or any aquatic resource.
- No specific mitigation measures for terrestrial wildlife or aquatic resources would be implemented under any of the four alternatives.

5.5.7.2 *Birds*

- No significant adverse effects to the local bird community are anticipated under any of the four alternatives due to the large amounts of similar habitat available adjacent to all permanently disturbed areas.
- Bird mortality due to Phase IV construction is anticipated to be minor under any of the four alternatives and population level effects from construction of Phase IV are not expected for any bird species under any of the four alternatives.
- Over the 22-year life of the Project, it is estimated that approximately 41,634 birds ([1,867 birds x 2 years] + [2,362 birds x 15 years] + [494 birds x 5 years]) would be killed.
- No population level disturbance or displacement impacts to bird species would occur under any of the four alternatives.
- The effect of potential displacement of American golden plovers from the Project area is expected to be minor, given that both protected and comparably large areas of other suitable habitat is available adjacent to the Project area.
- No impacts to bald or golden eagles from the Project are anticipated based on the location of the Project area and the distribution of eagles in the area.
- No effects as a result of maintenance or decommissioning are expected for any bird species.

- No specific mitigation measures for birds would be implemented under any of the four alternatives.

5.5.7.3 *Bats Not Listed Under the ESA*

- No maternity, roosting, or native foraging habitat for bats not listed under the ESA would be lost due to Phase IV construction under any of the four alternatives. Additionally, construction of Phase IV would not impact fall swarming habitat for bats or hibernacula for cave-dwelling species under any of the four alternatives.
- Phase IV construction activities and associated increases in noise, light, vibration, human activity, and/or traffic are not expected to disturb or displace bats not listed under the ESA under any of the four alternatives.
- Mortality of bats not listed under the ESA is not expected to occur as a result of Phase IV construction under any of the four alternatives and population level effects from construction of Phase IV under any of the four alternatives are not expected for any bats not listed under the ESA.
- Bats not listed under the ESA are not expected to be disturbed or displaced from the Project area as a result of Project operation under any of the four alternatives
- Mortality of bats not listed under the ESA are expected to average 30.12 bats/turbine during the fall without turbine operational adjustments; this mortality rate is expected to vary greatly across the alternatives under consideration.

Over the 22-year life of the Project, it is estimated that approximately 28,173 bats not listed under the ESA ([1,264 bats x 2 years] + [1,598 bats x 15 years] + [335 bats x 5 years]) would be killed under the **No Action Alternative** (

- Table 5.3).

Over the 22-year life of the Project, it is estimated that approximately 180,776 bats not listed under the ESA ([8,108 bats x 2 years] + [10,255 bats x 15 years] + [2,147 bats x 5 years]) would be killed under the **3.5 m/s Cut-In Speed (Feathered) Alternative** (

- Table 5.3).

Over the 22-year life of the Project, it is estimated that approximately 147,458 bats not listed under the ESA ([6,614 bats x 2 years] + [8,365 bats x 15 years] + [1,751 bats x 5 years]) would be killed under the **5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)** (

- Table 5.3).

Over the 22-year life of the Project, it is estimated that approximately 80,649 bats not listed under the ESA ([3,617 bats x 2 years] + [4,575 bats x 15 years] + [958 bats x 5 years]) would be killed under the **6.5 m/s Cut-In Speed Alternative** (

- Table 5.3).

- Insufficient information currently exists to understand the population level effects of the magnitude of loss to the various bat species that will be killed at the Project.
- No effects as a result of maintenance or decommissioning are expected for bats not listed under the ESA.
- No specific mitigation measures for bats not listed under the ESA would be implemented under any of the four alternatives.

5.6 RARE, THREATENED AND ENDANGERED SPECIES

5.6.1 Impact Criteria

The ESA and the State of Indiana protect species that are federally and/or state-listed as threatened, endangered, or other listing status from unauthorized taking. Taking includes harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting. Federal agencies must ensure any federally-funded or authorized action is unlikely to jeopardize listed species' continued existence or destroy or adversely modify designated critical habitat.

This review includes potential direct and indirect effects[57] to threatened and endangered species. Direct effects consist of the taking of the listed species due to Project construction and operation, and include changes to the species' habitat use due to noise, vibration, visual disturbance, and transportation activities. Indirect effects include issues such as increased competition for resources or habitat due to displaced individuals, habitat destruction, or other indirect effects that cause mortality, decreased breeding and future population recruitment, or decreased fitness. Both direct and indirect effects on habitat types that affect population size and viability are addressed

5.6.2 State-listed Species

As summarized in Section 4.6, state-listed threatened and endangered species with the potential to occur in or migrate through the Project area were considered in this EIS, including three aquatic species, two insects, two reptiles, eight birds, seven mammals and 10 plants (see Indiana state-listed species in Section 4.6.2.2).

Impacts to all state-listed species, with the exception of the seven state-listed bat species, are expected to be the same under all four alternatives under consideration. Impacts to state-listed plants are covered in the inclusive discussion in Section 5.3 and impacts to state-listed wildlife species are addressed in the inclusive discussion in Section 5.5, above. Impacts to the seven listed bat species (one endangered: evening bat, and six special concern: little brown, northern myotis, tri-colored, silver-haired, hoary and eastern red) are addressed comprehensively with non-listed bat species in Section 5.5, above. The rest of this section discusses impacts to the one federally-listed species that may occur within the Project area, the federally-endangered Indiana bat.

[57] Per the definitions in the ESA, the discussion on threatened and endangered species uses the following terms: "direct effects" are those caused by the Project and occur at the same time and place, and "indirect effects" are those caused by the Project and that are later in time, but are still reasonably certain to occur (50 CFR §402.02).

5.6.3 Indiana Bat

5.6.3.1 *Construction Effects*

Construction of Phase IV would occur under all four of the alternatives under consideration and consequently, construction impacts to the Indiana bat are the same for all of the alternatives. The Service, in a letter dated October 13, 2006, has determined that no potentially suitable summer habitat, fall swarming habitat, or hibernacula are found within the Project area overall or within Phase IV and that Indiana bats are not expected to be in the Phase IV area during the summer maternity season, approximately May to July (Appendix C). Therefore, construction of Phase IV would not affect summer maternity habitat, fall swarming habitat, or hibernacula for Indiana bats.

Construction activities and associated increases in noise, vibration, human activity, and/or traffic are not expected to disturb or displace Indiana bats from the Project area due to the lack of suitable maternity habitat, roosting habitat, foraging habitat, fall swarming habitat, and hibernacula for Indiana bats within the Project area. The only Indiana bat activity expected to occur in the Project area is during migration. Because construction activities are not known to impact migrating bats and will occur primarily during daylight hours, little impact to migrating bats is anticipated. Any movement of Indiana bats through the Project area is also expected to be short in duration since the Project area lacks suitable foraging or roosting habitat (i.e., individuals are expected to simply travel through the Project area and not stop to forage or roost). Therefore, potential displacement effects to migrating Indiana bats from increased noise, light, vibration, human activity, or traffic associated with construction and maintenance activities are not expected to rise to the level of take.

Construction of Phase IV is not expected to result in mortality or loss of reproductive fitness for Indiana bats due to the lack of suitable summer maternity habitat, foraging habitat and the absence of hibernacula in the Project area and vicinity. Therefore, take of Indiana bats is not expected to occur during the construction of Phase IV.

Impacts to Local Summer Maternity Colonies

There are no known maternity colonies in Benton County, and, as mentioned above, there is no potentially suitable Indiana bat maternity habitat within the Project area. The closest known maternity colony to FRWF is located in adjoining Warren County, where the estimated distance to the edge of the maternity colony is 9.1 miles from Phase IV's southern-most project boundary. The distance as well as the lack of suitable habitat precludes the potential for that maternity colony to extend into the Project area. Therefore, no impacts to maternity colonies as a result of construction of Phase IV are anticipated under any of the four alternatives under consideration.

5.6.3.2 *Operations Effects*

Disturbance/Displacement

Indiana bats are not expected to be disturbed or displaced from the Project area as a result of Project operation under any of the four alternatives under consideration. Although Indiana bat behavior at wind energy facilities is not well understood, displacement from wind facilities has not been documented for any species of bat. Additionally, the Project area does not provide

suitable maternity habitat, roosting habitat, summer foraging habitat, fall swarming habitat, or hibernacula from which Indiana bats could be displaced.

Mortality

Turbine operational protocols have been demonstrated by studies at FRWF and several other wind energy facilities to significantly influence bat mortality (Fiedler 2004, Kerns et al. 2005, Arnett et al. 2008, Baerwald et al. 2008, Good et al. 2011a and 2012). Therefore, it is expected that impacts to Indiana bats at the FWRF would vary greatly depending on the alternative under which the Project turbines are operated.

Under each of four alternatives under consideration, Indiana bats are expected to be at risk of turbine collision and/or barotrauma only during the fall migratory season (August 1 – October 15) and not the spring migration season or summer maternity season. This is based on the timing of the five documented Indiana bat fatalities at wind facilities, the lack of suitable maternity habitat within the Project area, and the distance to the nearest known hibernaculum (105 miles) (USFWS 2007), as well as the results of the spring bat mortality surveys completed at Phases I - III (Appendix D).

Impacts to Local Summer Maternity Colonies

There are no known maternity colonies in Benton County; however, maternity colonies have been documented in counties adjacent to Benton County (USFWS 2007). The closest known maternity colony to FRWF is located in adjacent Warren County, where the estimated distance to the edge of the maternity colony is 1.5 miles from FRWF's southern-most project boundary. As previously mentioned, the distance as well as the lack of suitable habitat between the maternity colony and FRWF precludes the potential for that maternity colony to extend into the Project area. Additionally, the Service has determined that Indiana bats are not expected to be in the Phase IV area during the summer maternity season, approximately May to July, based on the lack of Indiana bat summer habitat within the Project area. Therefore, no mortality impacts to local maternity colonies are anticipated to occur during summer maternity season as a result of operation of the FRWF under any of the four alternatives under consideration.

Impacts to Migrating Indiana Bats

Little is known about Indiana bat migration, but the post-construction monitoring at FRWF and other facilities suggest that movement of migratory Indiana bats is dispersed in time and space (i.e., multiple Indiana bat fatalities have not been found together nor has more than one Indiana bat been found dead at any facility in one season). Based on the best available data, Indiana bat movement through the Project area is not expected to occur in large concentrations or be focused at any particular section of the approximately 20-mile wide Project area. For all three alternatives below that result in take of fall migrating bats, the maternity colonies from which those bats would come are unknown. Multiple maternity colonies are known to exist north of FRWF and it is assumed there are more colonies north of FRWF that have not been discovered, based on the estimated MRU population. Therefore, fall migrating Indiana bats that pass through the Project area on their way to hibernacula (primarily in southern Indiana and Kentucky) are assumed to come from multiple maternity colonies. The specific hibernacula to which fall migrating bats passing through the Project area return is also unknown. With numerous hibernacula south of the Project area, it is a reasonable assumption that Indiana bats migrating through the project area in the fall are flying to multiple hibernacula. There are no good data on the effect of the loss of fall migrating bats on a hibernating population. There is

likely some threshold at which a hibernating population is no longer viable; however, some populations of hibernating bats are quite small. P4 hibernacula are defined as having current or observed historic populations of fewer than 50 bats, and Indiana bats have been found roosting in small groups or even singly (USFWS 2007).

No Action Alternative

Under the No Action Alternative, all FRWF turbines would be shut off from sunset to sunrise between August 1 and October 15, the primary Indiana bat fall migratory period, each year during the operational life (22 years) of the FRWF. Therefore, it is expected that Indiana bat mortality would not occur during the fall migration season under this alternative (Table 5.4 and Table 5.5). Because Indiana bat take is not expected to occur during spring or summer (see Section 4.5.2.4 and Section 4.1.1.3 of the HCP), it is expected that the No Action Alternative would avoid take of Indiana bats altogether at the FRWF and issuance of an ITP would not be necessary.

Mortality monitoring would be conducted according to the FRWF BBCS (Appendix D) under the No Action Alternative. However, Indiana bats would not receive the habitat enhancement and protection benefits associated with the mitigation and conservation measures that would be implemented as part of an HCP. If take of an Indiana bat were to occur during the unrestricted period (i.e., spring or summer), the Applicant would meet with the Service and determine the appropriate mechanism for future authorization for take and the need for operational restrictions

Table 5.4 Predicted Indiana Bat Fatalities per Year by EIS Alternative

Alternative	Indiana Bat Take			
	Bats/Turbine/Year (fall only)	355 Turbines[3] (bats/yr) (90% CI)	449 Turbines[4] (bats/yr) (90% CI)	94 Turbines[5] (bats/yr) (90% CI)
No Operational Adjustment Scenario[1]	0.048[58]	17.0 (14.0-21.1)	21.6 (18.0-26.9)	4.5 (3.8-5.6)
No Action Alternative[2]	0	0	0	0
3.5m/s Cut-In Speed (Feathered) Alternative	0.031	10.9 (9.0-13.5)	13.9 (11.5-17.2)	2.9 (2.4-3.6)
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	0.024	8.6 (7.0-10.6)	10.9 (8.8-13.4)	2.3 (1.9-2.8)
6.5m/s Cut-In Speed Alternative	0.011	3.9 (3.1-4.6)	4.9 (4.0-5.9)	1.0 (0.8-1.2)

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Phases I - III in operation; 2 year of the 22-year life of the Project
[4]Phases I - IV in operation; 15 years of the 22-year life of the Project
[5]Phase IV only in operation; 5 years of the 22-year life of the Project

[58] Rounded to 0.05 Indiana bats/turbine in the HCP.

Table 5.5 Predicted Indiana Bat Fatalities over the 22-Year Life of Fowler Ridge Wind Farm by EIS Alternative

Alternative	Indiana Bat Take [3]
No Operational Adjustment Scenario[1]	381
No Action Alternative[2]	0
3.5m/s Cut-In Speed (Feathered) Alternative	245
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	193
6.5m/s Cut-In Speed Alternative	86

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Take = (total bats killed per year Phases I - III (355 turbines) x 2 years) + (total bats killed per year Phases I - IV (449 turbines) x 15 years) + (total bats killed per year Phase IV x 5 years)

3.5 m/s Cut-In Speed (Feathered) Alternative

Under the 3.5 m/s Cut-In Speed (Feathered) Alternative, FRWF turbines would be feathered under wind speeds of 3.5 m/s from sunset to sunrise between August 1 and October 15. Based on the results of post-construction curtailment studies at FRWF (Good et al. 2012), it is expected that fall bat mortality under this alternative would be reduced by 36% from the levels of fall bat mortality observed at un-curtailed turbines during the 2010 and 2011 post-construction mortality studies. A 36% reduction in mortality would result in an average annual bat mortality rate of approximately 19.31 bats/turbine during the fall season. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bat fatality is estimated at approximately 0.031 bats/turbine during the fall migration season under the 3.5 m/s Cut-In Speed (Feathered) Alternative (Table 5.4). Indiana bat take is not expected to occur during spring or summer.

Based on post-construction mortality data collected at FRWF, total Indiana bat take under the 3.5 m/s alternative is predicted to be approximately 10.9 Indiana bats per year when Phases I - III are operating (355 turbines), 13.9 Indiana bats per year when Phases I - IV are operating (449 turbines), and 2.9 Indiana bats per year when only Phase IV is operating (94 turbines) (Table 5.4). Over the 22-year life of the Project, it is estimated that approximately 245 Indiana bats would be killed under the 3.5 m/s Cut-In Speed (Feathered) Alternative (Table 5.5).

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of 184 females taken by the Project is estimated as potentially contributing an additional 202 bats to the population by Year 22 of the Project. Thus, the total impact of the taking under this alternative would be 447 Indiana bats over the life of the Project, or 20.3 bats per year on average. The loss of 20.3 Indiana bats per year would represent a loss of 0.007% of the estimated 2011 population of the MRU (305,297 Indiana bats) (USFWS 2012d). The loss to the rangewide population would be 0.005%, based on the 2011 estimated population size of 424,708 Indiana bats (USFWS 2012d). Losses of this magnitude across the range of the Indiana bat or within the MRU would not in itself pose a threat to any

population or the species as a whole. How these impacts are distributed among maternity colonies and hibernacula are, however, important to consider.

The effect on a maternity colony or hibernaculum, however, is most appropriately measured by the greatest number of bats killed in any one year, since that highest number of bats would be removed from one or more hibernacula and one or more maternity colonies in each of those years. Therefore, under the 3.5 m/s alternative 13.9 Indiana bats are estimated to be killed each year for 15 years while all four phases are operational. The loss of 13.9 Indiana bats would likely be distributed among multiple hibernating populations because maternity colonies are known to be comprised of bats from more than one hibernaculum and multiple large and small hibernacula exist south of FRWF (USFWS 2007). In Indiana, there are seven P1, one P2, 16 P3, and nine P4 hibernacula and in Kentucky there are five P1, 15 P2, 34 P3, and 20 P4 hibernacula (note that not all of the Kentucky hibernacula would be used by bats migrating through FRWF). The loss of 13.9 Indiana bats would represent a minor impact if, as predicted, the impact would be distributed among multiple hibernating populations, including large P1 and P2 hibernacula.

Although it is unknown where most Indiana bat maternity colonies are located, the summer habitat north of the FRWF and within the range of the Indiana bat likely supports multiple colonies from which migrating bats potentially encountering FRWF would come. The impact of killing 13.9 Indiana bats each year for multiple years could be unsustainable and lead to the decline or extirpation of one or more of those maternity colonies if all the bats came from one or a small number of maternity colonies each year. The larger the number of bats taken (or the fewer potentially affected colonies), the greater the likelihood that impacts would be significant for one or more colonies. The greater the number of consecutive years this occurred would likely also contribute to potential decline or extirpation of affected colonies. Whether or not the level of take estimated for the 3.5 m/s alternative (13.9 bats / year for 15 years) is sustainable is unknown, but the best biological judgment suggests it would be sustainable if the bats would be taken from multiple maternity colonies.

Mortality monitoring would be conducted according to the Project HCP under the 3.5 m/s Cut-In Speed (Feathered) Alternative. To facilitate responsiveness in management actions that would ensure that the 22-year take estimate is not exceeded, the HCP would intensively monitor mortality and include associated annual and within-year adaptive management take thresholds. Under the HCP, mortality monitoring would track the take of Indiana bats and mortality of all bats in general on an annual basis, and adaptive management would be used to ensure that Indiana bat take does not exceed the authorized take limit. Additionally, Indiana bats would receive the habitat enhancement and protection benefits associated with the mitigation and conservation measures that would be implemented as part of the HCP intended to fully offset the impacts of take at the FRWF and promote recovery of the species.

5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)

Under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), FRWF turbines would be feathered under wind speeds of 5.0 m/s when the ambient temperature is at or above 50° F from sunset to sunrise between August 1 and October 15. It is conservatively[59] expected that

[59]. In 2010, a cut-in speed of 5.0 m/s, no feathering, resulted in a mortality reduction of 50% (Good et al. 2011a). In 2011, cut-in speeds of 4.5 m/s and 5.5 m/s, feathered, and resulted in mortality reductions of 57% and 73%, respectively (Good et al. 2012). It is therefore reasonable to assume that a cut-in speed of 5.0 m/s, feathered, would result in a mortality reduction between 57% and 73%.

fall bat mortality under this alternative would be reduced by 50% from the levels of fall bat mortality estimated for un-curtailed turbines based on the 2010 and 2011 post-construction mortality studies (see Section 4.1.1.2 of the HCP). A 50% reduction in mortality would result in an average annual bat mortality rate of approximately 15.09 bats/turbine during the fall season. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bat fatality is estimated at approximately 0.024 bats/turbine during the fall migration season under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (Table 5.4). Indiana bat take is not expected to occur during spring or summer.

Total Indiana bat take under the 5.0 m/s alternative is predicted to be approximately 8.6 Indiana bats per year when Phases I-III are operating (355 turbines), 10.9 Indiana bats per year when Phases I-IV are operating (449 turbines), and 2.3 Indiana bats per year when only Phase IV is operating (94 turbines) Table 5.4). Over the 22-year life of the Project, it is estimated that approximately 193 Indiana bats would be killed under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (Table 5.5). Actual Indiana bat mortality is likely to be lower than these estimates, because they were based on the minimum reductions in mortality that were observed in studies using similar operational adjustments.

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of 145 females taken by the Project is estimated as potentially contributing an additional 160 bats to the population by Year 22 of the Project. Thus, the total impact of the taking under this alternative would be 353 Indiana bats over the life of the Project, or 16.0 bats per year on average.

The loss of 16.0 Indiana bats per year would represent a loss of 0.005% of the estimated 2011 population of the MRU (305,297 Indiana bats) (USFWS 2012d). The loss to the rangewide population would be 0.004%, based on the 2011 estimated population size of 424,708 Indiana bats (USFWS 2012d). As previously discussed, losses of this magnitude across the range of the Indiana bat or within the MRU would not be considered a significant adverse effect.

For the reasons discussed above, the loss of 10.9 Indiana bats per year for 15 years is expected to be sustainable in terms of both reproductive and hibernating populations provided, as our best biological judgment indicates, that the impacts are spread over multiple maternity colonies and hibernacula. Fewer bats taken decreases the probability, everything being equal, that the impacts would occur to a single or small number of maternity colonies or hibernacula and be unsustainable. The impacts to Indiana bats under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) are not expected to have population level consequences.

Mortality monitoring would be conducted according to the Project HCP under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). To facilitate responsiveness in management actions that would ensure that the 22-year take estimate is not exceeded, the HCP proposes intensive mortality monitoring and associated annual and within-year adaptive management take thresholds, which are described in detail in Chapter 5 of the HCP. Under the HCP, mortality monitoring would track the take of Indiana bats and mortality of all bats in general on an annual basis, and adaptive management would be used to ensure that Indiana bat take does not exceed the authorized take limit. Additionally, Indiana bats would receive the habitat enhancement and protection benefits associated with the mitigation and conservation measures that would be implemented as part of the HCP to fully offset the impacts of take at the Project and promote recovery of the species.

6.5 m/s Cut-In Speed Alternative

Under the 6.5 m/s Cut-In Speed (Feathered) Alternative, FRWF turbines would be feathered under wind speeds of 6.5 m/s when the ambient temperature is at or above 50° or above from sunset to sunrise between August 1 and October 15. Based on the results of post-construction curtailment studies at FRWF (Good et al. 2011a), it is expected that fall bat mortality under this alternative would be reduced by 78% from the levels of fall bat mortality observed at un-curtailed turbines during the 2010 and 2011 post-construction mortality studies. A 78% reduction in mortality would result in an average annual bat mortality rate of approximately 6.64 bats/turbine during the fall season. Based on the species composition of bat mortalities recorded at FRWF to-date, Indiana bat fatality is estimated at approximately 0.011 bats/turbine during the fall migration season under the 6.5 m/s Cut-In Speed Alternative (Table 5.4). Indiana bat take is not expected to occur during spring or summer.

Based on post-construction mortality data collected at FRWF, total Indiana bat take under the 6.5 m/s alternative is predicted to be approximately 3.9 Indiana bats per year when Phases I - III are operating (355 turbines), 4.9 Indiana bats per year when Phases I - IV are operating (449 turbines), and 1.0 Indiana bats per year when only Phase IV is operating (94 turbines) (Table 5.4). Over the 22-year life of the Project, it is estimated that approximately 86 Indiana bats would be killed under the 6.5 m/s Cut-In Speed Alternative (Table 5.5).

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of 65 females taken by the Project is estimated as potentially contributing an additional 72 bats to the population by Year 22 of the Project. Thus, the total impact of the taking under this alternative would be 158 Indiana bats over the life of the Project, or 7.2 bats per year on average.

The loss of 7.2 Indiana bats per year would represent a loss of 0.002% of the estimated 2011 population of the MRU (305,297 Indiana bats) (USFWS 2012d). The loss to the rangewide population would be 0.002%, based on the 2011 estimated population size of 424,708 Indiana bats (USFWS 2012d). Losses of this magnitude across the range of the Indiana bat or within the MRU would not be considered a significant adverse effect.

As discussed above, the loss of this number of Indiana bats is expected to be sustainable in terms of both reproductive and hibernating populations provided, as has been assumed, that the impacts are spread over multiple maternity colonies and hibernacula. If these impacts were to fall on a small number of maternity colonies they may be unsustainable and result in the loss of those colonies. However, fewer bats taken decreases the probability, everything being equal, that the impacts would occur to a single or small number of maternity colonies or hibernacula and therefore be unsustainable. The impacts to Indiana bats under the 6.5 m/s Cut-In Speed Alternative would not be expected to have population level consequences.

Mortality monitoring would be conducted according to the Project HCP under the 6.5 m/s Cut-In Speed Alternative. To facilitate responsiveness in management actions that would ensure that the 22-year take estimate is not exceeded, the HCP would intensively monitor mortality and include associated annual and within-year adaptive management take thresholds. Under the HCP, mortality monitoring would track the take of Indiana bats and mortality of all bats in general on an annual basis, and adaptive management would be used to ensure that Indiana bat take does not exceed the authorized take limit. Additionally, Indiana bats would receive the habitat enhancement and protection benefits associated with the mitigation and conservation

measures that would be implemented as part of the HCP intended to fully offset the impacts of take at the FRWF and promote recovery of the species.

5.6.3.3 *Maintenance Effects*

Maintenance activities would be required to maintain the safety and operability of the Project under all four of the alternatives under consideration and consequently, maintenance impacts to Indiana bats are the same for all of the alternatives. Maintenance may include changing oil in the turbine nacelle, maintaining electrical equipment inside the turbine tower, etc. Additionally, approximately every three years, or on an as-needed basis, tree branches identified as hazardous to the continued operation of the generation tie-in lines (that connect all phases of the Project to the Dequine Substation) would need to be trimmed.

As stated previously, because the Project area lacks suitable foraging or roosting habitat for the Indiana bat, and because movement of Indiana bats through the Project area is expected to be limited to migrating individuals that simply travel through the Project area and do not stop to forage or roost, potential direct effects to migrating bats from maintenance activities are not expected to rise to the level of take.

5.6.3.4 *Decommissioning Effects*

Decommissioning of the Project would occur under each of the alternatives under consideration and consequently, decommissioning impacts to listed species are the same for all of the alternatives. Decommissioning of the Project would minimize the long term impacts (when compared with re-commissioning or re-powering the Project) by removing turbines from the Project area and restoring the area to the pre-existing land use and vegetation communities. Impacts to Indiana bats from decommissioning activities would be the same as for construction activities and similar avoidance and minimization measures would be implemented. The impacts would be intermittent, short-term, and localized and are not expected to rise to the level of take.

5.6.3.5 *Mitigation for Take of Indiana Bats*

Mitigation would not occur under the No Action Alternative. Mitigation for Indiana bats is described below for the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). Mitigation under the 3.5 m/s Cut-In Speed (Feathered) Alternative and the 6.5 m/s Cut-In Speed Alternative would be qualitatively similar to that described for the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). Mitigation proposed by the HCP is designed to compensate for the 353 total Indiana bats expected to be lost from the population (from direct take and consequent reproductive loss) as a result of Project operation. It is expected that the summer habitat mitigation, described below, would be sufficient to mitigate the take of 131 Indiana bats (37% of the total affected bats) and that the winter habitat mitigation would be sufficient to mitigate the take of the remaining 222 Indiana bats (63% of the total affected bats).

In cooperation with the USFWS, the Applicant would implement the following mitigation actions to further the recovery of the Indiana bat (see Section 5.3 in the Applicant's HCP for a detailed description). Considered together, the summer and winter habitat mitigation efforts are expected to produce a population increase sufficient to fully offset the impacts of Indiana bat take and associated lost reproductive capacity caused by the Project under any of the action alternatives. The impacts of mitigation efforts would be monitored to ensure that the mitigation goals are met.

Summer Habitat Mitigation

Habitat Preservation/Restoration. Proposed mitigation includes steps to preserve and restore 240 acres of summer maternity habitat within the home range of an extant Indiana bat maternity colony(ies) in Putnam County, Tippecanoe County, Vermillion County, or Warren County. Summer mitigation efforts would focus on 60-acre or larger habitat blocks associated with extant maternity colonies in the target counties. Parcels less than 60 acres can count towards the total mitigation requirement of 240 acres if they are functionally connected to an area of existing suitable Indiana bat habitat and, together, the parcels total at least 60 acres. The Service would have final approval as to whether or not the land parcel selected for mitigation is part of a functional 60-acre unit.

Mitigation Bank Option. FRWF has the option to utilize any mitigation bank that has been set up and approved by the USFWS for mitigation of Indiana bats in the MRU that includes lands within Indiana provided such a bank is operational at the time FRWF must meet its mitigation obligations. FRWF may have the option to contribute to the mitigation bank at a level sufficient to offset the impacts of taking 131[60] Indiana bats.

Effect of Summer Habitat Mitigation. No direct negative effect to Indiana bats would occur as a result of protection and/or restoration of summer habitat (i.e., tree planting and monitoring activities). Monitoring activities, including acoustic monitoring and exit counts are expected to result in very minimal, if any, human disturbance due to the short duration of these activities and the limited time people would be in the vicinity of roosting bats. Therefore, summer habitat mitigation is not expected to have any negative direct or indirect effects to Indiana bats.

Winter Habitat Mitigation

Proposed mitigation includes the protection of winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana, currently the largest known Indiana bat hibernaculum, with an estimated population of 61,618 bats in 2011 (L. Pruitt, pers. comm.). IDNR will be responsible for monitoring the winter mitigation (see letter dated February 28, 2013 in Appendix C).

Effect of Winter Habitat Mitigation. Winter habitat mitigation would include activities that have the potential to result in harm or take of Indiana bats, including gate construction and maintenance of human activity monitoring devices (i.e., speloggers and dataloggers), and monitoring activities. Construction activities would cause short-term surface disturbance at the cave entrance. However, potential direct effects to Indiana bats from noise, vibration, and human activity during construction of the cave gate are not expected because construction would not occur during the winter or fall when Indiana bats are hibernating or swarming. Further, the area in the vicinity of the planned gate installation would be inspected prior to construction activities to evaluate potential effects to roosting Indiana bats. Measures would be taken to avoid direct impacts to Indiana bats that may be roosting at the cave entrance at the time of gating according to guidance and oversight from the Service's Bloomington Field Office.

[60] Under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), a total of 353 Indiana bats would need to be mitigated for (i.e., impact of taking). The 131 bats equates to 37% of that impact, which is the amount accounted for by summer mitigation. The other 222 bats (63%) would be mitigated for by the Wyandotte Cave gating.

Additionally, an air curtain would be installed each day during construction to prevent exposure to construction fumes (e.g., dust, generator, welding) of bats roosting inside the cave, if air flow is moving into the cave.

Potential disturbance to Indiana bats as a result of maintenance of speloggers and dataloggers that would be used to monitor human visitation to the cave and cave microclimate would be eliminated by performing maintenance outside of the winter hibernation period. Speloggers and dataloggers would be downloaded and maintained annually between April 1 and May 31. Other potential direct effects of cave gating could result if bats collided with gate slats, were not able to fly through the bars of the gate and had to land and crawl through, or had to expend extra energy to navigate between gate slats. However, these direct effects are not expected because the cave gates would be modeled after designs of other successful bat gates that have resulted in increased populations of Indiana bats and because post-gating monitoring would be conducted to be certain that the gate is not adversely affecting bat movement (more information on gate design is provided in Chapter 5 of the HCP). Spacing between the angle irons would be sufficient to restrict human access to the cave, but not so tight as to impede bat flight through the gate or result in collisions.

Indirect effects of cave gating could include increased predation by owls, snakes, raccoon, feral cats, or other predators if the gate slows down or stops the flight of bats as they move in and out of the cave opening. Predation at the entrances of hibernacula is a relatively common and natural phenomenon at caves with large populations of bats. However, the gate would be designed so that spacing between gate slats would be sufficient to restrict human access to the cave, but not so narrow as to hinder or slow bat flight through the gates. This should minimize predators' abilities to capture bats as they are moving in and out of the cave. Further, during gate construction, special attention would be paid to removing or modifying any potential overhangs, nearby branches, or other perches or structures that might provide easier access to predators. Post-gating monitoring would be conducted to be certain that the gate is not adversely affecting bat movement (which could increase bat susceptibility to predators). The gates would also be inspected for potential predator perches during biennial surveys and perches would be modified or removed as needed. Since there is currently a gate at Wyandotte Cave that has not resulted in population decreases, it is not expected that predation associated with the new gate would hinder population growth. Therefore, indirect effects that might rise to the level of take are not expected from winter habitat mitigation.

5.6.4 Summary of Effects to Rare, Threatened and Endangered Species

- Impacts to state-listed plants and non-bat species are expected to be minor and the same under all four alternatives and are discussed in Sections 5.3 and 5.5.
- Impacts to the seven state-listed bat species (one endangered: evening bat, and six special concern: little brown, northern myotis, tri-colored, silver-haired, hoary and eastern red) are addressed comprehensively in Section 5.5 with bats not listed under the ESA.
- Construction of Phase IV and maintenance and decommissioning of the FRWF are not expected to disturb, displace, or cause mortality of Indiana bats under any of the four alternatives due to the lack of available maternity, roosting, foraging, fall swarming, and hibernacula for Indiana bats within the Project area.

- Indiana bat take as a result of operation of the Project is not expected to occur during spring or summer under any of the four alternatives.
- It is expected that the **No Action Alternative** would avoid take of Indiana bats altogether.
- Over the 22-year life of the Project, it is estimated that approximately 245 Indiana bats would be killed under the **3.5 m/s Cut-In Speed (Feathered) Alternative** (Table 5.5). The total impact of the taking (females + pups) would be 447 Indiana bats over the life of the Project, or 20.3 bats per year on average.
- Over the 22-year life of the Project, it is estimated that approximately 193 Indiana bats would be killed under the **5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)** (Table 5.5). The total impact of the taking (females + pups) would be 353 Indiana bats over the life of the Project, or 16.0 bats per year on average.
- Over the 22-year life of the Project, it is estimated that approximately 86 Indiana bats would be killed under the **6.5 m/s Cut-In Speed Alternative** (Table 5.5). The total impact of the taking (females + pups) would be 158 Indiana bats over the life of the Project, or 7.2 bats per year on average.
- Under any of the three action alternative, the Applicant would:
    1) Preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County;
    2) Protect winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana.

5.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

5.7.1 Impact Criteria

Pursuant to NEPA, effects to the human environment include those to socioeconomic conditions (40 CFR 1508.14). Additionally, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires assessment of socioeconomic effects on minority and low-income communities. This section of the EIS describes the effects of the four alternatives under consideration on socioeconomic conditions of Indiana, Benton County and the incorporated towns of Fowler, Boswell, Earl Park, and Oxford, all of which are in close proximity to the Project. Current socioeconomic conditions are described in Section 4.7. Public scoping did not raise concerns regarding the Project's potential effects on the socioeconomic conditions in the Project area.

Effects would be considered significant if any of the following occurred as a result of implementing any of the four alternatives:

(1) Decline in local or regional employment;

(2) Decrease in local or regional property values;

(3) Decline in valuable community services; or

(4) Disproportionate share of adverse environmental effects placed on any minority or low-income community.

5.7.2 Construction Effects

Implementation of any of the four alternatives under consideration would include construction of Phase IV. Benefits to the socioeconomic conditions from construction of Phase IV at the state and local levels would apply to all alternatives. Benefits would include an estimated $300 million benefit to the local economy[61] and an indirect benefit of having construction workers living and working in the area of Phase IV. Because local and state construction trades would be used for constructing Phase IV, total wages and salaries paid to contractors and workers would increase temporarily and contribute to the total personal income in the region. During construction, local businesses would benefit from increased sales and revenue associated with the addition of construction workers as clientele. No minority or low-income communities would be disproportionately affected by construction of Phase IV under any of the four alternatives.

5.7.3 Operations Effects

Implementation of any of the four alternatives under consideration is not likely to result in alteration of any existing land uses. Project operations have been a part of the agricultural landscape since early 2009, and farming continues be an important component of the economic landscape.

Implementation of any of the four alternatives would likely have the same effect, if any, on property values. Losses in property values in those lands in and surrounding the Project have not been documented. In Illinois, Hinman (2010) used an improved methodology for analyzing wind facility impacts on property valuation. An initial stigma associated with wind farms may have caused property values to diminish during the facility proposal and planning stage. However, after development of the wind facility, property values rebounded and some increased around the Illinois facility. Similarly, Hoen et al. (2009) looked at data from roughly 7,500 homes situated within 10 miles of wind facilities. Hoen et al. (2009) found no conclusive evidence of any widespread property value impacts in these communities. Specifically, Hoen et al. (2009) did not find any consistent, measurable, or statistically significant effect on home sales prices relative to the view of a wind facility nor the distance of the home to the facility. Implementation of any alternative is not expected to result in reduced valuation in those properties in and around the Project. No minority or low-income communities would be disproportionately affected by operation of the Project under any of the four alternatives.

Implementation of any of the four alternatives under consideration would result in an average of $5 million in annual property taxes paid to Benton County. It should be noted that this value includes all Phases of the Project including Phase IV. Implementation of any of the four alternatives would result in similar benefits to those community services that receive funding derived from taxes paid by the FRWF. The education system in Benton County is a principle beneficiary of funds derived from the Project. .

Additional personal income would be generated for residents in the local area and the state by circulation and recirculation of dollars paid out by the Applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies, and

[61] Based on the industry standard that estimates benefits to local economy are $2 million per MW of installed capacity.

other products and services would benefit businesses in Benton County and the State of Indiana.

Implementation of any of the four alternatives is not expected to affect community services such as water and wastewater services. Any of the four alternatives would have the same effect on those community-based services that derive funding from the tax revenue provided by the Project. Project operation and maintenance would not cause additional impacts on leading industries within the Project area. None of the four alternatives would indirectly affect those community-based services that derive funding from the tax revenue provided by the Project. Property taxes and the number of permanent jobs would not be affected.

Landowners with turbines receive royalty payments, which are in part based on the actual generation of the turbine on their land. As production is reduced, the landowner receives less income down to a minimum value. Energy production would be highest under the 3.5 m/s alternative, which is equivalent to unrestricted operation in terms of energy production, followed by the 5.0 m/s and 6.5 m/s alternatives, respectively. The No Action alternative would produce the least electricity annually because the turbines would be shut down nightly between August 1 and October 15 each year. Insufficient data exists to characterize the extent of the effect that restricted operations under any individual alternative would have on royalty payments to the landowners.

5.7.4 Maintenance Effects

Impacts associated with maintaining the Project are not expected to vary among the four alternatives. Implementation of any of the four alternatives is expected to need the same level of maintenance in the event or absence of operational restrictions. Effects to socioeconomic conditions from project maintenance are not expected to vary among alternatives. All four phases of the Project would necessitate approximately 60 full-time jobs to monitor and maintain the site.

5.7.5 Decommissioning Effects

There is little information on the effects to economic conditions associated with decommissioning large, commercial-scale wind farms. European countries like Denmark and Germany have begun re-powering or decommissioning projects only recently. Impacts associated with decommissioning are not expected to vary among the four alternatives under consideration. Implementation of any considered alternative is expected to require the same level of effort for decommissioning. The presence of the added temporary labor force would benefit the socioeconomic conditions at the state and local levels. Because local and state construction trades would be used for decommissioning activities, total wages and salaries paid to contractors and workers would increase temporarily and contribute to the total personal income in the region.

5.7.6 Mitigation for Impacts to Socioeconomics and Environmental Justice

Adverse effects to socioeconomic conditions at the state and local levels are not anticipated as a result of any of the four alternatives under consideration. A disproportionate share of adverse environmental effects as a result of construction of Phase IV or operation, maintenance and decommissioning of all four phases of the Project would not be placed on any minority or low-income community. No specific mitigation measures for socioeconomics or environmental justice would be implemented under any of the four alternatives.

5.7.7 Summary of Effects to Socioeconomics and Environmental Justice

- No concerns related to socioeconomics or environmental justice were identified during the scoping period.
- Implementation of any of the four alternatives under consideration is not expected to result in adverse effects in the form of changes in population levels or trends at the state or local levels; lost valuation in properties due to the presence of the Project; declines in community services; or disproportionate effects on low-income or minority populations.
- No specific mitigation measures for socioeconomics or environmental justice would be implemented under any of the four alternatives.

5.8 CULTURAL AND HISTORIC RESOURCES

5.8.1 Impact Criteria

Qualifying cultural resources are protected under the NHPA. NHPA defines a historic property as:

…any Pre-European contact or historic district, site, building, structure, or object included in, or eligible for listing on the National Register, including artifacts, records, and material remains related to such a property or resource (46 CFR 800, as amended 2006 Public Law 89-665; 16 U.S.C. 470, TITLE III, Section 301 (5)).

In general, a property must be at least 50 years old and possess both historic significance and integrity to be considered eligible for listing in the NRHP.

Adverse effects to cultural resources (e.g., historic structures, archaeological sites, traditional cultural properties, etc.) eligible for NRHP listing occurs when an action directly or indirectly alters any characteristic of an historic property in a way that diminishes the integrity of the property's design, location, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable impacts that may occur later in time or are cumulative.

For this EIS, the direct APE is considered to be the Phase IV project area and the Indiana bat mitigation areas because it is only construction of Phase IV and restoration activities at the mitigation areas that have potential to directly impact cultural resources. Specifically, the direct APE includes the up to 94 turbine locations, access roads and buried interconnect lines, construction staging areas, and the substation location; and, Indiana bat mitigation sites including Wyandotte Cave and sites selected by FRWF and approved by the Service within a 2.5 mile radius circle around known maternity colonies in Indiana. The visual APE includes the area within 1 mile of Phase IV turbine locations at the request of the Indiana SHPO.

A significant adverse effect would be considered to be visual effects, noise effects, and/or cultural effects to cultural resources identified as eligible for or listed in the NRHP and located within the APE. Significant beneficial effects could result from the removal of an adverse effect (i.e., decommissioning). No issues related to cultural resources were identified during the scoping period.

5.8.2 Construction Effects

5.8.2.1 *Archaeological Resources*

A PA has been developed by the Service Region 3 Historic Preservation Office in coordination with the Applicant and the SHPO. The PA (Appendix G) commits the Applicant to archaeological investigation of the Phase IV project area, including but not limited to the 94 turbine sites, access roads and buried interconnect lines, construction staging areas, and the substation location; and Indiana bat mitigation sites including Wyandotte Cave and sites selected by the Applicant and approved by the Service within a 2.5 mile radius circle around known maternity colonies in Indiana once their exact locations have been established to avoid all archaeological impacts. As has been previously discussed, this may require that one or more of the turbine locations be changed to avoid impacts should any resources requiring avoidance be discovered.

Prior to the initiation of any construction or mitigation activities that could potentially disturb or damage archaeological resources, the Applicant shall carry out archaeological investigations in accordance with the provisions of IC 14-21-1, 312 IAC 21, 312 IAC 22, and the most current Guidebook for Indiana Historic Sites and Structures Inventory- Archaeological Sites and in accordance with the methodology set forth in the PA. The Service shall ensure that all scopes of work for archaeological identification and evaluation produced by the Applicant include a plan for the treatment of human remains and funerary objects that might be encountered.

1. Phase I Archaeological Survey. The Service shall ensure that a Phase I Scope of Work will be developed by the Applicant in consultation with SHPO. Phase I work will be designed to provide information regarding the significance of all identified archaeological sites to the NRHP. This work will be done in consultation with SHPO and all deliverables will be submitted by the Service to SHPO for review and comment.

    a. If the Service determines and SHPO concurs that a “site is not eligible” for the NRHP, then no further investigations of that site will be conducted.

    b. If the Service determines and SHPO concurs that a site with indeterminable eligibility can and will be avoided,, which would be the preferred option, then no further investigation of that site will be conducted, unless avoidance no longer becomes feasible.

2. Phase II Archaeological Testing. If all parties agree that the “eligibility of a site is indeterminable” and avoidance is not feasible, the Service shall ensure that a Phase II Research Design will be developed by the Applicant in consultation with the SHPO. This document will be consistent with SHPO guidelines. Phase II work will be designed to provide information regarding the significance of an archaeological site as “site is not eligible” or “site is eligible” to the NRHP. This work will be done in consultation with SHPO and all deliverables will be submitted by the Service to SHPO for review and comment.

    a. If the Service determines and SHPO concurs that a “site is not eligible” for the NRHP, then no further investigations of that site will be conducted.

    b. If the Service determines but SHPO will not concur regarding eligibility, all appropriate information regarding the site will be submitted by the Service to the

Keeper of the National Register, National Park Service, for review. The Keeper's determination of eligibility will be final.

c. If the Service determines and SHPO concurs that an eligible site can and will be avoided which would be the preferred option, then no further investigation of that site will be conducted, unless avoidance no longer becomes feasible.

5.8.2.2 *Historic Structures*

The results of a desktop review conducted by Stantec Consulting Services found that no NRHP listed historic resources are located within the footprint of the 94 Phase IV turbines; therefore, none would be directly affected by the project. A total of 73 resources which are listed in SHAARD as "Notable" (i.e., potentially eligible), or "Outstanding" (i.e., considered eligible) are located within the indirect APE, within one mile of a Phase IV turbine. Additionally, three resources located within the town of Fowler are actually listed on the NRHP. Construction of FRWF Phase IV would have no adverse effect on these 76 structures due to their location within the town and their current rating status in SHAARD. The Indiana SHPO, in a letter dated October 18, 2012, concurred with this finding (Appendix C).

5.8.3 Operations Effects

5.8.3.1 *Archaeological Resources*

No effects to archaeological resources would occur as a result of operations under any of the four alternatives under consideration.

5.8.3.2 *Historic Structures*

Based on the current project layout, of the 94 Phase IV turbines, 70 would have no visual effect on NRHP Listed, Notable, or Outstanding resources. A total of 76 NRHP Listed, Notable, or Outstanding resources are located within one mile of a Phase IV turbine, all but three of which are located within the town of Fowler. The three Notable structures located outside of the town of Fowler are each located within one mile of several Phase IV turbines; however, two of the structures are also located within one mile of several existing turbines constructed during earlier phases of the Fowler Ridge project. The remaining 73 structures are located within the town of Fowler, including the three NRHP listed structures, and are located within one mile of five Phase IV turbines. All of these resources are also within one mile of a number of existing turbines constructed during earlier phases of the Fowler Ridge project. Photosimulations conducted at all three of the NRHP listed resources (Fowler Theater, Fraser & Isham Law Office, and Benton County Courthouse) indicate that the tip of a single blade of one turbine may be seen at times from the Fowler Theater. None of the proposed Fowler IV turbines would be seen from street level. In addition, the potentially eligible or eligible structures within Fowler have a low potential for visual effects from the project due to their location within the town and their current rating status in SHAARD. Based on this, the Service made a determination of no effect on historic properties as a result of Phase IV regardless of the alternative chosen. The Indiana SHPO, in a letter dated October 18, 2012, concurred with the Service's finding that no historic structures within the APE would be adversely affected by Phase IV (Appendix C).

5.8.4 Maintenance Effects

Maintenance activities involved with upkeep and repair of Phases I - IV turbines has little potential to affect buried archaeological resources as long as any ground-disturbing activities associated with operation are confined to previously surveyed areas. No adverse effects to historic properties would occur as a result of Project maintenance under any of the four alternatives under consideration.

5.8.5 Decommissioning Effects

Decommissioning activities would be similar to those associated with construction; however, a shorter duration than construction. Decommissioning has the potential to impact buried archaeological resources within the footprint of all turbines, facilities, and other components of the Project that would be removed. If any previously unsurveyed areas would be directly affected by decommissioning, archaeological surveys would be required to determine the presence of archaeological sites, and the potential effects.

5.8.6 Mitigation for Impacts to Cultural and Historic Resources

5.8.6.1 *Archaeological Resources*

If all parties agree that construction of Phase IV and/or Indiana bat mitigation will have an "adverse effect" on an eligible site and avoidance is not a feasible option, then the Service will consult with SHPO to identify measures to minimize and mitigate the adverse effect to the site. The Service shall ensure that a Treatment (Data Recovery) Plan within a Memorandum of Agreement (MOA) will be developed by the Applicant in consultation with SHPO. The plan will be consistent with SHPO guidelines and all deliverables will be submitted by the Service to SHPO for review and comment.

Following SHPO review and concurrence of proposed Phase III Archaeological Data Recovery deliverables, no further investigations of that site will be conducted, unless an unanticipated post-review discovery is made. Procedures for handling post-review discoveries are described in the PA (Appendix G).

5.8.6.2 *Historic Structures*

Construction of Phase IV and operation, maintenance, and decommissioning of all Project Phases would have no adverse effect on historic structures regardless of the alternative chosen. Therefore, no mitigation is proposed.

5.8.7 Summary of Effects to Cultural and Historic Resources

- No concerns related to cultural and historic resources were identified during the scoping period.
- Construction of Phase IV, Indiana bat mitigation, operation, maintenance, and decommissioning of all Project Phases would have no adverse effect on historic structures under any of the alternatives.
- A PA has been developed by the Service Region 3 Historic Preservation Office in coordination with the Applicant and the SHPO. The PA commits the Applicant to

archaeological investigation of the Phase IV project area, including but not limited to, the 94 turbine sites, access roads and buried interconnect lines, construction staging areas, and the substation location; and Indiana bat mitigation sites including Wyandotte Cave and sites selected by the Applicant and approved by the Service within a 2.5 mile radius circle around known maternity colonies in Indiana once their exact locations have been established to avoid all archaeological impacts.

- The Applicant commits to relocating one or more of the turbine locations to avoid impacts to archaeological resources should any resources requiring avoidance be discovered.
- If construction of Phase IV or the Indiana bat mitigation under any of the four alternatives will have an "adverse effect" on an eligible site and avoidance is not a feasible option, then the Service will consult with SHPO to identify measures to minimize and mitigate the adverse effect to the site.
- The Service shall ensure that a Phase III Archaeological Data Recovery Plan within an MOA will be developed by the Applicant in consultation with SHPO.

5.9 TRANSPORTATION

5.9.1 Impact Criteria

Potential transportation issues would primarily be associated with increased truck traffic during construction of Phase IV. In general, potential issues that may occur during construction include traffic congestion on local and regional roads as a result of the transport of Phase IV materials (e.g., tower sections, blades, nacelles, etc.), increased vehicle emissions and increased traffic noise, all of which are common as a result of typical construction activities. No transportation issues were identified during the scoping period.

Prior to construction activities, the Benton County Wind Siting Ordinance (the Ordinance) requires that an Improvement Location Permit be obtained from the Benton County Building Commissioner. As part of this permit application, a transportation plan must be prepared that would describe how vehicles would access the site and describe the effects of the proposed wind facility on the local and regional road system during construction and operation. An Improvement Location Permit per the Ordinance was obtained for all existing phases of the Project and the Applicant has indicated that this permit would also be obtained for Phase IV prior to construction.

5.9.2 Construction Effects

Potential transportation issues as a result of construction of Phase IV may include traffic congestion on local and regional roads as a result of the transport of construction materials and equipment, increased heavy truck traffic, increased vehicle emissions and increased traffic noise, all of which are common as a result of typical construction activities. These effects are expected to be limited to the duration of construction activities. Regardless of the alternative chosen, traffic levels during construction of Phase IV would be similar to those experienced during construction of the first three phases of the Project, during which, no transportation issues were identified. No significant adverse effect to local and regional traffic is anticipated as a result of construction of Phase IV.

Minor improvements to local roads may be required prior to construction of Phase IV to improve existing turn radii, expand road widths to accommodate large trucks, etc., where necessary. Any proposed construction routes would be approved by the Benton County Highway Supervisor prior to construction. The County Supervisor would conduct a pre-construction baseline survey to determine existing road conditions for assessing future damage. Any road damage caused by construction of Phase IV would be repaired to the satisfaction of the Benton County Highway Supervisor, as required by the Ordinance.

Two railroad lines traverse the Project area, one of which is found within the limits of the Phase IV area (Figure 4.9.2, Chapter 4). The Applicant has indicated that should a collector line need to cross this rail line, directional boring would be used so as not to impact rail service. Therefore, regardless of the alternative chosen, rail service would continue to operate as normal and no adverse effects to railroad operations would occur as a result of construction of Phase IV.

FRWF has received a Determination of No Hazard to Air Navigation from the FAA for 91 of the 94 Phase IV turbine locations. FRWF would continue to work with the FAA to resolve siting of the remaining three turbines. Revised turbine locations will remain within the Phase IV boundary and in active cropland. Regardless of the alternative chosen, all required approvals from FAA would be obtained prior to construction of Phase IV so that none of the turbines pose a risk to air navigation.

5.9.3 Operations Effects

Operation of Phases I-IV under any of the four alternatives under consideration would not have a significant adverse effect on local and regional traffic as only a small number of employees would travel to or within the Project area on a daily or weekly basis. In addition, rail service would continue to operate as normal and no adverse effect to railroad service would occur as a result of operations.

By the time of construction and operation, Phase IV would be in compliance with all applicable FAA requirements. Therefore, regardless of the alternative chosen, no significant adverse effects to air navigation would occur as a result of Phase IV operations.

5.9.4 Maintenance Effects

Potential transportation issues as a result of Project maintenance would be similar to those experienced during construction; however, it is anticipated that the level of heavy truck traffic would be less. The number of maintenance vehicles using local and regional roads would be similar to those present as a result of maintenance of the existing phases of the Project. Rail service and air navigation would not be affected by maintenance activities. No significant adverse effect to local and regional traffic, rail service or air navigation would occur under any of the four alternatives under consideration as a result of Project maintenance.

5.9.5 Decommissioning Effects

Potential transportation issues as a result of decommissioning of Phases I-IV would be similar to those experienced during construction. Any road damage caused by decommissioning activities would be repaired to the satisfaction of the Benton County Highway Supervisor, as required by

the Ordinance. No significant adverse effect to local and regional traffic, rail service or air navigation would occur as a result of Phase IV decommissioning.

5.9.6 Mitigation for Impacts to Transportation

No significant adverse effect to local and regional traffic, rail service or air navigation would occur as a result of Phase IV construction, operation or decommissioning; therefore, no specific mitigation measures are proposed.

5.9.7 Summary of Effects to Transportation

- No concerns related to transportation were identified during the scoping period.
- No significant adverse effects to local and regional traffic, rail service or air navigation would occur as a result of construction or operation of Phase IV, or decommissioning of the Project.
- Local roads may be improved in preparation for construction of Phase IV, resulting in a beneficial effect to local and regional transportation systems.
- No significant adverse effects to transportation resources are anticipated as a result of construction of Phase IV, or operation, maintenance, and decommissioning of all four phases under any of the four alternatives.
- No specific mitigation measures for transportation would be implemented under any of the four alternatives.

5.10 NOISE

The analysis area for noise effects is the Phase IV Project Area. Noise generated from Phases I - III is already part of the existing environment. Hence, the noise analysis addresses the effects associated with adding up to 94 Phase IV turbines to the existing Project. This added effect will be contained largely within the Phase IV Project Area.

5.10.1 Impact Criteria

Noise standards applicable to WECS in Benton County are contained in Chapter 8, Zoning, Subdivision, Comprehensive Plan, Article 1. Zoning Code of Benton County, Section 8-7, Paragraph 7.B. Noise and Vibration Standards that Apply to WECS. The zoning regulations limit octave band sound levels to a maximum level in each of the eight standard octave bands from 63 Hertz (Hz) to 8 kilohertz (kHz) as measured at a distance of 200 feet from any primary residence (see Section 4.10).

Noise levels that exceed the maximum level established in the County zoning regulations would be a significant effect. Public scoping did not identify noise concerns.

5.10.2 Construction Impacts

Construction of Phase IV would generate noise that would likely be audible at homes and public areas within and surrounding the Phase IV area. Assessing noise impacts as a result of construction is difficult because the location of construction activities in the area may be

variable. Noise levels would vary with each phase of construction depending on the construction activity and the amount of equipment used.

Noise levels from the construction activities, including increased truck traffic noise, would occur mostly during daylight hours. Noise audible to surrounding residences or businesses would be similar to that of a few days to a few weeks of a typical road construction project or the sound of farm machinery operating on a nearby farm. The sounds from Phase IV construction would likely only be faintly heard at residences that are located some distance away. Audible sounds may include heavy truck traffic, earthmoving equipment or clanking metal tracks. No significant adverse effect to noise levels would occur as a result of construction activities under any of the four alternatives under consideration. Construction noise is not expected to have adverse effects on receptors.

5.10.3 Operations Impacts

Stantec Consulting Services used predictive noise modeling to evaluate two scenarios within the Phase IV Project Area (Appendix H). The first scenario considered the resulting effect of the operation of Phase IV alone, and the second scenario considered the combined effect of the operation of the entire Project on the Phase IV area.

Benton County's noise standards impose separate limits in the eight octave bands. When converted to A-weighted sound (weighted according to perception thresholds of people) the limits have a total sound limit of 62 dBA. This would be the applicable limit only if the spectrum of the turbine sound emissions matched exactly the spectrum of the octave band limits, which is unlikely to be the case. To be in compliance, turbine sound emissions must be estimated for each of the individual octave bands.

Stantec assessed the aggregate emissions along with each of the eight octave band sound emissions from 1) just the Phase IV turbines, and 2) the collective Phases I - IV turbines. Stantec found that the 1000 Hz octave band emissions are the highest relative to the limits set in the County's noise standard. The study determined that aggregate turbine sound could be as high as 57 dBA before exceeding the 1000 Hz limit of 53 dBA. Therefore, for the turbines to be in compliance with the Benton County standards, noise levels within 200 feet from any primary residence must not exceed 57 dBA. The model indicates that the highest predicted noise levels in Phase IV, under either of the two scenarios studied, ranged from 45 – 50 dBA with much of the Phase IV area in the 40 – 45 dBA range (see Appendix H). Therefore, operation of Phase IV would be in compliance with the Benton County noise standards and no significant noise effects are anticipated under any of the four alternatives under consideration. It should be noted that the analysis was based on the turbines operating at full power, with respect to sound emissions. Reduced operating speeds or control modes will result in lower sound levels.

Some rural residents, primarily those nearest to Phase IV turbines, may perceive and become annoyed with a change or increase in the amount of turbine noise once Phase IV begins operations. Noise levels within the town of Fowler are expected to be virtually unchanged from the existing condition (35-40 dBA) (Appendix H). Construction-related traffic on local and regional roads would decrease following construction of Phase IV; therefore, impacts from traffic noise are not anticipated during Project operations.

Daytime sound levels would not differ between alternatives. Conversely, projected nighttime noise levels would vary slightly among alternatives relative to the amount of time turbines would be operational at night during the fall bat migration period:

(1) Under the No Action Alternative, Project turbines would be turned off nightly from August 1 – October 15. Therefore, no noise would be produced at night during this time period. There would be no effect to receptors associated with nighttime operations under the No Action Alternative.

(2) Under the 3.5 m/s Cut-In Speed (Feathered) Alternative, turbines would be fully feathered when nighttime wind speeds are below 3.5 m/s from August 1 – October 15, but would begin spinning when wind speed exceeds 3.5 m/s. This alternative would result in more audible turbine noise at night when compared to the No Action Alternative because turbines would be operational for longer periods of time. Based on the results of the noise modeling, nighttime noise is not expected to exceed the standards applicable to WECS in Benton County. Nighttime noise is not expected to have adverse effects on receptors.

(3) Under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), turbines would be fully feathered when nighttime wind speeds are below 5.0 m/s and nightly air temperatures are 50° F or above from August 1 – October 15. Turbines would begin spinning when wind speed is above 5.0 m/s regardless of air temperature. Based on the assumed amount of time turbines would be operational at night, this alternative would result in more audible turbine noise at night than the No Action Alternative, but less than the 3.5 m/s Cut-In Speed (Feathered) Alternative. Based on the results of the noise modeling, nighttime noise is not expected to exceed the standards applicable to WECS in Benton County. Nighttime noise is not expected to have adverse effects on receptors.

(4) Under the 6.5 m/s Cut-In Speed Alternative, FRWF turbines would be fully feathered when nighttime wind speeds are below 6.5 m/s and nightly air temperatures are 50° or above from August 1 - October 15. Turbines would begin spinning when wind speed is above 6.5 m/s regardless of air temperature. Based on the assumed amount of time turbines would be operational at night, this alternative would result in more audible turbine noise at night than the No Action Alternative, but less than the 3.5 m/s Cut-In Speed (Feathered) Alternative and the 5.0 m/s Cut-In Speed Alternative. Based on the results of the noise modeling, nighttime noise is not expected to exceed the standards applicable to WECS in Benton County. Nighttime noise is not expected to have adverse effects on receptors.

(5) The predictive noise model indicates that regardless of the alternative chosen, with the addition of Phase IV the sound pressure levels in Fowler are, for the most part, unchanged (35 – 40 dBA) (see Appendix H). Individual residences within Phase IV would experience increased sound levels over the existing conditions, and individual dwellings located within Phase IV would experience sound levels greater than 40 dBA.

5.10.4 Maintenance Impacts

Potential effects to noise levels as a result of Project maintenance would be similar to those experienced during construction; however, it is anticipated that the level of heavy truck traffic and heavy equipment usage would be less. Noise levels would be very similar to what is currently experienced as a result of maintenance on the existing phases of the Project and

would occur mostly during daylight hours. No significant adverse effect to noise levels would occur as a result of Project maintenance under any of the four alternatives under consideration. Maintenance noise is not expected to have adverse effects on receptors.

5.10.5 Decommissioning Impacts

Potential effects to noise levels as a result of Project decommissioning would be similar to those experienced during construction. Other than short-term and localized noise during decommissioning, which would occur primarily during daylight hours, no significant adverse effect to noise levels would occur as a result of Project decommissioning under any of the four alternatives under consideration. Noise emitted from decommissioning activities is not expected to have a significant adverse effect on receptors.

5.10.6 Mitigation for Noise Impacts

No adverse effects related to noise are anticipated under any of the four alternatives under consideration. Therefore, no specific noise mitigation measures are proposed.

5.10.7 Summary of Noise Effects

- No concerns related to noise were identified during the scoping period.
- No significant adverse effect to noise levels would occur as a result of construction, maintenance, and decommissioning activities under any of the four alternatives.
- Some residences would have increased noise levels as a result of operation of Phase IV; however, Phase IV would be in compliance with the Benton County noise standards and no significant noise effects are anticipated under any of the four alternatives.
- Nighttime noise would differ between the four alternatives from August 1 – October 15; however, nighttime noise is not expected to have adverse effects to receptors under any of the four alternatives.
- The construction of Phase IV, or operation, maintenance, and decommissioning of Phases I - IV under any of the four alternatives would not have significant adverse noise effects in the Phase IV area.
- No specific mitigation measures for noise would be implemented under any of the four alternatives.

5.11 VISUAL RESOURCES

5.11.1 Impact Criteria

Pursuant to NEPA, the human environment “include[s] the natural and physical environment and the relationship of people with that environment” (40 CFR 1508.14). Aesthetics in the environment are important to most people, and visual appreciation of natural and man-made views is a universal way for people to interact with their environment. The current condition of visual resources associated with Phase IV is described in Section 4.11. Public scoping did not raise concerns regarding the proposed action’s potential effects on visual resources relative to the Phase IV Project Area.

This EIS addresses the potential for the proposed action to affect visual resources. For the purposes of this EIS, the effects of Phase IV on sensitive visual resources were analyzed within a one-mile buffer of the Phase IV project area. Affected visual resources do not include NRHP and other cultural resources, which are assessed in Section 5.8 – Cultural and Historic Resources. Phases I, II, and III (comprising 355 turbines) are not included in the visual effects analysis area; these turbines have been operating and a part of the visual landscape since 2009.

The analysis of visual resource impacts is qualitative in nature and targeted to those locations where Phase IV would be visible. Aerial photographs, site photographs, and windshield surveys were used to assess the visual character of Phase IV and surrounding area. Photosimulations are most often used for illustrating potential visual impacts associated with projects involving highly visible structures; they are effective and easily interpreted. Viewsheds are photographed from locations identified for their potential to provide scenic value. These locations, often referred to as sensitive receptor locations, may include schools and churches, parks and other recreational areas, designated scenic byways, and wildlife management areas and nature preserves.

Due to the character of the landscape and topography, and the nature of the structures proposed, Phase IV would be visible from almost everywhere in and around the site. Hence, it was not practical to evaluate every conceivable location where Phase IV might be visible. Sensitive receptors proximal to Phase IV do not include designated scenic byways, wildlife management areas, or nature preserves. The evaluation of visual impacts was limited to five locations within the visual analysis area that are likely to be of aesthetic importance, including one church, one cemetery, one town park, and two roadways (Figure 5.11.1). Photosimulations of Phase IV were created using photographs of the project area taken from the five locations. Scaled images of turbines were added to the photographs for comparison and to illustrate potential effects to the five locations (see Photos 5.1 through 5.12 below).

The evaluation of visual effects is subjective due to varying opinions about aesthetics and perceived viewsheds. Wind turbine generators may be perceived as appealing and interesting or disturbing and obtrusive depending on the individual. For the purposes of this EIS, views of one or more wind turbines in the five illustrated viewsheds were considered to be a significant effect, either negative or positive, depending on the viewer. Viewers were classified as either 1) local residents that would view the wind farm on a daily basis, or 2) individuals that would view the wind farm while traveling through Benton County and proximal to the Project Area.

Although considered significant, the effect of one or more turbines may be diminished or pronounced based on the context of the adjacent elements in the viewshed; i.e., vegetation, open sky, other structures, etc. In other words, one or two turbines that are visible in flat terrain against a backdrop of sky may have a diminished appearance as opposed to 30 or so turbines in a rolling landscape with open fields as a backdrop making the turbines more visible.

As described in Section 4.11.2, the Phase IV landscape is one of flat to gently rolling topography and rural character. Land cover is dominated by agriculture dotted with small communities, farmsteads, residences, and wind turbines. Naturally occurring vegetation is almost completely confined to roadsides, farmyards, ditches, small streams, fencerows, and residual trees. In addition to FRWF's existing 355 wind turbines, there are two other wind farms (150 turbines) in Benton County that are visible from the towns of Fowler, Earl Park, farmsteads, rural residences, and roadways.

Among the four alternatives under consideration, effects to visual resources would be the same. Implementation of any considered alternative includes constructing and operating the 94 Phase IV turbines. The alternatives vary in their operational adjustments, which would largely occur when the turbines are not visible to people (i.e., at night). Nonetheless, visual impact assessments for wind projects do not usually make distinctions between spinning and stationary wind turbines, and it is assumed there would not be perceived differences in visual impacts associated with operational adjustments.

5.11.2 Construction Effects

Implementation of any of the four alternatives under consideration would include construction of Phase IV. Turbine components would be transported through the visual analysis area on large trucks. Construction would involve the large, mobile cranes that would work briefly at each turbine location. The presence of the trucks and cranes would be temporary and create short-term impacts. Depending on the individual, the installation of a wind turbine generator could be viewed as a fascinating spectacle. Especially during those times when towers are raised and rotors are installed, it is expected that certain individuals may wish to observe the construction of Phase IV, and the open landscape would allow those to do so safely.

It is recognized that Phase IV construction would have effects on visual resources, but the larger concern is with the more prolonged nature of those effects associated with operations.

5.11.3 Operations Effects

Phase IV turbines are visible from all five of the viewing locations analyzed (Photos 5.1 through 5.12). Existing turbines are visible from the viewshed illustrated in Photo 5.10. Based on the simulated views provided in the photos below, trees, which are abundant only in the Town of Fowler, provide the only screening to restrict turbine visibility. Filtered or framed views of turbines are illustrated in photographs taken from the three locations in the Town of Fowler (Photos 5.1 through 5.3). Conversely, turbine visibility is comparatively more pronounced from the roadway locations (Photos 5.4 and 5.5).

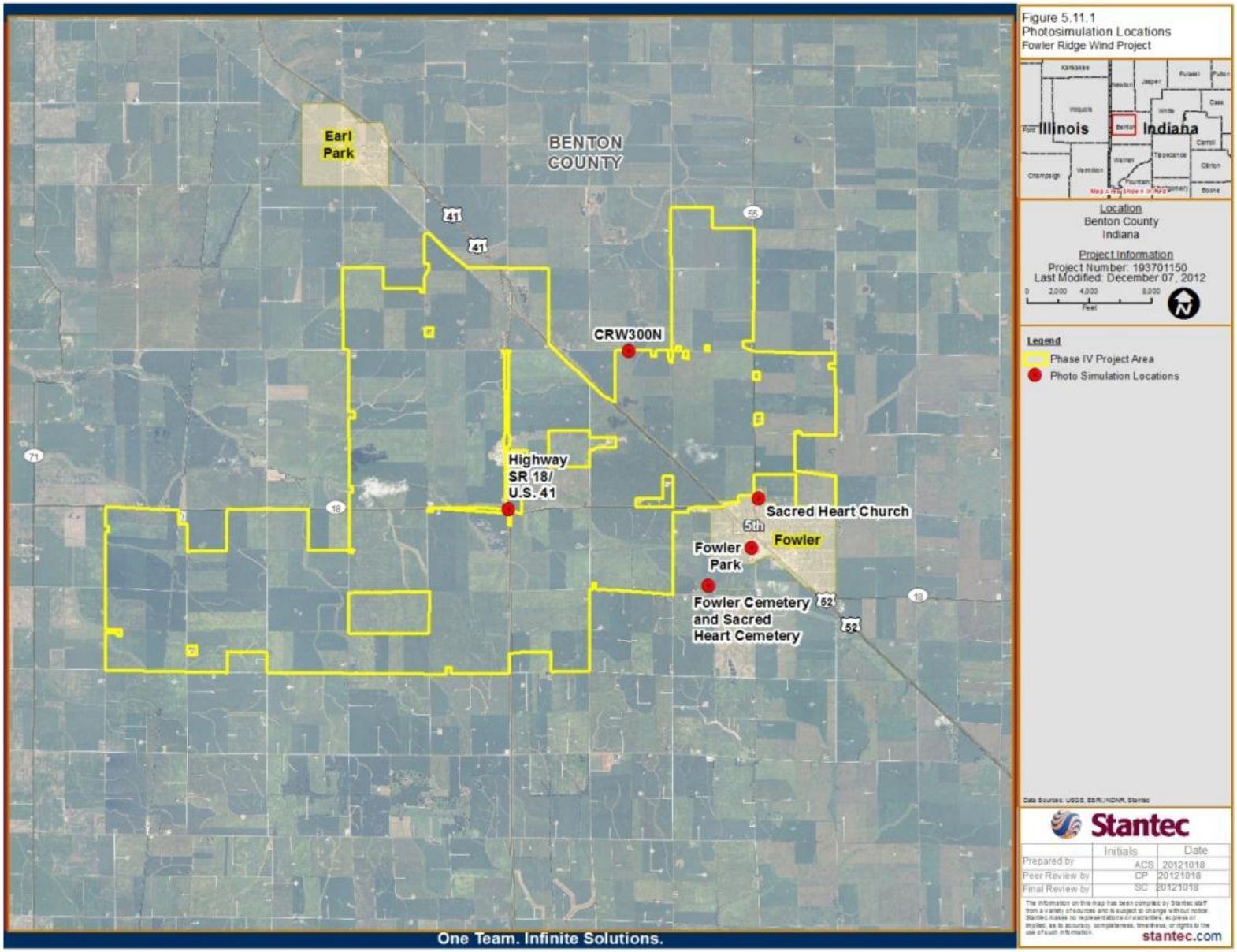
Earl Park
BENTON COUNTY
41
41
55
CRW300N
71
Highway SR 18/ U.S. 41
18
Sacred Heart Church
5th
Fowler
Fowler Park
Fowler Cemetery and Sacred Heart Cemetery
52
52
18
One Team. Infinite Solutions.
Figure 5.11.1
Photosimulation Locations
Fowler Ridge Wind Project
Illinois
Indiana
Benton
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 07, 2012
0 2,000 4,000 8,000
Feet
Legend
Phase IV Project Area
Photo Simulation Locations
Stantec
Initials
Date
Prepared by ACS 20121018
Peer Review by CP 20121018
Final Review by SC 20121018
stantec.com

Photo 5.1 Existing view from Fowler Park.

Photo 5.2 Simulated view from Fowler Park.
Note that proposed turbines are highlighted in red.

Photo 5.3 Existing view from Fowler Cemetery.

Photo 5.4 Simulated view from Fowler Cemetery.
Note that proposed turbines are highlighted in red.

Photo 5.5 Existing view from Sacred Heart Church.

Photo 5.6 Simulated view from Sacred Heart Church.

Photo 5.7 Existing view from State Route 18 near intersection with U.S. Route 41 looking east.

Photo 5.8 Simulated view from State Route 18 near intersection with U.S. Route 41 looking east.

Photo 5.9 Existing view from State Route 18 near intersection with U.S. Route 41 looking southwest.

Photo 5.10 Simulated view from State Route 18 near intersection with U.S. Route 41 looking east.

Photo 5.11 Existing view from County Road W 300 N (~ ½-mile from U.S. Route 52) looking south.

Photo 5.12 Simulated view from View from County Road W 300 N (~ ½-mile from U.S. Route 52) looking south.

Because the landscape is relatively flat with few trees, the Phase IV turbines would present noticeable vertical elements in the Project Area. Excepting those rare sites with enough trees to provide screening, views of turbines would be irrefutably prominent. Some factors tend to moderate turbine prominence. As indicated in the photosimulations, cloudy or hazy conditions would tend to diminish turbine visibility as the structures tend to blend in with the sky. Views framed by trees or power poles also tend to diminish turbine visibility as shown in Photos 5.1 through 5.3.

The Project, including Phase IV, would be viewed by local residents and those individuals traveling through Benton County. Those living in the Towns of Fowler and Earl Park would have screened and pronounced views of Phase IV. It is important to note that the same noticeable vertical elements already have been introduced to nearby sites south and east of the Phase IV project area. The addition of Phase IV would further extend an already familiar view in the landscape.

People traveling through the area on U.S. Routes 41 and 52 would have largely unobstructed views of Phase IV for roughly six miles in addition to the four to six miles of viewing the existing FRWF. This could have a startling effect on some individuals if they have had no experience viewing a commercial-scale wind farm in an open landscape. Additionally, reactions to Phase IV would be variable and impacts would be based in subjectivity. Wind turbines, whether there is one or several visible, may degrade or enhance the aesthetic experience of a viewer.

As required by the FAA, Phase IV would include red, flashing lights positioned at the top of towers to mark obstructions for aviation. This effect would be the same for all four alternatives under consideration. Not all turbines would have this lighting; it is not necessary nor is it desirable from the standpoint of protecting nighttime migrating birds. However, these lights are visible nighttime elements within the visual analysis area. Given the flat topography and open character of the landscape, many of these lights would be visible from numerous locations. Because this kind of lighting is already present in Phases I, II, and III, along with the other two wind farms operated by others, it is not anticipated that nighttime lighting at Phase IV would add significantly to the existing visual intrusion.

In addition to the turbines, Phase IV would require new access roads, transmission line, and collector lines. These are considered to be minor visual impacts. The access roads would not be highly visible or perceived as out-of-place elements in the agricultural landscape. The transmission line would be notably visible but it would not have as striking a presence as the wind turbines. As is the case for the existing phases of the FRWF, collector lines would be buried and contribute no additional visual impact.

5.11.4 Maintenance Effects

Impacts associated with maintaining Phases I - IV are not expected to vary among the four alternatives under consideration. Implementation of any considered alternative is expected to need the same level of maintenance in the event or absence of operational restrictions. Impacts to visual resources from maintenance activities are not expected. It is possible that large, mobile cranes may be necessary to make certain repairs, but this would be an unusual and short-term circumstance.

5.11.5 Decommissioning Effects

Implementation of any of the four alternatives under consideration would include decommissioning of Phase IV just as with the other Phases of the Project. Decommissioning activities would be similar in character to those associated with construction. However, the decommissioning timeframe is not likely to be as long as that for constructing any of the Project Phases. Decommissioning would involve the large, mobile cranes that would work briefly at each location to dismantle the turbines. The presence of the trucks and cranes would be temporary and create short-term visual impacts. Depending on the individual, dismantling a wind turbine generator is not likely to be as fascinating as installation. However, it is expected there would be some individuals that wish to observe the decommissioning of Phase IV, and the open landscape would allow those to do so safely. Dismantled turbine components would be transported through the visual analysis area on large trucks.

5.11.6 Mitigation for Impacts to Visual Resources

The construction of Phase IV and operation of all Phases would have impacts to visual resources in the visual analysis area. However, in a landscape with 355 operating FRWF turbines and 150 other wind farm turbines, the addition of up to 94 Phase IV turbines would not have adverse effects to visual resources. Nonetheless, the Applicant plans to implement measures for minimizing visual impacts associated with wind turbines. These measures are typically implemented for the construction and operation of land-based wind farms.

To minimize visual complexity, all turbines would be similar in color and overall appearance and rotate in the same direction as existing turbines in Phases I, II, and III. Turbines would not be used for commercial advertising or possess overly conspicuous lettering or logos. The blades, nacelle, and tower would be neutral off-white in color. Where manufacturer specifications permit, non-specular paint would be used on all outside surfaces to minimize reflected glare.

5.11.7 Summary of Effects to Visual Resources

- No concerns related to visual effects were identified during the scoping period.
- Phase IV would result in minor visual impacts under any of the four alternatives.
- Phase IV would add to the nighttime landscape red, flashing lights in the visual analysis area; however, this additional nighttime lighting is not anticipated to add significantly to the existing visual intrusion created by the existing wind farms.
- Visual impacts associated with wind farms would be further extended to a currently unaffected area. However, in a landscape with 355 operating FRWF turbines and 150 other wind farm turbines, a Comprehensive Land Use Plan that has a stated goal of supporting wind farms, and no concerns regarding visual impact having been raised by residents during the first three phases of FRWF or during scoping for Phase IV, these impacts are not likely to be considered adverse.
- As described above, the Applicant plans to implement typical measures for the construction and operation of land-based wind farms for minimizing visual impacts associated with wind turbines.

5.12 AIR QUALITY AND CLIMATE

5.12.1 Impact Criteria

The Clean Air Act of 1970 (CAA), and the CAA Amendments of 1990 established National Ambient Air Quality Standards (NAAQS) for selected pollutants. The NAAQS established maximum levels of acceptable background pollution with a margin of safety to protect public health and welfare. NAAQS compliance in Indiana is monitored by IDEM.

Per the CAA and the Amendments of 1990, USEPA has established New Source Performance Standards (NSPS) to regulate air pollution emissions from new stationary sources. These standards apply to various facilities, but because wind turbines generate electricity without releasing air pollutants, NSPSs do not apply to this Project.

The Acid Rain Program, established by CAA Amendments of 1990 to lower sulfur dioxide and nitrogen oxides emissions, does not apply to the Project because wind turbines generate electricity without releasing air pollutants. Likewise, the Prevention of Significant Deterioration (PSD) does not apply to the Project for the same reason.

Recent federal greenhouse gas (GHG) policy has focused on voluntary initiatives to reduce GHG emissions. In 2010, the CEQ drafted guidance regarding GHG emissions in evaluating Federal actions under NEPA. The guidance indicated that if the Project leads to 25,000 metric tons or more of carbon dioxide equivalent emissions then it may warrant some description in the appropriate NEPA analysis.

No phase of the Project would emit new major sources of air pollutants; therefore, the Project would not be a source of air pollution. No issues related to air quality were identified during the scoping period.

5.12.2 Construction Effects

During the site preparation and construction phase, temporary and localized impacts to air quality would result from the operation of construction equipment and vehicles. Impacts would occur as a result of emissions from engine exhaust (criteria pollutants and GHGs), fugitive dust generation during earth-moving and vegetation removal, and travel on unpaved roads. Dust may annoy existing residents and travelers, and could potentially be deposited on surfaces at certain locations in public areas or near residences. Fugitive dust associated with vehicle travel on gravel roads and with agricultural practices is a normal occurrence in rural areas such as Phase IV and residents in these areas are likely acclimated to dealing with dust. Construction of Phase IV may increase the amount of fugitive dust in some areas within Phase IV, but this would be temporary and last only during construction.

No significant adverse effect to air quality would occur as a result of construction of Phase IV under any of the four alternatives under consideration.

5.12.3 Operations Effects

No significant adverse effect to air quality would occur as a result of Project operations, regardless of which of the four alternatives under consideration is chosen. Adverse impacts to air quality would not occur, as the Project would not release pollutants into the atmosphere. Project operations may require a small amount of vehicular traffic resulting in the release of

carbon dioxide emissions and particulates. These emissions are not estimated to have a significant effect on local or regional air quality or contribute greatly to the amount of greenhouse gases. Project operation would not generate any new sources of air pollutants.

Energy production would be highest under the 3.5 m/s alternative, followed by the 5.0 m/s and 6.5 m/s alternatives, respectively. The No Action alternative would produce the least electricity annually because the turbines would be shut down at night between August 1 and October 15 each year. Nevertheless, under any of the four alternatives under consideration, power delivered to the grid from the Project would not cumulatively add to the emissions produced at existing conventional power plants.

Operation of Phase IV along with the existing Project would not cause direct emissions of 25,000 metric tons or more of carbon dioxide-equivalent greenhouse gas emissions annually; therefore, the Phase IV would not result in greenhouse gas emissions that would contribute to problems associated with climate change.

5.12.4 Maintenance Effects

No significant adverse effect to air quality would occur as a result of Project maintenance, regardless of which of the four alternatives under consideration is chosen. As with project operation, some vehicular traffic would be required resulting in the emission of carbon dioxide emissions and particulates. Some localized impacts to air quality may result from engine exhaust emitted from maintenance equipment and vehicles. These emissions are not estimated to have a significant effect on local or regional air quality or contribute greatly to the amount of greenhouse gases.

5.12.5 Decommissioning Effects

No significant adverse effect to air quality would occur as a result of Project decommissioning, regardless of which of the four alternatives under consideration is chosen. Air quality impacts associated with decommissioning would be similar to those during construction and may include localized engine exhaust emissions from equipment and vehicles. These emissions are not estimated to have a significant effect on local or regional air quality or contribute greatly to the amount of greenhouse gases.

5.12.6 Mitigation for Impacts to Air Quality and Climate

During the Phase IV construction, and Project maintenance and decommissioning phases, air quality impacts would be intermittent, short term, and localized. BMPs (e.g., watering roads; see Appendix E) would be implemented to reduce the amount of fugitive dust produced during construction and decommissioning. Exposed soil would be stabilized as quickly as possible in compliance with the site's NPDES permit. No adverse effects to air quality would occur as a result of Project operations, regardless of which of the four alternatives under consideration is chosen. Therefore, mitigation for air quality impacts is not warranted and no mitigation measures would be implemented.

5.12.7 Summary of Effects to Air Quality and Climate

- No concerns related to air quality were identified during the scoping period.
- Construction of Phase IV under any of the four alternatives would have short-term negative impacts on air quality in the Phase IV area due to increased emissions from vehicles and equipment used during construction.
- Minor localized effects on air quality would occur associated with fugitive dust and vehicle emissions during Phase IV construction and throughout the lifetime maintenance and decommissioning of the entire Project.
- No adverse effects to air quality would occur as a result of Project operations under any of the four alternatives.
- Phase IV and the FRWF project in general are expected to have a long term beneficial effect on air quality by replacing carbon producing sources of energy with clean, renewable energy.
- No specific mitigation measures for air quality in addition to the BMPs discussed above would be implemented under any of the four alternatives.

5.13 COMMUNICATIONS

5.13.1 Impact Criteria

The Project could potentially effect and interfere with microwave paths, radio and television broadcast signals and cellular and two-way radio signals and wireless internet within the Phase IV area. Effects of the Project on communication resources would be significant if users are unable to rely on these systems. Phases I, II and III of the Project are in compliance with all FCC rules and policies. No issues related to communications were identified during the scoping period.

5.13.2 Construction Effects

There would be no significant difference in potential impacts to communications as a result of construction of Phase IV under any of the four alternatives under consideration. Any interference from (and impacts due to) the partially or fully completed turbines during the construction phase would be comparable to, but less intense than, the interference that might be expected during the operations phase of the Project.

5.13.3 Operations Effects

Phase IV would comply with all FCC rules and policies. Therefore, no significant negative impacts would occur as a result of operation of Phase IV under any of the four alternatives under consideration.

Two microwave paths intersect the Phase IV project area. Both paths utilize the same air space because they connect the same two towers. No significant interference with these microwave paths would occur as a result of operations. In addition, operation of Phase IV is not likely to cause interference with cellular or two-way radio communications.

All television stations serving the Phase IV area have transitioned from analog to digital signals, thus reducing the likelihood that Phase IV would adversely impact television reception. Digital television systems would not experience shimmering, ghosting, or poor picture quality that has been known to occur within analog systems. During construction and operation of Phases I – III, the Applicant has dealt with television reception issues on a case-by-case basis by working with any affected residents to identify the best solution. It is anticipated that the Applicant would continue to do so during and after construction of Phase IV

Wireless system reliability and performance is strongly affected by the strength of the incoming signal. To maximize signal strength, links are usually designed with a clear line-of-sight between antennae. A wireless customer may have reliability and/or performance issues if the path between antennae is blocked by a turbine, or if a turbine blade intersects the signal path. If necessary, any wireless internet degradation that occurs with Phase IV due to turbines would be dealt with on a case-by-case basis by working with any affected residents to identify the best solution.

5.13.4 Maintenance Effects

Potential impacts to television, microwave paths, cellular and two-way radio, and wireless internet signals as a result of maintenance activities are expected to be similar to those of operations (discussed in 5.13.2 above). Effects to any of these are likely to be sporadic and would impact only a few residents or businesses. Accordingly, maintenance of Phase IV, regardless of the alternative chosen, would have no significant negative direct or indirect impacts on communications.

5.13.5 Decommissioning Effects

During decommissioning, turbines and other Project structures would be dismantled and removed. Any interference from (and impacts due to) the partially or fully dismantled turbines during the decommissioning phase would be comparable to the interference that might be expected during the construction phase. Decommissioning activities would have no significant effect on communications regardless of the alternative chosen.

5.13.6 Mitigation for Impacts to Communications

Should Phase IV result in any impacts to any existing communications systems, each problem would be addressed individually. Resolutions could include the provision of stronger digital antennas, or cable or satellite television service in lieu of non-functional over-the-air television.

5.13.7 Summary of Effects to Communications

- No concerns related to communications were identified during the scoping period.
- The construction of Phase IV, or operation, maintenance, and decommissioning of the Project under any of the four alternatives would not have significant adverse effects to communications services in the region.
- Should Phase IV result in any impacts to any existing communications systems, each problem would be addressed on a case-by-case basis by working with any affected residents to identify the best solution.

5.14 HEALTH AND SAFETY

5.14.1 Impact Criteria

This section evaluates potential concerns related to health and safety that could occur as a result of construction of Phase IV and operation of Phases I - IV. This analysis includes evaluation of risks to the rural communities in Benton County, major transportation routes, utility corridors, buildings, residences, and public and private recreational areas. Effects would be significant if any of the features listed above would be at a measurable risk to tower collapse, blade failure, ice throw or excessive shadow flicker. Measurable risk is based on identified setbacks. No issues related to health and safety were identified during the scoping period.

5.14.2 Construction Effects

Most safety concerns associated with construction of Phase IV are similar to those potential risks associated with construction of other tall structures, such as the potential for injuries to workers and the general public from the movement of construction vehicles, equipment, and materials; falls from structures or into open excavations; and electrocution.

The Applicant is fully committed to a program of responsible management in all areas of health, safety and the environment. For construction of Phase IV, the Applicant would prepare a Site Safety Plan that would provide the framework for communicating specific policies and demonstrating management's commitment to health and safety. The plan would address issues such as personal protective equipment, housekeeping, maintaining a safe workplace, fire prevention, and safe work practices. The Site Safety Plan would apply internally and externally as appropriate and every contractor company involved in the construction of Phase IV would be expected to adhere to the requirements of the Site Safety Plan at a minimum. Compliance with federal, state, and local safety regulations as well as the safety and training requirements of the contractor(s) and the Applicant would be mandatory.

Beyond the potential general risks associated with construction described above, the Project would have no adverse effect on health and safety. Assuming proper planning, implementation and monitoring of potential construction-related health and safety risks, construction of Phase IV would have no significant adverse effect on health and safety regardless of which of the four alternatives under consideration is chosen.

5.14.3 Operations Effects

Potential safety risks as a result of Project operations are described in Section 4.14.2 and include structural failure and ice shedding, lightning strikes, shadow flicker, and fire and fuels. All design safety measures for Phase IV would be in compliance with the Benton County Wind Siting Ordinance and all applicable industry standards.

Phases I, II and III operate under an existing health and safety plan which addresses potential safety risks to Project staff and to general public safety. The plan addresses procedures for safe work practices, personal protective equipment, fire prevention, emergency procedures and safe driving, among others. It is anticipated that Phase IV would operate under a similar health and safety plan with similar requirements.

5.14.3.1 *Structural Failure and Ice Shedding*

Turbine structural failure includes turbine collapse and blade shear, both of which are potentially very serious, but also very rare. Such occurrences have been largely eliminated due to technological improvements and mandatory safety standards during turbine design, manufacturing, and installation. There are no known occurrences of tower collapse or blade shear at large-scale wind farms within the state of Indiana, and to date, FRWF has not experienced any failure of Project components.

Currently, there are no standard setbacks in the wind industry. The Benton County Wind Siting Ordinance requires a setback distance of 1,000 feet or more for turbines with a rated capacity of 1.0 MW or more. Rademakers and Braam (2005) reviewed documented incidences of turbine failure in Europe and found:

- 1,650 feet was the maximum throw distance for small blade parts and tips
- 495 feet was the maximum confirmed throw distance for an entire blade
- The risk zone is approximately equal to one half the rotor diameter for rotor and nacelle collapse
- The risk zone is equal to the height of the tower plus one half the rotor diameter for entire tower collapse

Ice shedding occurs when ice builds up on a turbine blade and either sheds straight to the ground or is thrown by the spinning motion. Although limited observations of ice throw exist, field observations indicate that most fragments fall within 330 feet of the turbine base (Morgan et al. 1998).

Phase IV turbines would be located a minimum of 1,320 feet from residences, a minimum of 1.5 times the turbine height (turbine height is defined as maximum blade tip height) from 4-lane highways and a minimum of 1.1 times the turbine height from all other roads. Turbines in Phases I-III are sited similarly. Based upon the implementation of these setbacks, control of public access to the site, and the low known incidence rate of blade shear, tower collapse, and ice throw, it is unlikely that the Project would result in risks to health and safety of the general public.

5.14.3.2 *Lightning Strikes*

An electrical grounding system is installed at each turbine to prevent damage caused by lightning strikes and provide grounding for electrical components. Modern turbines have lightning protection systems, which typically include automatic shutdown procedures in the case of damage to the blades or turbine. As such, Phase IV and all Project turbines would have no significant adverse impact on health and safety due to lightning strikes.

5.14.3.3 *Shadow Flicker*

Shadow flicker from wind turbines can occur when moving turbine blades pass in front of the sun, creating alternating changes in light intensity or shadows. These flickering shadows can cause an annoyance when cast on nearby residences (“receptors”). The distance between a wind turbine and a receptor, along with weather characteristics such as wind direction and sunshine probability are key factors related to shadow-flicker impacts. Beyond a distance of 1,000 feet, shadow flicker becomes much less noticeable, except at sunrise and sunset when shadows are long (NRC 2007).

Phase IV turbines would be located a minimum of 1,320 feet from residences, a minimum of 1.5 times the turbine height from 4-lane highways and a minimum of 1.1 times the turbine height from all other roads. Turbines in Phases I-III are sited similarly. Travelers along local roads are likely to experience some shadow flicker at times while driving; however, exposure is expected to be minimal and not significantly different than existing conditions, such as sun shining through trees, utility poles and other obstructions. Due to the rural nature of the Project area, residences tend to be widely spaced. In addition, some houses would be screened by wind breaks, trees and outbuildings. Based on this, and the setbacks that would be implemented, it is unlikely that Phase IV or all Project turbines would result in an adverse impact due to shadow flicker.

5.14.3.4 *Fire and Fuels*

Lightning, short circuit, or mechanical failure/malfunction poses the most significant risk of fire for turbines. Standard industry practice in the event that a wind turbine catches fire is to allow the fire to burn itself out while maintenance and fire personnel maintain a safety area around the turbine and protect against the potential for spot ground fires that might start due to sparks or falling material. The Applicant would prepare emergency response plans that comply with Occupational Safety and Health Administration (OSHA) regulations. Wind turbine operations and maintenance personnel are trained in fire safety and response. Phase IV would have no significant adverse impact on health and safety due to fire and fuels.

5.14.4 Maintenance Effects

Potential safety concerns associated with Project maintenance would be similar to those expected during construction, including potential injuries to workers and the general public as a result of movement of Project vehicles and equipment; falls from structures and electrocution. Assuming that the Site Health and Safety Plan is implemented and proper emergency procedures are followed, Project maintenance activities would have no significant adverse effect on health and safety.

5.14.5 Decommissioning Effects

Potential safety concerns associated with decommissioning activities would be similar to those expected during construction. Assuming proper planning and implementation of a health and safety plan, the general risks associated with decommissioning of the Project would have no significant adverse effect on health and safety.

5.14.6 Mitigation for Impacts to Health and Safety

Phase IV would operate under a health and safety plan, similar to that implemented for Phases I – III that would address potential safety risks to FRWF staff and to the general public. The Project is not expected to have a significant adverse effect on health and safety; therefore, no specific mitigation measures are proposed.

5.14.7 Summary of Effects to Health and Safety

- No concerns related to health and safety were identified during the scoping period.
- Construction of Phase IV and operation of all Project phases under any of the four alternatives would have minor effects on human health and safety.

- Threats to public safety during operation of the Project are expected to be minimal due to the implementation of required setbacks from residential structures and public roads.
- Phase IV would operate under a health and safety plan similar to that implemented for Phases I – III that would address potential safety risks to FRWF staff and to the general public.
- Assuming proper planning and implementation of a site health and safety plan under nay of the four alternatives, the general risks associated with construction, operation, maintenance and decommissioning of the Project would have no significant adverse effect on health and safety.
- No specific mitigation measures for health and safety would be implemented under any of the four alternatives.

5.15 CUMULATIVE EFFECTS

The CEQ defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). In 1997, the CEQ published *Considering Cumulative Effects under the National Environmental Policy Act* as a comprehensive guidance document for cumulative analyses. The CEQ guidelines acknowledge that while "in a broad sense all the impacts on affected resources are probably cumulative," it is important to "count what counts" and narrow the focus of the analysis to important national, regional, and local issues. While the CEQ recommends this be done through scoping, they also caution that "not all potential cumulative effects issues identified during scoping need to be included" in an EIS, but only those effects with direct influence on the Project and Project decision-making.

This section analyzes the cumulative effects on each of the specific resources discussed in Sections 5.1 to 5.14, and provides an overall, synergistic analysis of the cumulative effects of the alternatives and other past, current, and reasonably foreseeable actions in the region surrounding the Project. Reasonably foreseeable actions are future actions that have been proposed. The geographic scope of this cumulative effects analysis varies for each resource depending on the spatial extent of potential cumulative impacts. The temporal scope of the cumulative analysis extends approximately 22 years into the future, which is the duration of the ITP.

5.15.1 Methodology for Cumulative Effects Analysis

The CEQ guidelines (1997) recommend analyzing cumulative effects according to a tiered approach, which allows for a quantitative, resource-specific analysis of regional actions. As per the CEQ guidelines, resources that would not be impacted by the action alternatives, have beneficial effects, or are only subject to temporary effects were excluded from this analysis (CEQ 1997). Table 5.6 summarizes the screening process to determine the resources included in the cumulative effects analysis.

Table 5.6 Summary of Cumulative Effects of the Project

Resource	Potential Long Term Adverse Effects as a Result of the Project?	Potential Significant Effect	Cumulative Effects Analysis Required?	Analysis Area
Geology and Soils	No	No	No	N/A
Land Use	No	No	No	N/A
Vegetation	No	No	No	N/A
Water Resources	No	Only temporary effects during construction of Phase IV	No	N/A
Birds	Yes	Project would have no significant effect	Yes – Direct mortality, displacement, habitat loss	Partners in Flight Physiographic Region 31
Indiana Bat	Yes	Project would have no significant effect on Indiana bat	Yes – Direct mortality, displacement, habitat loss	Indiana Bat MRU
Bats Not Listed Under the ESA	Yes	Potential for significant effect is uncertain	Yes – Direct mortality, displacement, habitat loss	USFWS Region 3
Socioeconomic Resources	No	No	No	N/A
Cultural and Historic Resources	No	No	No	No
Transportation	No	No	No	N/A
Noise	No	No	No	N/A
Visual Resources	No	No	No	N/A
Air Quality and Climate	No	Minor beneficial effect	No	N/A
Communications	No	No	No	N/A
Hazardous Materials	No	No	No	N/A
Health and Safety	No	No	No	N/A

5.15.2 Reasonably Foreseeable Actions That Could Contribute Cumulative Effects

Reasonably foreseeable future development in Phase IV is expected to be limited to road maintenance and building projects, agricultural practices such as land clearing, cultivation and installation of drainage structures, and residential development. Conversations with the Director of the Benton County Economic Development Office indicate no large-scale industrial or commercial operations, or residential developments, are known to be planned for Benton County. Individual small or medium-sized businesses may come into the area; however, these businesses would likely move into existing facilities or would be constructed immediately adjacent to other industrial/commercially zoned areas in the county.

5.15.3 Birds

5.15.3.1 *Geographic and Temporal Scale and Types of Impacts*

Due to their extraordinary range of mobility, the cumulative effects analysis area for birds addresses potential effects within the Partners in Flight (PIF) Physiographic Region 31 (Prairie Peninsula) (Figure 5.15.3.1).

Mortality of 168 birds of 34 identified species has been documented at the first three Phases of FRWF (see Section 4.5.2.2, Chapter 4), and the proposed Phase IV has the potential to kill additional birds. This cumulative effects analysis for birds primarily focuses on mortality impacts attributable to the Project in the context of other existing and planned wind facilities in PIF Region 31. However, this analysis also considers some other anthropogenic (i.e., caused or produced by humans) sources of bird mortality. Elements that are known to cause avian mortality are discussed briefly and on a national scale. This is largely due to how the current data have been treated to provide estimates, which are most often provided on a national scale.

The proposed Project has the potential to displace birds due to Project presence and habitat alteration. These effects are analyzed for PIF Region 31 so as to remain in the context of a similar landscape.

It is recognized that birds that breed in PIF Region 31 are affected by habitat loss on their wintering grounds located outside of these areas. In addition, birds sustain injury and death from weather, disease, and hunting. Hunting is a regulated activity, and the numbers of birds harvested are closely monitored by federal and state agencies to avoid adverse effects to those species that are hunted. We did not include impacts to birds from extraction of, and power generation from, other fuel sources, such as coal, oil, gas, and nuclear.

This analysis includes past and present actions and reasonably foreseeable future sources of impacts to birds during the 22-year operation of the Project.

5.15.3.2 *Wind Energy Development*

PIF Region 31

PIF Region 31 stretches from northeastern Missouri, across much of Illinois and through the middle of Indiana into Ohio (Figure 5.15.3.1) and is contained entirely within the Service's Region 3, covering approximately 39% of Region 3 in Illinois, Indiana, Missouri, and Ohio. Currently, there are approximately 1,946.11 MW of wind energy development installed (excluding FRWF) and 814.94 MW under construction in PIF Region 31, as estimated based on the best available data concerning the distribution of wind energy facilities in each state in PIF Region 31. Over the 22-year life of the Project, it is assumed that wind energy build-out in PIF Region 31 could possibly reach up to 70,859.91 MW, or 25% of the region's potential installed capacity as estimated from National Renewable Energy Laboratory (NREL) projections based on the percent of Region 3 comprised by the PIF Region. Already, approximately 28,607.70 MW of development are proposed in PIF Region 31.

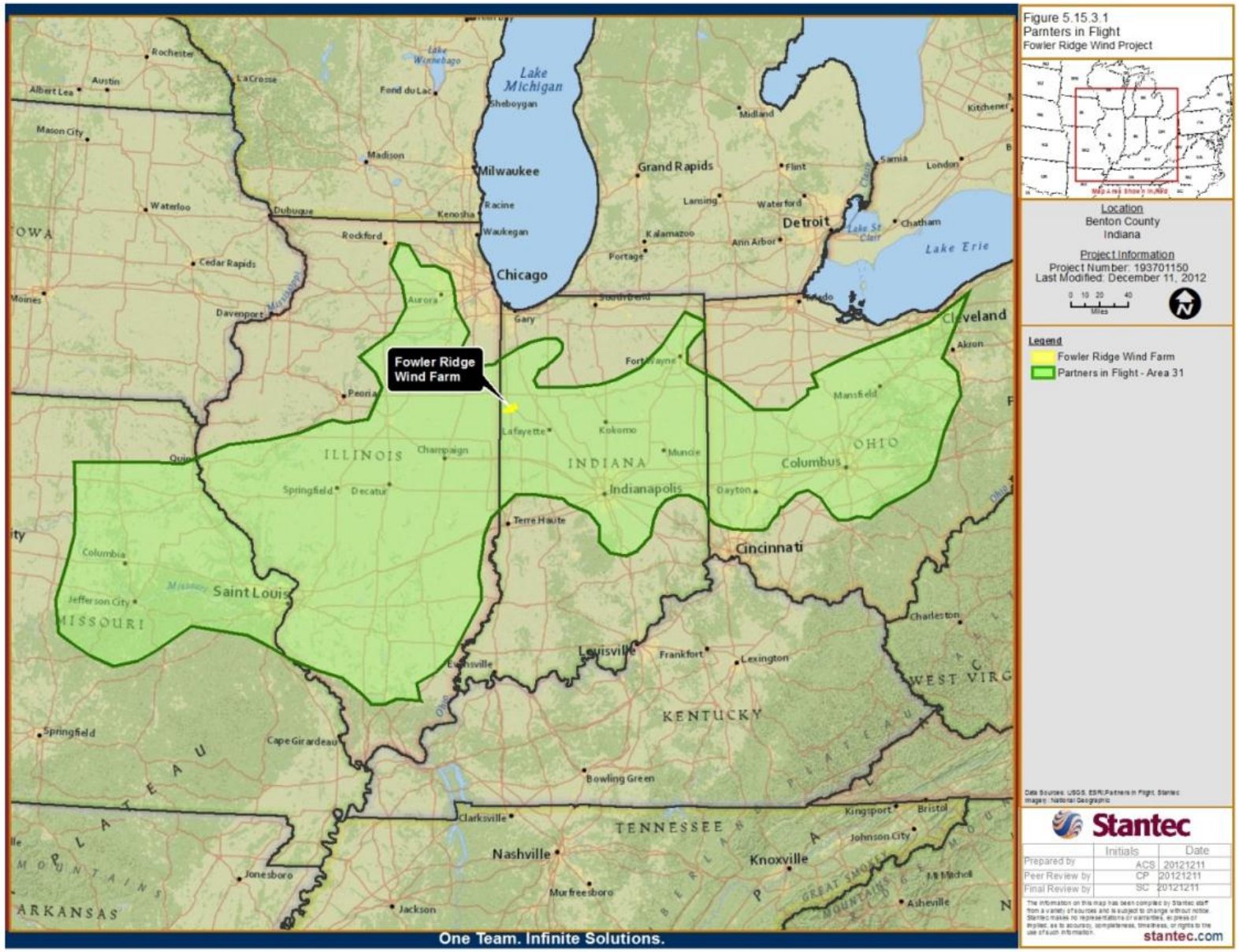
Figure 5.15.3.1
Partners in Flight
Fowler Ridge Wind Project
Location
Benton County
Indiana
Project Information
Project Number: 193701150
Last Modified: December 11, 2012
Legend
Fowler Ridge Wind Farm
Partners in Flight - Area 31
Fowler Ridge Wind Farm
Lake Michigan
Lake Erie
Chicago
Milwaukee
Detroit
Cleveland
Cincinnati
Indianapolis
Saint Louis
Louisville
Nashville
Knoxville
Columbus
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSOURI
ARKANSAS
IOWA
Stantec
Prepared by
Peer Review by
Final Review by
stantec.com
One Team. Infinite Solutions.

Results from mortality monitoring studies at eight facilities in the Region average 3.01 birds killed per MW per year, of which, migrating and resident passerines have comprised approximately 75% (Poulton 2010, Barclay et al. 2007, Johnson et al. 2010b). Applying the Region 3 avian mortality rate to the estimated installed capacity of the PIF Region 31 indicates that approximately 5,858 birds may currently be killed at other wind energy facilities in PIF Region 31 each year. It is expected that approximately 4,393 of these fatalities may be passerines. As discussed in Section 5.5 above, the additional level of bird mortality contributed by Fowler is expected to be generally similar regardless of the alternative under which the Project operates: approximately 2,362 birds per year at the maximum build-out of 449 turbines. Therefore, FRWF will contribute an additional 40% of the total bird mortality in PIF Region 31 each year, approximately.

Applying the current regional average bird mortality rate to the expected level of build-out in 22 years results in an estimated 213,288 total birds killed annually at other wind energy facilities across PIF Region 31 at the end of the life of the Project. Although the rate at which wind energy development would occur over the next 22 years is difficult to predict, averaging the expected maximum rate of bird mortality (213,288 birds/year at the 22-year maximum build-out capacity) with the current rate of bird mortality (5,858 birds/year at the currently-installed capacity) indicates that an average of 109,573 total birds may be killed in PIF Region 31 each year for the next 22 years, for an overall total of 2,410,606 birds killed in PIF Region 31 during the life of FRWF. In addition to this mortality, FRWF will contribute over its lifespan a total of approximately 41,634 birds, entailing an increase of 1.73% to the overall mortality of birds at wind energy facilities over the next 22 years in PIF Region 31. Compared to other anthropogenic sources of avian mortality (see Section 5.15.3.3 below), the effect of avian mortality at wind energy facilities in PIF Region 31 is expected to be minor and unlikely to cause population level effects.

5.15.3.3 *Anthropogenic Sources of Avian Mortality Other than Wind Farms*

Many sources of mortality can affect birds, including predation by feral and domestic cats, poisoning from pesticide use and other hazardous materials releases, electrocution, and mortality due to collisions with human-made obstacles such as aircraft, vehicles, buildings, high tension lines, and communication towers. It is expected that impacts to birds from these sources of mortality would generally remain the same for the foreseeable future.

Table 5.7 provides annual mortality levels of birds due to anthropogenic sources in the U.S. The national level is not the cumulative effects analysis area selected for birds in this EIS, but similar estimates for PIF Region 31 are not available.

Table 5.7 Estimated annual avian mortality from anthropogenic causes in the U.S.

Mortality Source	Estimated Annual Mortality	% of Overall Mortality
Collisions with buildings (including windows)	97-1,200 million	17-66
Collisions with power lines	130-174 million	10-23
Legal harvest	120 million	7-21
Depredation by domestic cats	100 million	6-18
Automobiles	50-100 million	9-18
Pesticides	67 million	4-12
Communication towers	4-50 million	1-3
Oil pits	1.5-2 million	0.1-0.3
Wind turbines	20,000-440,000	<0.1
Total mortality	569.5-1,813 million	--

Source: Various cited in Erickson et al. (2005), Thogmartin et al. (2006), and Manville (2009).

Communication Towers

Avian collisions with communication towers in the U.S. present a significant source of annual mortality, particularly for nocturnally migrating songbirds (Erickson et al. 2005). As of June 2003, 93,000 towers were listed with the Federal Communication Commission Antenna Structure Registry Database. However, the actual number of towers is probably much higher and constantly increasing (Manville 2005). Erickson et al. (2005) suggest the number of communication towers in the U.S. may be as high as 200,000 towers; and that 5,000 to 10,000 new towers are built each year. Cellular, radio, and television towers range in height from less than 100 feet to over 2,000 feet (Kerlinger 2000).

Mortality estimates range from 4-5 million to 40-50 million birds per year in the U.S. and involve over 230 species (Shire et al. 2000, Kerlinger 2000, Manville 2005, Erickson et al. 2005, Thogmartin et al. 2006). Estimates of mean annual collisions per tower have ranged from 82 birds per year at a 250-m (825 feet) tower in Alabama, to 3,199 birds per year at a 305-m (1000-feet) tower in Wisconsin (Erickson et al. 2005). Collisions occur throughout the year though are most frequently documented during migration periods. Studies indicate fatality rates are highest at taller, guyed towers (Gehring et al. 2009, 2011), and pulsating beacons and steady burning FAA obstruction lighting result in higher collision rates than towers lit only with flashing or white strobe beacons (Erickson et al. 2005, Gehring et al. 2009, 2011). Some researchers suspect that during nights with fog or low cloud-ceiling heights, nocturnal migrants become disoriented by strobe and/or steady burning lights on towers (Erickson et al. 2005).

Buildings

Based on the probable number of commercial buildings and residential houses in the U.S., estimates of bird mortality due to collisions with buildings and windows range from 3.5 million to

1,200 million bird deaths per year (Erickson et al. 2005, Thogmartin et al. 2006). The American Bird Conservancy (ABC) has suggested these numbers may be significantly higher (ABC 2013). The vast majority of avian building and window collisions involve passerines (Erickson et al. 2005). A study conducted in 1996 in Toronto, Ontario estimated 733 avian fatalities per building per year (Erickson et al. 2005). A study of avian collisions with residential windows indicated that avian fatalities range from 0.65 to 7.7 birds per house per year (Erickson et al. 2005). Collisions with other tall structures such as smoke stacks are estimated to result in tens to hundreds of thousands of collisions.

Power Lines

Manville (2005) estimated that there is collectively 500,000 miles of transmission lines in the U.S. Williams (2000) indicated there are 116,531,289 distribution poles in the U.S[62]. An accurate estimate of the collective distance of distribution lines is not feasible, but Manville (2005) suggests the length to be in the millions of miles. In general, avian collision and electrocution mortality at power transmission and distribution lines are not systematically monitored and are subject to observational biases. Collision estimates range from hundreds of thousands to 175 million birds annually, and estimates of electrocutions range from tens to hundreds of thousands of birds annually. Raptors, particularly eagles, are most commonly reported for collision or electrocution with transmission or distribution lines in the U.S. (Manville 2005). The species composition of birds involved in power line collisions is largely dependent on location. For example, power lines located in wetlands have resulted in collisions of mainly waterfowl and shorebirds; while power lines located in uplands and away from wetlands have resulted in collisions of mainly raptors and passerines (Erickson et al. 2005, Manville 2005).

Vehicles and Airplanes

Vehicle strikes are estimated to result in 50 million to 100 million avian fatalities per year (Thogmartin et al. 2006). Numbers and species involved in vehicle collisions are dependent on habitat and geographical location (Erickson et al. 2005). Including both United States Air Force and civil aircraft strikes, it is estimated that over 28,500 avian collisions occur each year (Erickson et al. 2005). The majority of bird species involved in airplane strikes includes gulls, waterfowl, and raptors (Erickson et al. 2005).

Pesticides

Based on data collected in the 1980s and 1990s, approximately 160 million acres of cropland in the U.S. are treated with pesticides each year. Consequently, 67 million birds (10% of the 672 million birds estimated to be exposed) die in the U.S. annually due to pesticide exposure (Pimental et al. 1991 as cited by Erickson et al. 2005, USFWS 2000). Other estimates indicate 72 million pesticide-related avian fatalities per year (USFWS 2002). One study indicated that there are 0.1 to 3.6 avian fatalities per acre of pesticide-treated cropland (Mineau 1988 as cited by Erickson et al. 2005).

Domestic Cats

Dauphiné and Cooper (2009) estimate that 117 to 157 million feral and free-ranging domestic cats within the U.S. kill at least 1 billion birds annually. Based on this estimate and others

[62] http://archive.audubonmagazine.org/incite/incite0001.html

(Manville 2005, Erickson et al. 2005), cat predation may be the most significant anthropogenic source of bird mortality in the U.S. (Dauphiné and Cooper 2011). Butchart et al. (2006) cited domestic cats as significant threats to rare, threatened, and endangered birds and sources of species extinction worldwide.

5.15.3.4 *Habitat Loss and Displacement*

In PIF Region 31, avian resources have experienced impacts due to land conversion (habitat loss) associated with oil and gas development, urbanization, agriculture, and residential development. All of these activities are likely to continue into the reasonably foreseeable future. Most of these land conversion activities often include extensive road networks.

Agriculture activities, urbanization, and residential development convert habitat for the length of time that the development is maintained. Development that results in pavement (asphalt, concrete) results in an extreme conversion of habitat with a very slow recovery rate unless pavement is removed. Conversely, some active agricultural lands may become inactive and revert to native habitats within the 22-year time frame.

Reasonably foreseeable future actions in the Project area for the next 22 years that would affect avian resources include low-density development for residences. This would largely affect those birds that would be likely to use agriculture lands.

5.15.3.5 *Summary of Cumulative Effect to Birds*

In summary, many sources of mortality can affect birds, including predation by domestic cats, poisoning from pesticide use and other hazardous materials releases, electrocution, and collision interactions with human-made obstacles such as aircraft, vehicles, buildings, power lines, and communication towers. The extent and severity of these impacts to birds from these sources of mortality have been ongoing for decades and are expected to generally remain the same for the foreseeable future. Compared to these sources of anthropogenic mortality, wind energy development currently contributes a very low magnitude of bird mortality, less than 1% (see Table 5.7) and is therefore not expected to have population level effects on bird populations.

5.15.4 Indiana Bat and Bats Not Listed Under the ESA

Many sources of mortality can affect bats, including mortality due to collisions with human-made obstacles such as lighthouses, communication towers, aircraft, and buildings (Johnson 2004, Peurach et al. 2009). It is expected that impacts to bats from these sources of mortality would generally remain the same for the foreseeable future. Therefore, this section focuses on new and foreseeably increasing sources of mortality for both listed (including Indiana bat) and non-listed bat species.

For the purposes of this EIS, the cumulative effects analysis area for Indiana bats is the MRU, which includes the states of Michigan, Ohio, Indiana, Kentucky, Tennessee, northern Alabama, and the tip of southwest Virginia. The cumulative effects analysis area for bats not listed under the ESA is the Region 3. The cumulative effects analysis used a 22-year timeframe based on the requested duration for the ITP. The selected spatial and temporal scales provide a reasonable assessment of past and potential future cumulative effects. Not enough data are available to understand what spatial scale may be appropriate for bats not listed under the ESA, so Region 3 is the best available and most reasonable spatial scale to use for all bat species.

The cumulative effects analysis for bats considers the effects of wind projects associated with land clearing for roads, turbine pads, and transmission lines (habitat-related impacts), and Project operation (injury and mortality). We also address two other actions, WNS and habitat loss or alteration that can have significant effects to bats that may accumulate over time.

5.15.4.1 *Wind Energy Development*

Over the 22-year life of the Project, it is assumed that wind energy build-out in Region 3 could possibly reach up to 486,793.15 MW, or 25% of the region's potential installed capacity as estimated by the NREL, excluding FRWF. It is assumed that build-out in the MRU (Michigan, Ohio, Indiana, Kentucky, Southwest Virginia, Tennessee, Alabama) could reach up to 64,920.40 MW, excluding FRWF, over the life of the Project. Already, approximately 82,525.02 MW of development are proposed in Region 3, and 73,538.53 MW are proposed in the MRU. Currently, there are 13,082 MW of wind energy development installed (excluding FRWF) in the USFWS Region 3 and 821.56 MW installed in the MRU.

Bats Not Listed Under the ESA

Results from 23 mortality monitoring studies in the region average 10.07 bats killed per MW per year, of which, tree bats have comprised 80.62%. Applying this mortality rate to the installed capacity of the region indicates that approximately 131,736 bats may currently be killed at other wind energy facilities in Region 3 each year. It is expected that approximately 106,206 of these fatalities may be tree bats (red bats, hoary bats, and silver-haired bats). As discussed in Section 5.5 above, the additional level of mortality contributed by the FRWF would depend on the alternative under which the Project is operated. It is predicted that mortality of bat species not listed under the ESA at FRWF, at its maximum build-out of 449 turbines, would range from 10,255 bats per year under the 3.5 m/s Cut-In Speed (Feathered) Alternative, to 8,365 bats per year under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), to 4,575 bats per year under the 6.5 m/s Cut-In Speed Alternative, to 1,598 bats per year under the No Action Alternative. Therefore, FRWF would contribute anywhere from an additional 7.8% to 6.3% to 3.5% to 1.2% of the total bat mortality in Region 3 each year under the Project Alternatives, respectively.

Applying the current regional average bat mortality rate to the expected level of build-out in 22 years results in an estimated 4,902,000 total bats killed annually at other wind energy facilities across the region at the end of the life of the Project. Although the rate at which wind energy development will occur over the next 22 years is difficult to predict, averaging the expected maximum rate of bat mortality (4,902,000 bats/year at the 22-year maximum build-out capacity) with the current rate of bat mortality (131,736 bats/year at the currently-installed capacity) indicates that an average of 2,516,870 total bats may be killed in the region each year for the next 22 years, for an overall total of 55,371,140 bats killed in Region 3 during the life of FRWF. In addition to this mortality, FRWF would contribute over its lifespan a total of 180,776 bats under the 3.5 m/s Cut-In Speed (Feathered) Alternative, 147,458 total bats under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), 80,649 bats under the 6.5 m/s Cut-In Speed Alternative, and 28,173 bats under the No Action Alternative. FRWF's mortality contribution would entail an increase of 0.33%, 0.27%, 0.15%, or 0.05%, under the Project Alternatives, respectively, to the overall mortality of bats not listed under the ESA over the next 22 years in Region 3. Therefore, mortality of bat species not listed under the ESA at FRWF is not expected to be a significant addition to the overall level of bat mortality at wind energy facilities in Region 3, particularly under the adjustment alternatives.

The actual level of bat mortality across the region may be lower, as many wind energy facilities in Region 3 now implement at least some degree of modified turbine operations during the fall bat migration season, although several older facilities in the region remain unregulated under ESA or state laws. Additionally, a growing body of research and improved understanding of the factors affecting bat mortality risk at wind energy facilities is likely to increase the effectiveness of future turbine operational protocols at reducing bat mortality. If all wind energy facilities in the region implemented modified turbine operations that reduced bat mortality by 50%, the cumulative impacts of wind energy development on bat species not listed under the ESA in Region 3 would be greatly reduced. Predicted bat mortality would decrease to approximately 1,258,435 bats per year on average, or approximately 27,685,570 bats killed in Region 3 during the life of the FRWF. FRWF's mortality would contribute an increase of 0.66%, 0.54%, 0.30%, or 0.10%, under the Project alternatives, respectively, to this reduced level of overall mortality of bats not listed under the ESA over the next 22 years in Region 3. FRWF's mortality contribution would therefore still not entail a significant addition to overall bat mortality in the region.

As discussed above, based on current data, fatalities at industrial wind facilities are heavily skewed toward the three species of migratory tree bats. If the build-out scenarios are implemented and the estimates based on current post-construction monitoring remain more or less the same, millions of tree bats would die at wind facilities in Region 3 alone. Because we do not have good population estimates for most bat species including migratory tree bats, it is unclear how either the cumulative mortality under no curtailment (55,371,140 bats), under 50% curtailment (27,685,570 bats), or some scenario in-between would impact the various affected bat species. As far as we understand, bat species potentially impacted by wind development in Region 3 have an evolutionary strategy focused on high adult survival and low fecundity. This suggests that a high level of adult loss could be detrimental to the affected populations. The loss of millions of tree bats over the life of the project is unknown but may be unsustainable. Kunz, et al. (2007b) essentially characterized the current state of our understanding in their 2007 article on the ecological impacts of wind development: "Our current knowledge and the projected future development of wind energy facilities in the U.S. suggest the potential for a substantial population impact to bats." Research is ongoing to estimate population levels and the potential impacts of wind facilities focused on migratory tree bats.

Indiana Bat

Although FRWF is one of only two wind energy facilities in the MRU at which Indiana bat fatalities have been documented thus far, it is expected that any wind energy facility within the Indiana bat's range has the potential to take an Indiana bat during the fall migration season. Because the factors influencing Indiana bat mortality risk at wind energy facilities are not understood at this point, it is assumed that risk of Indiana bat mortality may be similar across all wind energy facilities in the MRU.

Applying the estimated baseline (i.e., no turbine operational adjustments) rate of Indiana bat mortality (0.05 Indiana bats/MW/year) derived from studies at FRWF to the current installed capacity (excluding FRWF) at wind energy facilities in the MRU (821.56 MW), indicates that approximately 41 Indiana bats may be killed at other wind energy facilities in the MRU each year. This mortality would represent 0.013% of the 2011 MRU Indiana bat population (305,297) (USFWS 2012d). As discussed in Section 5.6 above, the additional level of mortality contributed by FRWF would depend on the alternative under which the Project is operated. FRWF would be expected to contribute, at its maximum build-out of 449 turbines, approximately

13.9 Indiana bat fatalities per year under the 3.5 m/s Cut-In Speed (Feathered) Alternative, 10.9 Indiana bat fatalities per year under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), 4.9 Indiana bat fatalities per year under the 6.5 m/s Cut-In Speed Alternative, and zero (0.0) Indiana bat fatalities per year under the No Action Alternative. Therefore, FRWF would contribute anywhere from an additional 34.0% to 26.6% to 12.0% to 0.0% of the total Indiana bat mortality in the MRU each year under the Project alternatives, respectively.

Applying the recovery unit's current estimated baseline Indiana bat mortality rate to the expected level of build-out in 22 years (64,920.40 MW) results in an estimated 3,246 total Indiana bats killed annually at wind energy facilities across the recovery unit at the end of the life of the Project. Although the rate at which wind energy development would occur over the next 22 years is difficult to predict, averaging the expected maximum rate of Indiana bat mortality (3,246 Indiana bats/year at the 22-year maximum build-out capacity) with the current rate of Indiana bat mortality (41 Indiana bats/year at the currently-installed capacity) indicates that an average of 1,644 Indiana bats may be killed in the recovery unit each year for the next 22 years, representing 0.54% of the MRU's 2011 population. At this rate, a total of 36,168 Indiana bats would be killed in the MRU during the life of FRWF, assuming no operational adjustments are implemented. In addition to this mortality, FWRF would contribute over its lifespan a total of 245 Indiana bat fatalities under the 3.5 m/s Cut-In Speed (Feathered) Alternative, 193 Indiana bat fatalities under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), 86 Indiana bat fatalities under the 6.5 m/s Cut-In Speed Alternative, and zero (0) Indiana bat fatalities under the No Action Alternative. FRWF's mortality contribution would entail an increase of 0.68%, 0.53%, 0.24%, or 0.00%, under the Project alternatives, respectively, to the overall mortality of Indiana bats over the next 22 years in the MRU. However, mitigation measures designed to fully compensate for the level of expected take and the associated loss in reproduction would be implemented as a part of the HCP under the 3.5 m/s Cut-In Speed (Feathered) Alternative, the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), and the 6.5 m/s Cut-In Speed Alternative. Therefore, mortality of Indiana bats at FRWF is not expected to be a significant addition to the overall level of Indiana bat mortality at wind energy facilities in the MRU. The loss of 1,644 Indiana bats each year during the 22 year life of the Project would be distributed across many maternity colonies and hibernacula. In the absence of other major threats, we would not expect this level of impact to negatively affect either the MRU population or specific maternity or hibernating populations. We do not yet fully understand the impacts of WNS on the MRU; however, this may alter the dynamics of the MRU population (see Section 5.15.4.2 for a discussion of WNS).

Actual risk of Indiana bat mortality is likely to vary among wind energy facilities in the MRU. In particular, wind energy facilities located in proximity to Indiana bat maternity colonies are likely to present a risk of greater mortality for the species than the level of mortality documented at FRWF; however, it is expected that such facilities would be required to implement significant mortality minimization and mitigation measures. Additionally, because take of Indiana bats is illegal under the ESA, it is expected that nearly all future wind energy facilities in the MRU would either implement modified turbine operations adequate to avoid Indiana bat take or would obtain ITPs and implement the associated HCPs, including modified turbine operations to reduce Indiana bat take and mitigation measures to fully compensate for the level of authorized take. Consequently, actual Indiana bat mortality at wind energy facilities in the MRU is likely to be much lower than the estimate presented above.

5.15.4.3 *White-Nose Syndrome*

White-nose Syndrome (WNS) is a rapidly spreading epidemic that has caused mass mortality of cave-dwelling bats in the Northeastern U.S. since its discovery in February, 2006. In January, 2012, the Service estimated that the death toll had exceeded 5.5 million bats (USFWS 2012e). WNS is characterized by white fungal growth on the muzzle and other body parts of infected hibernating bats, caused by the fungus *Geomyces destructans*. Although the actual mechanism by which the fungus kills bats is not currently understood, WNS is associated with uncharacteristic behavior and extremely high rates of mortality among infected bats and hibernacula (USFWS 2012f).

WNS mortality in the Northeast has varied by species and state, ranging from 12% in small-footed myotis (*Myotis leibii*) populations to 98% in northern myotis populations, and from 68% in Virginia to 98% in Pennsylvania. Overall mortality averages 88% for all species combined. The reasons for mortality variation are not currently understood and may be due in part to census biases resulting from behavioral differences among species and in WNS-infected bats. Species with smaller WNS-related population reductions documented to-date are hopefully less susceptible or more resistant to *G. destructans*, but it is possible that they are just declining at a slower rate, with total mortality rates eventually reaching those of the other species (Turner et al. 2011). Consequently, the best assumption at this time is that newly infected bat populations will experience a similar overall rate of mortality.

Although some populations in the Northeast show some evidence of stabilization post-WNS, at severely reduced levels these populations remain very susceptible to the impacts of disease, predation, weather impacts, stochastic events, and other sources of mortality and much less resilient than larger populations. For example, post-WNS annual survey numbers have stabilized at just over 1,000 bats for the past four years in Hailes Cave, NY, down from a pre-WNS survey count of 15,374 bats (Turner et al. 2011). Unfortunately, many results of WNS monitoring in the Northeast have indicated levels of mortality consistent with the models developed by Frick et al. (2010) which predict potential regional extinction of the little brown bat, a previously (pre-WNS) common and ubiquitous species throughout much of North America, due to WNS in the next 7 to 30 years. Based on observed WNS mortality rates, similar fate may await Indiana bats, northern long-eared bats, and tricolored bats (Turner et al. 2011). Even if certain species are not lost to extinction, the species composition of impacted bat communities is expected to change dramatically, as has already been observed in the Northeast.

Bats Not Listed Under the ESA

Although WNS has not yet caused severe mortality in Region 3 bat populations, our current understanding of the disease indicates that it should be expected to have impacts similar to those documented in the Northeast as the epidemic progresses in the Midwest. WNS has been confirmed in Region 3 since winter 2010-2011 and is now known to occur in three states (Ohio, Indiana, and Missouri) in the region. As of May 2012, WNS had been confirmed in nine counties in Indiana (USFWS 2012g). It is expected that WNS may eventually affect all cave-dwelling bat species which occur in Region 3. The rate at which WNS may impact Region 3 bat populations cannot be predicted, as the progression from detection of a single bat with visible fungus to large-scale mortality has been observed to occur within a matter of weeks at some sites in the Northeast but at others it has not occurred until the next hibernation season, or even later (Turner et al. 2011). However, it is expected that WNS will ultimately have similarly

devastating impacts on Region 3 hibernacula, causing mortality near 88% and possibly the abandonment or extinction of certain hibernacula.

Collection of accurate population counts prior to the onset of WNS in the Midwest may allow for a better understanding of WNS-related declines and improved monitoring of population level impacts. Although efforts are ongoing to study the basic biology of WNS and to generate a toolkit of mitigation strategies, it is unknown if and when effective mechanisms for fighting WNS will be developed. Therefore, the impacts of WNS on cave-dwelling bat populations in Region 3 are expected to be severe, which will make additional mortality from other sources, such as wind energy facilities, more significant. Indiana bats will serve as an indicator of WNS impacts to cave-dwelling bat species in the region because more population data are available for this species than any other in the region, enabling the most accurate evaluation of WNS impacts. If the population of Indiana bats in the MRU becomes substantially reduced as a result of WNS, FRWF would take corresponding action as described in Section 8.4.6 – Changed Circumstances in the HCP. These actions are expected to also protect other cave-dwelling bats in the region from the impacts of additive mortality from FRWF, since increased turbine operational restrictions and hibernaculum protection have been demonstrated to reduce mortality of all cave-dwelling bats in general.

Indiana Bat

Indiana bat is among the species impacted by the disease. WNS mortality in the Northeast Recovery Unit's Indiana bat population has varied by state, ranging from 30% in Virginia to 100% in Pennsylvania. Overall, Indiana bat mortality in the Northeast has averaged 72% (Turner et al. 2011). The reasons for mortality variation between states are not currently understood and may be due in part to census biases resulting from behavioral differences in WNS-infected bats. Based on observed WNS mortality rates in already-fragile populations of Indiana bats in the Northeast, Turner et al. (2011) have expressed concern that regional extinction due to WNS, as predicted by Frick et al.'s (2010) models of WNS impacts on the previously common little brown bat, may also await Indiana bats. Thogmartin et al. (2012) modeled the impact of WNS on the status and trends of Indiana bat populations in the Northeast, finding that although the overall species population has not credibly declined due to WNS, WNS has stalled and in some cases reversed population gains made by Northeast populations in recent years.

Although WNS has not yet caused severe mortality in the MRU Indiana bat populations, it should be expected to have impacts similar to those documented in the Northeast Indiana bat populations as the epidemic progresses through the Midwest. In winter 2011, WNS was confirmed on bats hibernating in Wyandotte Cave, the Indiana bat hibernacula at which FRWF would focus its winter habitat mitigation measures (see HCP Sections 5.3.2 and 5.4.3). FRWF would monitor signs of WNS at the cave entrances and follow decontamination protocols following installation of gates to prevent unauthorized human access to the cave (USFWS 2010).

The rate at which WNS may impact the MRU's Indiana bat populations cannot be predicted, as timeline of disease progression has been observed to vary widely among sites in the Northeast. However, it is expected that WNS would ultimately have similarly devastating impacts on Indiana bat hibernacula in the MRU, causing mortality near 72% and possibly the abandonment or extinction of certain hibernacula. This would reduce the Midwest population from its 2011 level of 305,297 to a post-WNS level of 85,483. Because the MRU currently includes 71.9% of

the total Indiana bat population (USFWS 2012d), the impacts of WNS in the recovery unit are expected to have significant consequences for the species as a whole; a 72% population loss due to WNS in the MRU would constitute a loss of 51.8% of the total species population.

Due to its federally endangered status, population levels and hibernacula use are better understood for the Indiana bat than for most bat species in the Midwest or North America. This is expected to allow for a more accurate assessment of WNS impacts at both the hibernacula and population levels. However, effective mechanisms for fighting WNS have yet to be developed, so although WNS impacts may be better understood for Indiana bats, they cannot currently be mitigated. Therefore, the impacts of WNS on Indiana bat populations in the MRU are expected to be severe, which would make additional mortality from other sources, such as wind energy facilities, more significant. If the population of Indiana bats in the MRU becomes substantially reduced as a result of WNS, FRWF would take corresponding action as described in Section 8.4.6 – Changed Circumstances in the HCP. These actions are intended to protect Indiana bats from the impacts of additive mortality at FRWF, through methods such as alternative hibernaculum mitigation site(s), increased turbine operational restrictions, and possible methods of bat deterrence from turbines.

5.15.4.4 *Habitat Loss and Fragmentation*

The following section on habitat loss and fragmentation addresses bat species not listed under the ESA and Indiana bats together to allow for a broader discussion of cumulative habitat impacts.

Summer

For the most part, agriculture has been the predominant land use in the MRU for decades. Suitable summer foraging and roosting habitat for Indiana bats and other bats is either absent or severely fragmented. However, some parts of the MRU are experiencing increases in forested habitat. For example, since 1940 in Ohio, forests have been increasing in those places where agricultural practices have been abandoned and fields have been reverting back to forest. Other states in the MRU may have also been exhibiting this trend although likely at a slower rate. However, time and proper management is needed before young forests become suitable habitat for bats, especially Indiana bats.

Future losses in forested habitat are likely to occur as a result of expanding urban areas. It is difficult to state whether or not this effect would be offset by any concurrent reversion of croplands to forests.

Phase IV would not add to cumulative effects associated with summer habitat loss. The project does not include removing forests or trees. Mitigation proposed by the Applicant would have positive effects to Indiana bat summer habitat by restoring 240 acres of forest. This mitigation would add cumulatively to positive impacts to overall summer habitat in the MRU.

Winter

The original 1983 recovery plan cited winter habitat destruction and degradation to be the dominant threat to the Indiana bat population. In the past, modifications to Indiana bat caves impacted the ability of those caves to provide the specific optimal conditions necessary for hibernating bats resulting in large scale disappearances of thousands of hibernating bats. Many of the primary threats to winter habitat largely have been addressed and are no longer

adversely affecting the species to the degree or extent that they once had. Additional protective measures for hibernacula are a reasonably foreseeable beneficial cumulative effect, particularly in association with other future wind projects that may be required to do so for compensating impacts to Indiana bats and other cave-dwelling bats.

Conservation and management of Indiana bat hibernacula is listed as a Recovery Action in the Indiana Bat Draft Recovery Plan, First Revision (USFWS 2007). Gating and other measures designed to restrict access at hibernacula and/or stabilize entrances, when done correctly have been shown to have positive effects on wintering Indiana bats (USFWS 2007). Mitigation proposed by the Applicant would have positive effects to Indiana bat winter habitat in the form of a gating project at a Priority 1 hibernaculum. This mitigation would add cumulatively to any future positive impacts to overall winter habitat in the MRU resulting from on-going hibernacula protection and restoration projects conducted by entities such as state resource agencies, Bat Conservation International, private mining companies, and other wind developers.

5.15.4.5 *Summary of Cumulative Effect to Bats*

The biological significance of cumulative impacts is dependent on the life-history strategy of the species in question. Life-history characteristics of a species population determine the degree to which its viability is affected by added mortality. Organisms whose populations are characterized by low birth-rate, long life-span, naturally low mortality rates (Pianka 1970), high trophic level, and small geographic ranges are likely to be most susceptible to cumulative, long-term impacts on population size, genetic diversity, and ultimately, population viability (McKinney 1997, Purvis et al. 2000 as cited in NRC 2007).

With some variation, bats as a group have relatively long life spans and produce relatively few offspring compared with other small mammals. Given the historic stressors typically associated with their life history strategies, the mortality of bats caused by turbine collision or barotrauma is considered to be an additive effect to other modern stressors now adversely affecting population levels (such as disease, predation, and habitat loss and degradation which decrease reproduction and survival). Even though individual wind projects may only contribute a small percentage of cumulative effects, the multiple sources of mortality together may result in significant losses, especially in light of the mortality observed due to WNS.

Bats Not Listed Under the ESA

The effect of cumulative mortality on cave-dwelling and tree-roosting migratory bat populations is highly uncertain because estimates of current population sizes are unknown. The cumulative effect of wind power mortality on low fecundity, cave-dwelling bats is additive to the already high mortality caused by WNS. Tree-roosting bat mortality at wind power projects is significantly higher than that experienced by cave-dwelling bats; however, other significant sources of mortality for tree-roosting bats are unknown. It is unknown whether or not tree bat populations can be sustained under a new threat that may cause the loss of millions of bats over the next two decades.

Indiana Bats

Many cave-dwelling bats are experiencing moderate to significant population declines from WNS. Seemingly negligible annual mortality of bats at a wind farm may become an important population impact in time should populations of cave-dwelling bats, including Indiana bats, become reduced to the point that they cannot recover. WNS may reduce cave-dwelling bats to

such low numbers it may become necessary for the Applicant, under the Service's direction, to implement changed circumstances for Indiana bats. In Section 8.4, the Applicant's HCP discusses those foreseeable changed circumstances and the Applicant's proposed measures for addressing them should they occur. The responses are designed to reduce the impact to Indiana bats under the reduced population numbers brought about by WNS. It is likely that other wind energy projects regulated under the ESA would have similar measures in place. This would presumably lessen the cumulative impact of wind energy on Indiana bat populations affected by WNS in MRU.

To understand the implications of cumulative bat mortality requires knowledge of baseline populations. Unfortunately, there is little information on current population estimates for most bat species in North America at local, regional, or continental scales (O'Shea et al. 2004, Kunz et al. 2007a). We have a better understanding of past and current population levels for Indiana bats than for any other species, which is largely an artifact of their long-standing endangered status and the ability to monitor populations through hibernacula counts. The total impact of the taking (353 Indiana bats) over the 22-year life of the FRWF sought by the Applicant is roughly 0.1% of the 2011 MRU Indiana bat population. Additionally, the Applicant's strategy for addressing changed circumstances, including population declines associated with WNS, provide further mechanisms for reducing the Project's contribution to cumulative effects to Indiana bats.

The impact of the 25% build-out scenario on Indiana bats in combination with the other major stressor, WNS, is unknown. There are various possibilities including a synergistic effect of two new stressors affecting the species at the same time. It is also possible that as the population of Indiana bats is reduced by WNS, as it almost certainly will be, the total number of bats taken by wind facilities will be less. However, the impacts of taking those fewer bats could increase, since each individual will become more important as the population decreases. Research into these questions is ongoing and will likely focus in part on how these new stressors will affect not only the numbers of bats but also their life histories, particularly maternity colony and hibernaculum dynamics.

5.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources refers to the loss, as a result of the Project, of future options for resource development or management, especially of nonrenewable resources such as minerals and cultural resources (40 CFR 1508.1 1). Irretrievable commitment of resources refers to the lost production or use value of renewable natural resources as a result of the Project (40 CFR 1508.1 1). Construction of Phase IV and operation of the Project would involve the irreversible and irretrievable commitment of material resources, energy, and biological resources.

Regardless of which of the four alternatives under consideration is chosen, the use of material resources would be required for construction of Phase IV, including building materials for new turbines, access roads, underground and overhead electricity collection lines, MET towers, and a substation. Equipment used for construction of Phase IV would require use of fossil fuels, a nonrenewable natural resource; however, operation of FRWF would have the benefit of lowering overall fossil fuel use since power generated by FRWF would offset that generated at existing conventional power plants powered by the combustion of fossil fuels.

Under any of the four alternatives under consideration, construction of the Phase IV would result in an irreversible or irretrievable loss of some resources over the life of the Project, including prime and unique farmland. Operation of all four phases of FRWF would result in an irreversible or irretrievable loss of some biological resources over the life of the Project, federal and state listed bats, non-listed bats, and birds. These are discussed by alternative in the following sections.

5.16.1 No Action Alternative

Construction of Phase IV under the No Action Alternative would result in an irreversible or irretrievable alteration of 78.2 acres of prime and unique farmland. However, turbines would be removed during decommissioning (after a 22-year operation life), and the land would be restored to agricultural use.

Operation of the Project under the No Action Alternative would result in the incidental take of 0 Indiana bats over the life of the Project (see Section 5.6.7). Up to 41,634 birds and 28,173 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

5.16.2 3.5 m/s Cut-In Speed (Feathered) Alternative

Construction of Phase IV under the 3.5 m/s Cut-in Speed (Feathered) Alternative would result in the same irreversible or irretrievable alteration as the No Action Alternative.

Operation of the Project under the 3.5 m/s Cut-in Speed (Feathered) Alternative would result in the incidental take of approximately 245 Indiana bats over the life of the Project (see Section 5.6.7). Additionally, up to 41,634 birds and 180,776 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

5.16.3 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)

Construction of Phase IV under the 5.0 m/s Cut-In Speed Alternative would result in the same irreversible or irretrievable alteration as the No Action Alternative.

Operation of the Project under the 5.0 m/s Cut-In Speed Alternative would result in the incidental take of approximately 193 Indiana bats over the life of the Project (see Section 5.6.7). Additionally up to 41,634 birds and 147,458 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

5.16.4 6.5 m/s Cut-In Speed Alternative

Construction of Phase IV under the 6.5 m/s Cut-in Speed Alternative would result in the same irreversible or irretrievable alteration as the No Action Alternative.

Operation of the Project under the 6.5 m/s Cut-in Speed Alternative would result in the incidental take of approximately 86 Indiana bats over the life of the Project (see Section 5.6.7). Additionally, up to 41,634 birds and 80,649 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

5.17 IDENTIFICATION OF PREFERRED ALTERNATIVE

The Department of the Interior (DOI) defines the preferred alternative as "the alternative which the [agency] believes would best accomplish the purpose and need of the proposed action while fulfilling its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors" (43 CFR 46.420(d)). The preferred alternative may or may not be the same as the project proponent's proposed action or the environmentally preferable alternative. When an EIS has been prepared the ROD must identify all alternatives considered and specify the environmentally preferable alternative(s) (40 CFR 1505.2(b). The environmentally preferable alternative is that which reflects the policy in Section 101 of NEPA, i.e., the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources (43 CFR 46.30).

The "preferred alternative" is a preliminary indication of the federal responsible official's preference of action, which is chosen from among the alternatives analyzed in an EIS. The preferred alternative may be selected for a variety of reasons (such as the priorities of the particular lead agency) in addition to the environmental considerations discussed in the EIS. The preferred alternative is not a final agency decision; rather, it is an indication of the agency's preference. The final agency decision is presented in the ROD.

In accordance with NEPA and the CEQ reulations and based on consideration of agency and public comments on the DEIS, the Service has selected the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) as the preferred alternative. Of the alternatives evaluated in this FEIS, this alternative best fulfills the agency's statutory mission and responsibilities while meeting the purpose and need for the following reasons:

1. Issuance of an ITP under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) would reduce impacts to Indiana bats and other non-listed bats and provide compensatory mitigation to offset the loss of Indiana bats as a result of operation of the FRWF.

2. Issuance of an ITP meets the need of the existing FRWF and allows all four phases of the FRWF to operate legally under the ESA.

6.0 CONSULTATION AND COORDINATION

6.1 CONSULTATION AND COORDINATION

Section 1.4 summarizes the initial public scoping process used in development of this EIS, including issuance of the NOI, and a summary of the issues identified by the public during the scoping process. In addition, scoping letters were sent to federal, state and local agencies as described in Section 6.1.1 below.

6.1.1 Agency Coordination

On June 2, 2011, a scoping letter was sent via e-mail to federal, state and local agencies and Non-governmental Organizations (NGOs) to familiarize them with the project and allow them the opportunity to provide comments. Scoping letters were sent to the following entities:

- U.S. Army Corps of Engineers, Louisville District
- U.S. Department of Agriculture – Rural Development – Covington Area Office
- U.S. Environmental Protection Agency (USEPA) – Region 5
- U.S. Department of Housing and Urban Development – Indiana Field Office
- Indiana Department of Environmental Management (IDEM)
- Indiana Department of Natural Resources (IDNR) – Division of Fish and Wildlife
- IDNR – Division of Nature Preserves
- IDNR – Division of Historic Preservation and Archaeology
- Indiana Department of Transportation (IDOT) – Aeronautics Division
- Indiana Karst Conservancy
- Benton County Commissioners
- City of Fowler – City Clerk
- Audubon Society – Indiana
- Hoosier Environmental Council
- National Wildlife Federation (NWF) – Indiana
- The Nature Conservancy – Indiana
- Center for North American Bat Research and Conservation

No written comments were received from these entities during the scoping period.

6.1.2 Distribution of the Draft EIS

In accordance with NEPA, the DEIS was circulated for public review and comment. The DEIS was published in the Federal Register for public review on April 5, 2013 (78 Fed. Reg. 20690-20692) in accordance with requirements set forth in the NEPA and its' implementing regulations. Public comments were accepted during a 60-day period following publication of the Federal Register Notice of Availability. One public information meeting was held during the comment period, on April 18, 2013 in Fowler, Indiana. Responses to substantive comments on the DEIS and Draft HCP can be found in Appendix I of this EIS.

The DEIS was distributed via copies or web links to the following elected officials, federal agencies, and state, county and local offices, and to individuals and organizations who specifically requested a copy of the document:

- Federal Agencies
  - U.S. Department of the Interior
  - U.S. Department of the Interior, U.S. Fish and Wildlife Service
  - U.S. Department of Transportation, Office of the Secretary
  - U.S. Army Corps of Engineers, Louisville District
  - U.S. Environmental Protection Agency, Region 5
  - U.S. Department of Agriculture Rural Development
  - Natural Resources Conservation Service
  - U.S. Department of Energy
  - Federal Emergency Management Agency, Region 5
  - Federal Communications Commission
  - Federal Aviation Administration
  - Federal Railroad Administration
  - Federal Highway Administration, Indiana Division
  - U.S. Department of Commerce
  - Advisory Council on Historic Preservation
- State Agencies
  - Indiana Department of Environmental Management
  - Indiana Department of Transportation, Aeronautics Section
  - Indiana Department of Natural Resources
  - Indiana Geological Survey
  - Indiana Department of Health
  - Indiana Attorney General's Office
  - Indiana Board of Health
- Federal and State Elected Officials
  - Governor Mike Pence
  - Honorable Dan Coats (U.S. Senator)
  - Honorable Joe Donnelly (U.S. Senator)
  - Honorable Pete Visclosky (U.S. Representative)
  - Honorable Sue Landske (State Senator)
  - Honorable Sharon Negele (State Representative)
- Local Units of Government
  - Benton County Commissioners
  - Town of Fowler
  - Benton County Public Library
  - Otterbein Public Library
  - Benton County Sheriff
- Others
  - Hoosier Environmental Council
  - The Nature Conservancy – Indiana

- Audubon Society
- Indiana Wildlife Federation
- Center for North American Bat Research and Conservation
- Indiana Karst Conservancy
- Maine Department of Inland Fisheries and Wildlife
- Northeast Bat Working Group
- Southeast Bat Diversity Network
- Midwest Bat Working Group

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APPENDICES

Appendix A Notice of Intent

receiving moderate to high goose use. Refuge farming program costs would increase and goose use would likely decrease.

This alternative would create the opportunity to restore approximately 1,436 acres of cropland to native habitat since the amount of farmland would be reduced. However, the fields to be restored would likely lie fallow and could become weedy while awaiting staff time and funding for restoration.

Wildlife observation and interpretation would continue to be emphasized as the cornerstone of the public use program, but this alternative does little to expand these programs further. Interpretive signs would be developed or updated for existing facilities where needed, but major new developments and new interpretive methods would generally not occur. One or two special events would be held each year. The current area closed to public access on all three refuges would remain in effect to provide sanctuary during the wintering waterfowl season.

Deer hunting, threatened and endangered species management, environmental education, fishing, elk management, cultural resources, subsequent land protection planning, and conservation partnership activity would occur as under Alternative 2.

Public Availability of Documents

In addition to the information in **ADDRESSES**, you can view or obtain documents in the following ways: by calling the refuge complex at (541) 757–7236 or visiting our Web site at *http://www.fws.gov/WillametteValley/finley/refuge_planning.html.* Printed copies will be available for review at the following libraries:

- Corvallis-Benton County Public Library, 645 NW. Monroe Avenue, Corvallis, OR 97330, 541–766–6926.
- Albany Public Library, 2450 14th Avenue SE., Albany, OR 97231, 541–917–7580.
- Dallas Public Library, 950 Main Street, Dallas, OR 97338, 503–623–2633.
- Jefferson Public Library, 128 South Main Street, Jefferson, OR 97352, 541–327–3826.

Next Steps

After this comment period ends, we will analyze the comments and address them in the final CCP and decision document.

Public Availability of Comments

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may become publicly available at any time. While you can ask us in your comment to withhold your identifying information from the public, we cannot guarantee that we will be able to do so.

Dated: April 28, 2011.

Robyn Thorson,

Regional Director, Region 1, Portland, Oregon.

[FR Doc. 2011–12964 Filed 5–24–11; 8:45 am]

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R3–ES–2011–N096; 30120–1112–000–F2]

Notice of Intent To Prepare a Draft Environmental Impact Statement for a Proposed Habitat Conservation Plan and Incidental Take Permit

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of intent; request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), advise the public that we intend to prepare a draft environmental impact statement (EIS) to evaluate the impacts of several alternatives relating to the proposed issuance of an Endangered Species Act Permit to Fowler Ridge Wind Farm LLC, Fowler Ridge Wind Farm II LLC, Fowler Ridge Wind Farm III LLC, and Fowler Ridge Wind Farm IV LLC (Applicant) for incidental take of the Indiana bat (*Myotis sodalis*), a Federal endangered species, from activities associated with the operation of Fowler Ridge Wind Farm in Benton County, Indiana. We also announce a public comment period.

DATES: The public scoping period begins with publication of this notice in the **Federal Register** and will continue through June 23, 2011. The Service will consider all comments defining the scope of the EIS that are received or postmarked by this date. Comments received or postmarked after this date will be considered to the extent practicable. The Service will conduct a public scoping meeting in Fowler, IN, on June 7, 2011. The scoping meeting will provide the public with an opportunity to present comments, ask questions, and discuss issues with Service staff regarding the EIS.

ADDRESSES: You may submit comments by U.S. mail or hand-delivery to Mr. Scott Pruitt, U.S. Fish and Wildlife Service, 621 South Walker St., Bloomington, Indiana, 47403; *electronic mail: FowlerRidgeHCP@fws.gov;* or *fax:* (812) 334–4273 (*Attention:* Scott Pruitt).

FOR FURTHER INFORMATION CONTACT: Mr. Scott Pruitt at (812) 334–4261. Individuals who are hearing-impaired or speech-impaired may call the Federal Relay Service at (800) 877–8337 for TTY assistance.

SUPPLEMENTARY INFORMATION: We publish this notice in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 *et seq.*), and its implementing regulations (40 CFR 1501.7, 1506.6, and 1508.22), and Section 10(c) of the Endangered Species Act of 1973 (the Act), as amended (16 U.S.C. 1539(c)). We intend to gather the information necessary to determine impacts and alternatives to support a decision regarding the potential issuance of an incidental take permit to the Applicant, and the implementation of the supporting draft habitat conservation plan (HCP). We intend to prepare an EIS to evaluate the impacts of several alternatives relating to the proposed issuance of an incidental take permit (ITP) under the Act. The applicant proposes to apply for an incidental take permit through development and implementation of an HCP. The proposed HCP will cover take of the Indiana bat that is incidental to activities associated with the operation of Fowler Ridge Wind Farm, and will include measures necessary to minimize and mitigate impacts to the Indiana bat and its habitat to the maximum extent practicable.

Request for Information

The Service requests data, comments, new information, or suggestions from the public, other concerned governmental agencies, the scientific community, Tribes, industry, or any other interested party on this notice. These comments will be considered in the development of a draft EIS, in the development of a draft HCP by the applicant, and in the determination of whether to issue an ITP. We particularly seek comments concerning:

(1) Biological information concerning the Indiana bat;

(2) Relevant data concerning wind power and bat interactions;

(3) Additional information concerning the range, distribution, population size, and population trends of the Indiana bat;

(4) Current or planned activities in the subject area and their possible impacts on the Indiana bat;

(5) Any information identified in the aforementioned as it relates to other bat

species, in particular, tree bat species such as red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) that occur in the project area;

(6) The presence of archeological sites, buildings and structures, historic events, sacred and traditional areas, and other historic preservation concerns, which are required to be considered in project planning by the National Historic Preservation Act (16 U.S.C. 470 *et seq.*); and

(7) Identification of any other environmental issues that should be considered with regard to the proposed development and permit action.

Public Comments

You may submit your comments and materials considering this notice by one of the methods listed in the **ADDRESSES** section.

Comments and materials we receive, as well as supporting documentation we use in preparing the NEPA document will be available for public inspection by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Bloomington Indiana Field Office (see **FOR FURTHER INFORMATION CONTACT** section). You may obtain copies of this notice on the Internet at: *http://www.fws.gov/midwest/Endangered/permits/hcp/r3hcps.html,* or by mail from the Bloomington Indiana Field Office (see **FOR FURTHER INFORMATION CONTACT** section).

Background

Section 9 of the Act prohibits "take" of fish and wildlife species listed as endangered under section 4 (16 U.S.C. 1538, 1533, respectively). The Act's implementing regulations extend, under certain circumstances, the prohibition of take to threatened species (50 CFR 17.31). Under section 3 of the Act, the term "take" means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 CFR part 1521). The term "harm" is defined by regulation as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3). The term "harass" is defined in the regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

Section 10(a)(2)(A) of the Act requires an applicant for an incidental take permit to prepare an HCP that describes:

(1) The impact that will likely result from such taking;

(2) the steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;

(3) the alternative actions to such taking that the applicant considered and the reasons why such alternatives are not being utilized; and

(4) the other measures that the Secretary may require as being necessary or appropriate for the purposes of the plan (16 U.S.C. 1539(a)(2)(A)).

Section 10(a)(2)(B) of the Act requires the Secretary to issue an incidental take permit to an applicant when it determines that:

(1) The taking will be incidental;

(2) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;

(3) the applicant has ensured that adequate funding for the plan will be provided;

(4) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and

(5) the measures, if any, the Secretary may require as necessary or appropriate for the purposes of the plan will be met (16 U.S.C. 1539(a)(2)(B)).

Regulations governing permits for endangered and threatened species are at 50 CFR 17.22 and 17.32.

The Indiana bat was added to the list of Endangered and Threatened Wildlife and Plants on March 11, 1967 (32 FR 4001). It is currently listed as an endangered species under the Act. The population decline of this species is attributed to habitat loss and degradation of both winter hibernation habitat and summer habitat, human disturbance during hibernation, and possibly pesticides. An additional and emerging threat to Indiana bats is White-Nose Syndrome (WNS). WNS is associated with a recently discovered fungus (*Geomyces destructans*) that affects the skin and wing membranes of bats. Over 1 million bats of 6 species, including the federally endangered Indiana bat, have died in eastern North America from WNS since 2006. The range of the Indiana bat includes much of the eastern United States, and Indiana is located within the core of the species' range; approximately half of the known population of Indiana bats hibernates in Indiana.

Winter habitat for the Indiana bat includes caves and mines that support high humidity and cool but stable temperatures. In the summer, Indiana bats often roost under loose bark of dead or dying trees. During summer, males roost alone or in small groups while females and their offspring roost in larger groups of up to 100 or more. Indiana bats forage for insects in and along the edges of forested areas and wooded stream corridors. Maternity colonies of Indiana bats occur throughout Indiana. FRWF is located approximately 100 miles from the nearest known hibernaculum, and it is unlikely that Benton or surrounding counties contain Indiana bat hibernacula.

Proposed Action—Modified Operations Alternative

The proposed action is issuance of an incidental take permit (ITP) for the Indiana bat during operation of Phases I, II, III, and IV of the Applicant's FRWF. The proposed HCP, which must meet the requirements in section 10(a)(2)(A) of the Act, would be developed and implemented by the applicant, and will include measures necessary to minimize and mitigate impacts to the Indiana bat and its habitat to the maximum extent practicable. The HCP will present the Applicant's plan to modify operations to avoid, minimize, and mitigate impacts to endangered species that are present or migrating through the action area.

The Applicant for the ITP is developing and operating a wind power project in Benton County, Indiana. The area under lease for the FRWF is approximately 54,880 acres (ac) (22,209 hectares (ha)) within portions of Richland, Parish Grove, Center, Pine, Hickory Grove, Grant and Oak Grove Townships. The wind power project includes the operation of 355 existing wind turbine generators during the first three phases of the project, and construction and operation of up to 93 additional turbines at Phase IV of the project, for a total of up to 448 wind turbines. The project would also include all associated collector lines, access roads, utility lines, substations, operation and maintenance facility buildings, and temporary staging areas and concrete batch plants, if applicable. Up to five different models of wind turbines may be in use at various times during the four phases of FRWF. The wind turbine hub height at Phases I, II, and III is 263 feet (ft) (80 meters (m)), with the rotor diameter varying from 253 ft (77 m) to 315 ft (96 m), depending on the type of turbine. Approximate total height at the rotor apex at Phases I, II, and III varies from 389 ft (118.5 m)

to 446 ft (136.5 m), depending on the type of turbine. The proposed wind turbine hub height for Phase IV would range 263–328 ft (80–100 m), depending on the type of turbine selected. Rotor diameters at Phase IV may vary from 253 to 371 ft (77 to 113 m), depending on the type of turbine selected. Approximate total height at the rotor apex would vary from 389 to 514 ft (118.5 to 156.5 m). Installation of each individual turbine will temporarily impact an area of approximately 2.9 ac (1.2 ha), while the final footprint of each turbine will be approximately 0.2 ac (0.08 ha). Access roads to the turbines will have a temporary width of up to 55 ft (17 m) during construction and a permanent width of 16 to 20 ft (4.8 to 6.1 m).

The project is located in a rural setting, with the landscape primarily composed of agricultural properties. Of the roughly 72,953 ac (29,523 ha) within 0.5 mi (0.8 km) of turbine locations, row crops comprise about 93 percent of the land use for the study area. After tilled agriculture, the next most common land uses within the FRWF are developed areas (e.g., houses and buildings), which comprise 5.0 percent of the total, and pastures/hayfields, which comprise 1.4 percent of the total. There are 22.8 ac (9.2 ha) of grasslands, which compose less than 0.1 percent of the study area. Grasslands in the study area are limited primarily to strips along drainages, railroad rights-of-way (ROW), and ROWs along county and State roads. Trees in the study area occur at homesteads, along some of the drainages and fencerows, and within some small, isolated woodlots. Forested areas are rare within the study area, based on 2001 data, and the 249.3 ac (100.8 ha) of forest comprise 0.5 percent of the total area. Small amounts of barren ground, open water, and woody wetlands are also present.

Despite the relatively small acreage of land to be affected by the project, impacts to wildlife, particularly birds and bats, are anticipated. Minimization for potential impacts to Indiana bats will include a turbine operational management adjustment program developed based on the results of post-construction studies conducted at Phases I, II, and III of the project.

Any turbine operational management adjustment program is likely to contain various measures to avoid and minimize impacts to Indiana bats, including the impact of lethal take. Various methods that may be considered include, but are not limited to: Protection of roost trees and surrounding habitat, set-back distances from known roost trees, mapping and avoidance of foraging areas, protection and enhancement of Indiana bat habitat outside the project area, various operational adjustments for turbines during prime activity or migration periods, and post-construction monitoring for fatalities.

Alternatives to the Proposed Action

In addition to the proposed action, there is one additional action alternative that is currently under consideration related to the proposed issuance of an ITP to the Applicant for activities associated with operation of the Fowler Ridge Wind Farm. These alternatives, and possibly additional alternatives, will be considered in the draft EIS, along with the potential impacts associated with each alternative. Each action alternative analyzed in the draft EIS will be compared to the No Action alternative. The No Action alternative represents estimated future conditions to which the proposed action can be compared.

No Action Alternative

Under the No Action Alternative, an ITP pursuant to Section 10(a)(1)(B) of the Act would not be issued for the existing phases or the future Phase IV of the Fowler Ridge Wind Farm. The existing phases of the project would continue to fully operate, and Phase IV would fully operate once construction is complete. Under the No Action Alternative, the applicant would not have coverage for an incidental take of the Indiana bat and would be at risk of violation of Section 9 of the Act. In addition, no HCP would be produced; therefore, the Indiana bat would not have the protections afforded to it through development and implementation of an HCP. The proposed project purpose would not be met under the No Action Alternative.

Maximally Restricted Operations Alternative

Under the Maximally Restricted Operations Alternative, an ITP would be issued; Phases I, II and III would continue to operate; and Phase IV would be constructed as described under Proposed Action—i.e., full build-out of up to 448 turbines. Minimization for potential impacts to Indiana bats would include shutting down turbines at night during the period from April 1 through October 31, the active period for Indiana bats. This minimization would occur during all four phases of the project, every year the FRWF is in operation.

Environmental Review

The Service will conduct an environmental review to analyze various alternatives for implementing the proposed action and the associated impacts of each. The draft EIS will be the basis for the impact evaluation for Indiana bats and the range of alternatives to be addressed. The draft EIS is expected to provide biological descriptions of the affected species and habitats, as well as the effects of the alternatives on other resources such as vegetation, wetlands, wildlife, geology and soils, air quality, water resources, water quality, cultural resources, land use, recreation, water use, local economy, and environmental justice. Following completion of the environmental review, the Service will publish a notice of availability and a request for comments on the draft EIS and the Applicant's permit application, which will include the draft HCP. The draft EIS and draft HCP are expected to be completed and available to the public in late 2011.

Authority

This notice is being furnished as provided for by NEPA, the NEPA regulations, and the Act. The intent of the notice is to obtain suggestions and additional information from other agencies and the public on the scope of issues to be considered. Comments and participation in this scoping process are solicited.

Dated: May 9, 2011.

Lynn Lewis,

Assistant Regional Director, Ecological Services, Region 3, Fort Snelling, MN.

[FR Doc. 2011–12860 Filed 5–24–11; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R9–IA–2011–N110; 96300–1671–0000–P5]

Endangered Species; Marine Mammals; Receipt of Applications for Permit

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of receipt of applications for permit.

SUMMARY: We, the U.S. Fish and Wildlife Service, invite the public to comment on the following applications to conduct certain activities with endangered species, marine mammals, or both. With some exceptions, the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) prohibits activities with listed species unless a Federal permit is issued that allows such activities. Both laws

Appendix B Public Scoping Comments

Scott Pruitt/R3/FWS/DOI
05/26/2011 08:53 AM

To Forest Clark/R3/FWS/DOI@FWS, Marissa Reed/R3/FWS/DOI@FWS, Lori Pruitt/R3/FWS/DOI@FWS
cc
bcc
Subject Fw: public comment on federal register Fw: THE BAT IS MORE IMPORTANT THAN THE WINDMILL IN THAT LOCATION

Our first comment.

Scott
----- Forwarded by Scott Pruitt/R3/FWS/DOI on 05/26/2011 08:52 AM -----

"bk1492@aol.com" <bk1492@aol.com>
05/25/2011 05:09 PM

To lynn_lewis@fws.gov, fowlerridge@fws.gov, scott_pruitt@fws.gov, rush.holt@mail.house.gov, speakerboehner@mail.house.gov, SF.NANCY@MAIL.HOUSE.GOV
cc broads@greatoldbroads.org, information@sierraclub.org, foe@foe.org, info@emagazine.com
Subject public comment on federal register Fw: THE BAT IS MORE IMPORTANT THAN THE WINDMILL IN THAT LOCATION

deny this permit to fowler ridge. the windmill can be put anywhere. we need to sve those bats, which help everybody in america by eating insects.
jean public address if required

[Federal Register Volume 76, Number 101 (Wednesday, May 25, 2011)]
[Notices]
[Pages 30384-30386]
From the Federal Register Online via the Government Printing Office [www.gp
[FR Doc No: 2011-12860]

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS-R3-ES-2011-N096; 30120-1112-000-F2]

Notice of Intent To Prepare a Draft Environmental Impact Statement for a Proposed Habitat Conservation Plan and Incidental Take Permit

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of intent; request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), advise the public that we intend to prepare a draft environmental impact statement (EIS) to evaluate the impacts of several alternatives relating to the proposed issuance of an Endangered Species Act Permit to Fowler Ridge Wind Farm LLC, Fowler Ridge Wind Farm II LLC, Fowler Ridge Wind Farm III LLC, and Fowler Ridge Wind Farm IV LLC (Applicant) for incidental take of the Indiana bat (Myotis sodalis), a Federal endangered species, from activities associated with the operation of Fowler Ridge Wind Farm in Benton County, Indiana. We also announce a public comment period.

DATES: The public scoping period begins with publication of this notice in the Federal Register and will continue through June 23, 2011. The Service will consider all comments defining the scope of the EIS that are received or postmarked by this date. Comments received or postmarked after this date will be considered to the extent practicable. The Service will conduct a public scoping meeting in Fowler, IN, on June 7, 2011. The scoping meeting will provide the public with an opportunity to present comments, ask questions, and discuss issues with Service staff regarding the EIS.

ADDRESSES: You may submit comments by U.S. mail or hand-delivery to Mr. Scott Pruitt, U.S. Fish and Wildlife Service, 621 South Walker St., Bloomington, Indiana, 47403; electronic mail: FowlerRidgeHCP@fws.gov; or fax: (812) 334-4273 (Attention: Scott Pruitt).

FOR FURTHER INFORMATION CONTACT: Mr. Scott Pruitt at (812) 334-4261. Individuals who are hearing-impaired or speech-impaired may call the Federal Relay Service at (800) 877-8337 for TTY assistance.

SUPPLEMENTARY INFORMATION: We publish this notice in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.), and its implementing regulations (40 CFR 1501.7, 1506.6, and 1508.22), and Section 10(c) of the Endangered Species Act of 1973 (the Act), as amended (16 U.S.C. 1539(c)). We intend to gather the information necessary to determine impacts and alternatives to support a decision regarding the potential issuance of an incidental take permit to the Applicant, and the implementation of the supporting draft habitat conservation plan (HCP). We intend to prepare an EIS to evaluate the impacts of several alternatives relating to the proposed issuance of an incidental take permit (ITP) under the Act. The applicant proposes to apply for an incidental take permit through development and implementation of an HCP. The proposed HCP will cover take of the Indiana bat that is incidental to activities associated with the operation of Fowler Ridge Wind Farm, and will include measures necessary to minimize and mitigate impacts to the Indiana bat and its

habitat to the maximum extent practicable.

Request for Information

The Service requests data, comments, new information, or suggestions from the public, other concerned governmental agencies, the scientific community, Tribes, industry, or any other interested party on this notice. These comments will be considered in the development of a draft EIS, in the development of a draft HCP by the applicant, and in the determination of whether to issue an ITP. We particularly seek comments concerning:

(1) Biological information concerning the Indiana bat;

(2) Relevant data concerning wind power and bat interactions;

(3) Additional information concerning the range, distribution, population size, and population trends of the Indiana bat;

(4) Current or planned activities in the subject area and their possible impacts on the Indiana bat;

(5) Any information identified in the aforementioned as it relates to other bat

[[Page 30385]]

species, in particular, tree bat species such as red bat (Lasiurus borealis), hoary bat (Lasiurus cinereus), and silver-haired bat (Lasionycteris noctivagans) that occur in the project area;

(6) The presence of archeological sites, buildings and structures, historic events, sacred and traditional areas, and other historic preservation concerns, which are required to be considered in project planning by the National Historic Preservation Act (16 U.S.C. 470 et seq.); and

(7) Identification of any other environmental issues that should be considered with regard to the proposed development and permit action.

Public Comments

You may submit your comments and materials considering this notice by one of the methods listed in the ADDRESSES section.

Comments and materials we receive, as well as supporting documentation we use in preparing the NEPA document will be available for public inspection by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Bloomington Indiana Field Office (see FOR FURTHER INFORMATION CONTACT section). You may obtain copies of this notice on the Internet at: http://www.fws.gov/midwest/Endangered/permi the Bloomington Indiana Field Office (see FOR FURTHER INFORMATION CONTACT section).

Background

Section 9 of the Act prohibits ``take'' of fish and wildlife species listed as endangered under section 4 (16 U.S.C. 1538, 1533,

respectively). The Act's implementing regulations extend, under certain circumstances, the prohibition of take to threatened species (50 CFR 17.31). Under section 3 of the Act, the term ``take'' means ``to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct'' (16 CFR part 1521). The term ``harm'' is defined by regulation as ``an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering'' (50 CFR 17.3). The term ``harass'' is defined in the regulations as ``an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering'' (50 CFR 17.3).

Section 10(a)(2)(A) of the Act requires an applicant

Paul Friesema
<pfree@northwestern.edu>

05/25/2011 04:33 PM

To: FowlerRidgeHCP@fws.gov
cc:
Subject: ATTN: Scott Pruitt

Hello Scott. Please put me on the mailing list for the DEIS on the Proposed Habitat Conservation Plan and Incidental Take Permit for the Fowler Ridge Wind Farm. If there is a current status report on the Indiana Bat, would you send that along too. I prefer paper copies of materials, beginning with the scoping announcement and summary. Please send material to:

Professor Paul Friesema
Environmental Policy and Culture Program
227 Scott Hall, Northwestern University
Evanston, IL.60208-1006

Thank you! Paul Friesema

[Federal Register Volume 76, Number 101 (Wednesday, May 25, 2011)]
[Notices]
[Pages 30384-30386]
From the Federal Register Online via the Government Printing Office [www.gpo.gov]
[FR Doc No: 2011-12860]

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS-R3-ES-2011-N096; 30120-1112-000-F2]

Notice of Intent To Prepare a Draft Environmental Impact Statement for a Proposed Habitat Conservation Plan and Incidental Take Permit

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of intent; request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), advise the public that we intend to prepare a draft environmental impact statement (EIS) to evaluate the impacts of several alternatives relating to the proposed issuance of an Endangered Species Act Permit to Fowler Ridge

Wind Farm LLC, Fowler Ridge Wind Farm II LLC, Fowler Ridge Wind Farm
III LLC, and Fowler Ridge Wind Farm IV LLC (Applicant) for incidental
take of the Indiana bat (Myotis sodalis), a Federal endangered species,
from activities associated with the operation of Fowler Ridge Wind Farm
in Benton County, Indiana. We also announce a public comment period.

DATES: The public scoping period begins with publication of this notice
in the Federal Register and will continue through June 23, 2011. The
Service will consider all comments defining the scope of the EIS that
are received or postmarked by this date. Comments received or
postmarked after this date will be considered to the extent
practicable. The Service will conduct a public scoping meeting in
Fowler, IN, on June 7, 2011. The scoping meeting will provide the
public with an opportunity to present comments, ask questions, and
discuss issues with Service staff regarding the EIS.

ADDRESSES: You may submit comments by U.S. mail or hand-delivery to Mr.
Scott Pruitt, U.S. Fish and Wildlife Service, 621 South Walker St.,

Bloomington, Indiana, 47403; electronic mail:
FowlerRidgeHCP@fws.gov;
or fax: (812) 334-4273 (Attention: Scott Pruitt).

FOR FURTHER INFORMATION CONTACT: Mr. Scott Pruitt at (812) 334-4261.
Individuals who are hearing-impaired or speech-impaired may call the
Federal Relay Service at (800) 877-8337 for TTY assistance.

"Hyman, Jeffrey Bruce" <jbhyman@indiana.edu>

06/22/2011 05:26 PM

To: "FowlerRidgeHCP@fws.gov" <FowlerRidgeHCP@fws.gov>
cc:
Subject: Comments on Fowler Ridge NOI Attn Scott Pruitt

Thanks, Scott, for this opportunity to comment on the Fowler Ridge NOI, 76 Fed. Reg. 30384. Comments are attached in pdf format. Mail delivery to follow.

Please verify receipt of this e-mail.
Thanks.

Jeff Hyman

Jeffrey B. Hyman, Ph.D., J.D.
Staff Attorney, Conservation Law Center
Adjunct Professor of Law, Indiana University Maurer School of Law

Bloomington, IN 47408
(812) 856-5737 (Direct Line)
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jbhyman@indiana.edu

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Conservation Law Center_COMMENTS_Indiana Bat Scoping_Fowler Ridge_F.pdf

CONSERVATION LAW CENTER

116 South Indiana • Bloomington, Indiana 47408
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admin@conservationlawcenter.org • www.conservationlawcenter.org

Comments on NOI to prepare draft EIS for Indiana Bat ITP and HCP at Fowler Ridge,
76 Fed. Reg. 30384

June 22, 2011

Mr. Scott Pruitt
U.S. Fish and Wildlife Service
621 South Walker St.,
Bloomington, Indiana, 47403;
Electronic mail: FowlerRidgeHCP@fws.gov (receipt verification requested);
fax: (812) 334–4273 (Attention: Scott Pruitt).

Dear Mr. Pruitt,

We offer these comments pursuant to the Service's Notice of Intent ("NOI") to prepare a draft National Environmental Policy Act Environmental Impact Statement ("EIS") for a proposed habitat conservation plan ("HCP") and incidental take permit ("ITP") for the Fowler Ridge Wind Farm project (the "Project") in Benton County, Indiana.[1] The Conservation Law Center is a nonprofit public interest law firm located in Bloomington, Indiana. Our mission is to help clients solve natural resources conservation problems, to work to improve the body of conservation law and policy, and to educate law students.

The comments below identify environmental issues that should be considered with regard to the proposed development, permit action, and EIS content.

I. DELINEATION OF THE ACTION AREA OF THE PROJECT MUST ACCOUNT FOR FORAGING AND OTHER MOVEMENTS

The NOI describes the percentage of habitat types in the area of the Project as follows:

> The project is located in a rural setting, with the landscape primarily composed of agricultural properties. Of the roughly 72,953 ac (29,523 ha) *within 0.5 mi (0.8 km) of turbine locations*, row crops comprise about 93 percent of the land use for the study area. After tilled agriculture, the next most common land uses within the FRWF are developed areas (e.g., houses and buildings), which comprise 5.0

[1] 76 Fed. Reg. 30384 (May 25, 2011).

> percent of the total, and pastures/hayfields, which comprise 1.4 percent of the total. There are 22.8 ac (9.2 ha) of grasslands, which compose less than 0.1 percent of the study area. Grasslands in the study area are limited primarily to strips along drainages, railroad rights-of-way (ROW), and ROWs along county and State roads. Trees in the study area occur at homesteads, along some of the drainages and fencerows, and within some small, isolated woodlots. Forested areas are rare within the study area, based on 2001 data, and the 249.3 ac (100.8 ha) of forest comprise 0.5 percent of the total area. Small amounts of barren ground, open water, and woody wetlands are also present.

Emphasis added.

The referenced "72,953 ac (29,523 ha) within 0.5 mi (0.8 km) of turbine locations" may be a sufficient area for monitoring bat fatalities below turbines, but this area is too small to constitute an "action area" for the Project's effects on Indiana bats. An "action area" is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.[2] The action area is not limited to the footprint of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species.

When delineating the action area of the Project, the movement patterns of Indiana bats must be considered. Indiana bats residing in maternity colonies may forage over several miles and often travel miles between roosts and foraging areas. For example, the EIS and associated documents for the I-69 Evansville to Indianapolis project consider the summer action area to be the area within 2.5 miles to either side of the centerline of the highway corridor, and these documents state that this distance corresponds to the average range around maternity colonies in which female adult bats will forage during the summer breeding season. Bats roosting in colonies (and, indeed, any gathering of bats) two to three miles from the Project's turbines potentially will be impacted by those turbines during foraging and gathering movements.

Indiana bats migrating during spring from hibernacula to summer foraging areas and back again in autumn also may come into contact with the Project turbines. Reproductive females may migrate up to 575 km (357 mi) to form maternity colonies to bear and raise their young."[3]

[2] 50 C.F.R. § 402.02.
[3] USFWS, *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision*, April 2007, p. 37.

In addition, both male and female Indiana bats change roost trees and locations throughout the summer,[4] and such movements also may bring bats into the Project.

The Fowler Ridge EIS should evaluate the extent and timing of bat foraging, gathering, migration, and dispersal movements and should analyze how such movements influence the delineation of an "action area" for the Project. The habitat composition and landscape features for the justifiable "action area" of the Project, which is certainly larger than the area "within 0.5 mi (0.8 km) of turbine locations," can then be determined.

II. INDIANA BAT MATERNITY COLONIES, AS WELL AS NON-REPRODUCTIVE FEMALES AND ADULT MALES, SHOULD BE SURVEYED

The Project EIS should describe the results of landscape surveys for Indiana bat maternity colonies and estimate the likelihood that reproductive females and juveniles will interact with Project wind turbines. Even small clumps of trees may house maternity colonies. As the surveys for the I-69 project EISs and Biological Opinions have shown, Indiana bat maternity colonies are widespread throughout Indiana and may not be detected during initial surveys. Several maternity colonies are likely to exist in the "action area" of the Fowler Ridge Project.

The Project EIS should also describe the results of landscape surveys for non-reproductive female bats and male bats, and should estimate the likelihood that these bats will interact with Project wind turbines. Although some Indiana bat bachelor colonies have been observed, males and non-reproductive females typically do not roost in colonies and may migrate long distances to their summer habitat.

III. THE PERCENTAGE OF FORESTED ACRES WITHIN THE ACTION AREA WILL NOT ACCURATELY REFLECT THE LIKELIHOOD OF TAKE

As discussed above, the NOI makes a point of describing the habitat composition of the Project "study area," noting that forested habitat is rare. Although female Indiana bats congregating in maternity colonies may use roost trees or forested areas as a base for foraging

[4] See, for males, *Animal Welfare Institute v. Beech Ridge Energy LLC.*, 2009 U.S. Dist. LEXIS 114267, * 13, _____ F. Supp. 2d _____ (D. Md., December 8, 2009); for females, USFWS, *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision*, April 2007, pp. 46-47, 50-51.

bouts, Indiana bats are likely to be associated also with nonforested areas, especially during migration. Thus, the number of bats contacting wind turbines cannot be predicted from the location or amount of forested areas or roost trees alone, and the EIS should not focus on trees to the exclusion of other habitats. The Project EIS should describe the results of surveys for all Indiana bats and should estimate the likelihood that any Indiana bat – whether foraging, gathering, dispersing, or migrating – will interact with Project wind turbines under various alternatives and scenarios.

IV. THE EIS SHOULD EVALUATE AT LEAST ONE ALTERNATIVE THAT REQUIRES SHUTTING DOWN TURBINES FROM SUNSET TO SUNRISE DURING THE NON-HIBERNATING SEASON

The Service, to issue an ITP, must find that the Project's applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking.[5] This finding typically requires consideration of two factors: adequacy of the minimization and mitigation program, and whether it is the maximum that can be practically implemented by the applicant. Particularly where the adequacy of the mitigation is a close call, the record must contain some basis to conclude that the proposed program is the maximum that can be reasonably required by that applicant. This may require weighing the costs of implementing additional mitigation, benefits and costs of implementing additional mitigation, the amount of mitigation provided by other applicants in similar situations, and the abilities of that particular applicant.[6]

This Project and ITP are but the beginning of a wave of similar projects and ITP applications as wind power development surges forward. The cumulative impact of wind power development is potentially severe for the Indiana bat and other hibernating bats as well as for tree bat species such as the red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).[7] The Service now has an opportunity to ensure that wind power is developed in an environmentally responsible and sustainable manner that is protective of bats and other wildlife.

[5] 16 U.S.C. §1539(a)(2)(B); USFWS, *Habitat Conservation Planning (HCP) and Incidental Take Permit Processing Handbook*, Dec. 4, 1996, pp. 7-3 to 7-4, available at http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm.
[6] HCP Handbook (1996), pp. 7-3 to 7-4.
[7] See, e.g., Paul M. Cryan, *Wind Turbines as Landscape Impediments to the Migratory Connectivity of Bats*, Environmental Law 41, 355–370 (2011).

As the Service suggests, the Project EIS must consider the "Maximally Restricted Operations Alterative," which includes shutting down turbines at night during the period from April 1 through October 31. If other curtailment options – based, for example, on time of day, season, bat activity level, or wind speed – are considered, the EIS should compare information on their effectiveness for minimizing take of bats with the projected benefits of the Maximally Restricted Operations Alterative.

We recognize that the effectiveness of curtailment regimes during prime activity or migration periods is highly uncertain; operational mitigation measures were cited in Appendix 4 of the USFWS Interim Wind Power Guidelines as a subject in need of research.[8] The Project EIS, ITP, and HCP must work with that uncertainty, however, and devise measures likely to be effective. The effectiveness of alternative design and operational measures must be evaluated using the best available data, reasonably obtainable new data developed for this Project, and risk assessments. An EIS should resolve key information gaps where practical and analyze the remaining uncertainties.[9] "The purpose of an EIS is to obviate the need for speculation by insuring that available data are gathered and analyzed prior to the implementation of the proposed action."[10] "Lack of knowledge does not excuse the preparation of an EIS; rather it requires the agency to do the necessary work to obtain it."[11] The Project EIS should analyze existing information, gather new information that is reasonably obtainable, and provide for further gathering of needed information on the effectiveness of curtailment regimes.

V. SETBACKS, ROOST TREE PROTECTION, AND HABITAT PROTECTION AND ENHANCEMENT, BY THEMSELVES, ARE NOT ADEQUATE TO MINIMIZE TAKE

In the NOI, the Service listed some possible mitigation measures to avoid and minimize impacts to Indiana bats, including the impact of lethal take, for this Project:

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[8] USFWS, *Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines*, May 13, 2003, App. 4 (discussing effectiveness of seasonal wind turbine shutdowns at preventing mortalities, including the feasibility of using self-erecting turbines that are easily erected and dismantled without cranes, and taking them down during critical periods such as migrations), available at http://www.fws.gov/habitatconservation/wind.pdf.

[9] See *Nat'l Parks & Conservation Ass'n v. Babbitt*, 241 F.3d 722, 733-35 (9th Cir. 2001) (EIS required where effectiveness of proposed mitigation measures was too uncertain).

[10] *Nat'l Parks*, 241 F.3d at 732 (quoting *Sierra Club v. United States Forest Serv.*, 843 F.2d 1190, 1195 (9th Cir. 1988)).

[11] *Nat'l Parks*, 241 F.3d at 733.

> Any turbine operational management adjustment program is likely to contain various measures to avoid and minimize impacts to Indiana bats, including the impact of lethal take. Various methods that may be considered include, but are not limited to: Protection of roost trees and surrounding habitat, set-back distances from known roost trees, mapping and avoidance of foraging areas, protection and enhancement of Indiana bat habitat outside the project area, various operational adjustments for turbines during prime activity or migration periods, and post-construction monitoring for fatalities.

As discussed above, a criterion for the issuance of an ITP is that the applicant, to the maximum extent practicable, must minimize and mitigate the impacts of taking. The immediate impact of the Project on bats is death or sub-lethal injury. Thus, minimizing such harm to bats requires turbine design and operational standards to avoid exposing bats to harm, restricting siting of turbines away from places that bats visit, or deterring bats from coming within harms way of turbines.

In contrast, protecting tree roosts and surrounding habitat and protecting or enhancing Indiana bat habitat outside the project area do nothing to minimize bat fatalities resulting from contact with turbines. Protecting habitat as "mitigation" for turbine-related fatalities is not like protecting habitat as mitigation for a project's destruction of habitat. The impact of a project that destroys habitat used by a maternity colony may be mitigated to some extent by replacing the destroyed habitat with restored habitat in the colony area. For the Fowler Ridge Project, in contrast, habitat protection does not avoid or minimize the impact of turbine-related fatalities, does not reduce or alleviate that impact over time, and does not replace or provide substitute resources. The only actions that reduce or alleviate the immediate impacts of wind turbines on Indiana bats are those that reduce the risk of harm at the turbines. In fact, protecting tree roosts and habitat within the action area may have the perverse effect of increasing interactions of bats with turbines.[12]

Moreover, protecting tree roosts and surrounding habitat, and establishing setbacks from tree roosts or maternity colonies, do not minimize harm to Indiana bats that are passing through the Project area while migrating to and from hibernacula or while moving among different foraging and roosting locations. Habitat protections and setbacks to roost trees also will be

[12] As we noted in prior comments on an Ohio wind facility, removing tree roosts and bat habitat from the action area is not a solution to turbine-related mortality either. The point is that manipulating habitat in either direction is not likely to be useful for minimizing and mitigating take due to contact with turbines.

largely ineffective if the bats are attracted to wind turbines, a hypothesis discussed by Cryan and Barclay.[13]

Protection and enhancement of Indiana bat habitat outside the project area may, however, compensate for the population-level effect (loss of abundance and reproductive potential) of individual bat fatalities, but only if such habitat measures increase reproductive output or reproductive success.[14] The Project EIS should present any available data on such compensatory effects in the Indiana bat, if expected, and should carefully analyze the possibility of such effects. It cannot be assumed that protection and enhancement of Indiana bat habitat outside the Project area will compensate for population-level impacts of wind turbine mortality.[15]

Moreover, how bat presence and mortality are related to landscape and habitat features is highly uncertain. The Service has recently stated that there is "currently no reliable method for determining or evaluating the relative value of [different] areas as summer habitat for the Indiana bat."[16] Thus, attempting to mitigate for mortality (or even habitat loss) in one area with increased protection of another area will require detailed analysis in the Project EIS.

VI. CUMULATIVE IMPACTS OF RAPID WIND POWER GROWTH AND OTHER DEVELOPMENT IN THE RANGE MUST BE CAREFULLY ANALYZED AND MINIMIZED

The Service recognizes that further information and analysis is needed regarding the cumulative impact of past, present, and future wind developments.[17] Individual impacts may appear small but, combined with other small projects, may collectively have significant impacts. In general, there is growing concern in the scientific community regarding the potential for bat kills and population declines given the rapid proliferation of wind power facilities and the large-scale mortality that has occurred at some facilities.

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[13] Cryan, P. M. and R. M. R. Barclay, *Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions*, J. Mammalogy 90(6), 1330–1340 (2009); see also Paul M. Cryan, *Wind Turbines as Landscape Impediments to the Migratory Connectivity of Bats*, Environmental Law 41, 355–370 (2011). Bats may be attracted to wind turbines, to insects swarming around lighting, or to other features on the Project.

[14] See, e.g., McGowan C.P., Ryan M.R., Runge M.C., et al., *The Role of Demographic Compensation Theory in Incidental Take Assessments for Endangered Species*, Biological Conservation 144(2), 730–737 (2011); McGowan C.P. and Ryan M.R., *A Quantitative Framework to Evaluate Incidental Take and Endangered Species Population Viability*, Biological Conservation 142(12), 3128–3136 (2009).

[15] See references in note 14.

[16] 72 Fed. Reg. 9916, *Endangered and Threatened Wildlife and Plants; 90-Day and 12-Month Findings on a Petition To Revise Critical Habitat for the Indiana Bat* (March 6, 2007).

[17] See, e.g., USFWS, *Indiana Bat Draft Recovery Plan* (2007), p. 101.

"Cumulative impact" is defined in NEPA as "the impact on the environment [that] results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."[18] Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts are thus the total effect, including both direct and indirect effects, on a given resource (in this case the endangered Indiana bat), of all actions taken, no matter who has taken the actions (federal, nonfederal, and private).[19]

The CEQ advises that when analyzing the contribution of the proposed action to cumulative effects, the geographic boundaries of the analysis should be conducted at the scale of human communities, landscapes, airsheds, watersheds, or eco-regions.[20] Generally, the NEPA analyst must determine the geographic areas occupied by the affected resources outside of a project impact zone, and in most cases "the largest of these areas will be the appropriate area for the analysis of cumulative effects."[21] For example, for migratory wildlife the appropriate geographic scale of analysis would be the breeding grounds, migration route, wintering areas, and total range of affected population units.[22]

Other sources of direct and indirect mortality for Indiana bats, besides wind power projects, include those listed in the 2007 Indiana bat draft recovery plan: quarrying and mining operations (summer and winter habitat), loss/degradation of summer/migration/swarming habitat, loss of forest habitat connectivity, some silvicultural practices and firewood collection, disease and parasites (e.g., White-Nose Syndrome), predation, competition with other bat species, environmental contaminants (not just "pesticides"), climate change, and collisions with man-made objects (communication towers, airstrikes with airplanes, and roadkill).[23] Human

[18] 40 C.F.R. § 1508.7.
[19] Council on Environmental Quality (CEQ), *Considering Cumulative Effects Under the National Environmental Policy Act*, January 1997, p. 8, available at http://ceq.hss.doe.gov/nepa/ccenepa/ccenepa.htm.
[20] CEQ (1997), p. 12-14.
[21] CEQ (1997), p. 15.
[22] See, e.g., *NRDC v. Hodel*, 865 F.2d 288, 297-300 (D.C. Cir. 1988) (requiring the Secretary of Interior to analyze the cumulative effects of offshore drilling near California and Alaska together because whales and salmon would pass through both project drilling areas in the normal course of migration).
[23] USFWS, *Indiana Bat Draft Recovery Plan* (2007); USFWS, *Indiana Bat (Myotis sodalis) 5-Year Review: Summary and Evaluation*, September 2009, pp. 13-14.

disturbance at hibernacula also is still an important threat to Indiana bats.[24] Furthermore, the impacts of WNS may mask population declines resulting from projects and these other sources.

This Project EIS is a golden opportunity to evaluate such cumulative impacts. The cumulative impacts of the numerous threats to Indiana bats throughout their range are highly uncertain and must be evaluated using the best available data, reasonably obtainable new data developed for this Project, and risk assessments. As the Service states, "significant information gaps remain regarding the species' ecology that hinder sound decision-making on how best to manage and protect the species."[25] The Project EIS should adequately study and discuss the relevant information gaps, should resolve key information gaps where practical, and should analyze the remaining uncertainties.[26]

VII. THE PROJECT EIS SHOULD ANALYZE THE POSSIBILITY THAT WNS-INDUCTED BEHAVIORAL CHANGES MAY INCREASE BAT FATALITIES AT TURBINES

The effects of White-nose Syndrome (WNS) on Indiana bats may be synergistic with impacts of wind turbines. For example, behavioral changes attributed to WNS include arousal from hibernation more frequently and/or for longer periods than normal; shifts of large numbers of bats in hibernacula to locations near the entrances or unusually cold areas; large numbers of bats dispersing during the day from hibernacula, even during mid-winter; a general unresponsiveness to human disturbance; and, disruption of important wing-dependent physiological functions, including inhibition of flight.[27] Such behavioral changes may increase the vulnerability of bats to wind turbine fatality. Such synergistic effects may be exacerbated if Indiana bats are attracted to turbines.[28] The EIS should consider such potential effects of WNS on turbine-related risk.

[24] USFWS, *Indiana Bat 5-Year Review* (2009), p. 15.
[25] USFWS, *Indiana Bat Draft Recovery Plan* (2007), p. 8; see also USFWS, *Indiana Bat 5-Year Review* (2009).
[26] See *Nat'l Parks*, 241 F.3d at 733-35.
[27] USFWS, *A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats*, May 2011, available at http://www.fws.gov/WhiteNoseSyndrome/pdf/WNSnationalplanMay2011.pdf.
[28] See references in note 13.

Thank you for considering our comments.

Sincerely,

/s/ Jeffrey B. Hyman, Ph.D., J.D.
Staff Attorney
Conservation Law Center
116 S. Indiana Ave.
Bloomington, Indiana 47408
jbhyman@indiana.edu

"Jim"
<jim_pairitz@yahoo.com>

06/23/2011 11:53 PM

To: <FowlerRidgeHCP@fws.gov>
cc:
Subject: Fowler Ridge Habitat Conservation Plan Comment

I support the Maximally Restricted Operations alternative because it will provide the most protection for a valuable endangered species against the destructive (economically as well as environmentally) impact of the massive number of wind turbines in the Fowler Ridge development.

Maximally Restricted Operations Alternative

Under the Maximally Restricted Operations Alternative, an ITP would be issued; Phases I, II and III would continue to operate; and Phase IV would be constructed as described under Proposed Action—i.e., full build-out of up to 448 turbines. Minimization for potential impacts to Indiana bats would include shutting down turbines at night during the period from April 1 through October 31, the active period for Indiana bats. This minimization would occur during all four phases of the project, every year the FRWF is in operation.

A clear understanding of the cost / benefit of any change to the environment needs to be carefully considered. I believe the overall economic benefit of the Indiana bat is far greater than the contribution of Wind Technology. In fact, I believe Wind technology will ultimately prove to be a detriment to the economy of the United States as it has for countries around the world. The cost of electric energy will inevitably increase as the amount of wind energy is forced onto the electrical grid and into our homes. I believe the quality of life for both animals and humans living within the development will be reduced.

Keeping the Indiana Bat a viable species will be of a greater benefit than wind, and unlike wind, bats have no significant detriment to man or the environment. As a professional engineer who has been investigating the pros and cons of wind technology I have come to the conclusion that wind is bad for America for many reasons. Here are just a few negatives of Wind Energy. It is neither clean nor green.

1. Other forms of energy production will create less destruction of habitat and animals than wind. Thousands of birds / bats have been killed by Wind Turbines whereas other forms of energy production have not.
2. Wind systems do not reduce CO2 as fossil fuel systems are needed to provide consistent and reliable power when the wind is not blowing. Ramping fossil fuel system up and down to track the erratic supply of power delivered by wind causes increased CO2 emissions that are greater than the CO2 savings generated when the wind is blowing.
3. Wind systems require subsidies far greater than any other energy source even though it is a "mature" technology used for over 20 years around the globe. Without these subsidies and Renewable energy standards that force people to pay a premium for electricity generated by wind, the entire industry would fold. This statement has been made by several wind proponents at several wind conferences to encourage attendees to lobby for both items.
4. Wind systems are just distributed power plants that suck up hundreds of thousands of acres of land and are not Ag compatible. The development is detrimental to the soil via compaction and disturbance of large volumes of prime farm ground.

The Indiana bat is 100 % compatible with Agriculture and is of great benefit to it. Wind Turbines are not and should take a back seat to the benefits provided by nature at no cost to us. I believe wind turbines will be extinct in the future as the reality of their many negative impacts are fully understood. I only hope the Indiana Bat can survive until that happens.

Finally, the pressure being applied to this species by many existing factors is leading to a rapid decline in population. Adding the killing that is guaranteed to occur due to the rapid installation of hundreds of these machines all over the country side could be the straw that puts the Indiana bat out of existence. This guaranteed "take" will be operating for at least 30 years – what a destructive thing to do to man and the environment.

Sincerely

Jim Pairitz PE

765 491 0619 Cell
765 275 2553 Home

8323 W 1200 S
Westpoint, IN 47992

Kay Pairitz
<kaypairitz@gmail.com
>

06/23/2011 11:49 PM

To: "FowlerRidgeHCP@fws.gov" <FowlerRidgeHCP@fws.gov>
cc: kaypairitz@gmail.com
Subject: EIS comments

Mr. Scott Pruitt,
U.S. Fish and Wildlife Service,
I am writing concerning the Fowler Ridge Wind Farm – Indiana Bat HCP. My general comments regarding wind energy and the killing of bats and particularly the endangered species:
Wind turbines have been used for many years now and it is a known fact that they kill bats. I know that the killing of bats is "incidental" to the process of generating electricity with the wind turbines. But with the knowledge now that bats will be killed, why is the developer even allowed to erect a turbine in the area? When a developer puts up that turbine he is setting a trap because he knows full well that he will kill bats. To me, this is wrong and a developer should not even be allowed to erect turbines in an area where it is a known fact that bats will be killed or harmed.
The amount of electricity that is produced from a turbine is so small and insignificant. It has never been proven that wind energy reduces CO2 emissions. Wind energy is not worth ruining a valuable part of our ecosystem! Bats are an important part of our ecosystem, more important than the perceived benefit of wind energy. Why be allowed to kill off one important part of the ecosystem that we know is very beneficial just for the so called "perceieved benefit" of wind energy? We know that wind energy is a very inefficient form of energy. Keeping the bats alive is more important than having wind turbines! Keeping the Indiana bat alive is more important than wind turbines! Also, I think that wind developers are taking advantage of the incidental take permit process. Wind turbine developments keep killing bats over and over again. It is not like building a bridge once and being done with the killing.
My comments specific to the Fowler Ridge development: I understand that three phases are already built. I understand that the Indiana bat has been found dead in the project site. Why is phase four even being allowed to be built? How many bats will they be allowed to kill with the ITP? What percent is OK to take as the population continues to decrease? As the number of the IN bat drops, the value of each individual bat increases. Every kill becomes more significant and has a bigger impact. When do we say enough killing is enough? The proposed action is the Modified Operations Alternative. In this section the second sentence states "The proposed HCP, which must meet the requirements.....etc....to the maximum extent practicable. My question and concern is "what is the maximum extent practicable and who determines this?" I do not think the Modified Operations Alternative is a strong enough action.
I think the Maximally Restricted Operations Alternative is the action that needs to be implemented. This is the stronger action that will do the most to avoid taking of the IN bat not just minimize impacts.
We are talking about a wind project in the state of Indiana. Indiana is located within the core of the species' range; approximately half of the known population of Indiana bats hibernate in Indiana. Maternity colonies of Indiana bats occur throughout Indiana. We are <u>the home state</u> for the Indiana bat. If we don't do everything to the maximum extent possible to protect the Indiana bat here in this state why should other localities and states be expected to protect the Indiana bat??? Let's set the example and do things right and that means being strict with the rules and regulations.
Thank you for the opportunity to comment on the Fowler Ridge project.

Kay Pairitz
8323W 1200S
West Point, IN 47992

Julie Peretin
<julie.peretin@gmail.com>

06/21/2011 11:46 AM

To: FowlerRidgeHCP@fws.gov
cc:
Subject: Comments on Fowler Ridge Habitat Conservation Plan

Comments on Fowler Ridge Habitat Conservation Plan:

Bats, including the endangered Indiana Bat, are responsible for billions of dollars in agriculture benefits according to the April 2011 edition of Science. Fewer bats in agricultural areas will lead to more pesticide use. Conservation of wildlife, particularly the endangered Indiana Bat, is vital to protect and preserve our fragile existence with the land that supports our life.

The cumulative impact of White Nose Syndrome and Industrial Wind Turbines is unacceptable. We must take all reasonable action as stewards of the land to protect and conserve the existing species. Industrial wind energy provides modest economic impacts to Benton County, but the promises of money will not protect the delicate balance between wildlife and human activity. Industrial Wind Turbines do not create CO2 emissions when they are operated, but the construction of each tower includes the use of over 300 tons of concrete; Portland cement is responsible for at least 10% of the US CO2 emissions. Industrial Wind Turbines do not require large amounts of water to operate, but the manufacture of the specialized magnets in each turbine includes over 2 tons of rare earth minerals which are destructively mined and processed in China.

Industrial Wind Energy does not replace other energy producers, either. Wind Energy usually offsets natural gas--which does not produce CO2--and has little to no impact on coal usage. Industrial Wind Energy is not a reliable energy source. Energy from Industrial Wind Turbines is "noise" on the electrical grid. Such an immature technology propagated in areas that have marginal wind resource--like Indiana--is an affront to environmental and conservation groups.

Industrial Wind Energy is clearly not the answer to our nation's energy needs and should not be given preference in its willing and unrepentant take of bats and birds. Industrial Wind Energy is being exposed as a environmentally irresponsible activity. Please protect our wildlife from this menace. The Fowler Ridge Habitat Conservation Plan will set a pattern for wind developers across the nation as they prey on unsuspecting communities.

The miniscule electrical output of the wind development will not come close to offsetting the benefits that bats provide to Midwestern ecosystems. I fully support the maximally restricted operations alternative in order to protect the Indiana Bat. In addition to curtailment of operations during migration periods, I hope you will provide guidelines for creating or enhancing Indiana Bat habitat. Please consider requiring long-term (15-20 year) mortality studies to provide research opportunities on the long-term impact to bat populations. I am afraid the decline of bat populations in areas industrialized by wind energy will happen on a greater scale (with a steeper trajectory) than is recognized at this time.

Thank you for the opportunity to comment.
Julie Peretin

505-13 Portledge Commons Drive
Lafayette, IN 47904
765.491.9721
--

Facts do not cease to exist because they are ignored. -- Aldous Huxley

mdr6001@aol.com

06/22/2011 09:00 PM

To: fowlerridgehcp@fws.gov
cc:
Subject: Fowler Ridge HCP comment

TO: Scott Pruitt

Mr. Pruitt,

I feel very strongly that the conservation of the endangered Indiana Bat must be of utmost importance. This means the ultimate goal should be that not even one Indiana Bat is taken (even incidentally). There really should be protection for all bats.

The alternative in which the operation of all towers is maximally restricted would hopefully achieve this goal. I strongly support this alternative in which all towers are shut down at night April 1 thru October 31, when the Indiana Bat is active.
Thank you.

Sincerely,

Lori Russell

"Mark Russell (Frank)"
<Markr@cbpmail.net>

06/23/2011 01:05 PM

To: "FowlerRidgeHCP@fws.gov" <FowlerRidgeHCP@fws.gov>
cc:
Subject: Public comments

Mr. Pruitt- thanks for the opportunity to comment. I want to say that being “green and renewable” needs to pertain to being “green’ to wildlife as well as to the atmosphere. The indiscriminate killing of wild life must be curtailed. Unlike hunting licenses the take permit does not have a daily bag limit. The impact of long term kill rates is only a guesstimate. Wind energy is not the cure all and mandatory regulations need to be put into place to protect all avian species. Thanks for your efforts in this matter.

Mark Russell
6001 Maple Forest Road
West Point IN 47992

Mark D. Russell
Custom Building Products-Frankfort Plant
Quality Control Manager
Frankfort, Indiana 46041
765-656-0234 ext.236

"John Shure"
<eldadhannah@cawi.org>

06/23/2011 06:04 PM

To: <FowlerRidgeHCP@fws.gov>
cc:
Subject: Fowler Ridge Wind Farm and Indiana Brown Bat

I wish to submit the following comments regarding allowing the Fowler Ridge Farm to operate in area inhabited by the Indiana Brown Bat, a legally protected and endangered species. These bats are in danger of extinction due to white nose syndrome and wind farm kills. The bats have proven to be extremely valuable to agriculture production through feeding on insects that otherwise would reduce crop harvest, etc. It seems that allowing the Fowler Ridge Wind Farm to operate and kill these bats is against the principles of the endangered species act and defeats its purposes. I urge that the application for the Fowler Ridge Wind Farm be denied. Respectfully submitted. John Shure, 044 E 900 North Road, Buckley, IL 60918. Telephone: 630-774-7511

liz switzer
<switzer.liz@gmail.com
>

To: FowlerRidgeHCP@fws.gov
cc:
Subject: Fowler Ridge questions

05/31/2011 08:51 AM

Mr. Pruitt,

I am a journalist for a renewable energy newsletter and I am doing an article on Fowler Ridge. Can you give me a statement as to how many bats have been killed? What is the scope of the problem, and how big will the expansion of the wind farm be?
Also, how long does this incidental take permit process take and could the farm possibly be closed down due to the bat issue?

Thanks very much,

--
Liz Switzer

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Liz@reNewsAmericas.com

jvancamp@tc3net.com
06/22/2011 09:59 PM

To: FowlerRidgeHCP@fws.gov
cc:
Subject: Comments on Fowler Ridge Habitat Conservation Plan

USFWS,

Wind energy should NOT come at the expense of bats and the benefits they provide. Wind turbine are generally less productive in the midwest during the summer months, therefore I support the adaptation of the maximally restricted operations alternative so that the bats and the turbines can co-exist.

Maximally Restricted Operations Alternative

Under the Maximally Restricted Operations Alternative, an ITP would be issued; Phases I, II and III would continue to operate; and Phase IV would be constructed as described under Proposed Action.i.e., full build-out of up to 448 turbines. Minimization for potential impacts to Indiana bats would include shutting down turbines at night during the period from April 1 through October 31, the active period for Indiana bats. This minimization would occur during all four phases of the project, every year the FRWF is in operation.

Thank you receiving my comment.

Josh Van Camp
3883 Fike Rd
Jasper, MI 49248

517-443-5935
jvancamp@tc3net.com

Appendix C Agency Coordination

DNR Indiana Department of Natural Resources

Mitchell E. Daniels, Jr., Governor
Kyle J. Hupfer, Director

Division of Nature Preserves
402 W. Washington St., Rm W267
Indianapolis IN 46204-2739

September 22, 2006

Ms. Victoria Poulton
West, Inc.
2003 Central Avenue
Cheyenne, WY 82001

SEP 26 2006

Dear Ms. Poulton:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas documented from wind energy project area, Benton County, Indiana. The Indiana Natural Heritage Data Center has been checked and enclosed you will find information on the ETR species documented from the project area.

For more information on the animal species mentioned, please contact Katie Smith, Nongame Supervisor, Division of Fish and Wildlife, 402 W. Washington Room W273, Indianapolis, Indiana 46204, (317)232-4080.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. You should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service
620 South Walker St.
Bloomington, Indiana 47403-2121
(812)334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal. For more information, please contact:

Kyle Hupfer, Director
Department of Natural Resources
attn: Christie Stanifer
Environmental Coordinator
Division of Water
402 W. Washington Street, Room W264
Indianapolis, IN 46204
(317)232-4160

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Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)232-8059 if you have any questions or need additional information.

Sincerely,

Ronald P. Hellmich

Ronald P. Hellmich
Indiana Natural Heritage Data Center

enclosure: data sheet
invoice

**** *Effective January 1, 2006, the Indiana Natural Heritage Data Center, Indiana Department of Natural Resources will be raising the fee for information requests to $42 per one half hour, one half hour minimum. Most requests take one half hour to complete. An invoice for the amount due will be included with the completed request response.*

Endangered, Threatened and Rare Species, and High Quality Natural Communities documented from a proposed wind energy facility, Benton County, Indiana

SPECIES NAME	COMMON NAME	FED	STATE	TOWN RANGE	DATE	MISCCOMMEN
Ixobrychus exilis	Least Bittern		SE	026N008W 34	1988-06	
Rallus elegans	King Rail		SE	026N008W 34	1988-06	
Bartramia longicauda	Upland Sandpiper		SE	025N008W 07	1988-06-15	
Bartramia longicauda	Upland Sandpiper		SE	025N007W 07	1997-06-10	
Tyto alba	Barn Owl		SE	024N006W NEAR OTTERBEIN	1958-06-30	
Asio flammeus	Short-eared Owl		SE	025N008W 30	1988-05-03	
Sturnella neglecta	Western Meadowlark		SSC	024N008W 30	1997-06-10	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	024N007W 9	2001	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	024N006W 29 SEQ	1994-06-02	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N009W 12 EH NEQ	1987-08-18	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N008W 23	1987-08-24	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N009W 34	1981	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	024N006W 36 SWQ SEQ	1986-07-22	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N008W 08 NEQ	1986-06-03	
Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N009W 32 NWQ NEQ	1987-08-07	
Geomys bursarius	Plains Pocket Gopher		SSC	024N007W 05	1988-10-10	
Geomys bursarius	Plains Pocket Gopher		SSC	025N008W 25 NWQ SEQ SEQ	1988-07-29	
Geomys bursarius	Plains Pocket Gopher		SSC	026N008W 34 NWQ SWQ NWQ	1988-07-05	
Mustela nivalis	Least Weasel		SSC	025N007W 31 NWQ NWQ	1988-05-07	
Taxidea taxus	American Badger			025N008W 23 SEQ SEQ SEQ	1988-11-05	
Taxidea taxus	American Badger			025N009W 12	2004-11-19	
Taxidea taxus	American Badger			024N006W 28	2004-11-12	
Emydoidea blandingii	Blanding's Turtle		SE	025N009W 4 MI W OF FOWLER	NO DATE	
Liochlorophis vernalis	Smooth Green Snake		SE	025N007W 07	1973	
Liochlorophis vernalis	Smooth Green Snake		SE	025N008W 23 NWQ SEQ	1988-07-07	
Liochlorophis vernalis	Smooth Green Snake		SE	024N006W 1/2 MI W-NW OF OTTERBEIN	1975	
Prairie - mesic	Mesic Prairie		SG	025N008W	NO DATE	
Venustaconcha ellipsiformis	Ellipse		SSC	025N009W 10	2001-09-25	Fresh dead
Liatris pycnostachya	Cattail Gay-feather		ST	025N008W 05 SWQ	1938-08-13	
Liatris pycnostachya	Cattail Gay-feather		ST	025N008W 26 NEQ	1981-09	
Prenanthes aspera	Rough Rattlesnake-root		SR	025N008W 16 SEQ SEQ	1928-09-20	
Aster sericeus	Western Silvery Aster		SR	025N008W 05 SWQ	1938-09	
Gentiana puberulenta	Downy Gentian		ST	025N008W FOWLER	NO DATE	

Fed: LE = listed federal endangered; C = federal candidate species

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SG = state significant; WL = watch list; no rank = not ranked but tracked to monitor status

Grank: Heritage Global Rank: G1 = critically imperiled; G2 = imperiled; G3 = rare or uncommon; G4 = widespread but with long term concerns; G5 = widespread and secure; GU = unranked

Srank: State Heritage Rank: S1 = critically imperiled; S2 = imperiled; S3 = rare or uncommon; S4 = widespread but with long term concerns SNR = not ranked; B = breeding rank; SNA = not resident in state in non-breeding season

Endangered, Threatened and Rare Species, and High Quality Natural Communities documented from a proposed wind energy facility, Benton County, Indiana

SPECIES NAME	COMMON NAME	FED	STATE	TOWN RANGE	DATE	MISCCOMMEN
Agalinis auriculata	Earleaf Foxglove		ST		1930-09-12	
OTTERBEIN HIGHWAY PRAIRIE MANAGEMENT AREA						
Camassia angusta	Wild Hyacinth		SE	024N006W 29 SEQ NEQ SWQ & NWQ SWQ SEQ	1992-06-09	

Hawkins Gamebird Habitat Area (IDNR Fish & Wildlife)	Sec 29 T26N R8W
Knob View Gamebird Habitat Area (IDNR Fish & Wildlife)	Sec 12 T24N R10W
Watland Gamebird Habitat Area (IDNR Fish & Wildlife)	Sec 7 T25N R8W
Falwell Gamebird Habitat Area (IDNR Fish & Wildlife)	Sec 30 T26N R7W
Kirsch Gamebird Habitat Area (IDNR Fish & Wildlife)	Sec 4 T24N R9W
Fowler Highway Management Area (INDOT & IDNR Nature Preserves)	Sec 22, 23, 25, 26 T25N R8W

Fed: LE = listed federal endangered; C = federal candidate species

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SG = state significant; WL = watch list; no rank = not ranked but tracked to monitor status

Grank: Heritage Global Rank: G1 = critically imperiled; G2 = imperiled; G3 = rare or uncommon; G4 = widespread but with long term concerns; G5 = widespread and secure; GU = unranked

Srank: State Heritage Rank: S1 = critically imperiled; S2 = imperiled; S3 = rare or uncommon; S4 = widespread but with long term concerns SNR = not ranked; B = breeding rank; SNA = not resident in state in non-breeding season

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

October 13, 2006

OCT 24 2006

Ms. Victoria Poulton
WEST, Inc.
2003 Central Avenue
Cheyenne, Wyoming 82001

Dear Ms. Poulton:

Thank you for your letter dated September 18, 2006 concerning a proposed wind energy project near Fowler, Benton County, Indiana. The transmission route study area also includes a small portion of Tippecanoe County along the U.S. 52 Highway corridor.

These comments are being provided pursuant to the Endangered Species Act (ESA), the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Fish and Wildlife Act of 1956. This information is being provided to assist you in making an informed decision regarding site selection, project design, compliance with applicable laws, and to determine whether a permit to cover anticipated take of species is appropriate under the ESA.

The Fish and Wildlife Service (Service) supports the development of wind power as an alternative energy source, however, wind farms can have negative impacts on wildlife and their habitats if not sited and designed with potential wildlife and habitat impacts in mind. Selection of the best sites for turbine placement is enhanced by ruling out sites with known high concentrations of birds and/or bats passing within the rotoswept area of the turbines or where the effects of habitat fragmentation will be detrimental. In support of wind power generation as a wildlife-friendly, renewable source of power, development sites with comparatively low bird, bat and other wildlife values, would be preferable and would have relatively lower impacts on wildlife.

THREATENED AND ENDANGERED SPECIES

The area described in your letter is within the range of the Federally endangered Indiana bat (*Myotis sodalis*), the Federally threatened bald eagle (*Haliaeetus leucocephalus*), and a Non-Essential, Experimental population of whooping cranes (*Grus americana*).

The Indiana bat uses woodlands during the summer when maternity colonies occupy trees with loose bark for roosting. These bats forage primarily over wooded stream corridors, although they have been collected in grazed woodlots, mature deciduous forests, and pastures with trees. There are no records of the Indiana bat in Benton County however we are not aware of any surveys conducted in that county. The Indiana bat has been found in adjacent Warren County (along Big Pine Creek and Little Pine Creek), Tippecanoe County (Wabash River and Indian Creek) and Newton County (Kankakee River). Bats in general have been the focus of several recent studies with regard to impacts from wind turbines and mortality appears to be highest during the fall migration period (Johnson et al. 2003). Based on a desktop review of aerial photographs, topographic maps, and other information, there does not appear to be much suitable summer bat habitat within the project area; however, spring and fall migration routes could include areas of Benton County.

Eagles nest in close proximity to lakes, rivers, or reservoirs. They construct their nests near habitat ecotones, such as lakeshores, rivers, and timber management areas (clearcuts or selective cuts). Tolerance of human activity during the nesting season has been variable, but, ideally, human disturbance of eagles should be avoided. The bald eagle's food base from the watershed includes carrion, waterfowl, and especially fish. There are no records for the bald eagle in Benton County but there are currently 2 nests in Tippecanoe County and a new nest in Newton County.

The eastern population of the whooping crane was reintroduced into the Midwest in 2001 and made its first migration to wintering sites in Florida following an ultralight aircraft. The birds make several stops along their fall migration route through Indiana, often including Benton County. The cranes utilize a variety of habitats during migration including croplands, marshes, and riverine areas. The birds stand up to five feet tall and have snowy white body feathers with black wingtips. The head is red and black with a long, pointed beak. The eastern population was listed as a non-essential, experimental population under the Endangered Species Act of 1973 (as amended). This designation relaxes the restrictions of the Endangered Species Act and lessens possible conflicts between people and whooping crane conservation. Whooping cranes are still fully covered under the Migratory Bird Treaty Act, as are most migratory birds.

Tippecanoe County has populations of two federally endangered Unionid mussels, the clubshell (*Pluerobema clava*) and fanshell (*Cyprogenian stegaria*). Both species are in the Wabash and Tippecanoe Rivers upstream from Lafayette and are not likely to occur in the transmission route study area.

Because of the potential for wind power projects to impact endangered bird, bat, or other listed species, they are subject to the Endangered Species Act (16 U.S.C. 1531-1544) section 9 provisions governing "take", similar to any other development project. Take incidental to a lawful activity may be authorized through the initiation of formal consultation, if a Federal agency is involved. If a Federal agency, Federal funding, or a Federal permit are not involved in the project, an incidental take permit pursuant to section 10 (a)(1)(B) of the ESA may be obtained upon completion of a satisfactory habitat conservation plan for the listed species. However, there is no mechanism for authorizing incidental take "after-the-fact".

OTHER SPECIES OF CONCERN

In addition to the above mentioned species, upland sandpipers (*Bartramia longicauda*), Franklin's ground squirrels (*Spermophilus franklinii*) and other species listed as endangered or special concern by the State Of Indiana may potentially be found near the area. Upland sandpipers are migratory birds that favor grasslands, pastures, and fields in early successional stages. They nest in loose colonies in taller vegetation and feed on insects, seeds of grasses and forbs, as well as waste grains (Castrale et al. 1998). Franklin's ground squirrels are burrowing animals that prefer dense grass/weed habitat which provides good cover. Some of the best remaining habitat may be along railroad embankments. This species feeds primarily on vegetable matter (although insects are sometimes eaten) and hibernates for several months (Mumford and Whitaker 1982). Both species have been recorded near the proposed project area. These animals are not afforded legal protection under the authorities of the federal Endangered Species Act (as amended); however, because they are State Endangered species the FWS encourages consideration of these species in project planning. We recommend that you consult with the Indiana Department of Natural Resources (IDNR) for more information regarding wildlife species and natural resources of interest to the State that may occur within the study area.

MIGRATORY BIRDS

The two primary types of wind turbine impacts to migratory birds (and bats) are direct mortality from collisions and indirect impacts from habitat avoidance, disruption and displacement. For these reasons, site selection and evaluation are extremely important. The study area near Fowler appears to be primarily comprised of agricultural row crops, although several small wetlands and areas of grassland/pasture (including several managed areas and Heritage Data Base records) may be present based on a "desktop" review of digital/GIS data. Since some data layers are over 10 years old, field verification may be necessary. These small, isolated areas of grassland and pasture may provide the only remaining habitat for sensitive grassland species, such as Henslow's sparrows, grasshopper sparrows, and upland sandpipers (Jeff Kiefer pers. comm.), as well as habitat for more common migratory grassland species such as dickcissels and eastern meadow larks (Castrale et al. 1998 and Dunning, Jr. and Braile 1998). Additionally, the transmission route study corridor crosses Big Pine Creek and 2 headwater tributaries of Indian Creek containing several wetlands.

The Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. Bald and golden eagles are afforded additional legal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Unlike the Endangered Species Act, neither the MBTA nor its implementing regulations at 50 CFR Part 21, provide for permitting of "incidental take" of migratory birds.

While the MBTA has no provision for allowing unauthorized take, the Service recognizes that some birds may be killed at structures such as wind turbines even if all reasonable measures to avoid it are implemented. While it is not possible under the MBTA to absolve individuals, companies, or agencies from liability if they follow these recommended guidelines, the Service's

Office of Law Enforcement and Department of Justice have used enforcement and prosecutorial discretion in the past regarding individuals, companies, or agencies who have made good faith efforts to avoid the take of migratory birds.

The Service's "voluntary" Interim Guidelines on Avoiding and Minimizing Impacts from Wind Turbines may be helpful as you evaluate your proposed wind power generation site (http://www.fws.gov/habitatconservation/wind.htm) (attached). The guidance contains a pre-development site evaluation and ranking process to assess potential project impacts, as well as recommendations for conducting post-construction monitoring. The guidance also contains more information on the applicable laws and permitting aspects in Appendices 3 and 5. Service staff welcome the opportunity to work with representatives of your industry.

Finally, we recommend that you contact the Indiana Department of Natural Resources, Division of Nature Preserves, and Division of Fish and Wildlife concerning possible State-listed species and other state resource concerns. Their addresses are:

Indiana Department of Natural Resources
Division of Nature Preserves
402 West Washington, Rm W267
Indianapolis, Indiana 46204

Indiana Department of Natural Resources
Division of Fish & Wildlife
402 West Washington, Rm W273
Indianapolis, Indiana 46204

Thank you for the opportunity to provide comments on your wind-power project. If we can be of further assistance during the design and implementation of your project, please contact Mike Litwin of my staff at (812) 334-4261 ext. 205.

Sincerely,

for Scott Pruitt,
Field Supervisor

cc: Katie Smith, Division of Fish and Wildlife, IDNR, Indianapolis, IN
John Castrale, Division of Fish and Wildlife, IDNR, Mitchell, IN

References

Castrale, J.S., E.M. Hopkins, and C.E. Keller. 1998. Altas of Breeding Birds of Indiana. Indiana Department of Natural Resources, Division of Fish and Wildlife, Indianapolis. 388pp.

Dunning Jr., J.B. and T.M. Braile. 1998. Checklist of the Birds of Benton County, Indiana. Department of Forestry and Natural Resources, Purdue University, Lafayette, IN. Internet format at http://www.ces.purdue.edu/extmedia/FNR/FNR-165/FNR-165.html

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.S. Sarappo. 2003. Mortality of Bats at a Large-scale Wind Power Development at Buffalo Ridge, Minnesota. American Midland Naturalist 150:332-342.

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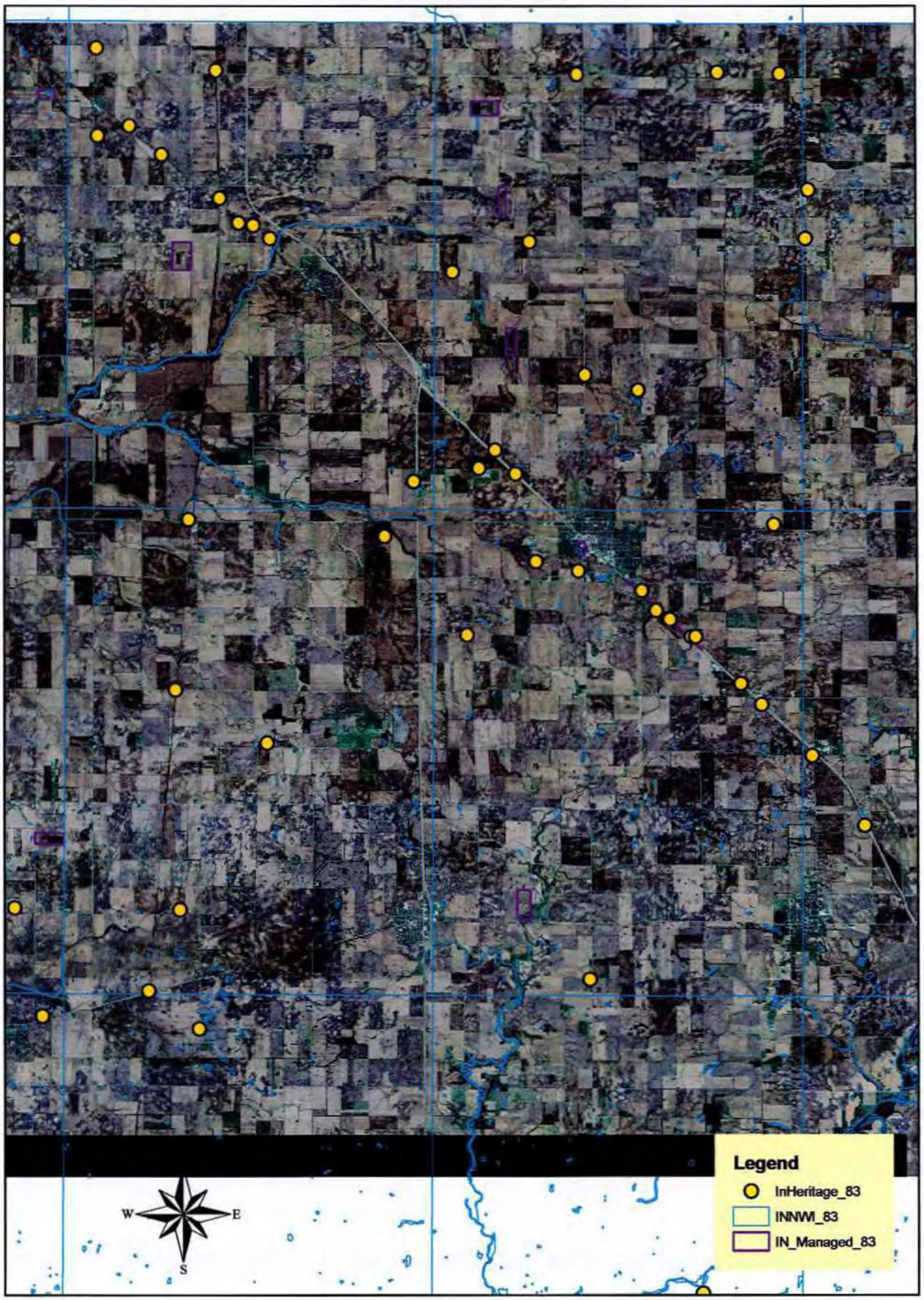
Mumford, R.E., and J.O. Whitaker. 1982. Mammals of Indiana. Indiana University Press, Bloomington, Indiana. 537pp.

Fowler Wind Project Study Area



THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Water

DEC 18 2006

Early Coordination/Environmental Assessment

DNR #: ER-12409 **Request Received:** September 20, 2006

Requestor:
Western EcoSystems Technology, Inc
Victoria Poulton
Biologist
2003 Central Avenue
Cheyenne, WY 82001

Project: Proposed wind energy facility, Town of Fowler

County/Site info: Benton - Tippecanoe Counties

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

Regulatory Assessment: This proposal may require the formal approval of our agency pursuant to the Flood Control Act (IC 14-28-1) for any proposal to construct, excavate, or fill in or on the floodway of a stream or other flowing waterbody which has a drainage area greater than one square mile. Please submit more detailed plans to the Division of Water's Technical Services Section if you are unsure whether or not a permit will be required.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
We recommend avoiding the area known as "Parish Grove" (located in Sections 35 and 36, Township 25 North, Range 9 West). This lightly wooded area is a significant natural and historical landscape feature. It is the last intact pre-settlement forest grove remaining in Benton County (a prairie county).

Significant prairie vegetation occurs alongside State Highway 55 and the adjacent railroad throughout the project area including the proposed transmission route from the point approximately one mile west of Otterbein (where the railroad begins paralleling the highway). Several state-listed species occur along this corridor and caution should be exercised to avoid adversely impacting them.

Minimize disturbances to natural vegetation along the highway/railroad corridor.

Fish & Wildlife Comments: Fish, wildlife, and botanical resource losses as a result of this project can be minimized through implementation of the following measures.
Pre-construction surveys within the effected zone (horizontal and vertical) should be conducted for impacts to both birds and bats.
Adjust the site to minimize direct impacts to birds and bats.
Avoid migratory pathways and DNR Gamebird Habitat Areas. Gamebird Habitat Areas should be avoided by a minimum of one mile to minimize habitat displacement due to avoidance of the turbines by birds.
Conduct annual and ongoing mortality surveys post construction. Allow site access for DNR to conduct mortality sampling and research.
Mitigation for mortality may include adjusting locations of specific turbines, altering hours of operation to avoid diurnal bird and/or bat activity, and possibly shutting down during migratory peaks for specific species such as Whooping Crane or American Golden-Plovers.

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Water

Early Coordination/Environmental Assessment

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Environmental Unit
Our agency appreciates this opportunity to be of service. Please do not hesitate to contact the above staff member at (317) 232-4160 or 1-877-928-3755 (toll free) if we can be of further assistance.

Date: December 11, 2006

Jon W. Eggen
Environmental Supervisor
Division of Fish and Wildlife

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

September 10, 2007

Rec'd 9/17

Ms. Rene Braud
BP Alternative Energy
700 Louisiana, Suite 3300
Houston, Texas 77002

Dear Ms. Braud:

The US Fish and Wildlife (FWS) appreciates British Petroleum Alternative Energy's (BP) attendance and cooperation at the meeting of June 13, 2007 regarding BP's proposed wind power project proposal near the town of Fowler in Benton County, Indiana. The meeting was also attended by representatives of the Indiana Department of Natural Resources (DNR), the Indiana Audubon Society, and West, Inc. acting as the environmental consultant for BP.

These comments are being provided pursuant to the Endangered Species Act (ESA), the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Fish and Wildlife Act of 1956.

The FWS submitted general comments regarding endangered species, migratory birds and other wildlife for the Fowler wind project in our letter of October 13, 2006. The main topic at the June 13, 2007 meeting was protection of the American golden plover, a migratory bird species which is heavily dependent upon an area within northwest Indiana and northeast Illinois for staging during its spring migration from South America to the Arctic. The US Shorebird Conservation Plan lists the American golden plover as a Species of High Concern due to its downward population trends and threats during the non-breeding season (Brown et. al. 2001). The Indiana Audubon Society considers this species to be the #1 stewardship species in Indiana (James Cole, Indiana Audubon Important Bird Areas Coordinator, personal communication).

The Fowler wind project site lies within the portion of the staging area most intensively used by migrating golden plovers, including an Audubon Society designated Important Bird Area (IBA). Based on information provided at the June 13 meeting, and on information we have acquired since then, the FWS is submitting a list of recommendations for protection of the migrating golden plover population within the wind project development area. This letter also provides updated information on concerns related to potential impacts from the project on federally endangered species.

At the June 13 meeting it was stated that West, Inc. conducted bird surveys at the project study area in Spring, 2007. During the surveys they observed approximately 61,000 American golden plover (20-30% of the global population) during peak migration from mid-April to early-May. These numbers are consistent with previous observations of golden plovers from surveys in the vicinity of the IBA, and it appears that the migrating population is stable at this time. We are not aware of any previous studies concerning the impact of wind power development on American golden plover staging areas in the Midwestern US, although there have been several wind farm studies where the affected species were other plover species, other shorebird species or grassland birds. The major concerns for these types of birds are avoidance of tall structures, habitat loss and fragmentation, and strike mortality. Avoidance behavior has been studied, and in some cases clearly demonstrated, for other species in other areas of the world, however it is somewhat speculative to extrapolate those results to this situation.

The fish and wildlife agencies, Illinois Natural History Survey and Audubon Society addressed appropriate conservation measures in a conference call on August 3, 2007. In view of the lack of previous data, the extreme importance of the study area to the American golden plover and the scope of potential impacts, the FWS is compelled to make conservative recommendations for protection of this species. The following recommendations, some of which were discussed at the June 13 meeting, are intended to provide a range of options. As many of these recommendations as possible should be implemented.

Timing of Development

1. Develop the project in phases, beginning in the southwest portion of the site. This will provide an opportunity to observe the effect on American golden plover use of the developed areas prior to potential development closer to the IBA.

Geographic Considerations

2. Shift the footprint of the development further west toward US 41 Highway.

3. Limit wind turbine development to the southwestern portion of the site as far as possible from the IBA.

4. If development occurs in the eastern portion of the site, maintain an undisturbed buffer at least 500 meters wide around the IBA. This measure is focused on avoidance behavior but is also intended to reduce strike mortality.

Design Considerations

5. Minimum blade distance from the ground should be higher than the typical American golden plover flying height during foraging. These birds normally fly at 30-40 feet above ground during foraging activity, but may rise considerably higher if alarmed by a predator or other disturbance.

6. Minimize the footprint of roads and other infrastructure.

Operation and Management

7. Cease or reduce operation of blades during peak incoming and outgoing migration flights. This measure would be most important for turbines nearest the IBA and other areas of heavy bird concentration.

8. Address the issue of vegetation management near turbines during migration season. Lower vegetation would facilitate mortality monitoring, however high vegetation adjacent to the turbine blades might discourage bird use and reduce the potential for blade strike mortality.

Measures to Offset Impacts on the American Golden Plover

9. For landowners within and near the IBA who anticipated leases for wind turbine construction, substitute conservation easements for leases.

10. Assist with funding of habitat enhancement measures on conservation easements, possibly through partnering with the Department of Agriculture's Wetland Reserve Program or other DOA conservation programs. Appropriate measures could include increased seasonal water regime management, vegetation plantings, and customized vegetation management practices.

Monitoring

11. Design and implement a plan for monitoring of American golden plover use of the project site and avoidance behavior. This would require at least 3 years of monitoring using a transect methodology as described by Leddy et al. (1999) and Erickson et al. (2007) to evaluate bird use with respect to distance from turbines. Study design should be developed through consultation and concurrence with the Indiana DNR and USFWS.

12. Conduct monitoring of mortality for at least 3 years, utilizing trained dogs to search for carcasses. Study design should be developed through consultation and concurrence with the Indiana DNR and USFWS.

Smiths Longspur

Another migratory bird species of concern in the project area is Smith's longspur (*Calcarius pictus*). This rare Arctic breeding species stages in eastern Illinois and northwestern Indiana in similar habitat to the American golden plover, although in much smaller numbers at any single location (see attached fact sheet). We are not aware of any data on the effects of wind turbines on Smith's longspur, however due to its small global population and narrow migration pathways, cumulative effects of multiple wind power developments could be of concern.

Endangered Species

The proposed project is within the range of the Federally endangered Indiana bat (*Myotis sodalis*) and a Non-Essential, Experimental population of whooping cranes (Grus americana). Our letter of December 13, 2006 included general information on these species with regard to the project area. We are providing the following additional endangered species information.

While there is very little habitat for the Indiana bat within the wind farm study area, there may more extensive habitat along the power line transmission route(s). Transmission routes should be sited to avoid or minimize forest loss and fragmentation. There are several summer records of this species in adjacent Tippecanoe and Warren Counties, along Mud Pine Creek, Big Pine Creek and Little Pine Creek. Of greatest concern is Big Pine Creek, where there are Indiana bat records within 3 miles downstream of the transmission route depicted in your coordination letter of September 20, 2006. Please notify this office if other transmission routes come under consideration.

The bald eagle (*Haliaeetus leucocephalus*) was recently removed from the federal endangered species list, however this species is still protected from disturbance under the Bald and Golden Eagle Protection Act. The distribution of eagle nests with respect to the project study area has not changed since our previous review of this project, and there are currently no anticipated impacts on bald eagles.

This endangered species information is provided for technical assistance only, and does not fulfill the requirements of Section 7 of the Endangered Species Act.

For further discussion please call Mike Litwin at (812) 334-4261 ext. 205.

Sincerely yours,

Michael A. Litwin

for Scott E. Pruitt
Field Supervisor

cc: Matt Buffington, Indiana Division of Fish and Wildlife, Indianapolis, IN
Jeff Gosse, USFWS, Twin Cities, MN
Elizabeth McCloskey, USFWS, Chesterton, IN
Keith Shank, Illinois DNR, Springfield, IL

Literature Cited

Brown, S., C. Hickey, B. Harrington and R. Gill eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences. Manomet, MA.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. Wilson Bulletin 111:100-104.

Erickson, W, D. Strickland, J.A. Shaffer, and D.H. Johnson. 2007. Protocol for investigating displacement effects of wind facilities on grassland songbirds. National Wind Coordinating Committee (NWCC). 15 pp.

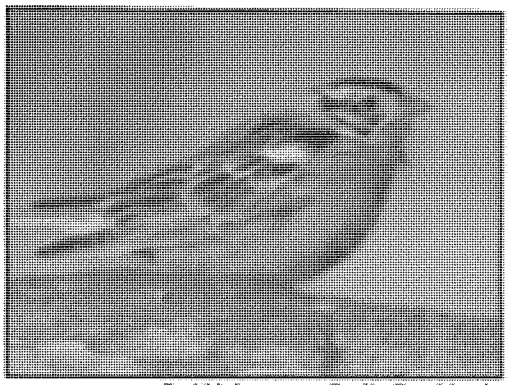
ATTACHMENT

U.S. Fish & Wildlife Service

Smith's longspur

Migratory habitat in the eastern Midwest

The Smith's longspur regularly migrates through a number of counties in east-central Illinois and northwest Indiana. An unknown number of this rare Arctic species—whose global population is estimated at 75,000—stages in the springtime in the eastern Midwest, preparing for the journey to the northern breeding grounds. Smith's longspurs usually appear in single species flocks or occasionally in mixed flocks with horned lark or Lapland longspur.



Smith's longspur Credit: Ron Martin

Numbers of migrating Smith's longspur are likely to be at most in the tens and low hundreds, not thousands, at any single location in the eastern Midwest.

Sightings are most frequently reported in Benton and Newton counties in Indiana, and in Illinois in McLean, Knox, Mason, Sangamon, Cook, Jasper and Champaign counties. Smith's longspur may also spend time in counties adjacent to those listed above, but both a lack of observers and a focus on targeted surveys in the species' habitat during the narrow spring migration window make this difficult to determine.

Preferred habitat of the Smith's longspur includes agricultural stubble fields and heavily grazed pastures with a large growth of *Aristida sp.*, or threeawn, particularly along the edges of wet depressions and recently wet or drying mudflats and along the muddy borders of water bodies in very open country. Historically, these were birds of mid-to tallgrass prairies in burned or heavily grazed areas and the edges of seasonal wetlands.

The Smith's longspur may be present in the eastern Midwest area from mid March (Illinois) or late March (Indiana) until early May. The species actually occurs in a broader region, extending from western Ohio as far west as central South Dakota, so only a small portion of the bird's population would be vulnerable at a single location.

Within that broad area though, the only known pathways with a major concentration of Smith's longspurs are quite narrow — an eastern Dakotas - western Missouri - western Minnesota route, and a route that uses the staging area in east central Illinois and western Indiana, and likely then heads northwest towards breeding grounds that begin on the western shores of Hudson Bay.

The effects of wind turbines on the Smith's longspur are unknown. Cumulative impacts from a large number of projected wind turbines could potentially negatively affect this species.

Smith's longspurs chasing each other on the breeding grounds may ascend out of sight and thus be susceptible to turbine blades. Similar behavior on migration is to be expected on occasion, particularly in late spring.

Generally, the Smith's longspur forages on the ground, and it seldom flies unless it is disturbed by a human or a predator or moves to another field to forage.

Produced by USFWS Midwest Region, September 2007

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

August 5, 2011

Robert Myer
BP Wind Energy NA, Inc.
700 Louisiana St., 33rd Floor
Houston, TX 77002

Dear Mr. Myer:

The U.S. Fish & Wildlife Service has completed our review of the spring bat mortality surveys you have completed at the Fowler Ridge Wind Farm, Benton County, Indiana. Surveys were completed during spring migration each year from 2009 – 2011. The results of those surveys reveal that few bat mortalities occur each spring. In addition, no bats of the genus *Myotis* were found. Based on those survey results the Service concludes that the operation of the Fowler Wind Farm during spring migration is not likely to result in the mortality of federally listed Indiana bat (*Myotis sodalis*) and consequently no take permit is needed. Surveys you have completed during fall migration have verified that Indiana bats are taken at your facility during that time and we look forward to working with you to complete your draft Habitat Conservation Plan with a goal of issuing you an Incidental Take Permit to allow for operation during fall migration in compliance with the Endangered Species Act.

Please contact me if you have questions or concerns.

Sincerely,

Scott E. Pruitt
Field Office Supervisor

DNR Indiana Department of Natural Resources

Mitchell E. Daniels, Jr., Governor
Robert E. Carter, Jr., Director

Division of Historic Preservation & Archaeology•402 W. Washington Street, W274 · Indianapolis, IN 46204-2739
Phone 317-232-1646•Fax 317-232-0693 · dhpa@dnr.IN.gov

October 18, 2012

James E. Myster
Regional Historic Preservation Officer
U.S. Department of the Interior
Fish and Wildlife Service
5600 American Boulevard West, Suite 990
Bloomington, Minnesota 55437-1458

Federal Agency: U.S. Fish and Wildlife Service

Re: Information and notification of the U.S. Fish and Wildlife Service's finding of "no adverse effect" regarding the Fowler Ridge Wind Farm, Phase IV (DHPA #13953)

Dear Mr. Myster:

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated September 17, 2012 and received on September 20, 2012 for the above indicated project near Fowler, Benton County, Indiana.

We see no reason to object to the U.S. Fish and Wildlife Service's September 17, 2012 finding that there are no historic buildings, structures, districts, or objects within the area of potential effects that will be adversely affected by the above indicated project.

It is our understanding that the identification and analysis of archaeological resources will be conducted programmatically. We look forward to participating in future consultation to reach an agreement.

If you have questions about buildings or structures please contact Chad Slider at (317) 234-5366 or cslider@dnr.IN.gov. If you have questions about archaeological issues please contact Amy Johnson at (317) 232-6982 or ajohnson@dnr.IN.gov. Additionally, in all future correspondence regarding the above indicated project, please refer to DHPA #13953.

Very truly yours,

James A. Glass, Ph.D.
Deputy State Historic Preservation Officer

JAG:CWS:cws

emc: Jon Currie, Stantec Consulting Services, Inc.
Blayne Gunderman, BP Wind Energy
James Myster, USFWS

February 28, 2013

Mrs. Blayne Gunderman
Environmental Manager
BP Wind Energy NA, Inc.
700 Louisiana St, 33rd Floor
Houston, Texas 77002
(713)299-3100

Mr. Scott Pruitt
Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services Field Office
620 S. Walker Street
Bloomington, Indiana 47403
(812)334-4261 Ext. 1214

Dear Mrs. Gunderman and Mr. Pruitt:

The purpose of this letter is to address the proposed gating project and subsequent monitoring activities at Wyandotte Cave. Wyandotte Cave is a state owned property and occurs within the O'Bannon Woods State Park located in Crawford County. The Indiana Department of Natural Resources (IDNR) has conducted various monitoring activities at the cave over the past several decades.

As a requirement of their Habitat Conservation Plan (HCP), the Fowler Ridge Wind Farm (FRWF) proposes to remove and replace the current gate at Wyandotte Cave in order to protect Indiana bats (*Myotis sodalis*) that are currently hibernating in an area of the cave that is outside of the current gate. The IDNR will have final approval authority concerning the location and design of the new gate and will provide Section 106 coordination for the gate construction. This gating project is being implemented to mitigate for the incidental take of Indiana bats as a result of the operation of the FRWF. In addition to the mitigation actions, the HCP requires monitoring be completed to ensure success of those mitigation actions.

This letter serves as confirmation that the IDNR will continue to conduct monitoring activities at Wyandotte Cave and will provide all necessary information to FRWF to ensure compliance with their HCP. Monitoring activities to be done include: 1) weekly checking of the gate by O'Bannon Woods State Park personnel to ensure the gate is intact and has not been damaged or breached; 2) installation and maintenance of dataloggers, and downloading of data collected by the dataloggers (i.e. temperature, humidity, air flow inside the cave); and 3) installation and

maintenance of speloggers, and downloading of data collected by the speloggers (i.e. human visitation occurrences). A summary report of monitoring activities will be provided annually for 12 years following installation on the new gate and will include: data from speloggers and dataloggers, digital photographs of the gate and cave entrance, and any management recommendations. To ensure that any required management actions can be taken prior to the upcoming hibernation period, the winter habitat mitigation report will be submitted to FRWF annually by June 30. In the event the IDNR cannot continue these monitoring activities, the IDNR will work with FRWF to ensure subsequent monitoring under the HCP is performed by qualified personnel using approved protocols.

Please contact Scott Johnson via phone (812-334-1137) or email (sjohnson@dnr.IN.gov) with any questions or concerns.

Sincerely,

John M. Davis SJR

John M. Davis
Deputy Director
Dept. of Natural Resources
402 W. Washington St. Rm W256
Indianapolis, Indiana 46204

Indiana Department of Natural Resources

Michael R. Pence Governor
Cameron F. Clark, Director

Division of Nature Preserves
402 W. Washington St., Rm W267
Indianapolis, IN 46204-2739

July 5, 2013

Molly Gillespie
Stantec
2300 Swan Lake Boulevard, Suite 102
Independence IA 50644

Dear Molly Gillespie:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas documented from the Fowler Ridge Wind Farm Phase Four project area, Benton County, Indiana. The Indiana Natural Heritage Data Center has been checked and following you will find information on the ETR species documented within 0.5 mile of the project area.

For more information on the animal species mentioned, please contact Christie Stanifer, Environmental Coordinator, Division of Fish and Wildlife, 402 W. Washington Room W273, Indianapolis, Indiana 46204, (317)232-8163.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. If you have concerns about potential Endangered Species Act issues you should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service
620 South Walker St.
Bloomington, Indiana 47403-2121
812-334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal.

For more information, please contact:

Department of Natural Resources
attn: Christie Stanifer
Environmental Coordinator
Division of Fish and Wildlife
402 W. Washington Street, Room W273
Indianapolis, IN 46204
(317)232-8163

Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)232-8059 if you have any questions or need additional information.

Sincerely,

Ronald P. Hellmich

Ronald P. Hellmich
Indiana Natural Heritage Data Center

Enclosure: invoice
Data sheet

Endangered, Threatened and Rare Species Documented From The Fowler Ridge Wind Farm Phase Four Project Area, Benton County, Indiana

Type	Species Name	Common Name	Fed	State	Town Range	Date	Comments
Bird	Asio flammeus	Short-eared Owl		SE	025N008W 30	1988-05-03	
Bird	Bartramia longicauda	Upland Sandpiper		SE	025N008W 07	1988-06-15	
Bird	Ixobrychus exilis	Least Bittern		SE	026N008W 34	1988-06	
Bird	Rallus elegans	King Rail		SE	026N008W 34	1988-06	
Bird	Sturnella neglecta	Western Meadowlark		SSC	024N008W 30	1997-06-10	
Mammal	Geomys bursarius	Plains Pocket Gopher		SSC	026N008W 34 NWQ SWQ NWQ	1988-07-05	
Mammal	Taxidea taxus	American Badger		SSC	025N009W 12	2004-11-19	
Reptile	Emydoidea blandingii	Blanding's Turtle		SE	025N008W 7	NO DATE	
Vascular Plant	Agalinis auriculata	Earleaf Foxglove		ST	025N008W 21	1930-09-12	
Vascular Plant	Aster sericeus	Western Silvery Aster		SR	025N008W 05 SWQ	1938-09	
Vascular Plant	Liatris pycnostachya	Cattail Gay-feather		ST	025N008W 05 SWQ	1938-08-13	

FOWLER RIDGE WIND FARM

Fed: LE = listed federal endangered; C = federal candidate species

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SG = state significant; WL = Watch List; no rank - not ranked but tracked to monitor status

Type	Species Name	Common Name	Fed	State	Town Range	Date	Comments
Mammal	Nycticeius humeralis	Evening Bat		SE	025N008W 20	2012	

GICK GAMEBIRD AREA (NEWP FGS #259)

Mammal	Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N009W 12 EH NEQ	1987-08-18	

Mud Creek

Mollusk	Venustaconcha ellipsiformis	Ellipse		SSC	025N009W 9	2001-09-25	FRESH DEAD

PC-GRAVEL HILL.S (NEWP FGS #022)

Mammal	Spermophilus franklinii	Franklin's Ground Squirrel		SE	025N008W 08 NEQ	1986-06-03	

Watland Gamebird Habitat Area, (DNR Fish & Wildlife) Section 7, Township 25 North, Range 8 West

Fed: LE = listed federal endangered; C = federal candidate species

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SG = state significant; WL = Watch List; no rank - not ranked but tracked to monitor status

Appendix D Bird and Bat Conservation Strategy – Fowler Ridge Wind Farm

FINAL

BIRD AND BAT CONSERVATION STRATEGY
FOWLER RIDGE WIND FARM

Benton County, Indiana

Prepared by:

Stantec Consulting Services Inc.
2300 Swan Lake Boulevard, Suite 102
Independence, Iowa 50644

Stantec

August 2013

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1.0 INTRODUCTION

Fowler Ridge Wind Farm LLC, Fowler Ridge Wind Farm II LLC, Fowler Ridge Wind Farm III LLC, and Fowler Ridge Wind Farm IV LLC are collectively called Fowler Ridge Wind Farm (FRWF). FRWF is developing, constructing, and operating the Fowler Ridge Wind Farm (Project) in Benton County, Indiana (Figure 1). The Project is planned to have a total build out capacity of 750 MW. The first three phases of the Project are currently operational, with a total capacity of 600 MW. Construction on Phase IV is expected to begin in 2013 and include an additional 150 MW of clean, renewable energy.

1.1 PURPOSE OF THE AVIAN AND BAT PROTECTION PLAN

Wind energy is one of the fastest growing sources of renewable energy in the United States and is the most economically competitive form of renewable energy (AWEA 2008). However, construction, operation, and decommissioning of wind energy projects has the potential to impact bird and bat populations through habitat fragmentation, displacement, and mortality due to collisions with Wind Turbine Generator (WTG) blades (NWCC 2010). FRWF has developed this Bird and Bat Conservation Strategy (BBCS) in a good faith effort to avoid and reduce potential impacts to birds and bats at the Project. The FRWF BBCS is based on the July 2010 draft "Considerations for Avian and Bat Protection Plans, U.S. Fish and Wildlife Service White Paper" prepared by the U.S. Fish and Wildlife Service (USFWS or the Service) (USFWS 2010) and demonstrates FRWF's adherence to the USFWS Land-Based Wind Energy Guidelines (USFWS 2012a). This BBCS will be in effect through the life of the Project as a working document.

The main goals of the FRWF BBCS are to:

- Describe measures to avoid and reduce potential impacts to birds and bats during development, construction, operations and maintenance, and decommissioning of the Project;
- Ensure the potential for impacts to protected and sensitive bird and bat species is reduced; and
- Develop effective post-construction monitoring and adaptive management procedures to guide management actions for the life of the Project.

1.2 REGULATORY FRAMEWORK

1.2.1 Federal

Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531 *et seq*.) provides for the listing, conservation, and recovery of endangered species. Section 9 of the ESA prohibits the take of any endangered or threatened species of fish or wildlife listed under the ESA. Under the ESA, the term "take" is defined to mean "*…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect*" species listed as endangered or threatened, or to attempt to engage in any such conduct. The siting, design, and operation components of the Project incorporate measures to ensure the potential for impacts to ESA-listed bird species is reduced; these measures are described in this BBCS.

FRWF is currently developing a Habitat Conservation Plan (HCP; FRWF 2013) and working to obtain an Incidental Take (Section 10(a)1(B)) Permit (ITP) for the Indiana bat (*Myotis sodalis*), based on the recommendations of Region 3 of the Service (Pruitt 2011, February 24, 2010 meeting minutes summary). FRWF was issued a two-year Scientific Research and Recovery

Permit for the Indiana bat (TE 15075A) by USFWS Region 3 to help build a better scientific basis for the potential minimization measures for HCP development.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA, 16 U.S.C. §§ 703-712) prohibits the taking, killing, injuring, or capture of listed migratory birds. Neither the MBTA nor its implementing regulations found in 50 Code of Federal Regulations [CFR] Part 21 provide for the permitting of "incidental take" of migratory birds that may be killed or injured by wind turbines. To avoid and reduce potential impacts to species protected under the MBTA at the Project, FRWF will implement this BBCS throughout the life of the Project. This BBCS incorporates the results of pre-construction avian habitat and use surveys within the Project area, patterns of bird mortality reported at other wind energy facilities in the Midwest, and recommendations obtained through consultation with the Service and the Indiana Department of Natural Resources (IDNR) for reducing impacts to birds. Avoidance and minimization measures for reducing impacts to MBTA-listed species at FRWF were developed based on these data and are described in this BBCS.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (50 CFR 22.26), and its implementing regulations, provides additional protection to bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) such that it is unlawful to take an eagle. In this statute the definition of "take" is to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest, or disturb." The term "disturb" is defined in regulations found at 50 CFR 22.3 to include "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The Service published a final rule (Eagle Permit Rule) on September 11, 2009 under BGEPA authorizing limited issuance of permits to take bald eagles and golden eagles ''for the protection of . . .other interests in any particular locality'' where the take is compatible with the preservation of the bald eagle and the golden eagle, is associated with and not the purpose of an otherwise lawful activity, and cannot practicably be avoided (FR 46836-46879).

On May 2nd, 2013, the Service announced the availability of the Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2[1] (FR 10387) (the "Guidance"). The Guidance provides a means of compliance with the BGEPA by providing recommendations and in-depth guidance for:

- Conducting early pre-construction assessments to identify important eagle use areas;
- Avoiding, minimizing, and/or compensating for potential adverse effects to eagles; and
- Monitoring for impacts to eagles during construction and operation.

The Guidance interprets and clarifies the permit requirements in the regulations at 50 CFR 22.26 and 22.27, and does not impose any binding requirements beyond those specified in the regulations. As for other MBTA-listed species, this BBCS incorporates site-specific, regional, and agency information and measures developed based on this information to avoid and reduce impacts to bald and golden eagles at the Project.

[1] http://www.fws.gov/windenergy/PDF/Eagle%20Conservation%20Plan%20Guidance-Module%201.pdf

1.2.2 State

The IDNR maintains a list of state endangered, threatened, rare, extirpated, special concern, significant, and watch-list wildlife and plant species. Under IC 14-22-34, the Wildlife Diversity Section of the IDNR is responsible for developing "programs designed to ensure the continued ability of nongame species in need of management to self-perpetuate successfully." The Indiana Nongame Fund was established by state legislature in 1982 to support these programs. This BBCS addresses measures to reduce impacts to state-listed bird and bat species from the Project.

FRWF has received a State Endangered Species ITP (Appendix A) from the IDNR Division of Fish and Wildlife for the evening bat (*Nycticeius humeralis*). The renewable permit was issued June 18, 2011 and will expire June 30, 2016. FRWF is required to monitor wind turbine sites for bat fatalities for the duration of the permit, and report any mortalities or suspected mortalities of evening bats to the IDNR within 24 hours of discovery.

1.3 COORDINATION WITH USFWS AND IDNR

Prior to Project construction, FRWF informally consulted with the Service and IDNR to discuss potential wildlife concerns. FRWF initiated agency consultation in 2006 by submitting data requests to the Service and IDNR regarding protected and high-quality biological resources within the Project area. In a response letter dated October 13, 2006, the Service identified the Project as within the range of a non-essential, experimental population of whooping cranes (*Grus americana*). A risk assessment for whooping cranes conducted in 2007 found the risk of impacts to the population to be low (Johnson and Tidhar 2007). The Service also noted that while there are no records for bald eagles in Benton County, two bald eagle nests are present in Tippecanoe County and one nest is present in Newton County; the Service did not indicate concern that the Project transmission line would impact either eagle nest in Tippecanoe County (USFWS letter addressed to Victoria Poulton, WEST, Inc., dated October 13, 2006).

Consultation with the Service identified the American golden-plover (*Pluvialis dominica*; AMGP), a migratory shorebird and U.S. Shorebird Conservation Plan species of high concern, as the primary avian concern for FRWF due to the proximity of the Project to the Benton County IBA and heavy use of the IBA as a staging ground by migrating AMGP (Pruitt 2007). FRWF attended and participated in a meeting with representatives of the Service, IDNR, the National Audubon Society, and Western EcoSystems Technologies (WEST) on June 13, 2007. The main focus of this meeting was to discuss the AMGP. The Service prepared a follow-up letter after this meeting, which stated that the major concerns for golden-plovers within the Project area are avoidance of tall structures, habitat loss and fragmentation, and strike mortality. The letter included a list of recommendations, developed during a conference call between the Service, IDNR, Illinois Natural History Survey, and the National Audubon Society on August 3, 2007, which were intended to provide a range of options for protection of the migrating golden-plover population within the Project area. The Service stated that as many of these recommendations as possible should be implemented (USFWS letter addressed to Rene Braud, BP Alternative Energy, dated September 10, 2007). These recommendations discussed timing, geography, design, monitoring, and mitigation.. In addition to phased Project development, AMGP concerns were addressed through three years of AMGP use and behavior surveys, described in Section 3.2.2. These surveys determined that AMGP may not be at significant risk of collisions with turbines, due to the majority of observed flying time being below the rotor-swept area and the lack of AMGP observed near newly-constructed turbines in 2009 (Johnson et al. 2009). Additionally, no AMGP fatalities have been found during the intensive post-construction mortality studies at Phase I, II, or III turbines.

The Service also documented in their September 2007 letter (Pruitt 2007) that there were no anticipated impacts to the bald eagle from the Project, based on the location of the Project site and the distribution of eagles in the area (USFWS letter addressed to Rene Braud, BP Alternative Energy). An eagle use assessment conducted in summer 2011 also concluded that risk to eagles at the FRWF is low, based on very limited foraging and nesting opportunities for eagles within the Project area, known eagle distributions, and survey results indicating low use of the Project area by eagles (Good and Simon 2011). Although the Service has mapped a spring and fall raptor migration route along the Indiana and Illinois border, the Service does not specify if the corridor is utilized by eagles. Survey results indicate low use of the Project area by migrating eagles and moderate use by other raptors (Good and Simon 2011).

IDNR responded to FRWF's data request in a letter dated September 22, 2006. IDNR listed records of occurrence in or near the Project area for six of the seven bird species listed by IDNR as endangered, threatened, or rare in Benton County. Each of these species was assessed for impacts from the Project; habitat for these species was found to be of marginal quality in the Project area (see Table 3.2 in Section 3.1). None of these species were found during carcass searches in 2009, 2010, or 2011 (see Section 3.3). IDNR also identified five Gamebird Habitat Areas (GHA) within the Project area (IDNR letter addressed to Victoria Poulton, WEST, Inc., dated September 22, 2006). IDNR staff originally recommended that no turbines be constructed within one mile (1.6 km) of any GHA (IDNR Early Coordination/Environmental Assessment dated December 11, 2006); follow-up conversations with IDNR identified that the one-mile (1.6-km) setback recommendation was drafted by a staff member who was no longer with the agency and the rationale for the recommendation was not readily apparent to IDNR representatives at a June 2007 meeting (Fowler Ridge II Wind Farm, LLC 2009). IDNR also recommended that Project siting avoid placing infrastructure within Parish Grove, the last intact pre-settlement forest grove in Benton County (IDNR Early Coordination/Environmental Assessment dated December 11, 2006). These areas were avoided during siting of Phase I-III turbines, and will be avoided during siting of Phase IV turbines as well.

Finally, the Service stated in their September 2007 letter (Pruitt 2007), that there was very little habitat for the Indiana bat within the Project area. However, the Service stated that there may be more extensive habitat along the power line transmission route, as there are several summer records of Indiana bats in Tippecanoe and Warren Counties, along Mud Pine Creek, Big Pine Creek, and Little Pine Creek. Of these areas, the Service was most concerned about Big Pine Creek (Pruitt 2007). Additionally, it was noted in an October 13, 2006 letter from the Service that spring and fall migration routes for Indiana bats could include areas of Benton County (Pruitt 2006).

The closest known Indiana bat hibernacula are located in Greene and Monroe Counties in southern Indiana and in LaSalle County, Illinois (USFWS 2007). Based on known migration distances, it is possible that Indiana bats from caves within a 350-mile (560-km) radius could travel through the Project area. Although there are no known maternity colonies in Benton County, maternity colonies have been documented in five of the seven counties which border Benton County (USFWS 2007). There is therefore a potential for migrating/dispersing Indiana bats to occur at the Project area. However, pre-and post-construction acoustic and mortality surveys conducted within the Project area indicate that late summer mating, seasonal swarming, and concentrated fall migration events do not occur in the Project area. There is no designated critical habitat for the Indiana bat in the Project area (USFWS 2007).

The Service has concluded, based on spring bat mortality studies conducted at FRWF in 2009, 2010, and 2011, that operation of the Project during spring migration is not likely to result in the mortality of Indiana bats. Consequently, the Service indicated that an ITP is not necessary for operation of the Project during the spring bat migration period (Pruitt 2011). Fall bat mortality

studies at the FRWF verified that Indiana bats are taken at the Project during the fall migration period and the Service recommended that FRWF complete an HCP and obtain an ITP for Indiana bats to provide ESA coverage for Project operation during the fall (Pruitt 2011).

Fall bat mortality studies at the FRWF also verified that state-listed evening bats are taken at the Project during the fall migration period. FRWF has obtained a State Endangered Species ITP from the IDNR to provide coverage for Project operation during the fall.

All USFWS and IDNR recommendations incorporated into the siting, design, and operation processes of the Project are described in Section 4.3 of this BBCS.

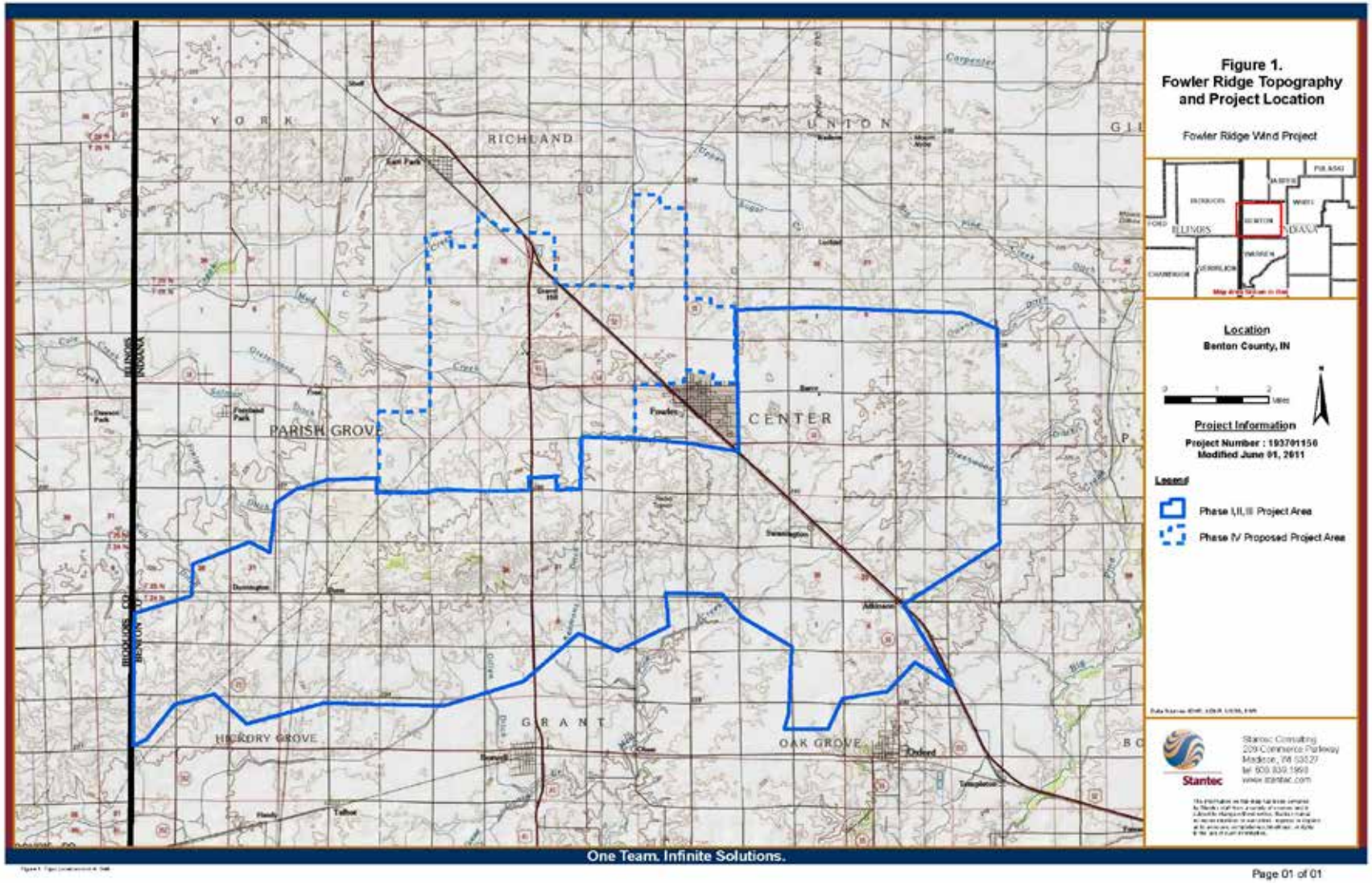

Figure 1 FRWF Topography and Project Location

2.0 PROJECT DESCRIPTION

2.1 PROJECT AREA

The Project is located in Benton County, Indiana, in the vicinity of the Town of Fowler and adjacent to the Illinois state line (Figure 1). An interconnect line for the Project extends into Tippecanoe County. The Project area encompasses approximately 72,947 acres (29,521 ha), only a portion of which is, or will, actually be occupied by Project facilities. All Project facilities are located or sited on private land.

The Project area is bisected and paralleled by improved roads, fence lines, buried pipelines, gates, residential structures, ephemeral drainages, earthen berms, drainage culverts, and two railroads. Land use within the Project area is dominated by tilled agriculture; of the approximately 72,947 acres (29,521 ha) within the Project area, row crops comprise about 93 percent. Corn (*Zea mays*) and soybeans (*Glycine max*) are the most abundant crops.

2.2 PROJECT COMPONENTS

The Project is being constructed in phases, as recommended by USFWS (Pruitt 2007; Figure 2). The facility is designed to have a total build-out capacity of approximately 750 MW. The first three phases of the Project are currently operational, with a total capacity of 600 MW. Construction on Phase IV is expected to begin in 2013. Each phase's minimum lifespan is expected to be about 20 years.

Table 2.1 Project Phases

Phase	Ownership	No. of Turbines	Turbine Type	Capacity	Status
I	Fowler Ridge Wind Farm	122 40	Vestas V82 1.65 MW Clipper C96 2.5 MW	301 MW	Operational (2009)
II	Fowler Ridge II Wind Farm	133	GE 1.5 MW	200 MW	Operational (2009)
III	Fowler Ridge III Wind Farm	60	Vestas V82 1.65 MW	99 MW	Operational (2009)
IV	Fowler Ridge IV Wind Farm	Up to 94	GE TC3+ 1.6 MW	149 MW	Construction expected in 2015

In addition to the wind turbine generators, each Project phase includes access roads and collection and transmission lines. Components of the Project also include three substations, a switchyard, and an Operations and Maintenance (O&M) Facility. Substation facilities were constructed in the Phase I, II, and III Project areas; transmission lines currently connect the substations to the interconnect switchyard. The Project O&M Facility was constructed with Phase I of the Project. This building will serve as the O&M Facility for the entire FRWF.

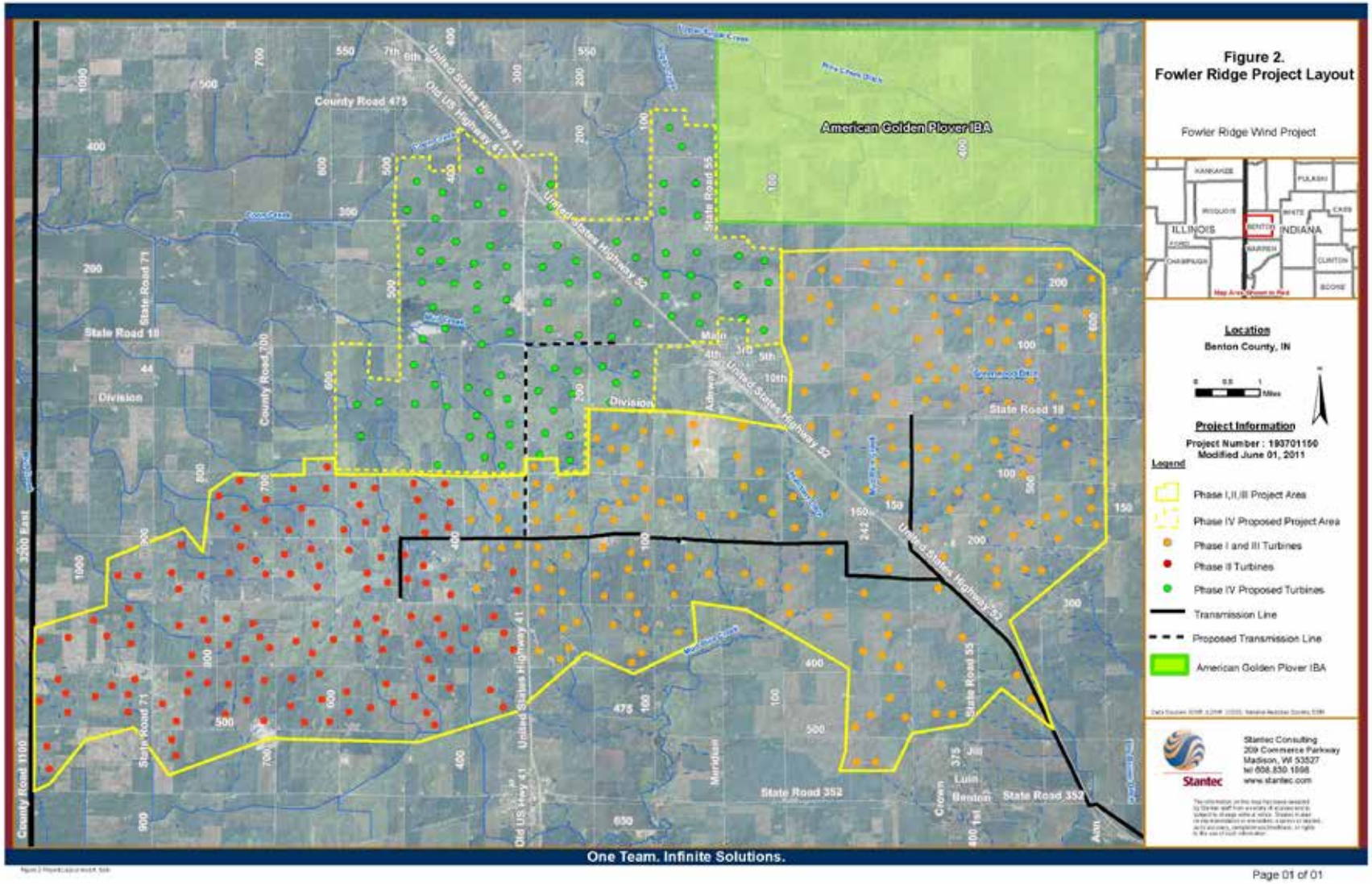

Figure 2 FRWF Project Layout

3.0 AVIAN AND BAT RESOURCES

3.1 HABITAT DESCRIPTION

The Project area is within the Tipton Tall Plain physiographic region that includes much of central Indiana. The topography of the Project area is mostly flat to slightly rolling. There are no hills, ridges, or other areas of starkly elevated topography (Figure 1). Elevations in the Project area range from 700 to 800 ft (213 to 244 m) above sea level, approximately. Annual precipitation in the Project area averages 40 inches (102 cm); average temperatures range from 19°F to 45°F (-7.2°C to 7.3°C) in January to 65°F to 86°F (18°C to 30 °C) in July. Soils in the region are various combinations of silt loam, clay loam, loam, silty clay loam, sandy loams, and sandy clays. Much of the area is classified as prime farmland based on soil type.

The Project area is dominated by tilled agriculture, with corn and soybeans being the dominant crops. Of the roughly 72,947 acres (29,521 ha) within 0.5 mile (0.80 km) of Phase I, II, III and IV turbine locations, row crops compose about 93 percent of the land use (Table 3.1, Homer et al. 2004). Developed areas (e.g., houses and buildings) comprise 5.2 percent of the Project area and pasture/hay fields constitute approximately 1.5 percent. The remaining area consists mostly of isolated patches of forested habitat and herbaceous habitat (i.e., grasslands). Forested areas are rare within the study area based on 2001 data (Homer et al. 2004), and the 286 acres (116 ha) of forest compose 0.4 percent of the total Project area. Trees in the study area occur at homesteads, along some of the drainages and fencerows, and within some small, isolated woodlots. Parish Grove, the largest contiguous tract of forest, is approximately 640 acres (259 hectares) in size, located in the southwest portion of the Project area. Grasslands in the Project area are limited primarily to strips along drainages, railroad rights-of-way, and rights-of-way along county and state roads. There are also a few grass-lined waterways within cultivated fields in the area. Small amounts of barren ground, open water, and woody wetlands are also present. The primary waterway is Sugar Creek in the northern part of the Project; there are several tributaries of this creek and other drainages in the area.

A total of 53 wetlands covering approximately 94.6 acres (38.2 ha) were identified and delineated in the vicinity of the Project area. Approximately 42 streams were also identified in the vicinity of the Project area (CBBEL 2007a and 2008). Additionally, small ephemeral pools of water may form in tilled fields following periods of rain.

Table 3.1 Land Cover Types, Coverage, and Composition within the FRWF Project Area

Habitat	Acres [Hectares]	Percent Composition
Row Crops	67,616 [27,363]	92.69%
Developed, Low Intensity	2,101 [850]	2.88%
Developed, Open Space	1,643 [665]	2.25%
Pasture/Hay Fields	1,100 [445]	1.51%
Deciduous Forest	286 [116]	0.39%
Developed, Medium Intensity	102 [41]	0.14%
Open Water	38 [15]	0.05%
Herbaceous (Grassland)	30 [12]	0.04%
Developed, High Intensity	17 [7]	0.02%
Barren Land	11 [4]	0.02%
Woody Wetlands	3 [1]	<0.01%
Total	**72,947 [29,521]**	**100.00**

3.1.1 Birds

Suitable avian habitat within the Project area is limited, as land use within the Project area is dominated by tilled agriculture. Due to high levels of disturbance and lack of native vegetation, agricultural habitats are of limited quality for birds. The many improved roads, fencelines, buried pipelines, gates, residential structures, and other disturbances which bisect and parallel the Project area also detract from the quality of the habitat within the Project area for many bird species.

Passerines and Waterbirds/Waterfowl

Cultivated agriculture is rarely used as nesting habitat by birds, although certain, disturbance-tolerant species may forage in crops. Agricultural fields may attract large flocks of birds, such as blackbirds and Canada Geese (*Branta canadensis*), during the fall migration and winter seasons (Erickson et al. 2002). Isolated patches of pasture and grassland habitat within the Project area may support sensitive or nesting grassland and prairie birds; however, these patches are small and comprised primarily of edge habitat. Similarly, the Project area contains only limited amounts of forested habitat (tree rows, drainage ditches, homesteads). Forest fragments such as those found within the Project area are typically not considered high-quality nesting habitat due to their limited size and abundance of edge habitat, which is associated with higher incidence of nest predation and parasitism (USGS 2011). These small patches of forest habitat may receive higher levels of bird use during migration, as forest fragments often provide stopover habitat for migrating passerines and other birds (Wallheimer 2009). In addition to the limited amount of stopover habitat, there is little discernible topography in the Project area and surrounding areas that would funnel migrating songbirds through the Project area. Songbirds migrating through the Project area likely do so in broad fronts moving in north-south or south-north directions (Johnson and Poulton 2007).

Small wetlands and streams throughout the Project vicinity may provide suitable habitat for certain bird species, although most wetlands and many streams in the area are ephemeral. Two ponds located to the north of the Project area were occupied by waterbirds and waterfowl during an October 2006 site visit by WEST staff (Johnson and Poulton 2007).

Raptors

Nesting habitat for raptors, with the exception of ground-nesting species, was found to be rare within the Project area, as less than one percent of the Project area is covered by forested habitat (Johnson and Bay 2008 and Carder et al. 2010). Consequently, habitat for raptors within the Project area is limited to foraging habitat. Prey densities and prey availability of species such as deer mice may be high in agricultural fields immediately after harvest, as mice forage on leftover grain. Densities of small mammals such as deer mice, voles, and shrews may also be higher along un-mowed ROW of county roads, highways, and railroads. However, overall, prey densities were expected to be low in the Project area based on the large amount of tilled agriculture present. Raptor use is not expected to be heavily influenced by topography within the Project area because of its general lack of defined ridges and rim edges. In addition, the Project area is not located on or near any major ridgelines, rivers, or other features which might funnel raptors through the Project area. Although site characteristics suggest that the Project area should not concentrate migrating raptors, information compiled by Region 3 of the USFWS indicates there may be a minor fall raptor migration route along the Illinois/Indiana border, which is near the Project area (Johnson and Poulton 2007).

Whooping Cranes

WEST staff determined during the October 2006 site characterization visit that the Project area contains little roosting habitat which could draw migrating ESA-listed whooping cranes to the area (Johnson and Poulton 2007). The most likely roosting area in Benton County is the Pine Creek GHA, located approximately 3.2 miles (5.1 km) east of the Project area (Johnson and Poulton 2007). Regarding habitat for IDNR-listed bird species, WEST determined that the Project area contained limited suitable habitat for most species (Johnson and Poulton 2007) (Table 3.2); a threatened and endangered species review of the Project area supported this conclusion of limited habitat (CBBEL 2007b).

Table 3.2 Habitat and Potential for Occurrence for IDNR-Listed Bird Species in the FRWF Project Area

Species	IDNR Status	Habitat	Potential for Occurrence
Short-eared owl *Asio flammeus*	Endangered	Wetlands, grasslands, agricultural areas	No suitable nesting habitat; could possibly forage over Project area; one record in area.
Upland sandpiper *Bartramia longicauda*	Endangered	Native grasslands, croplands, pastures and hayfields	Marginal habitat in Project area; recorded in area.
Northern harrier *Circus cyaneus*	Endangered	Nests in large grasslands and marshes, may hunt over agricultural fields	No suitable nesting habitat; suitable foraging habitat; one individual observed in Project area during October 18, 2006 site visit.
Least bittern *Ixobrychus exilis*	Endangered	Wetlands, especially those with dense cattails and reeds	Little suitable habitat in Project area; one record in area.
King rail *Rallus elegans*	Endangered	Freshwater marshes and marsh-shrub swamps, sedge and cattail marshes	Little suitable habitat in Project area; one record in area.
Barn owl *Tyto alba*	Endangered	Open areas such as grasslands, agricultural fields, and marshes	No recent records in Benton County; could possibly nest in abandoned barns and forage over Project area.
Western meadowlark *Sturnella neglecta*	Species of concern	Open grasslands, pastures, hayfields, weedy areas	At eastern limit of species range; some habitat available; one record in area.

American Golden Plover

An Important Bird Area (IBA) was established for AMGP in 2006 in the two southern-most quadrants of Union Township in Benton County. This area of approximately 11,520 acres (4,662 hectares) supports exceptionally high concentrations of golden-plovers during the spring migration season (late March and early April). The IBA is adjacent to Phase I, III, and IV of the Project area (Johnson and Poulton 2007; Figure 2). The Benton County IBA is located on private lands and is currently afforded no legal conservation protections (Fowler Ridge II Wind Farm, LLC 2009).

Gamebirds

Also within the Project area are five INDR GHAs and one Indiana Department of Transportation and IDNR Natural Preserves Highway Management Area (HMA): Hawkins GHA, Knob View

GHA, Watland GHA, Falwell GHA, Kirsch GHA, and Fowler HMA (IDNR letter addressed to Victoria Poulton, WEST, Inc., dated September 22, 2006; Figure 4).

3.1.2 Bats

A total of 12 species of bats occur in Indiana. Nine species, all members of the family Vespertilionidae, have geographic distributions that include Benton County: Indiana bat, evening bat, little brown bat (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), silver-haired bat (*Lasionycetris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), tri-colored bat (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*)(Simon et al. 2002; Whitaker and Mumford 2008). All nine of those bat species use woodland habitat for feeding or roosting at some time during the year. In addition, many of the species feed along stream corridors or over water. A limited number of narrow, linear tracts of woodland associated with stream corridors and small woodlots associated with farmsteads are found within the Project area. These areas may, at times, provide potentially suitable foraging and roosting habitat for bats. The Project area is not located in a karst region of Indiana and there are no known bat hibernacula in Benton County.

Limited information is available on how bats use agricultural areas in the Midwest; however, species such as the big brown bat and little brown bat will roost, and even overwinter, in attics or large buildings. The farmsteads located in the Project area, with their farmhouses and large outbuildings, likely provide suitable roosting locations for species such as these. Likewise, buildings in the towns of Fowler, Oxford, Boswell and Earl Park also likely provide suitable roosting and possibly overwintering sites for species such as the big brown bat and little brown bat.

A threatened and endangered species review of the Project area concluded that the woodlots within the Project area and the Big Pine Creek floodplain did not contain suitable roosting trees for Indiana bats (CBBEL 2007b). As described in Section 1.3 Coordination with USFWS and IDNR, the Service concurred that there was very little summer habitat for Indiana bats within the Project area.

Although habitat requirements for migrating bats are not well understood, based on the Project's location within the ranges of nine bat species and the dispersed and transitory patterns believed to characterize migration movements of most of those bat species (Cryan 2003, USFWS 2007), it is likely that common species of both tree bats and cave-roosting bats pass through the Project area during the spring and fall migration seasons. The results of post-construction monitoring studies conducted at FRWF to-date are reported in Section 3.5, Post-Construction Bat Mortality Studies; impacts to bats are further discussed in Section 4.2.2, Potential Impacts from the Fowler Ridge Wind Farm.

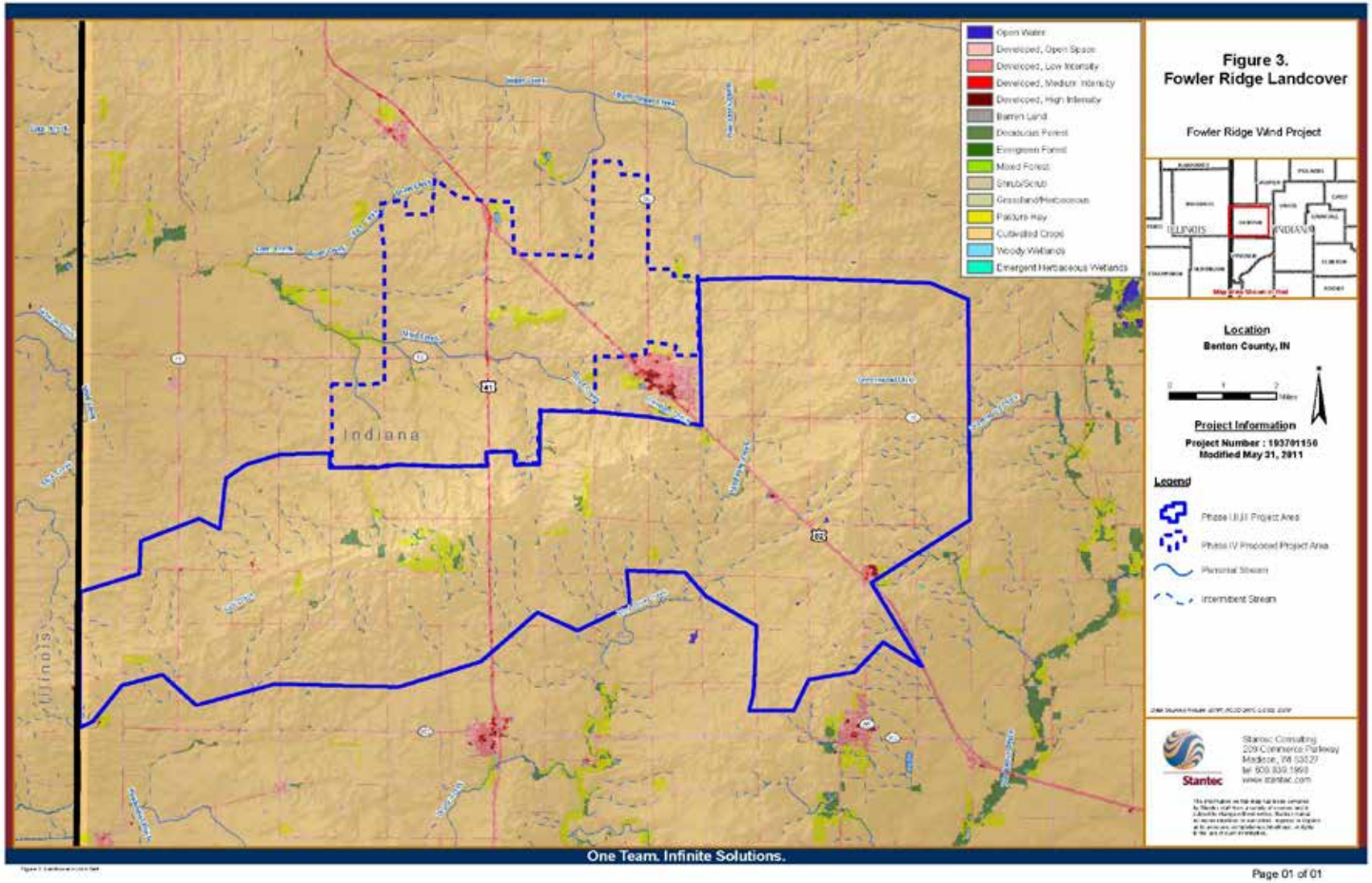

Figure 3 FRWF Landcover

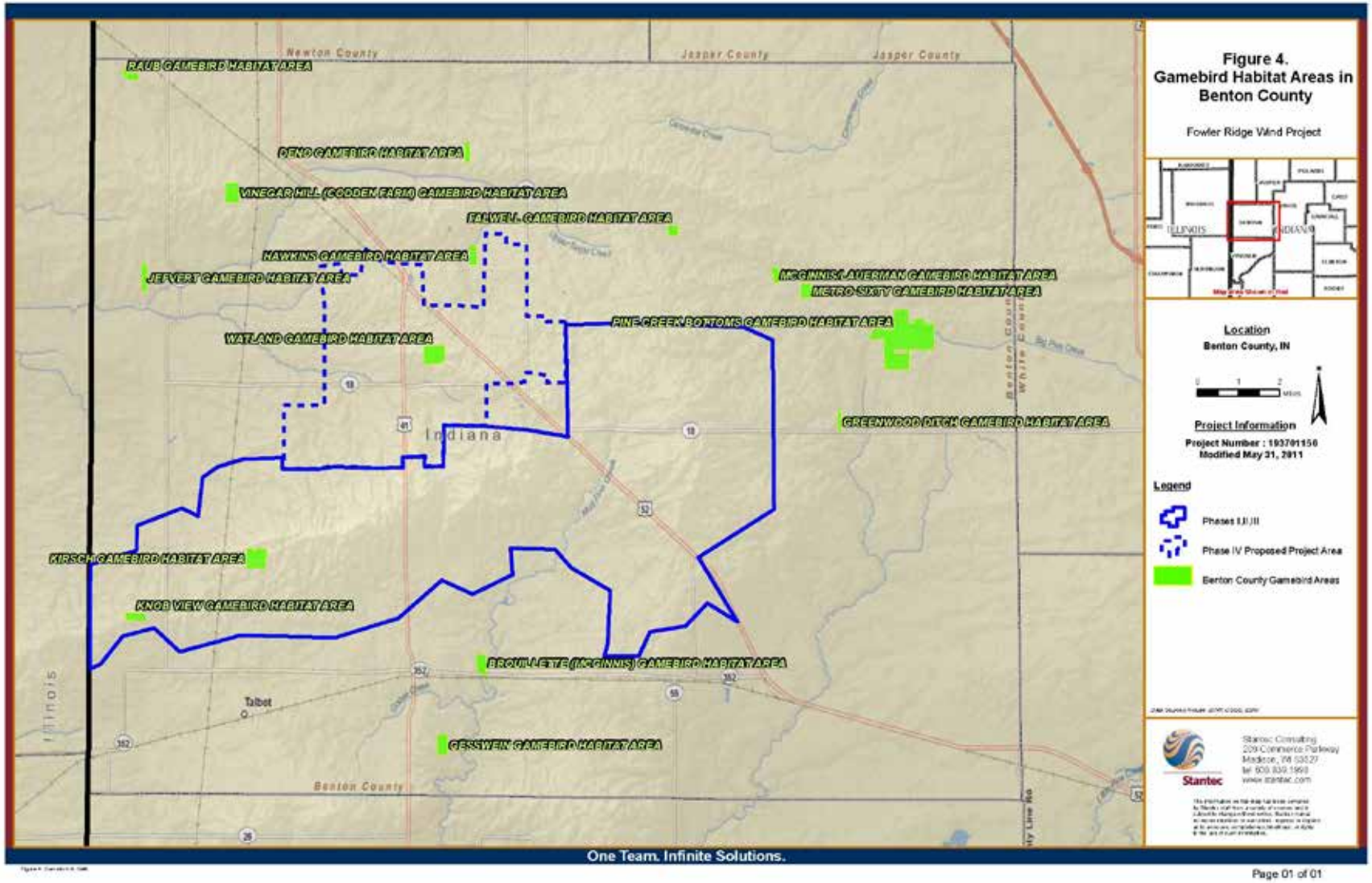

Figure 4 Gamebird Habitat Areas in Benton County

3.2 PRE-CONSTRUCTION AVIAN USE STUDIES

3.2.1 Fixed-Point Bird Use Surveys

WEST conducted fixed-point bird use surveys at 20 points distributed throughout the Project area from March 31, 2007 through April 9, 2009 (Johnson and Bay 2008 and Carder et al. 2010). Ten of the points were surveyed during studies in 2007; the other ten points were surveyed during studies in 2008 and 2009. In 2007, surveys were conducted approximately once a week during the spring (March 31 to April 28, 2007) and fall (September 20 to November 16, 2007). In 2008 and 2009, surveys were conducted approximately once a week during spring (March 15 to May 31, 2008) and fall (September 15 to November 15, 2008), and bi-weekly during summer (June 1 to September 14, 2008) and winter (November 16, 2008 to March 14, 2009). Results of these surveys are summarized below.

2007 Surveys

During the 2007 surveys, 7,738 individual birds within 507 separate groups were observed; 161 of which were raptors. Although forty-five unique species were recorded, six species (13.3% of all species) comprised 74.4 percent of all observations: unidentified blackbird, AMGP, European starling (*Sturnus vulgaris*), unidentified swallow, tree swallow (*Tachycineta bicolor*), and unidentified shorebird. All other species individually comprised less than five percent of the observations.

Overall bird use was higher in the spring (78.80 birds/plot/20 min survey) than in the fall (46.40 birds/plot/ 20 min survey). The higher use in spring was partly due to large numbers of shorebirds that were not observed during the fall surveys. For all bird species combined, use was highest at the survey points in the northern section of the Project area; these points were nearest to the plover IBA. High overall bird use in these areas was largely due to high use by shorebirds and passerines. Raptor use was consistent across all survey points.

A total of 5,484 individual birds were observed flying during the surveys; overall, 20.8 percent of the birds observed flying were within the rotor-swept area for collision with turbine blades of 82 to 410 ft (25 to 125 m) above ground level. The remaining birds observed flying were mostly below the rotor-swept area (79.0%); few birds (0.2%) were observed flying above the rotor-swept area. Raptors were observed at all flight height categories (50.8% below, 40.3% within, and 8.9% above the rotor-swept area). Waterbirds had the highest percentage (100%; 2 total birds) of flying birds within the rotor-swept area. Table 3.3 provides the observed flight characteristics for each bird type and raptor subtype observed flying within the rotor-swept area.

No ESA-listed bird species were observed within the Project area. Two species were recorded which were on the IDNR endangered species list at the time (2007): northern harrier (*Circus cyaneus*) and upland sandpiper (*Bartramia longicauda*). Six additional species which have since become listed (endangered or species of concern) by IDNR were also observed: osprey (*Pandion haliaetus*), sharp-shinned hawk (*Accipiter striatus*), AMGP, greater yellowlegs (*Tringa melanoleuca*; incidental observation), sandhill crane (*Grus canadensis*), and solitary sandpiper (*Tringa solitaria*; incidental observation). Most of these species, with the exception of northern harrier and AMGP, were observed in low numbers. AMGP were investigated further during a 2007-2009 AMGP survey effort, discussed below (Johnson et al. 2009). Northern harriers were observed to primarily fly below the rotor-swept area within the Project area; presumably because of this low flight pattern, the species has rarely been found as fatalities at wind energy facilities (Erickson et al. 2001).

2008-2009 Surveys

During the 2008-2009 surveys, 4,721 individual birds within 1,259 separate groups were observed; 64 of which were raptors. Fifty-eight unique species were recorded, but three species (5.2% of all species) comprised 39.7 percent of all observations: European starling, common grackle (*Quiscalus quiscula*), and brown-headed cowbird (*Molothrus ater*). All other species individually comprised less than 10 percent of the observations. Species richness was highest in the spring and lower in the summer, fall, and winter. Passerines were the most abundant bird type across all seasons during the 2008-2009 surveys.

Overall bird use was highest in the spring (19.89 birds/plot/20 min survey), followed by fall (9.81 birds/plot/20 min survey), winter (8.35 birds/plot/20 min survey), and summer (7.85 birds/plot/20 min survey). Bird types exhibited different and varying use across the survey points, likely due to differences in habitat between the points. Unlike the 2007 survey, survey results in 2008-09 were not dominated by shorebirds, and overall use was therefore influenced by many bird types and more evenly distributed throughout the Project area. Raptor use was again relatively uniform across all survey points.

A total of 3,634 individual birds were observed flying during the surveys; overall, 0.8 percent of the birds observed flying were within the rotor-swept area for collision with turbine blades of 115 to 427 ft (35 to 130 m) above ground level. The remaining birds observed flying were below the rotor-swept area; no birds were observed flying above the rotor-swept area. The majority (95.7%) of flying raptors were observed below the rotor-swept area. Vultures had the highest percentage (20.4%) of flying birds within the rotor-swept area. Table 3.3 provides the observed flight characteristics for each bird type and raptor subtype observed flying within the rotor-swept area.

No ESA-listed bird species were observed within the Project area. Nine bird species listed (endangered or species of concern) by the IDNR were observed during surveys. These species include: AMGP, sandhill crane, northern harrier, sharp-shinned hawk, greater yellowlegs (incidental observation), bald eagle, broad-winged hawk (*Buteo platypterus*; incidental observation), western meadowlark (*Sturnella neglecta*; incidental observation), and upland sandpiper. Data collected did not suggest that listed species are numerous within the study area, with the exception of AMGP, sandhill crane, and northern harrier. AMGP were investigated further during the 2007-2009 AMGP survey effort, discussed below (Johnson et al. 2009). The number of sandhill cranes observed within the Project area was much lower than the number observed at well-known stopover sites. Northern harriers are not considered to have especially high risks of colliding with turbines due to the tendency of this species to hunt close to the ground, thus avoiding the rotor-swept area of the turbines (Carder et al. 2010). Other sensitive species were observed in relatively low numbers, and were likely individuals migrating through the Project area.

Table 3.3 Flight Height Characteristics for All Bird Types and Raptor Subtypes Observed during Fixed-Point Bird Use Surveys at the FRWF Project Area, March 31, 2007-April 9, 2009

Group	#Gps Flying		# Ind Flying		Mean Flight Height (m)		% Obs Flying		% within Flight Height Categories					
									2007			2008-2009		
	2007	2008-2009	2007	2008-2009	2007	2008-2009	2007	2008-2009	0-82 ft (0-25m)	82-410 ft* (25-125m)	>410 ft (>125m)	0-114 ft (0-35m)	114-427 ft* (35-130m)	>427 ft (>130m)
Waterbirds	2	10	2	18	60.00	9.60	100	94.7	0	100	0	100	0	0
Waterfowl	3	11	6	112	16.00	12.18	24.0	93.3	100	0	0	100	0	0
Shorebirds	39	54	863	540	14.31	7.28	47.5	91.5	69.4	30.6	0	100	0	0
Coots	0	-	0	-	0	-	0	-	0	0	0	-	-	-
Raptors	106	47	124	47	38.04	12.04	96.9	82.5	50.8	40.3	8.9	95.7	4.3	0
Accipiters	6	-	6	-	80.83	-	100	-	50.0	33.3	16.7	-	-	-
Buteos	42	26	42	26	30.43	15.23	95.5	86.7	61.9	35.7	2.4	92.3	7.7	0
Northern Harrier	10	10	11	10	26.30	6.90	100	100	63.6	18.2	18.2	100	0	0
Eagles	-	1	-	1	-	15.00	-	100	-	-	-	100	0	0
Falcons	13	6	14	6	7.46	2.67	87.5	50.0	100	0	0	100	0	0
Other Raptors	4	4	4	4	80.25	17.50	100	100	25.0	50.0	25.0	100	0	0
Vultures	31	33	47	54	51.23	24.79	100	98.2	25.5	61.7	12.8	79.6	20.4	0
Upland Gamebirds	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	30	45	337	99	8.03	4.64	98.5	66.9	77.7	22.3	0	100	0	0
Passerines	212	632	4145	2759	9.86	5.45	98.3	78.5	81.9	18.1	0	99.5	0.5	0
Other Birds	7	4	7	5	7.57	5.25	100	83.3	100	0	0	100	0	0
Overall	**399**	**836**	**5484**	**3634**	**17.90**	**6.80**	**83.9**	**80.6**	**79.0**	**20.8**	**0.2**	**99.2**	**0.8**	**0**

* Rotor-swept area

3.2.2 Raptor Nest Surveys

Raptor nest surveys were conducted within the Project area by WEST during spring 2007 and spring 2008 prior to leaf-out (Johnson and Bay 2008 and Carder et al. 2010). The objectives of the raptor nest surveys were to locate and record raptor nests which may be subject to disturbance and/or displacement effects by Project construction and/or operation. Surveys were completed by walking and driving along public roads and accessible private roads and searching for raptor nest structures within areas of suitable habitat (trees, rock outcrops, powerline poles, etc.). No raptor nests were observed in the Project area in 2007 or 2008.

3.2.3 American Golden-Plover Surveys

AMGP occur in sizable congregations in many areas in west-central Indiana and eastern Illinois in late March and early April. AMGP have been observed to be especially concentrated in the two southern-most quadrants of Union Township in Benton County. An IBA was established in 2006 by the Indiana State Chapter of the Audubon Society in close proximity to the Project area (Figure 2). The Service, with input from IDNR and Indiana Audubon, recommended that a three year monitoring study be conducted to study AMGP use of the Project area (USFWS letter addressed to Rene Braud, BP Alternative Energy, dated September 10, 2007). While the AMGP is not listed as threatened or endangered under the ESA or by the state of Indiana, it is protected by the MBTA and listed as a species of special interest by the IDNR. Surveys were conducted in the springs of 2007, 2008, and 2009 to determine use of the Project area by AMGP (Johnson et al. 2009). Surveys were designed to be consistent with those conducted in previous AMGP studies in the region. Surveys were conducted twice a week during the spring season; surveyors drove public roads and searched for plovers. Twice each survey day, surveyors spent a minimum of 30 minutes recording detailed observations, including plover behavior and flight height.

During all three years of study, active farming operations were occurring throughout the Project area. In 2007, there was no construction activity occurring in the Project area during the study period. In 2008, Project construction activity was relatively light during the spring study period, involving some sporadic earth work with no tower deliveries or erected turbines. Between the spring of 2008 and December 2008, turbines were erected in the Phase I and III areas. In 2009, there was little construction activity during the study period, but road cleanup and restoration activities were conducted in the Phase I area (Johnson et al. 2009).

In 2007, a total of 58,943 AMGP in 184 groups were observed in the IBA and Project area. AMGP use of the Project area and IBA decreased during 2008 to 8,919 AMGP in 71 groups (the spring migration in 2008 was unusual for AMGP, with other observers also noting possible changes in plover distribution due to a wet and cold spring). In 2009, overall use was similar to that of 2008, with 8,981 AMGP in 38 groups observed. However, AMGP sightings in 2009 were located away from the newly erected turbines. AMGP sightings had been recorded in the turbines locations in 2007 and 2008, prior to erection of the turbines. It is possible that AMGP could have shown an especially pronounced avoidance of wind turbines in 2009 as this was the first year that turbines were encountered within areas historically used by AMGP. Crop type may also have influenced plover distribution, as 90 percent of plover sightings in 2009 were made in soybean fields, but soybean crops comprised only 35 percent of the turbine areas. Differences in AMGP used between 2007 and 2008 also show that weather can greatly influence use of the Project area between years, regardless of the presence of turbines (Johnson et al. 2009).

AMGP spent the majority of time flying below blade height during all three years of survey. Approximately 10 percent of observations of flying plovers were within blade height, while 90

percent of observations of flying plovers were below blade height. No plovers were found during a concurrent fatality study in 2009 (Johnson et al. 2009).

3.3 POST-CONSTRUCTION AVIAN MORTALITY STUDIES

Mortality monitoring studies were conducted at FRWF over three years from 2009 to 2011. In 2009, carcass searches occurred from April 2 to June 10 at Phase III and from April 6 to October 30 at Phase I. In 2010, carcass searches occurred at Phases I, II, and III from April 13 through May 15 and from August 1 through October 15. In 2011, carcasses searches occurred at Phases I, II, and III from April 1 to May 15 and July 15 to October 29. No Indiana state-listed or federally listed bird species were found during these searches.

During the study at Phase III in 2009, three birds were found. All three of the fatalities were comprised only of a few bones without any feathers or fleshy parts remaining. Two of the fatalities were identifiable only as ducks, based on skull characteristics. The remaining casualty was only identifiable as a large bird because no skull was present; that casualty was determined to also likely be a species of waterfowl. No AMGP fatalities were found during this survey. Because all three birds found during the study were estimated to have died well before (> 2 weeks-1 month) the study was initiated, no estimate of overall avian mortality could be made for the Phase III turbines.

A total of 28 birds comprised of 11 species were found during the searches at Phase I in 2009. The most common bird species found as a casualty was killdeer (four fatalities), followed by tree swallow (three), red-tailed hawk (three), and unidentified large bird (three); two unidentified ducks were also found as fatalities. The three unidentified large birds and two unidentified ducks found during the study consisted entirely of a few large bones with no feathers or flesh remaining. The estimated fatality rate and 90 percent confidence interval (CI) for the entire study period was 5.26 birds/turbine (90% CI=3.52, 10.25). Given the 301-MW nameplate capacity of Phase I, the overall fatality estimate for the entire study period (three seasons) was 2.83 birds/MW. This estimated fatality rate is lower than average compared to other wind energy facilities located in the Midwest. Overall bird fatality estimates at seven Midwest facilities in Nebraska, Wisconsin, Minnesota, Iowa, and Illinois have ranged from 0.6 to 7.2 and average 4.28 birds/MW/year (Johnson et al. 2010b).

A total of 60 bird carcasses comprised of 22 species were found during the 2010 monitoring (Good et al. 2011). The majority of carcasses were passerines. The most common bird species found was killdeer (nine fatalities), followed by European starling, golden-crowned kinglet, and unidentified birds (five each). No waterbirds or waterfowl fatalities were recorded. Three red-tailed hawk carcasses and one rough-legged hawk carcass were found. This monitoring effort was focused on detecting actual bat mortalities and estimating bat fatality rates for the Project. Consequently, bird carcasses were recorded but no estimate of bird fatality was developed for 2010.

A total of 77 bird carcasses comprised of 24 species were found during the 2011 monitoring (Good et al. 2012). The majority of carcasses were passerines. As in 2010, the most common bird species found was killdeer (21 fatalities), followed by European starling (seven carcasses), and mourning dove (six carcasses). Four unidentified large bird carcasses and three unidentified waterfowl carcasses were found. The unidentified large bird carcasses were determined not to be eagle carcasses based on bone and feather measurements. As in 2010, three red-tailed hawk carcasses and one rough-legged hawk carcass were found in 2011. The monitoring effort was again focused on detecting and estimating bat mortality, so no estimate of bird fatality was developed for 2011.

The results of these post-construction surveys were used to assess the relative impacts to birds at FRWF in the context of impacts reported for other wind energy projects; this discussion is provided in Section 4.1.2, Potential Impacts from the Fowler Ridge Wind Farm. Section 4.3, Avoidance and Minimization Measures, provides a description of the conservation measures developed for birds based on the results of the pre- and post-construction studies and the impacts assessment.

3.4 PRE-CONSTRUCTION BAT ACTIVITY STUDIES

Pre-construction ground-based bat acoustical surveys were conducted at the Project from August 15 through October 19, 2007 and from July 17 through October 15, 2008, time periods that cover the time frame during which most bat mortality occurs at wind energy facilities throughout North America (Arnett et al. 2008). Three AnaBat® II bat detectors (Titley Electronics Pty Ltd., NSW, Australia) were established approximately 3.2 ft (1 m) above the ground in habitat in the Project area similar to that at the turbine locations, and programmed to record from 0.5 hour before sunset to 0.5 hour after sunrise.

A total of 648 bat calls were recorded in 2007, averaging 4.7 bat calls per detector-night across the entire study period (Gruver et al. 2007). Bat activity peaked in late September and early October. Approximately equal numbers of high frequency ($\geq$ 35 kHz) calls (which may include *Myotis* species) and low frequency (<35 kHz) calls were recorded. High frequency calls averaged 2.3 calls per detector night, while low frequency calls averaged 2.4 calls per detector night. In general, high frequency calls per detector night exceeded low frequency calls on a weekly basis, except between September 19 and October 2, when bat activity was highest and nearly twice as many low frequency calls were recorded than high frequency calls.

A total of 851 bat calls were recorded in 2008, averaging 6.45 bat calls per detector night across the entire study period (Carder et al. 2009). Bat activity was highest in early August, and then peaked again from mid-August through early September. Just under half (47.4%) of the calls were low (<30 kHz) frequency, while mid-frequency (30-40 kHz) and high frequency (>40 kHz) calls comprised 18.4 percent and 34.2 percent of the total, respectively. The high frequency calls were likely attributable to tri-colored bats and several *Myotis* bat species.

3.5 POST-CONSTRUCTION BAT MORTALITY STUDIES

Over three years of post-construction mortality studies at FRWF from 2009 to 2011, a total of 1,543 bat carcasses of 10 different species were found. Table 3.4 gives a breakdown of the total recorded mortality by species.

Table 3.4 Bat Carcasses Found at the FWRF Project during Post-Construction Mortality Studies from 2009 to 2011, by Species

Species	Total Carcasses
Eastern red bat	877
Hoary bat	355
Silver-haired bat	235
Big brown bat	52
Little brown bat	5
Evening bat	4
Seminole bat	3
Tri-colored bat	3
Indiana bat	2
Northern Myotis	1
Unknown	6
Total	**1,543**

Adjusted fatality estimates for the FRWF ranged from 0.56 bats/turbine (90% CI=0.32, 0.82) for the 2010 spring survey to 30.54 bats/turbine (90% CI=25.40, 37.45) for the 2011 fall survey (Good et al. 2011 and 2012). The level of effort, study design, and results of the post-construction monitoring surveys varied across the three years, as described in the survey reports.

During the mortality study conducted at Phase III from April 2 to June 10, 2009, five bat fatalities comprised of four species were found, including two hoary bats and one each of the following species: eastern red bat, silver-haired bat, and big brown bat (Johnson et al. 2010a). Bat fatalities were evenly distributed throughout the study season. The estimated number of bat fatalities and associated 90 percent CI for the study period from April 2 to June 10 was 3.03 bats/turbine (90% CI=0.71, 6.58). Based on the 1.65-MW capacity of Phase III, the estimated number of bat fatalities was 1.84 bats/MW from April 2 to June 10, or a total of 182 estimated bat fatalities.

Mortality monitoring at Phase I conducted from April 6 through October 30, 2009 documented a total of 156 bat fatalities comprised of six species. Most (94.2%) of the bat fatalities were migratory tree bats, including 56 eastern red bats (35.9%), 48 hoary bats (30.8%), 42 silver-haired bats (26.9%), and one unidentified *Lasiurus* species (either hoary or eastern red bat). The other bat fatalities included four big brown bats, three little brown bats, one northern myotis, and one Indiana bat. The Indiana bat casualty was collected as an incidental casualty on September 11, 2009. Based on the lack of Indiana bat summer habitat in or near the Project area, and the date of the casualty (estimated to be September 9, 2009), the fatality was assumed to be a migrant through the area. Most (73.7%; n=115) of the bat fatalities occurred from August 1 to September 15, with an additional 12.8 percent (n=20) of fatalities found between September 16 and October 30. The estimated fatality rate and 90 percent CI for the entire study period was 15.03 bats/turbine (90% CI=10.89, 20.52). Given the 301-MW nameplate capacity of Phase I, the overall fatality estimate for the entire study period (three seasons) was 8.09 bats/MW (2,435 bats total for Phase I). This estimated fatality rate is moderate when compared to other wind energy facilities in North America and is somewhat below the regional average in the Midwest. Reported bat fatality estimates at seven other wind energy facilities in the Midwest (located in Nebraska, Wisconsin, Minnesota, Iowa, and Illinois) ranged from 0.8 to 30.6 bats/MW/year and averaged 9.8 bats/MW/year (Johnson et al. 2010b).

As a result of the discovery of the Indiana bat carcass during the fall 2009 monitoring at Phase I, the Service recommended that FRWF complete an HCP and obtain an ITP from the Region 3 USFWS office. FRWF was issued a two-year Scientific Research and Recovery Permit for the Indiana bat (TE 15075A) by USFWS Region 3 to help build a better scientific basis for the potential minimization and mitigation measures for HCP development. As part of the research conducted under the permit, daily carcass searches were conducted in 2010 and 2011 at Phases I, II, and III.

The 2010 carcass searches were conducted during the spring (April 13-May 15) and fall (August 1-October 15) migration seasons (Good et al. 2011). Overall, 36 bat casualties (18 silver-haired bats, 15 eastern red bats, two hoary bats, and one big brown bat) were found during the spring. During the fall, a total of 773 bats of seven species were found; most fatalities were found during the month of August. The majority (64.68%; 500 carcasses) of bat fatalities found during the fall were eastern red bats, followed by hoary bats (18.63%; 144 carcasses), silver-haired bats (12.03%; 93 carcasses), and big brown bats (3.88%; 30 carcasses). Three tri-colored bats, two little brown bats, and one Indiana bat were also found. The estimated fatality rates for the spring season were 0.56 bats/turbine (90% CI=0.32, 0.82) using the Shoenfeld estimator and 0.74 bats/turbine (90% CI=0.44, 1.14) using the empirical estimator. These estimates increased during the fall season, with 16.03 bats/turbine (90% CI=13.95, 18.33) based on the Shoenfeld

estimator and 21.45 bats/turbine (90% CI=18.50, 29.34) using the empirical estimator. Bat casualty rates were lower at turbines which were operated at higher cut-in speed treatments. Observed fatality rates during the fall season were 14.0 bats/turbine (90% CI=11.6, 16.5), 7.0 bats/turbine (90% CI=5.1, 9.1), and 3.0 bats/turbine (90% CI=1.8, 4.2) for control (3.5 m/s), 5.0 m/s, and 6.5 m/s treatment conditions, respectively. An approximate 50 percent reduction in observed bat mortality was realized by raising the cut-in speed from the control to 5.0 m/s and an approximate 78 percent reduction in observed bat mortality was realized by raising the cut-in speed from the control to 6.5 m/s.

In 2011, 573 bat carcasses were discovered, 465 of which were found during the fall monitoring period (July 15 – October 15). Only one carcass was found during the late fall monitoring period (October 16 – October 29). Most bat fatalities were again found in August, however more bat fatalities were found in September 2011 compared to 2010. Similar to 2010, the most commonly found bat species was eastern red bat (53.2%, 305 fatalities), followed by hoary bat (27.8%, 159 fatalities), silver-haired bat (14.1%, 81 fatalities), and big brown bat (2.8%). Two new species were found in 2011: the Seminole bat (*Lasiurus seminolus*, three carcasses) and the Indiana state-endangered evening bat (four carcasses). Seasonal adjusted fatality estimates based on the Shoenfeld estimator were 0.61 (90% CI=0.32, 1.06) bats/turbine from April 1 to May 15, 2.18 (90% CI=1.32, 3.26) bats/turbine from July 15 to July 31, and 22.99 (90% CI=19.21, 29.35) bats/turbine from August 1 to October 15, for an overall estimate of 25.78 (90% CI= 22.51, 32.37) bats/turbine. Empirical fatality estimates were higher: 0.66 (90% CI=0.32, 1.17) bats/turbine from April 1 to May 15, 2.90 (90% CI=1.57, 4.22) bats/turbine from July 15 to July 31, and 30.54 (90% CI= 25.40, 37.45) bats/turbine from August 1 to October 15, for an overall estimate of 34.10 (90% CI= 28.64, 41.37) bats/turbine. Bat casualty rates were lower at turbines which were feathered until higher cut-in wind speeds were reached. Bat casualty rates were decreased by about 36 percent, 57 percent, and 73 percent, compared to control turbines, when turbines were feathered at 3.5 m/s, 4.5 m/s, and 5.5 m/s, respectively.

Of the ten bat species found as fatalities at the FRWF, the Indiana bat is listed as Indiana state- and federally endangered and the evening bat is listed as Indiana state-endangered. Six species, the little brown bat, northern myotis, silver-haired bat, red bat, hoary bat, and tri-colored bat, are listed as special concern species by the IDNR. The big brown bat and the Seminole bat are the only two of the ten bat species found in the Project area that are not listed as either endangered or special concern. The big brown bat is widespread and common throughout its range. The FRWF is outside of the known range of the Seminole bat, which is typically a resident of the southern U.S. While few records of Seminole bat exist in Indiana, the species has occasionally been found outside of its range in other states, as well.

Acoustic monitoring was conducted simultaneously with carcass searches in 2010 and 2011 to research bat use rates at the Project area and the relationship of bat use levels to mortality levels (Good et al. 2011 and 2012). The average bat activity in 2010 was 1.34 $\pm$ 0.29 bat passes per detector-night at ground stations in the spring, and 11.46 $\pm$1.29 at ground stations and 3.10 $\pm$ 0.42 at nacelle stations in the fall. In 2011, the average spring bat activity was 2.57 $\pm$ 0.06 and 0.56 $\pm$ 0.02 bat passes per detector-night at the ground and raised stations, respectively. The average fall bat activity was 16.72 $\pm$ 1.52 and 5.19 $\pm$ 0.59 bat passes per detector-night at the ground and raised stations, respectively. The highest periods of bat use occurred during the first two weeks of August in 2010 and during mid to late August in 2011. Passes by high-frequency bats were outnumbered by passes by mid-frequency and low-frequency bats during the spring study period both years and during the fall study period in 2011. In fall 2010, high-frequency passes were outnumbered by low-frequency passes, but slightly exceeded the number of mid-frequency passes.

Very few *Myotis* calls (15.6% and 0.2% of identifiable calls in 2010 and 2011, respectively) were recorded during the course of the studies. Most of the 30 calls potentially resembling Indiana bat calls were recorded on August 9-10, 2010, at a reference station located away from the turbines. Bat casualty rates were found to be positively correlated with higher bat activity, although other factors were also associated with increases in observed casualty rates, including lower mean wind speeds, higher mean temperatures, increasing variance in temperature, and increasing barometric pressure. Data collected in 2011 showed that 77 percent of all bat fatalities and 73 percent of all bat activity recorded by detectors on nacelles occurred when wind speeds were below 5.5 m/s. These data suggest that wind speeds above certain thresholds greatly reduce the ability of bats to fly near nacelle height. The results of these post-construction surveys were used to assess the relative impacts to bats at FRWF in the context of impacts reported for other wind energy projects; this discussion is provided in Section 4.2.2, Potential Impacts from the Fowler Ridge Wind Farm. Section 4.3, Avoidance and Minimization Measures, provides a description of the conservation measures developed for bats based on the results of the pre- and post-construction studies and the impacts assessment.

4.0 POTENTIAL IMPACTS TO BIRDS AND BATS

4.1 BIRDS

4.1.1 Overview of Potential Impacts

Nationally, wind turbines are responsible for 0.01-0.02 percent of all avian fatalities due to human structures (Erickson et al. 2002). Fatality rates ranged from 0.00 birds/turbine/year to 9.33 birds/turbine/year and averaged 2.08 birds/turbine/year in 22 studies conducted at wind energy facilities across North America (Barclay et al. 2007). Mortality rates at sites in the west and Midwest, particularly agricultural ones, have typically been at the low end of the national range. Recent studies at the Blue Sky Green Field and Crescent Ridge sites in Wisconsin recorded unusually high bird fatality rates which increased the upper limit of the Midwest bird fatality range (Poulton 2010). Publicly-available estimates for the Midwest now range from 0.00 to 11.83 birds/turbine/year (Barclay et al. 2007 and Poulton 2010). The number of avian fatalities at wind energy facilities is generally low when compared to the total number of birds detected at these sites (Erickson et al. 2002). No particular species or family has been identified as incurring greater numbers of fatalities at wind energy facilities. However, likely due to differences in abundance and use of habitat, bird groups have experienced varied impacts from wind turbines. Passerines, both resident and migrant, represent the majority (approximately 75%) of mortalities at wind turbines nation-wide (Erickson et al. 2001 and Johnson et al. 2002) and result in spring and fall peaks of bird mortality rates at most wind energy facilities (Johnson et al. 2002). Although waterbird (waterfowl, shorebirds, and seabirds) mortality at wind energy facilities has been highly variable, national research has demonstrated that waterbirds rarely collide with inland turbines (Everaert 2003 and Kingsley and Whittam 2005). The only sites experiencing regular waterfowl fatalities have been those located on the shores of large, open expanses of water (Erickson et al. 2002). Raptor mortality rates at Midwest sites have been very low; generally one or two carcasses are found per study (Poulton 2010).

Episodic events involving large numbers of one or a few bird species during migration have been recorded at multiple wind energy projects, and are associated with lighting that attracts or disorients birds. The first documented episodic mortality event at a wind facility occurred in heavy fog during spring migration in May 2003 at Mountaineer Wind Energy Center in West Virginia and consisted of 33 passerine fatalities. Weather conditions and the location of the carcasses suggested that the birds were attracted to bright sodium vapor lights present at a substation located adjacent to three turbines. After these lights were extinguished, no other episodic events occurred at the substation or adjacent turbines (Kerns and Kerlinger 2004). Two additional episodic mortality events were observed in West Virginia during 2011. In October 2011, a total of 484 bird carcasses were found at the Laurel Mountain Substation, near a wind facility, after several days of fog, cold weather, and winds. Eight 250-watt high pressure sodium lamps were on at night during the event and were assumed to have attracted birds during adverse weather conditions. Similarly in September 2011 at the Mount Storm Wind Energy Facility in WV, 59 bird carcasses were found on one day, 31 of which were found at one turbine whose internal nacelle light had been inadvertently left on overnight. The previous night's weather had been foggy, and the nacelle light was thought to have attracted the birds to the turbine.

4.1.2 Potential Impacts from the Fowler Ridge Wind Farm

Pre-construction avian surveys and a review of other available site-specific bird use data have indicated that use by most bird species within the Project area is moderate when compared to other Midwest wind energy sites. AMGP and whooping crane are species of concern for the Project; impacts to these species are addressed specifically in Sections 4.2.1 and 4.2.2, below.

Over a total of 40 survey hours conducted during the spring and fall of 2007 at the Project area, a total of 7,738 birds comprised of 45 unique species were observed. This number was inflated by the high numbers of AMGP observed during surveys. Over a total of 112.67 survey hours conducted during all four seasons from spring 2008 to spring 2009, a total of 4,721 birds of 58 unique species were observed. During four years (March 15, 1996 - November 15, 1999) and approximately 325 hours of avian point count surveys at Buffalo Ridge, MN, a total of 70,727 birds of 164 species were recorded (Johnson et al. 2000). At Black Fork, OH, a total of 362 birds of 27 species were detected during approximately six hours of surveys in fall 2008. At the same facility in spring 2009, a total of 1,733 birds of 67 species were detected over approximately 18 hours of surveys (Ecology and Environment 2009).

Raptor use rates were also moderate at the Project area when compared to those recorded at similar Midwest sites. Plot sizes varied slightly across studies, but the results of other pre-construction surveys provide a relative comparison of raptor use per 20 minutes of survey effort. During the Fowler Ridge avian surveys, a total of 161 raptors of six species were observed in 2007 and a total of 64 raptors of 5 species were observed in 2008-2009. Raptor use at the Project averaged 0.60 and 1.22 raptors/plot/20 min survey in the spring and fall, respectively, at the Project area in 2007. During the 2008-2009 surveys, raptor use averaged 0.15, 0.13, 0.17, and 0.24 raptors/plot/20 min survey, in the spring, summer, fall, and winter, respectively. At Buffalo Ridge, MN, raptor use averaged 0.78, 0.22, 0.64, and 0.60 raptors/plot/20 min survey in the fall, winter, spring, and summer, respectively (Johnson et al. 2000). At Black Fork, OH, raptor use averaged 0.13 and 0.26 raptors/plot/20 min survey in the fall and spring, respectively (Ecology and Environment 2009). At Buckeye Wind, OH, raptor use averaged 0.11 and 0.20 raptors/plot/20 min survey in the fall and spring, respectively (Stantec Consulting Services, Inc. 2009). The number of raptor species detected has been similar across Midwest sites, ranging from 4 to 13 species (Kerlinger et al. 2007; Derby et al 2010; Guarnaccia and Kerlinger 2008; Cutright 2006 and 2009).

Potential Impacts from Construction of Phase IV

Potential impacts to birds during construction of Phase IV and Project decommissioning are likely to be minimal. Certain bird species may be temporarily displaced due to noise and increased human presence during these stages of the Project. Grassland birds may be particularly susceptible to displacement, although grassland and pasture habitat within the Project area is comprised of small fragments, with much edge habitat. The large majority of birds detected during surveys within and near the Project area were common species adapted to human disturbance (Johnson and Bay 2008 and Carder et al. 2010); these species are less likely to be displaced due to Project activities (Shaffer and Johnson 2008 and Kerlinger 2002). Mortality of juvenile birds may occur if construction or decommissioning actions occur in non-tilled areas during the breeding season. However, nesting habitat for ground- and shrub-nesting birds is limited within the Project area, due to the predominance of active agriculture (>90%).

Potential Impacts from Operation of Phases I-IV

Displacement

Although Project operation has the potential to cause displacement of birds from the Project area, bird species sensitive to disturbance currently exhibit low use of the Project area and minimal suitable habitat for these species is present, as discussed above. The majority of birds occurring within the Project area are members of common, disturbance-tolerant species; it is therefore unlikely that displacement impacts from the turbines would greatly alter the composition of the area's avian community. It is unclear if displacement impacts to more disturbance-sensitive species would persist for the life of the Project; certain species may adapt to the presence of the turbines (The Ornithological Council 2007).

Collision Risk

The operating turbines will also pose a risk of mortalities from collisions for avian resources within the Project area. Although the Project area does not exhibit any environmental characteristics indicating a high level of collision risk, the turbines are expected to regularly strike a small number of birds each year, based on the results of post-construction mortality studies at FRWF and similar facilities. Mortality rates over the life of the Project are expected to be within the 0.00 to 11.83 birds/turbine/year range reported from other Midwestern sites. Given the moderate levels of avian abundance and species richness, the lack of native habitats, and the low observed flight patterns of most birds in the Project area (Table 3.3), mortality rates are likely to be at the lower end of this range[2]. Initial post-construction monitoring studies estimated the bird mortality rate at 5.26 birds/turbine over spring, summer, and fall for Phase I of the FRWF (Johnson et al. 2010b). Given the 301-MW nameplate capacity of Phase I, the overall fatality estimate for the entire study period (three seasons) at FRWF was 2.83 birds/MW. This estimated fatality rate is lower than average compared to other wind energy facilities located in the Midwest. Overall bird fatality estimates at seven Midwest facilities in Nebraska, Wisconsin, Minnesota, Iowa, and Illinois have ranged from 0.6 to 7.2 and averaged 4.28 birds/MW/year (Johnson et al. 2010b).

Bird fatality rates have been observed to peak during the spring and fall migration seasons at most wind energy facilities (Johnson et al. 2002). The results of initial post-construction monitoring studies indicated that bird mortality at the Project area follows the same pattern of seasonality, though mortality rates are lower than the Midwest average (Johnson et al. 2010b). Passerines, both resident and migrant, are likely to constitute the greatest number of fatalities in the Project area, as this avian group represents the majority (75%) of mortalities at wind turbines nation-wide and was by far the group most frequently observed during surveys within and near the Project area (Johnson and Bay 2008 and Carder et al. 2010). Night-migrating passerines may be at a higher risk than other bird types, as this group has accounted for over 50 percent of avian fatalities at certain sites, but no particular species or group of species has been identified as incurring greater numbers of fatalities (Erickson et al. 2002). As a group, passerines constituted the majority of bird fatalities recorded at FRWF (Johnson et al. 2010b and Good et al. 2011). Birds taking off at dusk or landing at dawn, or birds traveling in low cloud or fog conditions (which lower the flight altitude of most migrants) are likely at the greatest risk of collision (Kerlinger 1995). Nationally, these mortalities have not been known to result in a significant population level impact to any one species, mainly because the migratory species with relatively high collision mortality are regionally abundant. Additionally, no large-scale night migration-related mortality events have been observed at turbines as have been seen at communications towers (Erickson et al. 2002).

Collision risk is likely to be much lower for other bird groups in the Project area. Very few waterbirds or waterfowl were observed during the pre-construction avian surveys; the high numbers of shorebirds (AMGP) observed are discussed under Section 4.2.1 below. National research has demonstrated that waterbirds rarely collide with inland turbines (Everaert 2003 and Kingsley and Whittam 2005), perhaps because of the consistently high (150-1500m)

[2] Recent post-construction studies at the Blue Sky Green Field (Gruver et al. 2009) and Cedar Ridge (BHE Environmental, Inc. 2010) facilities in Wisconsin have demonstrated that avian mortality rates at the high end of this range may result at facilities sited in agricultural habitats.

altitudes at which waterbirds migrate over land (Kerlinger 1995). Initial post-construction mortality studies recorded seven waterbird or waterfowl fatalities over two study seasons at both Phase I and Phase III and one study season at Phase II of the Project (Johnson et al. 2010a and b, Good et al. 2011). Risk to waterfowl may be increased on the Project area during the winter months if the croplands within the Project area attract large flocks of Canada Geese (Erickson et al. 2002). Raptor use of the Project area was observed to be moderate during the pre-construction surveys. The most frequently-observed raptor species were red-tailed hawk, American kestrel, and northern harrier (Johnson and Bay 2008 and Carder et al. 2010). Given the lack of major raptor migration lines through the Project area, low expected prey densities, and lack of raptor nests or nesting habitat observed during surveys (Johnson and Poulton 2007), raptor fatality rates at the Project site are expected to be similar to those at other Midwest sites. Initial post-construction monitoring studies recorded seven raptor fatalities over two seasons of studies at both Phase I and Phase III and one study season at Phase II of the Project, six of which were red-tailed hawks (Johnson et al. 2010b and Good et al. 2011). Fatality estimates were not calculated for birds in the Phase III or Phase II studies; however, the moderate avian fatality rate estimated from the Phase I 2009 study and the majority composition of red-tailed hawks, a widespread and common species in the Midwest, indicates these raptor fatalities are unlikely to represent an appreciable impact.

Section 4.3, Avoidance and Minimization Measures, provides a description of the conservation measures developed for birds based on the results of the pre- and post-construction studies and the impacts assessment. Although the potential for impacts is expected to be low and effectively minimized by the conservation measures, Section 5.2.2 includes adaptive management developed to address any unexpected impacts to birds.

Sensitive Species

Concerns expressed by the Service and IDNR regarding avian resources within the Project area focused primarily on collision risks during the migration season to listed species and certain other migratory birds. The Service and IDNR both expressed concern for migrating AMGP, a migratory bird and species of concern on the federal priority species lists and whooping cranes, a federally-endangered species with a population (listed under the ESA only as experimental) which migrates across Indiana. The IDNR also expressed concern for several state-listed species which are known or have the potential to occur near or within the Project area: least bittern, northern harrier, barn owl, short-eared owl, upland sandpiper, king rail, and western meadowlark. Four of these species: AMGP, upland sandpiper, northern harrier, and western meadowlark, were observed within the Project area during pre-construction surveys (Johnson and Bay 2008 and Carder et al. 2010). Several other IDNR-listed species were also observed during surveys (see Section 3.2). With the exception of AMGP and northern harrier, all sensitive species were observed in low numbers. A threatened and endangered species review of the Project area concluded that although construction activities will disturb a small percentage of available foraging habitats, in the form of grasslands and agricultural fields, for sensitive avian species, plenty of foraging areas will remain following Project construction. Additionally, all wetland areas, preferred habitat for many of the IDNR-listed bird species with potential for occurrence within the Project area, will be avoided by land-disturbing activities (CBBEL 2007b). Given the low numbers observed and limited available habitat, many of these species are therefore considered to be at low collision risk except during aerial mating displays or migration. Initial post-construction surveys in 2009, 2010, and 2011 recorded no fatalities of state or federally threatened or endangered bird species (Johnson et al. 2010a and b, Good et al. 2011).

American Golden-Plovers

Displacement and disturbance impacts to AMGP from the Project may be likely, as AMGP were not sighted near turbines during AMGP surveys conducted in 2007, 2008, and 2009 by WEST (Johnson et al. 2009). No AMGP were observed near the newly-erected turbines during the 2009 surveys, despite using these areas in 2007 and 2008 prior to the erection of the turbines. It is possible that AMGP could have shown an especially pronounced avoidance of wind turbines in 2009, as this was the first year that turbines were encountered within areas historically used by AMGP. Also, differences in AMGP used between 2007 and 2008, before turbines were constructed, showed that weather can greatly influence use of the Project area between years, regardless of the presence of turbines (Johnson et al. 2009). However, if AMGP continue to avoid areas near Project turbines, they may be displaced from much of the Project area (Figure 2). Displacement impacts are not expected to extend into the IBA, as neither erected nor proposed turbines are located immediately adjacent to the border of the IBA (Figure 2).

Given the high numbers of AMGP which occur within the Project area and adjacent IBA during the spring migration period (58,943 individuals were observed during the 2007 AMGP surveys), it is likely that some AMGP will collide with Project turbines or the Project transmission line. Flocks of AMGP will fly at altitudes within the rotor-swept area as they migrate into and out of the IBA and Project area, which may increase the risk of turbine collision. However, AMGP mortality at the Project is expected to be low relative to the number of individuals present and unlikely to have significant population-level impacts, considering the flight patterns and turbine avoidance observed during the surveys. During all three years of AMGP surveys within the Project area, AMGP were observed to spend the majority of time flying at their typical foraging altitudes, below blade height (Johnson et al. 2009). Based on these flight patterns and the lack of AMGP observed near newly-erected turbines during the 2009 surveys, despite previous observations in these areas in 2007 and 2008, it was concluded that AMGP may not be especially susceptible to collisions with wind turbines (Johnson et al. 2009). Initial post-construction monitoring studies conducted during the spring migration season for two years at both Phase I and Phase III and one year at Phase II of the Project did not detect any AMGP carcasses (Johnson et al. 2010a and b, Good et al. 2011).

Although impacts to AMGP have not been recorded at FRWF, Section 5.2.2 includes adaptive management developed for AMGP to address any unexpected impacts.

Whooping Crane Risk Assessment

In a response to a data request from FRWF dated October 13, 2006, the Service identified the Project as within the range of a non-essential, experimental population of whooping cranes (*Grus americana*). A risk assessment of potential impacts of the Fowler Wind Farm on the eastern experimental population of whooping cranes was undertaken in June 2007 (Johnson and Tidhar 2007). The eastern population of whooping cranes was reintroduced to the Midwest in 2001 and is listed as a non-essential, experimental population. This designation relaxes the restrictions of the ESA and lessens possible conflicts between people and whooping crane conservation. The flock is still protected under the MBTA. An ultra-light aircraft was used to imprint birds of this population to migrate between breeding grounds in Wisconsin and wintering grounds in Florida. One of the stopover sites on this route was in Benton County until 2008. Although juvenile cranes are no longer being led through Indiana during migration, whooping cranes that were trained to fly through the state may continue to maintain their route. Whooping cranes migrating on their own have the potential to occur anywhere in Indiana and eastern Illinois.

Within the 72,947 acres (29,521 ha) that comprise the FRWF, very few wetlands are present. However, approximately 94.6 acres (38.2 ha) of wetlands were identified in the vicinity of the

Project area. Habitat quality within these wetlands was found to be marginal for whooping cranes. There are also 38 acres (15 ha) of open water, primarily small ponds, within the Project area. It is possible that migrating whooping cranes may occasionally stopover in Benton County. The risk assessment determined that direct mortality during Project construction is very unlikely, especially when construction occurs outside of the spring and fall migration periods. Direct mortality was also determined to be unlikely during the steady migratory flight, since whooping cranes migrate at an altitude much higher (1,000 to 6,000 ft [305 to 1,829 m]) than the rotor-swept area of the Project turbines (approximately 82 to 427 ft [25 to 130 m]). The risk assessment identified greater potential for collision with turbines and/or the Project's transmission line during stopover periods when whooping cranes fly between foraging and rooting sites at sunset and sunrise under low-light conditions. Inclement weather was also determined to increase the chance of collision. Marking powerlines reduces collision rates; however, it was determined that the potential for adverse effects to whooping cranes, particularly from turbines, cannot be reduced to discountable or insignificant levels at the Project. The risk assessment concluded that for this reason, if the flock was protected under the ESA, the appropriate determination would be that operation of the Project is likely to adversely affect whooping cranes. Due to the presence of marginal stopover habitat in the Project area, the risk assessment considered the potential for disturbance and displacement of whooping cranes to be possible. However, based on the small total population size of the flock (~100 cranes) and the marginal quality of the habitat within the Project area, the overall risk to whooping cranes at the Project was determined to be low (Johnson and Tidhar 2007).

Although impacts to whooping cranes are not expected to occur at FRWF, Section 5.2.4 includes adaptive management developed for whooping cranes to address any unexpected impacts.

Eagle Use Assessment

The Service also documented in their September 2007 letter (Pruitt 2007) that there were no anticipated impacts to the bald eagle from the Project, based on the location of the Project site and the distribution of eagles in the area (USFWS letter addressed to Rene Braud, BP Alternative Energy).

An assessment of bald and golden eagle use at the FRWF was conducted in summer 2011 to summarize existing information and assess which risk category is most appropriate for the FRWF based on the latest guidance from the Service regarding eagle conservation plans (USFWS 2011a). Phases I-IV were found to lack primary bald eagle habitat in the form of mature forest and large, fish-bearing waters. Phases I-IV were also found to lack primary golden eagle habitat in the form of grasslands and other native habitat. Because over 98 percent of the Project area is composed of flat corn and soybean fields and developed areas, foraging and nesting opportunities were considered very low for bald and golden eagles. More suitable nesting habitat for bald eagles was found to exist outside of the FRWF along the forested corridors of the Tippecanoe and Wabash Rivers and associated woodlots over 10 miles (16 km) from the FRWF. Lower quality, but potentially suitable nesting habitat for bald eagles was also identified along Pine Creek, approximately two miles (3.2 km) east of the FRWF (Good and Simon 2011).

Correspondence provided by Matt Stuber, USFWS, on March 4, 2011, stated that there is one known bald eagle nest in Indiana within the 10-mile (16-km) buffer search zone, located approximately 6.5 miles (10.5 km) southeast of the southeast corner of the FRWF along Cranberry Marsh. The nest was recorded as active in 2009 and 2010, with two fledged young documented in 2009. Correspondence received on April 25, 2011, from Matt Sailor, USFWS, states that there are no records of bald or golden eagle use within the FRWF or the 10-mile (16-

km) buffer in Illinois, as of the most current dataset for Illinois (2009 nesting season). No records of nesting golden eagles exist for Indiana and the FRWF is located outside of the breeding range of the golden eagle. The Service also has records of additional bald eagle nests located along the Wabash River within 20 miles (32 km) of the FRWF, with the closest nest reported as 12 miles (19 km) away from the FRWF boundary. The Indiana nest information provided by the Service was current as of the end of the 2010 nesting season (Good and Simon 2011).

Over the course of four years of pre-construction bird surveys and post-construction carcass surveys at the FRWF, a total of three bald eagles and zero golden eagles were observed flying over the Project area. A single bald eagle was observed during regular point count surveys conducted in 2008. In addition, two bald eagles were incidentally observed during post-construction surveys conducted at the Project area in 2011. This low number of eagle observations was determined to indicate that although bald eagle nesting activity occurs within 6.5 miles of the FRWF, and although some lower-quality potential habitat is located as close as two miles (3.2 km) from the FRWF, eagles are not utilizing the FRWF for foraging or nesting due to the lack of habitat present, and are rarely observed flying over the FRWF. The low number of eagle observations was also interpreted to indicate that the Project area is rarely utilized by migrating bald eagles. The complete lack of golden eagle observations during wildlife studies and lack of known golden eagle use areas in Benton County suggested a very low probability of turbine collision for the species. No eagle fatalities were found at the FRWF over the course of 2.5 years of both formal fatality studies and implementation of the FRWF self-reporting, wildlife incident reporting system (Good and Simon 2011).

USFWS (2011) guidance, as currently written, states that any wind energy facility with important eagle use areas (e.g. nests) within 10 miles (16 km) of turbines should fall within Category 2—moderate to high risk to eagles. However, the eagle use assessment contends that the FRWF should be considered a Category 3—minimal risk site for eagles, due to site characteristics, known eagle distributions, and survey results indicating low use of the Project area by eagles and consequently low risk to eagles from the FRWF. In a letter dated September 10, 2007, the Service came to a similar conclusion, and stated “the distribution of eagle nests with respect to the project study area has not changed since our previous review of the project, and there are currently no anticipated impacts on eagles.” The Service documented in their September 2007 letter (Pruitt 2007) that there were no anticipated impacts to the bald eagle from the Project, based on the location of the Project area and the distribution of eagles in the area (Good and Simon 2011).

In February, 2012, the Service provided additional comments regarding eagle risk at the Project area in accordance with BGEPA and the MBTA, based on the eagle use assessment conducted and other data. The Initial Assessment of Eagle Risk, as outlined in the Draft ECP Guidance, for the Fowler Ridge Wind Energy Development (included as Appendix B) concluded that risk to eagles from the Project may be relatively low. This was determined based on data indicating that the FRWF a.) does not appear to overlap with any “important eagle use areas,” b.) appears to overlap only limited amounts of suitable eagle habitat, c.) may have low risk to eagles during the breeding and winter seasons, and d.) may have relatively limited eagle use during spring and fall migration (based on 2007-2009 survey results). However, based on sources of uncertainty associated with eagle use of the Project area and the relatively large size of the Project, the Service noted that risk to eagles is difficult to predict for the FRWF and may be underestimated. The Service’s predictive model arrived at a fatality estimate of 0.201 bald eagles per year for the Project, with a 95 percent confidence interval between 0 and 0.604 bald eagles per year. Extrapolated over the 25-year life of the Project, the fatality estimate adds up to 5 bald eagles; however, actual eagle fatality could be as low as zero, given the confidence intervals associated with the calculation of risk. The Service recommended that FRWF develop

an eagle management plan for the Project to consider risk to eagles and outline a management strategy. The Project's eagle management plan is included in Section 5.2.3.

4.2 BATS

4.2.1 Overview of Potential Impacts

Commercial wind facilities have been found to affect many bat species (Arnett et al. 2008). These impacts may include displacement of individuals, fragmentation of habitat, and direct mortality from collisions with or proximity to wind turbines (Kunz et al. 2007a). Mortality or loss of reproductive fitness may also occur due to habitat destruction or increased noise, vibration, human activity, or traffic associated with wind facility construction and maintenance. Direct mortality at wind turbines is currently the greatest concern for bats in general at wind facilities (Cryan 2008a). Whether bats are attracted to wind turbines and the exact mechanisms by which wind turbines cause mortality are unclear (reviewed in Kunz et al. 2007b); however, several hypotheses have recently been put forth and tested, including the role of land cover and environmental conditions in attracting bats to wind turbine locations, behavioral factors that might make wind turbines attractive to bats, pressure changes from rotating blades causing "barotrauma", or direct impact of unsuspecting migrant bats (Baerwald et al. 2008; Horn et al. 2008; Johnson et al. 2004; Kerns et al. 2005; reviewed in Kunz et al. 2007b).

The influence of landcover on bat mortality at wind turbine sites is unclear (Arnett et al. 2008). Johnson et al. (2004), for example, found no significant relationship between bat fatalities and landcover type within 328 ft (100 m) of wind turbines. They also found no significant relationship between bat mortality and distance to wetlands or woodlands (Johnson et al. 2004). Weather conditions, such as wind speed, rainfall, and temperature, have been found to have a significant impact on bat mortalities (Arnett et al. 2008). Bat mortality and insect activity are both high on nights with low wind speed (Kerns et al. 2005). Bat fatalities decrease with increases in wind speed and precipitation intensity (Kerns et al. 2005).

The primary bat species affected by wind facilities are believed to be migratory, foliage- and tree-roosting species that mostly emit low frequency calls (Johnson et al. 2004; reviewed by Kunz et al. 2007b). Arnett et al. (2008) compiled data from 21 studies at 19 wind facilities in the United States and Canada and found that mortality has been reported for 11 of the 45 bat species known to occur north of Mexico. Of the 11 species, nearly 75 percent were the migratory, foliage-roosting hoary bat, eastern red bat, and silver-haired bat (Kunz 2007a).

Some researchers have suggested that bats that roost in foliage of trees for most of the year may be attracted to wind turbines because of their migratory and mating behavior patterns (e.g. Kunz et al. 2007b; Cryan 2008b). At dawn, these tree bats may mistake wind turbines for roost trees, thereby increasing the risk of mortality (Kunz et al. 2007b). Cryan (2008) suggested that male tree bats may be using tall trees as lekking sites, calling from these sites to passing females. If this is the case, then tree bats may be more attracted to wind turbine sites after the turbines are erected. Migrating tree bats are also thought to navigate across large landscapes using vision rather than echolocation, possibly resulting in the bats being attracted to visual landscape features, such as wind turbines, during migration (Cryan and Brown 2007). As further support for these hypotheses, the majority of bat fatalities occur mid-summer through fall, during approximately the same time frame as southward migration of tree bats (Arnett et al. 2008). Tree bats tend to be larger species that emit low frequency calls. Bats that use low frequency calls may be more inclined to forage above tree tops where there are few obstructions. Migratory bats may also fly higher to maximize efficiency. Thus, tree bats may be more likely to fly in the rotor-swept area of wind turbines when compared to smaller bat species that have different foraging and migration strategies.

Although the number of bat fatalities recorded at wind energy facilities varies regionally, reports of mortality have been highest along forested ridge tops in the eastern U.S. and lowest in open landscapes of Midwestern and western states (Kunz et al. 2007b). However, it is difficult to make direct comparisons among projects due to differences in study length, metrics used for searches, and calculations for compensating for study biases (Arnett et al. 2008). Fatality rates ranged from 0.00 bats/turbine/year to 42.7 bats/turbine/year and averaged 7.12 bats/turbine/year in 21 studies conducted at wind energy facilities across North America (Barclay et al. 2007). In the Midwest, bat fatalities range from 0.1 to 40.5 bats/turbine/year (Poulton 2010), but higher fatality rates (up to 69.6 fatalities/turbine/year) have been reported in the eastern U.S. (Arnett et al. 2008). Estimates based on mortality studies conducted within USFWS Region 3 (Ohio, Michigan, Indiana, Illinois, Wisconsin, Missouri, Iowa, and Minnesota) suggest that fatalities range from 0.76 to 30.61 bats/MW/year (mean= 6.81) (USFWS data).

4.2.2 Potential Impacts from the Fowler Ridge Wind Farm

Bat mortality or loss of reproductive fitness is not expected to result from construction of the remaining phase of the FRWF (i.e., Phase IV), or associated increases in noise, vibration, human activity, and/or traffic, due to the lack of suitable maternity habitat or hibernacula for bats in the nearly 100 percent agricultural Project area.

Pre-construction acoustic bat use surveys indicated that use of the Project area by bats was moderate. Compared to the 4.7 and 6.45 mean bat passes per detector-night recorded in 2007 and 2008, respectively, at FRWF (Gruver et al. 2007 and Carder et al. 2009), 2.2 and 1.9 mean bat passes per detector-night were recorded in 2001 and 2002, respectively, at the Buffalo Ridge site in Minnesota (Johnson et al. 2004), 2.8 and 7.7 mean bat passes per detector-night were recorded at elevated and ground detectors, respectively, at the Blue Sky Green Field site in Wisconsin (Gruver 2008a), 5.7 mean bat passes per detector-night were recorded at the Glacier Hills site in Wisconsin (Gruver 2008b), 12.4 mean bat passes per detector-night were recorded at the Buckeye Wind site in Ohio (Stantec Consulting Services, Inc. 2009), and 34.9 mean bat passes per detector-night were recorded at the Top of Iowa site in Iowa (Jain et al. 2011).

Bat mortality monitoring studies conducted at FRWF have resulted in overall bat mortality rates that are within the range (0.1-40.5 fatalities/turbine/year) reported by studies at other Midwest wind energy facilities. The overall estimated fatality rate from all three seasons of mortality monitoring at Phase I was 15.03 fatalities/turbine/year (90% CI=10.89, 20.52) (Johnson et al. 2010b). The overall (spring and fall combined) estimated fatality rate from the mortality monitoring in 2010 at Phases I, II, and III was 16.59 fatalities/turbine/year (90% CI=14.36, 18.92) based on the Shoenfeld estimator and 22.20 fatalities/turbine/year (90% CI=19.32, 29.17) based on the empirical estimator (Good et al. 2011).

All nine bat species whose geographic ranges overlap with the Project area have been documented as fatalities at the FRWF; the Seminole bat has also been recorded as a fatality, although the species' range does not include the Project area (Johnson et al. 2010a and b, Good et al. 2011 and 2012). However, the majority of fatalities have consisted of migratory tree bat species. This pattern has been consistent at wind energy facilities throughout North America (Arnett et al. 2008) and it is expected that migratory tree bats will comprise the majority of the bat fatalities over the life of the Project. A separate HCP is being prepared to identify and address impacts specific to the ESA-listed Indiana bat at the FRWF (FRWF 2013). The majority of bat fatalities over the life of the Project are expected to occur during the fall migration period, as has been the pattern at wind energy facilities throughout North America (Arnett et al. 2008) and at the FRWF (Johnson et al. 2010b, Good et al. 2011).

A small number of bat fatalities were documented at the FRWF during spring monitoring (0.56 bats/turbine Shoenfeld estimate, 0.74 bats/turbine empirical estimate in 2010; 0.61 bats/turbine Shoenfeld estimate, 0.66 bats/turbine empirical estimate in 2011). Data collected at the FRWF show much lower overall bat activity in spring than in fall and the great majority of bat mortality at FRWF to-date has occurred during the fall migration season (see Sections 3.4 and 3.5), indicating that risk to bats at FRWF occurs mostly during the fall. It is not possible to compare the level of mortality observed at the FRWF to other wind facilities in the region. Relatively few post-construction monitoring studies have been conducted at wind facilities in the Midwest; only 12 wind power projects have publicly available post-construction monitoring data and among these, only six conducted monitoring during the spring. None of these six projects conducted spring monitoring with the same intensity as was done at the FRWF, and are therefore not comparable. However, bat fatalities that occurred during the spring at the FRWF comprised an extremely small percentage of the total bat fatalities; fall mortality constituted approximately 97 percent to 98 percent of the estimated annual bat fatality (Table 4.1).

Table 4.1 Seasonal Distribution of Bat Fatalities at FRWF, Benton County, Indiana

		Spring Bat Fatalities			Fall Bat Fatalities		
Study[1]	Method	Dates	Estimate[2]	% of Combined Spring & Fall Estimate	Dates	Estimate[2]	% of Combined Spring & Fall Estimate
Fowler I-III (Good et al. 2011)	Shoenfeld	4/13-5/15, 2010	0.56	3.4	8/1-10/15, 2010	16.03	96.6
	Empirical		0.74	3.3		21.45	96.7
Fowler I-III (Good et al. 2012)	Shoenfeld	4/1-5/15, 2011	0.61	2.6	8/1-10/15, 2011	22.99	97.4
	Empirical		0.66	2.1		30.54	97.9

[1] Note that monitoring conducted during the spring at the FRWF during 2009 was not included because the study period included spring and part of the summer (Apr 6, - Jul 3, 2009).
[2] Bats/turbine

Conservation measures that were implemented based on the results of the pre-construction studies to reduce the general impacts to bats at FRWF are described in Section 4.3, Avoidance and Minimization Measures. However, based on the post-construction monitoring results, FRWF also developed targeted conservation measures to reduce the impacts to bats during the period of highest risk in the fall, as described in Section 4.3.5, Operational Changes. Although the potential for impacts is expected to be effectively minimized by these conservation measures, Section 5.2.2 includes adaptive management developed to address any unexpected impacts to bats.

4.3 AVOIDANCE AND MINIMIZATION MEASURES

FRWF has taken several initial steps to reduce the impacts to avian and bat resources from the Project. The planning, development, and completed construction stages of the Project have incorporated guidance from the Wind Turbine Guidelines Federal Advisory Committee, APLIC, U.S. Fish and Wildlife Service, and the IDNR. These measures have long-term conservation benefits by having avoided potential impacts during Project development and construction.

The minimization measures presented below, particularly the operational protocol (Section 4.3.5), are expected to reduce potential direct impacts resulting from operation of the Project. The minimization measures are intended to protect all bird and bat species that may occur within the Project area, including the ESA-listed Indiana bat and the Indiana state-listed evening bat. Mortality monitoring (Section 5.1) will evaluate the effectiveness of the Project's minimization measures at protecting birds and bats at the FRWF and the Project's adaptive management plan (Section 5.3) will allow for adjustments to the minimization measures, if necessary.

A separate HCP is being prepared to address specific impacts to the Indiana bat from the FRWF; it is proposed that the ITP associated with the HCP authorize the incidental take of 193 Indiana bats over the 21-year permit term (FRWF 2013). The HCP includes the minimization measures presented below to ensure that the level of authorized take will not be exceeded. The HCP also includes additional conservation measures to mitigate for the take of Indiana bats at the FRWF. FRWF has received a State Endangered Species ITP from the IDNR Division of Fish and Wildlife authorizing take of evening bats as the result of operation of the wind turbines at the FRWF. Although the permit does not limit the number of evening bat takes that may occur at the FRWF, it is expected that the avoidance and minimization measures implemented at the Project to reduce Indiana bat mortality may also reduce evening bat mortality, as a subset of all bat mortality.

4.3.1 Pre-Construction Studies

Pre-construction studies were conducted for Phases I-IV to assess potential impacts to avian and bat resources and assist in micrositing of turbines and associated facilities to avoid and minimize the identified potential impacts. These studies, described in Sections 3.1, 3.2, and 3.4, include:

- Fixed-point bird use surveys
- Raptor nest surveys
- AMGP surveys
- Whooping crane risk assessment
- Eagle use assessment
- Acoustic bat surveys
- Wetland surveys
- Landcover mapping
- Threatened and endangered species review

4.3.2 Siting and Design

The Project has been developed in phases, beginning in the southwest portion of the overall Project area, per USFWS recommendations (Figure 2). This has provided the opportunity to observe the effect of the Project on AMGP use of the area prior to development closer to the AMGP IBA. Results of the AMGP surveys have influenced the siting and design of Project Phase IV, located closer to the IBA. All Phase IV turbines will be sited at least 1,760 ft (536 m) from the IBA border to avoid creating areas within the IBA which may not be used by plovers, as observed near turbines in 2009. Additionally, WEST determined that based on the flight patterns observed during three years of surveys, AMGP may not be especially susceptible to collisions with wind turbines (Johnson et al. 2009), indicating that construction of turbines closer to the IBA may not greatly increase the risk to AMGP.

The siting processes for all phases of the Project incorporated considerations to avoid or minimize impacts to avian and bat resources and habitat. During the micro-siting processes, pre-construction avian and bat use and habitat mapping study results were used to avoid locating turbines or access roads in areas of potentially suitable habitat for sensitive species and areas of higher use (riparian, grassland, woodlot habitats and gamebird areas). No turbines were placed within GHA's. Approximately 1,000 ft (305 m) of transmission line was routed within a right-of-way (ROW) easement granted by the IDNR which runs along the frontage road of the Hawkin's GHA. The design of the transmission line follows spacing recommendations included in the 2006 Avian Power Line Interaction Committee (APLIC) *Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006* (APLIC 2006). Project facilities and infrastructure were sited to avoid impacting the remaining forest stands in Parish Grove. As a best practice, the amount of aboveground collection and transmission lines were minimized across all Project sites. Six miles (9.7 km) of 345 kV overhead transmission line connect Phase II turbines to the Phase I substation. This line was built to the spacing guidelines recommended in the Avian Power line Interaction Committee's *Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006* (APLIC 2006). Sixty-two miles (99.8 km) of 34.5 kV collection line were buried within the Phase II site. There is no aboveground collection within the Phase I, II, and III Project areas. Collection lines crossing streams were directionally bored to minimize impact to streambeds. These best practices will also be utilized in designing and constructing the collection and transmission lines for Phases IV.

The Project substation is equipped with downward facing shields on all lights. The lights are equipped with light-sensors set to come on at night for security purposes. All operators and technicians on site are required to turn off internal lights in turbines at night unless staff is conducting repair work or maintenance on that turbine. Facility staff will be trained on the importance of light management to minimize impacts to birds.

Through engineering and micro-siting, county roads were utilized to the maximum extent possible during construction of Phases I-III. New roads were designed to cover the shortest distances, where possible, while also minimizing impacts to wetlands, jurisdictional waters, and sensitive habitat. Construction of Phases IV will exercise these same measures, as it is both environmentally and economically preferable to minimize the footprint of roads within the Project area.

Following the useful life of the Project facilities and infrastructure, the FRWF owners have the option to decommission the assets. Decommissioning of the Project will minimize the long term impacts (when compared with re-commissioning or re-powering the Project) by removing turbines from the Project area and restoring the area to the pre-existing land use and vegetation communities.

4.3.3 Construction Sensitive Species Awareness Training

Sensitive species training practices have been developed to teach all workers on the Project to be aware of sensitive wildlife. This training has been integrated into the standard construction orientation at FRWF. Training materials include laminated pamphlets detailing the potential sensitive species within the Project area, to serve as a convenient reference to be maintained in Project vehicles. Additionally, large sensitive-species posters are provided for display in construction trailers. Training includes an emphasis on reviewing the posters and instructions for reporting any suspected sensitive species observations to construction supervisors. Sensitive species identification training has been given to Phase I, II, and III staff. Training will also be provided to Phase IV staff.

4.3.4 Biomonitor

The construction schedule and location of proposed construction activities was evaluated against habitat mapping results for Phase II to determine the potential for construction to occur within areas of potentially-suitable habitat for state-listed bird species or nesting raptors. Where necessary, biological monitoring services were contracted for construction of Phase II of the Project. The biological monitor was present on-site three days per week, from April 22 to July 10, 2009. Surveys were conducted within the proposed construction footprint at least once per week during this time period in order to identify newly established bird nests. After June 15, it was expected that all birds should have established nesting territories, and no new nests would be established. Construction schedule and location plans will be evaluated for Phases IV prior to initiation of construction activities; if necessary, biological monitoring services will be contracted for construction of this Phase.

4.3.5 Operational Changes

Birds

Low bird mortality rates were observed during the post-construction mortality studies for Phases I and III (discussed in detail in Section 3.3) verifying the effectiveness of the avoidance and minimization measures incorporated in the development, siting, and design of the Project at reducing impacts to avian resources. The AMGP surveys indicate that construction of Phase IV turbines, in adherence with recommendations of the Service (Pruitt 2007), is unlikely to greatly increase impacts to AMGP in the Project area and IBA. Therefore, no operational minimization measures for birds are proposed by FRWF at this time. This determination will be re-evaluated throughout the life of the Project, through the adaptive management framework described in Section 5.3.2, below. Although the operational adjustments discussed below will reduce the amount of time that turbines are in operation at night during the fall season, this measure is not expected to noticeably affect bird mortality. Curtailment studies at FRWF in 2010 and 2011 did not detect a relationship between turbine operation and observed bird mortality (Good et al. 2011, Good et al. 2012).

Bats

Spring bat mortality rates have been low at FRWF to-date, comprising approximately 2 percent to 3 percent of bat fatalities documented during spring and fall monitoring (see Section 4.2.2). This pattern has been prevalent at wind energy facilities in North America (Arnett et al. 2008) and it is currently understood that bats behave differently during spring migration, making shorter, more direct flights that put them at much lower risk than during the fall, when mating behavior coincides with migration (Kunz et al. 2007b, Cryan 2008b). Therefore, no operational minimization measures for bats during spring are being proposed.

Fall bat mortality rates were moderate during the post-construction mortality studies for Phases I and III (discussed in detail in Section 3.5). However, two Indiana bat fatalities and four evening bat fatalities have been found at the FRWF to-date. In response to these unexpected impacts to federal and state-endangered species, FRWF implemented operational minimization measures at the Project, obtained a state ITP for evening bat from the IDNR, and is in the process of developing an HCP for Indiana bat and obtaining an ESA Section 10 ITP for Indiana bat from the USFWS Region 3 office (FRWF 2013). Implementation of operational minimization measures at FRWF has been shown to reduce overall bat mortality rates, comprised primarily of tree bat species, from moderate levels to low levels.

FWRF will minimize overall bat mortality and potential take of Indiana bats and evening bats from operations of the Project by implementing seasonal turbine operational adjustments. For the term of the ITP, FRWF will

1) Raise the turbine cut-in speed to 5.0 m/s during the fall migration season at the FRWF; and
2) Adjust the turbine operations parameters so that the rotation of the turbine rotors below cut-in wind speed is minimized (the blades are “feathered”).

Raised cut-in speeds and feathering of turbine blades below cut-in wind speed will be implemented on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually. Under this turbine operational protocol, FRWF has committed to reducing mortality of all bat species by at least 50 percent. This turbine operational protocol represents the maximum extent to which FRWF can reduce turbine operations and maintain Project viability, as demonstrated in the confidential financial document associated with the HCP (FRWF 2013, Appendix J).

In concurrence with other studies demonstrating an inverse relationship between bat mortality and increased turbine cut-in speeds and/or turbine feathering (Arnett et al. 2009 and Baerwald et al. 2009), bat fatalities at the FRWF were reduced by a mean of 50 percent (90% CI = 38%-60%) when cut-in speeds were increased to 5.0 m/s during the 2010 fall migration season (Good et al. 2011). However, turbines were not feathered below this cut-in speed in 2010. In 2011, turbines at the FRWF were feathered until cut-in wind speeds of 4.5 m/s and 5.5 m/s were reached. The results of this study indicated that feathering turbines below a cut-in speed of 5.0 m/s would have achieved between 57 percent (mean at 4.5 m/s; 90% CI = 39%-70%) and 73 percent (mean at 5.5 m/s; 90% CI = 60%-83%) reduction in mortality (Good et al. 2012). Tree bats comprised more than 90 percent of the fatalities recorded for each cut-in speed in the study; this consistent species composition indicates that the great majority of fatalities avoided at the higher cut-in speeds were also tree bats. Therefore, feathering of turbines during the fall migration season is expected to greatly reduce overall bat mortality as well as reduce potential take of listed bat species. Tree bat species, including red bat, hoary bat, and silver-haired bat, are particularly likely to benefit from this turbine operation measure, as these species have comprised the majority of bat mortality at the FRWF and consequently will comprise the majority of the reduction in mortality due to modified turbine operations. Fatality of bat species that are not federally listed is estimated to be reduced from 33.68 bats/turbine/year to 18.63 bats/turbine/year as a result of implementing operational changes at FRWF.

The only exception to feathering turbines below a cut-in speed of 5.0 m/s would occur on nights when temperatures are below 50˚ F (10.0°C) from August 1 to October 15. Turbines will be allowed to operate at full capacity below these temperatures. Turbines will be monitored and controlled based on temperature on an individual basis (i.e., the entire facility will not alter cut-in speed at the same time, rather operational changes will be based on temperature conditions specific to each turbine). Turbines will begin operating under normal conditions when the 5 to 10 minute rolling average temperature drops below 50˚ F (10.0 ˚C); raised cut-in speeds will be resumed if the 5 to 10 minute rolling average temperature goes to 50˚ F (10.0 ˚C) or above during the course of the night.

The 50˚F (10.0 ˚C) temperature threshold is based on results from post-construction mortality monitoring at FRWF and nightly temperatures measured at 10-minute increments derived from turbine Supervisory Control and Data Acquisition (SCADA) data between the hours of 20:00 and 08:00 from August 1 to October 15, 2010-2012. These data show that the proportion of fresh bat fatalities that occurred when average nightly temperatures were above 50˚ F (10.0 ˚C) was 99.7 percent (285 fatalities out of 286; range in nightly temperatures in this group of fatalities was

42.8˚F to 88.9˚F [6.0˚C to 31.6˚C]) in 2010, 99.0 percent (307 fatalities out of 310; range in nightly temperatures in this group of fatalities was 44.4˚F to 85.6˚F [6.9 ˚C to 29.8˚C]) in 2011, and 98.2 percent (55 fatalities out of 56; range in nightly temperatures in this group of fatalities was 44.1˚F to 100.4˚F [6.7˚C to 38.0˚C]) in 2012. Average nightly temperatures were below 50˚ F (10.0 ˚C) 4.1 percent of the time in 2010, 2.7 percent of the time in 2011, and 9.5 percent of the time in 2012.

Given the relatively small proportion of time temperatures are expected to be below 50˚ F (10.0˚C), and the large proportion of fatalities that occurred above 50˚ F (10.0˚C) during both years of study, feathering turbine blades below 5.0 m/s above this temperature threshold is expected to adequately minimize risk to bats and achieve at least a 50 percent reduction in all bat mortality from 2010/2011 levels. However, if greater than 10% of documented fatalities occur on nights when temperatures are below 10.0˚ C in any given year, as determined through analysis of mortality data at the conclusion of the fall monitoring period, then turbine operational adjustments (i.e., turbines feathered up to a cut-in speed of 5.0 m/s) will be resumed for the entire night during the fall, regardless of temperature, in future years. Should the FRWF be required to disable the temperature-controlled cut-in speed adjustment parameter, the turbine control software would be reconfigured remotely and rolled out to each individual turbine. Currently this task would require one to three days to implement, but user interfaces are improving which could accelerate implementation time in the future.

In addition raising cut-in speeds to 5.0 m/s and feathering turbines below this cut-in speed, FRWF will implement an adaptive management plan that includes raising cut-in speeds in 0.5 m/s increments, if needed, to assure that bat mortality does not exceed acceptable limits. The adaptive management plan is described in detail in Section 5.3.

5.0 ADAPTIVE MANAGEMENT AND MONITORING PLAN

5.1 FALL POST-CONSTRUCTION MONITORING

Post-construction monitoring has been conducted at Phases I, II, and III during each year of Project operation. Based on the results of past monitoring, fall post-construction monitoring will continue to be conducted at all Project phases (including Phase IV, once operational) throughout the life of the Project. Because bird mortality rates were found to be moderate (compared to other Midwest wind energy facilities; see Section 3.3), the monitoring protocol is focused on providing an accurate estimate of all bat mortality and enabling the detection of changing trends in bat mortality over time. However, the protocol will provide for the detection of unusual bird fatalities or mass mortality events, as all birds found during surveys will be recorded and included in survey reports. Monitoring will ensure that for all bird and bat casualties found, data recorded will include species, sex and age determination (when possible), turbine identification number, date and time collected, global positioning system (GPS) location, condition (live, injured, intact, scavenged, feather spot), and distance from turbine, as well as any comments that may indicate cause of death for fatalities. Monitoring will also ensure that take of all bat species is reduced by at least 50 percent throughout the life of the Project. Monitoring will also provide the information necessary to calculate the incidental take of Indiana bats by the FRWF and ensure compliance with the take limit established in the ITP. This is described in the HCP (FRWF 2013). Results of the monitoring efforts will serve as the basis for adaptive management decisions related to turbine operational changes, the primary bat mortality minimization measure for the Project.

5.1.1 Monitoring Phases and Schedule

Fall post-construction monitoring (referred to as take compliance monitoring in the HCP due to its focus on estimating Indiana bat fatality) will be conducted in two phases: the Evaluation Phase and the Implementation Phase. There are two main objectives for the post-construction monitoring: (1) to conduct monitoring that provides data to accurately determine if a 50 percent reduction in bat mortality from 2010/2011 levels has been achieved; and (2) to detect changing trends in bat mortality over time. Because risk to Indiana bats (and bats in general) and the effectiveness of minimization measures is uncertain, monitoring will be most intensive at the beginning of the ITP term. During the first fall migration period following issuance of the ITP, Evaluation Phase mortality monitoring will be conducted. It is expected that the Evaluation Phase, along with the four years of post-construction mortality monitoring conducted from 2009 to 2012, will provide sufficient information to accurately assess the level of risk to Indiana bats and bats in general by confirming the effectiveness of the operational curtailment.

After the completion of the first year of Evaluation Phase mortality monitoring, provided the results confirm at least the estimated 50 percent reduction in mortality calculated from the fall 2010-2011 data, FRWF will implement the less intensive Implementation Phase monitoring every year for the duration of the ITP. A stepped-down approach to monitoring will be adopted during the Implementation Phase that will nevertheless be sufficient to continue monitoring bat mortality and to detect year to year changes in bat mortality that may occur. The Implementation Phase monitoring will remain in effect for the remainder of the operational life of the Project, unless a less than 50 percent reduction in bat mortality (indicating less than a 50% reduction in Indiana bat mortality, which equates to the adaptive management threshold) from 2010/2011 levels is observed. If this occurs, operational changes in accordance with the adaptive management framework described in Section 5.3 would be made and two years of Evaluation Phase monitoring would be conducted following the operational change to confirm its effectiveness at reducing bat mortality by at least 50 percent from 2010/2011 levels. Table 5.1

summarizes the differences in sampling intensity for each phase of monitoring. During all phases of monitoring, searches will be conducted from August 1 to October 15, which encompasses the period of highest overall bat mortality at the FRWF during 2009, 2010, and 2011 (Good et al. 2011 and 2012), the fall migration period for Indiana bats (USFWS 2007), and the period in which both Indiana bat fatalities occurred at the FRWF.

5.1.2 Sample Size and Search Interval

Table 5.1 Permit Year and Sample Size for Each Phase of Monitoring at the FRWF, Conducted Annually from August 1 to October 15

Fall Monitoring Phase	Permit Year	Number of Turbines Searched		
		Phase I, II, III (355 turbines)	Phase I, II, III, IV (449 turbines)	Phase IV (94 turbines)
Evaluation Phase	Year 1	118	N/A	N/A
Implementation Phase	Years 2-21, with the exception of 2 years following any operational change	75	90	20
Evaluation Phase	2 Years following any operational change	118	150	31

To provide sufficient statistical power and spatial coverage to detect potential differences in mortality rates among years and avoid spatial biases, 33 percent of turbines will be searched for Evaluation Phase monitoring and 20 percent of turbines will be searched for Implementation Phase monitoring. To further minimize potential for bias due to search location, efforts will be made to ensure sampling locations are representative of the entire FRWF and are relatively equally distributed through the Project area. Search turbines will be distributed among turbine types in proportion to their relative occurrence in the Project area.

The search interval for each year of fall monitoring will be based on the average carcass removal length determined during the previous year's monitoring effort as follows:

- Weekly (i.e., each turbine will be searched once per week), if mean carcass removal is > 7 days;
- Semiweekly (i.e., each turbine will be searched twice per week), if mean carcass removal is > 3 days; or
- Daily (i.e., each turbine will be searched once per day), if carcass removal is < 3 days.

During the first year of fall mortality monitoring following issuance of the ITP, a weekly search interval will be used, based on mean carcass removal times of 9.93, 10.34, and 13.02 days observed during monitoring at FRWF in 2009, 2010, and 2011, respectively (WEST unpublished data, Good et al. 2011 and 2012). Searches on any given monitoring day will begin after 7:00

AM and will be completed by sunset. Most searches will be completed by mid-afternoon on any given search day.

5.1.3 Search Area

To develop reliable estimates of bat mortality, only roads and pads will be searched during monitoring. There are numerous benefits of roads and pads searches:

1) Searcher efficiency estimates are significantly higher on the roads and pads (about 85%) compared to cleared plots containing areas away from roads and pads (about 32%) (Good et al. 2011). Higher searcher efficiency results in more precise estimates of mortality.
2) A more randomized and representative sample can be acquired when only searching roads and pads. Logistics for clearing plots are significant and the location of plots is limited to landowners willing to cooperate with the study. Increased randomization strengthens model assumptions for fatality estimation.
3) A much larger sample of individual turbines can be searched, providing larger spatial coverage. Increased spatial coverage provides additional information regarding possible flyways. Additional spatial representation also allows for testing and evaluation of a larger number of factors that may influence mortality, including proximity to landscape features (e.g., distance to water, shelterbelts, or surrounding crop types).

The results of the 2010 FWRF study support the use of road and pad searches for generating comparable and unbiased overall bat fatality estimates (Good et al. 2011). The 2010 study determined, through a double sampling approach, that overall bat fatality estimates using only road and pad searches were comparable to bat fatality estimates generated from cleared plot searches. The study also confirmed that fatality density (fatalities per square meter) decreased as distance to turbine increased.

5.1.4 Data Collection

Observers trained in proper search techniques will conduct the carcass searches. All bat (and bird) carcasses will be recorded, although casualty rates will only be calculated for bats[3]. Searches will occur within all roads and pads located within 263 feet (80 m) of turbines selected for the study. Observers will walk at a rate of approximately 148 to 197 feet per minute (about 45 to 60 m per minute) scanning the ground out to 7-10 feet (2-3 m) either side of the transect for casualties. Transects will be spaced at a maximum of 16-foot (5-meter) intervals, allowing for some visual overlap of search area between transects to help maximize carcass detection.

The condition of each casualty found will be recorded using the following categories:

- Live/Injured – a live or injured bat or bird.
- Intact - a carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.

[3] Given the very low numbers of bird fatalities documented during mortality monitoring at the FRWF (HCP [FRWF 2013], Appendix A), and the likelihood for low bird fatality rates in the future, it is not possible to develop a road/pad correction factor specifically for birds that could be used to derive an adjusted bird fatality estimate. However, since bird carcasses will be collected, it will be possible to monitor for changes in patterns of bird mortality or to document large fatality events, if they were to occur.

- Scavenged - an entire carcass, which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass, etc.), or a carcass that has been heavily infested by insects.
- Feather Spot (for bird carcasses only) - 10 or more feathers at one location indicating predation or scavenging.

Fresh bat carcasses found, except for *Myotis* species, will be collected, identified, and utilized during searcher efficiency and carcass removal trials (see below for more details). Tissue and hair samples will be collected from all dead bats throughout the life of the Project. Older or scavenged bat carcasses, except those already positively identified as non-Myotis, will be identified, labeled with a unique number, and then bagged and frozen for future reference and species identification testing (e.g. deoxyribonucleic acid [DNA] analysis). A copy of the data sheet for each casualty will be maintained, bagged with the carcass, and kept with the carcass at all times. For all casualties found, data recorded will include species, sex and age determination (when possible), turbine identification number, date and time collected, Global Positioning System (GPS) location, condition (live, intact, scavenged, feather spot), and distance from turbine, as well as any comments that may indicate cause of death. For casualties where the cause of death is not apparent, the assumption that the casualty is due to wind turbine collision will be made for the analysis. All casualties located will be photographed as found and plotted on a detailed map of the Project area showing the location of the wind turbines and associated facilities.

All *Myotis* carcasses will be identified within seven days of collection by biologists trained in the identification of *Myotis* species, including Indiana bat, and approved by the Service. In order to verify field identifications, skin samples from carcasses too decomposed for positive identification will be sent to Jan Zink at the Portland State University or other suitable laboratories for identification via deoxyribonucleic acid (DNA) analysis. All *Myotis* carcasses will be delivered to the Service within seven days of collection, for concurrence on species identification.

Casualties found outside the formal search area by observers or by FRWF personnel will be treated following the above protocol as closely as possible. Casualties found in non-search areas (e.g., near a turbine not included in the sample of search turbines) will be coded as incidental discoveries and will be documented in a similar fashion as those found during standard searches.

In addition to carcasses found, all injured bats and birds observed will be recorded and treated as a casualty. Appropriate wildlife salvage permits will be obtained from the IDNR. Dissemination of data (e.g., to the USFWS Special Agent and/or other agency representatives) will be as needed or according to permit condition (see Disposition of Data section below).

5.1.5 Field Bias Trials

The efficiency rates of observers and removal rates of carcasses by scavengers will be quantified to adjust the estimate of total bat fatalities for detection bias. Bias trials will be conducted throughout the entire monitoring period each year. Only freshly killed bats conclusively identified as non-*Myotis* bat species will be used for carcass removal trials and searcher efficiency trials. The field crew leader will gather all bat carcasses and redistribute bat carcasses that are intact at the predetermined random points within any given turbine's searchable area prior to that day's searches. Data recorded for each trial carcass prior to placement will include date of placement, species, turbine number, and the distance to and the direction from the turbine. Small, black zip ties will be placed on the wing or legs of each bat to distinguish it from other fatalities landing nearby or if scavengers move the trial bat away from its original random location. For the scavenger removal trial, each trial bat will be left in place

and checked by the field crew leader or an observer not involved with carcass searches for up to 24 days, or until the carcass is removed by scavengers. Trial bats will be checked on days one, two, four, six, eight, 10, 12, 18, and 24.

Trial bats will also be used for estimating searcher efficiency bias. Observers conducting carcass searches will not know when or where the bat carcasses will be placed for bias trials. Carcasses placed by the field crew leader will be available and may potentially be found multiple times unless the carcasses are previously removed by a scavenger. The day that each bat was found by an observer will be recorded to determine the amount of time the carcass remained in the scavenger removal trial. When a bat carcass is found, the observer will inspect the carcass to determine if a bias trial carcass had been found. If so, the observer will contact the field crew leader and the bat will be left in place for the carcass removal trial as described above.

5.1.6 Statistical Methods for Bat Mortality Estimation

Statistical methods for estimating all bat mortality will be the same for all phases of monitoring. Estimates of facility-related bat mortality will be calculated based on:

1) Observed number of bat carcasses found during standardized searches during the monitoring period;
2) Non-removal rates expressed as the estimated average probability a bat carcass is expected to remain in search areas and be available for detection by the observers during removal trials; and
3) The area adjustment factor for bat carcasses landing outside of searched roads and pads.

Upon completion of each monitoring year, data will be analyzed using the same statistical methods for calculating overall bat mortality (casualty rate) employed during the 2010 and 2011 FRWF studies, namely the empirical measure of carcass availability. This empirical estimate is based on the overall ratio of trial carcasses found by searches to the number placed and does not separate out the influence of scavenging versus searcher detection. As described in the HCP, a correction factor of 6.56 will be used to adjust for fatalities that likely occurred outside of searched roads and pads, to determine total estimated bat mortality during the fall migration period (FRWF 2013).

5.1.7 Disposition of Data and Reporting

FRWF will prepare data sheets and report templates for monitoring that will be reviewed and approved by the Service prior to initiation of the first year of monitoring. During active monitoring, raw data forms will be stored on site and at the offices of the independent monitoring contractor. Raw data forms will be made available to the Service upon request. The following information will be maintained for each fatality in a database that will be provided to the Service annually or upon request: date and time of collection, species, UTM coordinate, closest turbine number, and, if available, temperature and wind speed for the night preceding *a Myotis* fatality.

All *Myotis* and unknown bat carcasses will be delivered to the Service within seven days of collection, for concurrence or determination of species identification. The final disposition of individual casualties will be based on direction from the appropriate salvage permits, the legal status of individual casualties, and the direction of the USFWS Law Enforcement Agent in Charge. In addition, the Service and IDNR will be notified (by email and/or phone) within 24 hours if a species protected under BGEPA, ESA, or the Indiana state endangered species list is discovered as a casualty.

An annual report describing methods and results of take compliance monitoring will be prepared following completion of the field surveys and data analysis for each year of monitoring. Annual reports will include:

- Results from monitoring, including results of bias corrections (i.e., searcher efficiency trials, scavenger removal trials, and searchable area adjustments) and estimates of total bat and Indiana bat mortality;
- Adaptive management changes that were implemented in response to observed and/or estimated bat mortality, if necessary;
- Raw data sheets from take compliance monitoring, including bird fatalities; and
- Spreadsheets showing the timing and actual speeds at which the turbines were operational and feathered during the minimization period.

The annual report will be prepared and submitted to the Service by January 31 following completion of the field surveys. A weekly summary of bats and birds found during fall monitoring will also be provided to the Service, which will be used to evaluate whether a trigger has been met that would require an adaptive management response, as described in detail in the HCP (FRWF 2013).

5.1.8 Wildlife Incident Reporting System

At the start of operation, each Phase of the FRWF began participating in the Wildlife Incident Reporting System (WIRS), which will be implemented for the life of the Project. The WIRS is currently in use at Phases I, II, and III. The WIRS is a protocol designed to provide a means of recording avian and bat species found in the Project area by Project staff, thereby increasing the understanding of wind turbine and wildlife interactions. WIRS provides a set of standardized instructions for FRWF personnel to follow in response to wildlife incidents in the Project area. Each incident will be documented on a data sheet and reported to the designated environmental affairs contact. The data will be logged in a tracking spreadsheet maintained by the environmental affairs team. A quarterly review of the reported incidents will be undertaken by environmental affairs. This review frequency may be modified based on the results of the reporting.

Training: Site personnel will be trained to follow WIRS procedure and fill out the WIRS reporting form (Appendix C). Additionally, posters identifying sensitive species have been prepared and are posted at the O&M Facility.

Reporting: Any incident, defined as an injury or fatality, involving a threatened or endangered species or a bald or golden eagle will be reported to the Service and/or IDNR within 24 hours of finding an identified or suspected member of one of these species.

Bird and bat casualties discovered by Project staff will be documented and recorded as part of the WIRS. This information will be used as a means of tracking impacts to all bats and birds from the Project.

5.2 ADAPTIVE MANAGEMENT

The FRWF BBCS represents a process through which FRWF plans to reduce impacts to birds and bats at the wind energy facility while maintaining optimal Project operation and generating electricity from the renewable, non-polluting wind energy resource. FRWF has sited the Project and incorporated measures into the proposed action to avoid and minimize impacts to birds and bats.

Based on best available science, it is assumed that minimization measures (i.e., raising cut-in speeds to 5.0 m/s and feathering turbines below the cut-in speed) will result in at least a 50

percent reduction in all bat mortality, especially mortality of the three tree bat species (red bat, hoary bat, and silver-haired bat) that have comprised the great majority of bat mortalities at FRWF thus far. Based on curtailment studies at FRWF in 2010 and 2011, the turbine operational adjustments are not expected to noticeably affect bird mortality from the Project (Good et al.2011, Good et al. 2012)). The Project will be managed under an adaptive management framework to enable the results of post-construction monitoring and research to influence the minimization measures implemented at the Project and ensure the goals of the HCP (FRWF 2013) and BBCS (Section 1.0) are being met. Adaptive management thresholds, defined below and in Table 5.3, are focused on Indiana bat mortality because the ESA-listed Indiana bat is the primary species of concern at the FRWF and management actions that reduce impacts to Indiana bats are expected to also reduce impacts to bats in general. Indeed, Indiana bat protection measures may confer even greater protection for tree bat species (red bat, hoary bat, and silver-haired bat) at the FRWF, given that the majority of bat mortality reduction is likely to consist of these high-fatality species. Adaptive management thresholds have also been established to address unexpected mortality of birds and increased risk to eagles during the life of the Project. Adaptive management will apply throughout the life of the Project; on-going evaluation of Project impacts and subsequent adaptation of Project management will provide effective measures for avoiding and reducing impacts to birds and bats.

5.2.1 Bats

The general adaptive management approach includes raising cut-in speeds in 0.5 m/s increments if fall bat mortality thresholds are met during, or at the conclusion of, the monitoring year. Adaptive management thresholds for any given year are based on the upper 90 percent confidence interval (or upper 95th percentile) for estimated fall bat mortality in 2010 and 2011 at turbines with minimization measures in place. This is based on Monte Carlo simulations that showed that over 1,000 22-year periods using the adaptive management strategy described below, the mean number of Indiana bat fatalities was 178 with a 90 percent confidence interval of 166 to 191 fatalities, assuming a conservative 50 percent reduction in fatality when feathering blades below a 5.0 m/s cut-in speed. Based on the calculated Indiana bat species composition for FRWF (0.16%), this level of Indiana bat mortality corresponds to 111,250 overall bat fatalities with a 90 percent confidence interval of 103,750 to 119,375 overall fatalities. Given that a 57 percent (90% CI = 39% - 70%) reduction in bat fatality was achieved by feathering blades below a 4.5 m/s cut-in speed in the 2011 FRWF study, a more realistic reduction in bat mortality of 60 percent by feathering blades below 5.0 m/s was also simulated. Using the same simulation methods (i.e., 1,000 22-year periods that assumed the adaptive management described herein), an average of 152 Indiana bat fatalities occurred over a 22-year period with a 90 percent confidence interval of 136 to 168 total Indiana bat fatalities, corresponding to 95,000 overall bat fatalities with a 90 percent confidence interval of 85,000 to 105,000 overall fatalities, under the assumption of a 60 percent reduction in all bat mortality when blades are feathered below 5.0 m/s (see Chapter 5.4.2 of the HCP [FRWF 2013] for full description).

The actual adaptive management threshold will depend on the number of turbines that are in operation in a given year: 6,625, 8,375, or 1,750 estimated bat fatalities per year for the 355-, 449-, or 94-turbine Project, respectively (Table 5.2)[4]. If take exceeding these levels is estimated,

[4] Estimated annual overall bat mortality and bat fall adaptive management thresholds are based on Table 4.6 of the HCP (FRWF 2013).

based on total bat mortality, at the end of the monitoring year, cut-in speeds will be increased by 0.5 m/s to ensure that overall bat mortality and estimated Indiana bat take is reduced in the following years. Conversely, if estimated bat mortality is equal to or less than the lower 90 percent confidence interval (or 5th percentile) at the end of a given monitoring year (see Table 5.2), cut-in speeds will be reduced by 0.5 m/s, but only if cut-in speeds have been increased above 5.0 m/s as a result of previous adaptive management decisions (i.e., cut-in speeds will not go below 5.0 m/s under any circumstance).

Table 5.2 Estimated Annual Overall Bat Mortality with Minimization of each Operational Phase of the FRWF

Phase	Turbines	Estimated Annual Overall Bat Mortality		
		Lower 90% CI	Mean	Upper 90% CI
Phase I, II, III	355	4,375	5,375	6,625
Phase I, II, III, IV	449	5,500	6,813	8,375
Phase IV	94	1,188	1,438	1,750

If an operational change was made in response to either the 95th percentile (or upper bound of the 90% CI) being exceeded or 5th percentile (or lower bound of the 90% CI) being met or exceeded, two years of Evaluation Phase monitoring (i.e., 33% of turbines searched weekly from August 1 to October 15) will be conducted to ensure that operational adjustments were sufficient to minimize overall bat mortality and comply with the terms of the Indiana bat ITP.

Within-Season Adaptive Management

Within-season adaptive management thresholds will be calculated to serve as an early indicator that adjustments to minimization efforts are necessary before the conclusion of the monitoring year. Within-season adaptive management thresholds will be based on the predicted number of bat carcasses that would be found[5] that would equal the upper quartile (i.e., 75th percentile) of estimated fall bat mortality in 2010 and 2011 at control turbines with minimization measures in place: 5,938, 7,500, or 1,563 estimated bat fatalities per year for the 355-, 449-, or 94-turbine Project, respectively. The 75th percentile was used instead of the 95th percentile (which is the adaptive management threshold at the end of the year) as a conservative way to ensure that the adaptive management threshold is not reached at the end of the year. To determine the number of bat carcasses of all species found that would equate to this level of estimated bat mortality, bias correction factors (i.e., unsearched areas, scavenger removal, and carcass removal) from the previous year's monitoring results will be applied. If this number of bats is found at any point during monitoring, FRWF will increase cut-in speeds by 0.5 m/s[6]. If an additional number of bat carcasses (of any species) are found during compliance monitoring within the same season that equate to one additional estimated Indiana bat fatality[7] after cut-in speeds have been increased, cut-in speeds will again be increased by 0.5 m/s. Cut-in speeds will be increased by 0.5 m/s each time a number of bat carcasses that equates to one additional estimated Indiana bat

[5] Cumulative counts of bat carcasses found during each fall monitoring period will be tallied on a weekly basis.
[6] Note that if within-year operational changes are needed based on adaptive management criteria, FRWF will require up to 1 business day to make the necessary cut-in speed changes to the turbine SCADA systems.
[7] The number of found bat carcasses equating to one estimated Indiana bat fatality will be established for each monitoring year based on the results of the searcher efficiency and carcass removal bias trials of the previous monitoring year.

fatality are found within the same season. This will effectively limit the number of all bat fatalities that would occur before adaptive management action is taken.

Note that any operational changes made based on within-season numbers of carcasses found may be adjusted before the start of the next fall season based on the final estimated all bat mortality for full fall season. Because within-season triggers are conservatively based on the 75th percentile rather than the 95th percentile, the end of the year mortality may in fact be below the 95th percentile adaptive management trigger. Also, because the within-season adaptive management thresholds are based on the previous year's bias correction results, the actual annual mortality estimate determined at the conclusion of the monitoring year (based on that year's bias correction trials) may be lower than the 95th percentile.

A set of control turbines will be used to determine whether or not the adaptive management trigger was reached at the end of the monitoring period. If the within-season adaptive management trigger is met, cut-in speeds will not be raised at 20 turbines among those selected for monitoring (cut-in speeds will be raised at all other turbines in the wind facility). A sample size of 20 was determined to have adequate power based on power modeling done to determine minimum sample size for monitoring (see Section 5.4.1.2 and Table 5.1). Control turbines allow for an accurate assessment of the effectiveness of the initial cut-in speed when a within-season adaptive management threshold results in raising the cut-in speed for the remainder of the monitoring period. If no turbines remain at the initial cut-in level, there is no way to evaluate whether or not mortality was below the 95th percentile as a result of raising cut-in speeds, or whether it would have been below the 95th percentile even if cut-in speeds had not been raised.

End-of-Year Adaptive Management

At the end of each monitoring year, if overall bat mortality estimated from the 20 control turbines is lower than or equal to the 95th percentile, the cut-in speed increase implemented in response to the within-season trigger will not be maintained in the following year and cut-in speeds will be resumed at 5.0 m/s (or as determined at the end of year response in the previous year) at the beginning of the subsequent fall monitoring season. Conversely, if at the end of the year, overall bat mortality estimated from the 20 control turbines is higher than the 95th percentile, the raised cut-in speed that was implemented within-season will be maintained in the subsequent year. If within-season thresholds are not triggered, total mortality estimated from the entire facility will be used to make adaptive management decisions for the following year (i.e., there will be no control turbines).

Table 5.3 Bat Adaptive Management Thresholds and Responses for the FRWF

Monitoring Year	Project Operations Action	Adaptive Management Thresholds and Responses	
		Within-year (August 1 – October 15)	End of Year
Year 1 (355 Turbines)	Cut-in speed of 5.0 m/s with blades feathered below cut-in (sunset to sunrise, August 1 – October 15) AND Monitoring of 33% of turbines weekly, roads and pads only, August 1 – October 15	If cumulative count of bat carcasses found suggest overall bat fatality is greater than the 75th percentile based on previously collected carcass removal and searcher efficiency data at any point during the monitoring period, cut-in speeds will be increased to 5.5 m/s and blades feathered below cut-in (sunset to sunrise, thru October 15) at all but 20 control turbines AND If a number of bat carcasses equal to 1 additional estimated Indiana bat fatality is found[8] after the initial cut-in speed increase, cut-in speed will again be increased by 0.5 m/s with blades feathered below cut-in (sunset to sunrise, thru October 15); each time this occurs within season, cut-in speed will be increased by 0.5 m/s with blades feathered below cut-in (sunset to sunrise, thru October 15)	If annual overall bat mortality estimated from fall searches at all searched turbines or from control turbines (if within-season AM trigger was met) is ≦6,625, continue feathering turbines below 5.0m/s in Year 2 OR If annual overall bat mortality estimated from fall searches at all searched turbines or from control turbines (if within-season AM trigger was met) is >6,625, increase cut-in speed to 5.5 m/s in Year 2
Years 2-21 (355, 449, or 94 Turbines)	Cut-in speed of 5.0m/s with blades feathered below cut-in (sunset to sunrise, August 1 – October 15) OR As determined in previous year's end of year response	If cumulative count of bat carcasses found suggest overall bat fatality is greater than the 75th percentile based on previously collected carcass removal and searcher efficiency data at any point during the monitoring period, cut-in speed will be increased by 0.5 m/s higher than initial Year 2 cut-in speed, and blades feathered below cut-in (sunset to sunrise, thru October 15) at all but 20 control turbines	If annual overall bat mortality estimated from fall searches at all searched turbines or from control turbines (if within-season AM trigger was met) is ≦ the lower 90% confidence interval (i.e., 5th percentile), reduce cut-in speed by 0.5 m/s (but only if cut-in speeds have been increased above 5.0 m/s from a previous AM response) OR If annual overall bat mortality estimated from fall searches at all searched turbines or from control turbines (if within-season AM trigger was met) is ≤ 6,625 (355 turbines), ≤ 8,375 (449 turbines), or ≤ 1,750 (94 turbines), continue feathering turbines below the initial year cut-in speed in subsequent year

[8] The adaptive management trigger is based on finding a number of bat carcasses, of any species, that is calculated to equal one estimated Indiana bat fatality. The trigger number of found bats will be established for each monitoring year based on the results of the searcher efficiency and carcass removal bias trials of the previous monitoring year.

Monitoring Year	Project Operations Action	Adaptive Management Thresholds and Responses	
		Within-year (August 1 – October 15)	**End of Year**
	AND Monitoring of 20% of turbines weekly, roads and pads only, August 1 – October 15	AND If a number of bat carcasses equal to 1 additional estimated Indiana bat fatality is found after the initial cut-in speed increase, cut-in speed will again be increased by 0.5 m/s with blades feathered below cut-in (sunset to sunrise, thru October 15); each time this occurs within season, cut-in speed will be increased by 0.5 m/s with blades feathered below cut-in (sunset to sunrise, thru October 15)	OR If annual overall bat mortality estimated from fall searches at all searched turbines or from control turbines (if within-season AM trigger was met) is >6,625 (355 turbines), >8,375 (449 turbines), or >1,750 (94 turbines), increase cut-in speed by 0.5 m/s increment in subsequent year AND If cut-in speed adjustments are made, perform 2 years of Evaluation Phase monitoring of 33% of turbines weekly, roads and pads only, August 1 – October 15 during following 2 years

5.2.2 Birds

Avian mortality is expected to continue to be generally low at Fowler, based on the assessment of potential impacts presented in Section 4.1. However, should post-construction monitoring or wildlife incident reporting detect avian mortality exceeding established adaptive management triggers, FRWF will take remedial actions.

Triggers for adaptive management will include[9]:

I. A mass avian mortality event (>100 birds killed in one night) is documented.
II. Observed raptor fatality exceeds six (6) individuals in one monitoring year.
III. Observed American golden-plover fatality exceeds 20 individuals in one monitoring year.

Remedial actions to be taken in response to adaptive management triggers will include:

I. FRWF will promptly notify the Service of the discovery and investigate, based on the available data, the circumstances under which the mass mortality event occurred. FRWF will coordinate with the Service to discuss the implementation of potential mitigation and/or minimization measures, including modified turbine operations under specific weather conditions.
II. FRWF will implement an on-site carrion removal program to reduce the availability of raptor food sources near turbines. FRWF will conduct a subsequent year of monitoring to evaluate the effectiveness of the carrion removal program.
III. FRWF will promptly notify the Service of the discovery and investigate, based on the available data, the circumstances under which plover mortality has occurred. FRWF will coordinate with the Service to discuss the implementation of potential mitigation and/or minimization measures, including modified turbine operations at certain locations during the plover migration season.

FRWF will conduct a year of mortality monitoring following the implementation of any of the above-listed actions to evaluate the effectiveness of the adaptive management measures.

5.2.3 Eagles

Although risk to eagles at FRWF is considered low (Section 4.1.2), the estimated risk to eagles will be periodically re-evaluated through the life of the Project to consider new information. Information considered will include any incidental observations of eagles at FRWF and post-construction mortality monitoring data. A shift in current land use within the Project area to include areas of cattle-grazed pasture would also trigger re-evaluation of eagle risk. Additionally, if the Service updates the eagle risk model in use, FRWF will request that the Service re-calculate eagle risk at the Project using the new model. If a significant change in the model-estimated eagle risk becomes apparent during the life of the Project, FRWF will meet with the Service to identify mitigation strategies based on the best available science garnered from current research and eagle interactions at other wind energy facilities.

[9] The very low numbers of bird fatalities documented during mortality monitoring at the FRWF (HCP [FRWF 2013], Appendix A), and the likelihood for low bird fatality rates in the future, indicates that these triggers are unlikely and would be substantial events which should be detectable through the WIRS system or incidental recording of bird casualties during the bat mortality monitoring.

If an eagle fatality is discovered at the Project, FRWF will notify the Service of the discovery within 24 hours. FRWF will coordinate with the Service to identify potential mitigation measures based on the best available science; these measures could include marking above-ground powerlines with bird flight diverters or retro-fitting powerline poles to avian-safe standards (APLIC 2006). Additionally, FRWF will meet with the Service to apply for an eagle programmatic take permit.

5.2.4 Whooping Cranes

This addresses potential future impacts to the Eastern U.S. non-essential experimental population (NEP) of whooping cranes at FRWF in Benton County, Indiana, primarily, the impacts from collision with overhead generation tie-in lines, which is a known hazard to whooping cranes and secondarily impacts from collision with turbines.

The BBCS risk assessment concludes that the probability of impacts to whooping cranes is small. There has been no whooping crane fatalities found during four years of post-construction surveys at the FRWF turbines (considering these are very large birds, it is logical to conclude that the probability of finding a fatality during searches is high). Although no formal searches have been done, no whooping cranes have been reported killed or injured by overhead generation tie-in lines at FRWF.

Currently, the NEP numbers approximately 106 animals that migrate between breeding areas in Wisconsin and wintering areas from southern Indiana south to northern Florida. The migratory pathway of all of the birds is not known; however, the fact that whooping cranes have been observed in Benton County, and that a number of cranes pass through or winter in south-central Indiana suggests the need for an adaptive management strategy to address potential risks to whooping cranes should the following triggers indicate the probability of impacts have increased.

Triggers: occurrence of any of the following triggers will result in FRWF implementing the appropriate adaptive management response as detailed below.

Trigger 1 – The designation of the NEP changes and this population becomes listed under the ESA.

Trigger 2 – Annual data requests from FRWF to IDNR or the Service provide documented evidence that whooping cranes are regularly (i.e., any two years out of ten) using (i.e., landing, feeding, or roosting) within 10 miles (16 km) of FRWF.

Trigger 3 – a documented fatality or injury of a whooping crane from overhead generation tie-in lines at FRWF.

Trigger 4 - a documented fatality or injury of a whooping crane from turbines at FRWF.

Trigger 5 – a documented fatality of a whooping crane at a wind facility (or associated overhead generation tie-in line) in Benton County.

Responses:

Response 1 – should Trigger 1,2, or 3 occur, FRWF will, in consultation with the Service, prepare a methodology to conduct an assessment of the overhead generation tie-in line carrying electricity from FRWF Phases I-IV to identify portions of the line where bird diverters may be effective at reducing whooping crane collision risk. The methodology will be based on the best available scientific data available at the time of the trigger and will be approved by the Service. Installation of bird diverters will occur within one calendar year of assessment methodology approval by the Service.

Response 2 – should Trigger 4 occur, FRWF in coordination with the Service will identify an appropriate response designed to minimize the potential impacts to whooping cranes from collision with turbines prior to the next migratory season.

Response 3 –should Trigger 5 occur, FRWF will consult with the Service within 60 days of the trigger to discuss the circumstances of the event and the implications, if any, for FRWF. If the Service determines increased vulnerability of whooping cranes based on this consultation, the Service, in coordination with FRWF, will determine an appropriate response based on the circumstances of the event. For example, if the documented fatality is due to the overhead generation tie-in line, then Response 1 will be implemented.

6.0 LITERATURE CITED

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APPENDIX A: STATE ENDANGERED SPECIES INCIDENTAL TAKE PERMIT

INDIANA FISH AND WILDLIFE PERMIT

State Form 2404R

Agency DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
402 W. Washington St., Rm. W273
Indianapolis, IN 46204-2781
Telephone: (317) 233-6527
Fax: (317) 232-8150

Name of Permittee FOWLER RIDGE WIND FARM	Authority - status IC 14-22-2 IC 14-22-34-12 Regulations (attached)
Address 700 LOUISIANA STREET, 33RD FLOOR	
City, State and Zip code HOUSTON, TX 77002 PHONE: (713) 354-2178	

Number	Effective	Expires	Renewable	May Copy
N/A	06/18/11	06/30/16	☑ Yes ☐ No	☑ Yes ☐ No

Name and Title of Principal Officer (If Permittee is a business) MATTHEW SAKURADA	Type of permit **STATE ENDANGERED SPECIES INCIDENTAL TAKE PERMIT**

Location where authorized activity may be conducted

FOWLER WIND FARM IN FOWLER, INDIANA ONLY (Benton County)

Conditions and Authorizations:

1. All activities authorized herein must be carried out in accordance with and for the purposes described in the application submitted. Continued validity, or validity, of this permit is subject to complete and timely compliance with all applicable conditions, including the filling of all required information and reports.
2. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local or other federal law.
3. Valid for use by permittee named above.

4. THE PERMIT HOLDER IS AUTHORIZED TO TAKE (KILL) EVENING BATS AS THE RESULT OF THE OPERATION OF THE WIND TURBINES AT THE FOWLER WIND FARM IN FOWLER, INDIANA.

5. REPORT ANY MORTALITIES OR SUSPECTED MORTALITIES OF EVENING BATS TO THE INDIANA DNR AT (317) 233-6527 (LINNEA PETERCHEFF) OR (317) 232-8160 (KATIE SMITH) WITHIN 24 HOURS OF DISCOVERY.

6. CONTINUE TO MONITOR WILD TURBINE SITES CONTROLLED BY THE PERMITTEE FOR BAT FATALITIES ASSOCIATED WITH THE TURBINES FOR THE DURATION OF THIS PERMIT.

6. SPECIMENS THAT ARE COLLECTED MUST BE STORED IN ACCORDANCE WITH THE SPECIAL PURPOSE SALVAGE PERMIT ISSUED BY THE INDIANA DNR.

6. THE PERMITTEE IS RESPONSIBLE FOR CARRYING OUT AND ABIDING BY ALL PERMIT CONDITIONS.

☐ Additional conditions and authorizations on a separate sheet.

Reporting requirements
PLEASE REPORT ANY ACCIDENTAL MORTALITY OF STATE ENDANGERED SPECIES TO LINNEA PETERCHEFF AT 317-233-6527 WITHIN 24 HOURS OF DISCOVERY.

Issued by	Title	Date
Linnea Petercheff	LINNEA PETERCHEFF OPERATION STAFF SPECIALIST DIVISION OF FISH AND WILDLIFE	6/18/11

APPENDIX B: INITIAL ASSESSMENT OF EAGLE RISK, USFWS 2012B

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

February 17, 20012

Ms. Blayne Gunderman
Environmental Manager
BP Wind Energy
700 Louisiana St. – 32nd Floor
Houston, TX 77002

Dear Ms. Gunderman:

Thank you for your previous correspondence with our office concerning eagle risk at your existing wind energy development, Fowler Ridge Wind Farm, located in Benton County, Indiana. Our records indicate that construction has been completed and turbines are operational in three phases of this development, which consists of 355 existing turbines. Additionally, we are aware that a fourth project phase is proposed adjacent to the existing turbines, which would add up to 93 additional turbines to the project.

We have reviewed your draft wildlife baseline study report from Feb 25, 2008 and your final wildlife baseline study report from July 27, 2011. Additionally, we have reviewed your Eagle Use Assessment from June, 2011. We are providing comments on your project in accordance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250; Eagle Act), and the Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA).

The Eagle Act is one of the primary federal laws protecting eagles and prohibits, among other things, the killing and disturbance of eagles. The Service published a Final Eagle Permit Rule on September 11, 2009 (50 CFR 22.26) authorizing limited issuance of permits to take bald and golden eagles where the take is associated with but not the purpose of an otherwise lawful activity (74 Fed. Reg. 46836, September 11, 2009). A permit is not required to conduct any particular activity, but is necessary to avoid potential liability for take caused by an otherwise lawful activity.

As you are aware through previous correspondence with the U.S. Fish and Wildlife Service (Service) and through your monitoring data, eagles may occur within your existing and proposed project area. The attached eagle risk analysis (Enclosure 1) discusses this office's assessment regarding eagle use of the project area and corresponding risk to eagles from turbine operation. This assessment is based on eagle-use and avian mortality data provided (from you) to our office as well as existing knowledge of eagle use areas within and in the vicinity of the project area.

As described in detail in the attached risk assessment, we have determined that the Fowler Ridge Wind Project a) does not appear to overlap with any "important eagle use areas" (definition in Enclosure 1), b) appears to overlap only limited amounts of suitable eagle habitat, c) may have low risk to eagles during the breeding and winter seasons, and d) may have relatively limited eagle use during spring and fall migration (based on 2007-2009 survey results). However, based on the sources of uncertainty outlined in Enclosure 1 and the relatively large size of your project, there is a possibility that we are underestimating risk and/or are incapable of predicting some risk with the

data we have been given. Lending support to this, as outlined in Enclosure 1, we arrived at a fatality estimate for this project of 0.201 bald eagles per year, with a 95% confidence interval between 0 and 0.604 bald eagles per year.

Based on the information available to us, we believe that the risk to eagles from your project may be relatively low. However, given the uncertainty and the fatality estimate outlined in Enclosure 1 and discussed above, it may be prudent for BP to adopt a conservative approach when considering risk to and developing management strategies for eagles at Fowler Ridge. To determine and outline a management strategy, we recommend that BP develop an Eagle Conservation Plan (ECP) or modify an existing Avian and Bat Protection Plan (ABPP) to be relevant to eagles. Completion and implementation of an ECP or ABPP will ensure that BP is aware of and prepared for changes in eagle use and movements in the vicinity of the project and prepared to address any current and future risk that may exist to eagles at this site.

The Service has prepared interpretive guidance, the *Draft Eagle Conservation Plan Guidance* (http://www.fws.gov/windenergy/; ECP Guidance), which provides detailed information on methods for data collection, risk assessment, examples of appropriate avoidance and minimization measures, and Advanced Conservation Practices (ACPs) for wind projects. Also, this document outlines when a permit may be recommended eagle take. Any eagle management plan for this project should be created using the ECP Guidance as a guide, should be shared with and reviewed by the Service, and should, at minimum, include the following:

1. A commitment to monitor for and report eagle mortality for the life of the project.
2. An operational plan to minimize, where appropriate, the likelihood that eagles will use the project site (i.e. carcass management, eagle prey management, etc.).
3. A plan to periodically update the predicted risk of the project to eagles utilizing the best available sources of information such as updated nest location information, post-construction fatality monitoring data, migration data, incidental observations, and other sources of information. This may also include new research, monitoring, and surveys if the above information is not available.
4. Adaptive management plans that initiate action (i.e. minimization or mitigation) if risk to eagles is found to increase in the future. Specifically, the management plan should identify methodologies and quantitative risk assessment methods that will be used to identify changing risk and describe criteria for adaptive management to take effect. ACPs that may be employed as a part of adaptive management should also be outlined.
5. A commitment to consider and incorporate, where appropriate, the latest research findings and minimization measures concerning eagle mortality at wind power projects.

Thank you for the opportunity to provide comments and conduct an eagle risk assessment for this proposed wind energy development. For further discussion on eagle risk, eagle management strategies, or for any questions you may have, please contact Matt Stuber at 517/351-8469 or at matthew_stuber@fws.gov.

Sincerely,

Scott Pruitt
Field Supervisor

Enclosure (1)

cc: USFWS, Matt Stuber – East Lansing, MI Field Office

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<u>Enclosure 1</u>: Initial Assessment of Eagle Risk, as outlined in the Draft ECP Guidance, for the Fowler Ridge Wind Energy Development

Summary of Monitoring Data Provided to the Service

Pre-construction point-count surveys were conducted at 10 stations throughout the project area between March 31, 2007 and April 9, 2009. Monitoring between these dates covered approximately two spring raptor migration seasons (2007 and 2008), two fall raptor migration seasons (2007 and 2008), one breeding season (summer 2008), and one winter/early spring season (2008/2009). A total of 458 20-minute, 800 meter radius, point count surveys were conducted during this time, for a total of 152 hours of raptor observation within the project area. The methods used during the point-counts were similar to the methods outlined in the ECP Guidance; however, the number of sample points used is notably less than recommended in this document (see discussion of fatality prediction, below).

Avian and bat carcass surveys were also conducted in certain portions of the project area at existing turbines. Carcass surveys began on April 6, 2009 and continue to date. These surveys were done within 160m x 160m plots in 2009, within 80m x 80m in 2010, and on roads and pads at other turbines during 2010. A total of 6,353 searches have been conducted on individual turbines up to October 15, 2010.

During pre-construction monitoring, one eagle was observed flying within the project area in the fall of 2008. This eagle was observed within the rotor swept zone. During carcass surveys, no eagle carcasses have been observed to date, although two observations were incidentally made of eagles in flight by carcass survey crews in the spring 2011. The flight height of these eagles was not recorded.

Initial Site Assessment and Site-Specific Surveys for Risk

Bald eagles and golden eagles associate with distinct geographic areas and landscape features throughout their respective ranges. The Service defines an "important eagle use area" as "an eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles" (USFWS 2009). Because migration corridors and migration stopover sites provide important foraging areas for eagles during migration (e.g., Restani *et al*. 2000, Mojica 2008), the Service believes that these areas fall within the regulatory definition of important eagle-use areas and they have been included as such in the Draft ECP Guidance and in this assessment.
Since risk to eagles is more likely to exist where a project area overlaps an "important eagle use area" (hereafter "eagle use area"), the ECP Guidance recommends that, to begin an eagle risk assessment, a project proponent first identify the location and type of all eagle use areas on and within a 10-mile perimeter of a project footprint. We further recommend that proposed project locations that do overlap known eagle use areas be re-sited or re-designed in order to minimize their risk to eagles unless subsequent data collection provides evidence that site-specific eagle movements and behavior do not put eagles at risk.

Breeding Season
An analysis of the proposed site and surrounding area using 2010 nesting data provided by the Service has located one known bald eagle nest (an eagle use area) within 10 miles of the project area, approximately 6.5 miles southeast. Although the movements of breeding eagles may vary drastically among adults and among territories, at this distance there is likely no overlap between the project area and the established territory of this pair. Additionally, the limited amount of eagle habitat within the project area suggests a relatively low abundance of non-breeding eagles (juveniles, sub-adults, or adult "floaters") are likely to be using the project area during the breeding season. This is supported by the data collected by BP, as no eagles were observed during monitoring within the project area during the breeding season. Based on this initial assessment, it appears that risk to eagles during the breeding season may be relatively low at this site. Note, however, that monitoring efforts did not cover all times of the breeding season equally. Specifically, surveys efforts were reduced to bi-weekly during the early breeding/courtship and late nesting/early fledging periods and these efforts only spanned one breeding season. More certainty could have been or could be obtained with added monitoring effort during the early breeding/courtship and late breeding/early fledging periods.

Winter Season
A search for any available information on eagle movements or concentration areas during the winter has produced no known eagle winter concentration areas within or in the vicinity of the project area. Additionally, during BP's pre-construction monitoring during the winter of 2008/2009, zero eagles were observed using the project area. Based on this initial assessment, it appears that risk to eagles during the winter may be relatively low at this site. Note, however, that the knowledge and documentation of winter eagle concentration areas and winter eagle movements may be sparse in Indiana and Illinois. There is no comprehensive database that our office is aware of that maintains concentration area information and very few reports on the subject of winter movements and roost locations in and near your project area. Additionally, as with portions of the breeding season, BP's monitoring efforts were again slightly reduced during the winter. Specifically, survey efforts during this time were reduced to bi-weekly and these efforts only spanned one winter. More certainty could have been or could be obtained with added monitoring efforts during the winter months.

Migration Season
The Service has determined the existence of a raptor migration route along the Indiana and Illinois border (USFWS 2006). It is possible that raptors travelling along this migration route will pass very near or through/over the Fowler Ridge Wind Farm, especially as they enter the relatively open landscape of northern Indiana/Illinois and may begin to disperse as they continue south. Both bald and golden eagles may be present along this migration pathway, especially during fall migration.

BP's pre-construction monitoring efforts collected data from two spring (2007 and 2008), and two fall (2007 and 2008) raptor migration seasons. During this monitoring effort, one bald eagle and no golden eagles were observed passing through the project area. The bald eagle observation occurred in the fall of 2008. Considering monitoring efforts only during the fall, one bald eagle was observed within the project area over 60 hours of observation. Based on this data, it appears that the monitored portion of the project area does not overlap an eagle migration corridor during the spring or fall migration season. Note, however, that during spring 2011 carcass searches, two bald eagles were incidentally observed and documented within the project area. Note also that, while the spring monitoring occurred during the generally accepted raptor migration season, bald eagles may be returning and establishing territories as early as mid-January in Indiana. This monitoring data may have missed some of this movement, although some of it may be captured in the winter monitoring data (see below discussion). More certainty could have been or could be obtained with added survey points and an extended spring monitoring season during the spring and fall migration seasons.

Initial Fatality Prediction

As outlined in the ECP Guidance, the Service has developed a predictive model in collaboration with modeling experts from outside and within the Service. The purpose of the model is to predict the number of eagle fatalities for a particular siting and operational configuration at a wind facility. As of the date of this letter, the model is in its late stages of development and discussion.

Because this project was conceived and monitoring data for this proposed project was collected before the publication of any consistent monitoring recommendations from the Service, the monitoring method for this project, understandably, may not have collected and/or reported data in a manner optimal for inclusion into the aforementioned model. For example, the number of points monitored during pre-construction monitoring relative to the large project area and number of turbines creates uncertainty in the data, and thus, the model output. Specifically, only ten monitoring points were established each year throughout the existing and proposed project areas. As such, only approximately four percent of the total project area was visually observed each year during point count monitoring.

Running the model, we arrived at a fatality estimate for this project, based on data collected by BP, of 0.201 bald eagles per year, with a 95% confidence interval between 0 and 0.604 bald eagles per year. Stated another way, our model predicts that eagle fatality rates at the proposed project site are likely to equal one eagle every 4.97 years and may be as high as one bald eagle every 1.66 years. Note the relatively large confidence interval calculated by the model. Note also that a model output of zero eagles per year is within the calculated 95% confidence interval.

Risk Summary
Considering the above risk analysis, the following are noteworthy about this project's risk to eagles:

1) Existing data collected by BP suggests that the project area does not overlap a spring and/or fall eagle migration corridor, although one eagle was observed within the project area (and the rotor swept zone) during formal monitoring in the fall 2008, and two eagles were incidentally observed in flight during carcass searches in the spring 2011.
2) There are no known bald eagle nest sites or other eagle use areas in the vicinity of the project area. The closest known eagle use area is a bald eagle nest, which is approximately 6.5 miles southeast of the project boundary.
3) There is limited eagle habitat within the project, reducing the potential of an eagle being attracted to the project area.
4) During 152 hours of formal observation within the project area, one bald eagle was observed, although, as mentioned, two were subsequently observed during carcass searches in spring 2011.
5) Despite several years of fatality monitoring with the potential to observe and document eagle carcasses at existing turbines, including cleared plots at some turbines and roads and pads at others, no eagle mortalities have been observed to date.
6) We arrived at a fatality estimate for this project of 0.201 bald eagles per year, with a 95% confidence interval between 0 and 0.604 bald eagles per year.

Uncertainty Summary
Uncertainty in our assessment may be relatively high. This uncertainty may be contributing, in part, to the aforementioned take prediction and large 95% confidence interval calculated by the model. In particular, a relatively low sampling effort and seasonally reduced sampling intensity relative to project size and number of turbines has left a large percentage of your project area and turbine locations unmonitored during times when eagles may be present. Uncertainty in this area is understandable, as monitoring data used in our assessment was collected prior to publication of any consistent monitoring recommendations from the Service. Uncertainty may also exist because the eagle monitoring data used in the attached analysis was collected between 2007 and 2009, ending approximately two years prior to the date of this letter. As a result of this, conditions relative to eagles may have changed slightly since pre-construction monitoring was completed.

APPENDIX C: WIRS PROCEDURE AND REPORTING FORM

BP WIND ENERGY
POLICIES AND PROCEDURES

WILDLIFE INCIDENT REPORTING SYSTEM (WIRS)

Document Control Details

DRAFT

Wildlife Incident Reporting System (WIRS)

1.0 Purpose/Scope

1.1 The purpose of this policy is to define the procedures that employees and contractors should take when they observe an injured animal or animal carcass (an "incident") at a wind operating asset.

- For the purposes of this reporting system, "incident" is a general term that refers to any bird, bat, or other animal, or evidence thereof, that is found either dead or injured within the wind project facility.
- An intact, carcass, carcass parts, bones, scattered feathers (10 or more feathers constitute a feather spot), or an injured bird or bat are all considered reportable incidences.

1.2 These procedures are intended to be in place for the life of the project.

1.3 These procedures are independent of any formal monitoring studies and should occur simultaneously to any formal monitoring studies.

1.4 Implementation of the WIRS will be part of the AE Power Services staff training program.

1.5 New or existing projects may from time to time have additional special requirements. Projects with special considerations are listed in Attachment 3. The VP - Operations and Asset Management, Director of HSSE and the Environmental Manager, Construction and Operations are authorized to periodically update Attachment 3 and communicate those requirements to Director of O&M, Facility Managers, and Deputy Facility Managers, where appropriate..

2.0 Reference

3.0 Responsibilities

3.1 Facility Manager (Facility/Project) or Deputy Facility Manager (if no Facility Manager on site)

A. Facility (or Deputy Facility) Managers have overall accountability to ensure that the requirements of this procedure are being followed by all facility employees and contractors within their respective organizations.

3.2 Employees and Contractors

A. Employees must take action when they observe a wildlife incident.

B. Employees must report, using the procedure herein, all wildlife incidents.

C. Contractors must take action when they observe a wildlife incident, as directed by the Facility (or Deputy Facility) Manager.

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3.3 Environmental Manager, Construction & Operations

A. Maintain completed WIRS reports and photos.

B. Answers questions as they arise, regarding the WIRS and wildlife interactions at the site.

C. Contacts agency(s) if an incident arises pertaining to threatened or endangered species.

4.0 Procedure

4.1 General

A. Prior to assuming a bird, bat, or other animal is injured, it should be observed to determine if it does not display normal behaviors.

- For example, raptors will occasionally walk on the ground, especially if they have captured a prey item. Raptors also "mantle" or hold their wings out and down covering a prey item. These types of behaviors may make the wings appear broken or the animal injured. Identification of specific behaviors typical to bird life cycles and distress behaviors will be part of the AE POWER SERVICES training program.

B. Always exercise caution before approaching or attempting to capture an injured bird. Typically, site personnel will not handle carcasses or injured animals on site, except with express approval from the HSSE Director.

C. Any incident involving a threatened or endangered species or a bald or golden eagle must be reported to BP Wind Environmental Manager, Construction & Operations immediately after identification.

4.2 Materials Needed to Complete a Report

- A copy of this WIRS procedure (unless already comfortable with the procedure)
- Wildlife Incident Report Form (see Attachment 1)
- Camera
- Pen/pencil

4.3 Incident Reporting Procedure

A. If the animal is injured:

- Move yourself to a distance far enough away that the animal is not further disturbed or uneasy due to your presence.
- Follow the procedure in Section 4.3B
- Call Environmental Manager, Construction & Operations, *immediately* to find out how the facility should handle getting the injured animal to a rehabilitation center. Leave a message if there is no answer.

B. If mortality occurs:

- Leave the animal in place.
- Photograph the incident, as it was found in the field. Take at least 2 pictures: a close-up shot of the animal as it lays in the field; and a broader view of the animal

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with a local feature (turbine, road) in view. For the close-up picture, lay a measuring object (radio, coin, pencil) next to the carcass so that there is a scale comparison.

- Prepare the Wildlife Incident Report Form (Attachment 2, for an example)
- Submit the report to the Facility (or Deputy Facility) Manager and the Environmental Manager, Construction & Operations within 24 hours.

NOTE:
Do not touch or pick up the dead animal. A Collection Permit is required in order to do this.

5.0 Training

5.1 Training on the content and requirements of the WIRS procedure shall be conducted upon hiring and/or assignment to a job with exposure to wildlife incidents, and new contractor orientation.

6.0 Auditing

6.1 The requirements called for in this procedure are subject to periodic inspection by the BP Facility (or Deputy Facility) Manager and annually during the BPWE site-specific HSSE audit.

6.2 This procedure shall be reviewed at least every three years.

7.0 Acronyms and Definitions

Acronyms Table

Acronym	Definition
HSSE	Health, Safety, Security and Environmental
WIRS	Wildlife Incident Reporting System

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Attachment 1
Wildlife Incident Reporting Form

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Wildlife Incident Reporting Form

Site:

Date: _____ Time: _____

Observer: _____

(Please list all observers in the close vicinity of the discovered animal)

Animals Observed:

Type of Animal: Bird, Bat, Other

Common Name (if known): _____

Color/Markings: _____

Sex: Male, Female, Unknown

Age: Adult, Juvenile, Unknown

Condition: Injured, Deceased

If injured what behavior is animal exhibiting? _____

If deceased what is the condition of the carcass? _____

Condition of remains		Age of remains	Was animal photographed?
Intact	Feather Spot	Fresh	Yes
Scavenged	Other	Aged	No
Dismembered		Unknown	Film roll/photo no. _____

Location of Animal:

Plot type: _____ Plot no. _____

Location if not on plot _____

UTM or long, lat coords (NAD27) _____

Distance and bearing from nearest tower/pole _____

Environmental conditions:

	Precipitation	Ambient Temperature	Wind Conditions	Other Weather Observations
Weather:	Clear	Cold	Calm	
	Fog	Cool	Gusty wind	
	Cloudy	Mild	Storm	
	Rain	Warm	Violent storm	
	Snow	Hot		
Habitat:	Bare ground	Forest	Other (describe)	
	Grassland	Tilled agriculture		
	Gravel road	Mix of above (check all that apply)		

Insect Pests: Mosquitos Fleas Ticks Flies None

Attachment 2
Wildlife Incident Reporting Form & Photos
(completed)

DRAFT

Wildlife Incident Reporting Form

Date: 6/22/11 Time: 1:35PM

Observer: Mark Hallowell

(Please list all observers in the close vicinity of the discovered animal)

Animals Observed:

Type of Animal: Bird / X Bat / Other

Common Name:

Color/Markings: Brown/Black

Is animal bagged or tagged? Yes / X No / Unknown

Does animal resemble a threatened or endangered species? Yes / No / X Unknown

Which species?

Sex: Male / Female / X Unknown

Age: Adult / Juvenile / X Unknown

Condition: Injured / Deceased X

If injured what behavior is animal exhibiting?

If deceased what is the condition of the carcass?

Condition of remains: Intact X / Scavenged / Dismembered / Feather Spot / Other

Age of remains: Fresh / Aged / Unknown

Was animal photographed? X Yes / No

Film roll/photo no.

Location of Animal:

Plot type: D4 Plot no. N/A

Location if not on plot Approximately 20 ft West of Turbine

UTM or long lat coords (NAD27) (hddd.mm.ss.s)

Distance and bearing from nearest tower/pole

Environmental conditions:

	Precipitation	Ambient Temperature	Wind Conditions	Other Weather Observations
Weather:	X Clear	Cold	X Calm	
	Fog	Cool	Gusty wind	
	Cloudy	X Mild	Storm	
	Rain	Warm	Violent storm	
	Snow	Hot		

Habitat:	X Bare ground	forest	Other (describe)	
	Grassland	Tilled agriculture		
	Gravel road	Mix of above (check all that apply)		

Insect Pests: Present:	mosquitos	Fleas	X None
	Ticks	Biting flies	

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Wildlife Incident Reporting System (WIRS)

Attachment 3
Projects with Special Conditions

Project	Special Condition	Date of Condition
Fowler Ridge WF	All reports of bat incidents must be made within 4 hours of the observance.	July 15, 2011

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DOCUMENT CONTROL DETAILS

			Document Name	Wildlife Incident Reporting System	
			Scope	BP Wind Energy	
Document #	HSSE 60.1.1		**Issue Date**	07-15-11	
Revision Date	07-14-11		**Next Review**	07-14-14	
Authority	Matt Sakurada	VP Operations & Asset Management	**Custodian**	Blayne Gunderman	Environmental Manager

REV #	REV DATE	Revision Detail	Authority	Custodian
0.0	07-14-11	Wildlife Incident Reporting System procedure	Matt Sakurada	Blayne Gunderman

Appendix E Best Management Practices (BMPs)

General Best Management Practices (BMPs)[1]

Land Use and Planning

- Fowler Ridge will plan, construct, operate and decommission its wind energy facilities (facilities) to maximize other potential land uses to the extent possible including, pastureland for continued livestock grazing, grasslands for wildlife use, and cropland for farming.

- Potential stakeholders, including county representatives and local landowners, are engaged early by Fowler Ridge in the planning process to begin the identification of potential issues and concerns associated with the proposed wind energy facility. Property owners and affected stakeholders will be engaged throughout the planning and development process to identify sensitive land uses to property owners.

- A notice of the proposed project will be provided to the Federal Aviation Administration (FAA) to identify any required air safety and construction measures that will need to be incorporated into the design of the turbine arrays and generation tie line.

- To facilitate efficient land use while minimizing disturbance to existing landscapes and habitats, the footprint of the proposed facilities including ancillary structures is being kept to the minimum required to operate the facilities and Fowler Ridge invests significant time and effort researching and evaluating current above ground and underground infrastructure, transmission lines, private and public roads and market access.

- Facilities will be designed to minimize the surface disturbance and area required for clearing of roads, staging areas and crane pads. Dust suppression will be employed to minimize impacts of vehicular and pedestrian traffic, construction activities and wind on exposed soil surfaces. Disturbed areas will be revegetated after or contemporaneously with construction activities to limit erosion and expedite the restoration of disturbed areas to pre-construction conditions (color, density and texture).

General Construction

- Good housekeeping protocol will be developed prior to construction activities and enforced during construction to ensure facilities are kept clean of debris, litter, garbage, fugitive trash or waste, graffiti, waste materials and to prohibit scrap heaps and dumps at the site while minimizing the area required for storage yards.

- The areas disturbed during construction activities including the footprint of wind turbine arrays, access roads, electrical collection lines, buildings (maintenance

[1] This list of General BMPs was prepared and provided by Fowler Ridge (Applicant)

and electrical substation) and the laydown/staging areas will be kept to a minimum.

- Soil removed during clearing, excavation, grading, trenching and other construction activities will be temporarily stockpiled and reused during site restoration and reclamation. Disturbed areas will be reclaimed using weed-free native grasses, forbs and/or shrubs and reclamation activities will be initiated as soon as practical to restore disturbed areas.

- Subsurface electrical collection lines will be installed using techniques that will minimize subsurface disturbance and located along roads or other routes of surface disturbance to decrease potential impacts to habitats along the proposed routes.

- Unstable slopes including factors that may induce slope instability will be identified and the creation of excessive slopes during excavation will be avoided. Special construction techniques will be employed, as needed while working in areas with steep slopes and soils with a high erosion potential.

- Construction of the facilities will be completed following procedures that will minimize and/or avoid impacts to soil, water, air and ground water resources while maintaining natural habitats and landscapes to the maximum extent possible.

- Construction activities will comply with applicable federal, state, county and local requirements including permitting, siting and design standards specified by the Clean Air Act, Endangered Species Act, Clean Water Act and federal/state historic preservation acts.

- Prior to construction, all contractors, construction workers and facility personnel will be briefed on BMPs and provided health and safety briefings to ensure site hazards are identified and avoided. The mandatory briefings will include:

    - review of construction constraints and schedules;

    - location, avoidance and protection of potential cultural, paleontological, historic and ecological resources including sensitive species and habitats;

    - training materials and location of facility management plans;

    - identification and location of emergency response and spill containment kits and materials including emergency notification numbers and reporting requirements; and

    - consequences and penalties associated with failure to adhere to federal, state, county and local regulations including project-specific standards established in permits and by Fowler Ridge.

- Copies of all Facility management plans and permits will be maintained at the facilities throughout construction, operation and decommissioning activities. Other graphical presentations of the BMPs and/or mitigation measures may include signs and/or posters inside work vehicles and facility buildings.

- No surface disturbances or other unauthorized use of the facilities will be allowed outside areas of planned development areas which will be clearly marked prior to construction. Access to facilities will be limited to access/service roads and all vehicles will comply with posted speeds and limited to approved roads, parking and staging areas.

- Clearing, grubbing, grading, excavation and/or other surface disturbances will be limited to approved areas and restricted to those areas only absolutely necessary to complete the required construction activities.

- No construction activities, vehicular traffic or surface disturbance will be allowed in areas outside of the designated construction zones without preapproval from Fowler Ridge and the affected landowners and county.

- Any alterations or modifications including relocation or realignment of structures, roads and electrical collection lines due to unforeseen circumstances or obstructions will not be initiated without prior written approval of Fowler Ridge.

- Construction activities will be monitored and supervised by an approved and qualified construction manager selected by Fowler Ridge. The construction manager will be responsible for adhering to established construction schedules and ensuring the project is completed on time and on budget with a goal of zero safety incidents. In addition, the construction manager will ensure that construction activities comply with all applicable goals, permits and regulations established for the proposed facilities.

- Temporary storage areas including the laydown/staging yards and concrete batch plant areas will be regraded to match the natural topography and reseeded to restore the native grass following construction.

- Revegetation of disturbed areas will be accomplished using approved grass seed mixes and methodologies conducive to restoring the areas with natural vegetation. The vegetative cover, composition and diversity used to restore disturbed areas will be commensurate with the ecological setting. Temporary erosion and sedimentation controls will be utilized during seeding and establishment of vegetation to minimize the time required to complete reclamation and restoration of disturbed areas.

Cultural/Historic Resources

- Surveys will be conducted to identify potential cultural and archeological resources within the project area. Development activity will be sited to avoid impacting significant resources.

- An Unanticipated Discovery Plan will be implemented to manage the unexpected discovery of new cultural, archeological and paleontological resources. If unexpected cultural resources are discovered during construction, operation or decommissioning of the facilities, the discovery will be reported to Fowler Ridge and the relevant stakeholders. In addition, construction activities will cease in the vicinity of the discovery to avoid further disturbance while the resources are evaluated and mitigation measures are developed.

Wildlife and Ecological Resources

- Existing information related to species, habitats and wildlife at the facilities will be evaluated to identify potential concerns.

- Sensitive and unique habitats will be considered during the design and siting of turbines, roads, transmission lines and ancillary structures with the goal of avoiding (if possible) critical wildlife habitats, riparian habitats, wetlands, intermittent or ephemeral streams, and sensitive species.

- A trash abatement program/waste minimization plan will be established. Trash and food items will be contained in secure, closed containers and removed regularly to reduce the attractiveness to migratory birds, raptors and other opportunistic predators.

- Revegetation, soil stabilization and erosion/sedimentation reduction measures will be implemented during construction of the facilities to ensure timely restoration of disturbed areas and facilitate/enhance reuse of the habitat by wildlife species.

- Disturbances to existing vegetation and habitats will be minimized by siting infrastructure (including utility corridors and access/service roads) in previously disturbed areas (i.e. utilize existing access roads, install interconnect lines and electrical substation close to existing transmission lines, etc.) as practicable.

- New access/service roads and utility corridors will be sited to avoid sensitive habitats and minimize fragmentation of habitats.

- Transmission towers and other ancillary structures will be designed to discourage use by birds for perching or nesting and the use of guy wires will be minimized.

- The generation tie line will be configured according to Avian Power Line Interaction Committed (APLIC) guidance to minimize the potential for electrocution of avian species.

- Underground electrical collection lines will be buried to minimize risk of electrocution or collision for avian species.

- To reduce attraction of migratory birds to the facilities, the minimum amount of lighting to safely operate the facility will be used. Outdoor lights will have a

partial shroud over the top to direct the light downward at night to minimize the visibility of these lights from overhead at night.

- Unnecessary lighting will remain off at night to limit the attraction of migratory birds and observations of potential wildlife problems including mortality will be reported to Fowler Ridge.

- Wind turbines will be lighted with simultaneously flashing red strobe lights in accordance with FAA requirements

- Construction workers will be briefed on policies to avoid harassment and disturbance of wildlife and sensitive species. No pets, non-indigenous wildlife or plants, hunting, trapping or recreational activities will be permitted at the facilities during construction.

- Habitat disturbance will be reduced by restricting vehicles to access/service roads and designated construction zones while minimizing foot and vehicular traffic through undisturbed areas.

- Higher-height vegetation or shrub species will be considered along transmission corridors to minimize foraging by raptors and areas around turbines, MET towers and other ancillary structures will be maintained as unvegetated areas (i.e. crushed gravel, etc.) or limited to non-attractive vegetation that will not attract or support wildlife.

Visual Resources

- The design of turbine arrays and towers will be integrated with the surrounding landscape and design considerations will include: visual conformity; use of tubular towers for turbines and MET tower; proportion and color of turbines (towers and nacelles); and prohibition of commercial messages, signs and advertisements on turbines. Other design considerations will include minimizing the profile of ancillary structures, burial of cables, prohibition of commercial signs and advertisements on ancillary structures and minimal lighting of these structures.

- Billboards and advertising messages will be prohibited at the facilities.

- Nacelles and towers will be designed to form an aesthetic unit and be combined with particular sizes and shapes to achieve an aesthetic balance between the rotor, nacelle and tower.

- The color of turbines will be designed to reduce visual impact and applied uniformly to tower, nacelle and rotor. Nonreflective paints and coatings will be used to reduce reflection and glare and turbines, visible ancillary structures and other equipment will be painted before or immediately after installation.

- To reduce visual impacts during construction activities, the areas of surface disturbance will be minimized, erosion/sedimentation will be controlled, dust suppression will be utilized, volume of traffic and storage of supplies will be minimized and restoration of disturbed areas will coincide with original topography and vegetation prior to construction.

- Conspicuous structures will be designed and constructed to harmonize with the characteristics of the surrounding landscape.

- Facilities will be designed to avoid or minimize security lights since these lights increase the contrast between wind energy facilities and the night sky in rural/remote areas. Security lights, if needed will be designed to normally remain off except when activated by motion detectors that may be installed around the electrical substation.

Air Quality

- Dust abatement techniques will be implemented on unpaved, unvegetated surfaces to minimize airborne dust and speed limits will be posted and enforced on access/service roads to reduce airborne fugitive dust.

- Dust abatement techniques will be used during surface clearing, grading, excavation, trenching, backfilling and other earthmoving activities as construction of the facilities progresses and disturbed areas reseeded as quickly as possible following completion of construction activities.

- Soil will be moist, drop heights minimized and soil loads maintained below the freeboard during the loading of trucks. Gate seals will be tight on dump trucks and trucks with soil loads covered prior to transportation of loads and travel on public roads.

- If blasting is necessary, dust abatement techniques will be used during blasting activities.

Roads

- To reduce surface disturbances, existing roads at the facilities will be used to the maximum extent possible to minimize additional road construction activities associated with new roads. Project planning will maximize the use of existing roads and corridors while minimizing the number and size of new roads, parking areas, storage areas and laydown/staging areas.

- New roads will be constructed on private lands at the minimal height necessary to accommodate the anticipated traffic volume and weight of vehicles and excessive grades on roads, embankments, ditches or other drainage structures will be avoided, especially in areas of unstable or erodible soils.

- Access/service roads at the proposed wind energy facilities will be surfaced with gravel or aggregate materials and located to coincide with natural contours to minimize cut and fill during construction activities.

- Roads will be sited to avoid drainage features (i.e. wetlands, ephemeral streams, creeks, etc.) to the extent practical and designed to minimize alterations to surface water runoff or creation of erosion and sedimentation. In addition, roads will be located to avoid new stream crossings and any structures required to cross streams will be constructed in accordance with U.S. Army Corps of Engineers (USACE) Section 404 of the Clean Water Act requirements to maintain channel stability.

Noise

- If feasible, various noisy activities will be scheduled at the same time of the day to minimize the duration of noise throughout the day with the goal of less frequent noise generation activities instead of frequent noise generation activities.

Noxious Weeds and Pesticides

- To prevent the introduction of undesirable plant species into disturbed area and to ensure slope stability following construction activities, seeding and site restoration efforts will utilize seed for grasses native to the area and free of noxious weeds to prevent the spread and establishment of noxious weeds in disturbed areas.

- Access/service roads and newly disturbed areas will be regularly monitored for invasive species and weed control measures implemented upon the discovery of invasive species. Invasive vegetation monitoring and control will be initiated after construction activities are completed.

- Source areas with known invasive vegetation will not be used to supply fill materials and only certified weed-free mulch will be used when stabilizing and reclaiming disturbed areas.

- Disturbed areas will be reseeded using weed-free native grass seed.

- If pesticides are required, applications will comply with applicable requirements using only U.S. Environmental Protection Agency- (EPA)-registered pesticides. Pesticide use will be limited to nonpersistent and immobile pesticides that are applied following label and application directions and stipulations for terrestrial and aquatic applications.

Paleontological Resources

- Unanticipated discovery of paleontological resources during construction will be reported to Fowler Ridge immediately, in accordance with the Unanticipated Discovery Plan, and work halted in the vicinity of the discovery to avoid further disturbance while the resources are evaluated for appropriate mitigation measures.

Geologic Resources

- Land disturbances will be minimized during construction, operation and decommissioning of the facilities by limiting the number, size, width and length of roads, temporary fences, laydown/staging yards, operation and maintenance buildings, electrical substations, temporary batch plants and turbine foundations.

- Topsoil removed during excavation and construction activities will be reused during restoration activities and disturbed areas reclaimed as expeditiously as possible to restore native conditions and habitats.

- Erosion controls (i.e. jute netting, silt fences, diversion structures, check dams, etc.) will be implemented in disturbed areas and comply with applicable federal, state and local standards to minimize potential increased soil erosion and sedimentation. Drainage ditches will be minimized and soil erosion will be controlled at culvert outlets. Potential catch basins, drainage ditches and culverts will be regularly maintained and routinely cleaned, as needed.

- Unstable slopes and local conditions that may induce slope instability will be identified and measures implemented to avoid creating excessive slopes during excavation and any necessary blasting operations. Special construction techniques will be evaluated as applicable in areas with steep slopes, soils with a high erosion potential and stream channel crossings.

- Excavations and trenches will be backfilled with as much of the originally excavated materials as possible and any excess materials will be stockpiled for future reclamation activities or thin spread in approved areas to control soil erosion and avoid disturbance of sensitive habitats.

Hazardous Materials and Waste Management

- Hazardous materials will be managed in accordance with applicable regulations and guidelines associated with the storage, use, transportation and disposal of hazardous materials including: comprehensive lists of hazardous materials that will be stored, used or transported during the construction, operation and decommissioning of the facilities; inspection procedures; storage requirements and quantities; inventory control; labeling and packaging; and disposal procedures.

- A Waste Management Plan will be developed to identify waste streams (solid and liquid) that are anticipated to be generated and will address hazardous waste determination protocol, waste storage locations, waste management and disposal requirements, and waste minimization BMPs for waste streams generated at the facilities during construction, operation, and decommissioning of the facilities.

- Secondary containment will be provided for on-site hazardous materials storage including temporary fuel storage for construction vehicles and equipment to support construction activities.

- Wastes will be containerized, labeled and periodically removed for disposal to approved and permitted facilities.

- A Spill Prevention Countermeasures and Control (SPCC) plan will be prepared for construction and operation of the facilities. All spills and releases will be documented and corrective actions implemented to contain, investigate and cleanup the spills and releases as quickly as possible. In addition, the incidents will be reported to Fowler Ridge and federal and state agencies, as required by applicable regulations and guidelines.

- Wastewater generated at portable sanitary facilities will be periodically removed by a licensed hauler for disposal at an approved municipal sewage treatment facility. Temporary sanitary facilities provided for construction workers will be removed following completion of construction activities.

Storm Water and Soil Erosion/Sedimentation

- A Storm Water Pollution Prevention Plan (SWPPP) will be prepared for the facilities to outline the procedures for preventing impacts to storm water runoff and for minimizing the potential for soil erosion and sedimentation.

- Erosion and sedimentation controls (i.e. jute netting, silt fencing, etc.) will be installed, as needed near disturbed areas. Existing drainage patterns will not be altered in sensitive areas and potential soil erosion in areas of soil with high erosion potential or steep slopes will be controlled.

- Roadway ditches and culverts will be routinely inspected, cleaned and maintained to prevent erosion and the accumulation of sediment and detritus.

Health and Safety

- Potential site hazards and safety issues will be identified and mitigated to eliminate potential hazards. Mitigation activities will likely include: limiting site access during construction activities; developing safe work practices (personal protective equipment, safety harnesses, safe work zones, break areas, etc.); barricading excavations and trenches; establishing evacuation procedures in event of fire or other emergencies; providing security fencing and locked gates (if warranted); managing traffic; and developing emergency procedures in the event of accident or injury.

- A health and safety program will be developed to protect construction workers, Facility personnel and site visitors during construction, operation and decommissioning of the facilities. The project-specific Heath and Safety Plan (HASP) will comply with applicable occupational safety standards including Occupational Safety and Health Administration (OSHA) standards (29 CFR Parts 1910 and 1926).

- Safety zones or setbacks for wind turbines from occupied buildings, roads and other public access areas will be established to prevent accidents or injuries

during operation of the turbines. Permanent fencing will be installed around electrical substations.

- Facilities will be planned and developed to minimize impacts to radar, microwave, television and radio transmissions and comply with Federal Communications Commission (FCC) regulations. Potential interference with public safety communication systems including 911 calls will be avoided.

- Facilities will comply with FAA regulations including lighting requirements to avoid potential safety issues associated with proximity to airports, military bases, training areas or landing strips.

- Electrical systems will be designed in accordance with applicable safety standards and measures developed to reduce occupational exposure to electromagnetic fields (EMF).

- Temporary fencing will be installed around staging areas, storage yards and excavations and trenches during construction activities to limit public access while protecting the safety of construction workers, site visitors and area wildlife.

Fire Management

- Fire management strategies with an emphasis on fire prevention will be implemented during construction, operation and decommissioning of the facilities.

- Potential ignition sources will be identified and eliminated whenever possible.

- Sources of water and firefighting equipment will be maintained at the site (i.e. water trucks, hoses, shovels, picks, etc.).

- Construction workers and Facility personnel will be briefed on the location of ignition sources and fire prevention protocol.

- Stockpiled brush, shrubs, etc. will be covered and/or periodically misted with water, as needed.

- High risk activities (i.e. welding, cutting, etc.) will be restricted, temporarily suspended or rescheduled during extremely dry weather conditions with high winds.

- Signs and restrictions on smoking will be posted at the facilities.

Water Resources

- A Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared to protect water resources near the facilities and will identify storage locations for fuel, oil (i.e. engine oil, lubricants, dielectric oils, etc.) and any other petroleum

products planned to be used during construction, operation and decommissioning of the facilities.

- The SPCC Plan will specify training requirements, spill prevention activities, spill response and containment protocol in the event of spills or releases, location of spill response kits and sorbent materials for cleanup, procedures for routine inspection of storage containers and secondary containment structures, recordkeeping and reporting requirements, and procedures for fuel deliveries and/or refueling activities. Spills will immediately be addressed in accordance with the SPCC Plan and soil cleanup and/or removal initiated, if needed.

- Refueling operations will be restricted to designated areas equipped with secondary containment or temporary berms and drip pans will be used during refueling to contain potential accidental releases. In addition, drip pans will be used beneath fuel pump and valve mechanisms of any bulk fueling vehicles parked at construction zones.

- Erosion and sedimentation controls that comply with applicable federal, state and county standards will be installed near disturbed areas at the facilities to minimize impacts to surface water resources.

- Culverts and/or water conveyances for temporary and permanent roads, if needed will be designed to comply with county and USACE standards

Operation and Maintenance (O&M)

- Inoperable turbines will be safely repaired, replaced or removed as expeditiously and economically as possible to maintain peak operating efficiency and minimize disruption to the supply of electricity to the power grid.

- Nacelle covers and rotor nose cones will remain in place and nacelles and towers will be regularly cleaned to remove spilled or leaking fluids and accumulated dirt and dust in seeping lubricants.

- Facilities will be kept clean of debris, litter, fugitive trash or waste and graffiti. In addition, scrap heaps and dumps will be prohibited and storage yards will be kept to an absolute minimum. Surplus, broken, unused and discarded materials and equipment will not be allowed to accumulate at the facilities.

- Facility personnel, O&M contractors, equipment vendors and site visitors will be briefed on avoiding harassment and disturbance of wildlife and sensitive species and no pets will be allowed in sensitive areas.

- Observations of wildlife disturbances and mortality including birds and bats will be reported to Fowler Ridge upon discovery.

- Road conditions, traffic volumes and structural integrity of wind turbines and ancillary buildings will be routinely inspected and maintained throughout the operation of the facilities.

- Permanent fencing around electrical substations and access doors for turbine towers will be routinely inspected to ensure the areas are secured and locked to limit public and unauthorized access. Broken and/or damaged locks and fencing will be repaired or replaced to maintain security throughout the operation of the facilities.

- If electromagnetic interference (EMI) develops during operation of the facilities, Fowler Ridge will work to resolve verified impacts to affected communication systems. Additional data will be evaluated, as needed to determine the need to convey warning information to aircraft with onboard radar systems so echoes from the wind turbines are quickly recognized by pilots.

Fowler Ridge Phase IV-Site Specific Best Management Practices (BMPs)[1]

The following BMPs will supersede the general BMPs where applicable:

- Construction access outside of roads would be minimized in order to limit soil compaction.

- Disturbance of surface and subsurface drainage features will be avoided and all tile lines inadvertently damaged will be repaired.

- Directional boring would be implemented at all collector line crossings of regulated streams, and no permanent fill will be placed below the ordinary high water mark at any stream crossing.

- If any intermittent or ephemeral streams have active flow at the time of construction, Fowler Ridge will hold off construction until the stream are no longer flowing or directionally bore, rather than open-trench through open stream flow.

- All farm ponds within the project area will be completely avoided. Additionally, all wetlands will be avoided during construction. No turbines will be located in wetlands, and no access roads will be constructed within potential wetland boundaries. If collector lines cannot completely avoid wetlands, directional boring will be implemented to avoid impacting wetlands.

- A site-wide 25 mph speed limit will be established.

- Aboveground transmission and collection lines will be minimized, and those aboveground lines which are necessary will be designed in accordance with APLIC standards.

- Should a collector line need to cross a railway, directional boring will be used so as not to impact rail service.

[1] This list of Fowler IV Site-Specific BMPs was prepared and provided by Fowler Ridge (Applicant)

Appendix F Farmland Conversion Rating Impact Form (AD-1006)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I (*To be completed by Federal Agency*)	Date Of Land Evaluation Request 6/15/2011
Name Of Project: Fowler Ridge Wind Farm	Federal Agency Involved: U.S. Fish and Wildlife Service
Proposed Land Use: Construction of Fowler Ridge Phase IV	County And State: Benton County, Indiana
PART II (*To be completed by SCS*)	Date Request Received By SCS: 8-17-11

Does the site contain prime, unique, statewide or local important farmland? *If no, the FPPA does not apply - do not complete additional parts of this form*).	Yes ☒	No ☐	Acres Irrigated	Average Farm Size: 378
Major Crop(s): Corn	Farmable Land In Govt. Jurisdiction Acres: 256,012 % 98		Amount Of Farmland As Defined In FPPA Acres: 252,327 % 97	
Name Of Land Evaluation System Used: LESA	Name Of Local Site Assessment System		Date Land Evaluation Returned By SCS: 8-30-11	

PART III (*To be completed by Federal Agency*)	Alternative Site Rating			
	Site A[1]	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	280			
PART IV (*To be completed by SCS*) Land Evaluation Information				
A. Total Acres Prime and Unique Farmland	280			
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.109			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	36			
PART V (*To be completed by SCS*) Land Evaluation Criterion Relative Value Of Farmland To Be Converted (*Scale of 0 to 100 Points*)	90			

PART VI (*To be completed by Federal Agency*) Site Assessment Criteria (*These criteria are explained in 7 CFR 658.5(b)*)	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Land Government	20	0			
5. Distance From Urban Builtup Area	0	5			
6. Distance To Urban Support Services	0	0			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	5			
10. On Farm Investments	20	10			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	8			
TOTAL SITE ASSESSMENT POINTS	160	83			
PART VII (*To be completed by Federal Agency*)					
Relative Value Of Farmland (*From Part V*)	100	90			
Total Site Assessment (*From Part VI above or a local site assessment*)	160	83			
TOTAL POINTS (*Total of above 2 lines*)	260	173			

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

[1]Estimate of permanent impacts as a result of construction of Phase IV. Impacts were assessed using an average length of 2,400 linear feet multiplied by a 16-foot width at access road locations and approximately 2 acres per turbine pad. A total of 93 turbines will be constructed as part of the proposed project.

Appendix G Programmatic Agreement

PROGRAMMATIC AGREEMENT (PA)

among
The U.S. Fish and Wildlife Service (USFWS),
The Indiana State Historic Preservation Officer (SHPO), and
Fowler Ridge Wind Farm LLC, Fowler Ridge II Wind Farm LLC, Fowler Ridge III Wind Farm LLC and Fowler Ridge IV Wind Farm LLC (Fowler Ridge)
regarding
Construction of the Fowler Ridge Wind Farm Phase IV Project (FRWF Phase IV)
to be located in Benton County, Indiana
and
Mitigation for Take of Indiana Bats at Fowler Ridge Wind Farm Phases I through IV (FRWF Phases I through IV)
to be implemented anywhere in Indiana

WHEREAS, issuance of an Incidental Take Permit (ITP) by USFWS to Fowler Ridge for incidental take of Indiana bats during operation of FRWF Phases I through IV triggers review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470 *et seq.*, § 470f, and its implementing regulations "Protection of Historic Properties" (36 CFR Part 800) and;

WHEREAS, USFWS has determined that construction of the proposed FRWF Phase IV project, to be located in Benton County, and implementation of Indiana bat mitigation, to be implemented anywhere within Indiana, may potentially cause an adverse effect on historic properties and;

WHEREAS, the proposed FRWF Phase IV project will include construction of up to 94 turbines for a total capacity of 150.4 MW (construction scheduled to begin 2014), and construction of a generation tie-in line, a substation, an operations and maintenance (O&M) building (should it be needed) access roads, and collection and communications lines and:

WHEREAS, mitigation required of Fowler Ridge to compensate for the impact of taking Indiana bats during operation of FRWF Phases I through IV, as described in the Habitat Conservation Plan (HCP) and required pursuant to the ITP, will include constructing a gate near the entrance of Wyandotte Cave (Crawford County, Indiana) and planting native trees on up to 240 acres adjacent to Indiana bat maternity colonies primarily within the same Indiana 8-digit Hydrologic Unit Code (HUC) watershed as Fowler Ridge Wind Farm Phases I through IV and;

WHEREAS, USFWS has determined the direct Area of Potential Effects (APE) for the undertaking will include the FRWF Phase IV project area including up to 94 turbine locations, access roads and buried interconnect lines, construction staging areas, tie-in lines, an O&M building, and the substation location; and Indiana bat mitigation sites including Wyandotte Cave and sites selected by Fowler Ridge and approved by the USFWS within a 2.5 mile radius circle around known maternity colonies in Indiana, and;

WHEREAS, USFWS has consulted with the SHPO to address potential effects of the FRWF Phase IV on historic properties in accordance with Section 106 of the NHPA (16 U.S.C. 470) and its implementing regulations, 36 CFR Part 800; and

WHEREAS, it is agreed among the signatories that adverse effects to above ground historic resources in the indirect APE will not occur as a result of the FRWF Phase IV project or the Indiana bat mitigation and;

WHEREAS, USFWS is phasing identification and evaluation of historic properties and application of the criteria of effects in accordance with 36 CFR Part 800.4(b)(2) and 36 CFR Part 800.5(a)(3), respectively, because final siting of project infrastructure and Indiana bat mitigation is not complete and;

WHEREAS, in accordance with 36 CFR Part 800.14(b)(1)(ii), execution of a Programmatic Agreement (PA) is appropriate because effects on historic properties cannot be fully determined prior to USFWS issuance of the ITP to Fowler Ridge; and

WHEREAS, Fowler Ridge has agreed to complete its stipulations, listed below, regarding the identification, evaluation of eligibility and assessment of effects on archaeological resources within the direct APE as elaborated below, as a condition of receiving the ITP and;

WHEREAS, the terms used in this PA are defined in 36 CFR Part 800.16;

NOW, THEREFORE, USFWS, SHPO and Fowler Ridge agree that the above-referenced construction and mitigation will be implemented in accordance with the following stipulations in order to take into account the effect of said undertakings on historic properties.

STIPULATIONS

USFWS will ensure that the following stipulations are carried out:

I. CONDITIONS

A. USFWS will ensure that the terms of this PA within its control are implemented prior to the start of construction of FRWF Phase IV and prior to the start of implementation of any Indiana bat mitigation. Construction of FRWF Phase IV and implementation of Indiana bat mitigation (gating of Wyandotte Cave) may begin in 2014.

B. USFWS will ensure that the Indiana Department of Natural Resources (IDNR) implements Section 106 coordination prior to allowing FRWF to construct the gate at the IDNR-owned Wyandotte Cave, as stated in a commitment letter from IDNR to USFWS (attached).

II. PROFESSIONAL STANDARDS

A. The studies and work required under the terms of this PA will be carried out by or under the direct supervision of a professional, hired and paid by FRWF, who, at a minimum, meets the U.S. Secretary of the Interior's *Professional Qualifications Standards* (48 FR 44716, September 29, 1983) in archeology or architectural history, as appropriate.

B. Studies of traditional resources that are of cultural and religious significance to the Consulting Tribes will be carried out by or under the direct supervision of a person, hired and paid by Fowler Ridge, acceptable to USFWS in consultation with the appropriate Consulting Tribes, and acceptable to SHPO.

III. IDENTIFICATION AND TREATMENT

A. Mitigation of Effects to Above Ground Historic Resources

Previously, Fowler Ridge commissioned a desktop review of above ground historic resources in the FRWF Phase IV direct APE. The desktop review found no National Register of Historic Places (NRHP) listed historic resources within the footprint of the 94 FRWF Phase IV turbines; therefore, none would be directly affected by the project. A total of 73 resources which are listed in SHAARD as "Notable" (i.e., potentially eligible for the NRHP), or "Outstanding" (i.e., considered eligible for the NRHP) are located within the indirect APE, within one mile of a FRWF Phase IV turbine. Additionally, three resources located within the town of Fowler are actually listed on the NRHP. In a letter dated September 17, 2012, USFWS found that construction of FRWF Phase IV would have no adverse effect on these 76 structures due to their location within the town and their current rating status in SHAARD. SHPO, in a letter dated October 18, 2012, concurred with this finding. Therefore, no mitigation is required for above ground resources within the indirect APE.

B. Identification and Mitigation Efforts for Archaeological Resources

1. Prior to the initiation of any construction or mitigation activities that could potentially disturb or damage archaeological resources, Fowler Ridge shall carry out archaeological investigations in accordance with the provisions of the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 F.R. 44716) and IC 14-21-1, 312 IAC 21, 312 IAC 22, and the most current Guidebook for Indiana Historic Sites and Structures Inventory- Archaeological Sites and in accordance with the methodology set forth in this PA. USFWS shall ensure that all scopes of work for archaeological identification and evaluation produced by Fowler Ridge include a plan for the treatment of human remains and funerary objects that might be encountered.

a. Phase I Archaeological Survey. USFWS shall ensure that a Phase I Scope of Work will be developed by Fowler Ridge in consultation with SHPO. Phase I work will be designed to provide information regarding the significance of all identified archaeological sites to the NRHP. This work will be done in consultation with SHPO and all deliverables will be submitted by USFWS to SHPO for review and comment.

1) If USFWS determines and SHPO concurs that a "site is not eligible" for the NRHP, then no further investigations of that site will be conducted.

2) If USFWS determines and SHPO concurs that a site with indeterminable eligibility can and will be avoided, which would be the preferred option, then no further investigation of that site will be conducted, unless avoidance no longer becomes feasible.

b. Phase II Archaeological Testing. If all parties agree that the "eligibility of a site is indeterminable" and avoidance is not feasible, USFWS shall ensure that a Phase II Research Design will be developed by Fowler Ridge in consultation with SHPO. This document will be consistent with SHPO guidelines. Phase II work will be designed to provide information regarding the significance of an archaeological site as "site is not eligible" or "site is eligible" to the NRHP. This work will be done in consultation with SHPO and all deliverables will be submitted by USFWS to SHPO for review and comment.

1) If USFWS determines and SHPO concurs that a "site is not eligible" for the NRHP, then no further investigations of that site will be conducted.

2) If USFWS determines but SHPO will not concur regarding eligibility, all appropriate information regarding the site will be submitted by USFWS to the Keeper of the National Register, National Park Service, for review. The Keeper's determination of eligibility will be final.

3) If USFWS determines and SHPO concurs that an eligible site can and will be avoided, which would be the preferred option, then no further investigation of that site will be conducted, unless avoidance no longer becomes feasible.

c. Application of Criteria of Adverse Effects. If USFWS determines and SHPO concurs that the "site is eligible", but through discussions with Fowler Ridge, USFWS determines avoidance is not a feasible alternative, then USFWS will consult with SHPO to apply the criteria of adverse effects. This work will be completed in consultation with SHPO guidelines and all deliverables will be submitted by the USFWS to SHPO for review and comment.

1) If following the application of the criteria of adverse effects, USFWS determines and SHPO concurs that FRWF Phase IV and the mitigation will have “no effect” or “no adverse effect” on an eligible site then no further investigations of that site will be conducted.

2) If USFWS determines and SHPO concurs that FRWF Phase IV and/or the mitigation will have an “adverse effect” on an eligible site, but the construction and/or mitigation project is subsequently redesigned by Fowler Ridge to avoid adverse effects, then the finding would be changed to “no effect”. USFWS shall provide written documentation demonstrating avoidance for SHPO concurrence.

3) If redesign of the construction and/or mitigation project by Fowler Ridge still determines that avoidance is not feasible, the scope of the adverse effect will be reassessed.

d. Phase III Archaeological Data Recovery. If all parties agree that FRWF Phase IV and/or mitigation will have an “adverse effect” on an eligible site and avoidance is not a feasible option, then USFWS will consult with SHPO to identify measures to minimize and mitigate the adverse effect to the site. USFWS shall ensure that a Treatment (Data Recovery) Plan will be developed by Fowler Ridge in consultation with SHPO as an amendment to this PA. The plan will be consistent with SHPO guidelines and all deliverables will be submitted by USFWS to SHPO for review and comment.

Following SHPO review and concurrence of proposed Phase III deliverables, no further investigations of that site will be conducted, unless an unanticipated post-review discovery is made.

e. Post-review discoveries. In the event of any unanticipated discoveries of archaeological sites, unmarked cemeteries, or human remains and associated funerary objects during the implementation of FRWF Phase IV and/or mitigation, all activities will be suspended in the area of discovery. Fowler Ridge will contact USFWS and SHPO within 48 business hours of the discovery, via telephone at the following numbers: For USFWS, Regional Historic Preservation Officer James Myster at 612-713-5439 and Forest Clark, NEPA Project Manager at 812-334-4261 ext. 206, and for SHPO/IDNR at 317-232-1646. If the discovery is of human remains, local law enforcement and the County Coroner will be contacted as well.

In consultation with SHPO, USFWS shall ensure that, if necessary, a qualified archaeologist, hired and paid by Fowler Ridge, will visit and assess the discovery, anticipated to be within 72 hours of the initial notification, or as soon as practicable. Based upon that verbal or written assessment and through

consultation, USFWS and SHPO shall agree upon the appropriate treatment of the discovery prior to resumption of construction activities in the area of discovery. If human remains are determined to be of Native American origin, Fowler Ridge, in consultation with USFWS and the SHPO, shall comply with relevant federal and state statutes including but not limited to IC 14-21-1, IC 14-21-2, IC 23-14. FRWF affirms that all human remains will be avoided by direct construction impacts where feasible.

If the construction contractor for Fowler Ridge believes that a discovery contains human remains and the discovery is not on federal lands, USFWS and Fowler Ridge will notify the Indiana Department of Natural Resources - Division of Historic Preservation and Archaeology within two (2) days pursuant to IC 14-21-1-27. Prior to the start of construction and mitigation, Fowler Ridge will remind its contractor, in writing, that finding unknown sites and/or human remains are still possible even if the project has been cleared and outline to them the process of inadvertent discovery notification as described above.

C. Curation

If the landowner would wish to retain ownership of any of the artifacts which are recovered and not place into permanent curation at a qualified curational facility, additional and more detailed analyses and documentation of the artifacts will be necessary. The archaeologist must consult with the Division of Historic Preservation and Archaeology regarding these additional analyses and documentation. All original notes, records, photographs, and artifacts etc. not retained by the landowner from the site should be curated at a qualified curational facility. Copies of the documentation may be given to the landowner. Fowler Ridge will request the landowners to donate the cultural material to a qualified curational facility whenever possible and appropriate.

If Fowler Ridge obtains signed gift agreements from private landowners, then Fowler Ridge will submit such artifacts, materials or records for permanent curation at a repository that meets federal standards under 36 CFR 79.

D. Dispute Resolution

Should any signatory to this PA object in writing at any time to any actions proposed or the manner in which the terms of this PA are implemented, USFWS, within the limits of its authority, will consult with such party to resolve the objection. If USFWS determines that the objection cannot be resolved, that agency will:

1) Forward all documentation relevant to the dispute, including the resolution proposed by USFWS, to the Advisory Council on Historic Preservation (ACHP). ACHP will provide USFWS with its advice, pursuant to 36 CFR Part 800.2(b)(2), on the resolution of the objection within thirty (30) days of receiving adequate

documentation. Prior to reaching a final decision on the dispute, USFWS will prepare a written response that takes into account any timely advice or comments from the ACHP, signatories and consulting parties regarding the dispute, and provide a copy of this written response. USFWS will then proceed according to its final decision.

2) Any ACHP comments provided in response to such a request will be taken into account in accordance with 36 CFR 800.7(c)(4).

3) If ACHP does not provide its advice regarding the dispute within thirty (30) days, USFWS may make a final decision and proceed accordingly. Prior to reaching a final decision, USFWS will prepare a written response that takes into account any timely comments regarding the dispute from the signatories and consulting parties to the PA and provide them and ACHP with a copy of the written response.

The responsibilities of USFWS to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

If at any time during the implementation of the measures stipulated in this PA an objection should be raised by the public, USFWS will notify the signatories to this PA and consult with the objecting party to seek resolution. If USFWS determines that the objection cannot be resolved, it will decide if the objection is of such magnitude to seek the advice or comment of ACHP (as described above).

E. Reporting

Should there be an interruption of activity associated with the construction and/or mitigation for any significant length of time, Fowler Ridge will provide to the signatories, at the minimum every six (6) months, a project status letter regarding the completion of work associated with the above stipulations.

IV. TERMS OF AGREEMENT

A. The term of this PA will be 22 years from the date of execution by the last signatory, unless the parties agree to extend its term. If its stipulations have not been carried out, and prior to work continuing on the proposed FRWF Phase IV project and/or mitigation, USFWS, SHPO or Fowler Ridge, as appropriate, will either (a) execute another agreement pursuant to 36 CFR 800.6, or (b) request, take into account, and respond to the comments of ACHP under 36 CFR 800.7.

B. Six (6) months prior to the PA's expiration date, USFWS will notify the other signatories of the impending expiration. USFWS, SHPO or Fowler Ridge as appropriate, may consult with the other signatories to reconsider the terms of the PA and amend it in

accordance with Stipulation V. USFWS, SHPO or Fowler Ridge as appropriate, will notify the parties as to the course to be pursued.

V. AMENDMENT

A. Any party to this PA may withdraw from it by providing thirty (30) days' notice to the other parties, provided that the parties will consult during the period prior to withdrawal to seek agreement on amendments or other actions that would avoid withdrawal.

B. Upon termination of the PA, and prior to work continuing, construction will cease on the proposed project and/or mitigation, until either (a) USFWS executes an agreement pursuant to 36 CFR 800.6, or (b) requests, takes into account, and responds to the comments of ACHP under 36 CFR 800.7. USFWS will notify the signatories and consulting parties as to the course of action it will pursue.

VI. NOTICES

Any notice permitted or required by this PA shall be in writing, delivered personally to the persons listed below, or shall be deemed given five (5) days after deposit in the United States Mail, certified and postage prepaid, return receipt requested and addressed as follows, or at such other address as any party may from time to time specify to the other party in writing. Notices may be delivered by facsimile or other electronic means, provided that they are also delivered personally or by certified mail, and such electronic notices shall thereafter be deemed effective upon receipt. Notices shall be transmitted so that they are received within the specified deadlines.

Fowler Ridge: Christina Calabrese, BP Wind Energy, 700 Louisiana St., 32nd Floor, Houston, TX 77002, Fax: (713) 354-2120, christina.calabrese@bp.com

USFWS: Forest Clark, Bloomington Field Office, 620 South Walker Street, Bloomington, IN 47403, 812-334-4273 (fax), forest_clark@fws.gov.

SHPO: Chad Slider, Asst. Dir. For Environmental Review, Indiana Department of Natural Resources, Div. of Historic Preservation & Archaeology, 402 W. Washington St., Rm W274, Indianapolis, Indiana 46204-2739, 317-232-0693 (fax), cslider@dnr.in.gov

EXECUTION of this PA by USFWS, SHPO, and Fowler Ridge, and implementation of its terms evidences that USFWS has taken into account the effects of this undertaking on historic properties and afforded ACHP a reasonable opportunity to comment.

Signatories

U.S. FISH AND WILDLIFE SERVICE

By_____ Date_____

Lynn M. Lewis, Assistant Regional Director, Ecological Services, Midwest Region

INDIANA STATE HISTORIC PRESERVATION OFFICE

By_____ Date_____

Chris Smith, Deputy Director, Indiana Department of Natural Resources

FOWLER RIDGE WIND FARM

By_____ Date_____

Larry Folks, Senior Vice President

Appendix H Noise Modeling

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

November 21, 2011
File: 193701296

Environmental Affairs Advisor
BP Wind Energy
700 Louisiana St., 33rd Floor
Houston, TX 77002

Attention: Daniel Barrera, Jr.

Dear Daniel:

Reference: Initial Noise Modeling Results, Fowler Ridge Wind Farm Phase IV

Stantec Consulting Ltd. was retained by BP Wind Energy to conduct predictive sound pressure level modelling on the proposed Fowler Ridge Wind Farm Phase IV. The Fowler Ridge Wind Farm Project currently consists of 355 wind turbines that were installed over three phases. Phase IV of the Project consists of the addition of ninety-three turbines. The modeling results presented in this letter are based on two scenarios. The first scenario considers the resulting impact during the operation of only Phase IV of the Project (93 turbines). The second scenario considers the combined impact of the operation of all four phases of the Project (478 turbines).

Predictive Noise Modeling Program and Methodology

There are numerous software packages available for the modeling of transmission of sound in the atmosphere. Some use proprietary algorithms, and some are based on published methods that have international recognition. Cadna (Computer Aided Noise Abatement, version 4.0), produced by Datakustik in Germany, is a software program that is based on the propagation models in ISO 9613. This ISO standard is in two parts. ISO 9613-1 is concerned with the attenuation of sound by the constituents of air. ISO 9613-2 incorporates the atmospheric absorption component into a framework that models the attenuation of sound by the geometric spreading of sound in the free atmosphere. Although Cadna contains other sound models, the ISO 9613 protocol is the one that is most commonly used for wind turbine studies, and is employed in this Study. To the best of our knowledge, Cadna is accepted by all regulatory agencies in North America.

This computerized model is capable of predicting sound levels at specified receiver positions originating from a variety of sound sources. Applicable national or international standards can also be included in its analysis, as described above.

CadnaA can also account for such factors as:

- Distance attenuation (*i.e.,* geometrical dispersion of sound with distance);
- Geometrical characteristics of the source and receivers;
- Atmospheric attenuation (*i.e.,* the rate of sound absorption by atmospheric gases in the air between sound sources and receptors);

- Ground attenuation (*i.e.,* effect of sound absorption by the ground as sound passes over various terrain and vegetation types between source and receptor);
- Screening effects of surrounding terrain; and
- Meteorological conditions and effects.

The application of the sound model requires a number of input variables. The most important variables are those that indicate the relative geometric position of the source and receiver. The source is taken to be the hub of the turbine, at the center of the disk swept by the rotation of the blades. The sound power is rated in decibels, dBA, where a decibel relates to the ratio of the sound power from the turbine to a constant in watts. Sound pressure levels, or sound levels, are also measured in decibels, dBA, but the sound pressure level is a ratio with respect to a sound level, not a power level. Unfortunately this can be confusing because the units look the same, but one is power, the other is sound level. The "A" in dBA refers to the weighting system used in the calculation. "A-weighting" reflects the normal human hearing sensitivities that are acute in the mid frequency, for example at 1000 Hz, but are much lower at high frequencies and low frequencies. This is taken into account by the standardized A-weighting.

The following table presents the sound pressure levels of common noise sources as an aid in interpretation of the model results.

Sound Source	Sound Pressure Level (dB)	Apparent Loudness
Painfully Loud	135	
Military Jet Take-off at 50'	130	256 times as loud
Thunder Clap, Chainsaw	120	128 times as loud
Car Horn at 4'	110	64 times as loud
Lawn Mower, Farm Tractor	100	32 times as loud
Motorcycle at 25'	90	16 times as loud
Freight Train at 50'	80	8 times as loud
Vacuum Cleaner	70	4 times as loud
City Bus at 30'	65	
Conversation in Restaurant, Noisy Office	60	Twice as loud
Conversation at Home, Quiet Suburb	50	Base Reference
Public Library	40	Half as loud
Soft Whisper at 15'	30	1/4th as loud
Leaves Rustling	20	1/8th as loud
Breathing	10	1/16th as loud
Median Threshold of Hearing	0	1/32 as loud

The second important point is the location of the receiver. Like the source, the receiver coordinates are input as an x, y, and z value. The x value is the "easting" horizontal coordinate and the y is the "northing" horizontal coordinate. The z value is the height above ground of the receiver. Between the source and the receiver, the sound energy spreads geometrically and the decrease is predictable through the principles of conservation of energy. In the real world, other factors also affect the attenuation, and the ISO 9613 methodology takes these into account.

Meteorological factors, such as temperature, humidity, wind speed and direction, influence sound propagation. The effects of wind on outdoor sound propagation during different weather conditions could cause variations in Project-related sound levels measured at a receptor. If the receptor is upwind of the facility, the wind could cause greater sound attenuation, and lower sound levels at the residence. However, if the residence is downwind of the facility, the opposite effect could occur, resulting in higher sound levels at the residence. Crosswinds have less effect on outdoor sound propagation. The ISO algorithms in Cadna were designed to reflect a situation where there is a modest wind direct from the source to the receiver; that is, the receiver is always downwind. Physically, it cannot happen that every wind turbine is upwind of every receiver at the same time; however, this is another instance where the conservative, worst-case assumption is made with the intention that any errors associated with assumptions are biased toward a higher sound output, and a more protective evaluation.

The following meteorological elements that represent low air absorption of sound are customarily used and were assumed for the sound assessment:

- Temperature = 10°C (50 °F);
- Relative humidity = 70 percent; and
- Wind conditions = variable.

These meteorological parameters can be considered typical of night-time conditions in the spring and summer (when outdoor activities are more likely) and representative of the sound effects during these seasons.

Factors such as terrain conditions, types of vegetation and ground cover can all affect the absorption that takes place when sound waves travel over land. For example, if the ground is moist or covered in fresh snow or vegetation, it will be absorptive and aid in sound attenuation. In contrast, if the ground is hard-packed or frozen, it will be reflective and will not aid in sound attenuation. Psychologically, trees and thick brush are beneficial in isolating the sound source and receiver; however, the actual degree of sound attenuation is limited. A thick growth of trees and brush about 100 feet deep will achieve a noise reduction of 3 to 4 dBA. If the vegetation is deciduous, the loss of the leaves means a loss in the attenuation properties, and the vegetation must be in the line of sight to achieve a reduction. Note also that some part of the sound energy will refract over the bush, just as it can refract over hills; therefore, doubling the depth of the forest will not necessarily double the reduction in sound transmission.

In countryside with substantial terrain relief, the height of the ground changes and the sound model uses a dense grid of terrain elevation values, typically at a spacing of 50 to 100 feet, to internally construct a digital terrain model. As the program executes, it is able to calculate absolute heights of the source and receiver from the data that the user provides, and from the digital terrain model of ground height. The model also uses the digital terrain model to determine if there is a clear line-of-sight from the source to the receiver, or whether topographic features interrupt this path and provide some screening effect on the sound transmission. Where there is a barrier effect due to topography, the model calculates the attenuation loss according to the standards of ISO 9613-2; typically, if present this attenuation will be of the order of 5 dBA.

Local terrain data, acquired from the US Geological Survey (1/3 arc second), were incorporated into this model.

Reference: Initial Noise Modeling Results, Fowler Ridge Wind Farm Phase IV

Summary of Model Assumptions/Inputs

In summary, the following conservative assumptions have been incorporated into the modeling for this development:

- Receiver height of 5 feet (1.5 m), which represents the height of the windows in a one-story home;
- Source height is equal to the hub height of the wind turbine generators (80 m);
- Local terrain effects;
- No intervening vegetation between the source and receptor;
- Ground absorption equal to 0.5;
- Receptor points are simultaneously located downwind of all turbines; and
- Sound Power Level of 105 dBA for Phase IV Turbines (GE 1.6-100) and octave band analysis using GE 1.6-82.5;
- Sound Power Level of 103.2 dBA for Phase 1 Turbines (V82) and octave band analysis for the V82;
- Sound Power Level of 107.9 for Phase II Turbines (C96) and octave band analysis for the C96; and
- Sound Power Level of 104 dBA for Phase III Turbines (GE 1.5 sle) and octave band analysis for the GE 1.5 sle.

Predictive Noise Modeling Results

The predictive sound pressure levels resulting from Phase IV of the Project alone, Phase's I, II and III and all four phases together are presented in the attached three figures. Generally, with the addition of Phase IV of the Project the sound pressure levels in Fowler, located to the south east of the Phase IV project boundaries, are (for the most part) unchanged (35 – 40 dBA). However, individual dwellings located within the Phase IV project bboundaries will experience sound levels greater than 40 dBA.

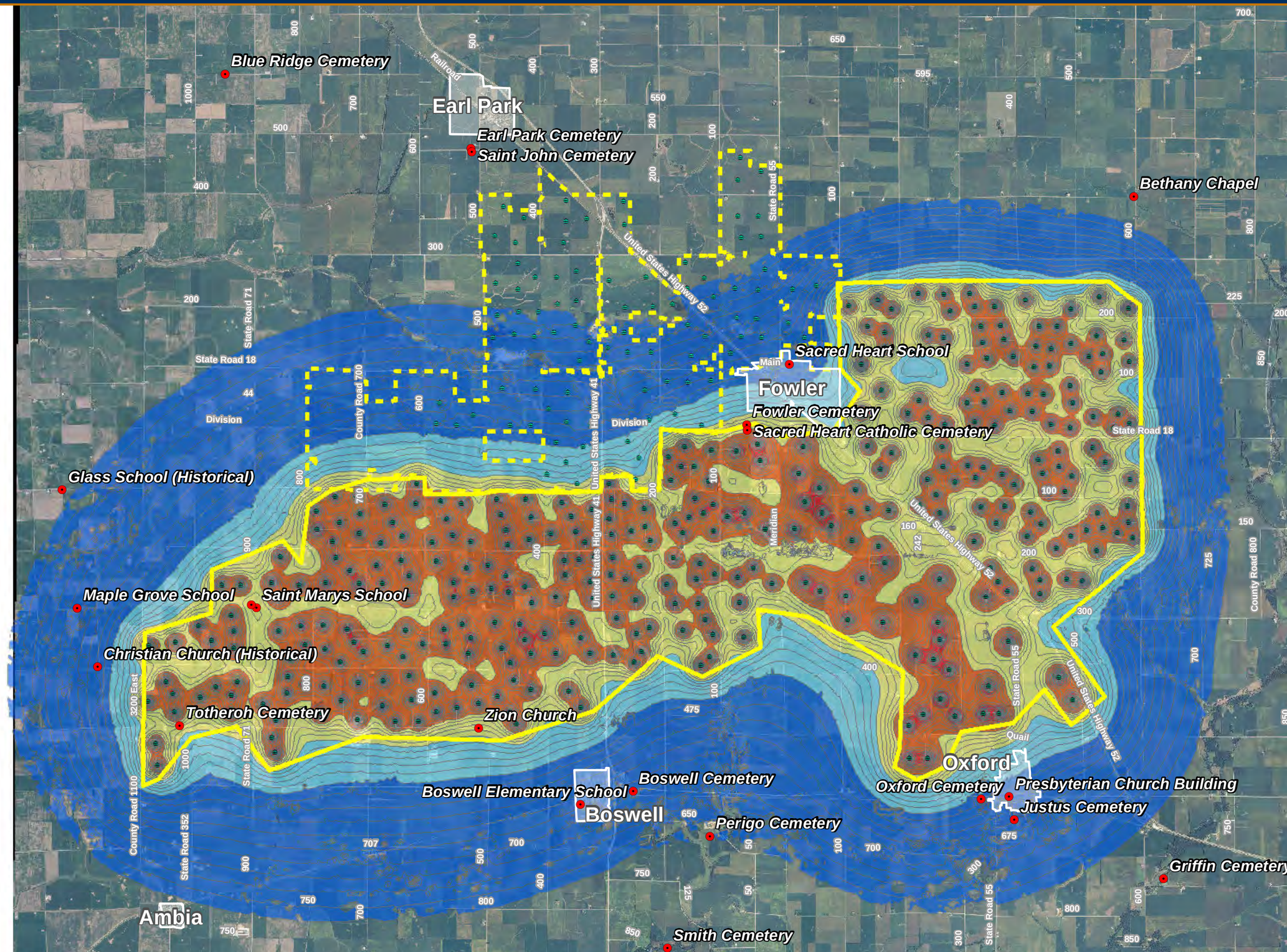
If you have any questions or concerns, or require further explanation please contact me via the information provided below.

Sincerely,

STANTEC CONSULTING LTD.

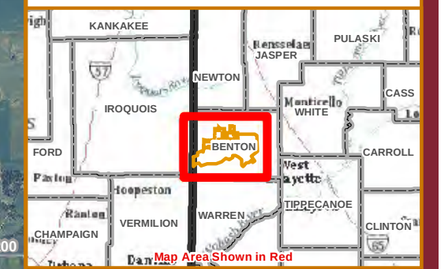
ORIGINAL SIGNED BY

John Walker, PhD
Senior Associate
Tel: (902) 468-0442
Fax: (902) 468-9009
John.Walker@stantec.com



Noise Studies

Phases I, II, III
Fowler Ridge Wind Project



Location

Benton County, IN

0 1 2 Miles

N

Project Information

Project Number : 193701150
Modified November 15, 2011

Legend

- Sensitive Receptors (schools, hospitals, cemeteries)
- Fowler Phases I, II, III Project Boundaries
- Fowler Phase I, II, III Turbines
- Fowler Phase IV Project Boundary
- Fowler Phase IV Microsite110801

Decibel Levels

- 50+ dBA
- 45 - 50
- 40 - 45
- 35 - 40
- < 35 dBA

Data Sources: IDNR, ILDNR, USGS, ESRI
Imagery: 2010 NAIP

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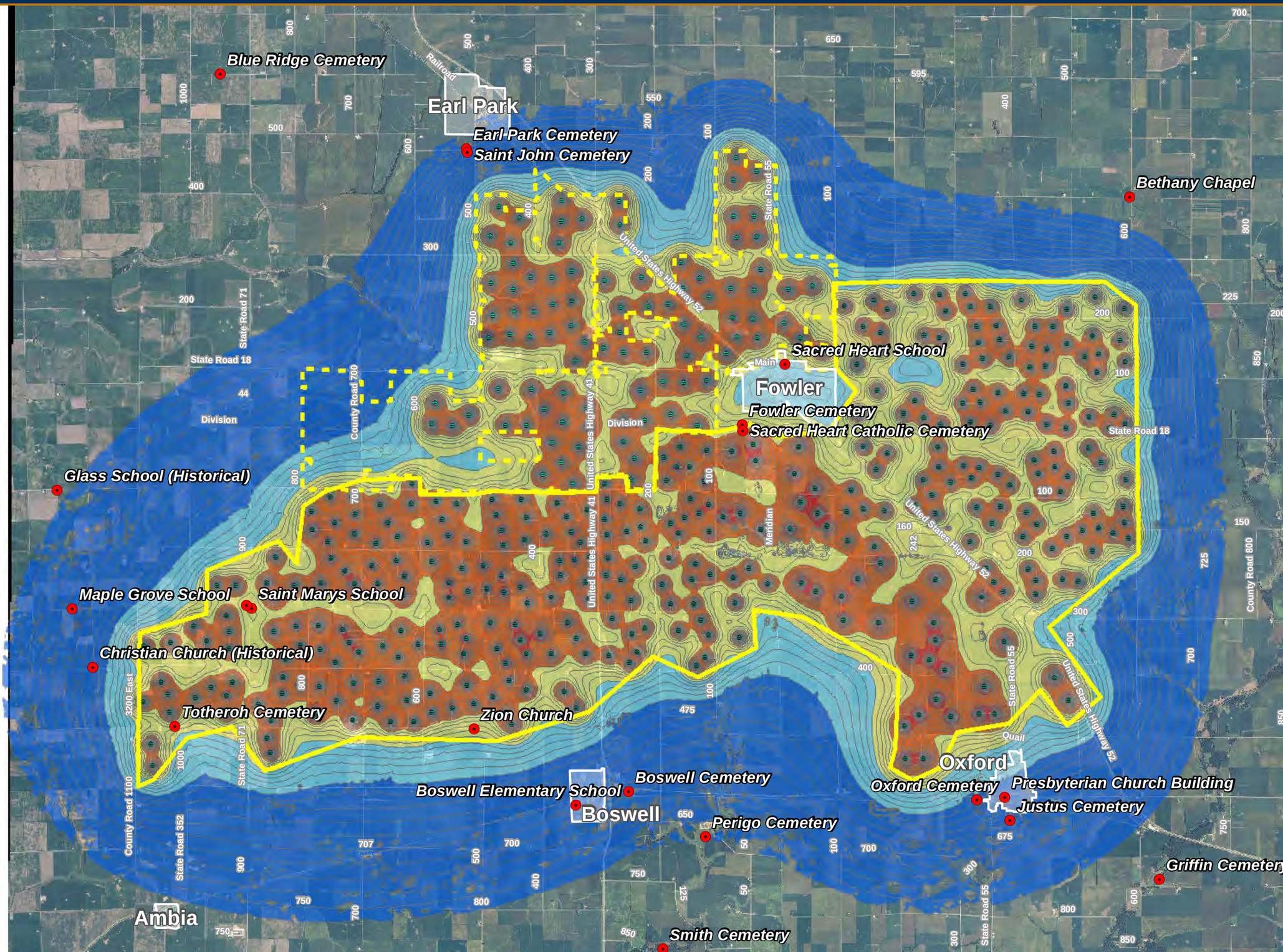
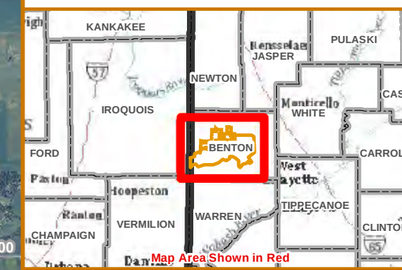
Noise Studies

Phases I, II, III, and IV
Fowler Ridge Wind Project





Location

Benton County, IN

0 1 2 Miles

N

Project Information

Project Number : 193701150
Modified November 15, 2011

Legend

- Sensitive Receptors (schools, hospitals, cemeteries)
- Fowler Phases I, II, III Project Boundaries
- Fowler Phase I, II, III Turbines
- Fowler Phase IV Project Boundary
- Fowler Phase IV Microsite110801

Decibel Levels

- 50 + dBA
- 45 - 50
- 40 - 45
- 35- 40
- < 35 dBA

Data Sources: IDNR, ILDNR, USGS, ESRI
Imagery: 2010 NAIP

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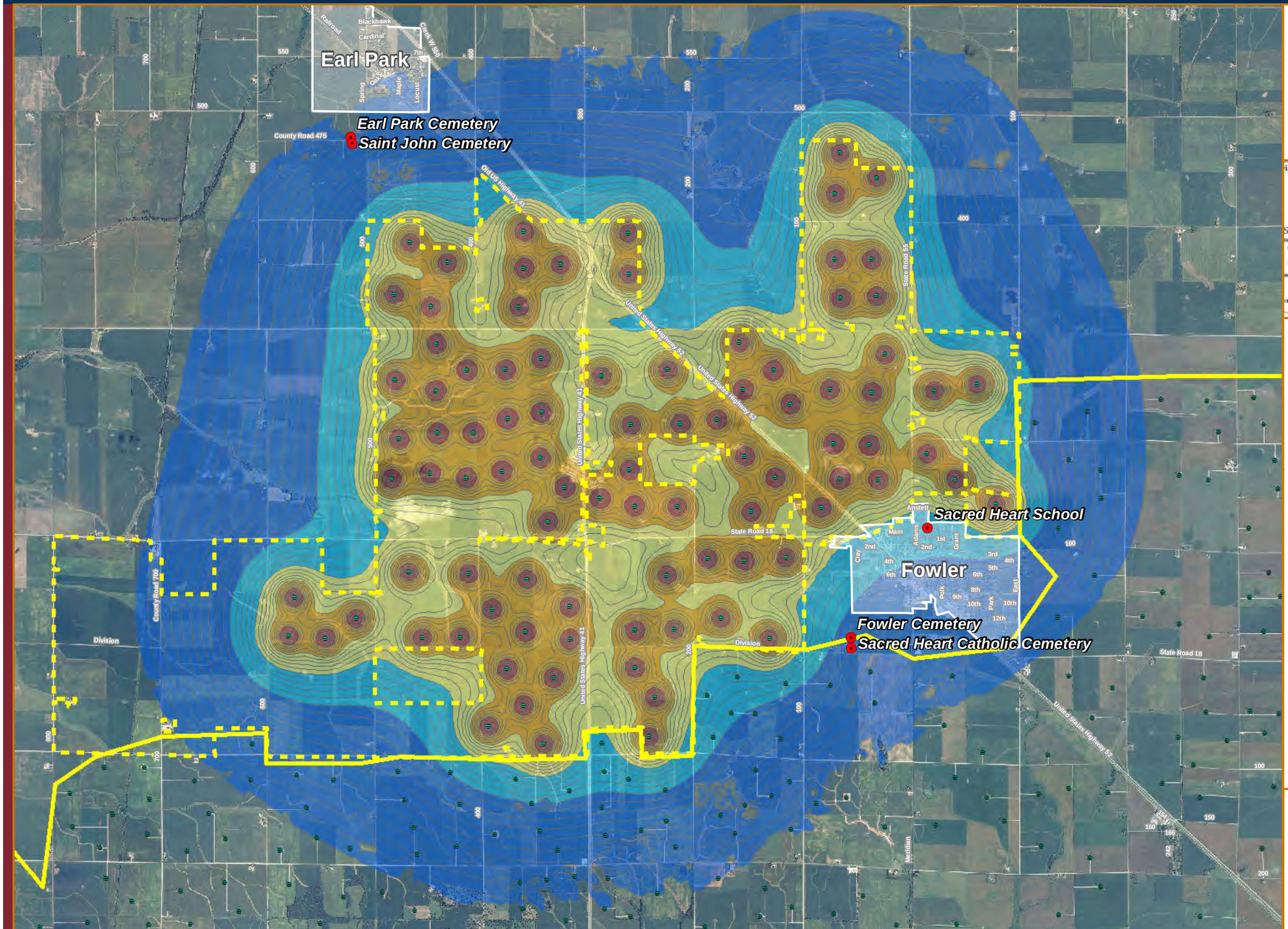
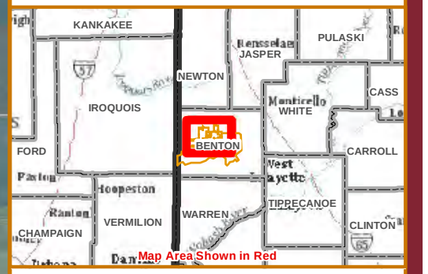
Phase I_II_III_Sound_Studies_update2011115.mxd A.Selk

Noise Studies

Phases IV
Fowler Ridge Wind Project





Location

Benton County, IN

0 2,000 4,000 Feet

N

Project Information

Project Number : 193701150
Modified November 15, 2011

Legend

- Sensitive Receptors (schools, hospitals, cemeteries)
- Fowler Phase IV Project Boundary
- Fowler Phase IV Microsite110801
- Fowler Phases I, II, III Project Boundaries
- Fowler Phase I, II, III Turbines

Decibel levels

- 50 + dBA
- 45 - 50
- 40 - 45
- 35 - 40
- < 35 dBA

Data Sources: IDNR, ILDNR, USGS, ESRI
Imagery: 2010 NAIP

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Phase_IV_Sound_Studies_updates20111115.mxd A.Selk

Appendix I Comments Received on the DEIS, DHCP and Responses

On April 4, 2013, the Service published a notice in the Federal Register stating the availability of and a request for comments on a Draft Environmental Impact Statement (DEIS) and Draft Habitat Conservation Plan (DHCP) as part of an application for an incidental take permit. The notice contained information on how to obtain the documents and how to submit a comment. The public comment period ended on June 4, 2013. The Service received comments through the Federal Rulemaking Portal at http://www.regulations.gov and via hard copy comments mailed in to the Public Comments Processing Center. All comments submitted electronically and in hardcopy were posted on http://www.regulations.gov. This appendix includes all comments received and the Service's responses to each.

This appendix is organized into two sections: Section 1 includes a table of the comments received and related information (commenter name, organization if applicable, the document ID number that was assigned on the Federal Rulemaking Portal docket, and itemized comment numbers and related comments). Section 1 is organized numerically according to the comment number. Section 2 includes copies of the individual comments, which were mailed in or submitted as a PDF document, arranged numerically by the Document ID number.

Provided below is a list of revisions to the DHCP that are now incorporated into the final HCP, including any changes in response to public comments. Specific responses to public comments and associated revisions are addressed in Section 1 of this Appendix.

- Updated date of document to "November 2013" on Title page and in header
- Added Appendix J to list of appendices on Page v
- Move list of appendices in Table of Contents on Page v
- Added sentence "The BBCS will be in effect through the life of the Project." on Page 5 of 167
- Changed permit term from 22 years to 21 years throughout the document. This change was necessary because the Draft HCP anticipated that the ITP would be issued in 2013; however, it is now anticipated that the permit would be issued in 2014
- Updated Table 1.1 to reflect updated permit term of 21 years on Page 7 of 167
- Updated Figure 1.2 on Page 8 of 167
- Revised phrase "At the end of the operating life of the Project (20 years)…" on Page 16 of 167
- Revised phrase "The Permittees anticipate that each Phase will operate for a minimum of 20 years, for a total permit term of 21 years for all phases of the Project covered by the ITP." on Page 16 of 167
- Deleted phrase "and subsequent monitoring of bat activity at the cave opening," from the statement "Specifically, covered mitigation activities include installation of a new bat gate at Wyandotte Cave, as well as protection, restoration, and monitoring of summer habitat for Indiana bats." on Page 17 of 167
- Added phrase "(predominantly males)" to the statement "In Kentucky, Gumbert et al. (2002) recorded 463 roost switches over 921 radio-tracking days of tagged Indiana bats (predominantly males) - an average of one switch every 2.21 days." on page 18 of 167
- Updated USFWS 2011a citation and Indiana bat population trends on Pages 23, 27, 28, 152, 153 of 167

- Deleted "and a church in Pennsylvania" on Page 24 of 167
- Added word “historic” to Figure 3.1 title. “Figure 3.1 Approximate historic range of the Indiana bat in the US.” on Page 24 of 167
- Added phrase “in spring” to statement “Chenger and Turner (J. Chenger, Bat Conservation Management [BCM], and G. Turner, PA Game Commission, pers. comm. 2011, as cited in USFWS 2011e) indicate that Indiana bats migrating in spring in the northeast closely follow topographic features, such as meandering stream corridors and utility ROWs for miles, and over multiple years.” on page 26 of 167
- Added phrase “or at least contemporaneously” to statement “Because female Indiana bats are likely cued into the same climatic or environmental stimuli during the spring and fall migration, there may be migratory pulses of Indiana bats moving through an area, and it is reasonable to assume that at least some individuals leave summer colonies together or at least contemporaneously (L. Pruitt, pers. comm. 2011; R. Reynolds, pers. comm. 2010; as cited in USFWS 2011e).” on Page 26 of 167
- Changed "Frick et al. 2010" to "Turner et al. 2011" on Page 28 of 167
- Changed WNS mortality rate to the average for Indiana bats from Turner et al. 2011 on Page 28 of 167
- Changed “a” to “five” in the statement “Caused by the fungus *Geomyces destructans*, WNS is estimated to have caused the deaths of over five million bats in the northeastern US, including Indiana bats (USFWS 2012d).” on Page 28 of 167
- Due to the decrease in the permit term, the overall expected level of take had to be adjusted from 193 to 184 throughout the document
- Revised phrase "This estimated level of take is approximately nine Indiana bats in Year 1 of the permit when only 355 turbines are operational, 11 Indiana bats per year during Years 2-17 when 449 turbines are operational, and two Indiana bats per year in Years 18-21 when only 94 turbines are operational.” on Page 29 of 167
- Revised phrase "The estimated reproductive capacity of females taken by the Project is 152 Indiana bats, resulting in a total estimated impact of 336 Indiana bats (see Chapter 4.2 for a discussion of the impact of the taking). Collectively, take from the FRWF and lost reproductive capacity of females represents the loss of approximately 16 Indiana bats per year over the 21-year ITP." on Page 30 of 167
- Added phrase “statistically significant” to statement “There was no statistical difference in fatality reductions at the two cut-in speeds, although the authors noted that the average wind speed at the site was between 5.0 and 6.5 m/s (wind speeds during which the two curtailment treatments were operationally distinct) only 10% of the study period, which may have explained in part why they found no statistically significant difference in bat fatalities between the two treatments (Arnett et al. 2010).” on Page 42 of 167
- Revised Table 4.7 to reflect 21-year permit term and revised take limit from 193 to 184 on Page 46 of 167
- Added phrase "during the fall migration period" to the statement "The only Project activity expected to result in Indiana bat take is operation of the wind facility during the fall migration period" on Page 46 of 167

- Added word "fall" to the statement " To facilitate responsiveness in management actions that will ensure that the 21-year take limit is not exceeded, this HCP includes annual fall monitoring and annual and within-year adaptive management take thresholds, which are described in detail in Chapter 5." on Page 46 of 167
- Changed "S. Pruitt, pers. comm." to "Appendix D" on Page 48 of 167
- Revised phrase "The Permittees estimate a total of 184 Indiana bats will be taken during the 21-year ITP term. Approximately 75% of the incidental take is expected to be attributed to females, for a total of 138 female Indiana bats taken over the operational life of the Project." on Page 49 of 167
- Revised phrase "Based on these assumptions, it is expected that the reproductive capacity of the 138 females that would be taken by the Project would have resulted in the production of an additional 152 bats by Year 21 of the Project. Thus, the total impact of the taking would be the loss of 336 Indiana bats (i.e., estimated take of 184 bats, plus the loss of 152 bats from the reproductive loss of taken female bats). Mitigation actions, therefore, will have a target increase of 336 Indiana bats, or 16 bats per year on average, to account for this lost reproductive capacity." on Page 49 of 167
- Deleted phrase "Implement a mitigation project that will protect and restore a minimum of 97 ha (240 ac) of summer habitat in blocks with a minimum size…" on Page 51 of 167
- Deleted phrase "It is expected that" from the statement "It is expected that turbines will begin operating under normal conditions when the 5- to 10-minute rolling average temperature drops below 10˚ C; raised cut-in speeds will be resumed if the 5- to 10-minute rolling average temperature goes above 10˚ C during the course of the night." on Page 53 of 167
- Revised phrase "Turbines will begin operating under normal conditions when the 5- to 10-minute rolling average temperature drops below 10˚ C; raised cut-in speeds will be resumed if the 5- to 10-minute rolling average temperature goes to 10˚ C or above during the course of the night" on Page 53 of 167
- Deleted phrase "It is expected that…" from the beginning of the statement "Turbines will begin operating under normal conditions when the 5- to 10-minute rolling average wind speed is above 5.0 m/s; turbines will be feathered again if the 5- to 10-minute rolling average wind speed goes below 5.0 m/s during the course of the night." on Page 53 of 167
- Revised temperature-bat activity numbers to reflect 10 degree C threshold on Page 55 of 167
- Changed temperature to reflect new threshold, i.e. old temperature was 15.5° C (60° F) and new temperature is 10° C (50° F) on Pages 53 and 55 of 167
- Added word "average" and changed temperature threshold in statement "However, if greater than 10% of documented fatalities occur on nights when average temperature is below 10˚ C in any given year, as determined through analysis of mortality data at the conclusion of the fall monitoring period, then turbine operational adjustments (i.e., turbines feathered up to a cut-in speed of 5.0 m/s) will be resumed for the entire night during the fall, regardless of temperature, in future years." on Page 55 of 167

- Added word “Indiana” to statement “The Permittees will: 1) preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County, Indiana;…” on Page 56 of 167
- Revised phrase" The actual take over the life of the permit at the FRWF is estimated at 184 Indiana bats and the estimated impact of that taking is 336 Indiana bats. Mitigation measures will be designed and implemented to compensate for this level of impact. Summer habitat mitigation is expected to compensate for 34% of the estimated impact of take (114 bats) and winter habitat mitigation is expected to compensate for 66% of the estimated impact of take (222 bats).” on Page 56 of 167
- Revised phrase "According to this formula, 73 ha (114/39 =2.9, rounded up to 3, multiplied by 24.2 ha = 72.6 ha) of summer habitat need to be protected and restored to compensate for the take of 114 bats.” on Page 57 of 167
- Added phrase "However, the Permittees will protect and restore an additional 24.2 ha of summer habitat to provide additional conservation benefits to Indiana bats. Therefore, a total of 97 ha of summer habitat will be protected and restored." on Page 57 of 167
- Revised phrase "The Permittees may have the option to contribute to the mitigation bank at a level sufficient to offset the impacts of taking 114 Indiana bats. A mitigation bank would only be considered if all of the following conditions are true: 1) the mitigation bank is established prior to when summer habitat mitigation is needed; 2) use of the mitigation bank has been approved by USFWS; 3) the mitigation bank includes lands within Indiana, unless otherwise approved by the USFWS; and 4) the mitigation bank has established a ratio of Indiana bat habitat required to offset the impact of 114 Indiana bats, and such ratio is approved by the USFWS BFO. If the mitigation bank has not established such a relationship, the Permittees and the USFWS may agree upon a number of acres within the mitigation bank that could be used to offset the take of 114 Indiana bats." on Page 59 of 167
- Added phrase “one of” to statement “Wyandotte Cave is currently one of the largest known Indiana bat hibernaculum, with an estimated population of 61,618 bats in 2011 (L. Pruitt, pers. comm.).” on Page 59 of 167
- Removed statement “The current gate at Wyandotte Cave will be removed prior to installing the new gate.” on Page 60 of 167
- Added phrase “outside of” to statement “The portion of the cave outside of where the current gate sits has a thermal profile that is suitable for hibernating Indiana bats (although temperatures are probably more variable than those further inside the cave) and has been used by several thousand Indiana bats over the last decade (S. Pruitt, pers. comm.).” on Page 60 of 167
- Removed phrase “Removal of the old gate and” from the statement “Installation of the new gate will occur between May 15 and July 31, 2013.” on Page 60 of 167
- Removed phrase “and conducted by Karst Solutions (Jerry Grant),” from statement “Cave gating will be planned and coordinated by Bat Conservation International (BCI),

with general oversight and project management performed by BCI in cooperation with O'Bannon Woods State Park (OWSP) and the IDNR." on Page 60 of 167

- Added word "current" to statement "To prevent the spread of *Geomyces destructans*, the current USFWS decontamination protocol will be followed during gate construction (USFWS 2012f)." on Page 60 of 167
- Revised phrase "Two years of intensive monitoring will be conducted that will add to the four years of research monitoring that was conducted during 2010, 2011, 2012, and 2013." on Page 63 of 167
- Revised phrase "Similar to the 2010 and 2011 monitoring, the 2012 and 2013 monitoring efforts, developed in coordination with and approved by the USFWS, was also conducted under a 10(a)(1)(A) research permit (Permit # TE73598A-0). In 2012, the majority of the facility (346 out of 355 turbines) was operating with the same operational and monitoring protocols that would have been implemented if the HCP were in place; turbines were feathered under a cut-in speed of 5.0 m/s and fatality monitoring conducted at 118 turbines followed the methods for Evaluation Phase monitoring described in this chapter. In 2013, 352 out of 355 turbines operated with the same operational and monitoring protocols that would have been implemented if the HCP were in place. Additional research was conducted in 2012 and 2013 at the FRWF at the other nine and three turbines respectively, to test if facilities operation management strategies were effective at reducing *Myotis sodalis* and other bat fatalities at wind farms." on Page 63 of 167
- Revised phrase "It is expected that the Evaluation Phase, along with the five years of mortality monitoring conducted from 2009-2013, will provide sufficient information to accurately assess the level of risk to Indiana bats by confirming the effectiveness of the operational curtailment." on Page 63 of 167
- Revised Table 5.2 to be consistent with new permit term of 21 years on Page 65 of 167
- Added "Bats not used for searcher efficiency and carcass removal trials may be provided to researchers if permissible within the conditions of the state salvage permit" on Page 67 of 167
- Added phrase "bats/turbine" to statement "The estimates were 24.17 bats/turbine (90% CI 19.50 – 30.02) for the cleared plots and 20.96 bats/turbine (90% CI 17.52 – 28.78) for road and pad searches." on Page 69 of 167
- Revised Table 5.5 on Page 76 of 167 to reflect delay of Year 1 of the ITP and to be consistent with Table 1.1
- Added phrase "(i.e. turbines that remain feathered below a cut-in speed of 5.0 m/s)" to statement "A set of control turbines (i.e. turbines that remain feathered below a cut-in speed of 5.0 m/s) will be used to determine whether or not the adaptive management trigger was reached at the end of the monitoring period." on Page 76 of 167
- Revised phrase " This is based on Monte Carlo simulations that showed that over 1,000 21-year periods using the adaptive management strategy described below, the mean number of Indiana bat fatalities was 170, with a corresponding 90% CI of 157 to 183 fatalities, assuming a conservative 50% reduction in fatality when feathering blades

below a 5.0 m/s cut-in speed. Given that a 57% (90% CI = 39% - 70%) reduction in bat fatality was achieved by feathering blades below a 4.5 m/s cut-in speed in the 2011 FRWF study, a more realistic reduction in bat mortality of 60% by feathering blades below 5.0 m/s was also simulated. Using the same simulation methods (i.e., 1,000 21-year periods that assumed the adaptive management described herein), an average of 144 Indiana bat fatalities over a 21 year period with a 90% CI of 129 to 160 total Indiana bat fatalities could occur, assuming a 60% reduction in all bat mortality when blades are feathered below 5.0 m/s." on Page 77 of 167

- Revised Table 5.7 on Page 79 of 167 to reflect delay of Year 1 of the ITP and to be consistent with Table 1.1
- Added footnote to Table 5.7 "*Hypothetical, based on 2010 bias correction results; actual within-season thresholds will be based on previous year's bias correction results." on Page 81 of 167
- Revised phrase: "One thousand 21-year periods were simulated based on the adaptive management strategies described above. Assuming a conservative 50% reduction in fatality when blades are feathered below a 5.0 m/s cut-in speed, the mean number of Indiana bat fatalities was 170, with a corresponding 90% CI of 157 to 183 fatalities from estimated 5th and 95th percentiles of simulated results. A 60% reduction in all bat mortality when blades are feathered below 5.0 m/s resulted in an average of 144 Indiana bat fatalities over a 22 year period with a 90% CI of 129 to 160 total Indiana bats (Table 5.8; Figure 5.2)." on Page 82 of 167
- Table 5.8 revised to be consistent with the 21-year permit term on Page 82 of 167
- Revised Figure 5.2 to reflect revised take limit on Page 83 of 167
- Changed phrase "during two critical periods: 1) fall migration, and 2) fall swarming" to "during fall migration/swarming" in statement "…the entrance of the cave will be monitored with night-vision equipment during fall migration/swarming." on Page 84 of 167
- Add statement "Thermal cameras will be placed in the cave and will record bat behavior throughout the night." on Page 84 of 167
- Changed phrase "two full" to "multiple" and changed word "each" to "this" in statement "The cave entrance will be monitored for multiple nights during this critical period." on Page 84 of 167
- Combined sentences "During monitoring, exit counts will be conducted for the first two hours after sunset and flight behavior will be observed for the entire night." and "The timing, frequency and duration of abnormal flight behaviors during egress and ingress (e.g., bats landing on the cave gate or crawling, rather than flying, through the gate) will be recorded using night vision video equipment." to read "During monitoring, the timing, frequency and duration of abnormal flight behaviors during egress and ingress (e.g., bats landing on the cave gate or crawling, rather than flying, through the gate) will be recorded." on Page 85 of 167
- Deleted the statement "All personnel involved in this monitoring must first be approved by the IDNR and the USFWS." on Page 85 of 167

- Added the statement “This work will be conducted by the IDNR, in cooperation with the USFWS.” on Page 85 of 167
- Added word “unauthorized” to statement “The IDNR will ensure the gate is in place and no unauthorized human visitation will be permitted during the winter for the life of the permit (Appendix I).” on Page 85 of 167
- Revised phrase in title of Table 5.9 "To mitigate for the take of Indiana bats, the summer mitigation project will be implemented at least five years prior to the first season summer habitat will be required (approximately Year 10 in the ITP term).” on Page 87 of 167
- Added phrase “by FRWF” to statement “The Surety will be made payable to the independent consultant selected by FRWF, and approved by USFWS, to conduct the monitoring.” on Page 92 of 167
- Deleted phrase “and monitoring activities” from statement “The Permittees have received cost estimates for the cave gating required for the winter habitat mitigation…” on Page 92 of 167
- Deleted the statements “…monitoring the cave entrance during the fall migration and swarming periods during the first year following gate installation to ensure that the newly installed gate is not negatively affecting the flight behavior of bats; and reporting in any year in which a mitigation action or monitoring occurs (see Table 6.2 for funding timing). Costs were estimated based on 2012 costs and increased by 2.9% annually to account for estimated inflation.” on Pages 92 and 98 of 167
- Revised Table 6.1 to reflect delay of Year 1 and 21-year permit term on Page 93 of 167
- Deleted “Wyandotte Cave Entrance Monitoring & Reporting” and associated information from Table 6.1 on Page 94 of 167
- Adjusted the “Winter Mitigation Subtotal” to $48,399 on Page 94 of 167
- Adjusted the “Total HCP Costs” to $4,922,180 on Page 97 of 167
- Deleted phrase “and monitoring” from statement “Funding for winter habitat mitigation will be guaranteed by increasing the cash of the Surety…” on Page 98 of 167
- Deleted “Cave Entrance Monitoring & Reporting” and associated information from Table 6.2 on Page 99 of 167
- Revised Table 6.2 to reflect delay of Year 1 and 21-year permit term on Page 99 of 167
- Revised phrase "The cost estimate for funds placed in the Surety for changed circumstances is based on acquisition of 46.8 ha in Year 10 (at an estimated cost of $8,649/ha [$3,500/ac]) in 2013 (and adjusted for inflation at 2.9% per year –total of $558,989) and restoration and maintenance in subsequent years ($723,765 – see Table 6.1 for breakdown of costs for restoration and maintenance), for a total changed circumstance Surety of $1,331,153." on Page 101 of 167
- Revised phrase "Consequently, this equals a total contingency base of $1,352,449; 5% of which equals $67,622.” on Page 102 of 167
- Revised Table 6.3 to reflect delay of Year 1 and 21-year permit term on Page 102 of 167
- Added word “completely” to statement “Completely curtailing the WTGs during night time hours of the fall migration season reduces annual availability by approximately 9%,

which has potential contractual consequences that would result in the project not being economically viable." on Page 103 of 167

- Added reference to Appendix J on Page 104 of 167
- Added phrase: "Take compliance will be determined by tallying the annual estimated Indiana bat fatality rates to derive a cumulative take that occurred over the 21-year operational life of the Project. If the within-season adaptive management trigger is reached in a given year, annual take for that year that will count towards the life of Project total will be based on both control and non-control turbines (i.e., those that were subject to increased cut-in speeds). Note that this is different than the fatality rate based on only the 20 control turbines that will be used to determine whether or not the end of season adaptive management trigger has been reached (i.e., the 95th percentile has been exceeded and cut-in speeds of all turbines need to be increased by 0.5 m/s in the subsequent year). In other words, the fatality rate based on control and non-control turbines will be used to determine actual take that has occurred in a given year, but only the 20 control turbines will be used as the basis for adaptive management decisions during years when the within season adaptive management trigger has been reached." on Page 106 of 167
- Revised paragraph "Winter habitat mitigation will offset the impacts of 66% of the total estimated take from the Project. Sixty-six percent of the 21-year permit term equates to approximately 14 years, whereas summer habitat mitigation will account for the remaining 34% of the take, which equates to approximately seven years of the 21-year permit term." on Page 106 of 167
- Removed *Myotis velifer* from list of bat species affected by WNS on Page 123 of 167
- Revised WNS population declines to reflect Turner et al. 2011 results on Page 123 of 167
- Changed phrase "have tissue" to "be" in statement "For this changed circumstance to be triggered, the following three conditions must occur: 1) Indiana bats from the hibernaculum must be infected by *Geomyces destructans* confirmed by genetic testing,…" on Page 125 of 167
- Added Turner et al. 2011 to Lit Cited on Page 152 of 167
- Added Appendix J to end of Appendices

Appendix I, Section 1: Comments received on DEIS and DHCP with responses. Comments all include the federal document ID number which was assigned via the online portal, and comments with this number in bold indicate that the PDF of the full/written comment is included in section 2 of this appendix; otherwise the comment was received electronically and is listed in full in this table.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
1	Longo, Carissa	The best for bats would be to shut down the turbines during prime bat season, but if the turbines could be feathered this would be an appropriate compromise. They should be feathered till wind speed reaches 6 m/s. This will also protect songbirds and raptors. (FWS-R3-ES-2013-0032-0005)	There is data to support that shutting the turbines off during "prime bat season", which the Service in this case interprets as the fall migration period, would reduce impacts to bats. Shutting the turbines off entirely (day and night) would likely result in additional protection for diurnal raptors (there have been documented fatalities of raptors during the fall) and could over the long-term result in some additional protection for song birds, which with the exception of the few birds that use the agricultural habitat at FRWF, are most often killed during episodic events of inclement weather. The applicant, however, is not required to completely eliminate take of HCP covered species nor to completely eliminate risk to other species (e.g., non-listed bats, raptors and song birds) The applicant has developed and has committed to implement a bird and bat conservation strategy (BBCS) (final EIS Appendix D). The applicant has also proposed a conservation strategy (avoidance, minimization, and mitigation) that the Service has preliminarily determined meets the maximum extent practicable (MEP) standard relative to Indiana bats, the only species covered by the HCP (see response to Comment 29 for a discussion of MEP). This will require the applicant to feather the turbines up to a cut-in speed of 5.0 m/s at night during the fall migration season for Indiana bats. Based upon monitoring studies conducted at the Fowler Ridge Wind Farm in 2011, it is reasonable to assume that a cut-in speed of 5.0 m/s, feathered, would result in a mortality reduction between 57% and 73%. It is unknown what additional reduction in take might be achieved by implementing a 6.0 m/s rather than a 5.0 m/s cut-in speed. This statistical analysis was not conducted because an independent analysis by the FWS indicated financial and contractual reasons why cut-in speeds higher than 5.0 m/s are not practicable for the applicant.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
2	Pennycoff, Darrell	There are bats throughout Indiana but wind energy companies downplay the existence of the endangered Indiana bats. I know for a fact the wind energy companies, JUWI and E-on, are developing wind farms in Tipton and Howard Counties with little regard for the endangered Indiana bat. Their local officials, Mr. Heck and Mr. Andy Melka, say they haven't found any Indiana bats in these counties. But, they'll submit kill counts to the appropriate agencies. Indiana bats are found in this area per Northwestern High School, Howard Co., Indiana. Their 325 ft tall turbine is programmed at night to operate only if wind speed is 11 mph because the bats are fragile flyers. JUWI and E-on don't alter their 500 ft tall turbines to save the Indiana bats! The reckless disregard for an endangered species is very sad. (FWS-R3-ES-2013-0032-0006)	Thank you for your comment.
3	Weth, Ray	I agree with your plan and see no reason why it will not work. We need to take care of our environment. **(FWS-R3-ES-2013-0032-0007)**	Thank you for your comment.
4	Davis, Elinor	I am in favor of allowing BP Wind Energy to proceed with their plans with the Fowler Ridge Wind Farms in Indiana. (FWS-R3-ES-2013-0032)	Thank you for your comment.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
5	Wealing, Dean and Beverly	In 2007 we signed an agreement with Fowler Ridge Wind Farm, Benton County, Indiana, to have 2 windmills placed on our farm. Because of a thesis written by someone at Purdue University, Lafayette, Indiana, the whole project was halted to examine the flight of the Golden Plover. We have waited patiently to receive the windmills and do not believe that birds or bats are environmentally affected by a windmill. If bats can sense insects, in flight, and are able to feed and birds can travel across fields, roads, and around buildings and survive, we do not believe that the windmills are detrimental to either species. Let Fowler Ridge Wind Farm finish the project. (FWS-R3-ES-2013-0032-0010)	Thank you for your comment.
6	Kirsch, Linda	As a landowner, I endorse BP Wind Energy's effort to get the Incidental Take Permit. (FWS-R3-ES-2013-0032-0011)	Thank you for your comment.
7	Record, Charles	We, as land owners of the Fowler Wind farms, support the application by BP Wind Energy for an Incidental Take Permit. The population growth will need more energy in the coming years and what better clean energy can be produced than wind. (FWS-R3-ES-2013-0032-0012)	Thank you for your comment.
8	Benham, Rebecca	As a landowner, I endorse BP Wind Energy to be granted the Incidental Take Permit. (FWS-R3-ES-2013-0013)	Thank you for your comment.
9	Wetli, Don and Sally	We support the the BP Wind Energy Incidental take Permit application as landowners. (FWS-R3-ES-2013-0014)	Thank you for your comment.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
10	Puetz, Kevin (Fowler Pest Control, Inc)	We believe you should grant an Incidental Take Permit in this case as we have found minimal wildlife impact in our area. (FWS-R3-ES-2013-0015)	Thank you for your comment.
11	Puetz, Alma (American Turf)	I believe the impact, made by the wind turbines, to the wildlife in our area is minimal. Therefore, I believe you should grant an Incidental Take Permit in this case. (FWS-R3-ES-2013-0016)	Thank you for your comment.
12	Mullett, Kristie	There is no way to know at this time how White Nose Syndrome will affect the Indiana Bat population other than to know the endangered Indiana bat population is severely declining due to the fungus causing WNS, and is not expected to recover anytime soon if at all. Therefore,any incidental take should not be permissible. The incidental take permit should be declined in order to assure the Fowler Ridge Wind Farm stays focused on protecting the Indiana Bat. (FWS-R3-ES-2013-0017)	The Service recognizes the severe threat posed by WNS. In certain populations (in the Northeast Recovery Unit) impacts to Indiana bats have been significant. WNS has now been documented in the Midwest Recovery Unit (MRU) for four years with some impacts to Indiana bats, but not large scale declines. The Service's biological opinion (under Section 7 of the ESA) will determine whether the level of take FRWF is requesting would appreciably reduce the survival or recovery of the Indiana bat in the wild (cause jeopardy). Provided the biological opinion does not determine jeopardy and provided the Service issues an incidental take permit to FRWF, the HCP has a Changed Circumstances section (see Section 8.4.6) focused on WNS. This will help insure that if WNS begins to have a greater effect on Indiana bats in the MRU, the HCP can adapt to those changes. Finally, issuance of an ITP does not preclude the Service from re-initiating consultation should impacts from WNS necessitate that step.
13	Mullett, Kristie	Any fines allowable by law should be assessed for each bat killed. (FWS-R3-ES-2013-0017)	If the Service issues an incidental take permit to FRWF, bats that are killed within the limits of that permit are considered to be taken legally incidental to the operation of the facility. The permitted level is carefully evaluated by the Service during the review of the HCP, the Service's EIS, and in the Service's Section 7 consultation on the federal action of issuing the permit (biological opinion). In addition, the adaptive management component of the HCP has specific triggers and responses designed to preclude FRWF from exceeding the permitted take. Indiana bats killed legally (i.e., within permitted levels) will be mitigated as described in the HCP (see response to Comment 14). If the take limit is exceeded, the Service has recourse to various options including revocation of the permit.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
14	Mullett, Kristie	[M]ore stringent incidental take mitigation plans should be required for each 1% decline in the Indiana Bat population to prudently protect the species as it continues to decline in the state from whatever cause. (FWS-R3-ES-2013-0017)	The HCP outlines the steps that FRWF will take to mitigate the impact of the taking (See Section 5.3). The Service must determine that the mitigation fully compensates for the impact of the taking prior to issuing a permit to FRWF. This "impact of the taking" takes into consideration, for example, the effect on the Indiana bat population of killing female bats. In addition, the adaptive management and changed circumstances sections of the HCP address a variety of circumstances that have the potential to affect the HCP over the life of the permit.
15	Mullett, Kristie	We also do not want the Fowler Ridge Wind Farm to set precedent for other wind farms to permit incidental kills of the Indiana Bat. (FWS-R3-ES-2013-0017)	Thank you for your comment. The purpose of Section 10 (a) (1) (b) is to authorize incidental take of listed species.
16	Mullett, Kristie	Shut down all turbines from August 1 to Oct 15 from sunset to sunrise. (FWS-R3-ES-2013-0017)	See response to Comment 1 (and 29) for an explanation of why the HCP does not propose to shut turbines down.
17	Pennycoff, Darrell	I am opposed to the conditional approval for bat killing especially of our endangered Indiana bat. The wind farms are creating a slaughter house which will annihilate birds of prey and bats. The best for bats would be to shut down the turbines from dusk to dawn during prime bat season between July 1 and October 1. (FWS-R3-ES-2013-0018)	See response to Comment 1 (and 29) for an explanation of why the HCP does not propose to shut turbines down. In addition, the best available scientific information indicates that the beginning of the risk period during fall migration for Indiana bats is August 1 not July 1.
18	Watson, Lori	Stop the wind turbines. (FWS-R3-ES-2013-0019)	Thank you for your comment.
19	Garr, Jane	I am asking you to implement the "no-action" alternative for Fowler Ridge. (FWS-R3-ES-2013-0020)	Thank you for your comment. The Service has not made a decision at this point whether an ITP will be issued or if so, for which alternative.
20	Webb, Sherry	US fish and wildlife to implement the No Action alternative for Fowler Ridge. (FWS-R3-ES-2013-0021)	See response to Comment 19.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
21	Sondgeroth, Justin J.	It is unfathomable to think a project of this magnitude delivering clean energy to over 220,000 homes could be vulnerable to any type restriction or temporary limited operation. . . . Let us utilize the clean energy producing qualities of this project and encourage them to develop more facilities of this nature being mindful and considerate of the environment and its inhabitants as they are and were with the Fowler Ridge projects. **(FWS-R3-ES-2013-0022)**	Thank you for your comment.
22	Smith, Norman K.	As a landowner in the BP Fowler Ridge Wind Farms, Indiana, I support BP's efforts and conservation plans. I think they are doing good- and I support their effort for a Incidental Take Permit, and I think it should be granted. **(FWS-R3-ES-2013-0023)**	Thank you for your comment.
23	Ellis, Marcia	To protect the bats- please turn the turbines off. **(FWS-R3-ES-2013-0024)**	See response to Comment 1 (and 29) for an explanation of why the HCP does not propose to shut turbines down.
24	Aprill, Grace	Please shut down turbines from July 1 thru Oct 15 from dusk to dawn to protect the endangered Indiana bat. (FWS-R3-ES-2013-0025)	See response to Comment 1 (and 29) for an explanation of why the HCP does not propose to shut turbines down. In addition, the best available scientific information indicates that the beginning of the risk period during fall migration for Indiana bats is August 1 not July 1.
25	Anonymous	Shut the turbines down from July 1 thru Oct 15 from dusk to dawn. (FWS-R3-ES-2013-0026)	See response to Comment 1 (and 29) for an explanation of why the HCP does not propose to shut turbines down. In addition, the best available scientific information indicates that the beginning of the risk period during fall migration for Indiana bats is August 1 not July 1.
26	Hyman, Jeffrey B. (Conservation Law Center [CLC])	The DHCP's proposed alternative does not minimize take of Indiana bats because the DEIS demonstrates that according to the best available science, the 6.5 m/s cut-in speed alternative can reduce take of Indiana bats significantly more than the proposed cut-in speed of 5.0 m/s. **(FWS-R3-ES-2013-0027)**	The Service does not agree that the proposed cut-in speed of 5.0 m/s with feathering does not minimize take (see response to Comment 29 for a more thorough discussion of this issue in relation to MEP). Furthermore, the DEIS demonstrates that a 6.5 m/s cut-in speed can reduce take of ALL BATS significantly more than the proposed cut-in speed of 5.0 m/s. Your comment provides no support for the statement that a 6.5 m/s cut-in speed can reduce take of Indiana bats *significantly* more than the proposed cut-in speed of 5.0 m/s. Thus, the FWS can neither concur with nor dispute the comment.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
27	Hyman, Jeffrey B. (CLC)	[T]he Applicant's proposed measures outlined in the DHCP are likely to not meet the § 1539(a)(2)(B)(ii) minimization requirement. **(FWS-R3-ES-2013-0027)**	Thank you for your comment, however, the Service disagrees and believes that the HCP meets the minimization standard. See response to Comment 29.
28	Hyman, Jeffrey B. (CLC)	The DEIS, which presumably reflects the best available science, predicts that a cut-in speed of 6.5 m/s (Alternative 3) will reduce Indiana bat fatalities to less than half of what the fatalities would be with a cut-in speed of 5.0 m/s. . . . the best available science as reflected in the DEIS and the studies of cut-in speed at Fowler Ridge shows that the DHCP's proposed operational alternative does not minimize the take of Indiana bats when compared to the DEIS's Alternative 3. **(FWS-R3-ES-2013-0027)**	See response to Comment 26.
29	Hyman, Jeffrey B. (CLC)	According to Gerber v. Norton, to approve the Applicant's proposed 5.0 m/s cut-in speed and still satisfy the ITP minimization requirement, the FWS must find, based on substantial evidence in the record, that higher cut-in speeds causing significant further reduction in take are "impracticable." **(FWS-R3-ES-2013-0027)**	The Service Habitat Conservation Planning (HCP) Handbook states that "The applicant will, to the maximum extent practicable (MEP), minimize and mitigate the impacts of such taking." and that "This finding typically requires consideration of two factors: adequacy of the minimization and mitigation program, and whether it is the maximum that can be practically implemented by the applicant". The HCP Handbook further states "To the extent maximum that the minimization and mitigation program can be demonstrated to provide substantial benefits to the species, less emphasis can be placed on the second factor". The HCP and EIS both provide irrefutable evidence that the proposed feathering of the turbines and implementation of a 5.0 m/s cut-in speed minimizes take of Indiana bats compared to the an un-feathered cut-in speed of 3.5 m/s, which represents the manufacturer's specified cut-in speed, and the speed at which FRWF would operate the turbines were an HCP and ITP not required. The Conservation Law Center (CLC) comments appear to define minimize as reduction to the lowest possible amount. The HCP Handbook employs a definition synonymous with "to lessen" (see the first definition under "minimize" in the Merriam Webster On-line Dictionary (http://www.merriam-webster.com/dictionary/minimize, accessed 06-21-13) "1: to reduce or keep to a minimum". Implementing a 5.0 m/s cut-in speed is estimated to reduce take of Indiana bats by more than 50% based on data collected over a number of years of actual turbine operation at FRWF. The Service maintains that a minimum 50% reduction meets the definition of substantial. Merriam Webster On-line Dictionary (http://www.merriam-webster.com/dictionary/minimize, accessed 06-21-13) "3 b: considerable in quantity: significantly great <earned a substantial wage>". FRWF has also proposed a mitigation plan in coordination with the Service that will offset and fully compensate for

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
			the residual take of Indiana bats proposed in the HCP. The information provided by FRWF will allow the Service to evaluate the impact of that level of take prior to issuance of an incidental take permit (ITP) and to determine the adequacy of the conservation plan (avoidance, minimization, and mitigation). The Service made a preliminary determination during HCP development that the minimization and mitigation provide substantial benefits to the species. While this lessens Service reliance on establishing practicability, it did not excuse FRWF from providing evidence to support their contention that the minimization and mitigation proposed is "…the maximum that can be practically implemented by the applicant". This aspect of HCP development involves negotiation between the Service and the applicant that presumes both parties are acting in good faith. It is not within the purview nor is it the policy of the Service to conduct a financial investigation of applicants, but to make them aware of their obligations under Section 10 of the ESA to be forthcoming and truthful in their approach to MEP as in all other parts of the HCP process. In accordance with this, FRWF provided the Service with confidential business information (including their final MEP document), protected under Exemptions 4 of the Freedom Of Information Act (FOIA), which demonstrates financial and contractual reasons why cut-in speeds higher than 5.0 m/s are not practicable. A redacted (under Exemption 4) version of the final MEP document along with relevant email communications were provided to the CLC on 10 June 2013. These are available as Appendix J to the HCP. While conducting its independent analysis over the course of several months, the Service reviewed and requested multiple clarifications and revisions to the final MEP document (see emails in Appendix J) before ultimately reaching a determination that the submission met the standard under Section 10 of the ESA. Although the Service must routinely make decisions based on information that is not provided to the public, versions of seven different MEP drafts that were redacted pursuant to FOIA Exemption 4 were provided to CLC on 24 October 2013 in response to their original FOIA request. In summary, the Service must conduct an independent analysis and determine whether an incidental take permit applicant will minimize and mitigate the impacts of take to the MEP. MEP cannot necessarily be determined based on generalizations from other facilities. It should be evaluated independently for each facility. Each facility must demonstrate what MEP is based upon relative to their unique circumstances. FRWF is unusual in this respect in that the majority of the facility was operational, with contracts and other financial arrangements in place when the HCP was begun.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
30	Hyman, Jeffrey B. (CLC)	The data show that the more effective Alternative 3 is known and available, and its superior effectiveness for protecting Indiana bats is supported by the best available science. Thus, pursuant to §1539(a)(2)(B)(ii), the Applicant must show, and the agency must find, that reducing take further than proposed in Alternative 2 is not "practicable." **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
31	Hyman, Jeffrey B. (CLC)	Neither the DHCP nor the DEIS presents or references any substantial evidence in the record that Alternative 3 is impracticable. **(FWS-R3-ES-2013-0027)**	The USFWS has conducted an independent analysis of confidential business information provided by FRWF that illustrates the financial and contractual reasons why cut-in speeds higher than 5.0 m/s are not practicable. This confidential business information is protected under Exemption 4 of FOIA. Redacted versions of these confidential documents were provided to the CLC and relevant emails and a redacted version of FRWF's final MEP document are available as Appendix J to the HCP.
32	Hyman, Jeffrey B. (CLC)	The Applicant's claim that 5.0 m/s cut-in speed is the highest cut-in speed that allows for project viability is suspect and is currently unsupported by substantial evidence. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
33	Hyman, Jeffrey B. (CLC)	[T]he Applicant agrees to implement an adaptive management plan that includes raising cut-in speeds in 0.5 m/s increments, if needed, to assure that bat mortality does not exceed what is deemed to be acceptable limits. How is it possible for the Applicant to promise to implement higher cut-in speeds than the proposed 5.0 m/s as part of an adaptive management plan if the Applicant is correct that such higher cut-in speeds would cause the Project to be economically nonviable? This apparent inconsistency begs the question of what the Applicant means by "Project viability." The DHCP fails to explain this apparent inconsistency. **(FWS-R3-ES-2013-0027)**	This comment and question requires more thorough consideration of both the expected effectiveness of the MEP cut-in speed and the structure of the adaptive management response. First, because FRWF has multiple years of post-construction data at the site, there is reasonable certainty on their part that the 5.0 m/s cut-in speed will exceed the minimum reductions in take expected. The applicant is confident that implementing the adaptive management response (increased cut-in speeds) will be used rarely if at all. Because turbine cut-in speed is the key component of the conservation plan, however, the Service and FRWF agreed that it is prudent to have adaptive management in place. Second, the adaptive management plan permits FRWF to revert to the 5.0 m/s cut-in speed, as early as, the following migratory season under specific circumstances (see HCP Section 5.4.2) thus minimizing the time the facility would have to operate at a higher cut-in speed. FRWF expects that even if needed, increased cut-in would be in response to a limited-time event and the project would revert to pre-adaptive management levels to begin the next season. Also, any permittee must stay within their authorized take limits or be out of compliance with their ITP. Increasing the cut in speeds would ensure they would remain in compliance with their ITP.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
34	Hyman, Jeffrey B. (CLC)	[P]ublished evidence indicates that operational alternatives with 6.5 m/s cut-in speed are indeed practicable. . . . [P]ublished results indicate that, by applying a cut-in speed of 6.5 m/s to an array of turbines, lost power revenues would be relatively small while bat mortality would be significantly reduced when compared to a 5.0 m/s cut-in speed. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
35	Hyman, Jeffrey B. (CLC)	[T]he DHCP does not present or reference any evidence that the DEIS's Alternative 3, or any other alternative that uses a cut-in speed of 6.5 m/s, is economically nonviable or impracticable. It is of course likely that the cost of implementing a 6.5 m/s cut-in speed will be higher than the cost of implementing a 5.0 m/s cut-in speed. But the fact of the increased cost associated with raising the cut-in speed is not alone sufficient to find that the increase in cost is not practicable. Costs must be viewed in relation to the resources and financial ability of the applicant. **(FWS-R3-ES-2013-0027)**	See responses to Comments 29 and 31.
36	Hyman, Jeffrey B. (CLC)	The Applicant's claim of impracticability is not supported by substantial evidence currently in the record. . . . The non-redacted portion of the [Fowler Ridge Financial Impact] document released to date pursuant to our FOIA request does not present substantial evidence to support the Applicant's claim that 5.0 m/s is the highest cut-in speed that can be practicably achieved. **(FWS-R3-ES-2013-0027)**	The Service believes the confidential business information provided by FRWF does support their position that 5.0 m/s meets the MEP standard in conjunction with Service assessment of the adequacy of the minimization and mitigation outlined in the HCP (see response to Comment 29).

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
37	Hyman, Jeffrey B. (CLC)	The first argument in the released document is that the Fowler Ridge Wind Farm contracts were negotiated when neither the Applicant nor the agency expected to discover the presence of an Indiana bat at the Project site, and so the contracts did not consider the costs of minimization and mitigation under the ESA. If this argument is made in good faith, the failure to foresee the possibility that Indiana bats might migrate through the Project area and the failure to incorporate ESA considerations into the Fowler Ridge contracts is simply unreasonable and possibly legally negligent. **(FWS-R3-ES-2013-0027)**	The FRWF project development team sited the project out of suitable Indiana bat habitat and consulted with the USFWS, who agreed in a letter dated October 13, 2006 (see Appendix D of the HCP), that there were no records of Indiana bats in Benton County. Indiana bat migration routes at the time were largely unknown and remain so. The project team used best available resources to site the project. In addition, at the time of project development, no Indiana bats had been found as fatalities at wind farms; therefore, there was no reason to include ESA considerations into power purchase contracts.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
38	Hyman, Jeffrey B. (CLC)	The second argument in the released document is that reducing the opportunity for turbines to generate power by raising the cut-in speed "directly reduces income and hence profitability." Granted, implementing a cut-in speed of 6.5 m/s may reduce the income of the Applicant relative to a 5.0 m/s cut-in speed because the turbine blades are expected to be generating electricity for fewer hours with the higher cut-in speed. In fact, the actual reduction in yearly income associated with using the higher cut-in speed will depend on the observed wind speeds throughout the fall season – specifically, on the number of hours in which wind speeds are between 5.0 m/s and 6.5 m/s. Without considering this and other factors, the expected reduction in income due to implementing Alternative 3 rather than Alternative 2 is speculative. In any event, increased cost does not necessarily imply that a measure is impracticable pursuant to § 1539(a)(2)(B)(ii). **(FWS-R3-ES-2013-0027)**	When calculating reduction in profitability, the Fowler team did, in fact, use actual wind speed distribution to determine the profitability of multiple cut-in speeds. The following from the MEP negotiations with the Service reflects the process used: [FRWF] based the financial impact resulting from each Alternative on observed wind speeds. As shown in the table below, the average wind speed for August and September is only 5.8 m/s with over 60% of the observed winds occurring during night time hours. *Month — Average Wind — % Day — % Night* *August — 5.4 — 37% — 63%* *September — 6.4 — 39% — 61%* In addition, see response to Comment 29.
39	Hyman, Jeffrey B. (CLC)	The third argument is . . . simply a bare conclusion that a cut-in speed of 5.0 m/s is considered by the Applicant to be "the absolute maximum extent practicable operational change that can be made and still maintain a healthy cash flow, as expected by our investors." This bare conclusion is stated without any supporting evidence or discussion of what constitutes "healthy" cash flow and why. **(FWS-R3-ES-2013-0027)**	During discussion with FRWF concerning MEP, FRWF's Vice President of Asset Management conveyed over the course of multiple meetings that for a business entity to be viable, it is required to manage cash to fund planned operating expenses, unplanned operating expenses, service debt and provide a positive return to investors. Healthy cash flow is that level that allows the business to achieve this objective. Further, financing agreements require the venture to achieve at least a minimum debt service coverage ratio (the ratio of funds available to service debt as compared to the principle and interest payments required under the loan documents). Should debt service coverage ratios fall below prescribed levels (which is often times greater than 1.0), the loan could be in default and the financial viability of the venture would be at risk.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
40	Hyman, Jeffrey B. (CLC)	[T}he Applicant appears to argue that investor expectation of profit is, or should be, a determining factor in the practicability determination under § 1539(a)(2)(B)(ii). [W]hat rate of return is reasonable to expect and whether practicability depends on investor expectation. . . . [T]he Applicant unreasonably led investors to believe that the Project, built in the state with by far the largest number of recorded maternity colonies and the largest hibernating population of the highly mobile endangered Indiana bat, would incur no costs associated with ESA compliance. **(FWS-R3-ES-2013-0027)**	See response to Comment 37.
41	Hyman, Jeffrey B. (CLC)	[F]or the agency to make a final finding regarding the practicability of the DEIS's Alternative 3 under § 1539(a)(2)(B)(ii), the agency must support its finding with substantial evidence in the record. Moreover, the public is entitled to fully evaluate any evidence on which the agency relies to make a finding regarding practicability. The agency cannot rely upon evidence that is withheld from the public. In other words, the agency cannot make a finding regarding practicability and then contend that the evidence underlying its finding, and on which it relies, is secret and cannot be disclosed to the public. Therefore, FWS cannot rely on information in the redacted portions of any document released under FOIA to support the agency's ultimate finding on the practicability of Alternative 3. **(FWS-R3-ES-2013-0027)**	The Service had available the full text of the MEP documents provided by FRWF on which to base its decision. Redacted versions of these confidential documents were provided to the CLC and relevant emails and a redacted version of FRWF's final MEP document are available as Appendix J to the HCP (see response to Comment 31). By necessity, agencies routinely make decisions based on confidential information or other information that is not generally available to the public.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
42	Hyman, Jeffrey B. (CLC)	The Applicant's "commensurate" or "good enough" approach to minimization under 16 U.S.C. § 1539(a)(2)(b)(ii) contravenes the plain meaning of the ESA and is invalid. . . . . [T]he DHCP's proposed operational strategy is more effective at reducing take than the manufacturer programmed settings or "normal" operation at 3.5 m/s cut-in speed. But doing some good is not sufficient. The proper comparison for the proposed strategy is instead with a measure that the best available science reasonably indicates is significantly more effective – e.g., Alternative 3. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
43	Hyman, Jeffrey B. (CLC)	We incorporate by reference CLC's submitted "Comments on Final EIS and Final HCP for Buckeye wind power project, Champaign County, Ohio, FWS-R3-ES-2012-0036," Document ID: FWS-R3-ES-2012-0036-0099, which discusses this ["good enough" approach to minimization under 16 USC 1539(a)(2)(b)(ii)] in further detail. **(FWS-R3-ES-2013-0027)**	See response to Comment 29. Neither the applicant nor the Service adopted a "commensurate" or "good enough" approach in the development of the HCP for FRWF.
44	Hyman, Jeffrey B. (CLC)	To the extent that the DHCP also appears to suggest that Alternative 2 is good enough because the take of Indiana bats will be mitigated, such an approach is invalid. Mitigation is selected only after the impact of take is minimized to the maximum extent practicable. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
45	Hyman, Jeffrey B. (CLC)	The DHCP states it will mitigate the level of take that is "unavoidable." Table 5.5 in the DEIS shows, however, that by implementing Alternative 3 (i.e., 6.5 m/s cut-in speed) rather than the proposed Alternative 2 (i.e., 5.0 m/s cut-in speed), the Project can avoid the take of 107 Indiana bats (Alternative 2's 193 bats minus Alternative 3's 86 bats). The proposed level of take is thus avoidable. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
46	Hyman, Jeffrey B. (CLC)	The DHCP seems to suggest that the proposed Alternative 2 is sufficient in part because cut-in speed will be increased in 0.5 m/s increments if the proposed take limit is exceeded. To the extent that the DHCP suggests that the Applicant can rely on adaptive management to satisfy the minimization requirement in § 1539(a)(2)(B)(ii), such an approach is invalid. **(FWS-R3-ES-2013-0027)**	See response to Comment 29. The adaptive management strategy is designed to ensure that FRWF does not exceed a specified level of take in any one year and that they remain in compliance with the ITP.
47	Hyman, Jeffrey B. (CLC)	[T]he take limit that serves as the threshold or trigger for implementing an adaptive increase in cut-in speed will itself be the result of selecting an inferior non-minimizing option. By the time the selected threshold is exceeded, more Indiana bats will already have been killed than would have been killed under the true minimizing alternative. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
48	Hyman, Jeffrey B. (CLC)	The HCP must instead implement what the current best available science reasonably indicates is the most effective yet practicable alternative – which is likely to be Alternative 3 or another similar alternative – and work from there. If monitoring or experimentation then shows that cut-in speeds lower than 6.5 m/s can produce a statistically equivalent reduction in take, this new information might then be used to amend the minimizing strategy in the future. This is the proper use of adaptive management in the ITP/HCP context. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.
49	Hyman, Jeffrey B. (CLC)	FWS's Preferred Alternative should be Alternative 3, the "6.5 m/s Cut-In Speed Alternative." **(FWS-R3-ES-2013-0027)**	Thank you for your comment, the Service will identify a Preferred Alternative in the final EIS.
50	Hyman, Jeffrey B. (CLC)	[T]he DHCP fails to explain how it will be possible to simultaneously minimize incidental take of Indiana bats to the maximum extent practicable and maximize power output from the facility. . . . maximizing output of the Project seems to preclude, or at least conflict with, minimizing take of Indiana bats to the maximum extent practicable. **(FWS-R3-ES-2013-0027)**	See response to Comment 29.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
51	Hyman, Jeffrey B. (CLC)	The DHCP's Goal 5 appears to claim that optimizing electrical output of the Project will have a positive effect on climate change and reduce risk to Indiana bats. Such a claim is not credible. Nothing in the DHCP or the DEIS shows or even suggests that increased power output from the Fowler Ridge facility would reduce GHG emissions from other energy sources. Such a claim would require that one megawatt of coal-produced power will be taken permanently offline in exchange for each megawatt of power produced by the Project. Absolutely no evidence is presented that this will occur. Thus, this causal link is just speculation. Even if the aforementioned offset of coal-fired power generation did occur for the Project, nothing referenced in the DHCP or DEIS shows that such an offset would slow or ameliorate environmental changes that may occur in Indiana or the Midwest region due to GHG emissions. No evidence is presented of a relationship between reducing GHG emissions in Indiana specifically and any climate-related habitat changes in recovery units of the Indiana bat. **(FWS-R3-ES-2013-0027)**	While it is true that we know of no data showing a direct relationship between the benefits of wind energy facilities to recovery units of the Indiana bat, it is reasonable to maintain that energy generated by wind energy facilities will necessarily offset energy generated from other sources that produce carbon emissions. Indiana has a voluntary clean emissions portfolio standard program for which energy produced at FRWF would qualify. In addition, 550 MW of the power and associated renewable energy credits (RECS) generated by the FRWF are sold under long term contracts to utilities with service territories in Ohio, Michigan and Virginia, states that have either mandated or voluntary renewable energy portfolio standards. Ohio requires that 25 percent of energy sold by electric distribution utilities come from alternative energy sources, Michigan has a renewable energy standard of 10 percent and Virginia has a voluntary energy renewable goal of 15 percent. There is evidence that carbon emissions contribute to global climate change, which has been identified as a potential risk to Indiana bats (see USFWS 2007, Indiana Bat Draft Recovery Plan). Therefore, increased output of wind energy promotes the health of Indiana bat populations by reducing the potentially harmful effects of emissions associated with other energy generation technologies.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
52	Hyman, Jeffrey B. (CLC)	[A]ccording to FWS's own research and publications, current climate and species modeling cannot support a species-specific analysis to assess the impacts of greenhouse gas emitters on species take, and by the same reasoning, the models cannot support a species-specific analysis to assess the benefits of decreased GHG emissions attributable to actions such as wind power facilities. The court in In re Polar Bear Endangered Species Act Listing and § 4(d) Rule Litigation, 818 F.Supp.2d 214 (D.D.C. 2011), agreed with FWS's position that the best available science does not allow the agency to draw a causal link between greenhouse gas emissions from a particular facility and take of a species. **(FWS-R3-ES-2013-0027)**	See response to Comment 51.
53	Hyman, Jeffrey B. (CLC)	[T]he long time scale of the relationship between GHG emissions and climate change effects casts serious doubt on the ability to rely on the "wind power effect" at a particular wind facility to minimize or mitigate take or to benefit Indiana bats. **(FWS-R3-ES-2013-0027)**	See response to Comment 51.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
54	Hyman, Jeffrey B. (CLC)	What the Applicant has done in Goal 5 is to use the tenable relationship between an aspirational renewable energy policy and potential future climate change benefits to justify allowing increased take of Indiana bats from a specific facility simply because that facility is consistent with that energy policy. There is absolutely no evidence that the Project itself will benefit Indiana bats. It is arbitrary and capricious to allow an actual cause of take of a listed species to increase based on such unsupported claims. FWS knows that Indiana Bats are at risk of harm from the Fowler Ridge turbines. FWS does not know, however, that the bats would benefit from maximizing the output of the facility. **(FWS-R3-ES-2013-0027)**	See response to Comment 51.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
55	Hyman, Jeffrey B. (CLC)	The BBCS describes a risk assessment for Whooping cranes [and] adopts a conclusion that the Project's overall risk to Whooping cranes is low for two reasons: first, because the population size is small, and second, because the quality of habitat within the Project area is marginal. The adoption of this conclusion . . . is unwarranted. **(FWS-R3-ES-2013-0027)**	The conclusion in the BBCS that the risk is insignificant is not arbitrary. The Service agrees that a risk analysis, as conducted in the BBCS (Johnson and Tidhar 2007) would normally evaluate the consequences of even a low-probability event occurring if the consequences would be important. The consequences to the species of the loss of animals of a non-essential experimental population (NEP), however, is by definition inconsequential. Moreover, the birds have limited protection under the ESA. The NEP is small (about 106 animals), which contributes to the small probability of a whooping crane being killed at FRWF. That probability is further reduced because for whooping cranes to be vulnerable they first have to migrate through the area and suitable habitat must be present for them to stop (cranes fly well above power lines and the rotor swept zone except when landing and taking off). There is suitable nightly stopover wetland habitat on and around FRWF, but it is limited and of marginal quality for whooping cranes. Since the reintroduction project began in 2001, the Service has found only one record documenting a whooping crane in Benton County. The Whooping Crane Management Plan 2006 (http://dnr.wi.gov/topic/endangeredresources/documents/wc mgmt plan.pdf) states that collision with power lines is a significant cause of mortality to migrating cranes. It documents 41 fatalities or serious injuries attributed to power lines among all populations in the last 50 years (17 or 41% of these, however, were from the non-migratory Florida population). Only two fatalities have been documented from the eastern migratory population. FRWF infrastructure is comparatively minor (approximately 35 miles of above-ground transmission lines) which in combination with factors previously discussed also reduces the probability of a collision. There have been no documented collisions of whooping cranes with FRWF power lines (or with any power lines in Benton County, Indiana). While the Service disagrees with the assertion that the conclusion in the BBCS is arbitrary, we recognize that the probability of whooping crane collision with power lines or turbines is very low, but not zero. Moreover, although there is no prohibition on incidental take of the NEP, the Service agrees that an adaptive management component to the BBCS is prudent. The Service has worked with FRWF to develop an adaptive management strategy (see BBCS, Section 5.3.4).

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56	Hyman, Jeffrey B. (CLC)	The error in concluding that the risk to Whooping cranes is low because the population size is small is that such use of the term "risk" considers only one half of the risk equation. To compare risk across different species and to manage that risk, the agency must consider not only the probability of exposure but also the consequences of exposure.58 To narrow a comparative risk assessment to the probability of exposure alone leaves out much valuable information. Because the consequences of losing members of a rare species are relatively severe, the overall risk due to even a low-probability event is properly perceived as relatively high. Low-probability but high-consequence events require a different response than low-probability but relatively inconsequential events in terms of prevention and mitigation. Thus, a valid assessment of the overall risk that the Project poses to Whooping cranes must consider both probability of collision and the consequences of such take. **(FWS-R3-ES-2013-0027)**	See response to Comment 55.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
57	Hyman, Jeffrey B. (CLC)	The DEIS and BBCS indicate that the main threat of the Project to Whooping cranes is collision with power lines and turbines, particularly during periods of inclement weather. . . . The BBCS also recognizes that "marking power lines reduces collision rates." Yet despite such information on existing threats of collision and potential remedies, the DEIS and BBCS have decided, arbitrarily, that the risk of collision of Whooping cranes with Project infrastructure is so insignificant that no minimization, mitigation, or adaptive management measures need be considered or evaluated. The BBCS does not attempt to reduce or mitigate the threat of Whooping crane collision with power lines or turbines, either by marking overhead transmission line or, as suggested by Indiana DNR, by possibly shutting down during migratory peaks. **(FWS-R3-ES-2013-0027)**	See response to Comment 55 and Comment 91.
58	Hyman, Jeffrey B. (CLC)	The MBTA requires at least that above ground power lines associated with the project be marked to reduce collisions by raptors and whooping cranes. **(FWS-R3-ES-2013-0027)**	The Service is not aware of any requirement in the MBTA to mark above-ground power lines.
59	Hyman, Jeffrey B. (CLC)	The DEIS and BBCS fail to seriously consider marking of Project power lines and the reduction in mortality that marking may produce, even though the Project is known to kill raptors and may pose a significant threat to migrating Whooping cranes. This failure is likely to lead to continued violations of the MBTA. **(FWS-R3-ES-2013-0027)**	The applicant has made a good faith effort to address the expected minor risk to whooping cranes, raptors, and other migratory birds through development of a BBCS (final EIS, Appendix D). The Service, however, agrees that amending the BBCS with an adaptive management section designed to address potential impacts to whooping cranes is a prudent measure, which has been included in the version attached to the FEIS.

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60	Hyman, Jeffrey B. (CLC)	The draft documents under review will facilitate continued violations of MBTA § 703 by the Project. The FWS Office of Law Enforcement focuses its resources on investigating and prosecuting those who take migratory birds without identifying and implementing reasonable and effective measures to avoid the take of species protected under the MBTA and BGEPA. Courts have found MBTA violations in such circumstances. Marking of overhead transmission lines associated with the Project is a reasonable and effective measure to minimize and mitigate the take of Whooping cranes, raptors, and other bird species, yet this measure has not been incorporated at Fowler Ridge or seriously considered in the DEIS. The MBTA and NEPA require at least that such violations of MBTA § 703 and such measures be given serious consideration. **(FWS-R3-ES-2013-0027)**	A BBCS was developed in conjunction with the EIS (final EIS, Appendix D). FRWF used guidance from the Wind Turbine Guidelines Federal Advisory Committee, APLIC, U.S. Fish and Wildlife Service, and the IDNR particularly in project planning and construction to minimize potential impacts to migratory birds. As Reducing Avian Collisions with Power Lines: State of the Art 2012 (APLIC 2012) points out, marking power lines is only one aspect of avoiding avian collisions (see Chapters 4 and 5 and Figure 5.1). The following discussion of power lines is taken from the BBCS: The design of the transmission line follows spacing recommendations included in the 2006 Avian Power Line Interaction Committee (APLIC) *Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006* (APLIC 2006)." As a best practice, the amount of aboveground collection and transmission lines were minimized across all Project sites. Six miles (9.7 km) of 345 kV overhead transmission line connect Phase II turbines to the Phase I substation. This line was built to the spacing guidelines recommended in the Avian Power line Interaction Committee's *Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006* (APLIC 2006). Sixty-two miles (99.8 km) of 34.5 kV collection line were buried within the Phase II site. There is no aboveground collection within the Phase I, II, and III Project areas. Collection lines crossing streams were directionally bored to minimize impact to streambeds. These best practices will also be utilized in designing and constructing the collection and transmission lines for Phases IV. The Service, however, believes it is prudent to add an adaptive management strategy for whooping cranes, which is included in the version of the BBCS in the final EIS.
61	Hyman, Jeffrey B. (CLC)	FWS's authorization of the Project's collision threats without readily available minimization measures, absent issuance of an MBTA incidental take permit or a special use permit, would itself not be in accordance with law under § 703 of the MBTA. **(FWS-R3-ES-2013-0027)**	The Service is not authorizing the "Project's collision threats", however, the Service may authorize take of Indiana bats through an ITP. There is currently no permit available under MBTA to address take of migratory birds. The applicant has a BBCS, Appendix D of the EIS, which documents FRWF's good faith efforts to minimize impacts to migratory birds (see response to Comment 60).

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62	Hyman, Jeffrey B. (CLC)	The BBCS contains an adaptive management plan for raptors, Golden plovers, Bald eagles, and birds in general . . . however, no actions or measures would be triggered should a Whooping crane be killed by Project infrastructure. This failure to plan for Whooping crane fatalities is an irresponsible omission under the MBTA. Given this omission, any harm to Whooping cranes by the Project would be a clear and particularly egregious violation of the MBTA. **(FWS-R3-ES-2013-0027)**	See response to Comment 55.
63	Billeck, Margaret (Rural Investment LLC)	Rural Investment LLC supports the application for the Indiana Bat Habitat Conservation Plan. (FWS-R3-ES-2013-0028)	Thank you for your comment.
64	Groen, Ludwig	We fully support the efforts of the Fowler Ridge Wind Farm to save wildlife in the area of their windmills. . . . We believe this plan should be approved in order for the additional windmills to be built . . . . **(FWS-R3-ES-2013-0029)**	Thank you for your comment.
65	Budreau, Dale	I believe you should grant the incidental take permit for the Fowler Ridge Wind Farm. (FWS-R3-ES-2013-0030)	Thank you for your comment.
66	Anonymous	I think it is important to protect the Indiana bat and that the wind mills if possible should run at 6.5 meters at night when the bat is active. (FWS-R3-ES-2013-0031)	See responses to Comments 26 and 29.
67	Anonymous	I also like the idea of Fowler Ridge preserving and restoring the maternity habitat of the bat. (FWS-R3-ES-2013-0031)	Thank you for your comment.
68	Bales, Ronald	I am in favor of the plan. (FWS-R3-ES-2013-0032)	Thank you for your comment.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
69	Shank, Keith (Illinois Department of Natural Resources [IL DNR])	The Illinois Department of Natural Resources believes the Fowler Ridge ITP DEIS does not adequately describe or evaluate potential adverse impacts related to wind turbine operations. Throughout Part 5 of the DEIS, impacts to humans and natural resources associated with wind turbine operations are described as insignificant or absent, with the exception of collision or barotrauma risk to birds and bats. A bias toward this view is explicitly stated in Section 5.5.3.1: "Terrestrial wildlife mortality is not expected to occur as a result of Project operations under any of the four alternatives because the risk of turbine collision is confined to the rotor-swept zone of each turbine." **(FWS-R3-ES-2013-0033)**	The Service appreciates the Illinois Department of Natural Resources comments, which bring some of the less obvious potential impacts from wind energy transmission to the attention of the public. The Service response revolves around two facts. First, the best available information is not sufficient to indicate that other effects associated with wind turbines (e.g., electromagnetic fields, shadow flicker, acoustic vibrations) function as stressors to wildlife using FRWF. Second, there is extremely limited habitat for either terrestrial or aquatic species in FRWF. Were FRWF situated within important habitat for native species, it might be appropriate to give additional consideration to adaptive management or even avoidance and minimization measures. The Service agrees that the effects discussed in the comment might be appropriate for further research, either basic or applied research at an appropriate facility.
70	Shank, Keith (IL DNR)	The Department believes there are many avenues for natural resources to be adversely affected by turbine operation . . . Because 93% of the land area of this facility is in row-crop agriculture, the DEIS dismisses it as of low-value to wildlife. [M]ost of Indiana . . . is devoted to row-crop production. It is the most common and abundant habitat available to wildlife in this region; any activity which renders wide areas of it less hospitable to wildlife should be viewed with concern. The DEIS should address these potential effects. **(FWS-R3-ES-2013-0033)**	We agree that much of [northern and central] Indiana is devoted to intensive agriculture. Intensive row-crop agriculture provides little habitat for native species, although it can be important in conjunction with natural vegetation. While permanent change to a more intensive use (e.g., agriculture to suburban) has potential long-term consequences to wildlife associated with it, wind farms are defined as temporary facilities. They also do not cause similar fundamental and essentially irreversible changes to the landscape (e.g., large areas of pavement). We do not agree that best available data indicates wind farms make existing agricultural habitats significantly less suitable for native species that use those habitats.

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71	Shank, Keith (IL DNR)	[P]otential adverse effects to wildlife and other natural resources may be related to the propagation of magnetic fields (around turbine nacelles, current conversion transformers at turbine tower bases, and around buried collection power lines); shadow flicker (both solar and lunar); visibility; noise; acoustic vibrations through soils and waters; aviation safety lighting, and thermal conduction in soils. While few of these characteristics of turbine operations have the potential to result in direct mortality of fish and wildlife, which is relatively easy to detect and measure, they have the potential to displace or exclude fish and wildlife from occupied habitats and to stress populations by making feeding and reproduction more difficult. Such effects are far more subtle than mortality and it is much more difficult to assign their cause to a specific aspect or combination of aspects of turbine operation. **(FWS-R3-ES-2013-0033)**	See response to Comment 69.
72	Shank, Keith (IL DNR)	A large wind generation project places a profusion of magnetic fields across the landscape, associated both with turbines and the collection power lines, most of which are buried only four feet below ground rather than the standard 20-40 feet above-ground of overhead power lines. Because magnetic field strength is directly related to distance, the potential for sub-lethal magnetic field effects to a wide array of terrestrial and aquatic organisms which are normally not exposed are greatly enhanced. **(FWS-R3-ES-2013-0033)**	See response to Comment 69.

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73	Shank, Keith (IL DNR)	it is a long accepted principle that moving objects affect wildlife, and there appears no persuasive reason to presume the visible movement associated with wind turbines, whether rotating or flashing, does not have similar effects. The current document contains an extensive discussion of apparent displacement effects to the American Golden Plover, though assigning no particular cause. Visibility may be a major factor in this displacement. **(FWS-R3-ES-2013-0033)**	This is possible; however, the Service believes displacement of American golden plover is unlikely because of the abundance of stopover habitat in the area. In addition, the American golden plover IBA is not directly impacted by FRWF (see sections 4.5.2.2 and 5.5.3.4 of the EIS).
74	Shank, Keith (IL DNR)	Species which are particularly sensitive regarding aerial predators may be stressed by flicker, and it may disrupt the thermo-regulatory activities of reptiles and amphibians for whom basking is an essential activity. For nocturnal animals with excellent low-light vision, the strobe effect of lunar flicker may be as distressing as that of daytime flicker to diurnal species. Where multiple turbines are present, flicker may be present during most of the normal activity period. Anecdotal accounts exist of effects to domestic livestock, particularly horses. Flicker has a strong potential to displace wildlife. **(FWS-R3-ES-2013-0033)**	See response to Comment 69.

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75	Shank, Keith (IL DNR)	A number of European studies have shown adverse effects of highway noise on breeding birds, where birdsongs must be modified to be heard but are less effective in attracting mates. Francis, et al. (2012)ii documented the effects of pipeline compressor noise in New Mexico (equivalent to highway noise at 500 feet) that resulted in high populations of rodents near compressors because predators (hawks and owls) could not hear their prey, with secondary effects on plant reproduction due to elevated seed predation by rodents. Elevated turbine noise over broad areas might produce similar effects, displacing predators which are less successful due to noise. This may be a primary reason Northern Harriers are rarely observed after wind farm construction though present beforehand. **(FWS-R3-ES-2013-0033)**	It is known that background noise requires birds to sing louder during the breeding season, however, we have no data suggesting wind turbines, which anecdotally appear to have a much different noise signature than highways, affect bird communication. In addition, there are few songbird species (horned lark is an exception) that use FRWF for mating/breeding habitat. Most diurnal raptors are sight hunters, although northern harriers hunt by sight and sound. Northern harriers may be less vulnerable to wind turbine collision because they typically hunt near the ground. Although northern harriers have been documented at FRWF, habitat within the boundaries of the project was limited even before turbine construction.

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76	Shank, Keith (IL DNR)	Studies in the United Kingdom have documented detectable vibration due to wind turbines through bedrock at distances up to 10 kilometers (six miles), although those studies had no biological component. Many soil animals are very sensitive to vibration, while most aquatic organisms are also attuned to vibrations in the water, to either detect prey or to avoid predators. Soil organisms, such as earthworms, play a vital role in soil tilth and aeration; their displacement or reduced activity can affect soil fertility and plant productivity. Sustained noise in aquatic environments may pose a barrier to migratory movements in streams, or prevent detection of food. The exclusion or displacement of host fish could be problematic for mussel populations, since fish are an essential part of the mussel reproductive cycle. The result could be reduced biodiversity in stream systems which are already compromised by human activities. **(FWS-R3-ES-2013-0033)**	See response to Comment 69.
77	Shank, Keith (IL DNR)	Any deviation from "normal" soil temperatures for the season will have effects on soil organisms, positive or negative. At a depth of four feet, variations in surface temperature [related to thermal conductivity/resistivity in buried power lines] are unlikely to be detected by humans, but this is not necessarily so for animals with thermal sensitivities, especially reptiles. **(FWS-R3-ES-2013-0033)**	See response to Comment 69.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
78	Shank, Keith (IL DNR)	If [Endagnered or Threatened] species are "documented" in Benton County, then the information on their last known locations should be available from the Indiana DNR. It is relevant whether any of these locations lie within the project area or external buffer. Those within the project may indeed be affected. **(FWS-R3-ES-2013-0033)**	See response to Comment 69. Phase IV will not result in ground disturbance of the railroad ROWs where Franklin's ground squirrel or plains pocket gopher are historically known to occur.
79	Shank, Keith (IL DNR)	The fact that occupied habitat may be marginal is not a reason to further degrade or destroy it; many state-listed endangered species largely persist in marginal habitat because primary habitat has been degraded or destroyed. Such marginal habitat often provides key linkages between otherwise isolated populations which are important for gene flow. Marginal habitat is not necessarily unimportant habitat. **(FWS-R3-ES-2013-0033)**	By marginal habitat, it is assumed that the responder means the remnant wetlands, prairies, and woodlots within the FRWF project area. These are small sites isolated by large agriculture landscapes and the Service has concluded that they have limited value even for connectivity. We agree that these sites have some value to wildlife. FRWF has avoided siting turbines in or immediately adjacent to these remnants and we do not agree that the data available suggest FRWF will further degrade their value.
80	Shank, Keith (IL DNR)	The cavalier dismissal of these state-listed species without any effort to ascertain their locations or numbers when the project in question will occupy most of the County is unconscionable. [Franklin's ground squirrel] could well occupy portions of the project area, but it is easy to miss. **(FWS-R3-ES-2013-0033)**	The Service disagrees with the characterization that state-listed species have been dismissed from consideration "cavalierly". The Heritage Database was reviewed as a part of this process, and the Service followed-up with INDR for the most recent version (Appendix C) of the Database. Most of the records for the FRWF site are decades old. The Service agrees, however, that there are likely some state-listed species still using railroad ROW and the handful of small areas of natural vegetation remaining within and adjacent to FRWF. The Service does not expect state-listed species, including Franklin's ground squirrel to be present outside of these areas. The best available science does not support the conclusion that the operation of wind turbines (i.e., shadow flicker and acoustic vibration) adversely affects these species. Phase IV will not result in ground disturbance of the railroad ROWs where Franklin's ground squirrel or plains pocket gopher are historically known to occur. It is unlikely that construction of Phase IV will affect any state listed species (suitable habitat will be avoided if at all possible).

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
81	Shank, Keith (IL DNR)	The Franklin's Ground Squirrel is also a good example of a species which may be adversely affected by visible motion, flicker, and acoustic vibration due to wind turbine operations. An inability to fly should not disqualify it or other terrestrial and aquatic species from due consideration in the DEIS. **(FWS-R3-ES-2013-0033)**	See response to Comment 80.
82	Shank, Keith (IL DNR)	An appropriate discussion of the potential effects and resource impacts might still support a conclusion there are no adverse effects to be considered, or that adverse effects will not significant, but the document would then address the affected environment and potential environmental consequences more completely without having to rely on unsupported assumptions. **(FWS-R3-ES-2013-0033)**	We do not know what "unsupported assumptions" the responder is referencing in the comment (also see responses to Comment 69).

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
83	Westlake, Kenneth (United States Environmental Protection Agency [USEPA])	[T]he Draft EIS does not indicate: 1) the number of temporary stream crossings proposed; 2) the linear feet of both temporary and permanent stream impacts; or 3) whether a Clean Water Act Section 401 Water Quality Certification will be required and obtained from the Indiana Department of Environmental Management, a Construction Floodway Permit will be required and retained from Indiana Department of Natural Resources, and a Nationwide or Regional General Permit will be required and obtained, from the U.S. Army Corps of Engineers for project-related crossings of Waters of the United States…..The Final EIS should discuss whether any permanent stream crossings will be required, and measures taken to obtain regulatory approvals for both temporary and permanent impacts to waters of the U.S. and Waters of the State. The Final EIS should discuss permits to be obtained, restoration measures to be taken, and associated mitigation (if applicable). Additionally, the Draft EIS does not indicate if any stream crossings would occur at intermittent or ephemeral streams. EPA recommends the Final EIS clarify this point. In the event that intermittent or ephemeral streams will be crossed, EPA supports the use of directional boring of underground utilities to avoid direct stream impacts. . . . . In the event that any intermittent or ephemeral streams have active flow at the time of construction, EPA recommends that a commitment be made to directionally bore, rather than open-trench through open stream flow. This commitment should be made in the Final EIS. **(FWS-R3-ES-2013-0034)**	The wetlands and streams, including temporary streams in the Phase IV project area, occur within an intensively farmed matrix and are generally disturbed and of low quality. We do not expect significant impacts to water resources from construction of Phase IV. In addition, directional boring will be implemented at all collector line crossings for regulated streams and no fill would be placed below the ordinary high water mark at any stream crossing (see Section 5.4.2.1). Therefore, the Service does not anticipate construction of Phase IV triggering any permits or authorizations. Prior to construction, however, the applicant will consult with appropriate state and federal agencies regarding any permit requirements or other authorizations that may be required (see final EIS Table 1.2). There is no requirement that the applicant avoid impacts to non-regulated streams.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
84	Westlake, Kenneth (USEPA)	[I]nformation regarding financial assurance for decommissioning and reclamation was not included in the Draft EIS. Additionally, information regarding financial assurance for mitigation, monitoring, and the adaptive management portions of the HCP was not discussed in the Draft EIS. EPA recommends the Final EIS include a discussion focused on USFWS' regulatory authority under the ESA to require financial assurance from an applicant to meet their responsibilities as stated in the HCP. **(FWS-R3-ES-2013-0034)**	Information regarding financial assurances has been included in the final EIS (see Section 3.1.2).
85	Westlake, Kenneth (USEPA)	The Geology and Soils Section of the Draft EIS . . . Revegetation will involve reseeding with native vegetation or other suitable seed mix based on land use and mulching to encourage growth. We recommend referring to the Indiana Department of Natural Resources' Native Plant List for Northern Indiana to prepare a list of plants suitable for use during re-vegetation. Please include this list as an appendix to the Final EIS. **(FWS-R3-ES-2013-0034)**	Information regarding native plants typically used in Indiana for revegetation has been included in the final EIS (see Section 5.1.2).

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
86	Westlake, Kenneth (USEPA)	We recommend the Final EIS contain typical BMPs that could be implemented to reduce impacts, particularly during construction and decommissioning. Expanding on the idea of BMPs to include a list of typical measures (i.e., cover construction materials and stockpiled soils, cover concrete batch materials, minimize disturbed area, and other dust abatement techniques) would provide reviewers with a better understanding of the actions that could be employed to reduce impacts. EPA recommends the Final EIS include examples of BMPs typically used for this type of project. **(FWS-R3-ES-2013-0034)**	FRWF has provided a standard list of BMPs that will be implemented to reduce construction and decommissioning impacts at the FRWF (see final EIS, Appendix E).
87	Westlake, Kenneth (USEPA)	EPA recommends the Final EIS be revised to indicate that any and all materials from the construction and/or the decommissioning phase will be removed from the project site, recycled, or disposed of appropriately. **(FWS-R3-ES-2013-0034)**	The Service has revised Section 1.2.2.8 of the final EIS to state: "The applicant has agreed that all materials from the construction process will be removed from the project site, recycled, or disposed of appropriately" and Section 1.2.4.1 to state “The applicant has agreed that all materials from the decommissioning process will be removed from the project site, recycled, or disposed of appropriately”, also please see section 2.1.2.8 in HCP where this is discussed.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
88	Westlake, Kenneth (USEPA)	According to The Ornithological Council, white strobe lighting typically results in the lowest mortality rate [on MET towers]. Seven permanent, un-guyed MET towers, fitted with red strobe lighting, are located with the FRWF project area, and a maximum of three additional permanent, unguyed MET towers will be constructed for Phase IV, and presumably fitted with red strobe lighting. We recommend the use of white strobe lighting on MET towers be discussed with the Federal Aviation Administration (FAA) to reduce avian mortality in the project area. If the use of white strobe lighting is not permissible, we recommend the Final EIS include the rationale behind the continued use of red strobe lighting at FRWF. **(FWS-R3-ES-2013-0034)**	The Service does not know what Ornithological Council reference is being cited. The only reference we located was a 1999 Issue Brief entitled *Deadly Spires of the Night*, which we could not find on-line. If this is what is being relied upon for the comment, it is outdated. The Service does not consider the met towers a significant risk to birds. The towers are comparatively short and they are un-guyed. Estimates are that 70% of bird fatalities are caused by the 1,000 tallest towers in the USA (Scientific American <http://www.scientificamerican.com/podcast/episode.cfm?id=communication-towers-pluck-birds-13-01-29>). In addition, studies have shown that eliminating the red steady-burning L-810 lights provides a 50% - 70% reduction in bird fatalities (Manville, A.M. II 2009). All of the FRWF towers are fitted with strobe lights. Gehring et al. (2009), found no statistically significant difference between red and white strobe lighting's effect on bird fatalities. The best available data suggests that taller, guyed towers with steady-burning (not strobe) lights are the greatest risk to migrating birds.
89	Westlake, Kenneth (USEPA)	According to the Draft EIS, . . . Bird collisions with all types of structures are episodic events involving large numbers of one or a few bird species during migration. These have been recorded at multiple locations, and are associated with lighting that attracts or disorients birds. [W]e recommend use of motion-detector lights that will shut off automatically after a pre-determined amount of time when no human movement is detected. **(FWS-R3-ES-2013-0034)**	Phases I-III use down-shields on lights and the applicant has committed to turning off lights in turbine nacelles when not needed for safety or compliance. The importance of light management for migratory birds will be incorporated into the applicant's training procedures for on-site staff. The applicant has agreed to implement the same measures at Phase IV.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
90	Westlake, Kenneth (USEPA)	We recommend the Final EIS indicate whether this [Final Eagle Conservation Plan] Guidance has been finalized and whether all relevant Guidance changes have been included in a revised bald and golden eagle management plan included in the Bird and Bat Conservation Strategy for the proposed project. **(FWS-R3-ES-2013-0034)**	Information regarding the final BGEPA guidance has been included in the final EIS (see Section 1.3.4).
91	Westlake, Kenneth (USEPA)	According to the Draft EIS, the potential for adverse effects to whooping cranes, particularly from turbines, cannot be reduced to discountable or insignificant levels. . . . . Even though the overall risk to whooping cranes at FRWF was determined to be low, based on the small total population size of the flock (~100 cranes) and the marginal quality of the habitat with the proposed project area, the Draft EIS indicated that marking power lines reduces collision rates. . . . [W]e recommend the Final EIS indicate whether the applicant will mark power lines to reduce adverse effects to whooping cranes using the project area during stopover periods when whooping cranes fly between foraging and roosting sites at sunset and sunrise. **(FWS-R3-ES-2013-0034)**	As of now, there are no data to suggest whooping cranes are roosting or foraging in proximity to FRWF's tie-in lines. Although the Service does not recognize a threat to the NEP of whooping cranes at this time, the Service has worked with FRWF to develop an adaptive management amendment to the BBCS. The adaptive management plan will result in a risk assessment of the tie-in lines should specific triggers related to whooping cranes occur. See response to Comment 55. The assessment will use the best available science and will include and evaluation of birds that might be flying between foraging and roosting grounds.
92	Buffington, Matt (IDNR)	I think we would like to see as much summer habitat protection/restoration as possible as it can benefit numerous bat species. Also, we weren't sure if all the mitigation numbers for bats were taking WNS into account or not. **(received via e-mail, PDF attached at end of section 2 of this appendix)**	As part of the mitigation package to fully compensate for the impact of taking Indiana bats, FRWF would have to implement summer habitat mitigation in addition to the IDNR coordinated gating of Wyandotte Cave. The amount of summer mitigation that would be required is approximately 250 acres. The Service is keenly aware of the potential for WNS to affect Indiana bats over the life of an ITP. WNS is figured into the changed circumstances section of the HCP and there are strategies in place to address possible impacts over the life of the permit to both summer and winter mitigation sites.

Comment No.	Commenter (Organization)	Comment (Document ID #)	Response
93	Buffington, Matt (IDNR)	In the FEIS, you may want to correct Table 1.2. The DNR, Division of Water, is in charge of the Flood Control Act, with Fish and Wildlife doing a review of the potential impacts to fish, wildlife, and plants for those permits. **(received via e-mail, PDF attached)**	The EIS has been revised (see final EIS Section 1.3.14)
94	Buffington, Matt (IDNR)	According to the State Land Office website, there are state-owned properties in Benton Co. Not parks, but still public land. http://www.in.gov/idoa/StateLandOffice/. This is correctly stated at 4.5.2.7 but the section about public use lands (4.2.2.7) suggests there is no state owned land. So technically correct but perhaps a slight misleading at first when the document states there is no state owned land in the project limits. **(received via e-mail, PDF attached)**	The EIS has been revised (see final EIS Section 4.2.2.7)
95	Buffington, Matt (IDNR)	Under 4.4.3.3 and 5.4.2.3 Floodplain, not all floodplains are mapped. Just because a FEMA map does not show a floodplain does not mean one does not exist, or that actions could not affect floodwater attenuation. Every stream has a floodplain and anything with a floodplain can be altered to affect flooding conditions. **(received via e-mail, PDF attached)**	The EIS has been revised (see final EIS Section 5.4.2.3).

FWS-R3-ES-2013-0032-0007

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APR 25 2013
Div. of Policy & Dir. Mgt.

COMMENT FORM

Name Ray Wettli

Address: 3932 W 300 S Fowler, In 47944

Telephone Number: 765 884 1732

3

I agree with your plan, & see no reason why it will not work. We need to take care of our eviroment.

Comments may be submitted at this public meeting, or by one of the following methods:

1) Electronically – Go to the *Federal eRulemaking Portal:* http://www.regulations.gov. In the Search box, enter FWS-R3-ES-2013-0032, which is the docket number for this notice. Then, on the left side of the next screen, under the Document Type heading, click on the notices link to submit a comment.
2) Hard Copy – Submit by U.S. Mail or hand delivery to: Public Comments Processing, Attention: FWS-R3-ES-2013-0032; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 North Fairfax Drive, MS 2042-PDM; Arlington, VA 22203.

Please submit comments by June 4, 2013

FWS-R3-ES-2013-0022

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MAY 28 2013
Div. of Policy & Dir. Mgt.

8840 N 125 W
Boswell, Indiana 47921

U.S. Fish & Wildlife Service
4401 N. Fairfax Drive
MS 2042-PDM
Arlington, VA 22203

May 14, 2013

Attention: Public Comments Processing
Division of Policy & Directives Management

Thank you for your concern in relationship to the wildlife and the preservation of defined species. Let us use wisdom and understanding in all of our endeavors.

As a local resident of the area, I am perplexed at the thought of the curtailment or restriction of such a well planned green energy operation. When I think of all the thousands and thousands of manhours invested in the Fowler Ridge Wind Energy project, the miles upon miles traveled delivering components for this magnificnt
21 installation, it is unfathomable to think a project of this magnitude delivering clean energy to over 220,000 homes could be vulnerable to any type restriction or temporary limited operation. It was constructed to produce electricity.

The thousands of acres of corn, wheat & soybeans sacrificed to build the facility for the betterment of mankind. The well planned safety rules and practices implemented and followed during construction and during maintenance of these facilities are commendable.

This wind farm located in the heart of American agriculture was and is constructed for the betterment of the human race and to help meet the energy needs of this and future generations. The investment in research, engineering, planning and construction is huge. Why tamper with progress? Requests were made, permits were applied for and granted, this project is capturing wind energy, clean energy for the production of electricity
21 for people. Let us utilize the clean energy producing qualities of this project and encourage them to develop more facilities of this nature being mindful and considerate of the environment and its inhabitants as they are and were with The Fowler Ridge projects.

What is the effect of herbicides, insecticides, pesticides on avian and bat wildlife? How many Indiana bats or birds have found their demise through the use of automobiles, trucks, airplanes and other motor equipment, and why was this never an issue?

In our society the use of electricity is essential to our way of life. It is good clean energy without the effects of pollutants of land, water or air. Wind farms are helping meet the increased demands of clean energy. Let us continue in the pursuit of meeting those demands.

Sincerely yours,

Justin J. Sondgeroth

FWS-R3-ES-2013-0023

22

MAY 21

To whom it may conseern -

As a land owner in the BP Fowler Ridge Wind Farms Indiana. I support BP's efforts and Conservation Plans - I think they are doing good - and I support their ~~effo~~ effort for a Incidental Take Permit, and think it should be granted —

Sincerely,

Norman R Smith
805 E 5th St,
Fowler, IN 47944

RECEIVED
MAY 28 2013
Div. of Policy & Dir. Mgt.

May 24, 2013

To Protect the bats - Please turn the turbines off.

Marcia Ellis

RECEIVED
MAY 31 2013
Div. of Policy & Dir. Mgt.

FWS-R3-ES-2013-0027

CONSERVATION LAW CENTER

116 South Indiana • Bloomington, Indiana 47408
phone: 812-856-0229 • fax: 812-855-1828
admin@conservationlawcenter.org • www.conservationlawcenter.org

June 3, 2013
Public Comments Processing
Attn: FWS-R3-ES-2013-0032
Division of Policy and Directives Management
U.S. Fish and Wildlife Service
4401 N. Fairfax Drive, MS 2042-PDM
Arlington, VA 22203

Electronic Portal submission: receipt verification requested
Federal eRulemaking Portal: http://www.regulations.gov.

Re: Comments on Draft EIS, Draft HCP/ITP, and Draft IA for Fowler Ridge wind energy facilities: FWS-R3-ES-2013-0032 [published at 78 Fed. Reg. 20690 (April 5, 2013)]

Dear Mr. Pruitt:

We offer these timely submitted comments on the Draft National Environmental Policy Act Environmental Impact Statement ("DEIS"), including Appendix D to the DEIS (the Bird and Bat Conservation Strategy, "BBCS"), and the Draft Habitat Conservation Plan ("DHCP") for the Fowler Ridge Wind Farm ("Fowler Ridge" or "Project") in Benton County, Indiana. The Conservation Law Center is a nonprofit public interest law firm located in Bloomington, Indiana. Our mission is to help clients solve natural resources conservation problems, to work to improve the body of conservation law and policy, and to educate law students in our clinical program operated in agreement with Indiana University Maurer School of Law.

We have organized our comments into three parts: (1) ITP/HCP Approval and Issuance Criteria; (2) HCP Goals and Objectives; and (3) Whooping Crane and Raptor Protection and Risk Assessment. Within each part, we provide one or more comments on the DEIS, BBCS, DHCP, or any combination of these that applies.

ISSUE 1
ITP/HCP APPROVAL AND ISSUANCE CRITERIA

COMMENT 1.1. **THE DHCP'S PROPOSED ALTERNATIVE DOES NOT MINIMIZE TAKE OF INDIANA BATS BECAUSE THE DEIS DEMONSTRATES THAT ACCORDING TO THE BEST AVAILABLE SCIENCE, THE 6.5 M/S CUT-IN SPEED ALTERNATIVE CAN REDUCE TAKE OF INDIANA BATS SIGNIFICANTLY MORE THAN THE PROPOSED CUT-IN SPEED OF 5.0 M/S.**

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To issue an ITP, the FWS must find, among other things, that the Project's applicant "will, to the maximum extent practicable, minimize and mitigate the impacts of such taking" of listed species. 16 U.S.C. § 1539(a)(2)(B)(ii).[1] This criterion contains both a minimization requirement and a mitigation requirement. For the reasons discussed below, the Applicant's proposed measures outlined in the DHCP are likely to not meet the § 1539(a)(2)(B)(ii) minimization requirement.

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The DHCP proposes to implement operational Alternative 2 from the DEIS, which calls for a cut-in speed of 5.0 m/s, with feathering, during the fall migration of Indiana bats:[2]

> 5.2.2 Minimization through Project Operations
>
> The Permittees will minimize potential take of Indiana bats from operations of the Project by implementing seasonal turbine operational adjustments. For the term of the ITP, the Permittees will: 1) raise the turbine cut-in speed to 5.0 m/s during fall migration at the FRWF (as discussed in Chapter 5 and documented in Appendices A and D, Indiana bat fatalities are not expected during spring migration, summer, or after October 15); and 2) adjust the turbine operational parameters so that the rotation of the turbine rotors below cut-in wind speed is minimized (the blades are "feathered"). Increasing cut-in speed and feathering of turbine blades below cut-in wind speed will be implemented on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, from August 1 to October 15 annually.
>
> * * *The only exception to feathering turbines below a cut-in speed of 5.0 m/s would occur on nights when temperatures are below 15.5°C (60˚ F) from August 1 to October 15. Turbines will be allowed to operate at full capacity below these temperatures.

[1] See also 50 C.F.R. § 17.22(b)(2)(i)(B) (essentially repeating the statutory language: "The Director . . . shall issue the permit if he or she finds that: . . . (B) The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings"); FWS, *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (Nov. 4, 1996), pp. 7-3 to 7-4 ("HCP/ITP Handbook"); FWS, *Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects, Revised* (Oct. 26, 2011) ("Wind Energy Project Guidance"), p. 47.

[2] Fowler Ridge Wind Farm, Draft Indiana Bat Habitat Conservation Plan (March 2013) ("DHCP"), pp. 52–53.

The DEIS analyzes three action alternatives, all of which involve operational curtailment at some specified cut-in speed, with feathering below that speed to stop blade rotation: Alternative 1 – 3.5 m/s Cut-in Speed; Alternative 2 – 5.0 m/s Cut-in Speed (Applicant's Proposed Action); and Alternative 3 – 6.5 m/s Cut-In Speed.[3]

Under Alternative 1, the turbine blades are "feathered" when the wind speed is below 3.5 m/s (3.5 Meters per Second = 7.83 Miles per Hour) so that there is no or little movement of the blades at those wind speeds. When the 5 to 10 minute rolling average of wind speed at a turbine is above 3.5 m/s, the blades of that turbine are allowed to rotate. This protocol would be implemented nightly from sunset to sunrise (adjusted weekly to track the change in those times) from August 1 to October 15 annually.[4]

Under Alternative 2, the turbine blades are "feathered" when the wind speed is below 5.0 m/s (5 Meters per Second = 11.18 Miles per Hour). When the wind speed increases to above 5.0 m/s the blades are allowed to rotate. This protocol would be implemented nightly from sunset to sunrise (adjusted weekly to track the change in those times) from August 1 to October 15 annually. In addition, on nights when the 5 to 10 minute rolling average temperature drops below 60˚ F at a turbine, that turbine would be allowed to operate at full capacity.[5] Alternative 2 is the Applicant's proposed action in the DHCP.

Under Alternative 3, the turbine blades are "feathered" when the wind speed is below 6.5 m/s (6.5 Meters per Second = 14.54 Miles per Hour). Otherwise, Alternative 3 appears to be identical to Alt. 2 with respect to the operational protocol.[6]

The DEIS compares the environmental consequences of these three action alternatives for the Indiana bat. The DEIS's Tables 5.4 and 5.5, which summarize the predicted Project-related fatalities of Indiana bats, are reproduced below.[7] <u>The DEIS, which presumably reflects the best available science, predicts that a cut-in speed of 6.5 m/s (Alternative 3) will reduce Indiana bat fatalities to less than half of what the fatalities would be with a cut-in speed of 5.0 m/s</u>

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[3] USFWS, *Draft Environmental Impact Statement for Proposed Habitat Conservation Plan and Incidental Take Permit, Fowler Ridge Wind Farm* (March 2013) ("DEIS"), Table 5.1, p. 90.
[4] DEIS, p. 23.
[5] DEIS, pp. 24–25.
[6] DEIS, pp. 26–27.
[7] DEIS, pp. 127–128.

(Alternative 2, Applicant's proposal). The lack of overlap between the confidence intervals in Table 5.4 shows that this difference in predicted fatalities is highly statistically significant. Table 5.5 shows that over the proposed 22-year life of the Project, implementing a 5.0 m/s cut-in speed, as proposed by the Applicant, would cause 196 deaths of endangered Indiana bats, whereas a 6.5 m/s cut-in speed is predicted to reduce that take to 86 Indiana bats.

Table 5.4 Predicted Indiana Bat Fatalities per Year by EIS Alternative

Alternative	Indiana Bat Take			
	Bats/Turbine/Year (fall only)	355 Turbines[3] (bats/yr) (90% CI)	449 Turbines[4] (bats/yr) (90% CI)	94 Turbines[5] (bats/yr) (90% CI)
No Operational Adjustment Scenario[1]	0.048[56]	17.0 (14.0-21.1)	21.6 (18.0-26.9)	4.5 (3.8-5.6)
No Action Alternative[2]	0	0	0	0
3.5m/s Cut-In Speed (Feathered) Alternative	0.031	10.9 (9.0-13.5)	13.9 (11.5-17.2)	2.9 (2.4-3.6)
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	0.024	8.6 (7.0-10.6)	10.9 (8.8-13.4)	2.3 (1.9-2.8)
6.5m/s Cut-In Speed Alternative	0.011	3.9 (3.1-4.6)	4.9 (4.0-5.9)	1.0 (0.8-1.2)

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Phases I - III in operation; 2 year of the 22-year life of the Project
[4]Phases I - IV in operation; 15 years of the 22-year life of the Project
[5]Phase IV only in operation; 5 years of the 22-year life of the Project

Table 5.5 Predicted Indiana Bat Fatalities over the 22-Year Life of Fowler Ridge Wind Farm by EIS Alternative

Alternative	Indiana Bat Take [3]
No Operational Adjustment Scenario[1]	381
No Action Alternative[2]	0
3.5m/s Cut-In Speed (Feathered) Alternative	245
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	193
6.5m/s Cut-In Speed Alternative	86

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Take = (total bats killed per year Phases I - III (355 turbines) x 2 years) + (total bats killed per year Phases I - IV (449 turbines) x 15 years) + (total bats killed per year Phase IV x 5 years)

The DEIS's estimates of the differential effectiveness of the 5.0 m/s and 6.5 m/s cut-in speeds is supported by studies of cut-in speed discussed in the DHCP, in particular the 2010 and 2011 Fowler Ridge studies.[8] In the 2010 study of cut-in speeds at Fowler Ridge,[9] from 1 August 2010 to 15 October 2010, 27 turbines were randomly assigned on a weekly basis to 1 of 3 experimental groups: fully operational, cut-in speed of 5.0 m/s, or cut-in speed of 6.5 m/s. An additional 9 turbines were fully operational for the entire survey period. Curtailment at 5.0 m/s was found to reduce mortality by about 50% (90% CI = 37% to 61%), and curtailment at 6.5 m/s was found to reduce mortality by about 79%[10] (90% CI = 71% to 85%). This difference is statistically significant.[11] The 2010 study did not use feathering, however, and the turbines with raised cut-in speeds had blade tips rotating at 50 mph or faster prior to reaching cut-in speeds, albeit at a reduced rate compared to control turbines.

Good et al. conducted a follow-up study of cut-in speed at Fowler Ridge in 2011.[12] The primary objective of the 2011 research was to measure the effectiveness of feathering turbine blades prior to reaching cut-in speeds for reducing bat fatality rates. In this 2011 follow-up study, nine turbines were randomly selected from a sample of 36 cleared plots as a "control" sample and were assigned no treatments for the duration of the study. Treatments for blade feathering and a second set of "control" turbines were rotated on a nightly basis between 168 turbines, with 42 turbines assigned to each group. Unfortunately, this study did not use the same treatments as the 2010 study. The treatments in 2011 included turbines with blades feathered below 5.5 m/s, below 4.5 m/s, and below 3.5 m/s, and a control group with no feathering. The results of this 2011 feathering experiment show that further reductions in bat fatality rates were uniformly realized by feathering the blades below cut-in speeds, compared to simply raising cut-in speeds and allowing the blades to seek the wind. Bat casualty rates were decreased by about 36%, 57%, and 73% in 2011 when blades were feathered at 3.5 m/s, 4.5 m/s, and 5.5 m/s,

[8] See Arnett et al., *Effectiveness of Changing Wind Turbine Cut-In Speed to Reduce Bat Fatalities at Wind Facilities: A Final Report Submitted to the Bats and Wind Energy Cooperative* (May 2010); Good et al., *Bat Monitoring Studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana, April 13 – October 15, 2010: A report prepared for Fowler Ridge Wind Farm* (Jan. 28, 2011); see also Good et al., *Bat Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana, April 1 – October 31, 2011: A Report Prepared for Fowler Ridge Wind Farm* (Jan. 31, 2012).
[9] Good et al. (2011).
[10] The actual result is 78.6%, but Good et al. do not round up when explaining the results. See Good et al. (2011), p. 39.
[11] See Good et al. (2011), p. 39.
[12] Good et al. (2012).

respectively, compared to control turbines. The following Table 1 summarizes the results of the 2010 and 2011 Fowler Ridge studies.

Table 1. Results of Fowler Ridge studies of cut-in speed: mean reduction in bat fatalities with change in cut-in speed only (2010) and with change in cut-in speed plus feathering of blades (2011), relative to "normal" operation (3.5 m/s cut-in speed with no feathering).

Cut-In Speed	**2010 Fowler Ridge Study (without feathering)**	**2011 Fowler Ridge Study (with feathering)**
3.5 m/s	Normal Operation	36%
4.5 m/s	No treatment	57%
5.0 m/s	50%	No treatment
5.5 m/s	No treatment	73%
6.5 m/s	79%	No treatment

These results of the Fowler Ridge studies reasonably lead to two conclusions. First, the best available science for this Project indicates that a cut-in speed of 6.5 m/s can significantly reduce turbine-related mortality of bats, and by implication, Indiana bats, compared to a cut-in speed of 5.0 m/s. Second, although the 2011 study failed to include 6.5 m/s with feathering as a treatment (which would have allowed direct comparison with the results of that cut-in speed in the 2010 study), a reasonable conclusion is that feathering below 6.5 m/s cut-in speed may reduce mortality even further than the 79% found in 2010. In fact, these results suggest a hypothesis that if turbines at Fowler Ridge are feathered below a wind speed of 6.5 m/s or above, Indiana bat fatalities might be nearly eliminated. There is simply no reason to believe that, had feathering been used in the 2010 Fowler Ridge study, the statistically significant difference between the 5.0 m/s and 6.5 m/s treatments would have disappeared or that feathering below 6.5 m/s would not have produced a bump in effectiveness similar to the increases observed at other cut-in speeds.

Finally, the parameters used in the DHCP's adaptive management simulation also supports the conclusion that cut-in speeds higher than the proposed 5.0 m/s are more effective at reducing take of Indiana bats. The simulation assumes an additional 10% mean reduction in fatality for every 0.5 m/s increase in cut-in speed that occurs during the adaptive management

process.[13] Although this positive relationship between mortality reduction and cut-in speed is based on the 2011 Fowler Ridge study, which tested 3.5, 4.5, and 5.5 m/s cut-in speeds, the existing data provide no reason to expect that this positive relationship would suddenly disappear at a cut-in speed of 6.5 m/s.

28 Accordingly, the best available science as reflected in the DEIS and the studies of cut-in speed at Fowler Ridge shows that the DHCP's proposed operational alternative does not minimize the take of Indiana bats when compared to the DEIS's Alternative 3.

COMMENT 1.2. **ACCORDING TO *GERBER V. NORTON*, TO APPROVE THE APPLICANT'S PROPOSED 5.0 M/S CUT-IN SPEED AND STILL SATISFY THE ITP MINIMIZATION REQUIREMENT, THE FWS MUST FIND, BASED ON SUBSTANTIAL EVIDENCE IN THE RECORD, THAT HIGHER CUT-IN SPEEDS CAUSING SIGNIFICANT FURTHER REDUCTION IN TAKE ARE "IMPRACTICABLE."**

29

The Applicant must minimize the impact of take to the maximum extent practicable in order to obtain an ITP. Choosing a minimization plan that is reasonably likely to be *less* effective at reducing take than a known and available alternative plan will fail to satisfy the minimization requirement at 16 U.S.C. § 1539(a)(2)(B)(ii), *unless* the Applicant can show that a more effective alternative is "impracticable."[14]

We have explained in Comment 1.1 that the data presented in the DEIS and the supporting studies of the effectiveness of raising cut-in speed for avoiding bat mortality reasonably indicate that the DEIS's Alternative 3 – *i.e.*, feathering below a cut-in speed of 6.5 m/s – is more likely to minimize the take of Indiana bats than the proposed Alternative 2 (feathering below a cut-in speed of 5.0 m/s) or Alternative 1 (feathering below a cut-in speed of 3.5 m/s). Thus, the Applicant's proposed curtailment plan – DEIS's Alternative 2 – is *not* the alternative that minimizes take of Indiana bats. This is not a situation where it is unclear how to

[13] DHCP, p. 81 ("This percent increase was selected based on the 2011 FRWF study of feathered turbines in which three cut-in speeds with turbine blades feathered below cut-in were tested. Percent decreases of 35.6, 58.5 and 75.2 were observed for 3.5, 4.5, and 5.5 m/s cut-in speeds, respectively. Thus, a 22.9% and 16.6% increase in fatality reduction from normal operation was observed with increases of 1.0 m/s in cut-in speed. This approximates to an average increase in fatality reduction of 10% per every 0.5 m/s increase in cut-in speed.").
[14] See USFWS, *HCP/ITP Handbook*, pp. 7-3 to 7-4.

30 minimize take. The data show that the more effective Alternative 3 is known and available, and its superior effectiveness for protecting Indiana bats is supported by the best available science. Thus, pursuant to § 1539(a)(2)(B)(ii), the Applicant must show, and the agency must find, that reducing take further than proposed in Alternative 2 is not "practicable."

The controlling judicial opinion on this matter is *Gerber v. Norton*, 294 F.3d 173 (D.C. Cir. 2002). In *Gerber v. Norton*, FWS issued an ITP to a residential developer to take an endangered fox squirrel. The Environmental Assessment had presented a "Reduced Impact Alternative" to the applicant's proposed plan that "would reduce the likelihood of take" of fox squirrels by relocating the development's access road "away from the [squirrels'] forested edge habitat," but the applicant rejected the more effective alternative.[15] The *Gerber* Court found that the agency's permit issuance violated the ESA. The Court stated that "before issuing the permit, the Service was obliged to find independently that no practicable alternative to [the applicant's] development plan would minimize the taking of fox squirrels." The Court then concluded, "Given the Service's finding that moving the road would reduce the taking of squirrels, the agency could not have issued the permit consistent with [the ESA] without making a finding that the Reduced Impact Alternative was impracticable."[16] *Gerber v. Norton* teaches that the agency cannot approve an ITP/HCP for a purported minimization strategy that the best available science reasonably indicates is significantly less effective at reducing take than an alternative, *unless* the more effective alternative is found to be impracticable to achieve.

The Fowler Ridge DHCP appears poised to commit the same error considered in *Gerber v. Norton*. 31 Neither the DHCP nor the DEIS presents or references any substantial evidence in the record that Alternative 3 is impracticable.[17] The Applicant thus proposes a less effective alternative without presenting the necessary evidence that this alternative represents the highest reduction in take that can be practically achieved when compared to other alternatives. FWS's approval of the DHCP's proposed minimization plan would require a supported finding by the agency that the DEIS's Alternative 3 curtailment plan, and other alternatives with similar cut-in speeds, are impracticable.

[15] Id. at 177–78.
[16] Id. at 185.
[17] See also Comment 1.3 below.

COMMENT 1.3. THE APPLICANT'S CLAIM THAT 5.0 M/S CUT-IN SPEED IS THE HIGHEST CUT-IN SPEED THAT ALLOWS FOR PROJECT VIABILITY IS SUSPECT AND IS CURRENTLY UNSUPPORTED BY SUBSTANTIAL EVIDENCE.

32

A. The Applicant's Claim of Impracticability Is Suspect.

The Applicant claims that its proposed alternative of 5.0 m/s cut-in speed "represents the maximum extent to which [the Applicant] can reduce turbine operations and maintain Project viability[.]"[18] This claim is highly suspect for several reasons.

First, the Applicant agrees to implement an adaptive management plan that includes raising cut-in speeds in 0.5 m/s increments, if needed, to assure that bat mortality does not exceed what is deemed to be acceptable limits.[19] How is it possible for the Applicant to promise to implement higher cut-in speeds than the proposed 5.0 m/s as part of an adaptive management plan if the Applicant is correct that such higher cut-in speeds would cause the Project to be economically nonviable? This apparent inconsistency begs the question of what the Applicant means by "Project viability." The DHCP fails to explain this apparent inconsistency.

33

34 Second, published evidence indicates that operational alternatives with 6.5 m/s cut-in speed are indeed practicable. Arnett et al. studied the power loss and financial costs associated with raising cut-in speeds and found that although power loss was three times higher for the 6.5 m/s cut-in speed as compared with the 5.0 m/s cut-in speed, "[l]ost power production resulting from [their] experimental treatments was markedly low when considering total annual productivity[.]"[20] The authors had earlier concluded in their report on the Casselman study that if the 6.5 m/s cut-in speed had been applied to all 23 turbines during the study period, the lost output would have amounted to only 1% of total annual output.[21] Similar percentage results can be expected in both larger and smaller arrays of turbines. These published results indicate that, by applying a cut-in speed of 6.5 m/s to an array of turbines, lost power revenues would be relatively small while bat mortality would be significantly reduced when compared to a 5.0 m/s cut-in speed.

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[18] DEIS, Appendix D, p. 36.
[19] DHCP, pp. 73–77; DEIS, Appendix D, pp. 37, 43–48.
[20] Arnett et al., *Altering Turbine Speed Reduces Bat Mortality at Wind Energy Facilities*, Frontiers in Ecology and the Environment 9 (2011), pp. 213–214.
[21] Arnett et al., *Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities – 2008 Annual Report* (2009), p. 3, *available at* http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf.

35 Third, the DHCP does not present or reference any evidence that the DEIS's Alternative 3, or any other alternative that uses a cut-in speed of 6.5 m/s, is economically nonviable or impracticable. It is of course likely that the cost of implementing a 6.5 m/s cut-in speed will be higher than the cost of implementing a 5.0 m/s cut-in speed. But the fact of the increased cost associated with raising the cut-in speed is not alone sufficient to find that the increase in cost is not practicable. Costs must be viewed in relation to the resources and financial ability of the applicant.

36 in part

B. The Applicant's Claim of Impracticability Is Not Supported By Substantial Evidence Currently in the Record.

As mentioned above, the Applicant claims in Appendix D of the DEIS that the proposed Alternative 2, with a 5.0 m/s cut-in speed, "represents the maximum extent to which [the Applicant] can reduce turbine operations and maintain Project viability, *as demonstrated in the confidential financial document associated with the HCP*."[22] This bare claim of economic nonviability by the Applicant relates directly to the "practicability" standard in the § 1539(a)(2)(B)(ii) criterion for agency approval of the ITP/HCP.

On April 23, 2013, we requested from FWS the referenced "financial document," as well as any other information regarding the practicability of the DEIS's Alternative 3, pursuant to FOIA. As of the date of submission of these comments, the non-redacted portion of the single document released by FWS presents four arguments, none of which constitutes substantial evidence to support the claim that 5.0 m/s is the highest cut-in speed that can be practicably achieved by the Applicant.

37 The first argument in the released document is that the Fowler Ridge Wind Farm contracts were negotiated when neither the Applicant nor the agency expected to discover the presence of an Indiana bat at the Project site, and so the contracts did not consider the costs of minimization and mitigation under the ESA.[23] If this argument is made in good faith, the failure to foresee the possibility that Indiana bats might migrate through the Project area and the failure to incorporate ESA considerations into the Fowler Ridge contracts is simply unreasonable and

[22] DEIS, Appendix D, p. 36 (emphasis added).
[23] See, e.g., Fowler Ridge Wind Farm, *Fowler Ridge Wind Farm Financial Impact of Minimization Options Prepared as Supplemental Information in Support of Maximum Extent Practicable in the Proposed HCP Application* (February 8, 2012), pp. 1–2.

37 possibly legally negligent. Sources of information available before the Fowler Ridge Project initiated operation indicated that the presence of the Indiana bat in northern Indiana around and in Benton County, at least during the fall migration period, was possible if not likely.[24] The Applicant took a business risk that no ESA listed species would be affected by the Project and the Applicant was wrong.

The second argument in the released document is that reducing the opportunity for turbines to generate power by raising the cut-in speed "directly reduces income and hence profitability."[25] Granted, implementing a cut-in speed of 6.5 m/s *may* reduce the income of the
38 Applicant relative to a 5.0 m/s cut-in speed because the turbine blades are expected to be generating electricity for fewer hours with the higher cut-in speed. In fact, the actual reduction in yearly income associated with using the higher cut-in speed will depend on the observed wind speeds throughout the fall season – specifically, on the number of hours in which wind speeds are between 5.0 m/s and 6.5 m/s. Without considering this and other factors, the expected reduction in income due to implementing Alternative 3 rather than Alternative 2 is speculative. In any event, increased cost does not necessarily imply that a measure is impracticable pursuant to § 1539(a)(2)(B)(ii).

The third argument is really not an argument – it is simply a bare conclusion that a cut-in speed of 5.0 m/s is considered by the Applicant to be "the absolute maximum extent practicable
39 operational change that can be made and still maintain a healthy cash flow, as expected by our investors."[26] This bare conclusion is stated without any supporting evidence or discussion of what constitutes "healthy" cash flow and why.

Finally, the Applicant appears to argue that investor expectation of profit is, or should be,
40 a determining factor in the practicability determination under § 1539(a)(2)(B)(ii). This begs the question of what rate of return is reasonable to expect and whether practicability depends on investor expectation. This argument also circles back to the first of Applicant's arguments, in

[24] See, e.g., USFWS, *Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision* (April 2007),
[25] See, e.g., Fowler Ridge Wind Farm, *Fowler Ridge Wind Farm Financial Impact of Minimization Options Prepared as Supplemental Information in Support of Maximum Extent Practicable in the Proposed HCP Application* (February 8, 2012), p. 2.
[26] See, e.g., Fowler Ridge Wind Farm, *Fowler Ridge Wind Farm Financial Impact of Minimization Options Prepared as Supplemental Information in Support of Maximum Extent Practicable in the Proposed HCP Application* (February 8, 2012), p. 3.

40 which the Applicant unreasonably led investors to believe that the Project, built in the state with by far the largest number of recorded maternity colonies and the largest hibernating population of the highly mobile endangered Indiana bat,[27] would incur no costs associated with ESA compliance.

36 cont. The non-redacted portion of the document released to date pursuant to our FOIA request thus does not present substantial evidence to support the Applicant's claim that 5.0 m/s is the highest cut-in speed that can be practicably achieved.

41 Yet for the agency to make a final finding regarding the practicability of the DEIS's Alternative 3 under § 1539(a)(2)(B)(ii), the agency must support its finding with substantial evidence in the record. Moreover, the public is entitled to fully evaluate any evidence on which the agency relies to make a finding regarding practicability. The agency cannot rely upon evidence that is withheld from the public. In other words, the agency cannot make a finding regarding practicability and then contend that the evidence underlying its finding, and on which it relies, is secret and cannot be disclosed to the public. Therefore, FWS cannot rely on information in the *redacted* portions of any document released under FOIA to support the agency's ultimate finding on the practicability of Alternative 3.

The *Gerber v. Norton* Court decided the issue of whether information relevant to ITP issuance could be withheld from the public. Under 16 U.S.C. § 1539(c), "Information received by the [Service] as part of any [incidental take permit] application shall be available to the public as a matter of public record at every stage of the proceeding." In *Gerber*, the FWS tried to keep secret, under a claim of confidentiality, a map of an off-site mitigation area that the applicant had submitted to the agency and was relying on for its HCP. The Court said that this was a clear violation of ESA, which requires that all of the information on which the ITP/HCP is based must be made available for public comment. Thus, under § 1539(c), "the map of the off-site mitigation parcel had to be made available to the public, because it was intended to be part of [the applicant's ITP/HCP] application."[28] The Court further concluded that "[t]he Service was also required to make the map available pursuant to section 10(a) of the ESA, which instructs the agency to provide an 'opportunity for public comment, with respect to a permit application and

[27] USFWS, *Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision* (April 2007), pp. 26, 29, 41–51.
[28] Gerber v. Norton, 294 F.3d at 179.

the related conservation plan.' 16 U.S.C. § 1539(a)(2)(B). That opportunity for comment must be a meaningful opportunity. . . . But as Defenders quite reasonably complained, they could not meaningfully comment on the mitigation value of the off-site parcel without knowing its location. . . . [T]here could not have been a meaningful opportunity to comment on the application without a meaningful opportunity to comment on the site."[29]

COMMENT 1.4. **THE APPLICANT'S "COMMENSURATE" OR "GOOD ENOUGH" APPROACH TO MINIMIZATION UNDER 16 U.S.C. § 1539(A)(2)(B)(II) CONTRAVENES THE PLAIN MEANING OF THE ESA AND IS INVALID.**

42

The Applicant claims that its proposed operational strategy (*i.e.*, DEIS's Alternative 2) to feather turbine blades below a wind speed of 5.0 m/s will "minimize" potential take of Indiana bats from operations by the Project.[30] As discussed above in Comments 1.1 and 1.2, the Applicant's claim of minimization does not reflect the best available science. Rather, the best available science, as presented in the DEIS, points to DEIS's Alternative 3 – feathering below a wind speed of 6.5 m/s – as the measure that will actually minimize take of Indiana bats. The Applicant's DHCP does not dispute that Alternative 3 can reduce take of Indiana bats significantly more than the Applicant's proposed Alternative 2.

Yet the Applicant seems to take the position in the DHCP that the proposed 5.0 m/s cut-in speed is somehow good enough, even though the significantly more effective Alternative 3 is known and available.

For example, the DHCP's objective for Goal 1 appears to be contrived to reach the conclusion that a cut-in speed of 5.0 m/s, which reduces take of Indiana bats by 50% relative to the take with no operational adjustment, is good enough.[31] Goal 1 is to "[m]aintain the integrity of Indiana bat migration through the Project area." The associated objective is stated as follows:

[29] Gerber v. Norton, 294 F.3d at 179. In addition, the Gerber Court held that FWS could not simply defer to the applicant's assertion as to what minimization measure was practicable; rather, the record would have to reflect that the agency itself made the requisite determination, and the agency's own analysis would have to be set forth in the record. Id. at 185.
[30] See, e.g., DHCP, p. 52.
[31] See DEIS, Table 5.5.

> Objective to achieve Goal 1: Implement an operational strategy that will decrease fall bat mortality by at least 50% compared to levels documented at control turbines during 2010 and 2011 mortality monitoring, and thereby decrease mortality of all bats and Indiana bats to no more than 193 Indiana bats over the 22-year operational life of the Project.[32]

The choice of an objective that starts with, and *a priori* finds acceptable, a 50% reduction in mortality is arbitrary and reflects an invalid "good enough" approach to meeting the § 1539(a)(2)(B)(ii) minimization requirement.[33]

Moreover, the Applicant seems to compare the effectiveness of its proposed strategy to past observed mortality, mortality which does not reflect § 1539(a)(2)(B)(ii) minimization efforts. Granted, the DHCP's proposed operational strategy is more effective at reducing take than the manufacturer programmed settings or "normal" operation at 3.5 m/s cut-in speed. But doing *some* good is not sufficient. The proper comparison for the proposed strategy is instead with a measure that the best available science reasonably indicates is significantly more effective – e.g., Alternative 3.

42

To the extent that the DHCP is making a "good enough" or "commensurate" argument to support the choice of Alternative 2, this approach is not sufficient and is not the standard for issuance of an ITP. Drawing a balance between reducing impacts to bats and maintaining "optimal" Project operation and electricity generation[34] will not satisfy the § 1539(a)(2)(B)(ii) minimization requirement for ESA listed species. Under § 1539(a)(2)(B)(ii), impacts to the Indiana bat must be minimized to the maximum extent practicable, *not* reduced to the extent that balances species protection with optimal Project operation and generation of electricity. A "good enough" or "commensurate" approach to the minimization requirement in § 1539(a)(2)(B)(ii) conflicts with the ruling in *Gerber v. Norton*, 294 F.3d 173 (D.C. Cir. 2002), and violates the ESA. (We incorporate by reference CLC's submitted "Comments on Final EIS and Final HCP

43

[32] DHCP, p. 50.

[33] Elsewhere FWS has referred to this ad hoc "good enough" approach to meeting the in § 1539(a)(2)(B)(ii) minimization requirement as a "commensurate" approach in which the level of take allowed is geared to be proportional to the perceived level of risk of take. See our comments on the final HCP and EIS for the Buckeye Wind Energy Project at CLC's submitted "Comments on Final EIS and Final HCP for Buckeye wind power project, Champaign County, Ohio, FWS-R3-ES-2012-0036," Document ID: FWS-R3-ES-2012-0036-0099, incorporated here by reference.

[34] See DEIS, Appendix D, p. 43.

43 for Buckeye wind power project, Champaign County, Ohio, FWS-R3-ES-2012-0036," Document ID: FWS-R3-ES-2012-0036-0099, which discusses this issue in further detail.)

COMMENT 1.5. THE APPLICANT CANNOT GET AROUND THE MINIMIZATION REQUIREMENT BY PROMISING MITIGATION.

44 To the extent that the DHCP also appears to suggest that Alternative 2 is good enough because the take of Indiana bats will be mitigated, such an approach is invalid. Mitigation is selected only *after* the impact of take is minimized to the maximum extent practicable. FWS guidance states in relevant part:[35]

> 68. Is it allowable for an applicant to mitigate in lieu of minimization measures, or must the applicant first minimize if possible?
>
> Response: An applicant must first minimize to the maximum extent practicable.
>
> 69. How do developers demonstrate "to the maximum extent practicable" when it comes to siting wind projects? How do we evaluate whether their "demonstration" is sufficient?
>
> Response: In reviewing an applicant's HCP, the Service must analyze the biological impacts of the project on the covered species. If the proposed siting of some or all of the turbines will cause impacts to the species the applicant should minimize those impacts by moving the turbines to more suitable locations. If an applicant is unwilling to move the turbines to further minimize the impacts due to economic reasons, the Service should require them to provide justification why they are unable to do so. An independent analysis or third party should review the information provided by the applicant to verify they have sited the turbines to the maximum extent practicable.

In various contexts the agency has repeatedly recognized that the applicant for an ITP/HCP is required to mitigate the level of take that is "unavoidable" after (*i.e.*, in spite of) minimization efforts. Take is "unavoidable" only if take that can practicably be avoided is in fact avoided.

[35] FWS, *Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects, Revised* (Oct. 26, 2011) ("*Wind Energy Project Guidance*"), pp. 47–48.

The DHCP states it will mitigate the level of take that is "unavoidable."[36] Table 5.5 in
45 the DEIS shows, however, that by implementing Alternative 3 (*i.e.*, 6.5 m/s cut-in speed) rather than the proposed Alternative 2 (*i.e.*, 5.0 m/s cut-in speed), the Project can avoid the take of 107 Indiana bats (Alternative 2's 193 bats minus Alternative 3's 86 bats). The proposed level of take is thus avoidable.

COMMENT 1.6. THE APPLICANT CANNOT GET AROUND THE MINIMIZATION REQUIREMENT BY PROMISING ADAPTIVE MANAGEMENT.

The DHCP seems to suggest that the proposed Alternative 2 is sufficient in part because
46 cut-in speed will be increased in 0.5 m/s increments if the proposed take limit is exceeded.[37] To the extent that the DHCP suggests that the Applicant can rely on adaptive management to satisfy the minimization requirement in § 1539(a)(2)(B)(ii), such an approach is invalid. Such a wait-and-see approach does not satisfy § 1539(a)(2)(B)(ii) and cannot make up for selecting a strategy that is, at best, the second most effective minimization measure, for two reasons.

First, the take limit that serves as the threshold or trigger for implementing an adaptive
47 increase in cut-in speed will itself be the result of selecting an inferior non-minimizing option. By the time the selected threshold is exceeded, more Indiana bats will already have been killed than would have been killed under the true minimizing alternative. The DHCP's proposed adaptive management plan thus risks locking in the results of a non-minimizing curtailment regime as a threshold for adaptive management for the entire term of the permit.

Second, a foundational feature of an adaptive management plan is that adaptive management cannot substitute for a showing of reasonable certainty that substantive criteria will be met.[38] Specifically, an adaptive management plan cannot be used to justify holding back measures that the best available science reasonably indicates can minimize take. A proposal to hold back a significantly more effective alternative unless or until a less-effective strategy does not work as expected is inconsistent with § 1539(a)(2)(B)(ii). Yet this is what the DHCP is
48 proposing. The HCP must instead implement what the current best available science reasonably

[36] See, e.g., DHCP, p. 55.
[37] See DHCP, p. 73–77.
[38] J. B. Ruhl & R. Fischman, *Adaptive Management in the Courts*, 95 Minn. L.Rev. 424, 472 (2010).

48 indicates is the most effective yet practicable alternative – which is likely to be Alternative 3 or another similar alternative – and work from there. If monitoring or experimentation then shows that cut-in speeds lower than 6.5 m/s can produce a statistically equivalent reduction in take, this *new* information might then be used to amend the minimizing strategy in the future. This is the *proper* use of adaptive management in the ITP/HCP context.

COMMENT 1.7. THE DEIS'S ACTION ALTERNATIVE 3 SHOULD BE THE PREFERRED ALTERNATIVE.

49 Of the three action alternatives presented in the DEIS, FWS's Preferred Alternative should be Alternative 3, the "6.5 m/s Cut-In Speed Alternative."[39] As the DEIS's Tables 5.4 and 5.5 show, predicted fatalities of Indiana bats, both yearly and life-of-Project, are statistically significantly lower under Alternative 3 than under Alternative 2 (5.0 m/s Cut-In Speed) or Alternative 1(3.5 m/s Cut-In Speed).[40] In fact, predicted Indiana bat fatalities under Alternative 3 are less than half of the predicted Indiana bat fatalities under Alternative 2, the Applicant's proposed alternative.[41] Not only does Alternative 3 provide the significantly lowest take for the Indiana bat, Alternative 3 also provides the lowest fatality rate for all non-listed bat species combined, calculated both per year and per Project life: predicted non-listed bat fatalities under Alternative 3 are about half of the predicted fatalities under Alternative 2 (80,649 versus 147.458, respectively, over the 22-year life of the Project).[42] Given the EIS's purposes, Alternative 3 best meets the agency's needs.

[39] DEIS, Table 5.1, p. 90.
[40] DEIS, Tables 5.4 and 5.5, pp. 127–28.
[41] Id.
[42] DEIS, Table 5.2 and 5.3, p. 110.

ISSUE 2
HCP GOALS AND OBJECTIVES

COMMENT 2.1. THE DHCP'S OBJECTIVE FOR GOAL 5 REFLECTS CONFLICTING TARGETS THAT CANNOT SATISFY § 1539(A)(2)(B)(II).

The DHCP's fifth biological goal for the Fowler Ridge Project states as follows:

> Optimize electrical output of the Project to realize the environmental benefit of wind energy. Specifically, increased generation from wind energy facilities has the potential to offset demand for other energy generation technologies that produce carbon emissions that have been shown to contribute to global climate change, identified as a potential risk to Indiana bats (USFWS 2007)."[43]

The DHCP then states an objective that is claimed to be a measurable target needed to achieve Goal 5:[44]

> Objective to achieve Goal 5: Implement an operational strategy at the FRWF that *maximizes* output of non-carbon-emitting, renewable energy *that also minimizes* incidental take of Indiana bats to the [maximum extent practicable].[45]

Goal 5 and its objective are based on illogic and faulty assumptions. These shortcomings are important because the agency will likely not consider alternatives that it deems do not meet the stated goals and objectives of the HCP. The goals of the HCP are the rationale behind minimization and mitigation strategies, and the objectives are measurable targets to achieve the goals.[46]

A. The Objective for Goal 5 Appears to Be Impossible to Achieve and the DHCP Makes No Attempt to Explain How It Can Be Achieved.

50 First, <u>the DHCP fails to explain how it will be possible to simultaneously *minimize* incidental take of Indiana bats to the maximum extent practicable and *maximize* power output from the facility.</u> Such a claim is untenable. FWS must ensure that the biological goals and objectives are consistent with conservation actions needed to adequately minimize and mitigate impacts to the covered species to the maximum extent practicable. It may be logical and

[43] DHCP, p. 51.
[44] DHCP, p. 52 (emphasis added).
[45] DHCP, p. 52 (emphasis added).
[46] See USFWS, *HCP 5-Point Policy*, 65 Fed. Reg. 35242 (June 1, 2000).

consistent with the ESA to say, in contrast, that one is attempting to maximize power output *subject to* the constraint of minimizing take, but that is not what the DHCP is claiming to do.

Specifically, it is reasonable to suppose that operational output of the Project generally increases with the number of turbines spinning, the length of time the blades are spinning (both seasonally and daily), and the speed at which those blades spin. For example, maintaining cut-in speed at 3.5 m/s would generally increase operational output relative to higher cut-in speeds. It is also reasonable to suppose that the risk of bat mortality generally increases with more turbines spinning, for longer periods and at faster speeds. Thus, maximizing output of the Project seems
50 to preclude, or at least conflict with, minimizing take of Indiana bats to the maximum extent practicable. It appears that the DHCP may be attempting to *balance* a desirable level of power output from the facility with a "good enough" reduction in turbine-related fatalities of Indiana bats. As discussed above in Comment 1.4, this "good enough" approach will not satisfy the § 1539(a)(2)(B)(ii) minimization requirement.

B. The Causal Chain Proposed in Goal 5 Is Not Credible.

The DHCP's Goal 5 appears to claim that optimizing electrical output of the Project will have a positive effect on climate change and reduce risk to Indiana bats.[47] Such a claim is not credible. Nothing in the DHCP or the DEIS shows or even suggests that increased power output from the Fowler Ridge facility would reduce GHG emissions from other energy sources. Such a claim would require that one megawatt of coal-produced power will be taken permanently offline in exchange for each megawatt of power produced by the Project. Absolutely no evidence is presented that this will occur. Thus, this causal link is just speculation.

51

Even if the aforementioned offset of coal-fired power generation did occur for the Project, nothing referenced in the DHCP or DEIS shows that such an offset would slow or ameliorate environmental changes that may occur in Indiana or the Midwest region due to GHG emissions. No evidence is presented of a relationship between reducing GHG emissions in Indiana specifically and any climate-related habitat changes in recovery units of the Indiana bat.

[47] If this is not the claim being made, then Goal 5 appears to be irrelevant to this DHCP.

52 In fact, according to FWS's own research and publications, current climate and species modeling cannot support a species-specific analysis to assess the impacts of greenhouse gas emitters on species take, and by the same reasoning, the models cannot support a species-specific analysis to assess the benefits of decreased GHG emissions attributable to actions such as wind power facilities. The court in *In re Polar Bear Endangered Species Act Listing and § 4(d) Rule Litigation*, 818 F.Supp.2d 214 (D.D.C. 2011), agreed with FWS's position that the best available science does not allow the agency to draw a causal link between greenhouse gas emissions from a particular facility and take of a species. The court stated,

> The Service further explained in response to comments that "[t]here is currently no way to determine how the emissions from a specific action both influence climate change and then subsequently affect specific listed species, including polar bears." AR4D 12942. In other words, because climate modeling does not currently allow the agency to draw a causal connection between the greenhouse gas emissions from a specific source and the impact on a particular polar bear, the Service determined that it cannot identify when a "take" has occurred for the purposes of enforcing the incidental take provisions of the ESA against an individual greenhouse gas emitter. AR4D 12942 (explaining that "the future indirect impacts of individual [greenhouse gas] emitters cannot be shown to result in 'take' based on the best available science at this time.").
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> * * *
>
> The administrative record amply supports the Service's conclusion. In a memorandum summarizing the most recent findings on this issue by the leading international climate science research organizations, the United States Geological Survey determined that "[i]t is currently beyond the scope of existing science to identify a specific source of CO2 emissions and designate it as the cause of specific climate impacts at an exact location." AR4D 14144A.02. Similarly, in a memorandum to the Service, the Environmental Protection Agency Office of Air and Radiation observed that "[t]he climate change research community has not yet developed tools specifically intended for evaluating or quantifying end-point impacts attributable to the emissions of [greenhouse gases] from a single source, and we are not aware of any scientific literature to draw from regarding the climate effects of individual, facility-level [greenhouse gas] emissions." AR4D 14336. Based on these findings, the Service Director issued a subsequent policy memorandum in which he concluded that "[t]he best scientific data available today do not allow us to draw a causal connection between [greenhouse gas] emissions from a given facility and effects posed to listed species or their habitats." AR4D 14145. The Department of the Interior has echoed these conclusions in a similar policy memorandum:
>
> > Given the nature of the complex and independent processes active in the atmosphere and the ocean acting on [greenhouse gases], *the causal link simply cannot currently be made between emissions from a proposed*

> *action and specific effects on a listed species or its critical habitat. Specifically, science cannot say that a tiny incremental global temperature rise that might be produced by an action under consideration would manifest itself in the location of a listed species or its habitat*. Similarly, any observed climate change effect on a member of a particular listed species or its critical habitat cannot be attributed to the emissions from any particular source. Rather it would be the consequence of the collective greenhouse gas accumulation from natural sources and the world-wide anthropogenically produced [greenhouse gas] emissions since at least the beginning of the industrial revolution.

Id. at 231–32 (emphasis added). The logical corollary of the agency's position endorsed by the *In re Polar Bear* court is that a causal link cannot currently be made between an offset or reduction of GHG emissions due to a proposed action and specific effects on a listed species.

This same point is made by J. B. Ruhl in a recent article on wind power and the ESA:[48]

> [T]he ESA requires that the FWS adhere to the best available science when making decisions under section 7. Applying this standard, the Agency has already concluded that the current capacity of climate and species modeling cannot support engaging in species-specific section 7 analyses to assess the harms of increased emissions attributable to actions such as new power plants. By the same reasoning, the current capacity of climate and species modeling cannot support engaging in species-specific section 7 analyses to assess the benefits of decreased emissions attributable to actions such as new wind power facilities.

Ruhl cites the following sources to support his conclusions: "U.S. Dept. of the Interior, Solicitor's Opinion M-37017, Guidance on the Applicability of the Endangered Species Act's Consultation Requirements To Proposed Actions Involving the Emissions of Greenhouse Gases 1 (2008), available at www.doi.gov/solicitor/opinions/M-37017.pdf (stating that the best available science does not support inferring the impact of climate change on any specific location); Memorandum from H. Dale Hall, FWS Dir., to FWS Reg'l Dirs., Expectations for Consultations on Actions that Would Emit Greenhouse Gases 1 (May 14, 2008), available at www.fws.gov/policy/m0331.pdf (stating the belief of the FWS that greenhouse gas emissions alone will not trigger section 7 review of an agency's action because 'the best available science does not allow us to draw a causal connection between GHG emissions from a given facility and effects posed to listed species or their habitats'); Memorandum from Mark Myers, supra note

[48] J. B. Ruhl, *Harmonizing Commercial Wind Power and the Endangered Species Act through Administrative Reform*, 65 Vanderbilt Law Rev. 1769, 1790–91 (2012).

104 (highlighting the difficulty in scaling down global climate change models to the local level)." According to Ruhl, the FWS under the Obama Administration has not wavered from this position staked out during the Bush administration.

53 Moreover, the long time scale of the relationship between GHG emissions and climate change effects casts serious doubt on the ability to rely on the "wind power effect" at a particular wind facility to minimize or mitigate take or to benefit Indiana bats. As Ruhl points out,[49]

> The climate change benefits of the wind power effect will inure to species in the future, perhaps the very distant future, as today's decreased emissions slowly work their way through the climate system, whereas the harms of wind power infrastructure are more immediate. Wisely, the FWS does not seem eager to make the case that it can reliably quantify and weigh that temporal tradeoff[.]

54 What the Applicant has done in Goal 5 is to use the tenable relationship between an aspirational *renewable energy policy* and potential future climate change benefits to justify allowing increased take of Indiana bats from a specific facility simply because that facility is *consistent with* that energy policy. There is absolutely no evidence that the Project itself will benefit Indiana bats. It is arbitrary and capricious to allow an actual cause of take of a listed species to increase based on such unsupported claims. FWS knows that Indiana Bats are at risk of harm from the Fowler Ridge turbines. FWS does not know, however, that the bats would benefit from maximizing the output of the facility, and the agency's own research shows this.

Accordingly, we maintain that Goal 5 in the DHCP and its associated objective are invalid and are likely to conflict with the requirement to minimize take of Indiana bats to the maximum extent practicable.

[49] J. B. Ruhl, 65 Vanderbilt Law Rev. at 1791.

ISSUE 3
WHOOPING CRANE AND RAPTOR PROTECTION AND RISK ASSESSMENT

COMMENT 3.1. THE DEIS'S ASSESSMENT OF RISK FOR WHOOPING CRANES IS DEFICIENT.

The Project area is located within the migration range of a non-essential experimental population of about 100 Whooping cranes (*Rhus americana*).[50] Whooping cranes that were trained to fly through Indiana may maintain their route and thus may migrate through or stop over in Benton County.[51] Whooping cranes migrating on their own have the potential to occur anywhere in Indiana and eastern Illinois.[52] A total of 53 wetlands covering approximately 94.6 acres (38.2 ha) were identified and delineated in the vicinity of the Project area.[53] Additionally, small ephemeral pools of water may form in tilled fields following periods of rain.[54]

The DEIS in Chapter 4.0 "Affected Environment" notes the presence of Whooping cranes in the Project area.[55] In Chapter 5 "Environmental Consequences," the DEIS briefly discusses possible impacts of the Project on Whooping cranes:

> Turbine Related Mortality
>
> Concerns expressed by the Service and IDNR regarding avian resources within the Project area focused primarily on collision risks during the migration season to listed species and a few other birds. The Service and IDNR both expressed concern for migrating American golden-plover, a species protected by the MBTA and listed as a species of special interest by the IDNR, *and whooping cranes, a federally endangered species with a population (listed under the ESA only as experimental, non-essential) that migrates across Indiana*."[56]

The next consideration of Whooping cranes in the DEIS is in Appendix D to the DEIS, the Bird and Bat Conservation Strategy ("BBCS"). <u>The BBCS describes a risk assessment for Whooping cranes</u> in part as follows:

55

[50] DEIS, p. 54.
[51] DEIS, p. 54.
[52] DEIS, p. 54.
[53] DEIS, Appendix D. p. 9.
[54] DEIS, Appendix D. p. 9.
[55] DEIS, p. 54.
[56] DEIS, p. 115 (emphasis added).

> Whooping Crane Risk Assessment
>
> During consultation with the Service, whooping crane (Grus americana) was identified as a potential concern for the Project. A risk assessment of potential impacts of the Fowler Wind Farm on the eastern experimental population of whooping cranes was undertaken in June 2007 (Johnson and Tidhar 2007). . . .
> * * *
> Within the 72,947 acres (29,521 ha) that comprise the FRWF, very few wetlands are present. However, approximately 94.6 acres (38.2 ha) of wetlands were identified in the vicinity of the Project area. Habitat quality within these wetlands was found to be marginal for whooping cranes. There are also 38 acres (15 ha) of open water, primarily small ponds, within the Project area. It is possible that migrating whooping cranes may occasionally stopover in Benton County. The risk assessment determined that direct mortality during Project construction is very unlikely, especially when construction occurs outside of the spring and fall migration periods. Direct mortality was also determined to be unlikely during the steady migratory flight, since whooping cranes migrate at an altitude much higher (1,000 to 6,000 ft [305 to 1,829 m]) than the rotor-swept area of the Project turbines (approximately 82 to 427 ft [25 to 130 m]). *The risk assessment identified greater potential for collision with turbines and/or the Project's transmission line during stopover periods when whooping cranes fly between foraging and rooting sites at sunset and sunrise under low-light conditions. Inclement weather was also determined to increase the chance of collision. Marking powerlines reduces collision rates;* however, it was determined that the potential for adverse effects to whooping cranes, particularly from turbines, cannot be reduced to discountable or insignificant levels at the Project. The risk assessment concluded that for this reason, if the flock was protected under the ESA, the appropriate determination would be that operation of the Project is likely to adversely affect whooping cranes. Due to the presence of marginal stopover habitat in the Project area, the risk assessment considered the potential for disturbance and displacement of whooping cranes to be possible. *However, based on the small total population size of the flock (~100 cranes) and the marginal quality of the habitat within the Project area, the overall risk to whooping cranes at the Project was determined to be low (Johnson and Tidhar 2007).*[57]

55 The last sentence of the above risk assessment adopts a conclusion that the Project's overall risk to Whooping cranes is low for two reasons: first, because the population size is small, and second, because the quality of habitat within the Project area is marginal. The adoption of this conclusion for these reasons is unwarranted.

[57] DEIS, Appendix D. pp. 27–28 (emphasis added).

A. Overall Risk to ESA-Listed Species Does Not Uniformly Decrease as Population Size Decreases.

The BBCS's conclusion about risk to Whooping cranes reflects an erroneous argument about the relationship between risk of take and the population's abundance. This argument is generally stated as follows: as the population size decreases, the risk of take also decreases because there are fewer individuals to come into harm's way. The logical extension of this argument is that risk goes to zero as the population drops toward extinction; that is, for example, when only two individuals of a species remain, the risk posed by a particular Project is insignificant because the species is so rare and so more such projects can be approved. The FWS has used this reasoning in other contexts involving ESA listed species. This argument is unhelpful and misleading.

56 The error in concluding that the risk to Whooping cranes is low because the population size is small is that such use of the term "risk" considers only one half of the risk equation. To compare risk across different species and to manage that risk, the agency must consider not only the probability of exposure but also the *consequences* of exposure.[58] To narrow a comparative risk assessment to the probability of exposure alone leaves out much valuable information. Because the consequences of losing members of a rare species are relatively severe, the overall risk due to even a low-probability event is properly perceived as relatively high. Low-probability but high-consequence events require a different response than low-probability but relatively inconsequential events in terms of prevention and mitigation. Thus, a valid assessment of the overall risk that the Project poses to Whooping cranes must consider both probability of collision and the consequences of such take.

This overly-limited conceptualization of risk is illustrated also in DEIS Chapter 5 "Environmental Consequences," section 5.5.3.4 "Operation Effects on Birds," in which the DEIS discusses the risk of turbine-related mortality for various species of birds:

> With the exception of American golden-plover and northern harrier, all sensitive species observed were low in number. Given the small number of individuals

[58] See, e.g., Stanley Kaplan and B. John Garrick, *On the Quantitative Definition of Risk*, Risk Analysis, Vol. 1, No. 1 (1981).

> observed and limited available habitat, many of these species are therefore considered to be at low collision risk.[59]

According to this reasoning, the only component of comparative risk worth considering is the probability of collision, which presumably decreases to zero as the species become very rare (assuming that the population is evenly dispersed in space regardless of population abundance); thus, a population of 100 starlings and a population of 100 Whooping cranes would have the same assessed risk. Such a limited view of risk does not help FWS to decide what to do for each species.

In contrast, when both components of the risk equation are considered – exposure and consequence – the risk associated with Whooping cranes colliding with unmarked above-ground power lines and wind turbines, particularly during inclement weather, is significant. The killing of a single Whooping crane would constitute a violation of the MBTA, and because the population size of the experimental population is so low, the loss of each bird is highly consequential.

B. According to Information in FWS Guidance and the BBCS, Whooping Cranes Face a Significant Threat of Collision With Project Power Lines and Turbines.

The BBCS's conclusion that the overall risk of the Project to Whooping cranes is low because, in part, the quality of habitat in the Project area is low is inconsistent with other sources of information on Whooping cranes published by FWS. <u>The DEIS and BBCS indicate that the main threat of the Project to Whooping cranes is collision with power lines and turbines, particularly during periods of inclement weather.</u> According to a 2009 FWS report on Whooping cranes and wind development, the main threat of collision occurs when Whooping cranes initiate or conclude a migration flight or a roost-to-forage flight, a period when the cranes may fly for several miles at very low altitude, particularly when visibility is low during inclement weather.[60] Thus, if stopover habitat occurs even miles away from a power line or wind turbine, cranes may collide with those power lines or turbines as the birds fly toward or away from the stopover habitat at low altitude. The FWS states that "unless the Whooping cranes recognize and steer clear of turbines, *any crane use occurring within an estimated 2–5 miles of a wind turbine* might

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[59] DEIS, pp. 115–116.
[60] USFWS, *Whooping Cranes and Wind Development – An Issue Paper* (April 2009), p. 17.

result in mortality as they make local flights or start or end migration flights."[61] The same considerations would logically apply to power lines, which are the greatest known cause of mortality of fledged Whooping cranes.[62]

Therefore, according to FWS's assessment, one must consider the habitat within 2–5 miles of the Project's above-ground power lines and wind turbines to get an accurate indication of the threat of collision with Project infrastructure. According to the BBCS, the Pine Creek GHA, a possible Whooping crane roosting area, is located approximately 3.2 miles east of the Project area.[63] This distance is well within the 2–5 mile distance that FWS has stated is the band of vulnerability for Whooping cranes around a turbine or power line. The Project contains hundreds of wind turbines. Six miles of overhead transmission line connect Phase II turbines to the Phase 1 substation.[64] So the potential for a Whooping crane to fly at low altitude through the Project area is significant, and if visibility were poor, the bird might strike a turbine or overhead power line.

The BBCS recognizes the potential for collision of Whooping cranes with turbines and power lines. The BBCS also recognizes that "marking power lines reduces collision rates."[65] Yet despite such information on existing threats of collision and potential remedies, the DEIS and BBCS have decided, arbitrarily, that the risk of collision of Whooping cranes with Project infrastructure is so insignificant that no minimization, mitigation, or adaptive management measures need be considered or evaluated. The BBCS does not attempt to reduce or mitigate the threat of Whooping crane collision with power lines or turbines, either by marking overhead transmission line or, as suggested by Indiana DNR, by possibly shutting down during migratory peaks.[66] The MBTA requires that this omission be remedied. NEPA requires that such measures at least be given serious consideration.

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[61] USFWS, *Whooping Cranes and Wind Development – An Issue Paper* (April 2009), p. 17 (emphasis added)
[62] USFWS, *Whooping Cranes and Wind Development – An Issue Paper* (April 2009), pp. 17–18.
[63] DEIS, Appendix D, p. 10.
[64] DEIS, Appendix D, p. 34.
[65] DEIS, Appendix D, p. 28.
[66] DEIS, Appendix C, *Agency Coordination – Threatened and Endangered Species*. The IDNR, in a Dec. 18, 2006 stamped document in the record, comments, "Fish, wildlife, and botanical resource losses as a result of this project can be minimized through implementation of the following measures * * * Mitigation for mortality may include adjusting locations of specific turbines, altering hours of operation to avoid diurnal bird and/or bat activity, and possibly shutting down during migratory peaks for specific species such as Whooping Crane or American Golden-Plovers."

COMMENT 3.2. **THE MBTA REQUIRES AT LEAST THAT ABOVE GROUND POWER LINES ASSOCIATED WITH THE PROJECT BE MARKED TO REDUCE COLLISIONS BY RAPTORS AND WHOOPING CRANES.**

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Six miles of overhead transmission line connect Phase II turbines to the Phase 1 substation.[67] The DEIS and BBCS fail to seriously consider marking of Project power lines and the reduction in mortality that marking may produce, even though the Project is known to kill raptors and may pose a significant threat to migrating Whooping cranes.[68] This failure is likely to lead to continued violations of the MBTA.

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According to the DEIS, the Applicant has incorporated several measures to avoid and minimize impacts to birds, including the following:[69]

- siting the Project in an area of moderate avian use;
- developing the Project in phases;
- micro-siting all Phase IV turbines in cultivated croplands and locating all Phase I - III turbines and facilities to avoid native bird habitat and IDNR Gamebird Habitat Areas;
- re-routing the Project's transmission line to avoid a Gamebird Habitat Area;
- building the transmission line to APLIC's avian-safe standards for *spacing* of wires;
- burying collection lines underground;
- equipping the Project substation with downward facing shields on all lights;
- providing sensitive species awareness training for all on-site workers;
- constructing unguyed MET towers;
- equipping MET towers with red strobe lighting (although the DEIS recognizes that *white* strobe lighting is the measure that reduces fatalities).

However, we find no plans or consideration in the DEIS, DHCP, or BBCS for marking overhead transmission lines in order to minimize or mitigate the threat of bird collision, other than as a potential adaptive management measure related to take of Bald eagles.

[67] DEIS, Appendix D, p. 34.
[68] See DEIS, Appendix D, p. 28 (stating that of the Whooping crane experimental population were essential, the operation of the Project would be "likely to adversely affect" the population).
[69] DEIS, p. 118.

As discussed above and in the BBCS, Whooping cranes potentially migrate through the Project area. In addition, several species of raptors have been found in the Project area: Bald eagle (*Haliaeetus leucocephalus*), Northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), Sharp-shinned hawk (*Accipiter striatus*), Red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and Osprey (*Pandion haliaetus*).[70]

Collision with unmarked power lines is a major threat to Whooping cranes, raptors, and other birds. Marking of power lines is a common minimization and mitigation measure called for by FWS guidance documents.[71] And as the BBCS recognizes, marking can substantially (although not completely) reduce collision mortality in birds.[72]

Moreover, Table 4.5 in the DEIS shows that several Red-tailed hawks and some Rough-legged hawks have already been killed at the Project over the last few years.[73] Specifically, over a two year period, nine Red-tailed hawk carcasses and two Rough-legged hawk carcasses have been found during mortality surveys. Because of search inefficiencies and other limitations, the number of actual raptor fatalities is likely to be higher than the number of found carcasses. Even if the cause of these fatalities is collision with turbines rather than with overhead power lines, these fatalities confirm and highlight the risk posed to raptors by the Project's infrastructure.

Thus, despite the fact that raptors are present and have already been killed at the Project, and will most likely continue to be killed there, and even though it is widely recognized that marking of overhead transmission lines can reduce bird (including raptor) fatalities, no line marking is called for in the draft documents under review. Furthermore, the BBCS's adaptive management plan allows for six raptors, 20 American golden-plovers, and apparently an unlimited number of Whooping cranes to be killed each year by the Project, each an MBTA violation, without any consideration of line marking or modified turbine operations.[74] These are significant errors.

[70] DEIS, p. 52.
[71] See USFWS, *Land-Based Wind Energy Guidelines* (March 23, 2012), p. 49.
[72] See DEIS, Appendix D, p. 28 (stating that marking power lines reduces collision risk).
[73] DEIS, p. 55.
[74] DEIS, Appendix D, pp. 49–50.

60 The draft documents under review will facilitate continued violations of MBTA § 703 by the Project. The FWS Office of Law Enforcement focuses its resources on investigating and prosecuting those who take migratory birds without identifying and implementing reasonable and effective measures to avoid the take of species protected under the MBTA and BGEPA.[75] Courts have found MBTA violations in such circumstances.[76] Marking of overhead transmission lines associated with the Project is a reasonable and effective measure to minimize and mitigate the take of Whooping cranes, raptors, and other bird species, yet this measure has not been incorporated at Fowler Ridge or seriously considered in the DEIS. The MBTA and NEPA require at least that such violations of MBTA § 703 and such measures be given serious consideration.

61 In addition, FWS's authorization of the Project's collision threats without readily available minimization measures, absent issuance of an MBTA incidental take permit or a special use permit, would itself not be in accordance with law under § 703 of the MBTA.

COMMENT 3.3. THE BBCS'S ADAPTIVE MANAGEMENT PLAN SHOULD INCLUDE WHOOPING CRANES.

62 The BBCS contains an adaptive management plan for raptors, Golden plovers, Bald eagles, and birds in general:[77]

> 5.3.2 Birds
> * * *
> Triggers for adaptive management will include:
>
> I. A mass avian mortality event (>100 birds killed in one night) is documented.
> II. Observed raptor fatality exceeds six (6) individuals in one monitoring year.
> III. Observed American golden-plover fatality exceeds 20 individuals in one monitoring year.

[75] See e.g., Final Environmental Impact Statement, Buckeye Wind Power Project, Ohio (April 2013), pp. 1-11.
[76] See, e.g., U.S. v. Moon Lake Electric Ass'n, Inc., 45 F.Supp.2d 1070 (D. Colo. 1999); Kalyani Robbins, *Paved With Good Intentions: The Fate of Strict Liability Under the Migratory Bird Treaty Act*, 42 ENTL 579 (2012).
[77] DEIS, Appendix D, pp. 49–50.

> 5.3.3 Eagles
> * * *
> If an eagle fatality is discovered at the Project, FRWF will notify the Service of the discovery within 24 hours. FRWF will coordinate with the Service to identify potential mitigation measures based on the best available science; these measures could include marking above-ground powerlines with bird flight diverters or retro-fitting powerline poles to avian-safe standards (APLIC 2006). Additionally, FRWF will meet with the Service to apply for an eagle programmatic take permit.

As discussed above in Comments 3.1 and 3.2, Whooping crane migrants may make temporary stopovers within 5 miles of the Project, and both the Project's wind turbines and the unmarked overhead power lines pose a threat to those migrants, particularly during periods of inclement weather and low visibility. According to the BBCS's adaptive management plan, however, no actions or measures would be triggered should a Whooping crane be killed by
62 Project infrastructure. This failure to plan for Whooping crane fatalities is an irresponsible omission under the MBTA. Given this omission, any harm to Whooping cranes by the Project would be a clear and particularly egregious violation of the MBTA.

Thank you for considering our comments.

Sincerely,

/s/ Jeffrey B. Hyman, Ph.D., J.D.,
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Division of policy and Directives Management

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Div. of Policy & Dir. Mgt.

Dear Sirs

63 We are landowners and residents in the area of the Fowler Ridge Wind Farm. We fully support the efforts of the Fowler Ridge Farm to save wildlife in the area of their windmills.

We think this is a very good overall plan to save wildlife and still have windmills that would benefit all mankind nation wide. We belive this plan should be approved in order for the additional windmills to be built by the Fowler Ridge Farm

Thankyou very much

Ludwig Groen
Dan Groen
4851 E 400 N
Fowler In 47944

Illinois Department of Natural Resources

Office of Realty and Environmental Planning

Division of Ecosystems & Environment

Impact Assessment Section

Keith M. Shank, Natural Resources Manager

Comments on the Fowler Ridge ITP DEIS

69 The Illinois Department of Natural Resources believes the Fowler Ridge ITP DEIS does not adequately describe or evaluate potential adverse impacts related to wind turbine operations. Throughout Part 5 of the DEIS, impacts to humans and natural resources associated with wind turbine operations are described as insignificant or absent, with the exception of collision or barotrauma risk to birds and bats. A bias toward this view is explicitly stated in Section 5.5.3.1: "Terrestrial wildlife mortality is not expected to occur as a result of Project operations under any of the four alternatives because the risk of turbine collision is confined to the rotor-swept zone of each turbine."

70 The Department believes there are many avenues for natural resources to be adversely affected by turbine operation, though few have been studied to any degree with explicit regard to wind turbine operations. Because 93% of the land area of this facility is in row-crop agriculture, the DEIS dismisses it as of low-value to wildlife. Unfortunately, most of Indiana, like Illinois, is devoted to row-crop production. It is the most common and abundant habitat available to wildlife in this region; any activity which renders wide areas of it less hospitable to wildlife should be viewed with concern. The DEIS should address these potential effects.

71 In addition to rotor blade collision and baro-trauma, potential adverse effects to wildlife and other natural resources may be related to the propagation of magnetic fields (around turbine nacelles, current conversion transformers at turbine tower bases, and around buried collection power lines); shadow flicker (both solar and lunar); visibility; noise; acoustic vibrations through soils and waters; aviation safety lighting, and thermal conduction in soils. While few of these characteristics of turbine operations have the potential to result in direct mortality of fish and wildlife, which is relatively easy to detect and measure, they have the potential to displace or exclude fish and wildlife from occupied habitats and to stress populations by making feeding and reproduction more difficult. Such effects are far more subtle than mortality and it is much more difficult to assign their cause to a specific aspect or combination of aspects of turbine operation. Well-known studies of grassland birds breeding near wind farms, such as that at Buffalo Ridge in Minnesota (Leddy *et al.*, 1999)[i], although finding significant displacement, make no effort to determine what aspect of turbine operation is responsible for the results.

In this example, the displacement of breeding birds could be due to any of the effects of visible motion, shadow flicker, noise, magnetic fields, or acoustic vibrations through the soil, or a

combination of them. Each of these effects is attenuated with distance, often through an inverse square ratio, and a gradient of occupation (tolerance) is evident in many of the few studies performed.

Magnetic Fields. Conventional forms of power generation occur in large buildings from which wildlife is excluded, so that potential wildlife contact with magnetic fields is limited. Wind generation is significantly different in this regard, with large generators set high in the sky, where the associated magnetic fields extend well beyond the physical dimensions of the wind turbine. Many forms of wildlife are known or surmised to be sensitive to magnetic fields, whether the geo-magnetic field (which may aid in long-distance migration) or the bio-magnetic fields associated with living organisms. A large wind generation project places a profusion of magnetic fields across the landscape, associated both with turbines and the collection power lines, most of which are buried only four feet below ground rather than the standard 20-40 feet above-ground of overhead power lines. Because magnetic field strength is directly related to distance, the potential for sub-lethal magnetic field effects to a wide array of terrestrial and aquatic organisms which are normally not exposed are greatly enhanced. Humans cannot sense magnetic fields, and become aware of them only when other technologies are affected. This is a major environmental alteration which is "out-of sight, out of mind" for most people, but likely is not for some forms of avian, terrestrial, and aquatic life.

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Visibility. Turbines more than 400 feet high are visible for more than ten miles on many days in the relatively flat lands of western Indiana and eastern Illinois. On clear nights aviation safety lights are visible considerably farther. While visibility is often raised as an issue of concern for humans, this agency is unaware of any study which has attempted to ascertain the possible effects of visibility on wildlife. Stillness is a well-practiced virtue among hunters and fisherman, if targeted fish and wildlife are not to be alarmed. The scarecrow is an ancient use of visible objects to deliberately displace or repel wildlife, and flags and streamers remain a common means of attempting to control undesired wildlife behavior. In other words, it is a long accepted principle that moving objects affect wildlife, and there appears no persuasive reason to presume the visible movement associated with wind turbines, whether rotating or flashing, does not have similar effects. The current document contains an extensive discussion of apparent displacement effects to the American Golden Plover, though assigning no particular cause. Visibility may be a major factor in this displacement.

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Flicker. To the extent it is discussed with regard to wind turbines, the discussion is nearly always limited to flicker's alleged or actual effects on humans residing within reach of the moving shadows. This means the discussion is usually limited to daytime effects, since moonlight is much less intense than daylight and humans are less likely to remain active through the hours of darkness. (This is illustrated by the fact that all flicker models now available address only daytime flicker, and usually on a specific target, such as a residential window.) But, compared to wildlife, humans are relatively insensitive to their surroundings. and many forms of wildlife are most active during crepuscular periods, when shadows reach farthest, and at night. Species which are particularly sensitive regarding aerial predators may be stressed by flicker, and it may disrupt the thermo-regulatory activities of reptiles and amphibians for whom basking is an essential activity. For nocturnal animals with excellent low-light vision, the strobe effect of lunar flicker may be as distressing as that of daytime flicker to diurnal species. Where

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74 multiple turbines are present, flicker may be present during most of the normal activity period. Anecdotal accounts exist of effects to domestic livestock, particularly horses. Flicker has a strong potential to displace wildlife. However, this Department is unaware of any research efforts to document such effects.

Noise. Noise (propagated through the air) is another characteristic usually discussed solely in terms of human impacts. Many states have promulgated "noise pollution" regulations, which focus on either injury to human aural organs (workplace noise) or nuisance value. In no case are such regulations related to wildlife effects. The current document extensively discusses noise impacts to humans. A number of European studies have shown adverse effects of highway noise on breeding birds, where birdsongs must be modified to be heard but are less effective in attracting mates. Francis, et al. (2012)[ii] documented the effects of pipeline compressor noise in New Mexico (equivalent to highway noise at 500 feet) that resulted in high populations of
75 rodents near compressors because predators (hawks and owls) could not hear their prey, with secondary effects on plant reproduction due to elevated seed predation by rodents. Elevated turbine noise over broad areas might produce similar effects, displacing predators which are less successful due to noise. This may be a primary reason Northern Harriers are rarely observed after wind farm construction though present beforehand.

Acoustic Vibration in Soils and Water. Studies in the United Kingdom have documented detectable vibration due to wind turbines through bedrock at distances up to 10 kilometers (six miles), although those studies had no biological component. Many soil animals are very sensitive to vibration, while most aquatic organisms are also attuned to vibrations in the water, to either detect prey or to avoid predators. Soil organisms, such as earthworms, play a vital role in
76 soil tilth and aeration; their displacement or reduced activity can affect soil fertility and plant productivity. Sustained noise in aquatic environments may pose a barrier to migratory movements in streams, or prevent detection of food. The exclusion or displacement of host fish could be problematic for mussel populations, since fish are an essential part of the mussel reproductive cycle. The result could be reduced biodiversity in stream systems which are already compromised by human activities.

Thermal Conduction/Resistivity. Collection power lines will be buried. All conductors provide resistance to current, which produces heating of the conductor. In the air, this heat is dissipated into freely moving air. Underground, this heat can only dissipate into stationary soil around the conductor. Most 0000 power lines are designed to operate at temperatures up to 195 degrees Fahrenheit. The actual temperature of the conductor is dependent on its diameter, the number of turbines on the circuit, and their level of electrical generation. The ability of the surrounding soils to absorb or dissipate this heat is referred to as soil thermal conductivity or thermal resistance. This characteristic is governed by the nature of the soil materials, pore spaces, and moisture level. (Example: Sandy soil with 10% moisture is more than twice as conductive of heat as dry sandy soil.) If the native soils are not capable of maintaining conductor temperatures within operating ranges, special backfill is required in the trenches to prevent line failure. This is a standard feature of the electrical engineering for any wind energy facility. Any deviation from
77 "normal" soil temperatures for the season will have effects on soil organisms, positive or negative. At a depth of four feet, variations in surface temperature are unlikely to be detected by humans, but this is not necessarily so for animals with thermal sensitivities, especially reptiles.

Endangered or Threatened Species. Section 4.6.2.2 lists 33 species of plants and animals protected by the State of Indiana and documented as occurring in Benton County. It then provides a four-fold rationale to dismiss the significance of any adverse effects to them related to the project. First, many of them have specific habitat requirements, which is true enough. It then states that little or no habitat for these species is present within the project area, but claims that any habitat that might be present is "generally marginal." Finally, it states that no mortality of endangered or threatened species is known from the project area, with the exception of the two state-listed bats.

78 If these species are "documented" in Benton County, then the information on their last known locations should be available from the Indiana DNR. It is relevant whether any of these locations lie within the project area or external buffer. Those within the project may indeed be affected.

Regarding specific habitat requirements, such combinations of requirements are not necessarily rare, but may be isolated, and often can be met within lands devoted mainly to agricultural pursuits. Further, the scientific literature often describes perfect or ideal habitat, not minimum requirements. The fact that occupied habitat may be marginal is not a reason to further degrade or destroy it; many state-listed endangered species largely persist in marginal habitat because
79 primary habitat has been degraded or destroyed. Such marginal habitat often provides key linkages between otherwise isolated populations which are important for gene flow. Marginal habitat is not necessarily unimportant habitat.

While extensive studies have been conducted for birds and bats, no surveys or studies for other animals or plants are described in the DEIS or the HCP. If nobody has looked, how does anyone know whether habitat or the listed species are present? If nobody has searched, it is easy to say that no mortality is known. The cavalier dismissal of these state-listed species without any effort
80 to ascertain their locations or numbers when the project in question will occupy most of the County is unconscionable.

The primary example is the Indiana Bat, itself. Without the mortality studies carried out by the applicant, there would be no record of the presence of the Indiana Bat in Benton County, and thus no concern about taking individual bats or adversely affecting its population.

Another good example is the Franklin's Ground Squirrel, listed as endangered in Indiana, and listed as threatened in neighboring Illinois. Much of the scientific literature claims this animal requires tallgrass prairie, but experience in Illinois shows its preference is for edge habitat—the species abandons mature prairies in favor of roadside edges, drainage ditches, railroad corridors, and even urban areas. The species is present in both Vermilion County and Champaign County, Illinois, areas every bit as devoted to rowcrop agriculture as Benton County, Indiana, if not more so. It has been found in grassed waterways of agricultural fields in the midst of proposed wind energy facilities. In Springfield, Illinois, it has been found to thrive on disturbance associated with construction, promptly colonizing soil stockpiles. Juveniles have been shown to disperse up to two miles from parental colonies in just a few weeks. This species could well occupy portions
80 of the project area, but it is easy to miss. It spends 90% of its time underground, and is active

above ground only from May through September. Unfortunately, many Illinois records are derived from road-kills, and this may be true in Indiana, as well.

81 The Franklin's Ground Squirrel is also a good example of a species which may be adversely affected by visible motion, flicker, and acoustic vibration due to wind turbine operations. An inability to fly should not disqualify it or other terrestrial and aquatic species from due consideration in the DEIS.

82 An appropriate discussion of the potential effects and resource impacts might still support a conclusion there are no adverse effects to be considered, or that adverse effects will not significant, but the document would then address the affected environment and potential environmental consequences more completely without having to rely on unsupported assumptions.

Thank you for the opportunity to comment.

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[i] Leddy, Higgins, & Naugle; Effects of Wind Turbines on Upland Nesting Birds In Conservation Reserve Program Grasslands; *Wilson Bulletin*; 111(1); 1999; pp. 100-104.

[ii] Francis, Kleist, Ortega, & Cruz; Noise Pollution Alters Ecological Services: Enhanced Pollination and Disrupted Seed Dispersal; Proceedings of the Royal Society B: Biological Sciences; March 21, 2012.

FWS-R3-ES-2013-0034

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JUN 04 2013

REPLY TO THE ATTENTION OF: E-19J

Public Comments Processing
Attn: FWS-R3-ES-2013-0032
Division of Policy and Directives Management
U.S. Fish and Wildlife Service
4401 North Fairfax Drive, MS 2042-PDM
Arlington, Virginia 22203

Re: Draft Environmental Impact Statement and Proposed Habitat Conservation Plan and Incidental Take Permit for the Indiana Bat for the Fowler Ridge Wind Farm, Benton, County, Indiana – CEQ No. 20130081

To Whom It May Concern:

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA), the National Environmental Policy Act (NEPA), and the Council on Environmental Quality regulations for implementing NEPA, the U.S. Environmental Protection Agency (U.S. EPA) has completed its review of the Draft Environmental Impact Statement (Draft EIS) prepared by the U.S. Fish and Wildlife Service (USFWS) for a Habitat Conservation Plan (HCP) for an existing wind farm and proposed Phase IV expansion located in Benton County, Indiana. The wind farm is owned by four separate companies: Fowler Ridge Wind Farm LLC, Fowler Ridge II Wind Farm LLC, Fowler Ridge III Wind Farm LLC, and Fowler Ridge IV Wind Farm LLC (FRWF). The applicant, FRWF, has applied to USFWS for an incidental take permit (ITP) under the Endangered Species Act of 1973 (ESA), as amended, for proposed impacts to the Federally-endangered Indiana bat (*Myotis sodalis*). The applicant has developed the HCP to ensure that impacts to the Federally-listed Indiana bat are adequately minimized and mitigated in accordance with the requirements of Section 10 of the ESA.

The Draft EIS analyzes the impacts associated with construction of Phase IV and the operation and decommissioning of the four phases of the Fowler Ridge Wind Farm. USFWS proposes to approve the HCP and issue a 22-year ITP to FRWF. The proposed project, specifically Phase IV, would involve construction of up to 94 turbines along with associated access roads and infrastructure, with generation of up to 150 megawatts (MW) of electricity. The first three phases of FRWF consist of 355 wind turbines with a total energy capacity of 600 MW. Total build-out for all four phases will be up to 449 turbines with a total energy capacity of 750 MW.

U.S. EPA supports the development of renewable energy resources, as recommended in the National Energy Policy Act of 2005 and President Obama's New Energy for America plan, in an expeditious and well-planned manner.

The Draft EIS analyzes the impacts of three action alternatives as well as the "No Action" alternative. The alternatives differ with respect to operation of all existing and proposed turbines. Under the No Action Alternative, the applicant would construct Phase IV, but all 449 turbines would

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be non-operational from sunset to sunrise from August 1 through October 15, the primary fall migratory period of the Indiana bat, each year during the operational life (22 years) of the FRWF. Implementation of this alternative would be expected to result in complete avoidance of impacts to Indiana bats; therefore, an ITP pursuant to Section 10 of the ESA would not be necessary and an ITP would not be issued for the existing phases of the FRWF or future Phase IV. In addition, an HCP would not be prepared and the Indiana bat would not have the conservation benefits (e.g., mitigation) afforded to it through development and implementation of an HCP. However, FRWF would commit to implementing the FRWF Bird and Bat Conservation Strategy (BBCS) as part of the No Action alternative to reduce the potential for impacts to migratory birds and bat species.

Under the Applicant's Preferred Action, the "5.0 meters per second (m/s) Cut-In Speed Alternative," seasonal operational adjustments would be implemented, an HCP would be prepared to avoid, minimize, mitigate, and monitor take of Indiana bats, and an ITP pursuant to Section 10 of the ESA would be issued for the existing phases of the FRWF and the future Phase IV. The HCP contains the following measures designed to avoid, minimize, mitigate, and monitor take of Indiana bats:

1) FRWF would minimize potential take of Indiana bats from operations of the project by implementing seasonal turbine operational adjustments. Based on the reduced number of overall bat fatalities and lack of Indiana bat fatalities found during the spring and summer compared to the fall during three years of monitoring at FRWF Phases I-III, USFWS has determined the risk to Indiana bats at FRWF occurs during the fall. Because take of Indiana bats is expected to occur only during the fall migration season and Indiana bat fatalities are not expected during the spring migration, summer maternity, or winter seasons, no operational adjustments would be made during the spring migration, the summer maternity season, or after October 15.
2) FRWF would implement operational practices that are expected to reduce take of Indiana bats. However, some level of unavoidable, incidental take may still occur. Therefore, FRWF would mitigate for the unavoidable impacts of the taking of Indiana bats by coordinating, funding, and monitoring the protection and restoration of both summer habitat and winter habitat. Specifically, FRWF would preserve and restore summer maternity habitat in the vicinity of existing maternity colonies in Putnam County, Tippecanoe County, Vermillion County, or Warren County; and protect winter habitat by installing a new bat gate near the entrance of a Priority 1 hibernaculum, Wyandotte Cave, in Crawford County, Indiana.

For the term of the ITP (22 years), FRWF will raise the turbine cut-in speed to 5.0 m/s on a nightly basis from sunset to sunrise, adjusted for sunset/sunrise times weekly, starting August 1 and ending October 15 annually. HCP implementation would also include post-construction monitoring, adaptive management, and mitigation focused on the Indiana bat, but would also benefit other avian and bat species. FRWF would commit to implementing the FRWF BBCS as part of this alternative to reduce the potential for impacts to migratory birds and bat species.

A non-preferred alternative, the "3.5 m/s Cut-In Speed (Feathered) Alternative", the minimally-restricted operations alternative, would consist of the same build-out as the Applicant Preferred Action, with the exception that all turbines would be feathered until a cut-in speed of 3.5 m/s is reached on a nightly basis from sunset to sunrise, starting August 1 and ending October 15 annually. In addition to feathering turbines below 3.5 m/s, FRWF would implement an adaptive management plan that includes adjusting cut-in speeds in 0.5 m/s increments, if needed, to ensure compliance with authorized take limits. Although feathering blades below the 3.5 m/s cut-in speed is anticipated to reduce take of Indiana bats, some level of unavoidable, incidental take may still occur.

To mitigate for unavoidable impacts of the taking of Indiana bats under this alternative, FRWF will coordinate, fund, and monitor the protection and restoration of both summer habitat and winter Indiana bat habitat. The monitoring program that would be implemented as part of the HCP would consist of two components: take limit compliance monitoring and mitigation effectiveness monitoring. The goal of take limit compliance monitoring is to ensure compliance with the terms of the ITP, whereas, the goal of mitigation effectiveness monitoring is to ensure the success of mitigation efforts at offsetting the impacts of unavoidable take of Indiana bats from the FRWF. Operations under this alternative are expected to have greater adverse effects on Indiana bat populations than the Applicant Preferred Action.

Another alternative, the "6.5 m/s Cut-In Speed (Feathered) Alternative," the maximally-restricted operations alternative, includes implementation of an HCP to avoid, minimize, mitigate, and monitor take of Indiana bats in accordance with Section 10 of the ESA. This alternative would consist of the same build-out as the Applicant Preferred Action, with the exception that all turbines would be feathered until a cut-in speed of 6.5 m/s is reached on a nightly basis from sunset to sunrise, starting August 1 and ending October 15 annually. In addition to feathering turbines below 6.5 m/s, FRWF would implement an adaptive management plan that includes adjusting cut-in speeds in 0.5 m/s increments, if needed, to ensure compliance with authorized take limits. Although feathering blades below the 6.5 m/s cut-in speed is anticipated to reduce take of Indiana bats, some level of unavoidable, incidental take may still occur.

To mitigate for unavoidable impacts of the taking of Indiana bats under this alternative, FRWF will coordinate, fund, and monitor the protection and restoration of both summer habitat and winter Indiana bat habitat. The monitoring program that would be implemented as part of the HCP would consist of the same two components as the 3.5 and 5.0 m/s alternatives: take limit compliance monitoring and mitigation effectiveness monitoring. Operations under this alternative are expected to have fewer adverse effects on Indiana bat populations than the Applicant Preferred Action. Fowler Ridge would commit to implementing the FRWF BBCS as part of this alternative to reduce the potential for impacts to migratory birds and bat species.

We commend the activities the applicant has taken to avoid and minimize impacts to species, including siting the project in an area of moderate avian use; developing the project in phases to observe the effect of the project on a state-listed avian species, the American golden plover, prior to development of phases located closer to the plover Important Birding Area (IBA); micro-siting all Phase IV turbines in cultivated croplands and locating all Phase I - III turbines and facilities to avoid native bird habitat and Indiana Department of Natural Resources Gamebird Habitat Areas; building the transmission line to Avian Power Line Interaction Committee avian-safe standards; burying collection lines underground; equipping the Project substation with downward-facing shields on all lights; and, providing sensitive species awareness training for all on-site workers.

Based on our analysis, U.S. EPA rates the Draft EIS as "**Environmental Concerns – Insufficient Information**" (EC-2). Please see the enclosed "Summary of Rating Definitions." We recommend the Final EIS address the following comments regarding aquatic resources, financial assurance, reclamation, best management practices, and avian mortality in the Final EIS.

Aquatic Resources - Streams

83 We commend the applicant's commitment to avoidance of all wetlands within the project area. The Draft EIS indicates access roads, etc. for the 94-turbine proposed project would not entail any permanent stream crossings. However, the Draft EIS does not indicate: 1) the number of temporary

stream crossings proposed; 2) the linear feet of both temporary and permanent stream impacts; or 3) whether a Clean Water Act Section 401 Water Quality Certification will be required and obtained from the Indiana Department of Environmental Management, a Construction in a Floodway Permit will be required and obtained from the Indiana Department of Natural Resources, and a Nationwide or Regional General Permit will be required and obtained, from the U.S. Army Corps of Engineers for project-related crossings of Waters of the United States. Because proposed stream crossings are most likely temporary, it is expected that these types of stream impacts can be restored. The Final EIS should discuss whether any permanent stream crossings will be required, and measures taken to obtain regulatory approvals for both temporary and permanent impacts to Waters of the U.S. and Waters of the State. The Final EIS should discuss permits to be obtained, restoration measures to be taken, and associated mitigation (if applicable).

Aquatic Resources – Intermittent or Ephemeral Streams

Additionally, the Draft EIS does not indicate if any stream crossings would occur at intermittent or ephemeral streams. EPA recommends the Final EIS clarify this point. In the event that intermittent or ephemeral streams will be crossed, EPA supports the use of directional boring of underground utilities to avoid direct stream impacts. However, there is a possibility that intermittent streams may not be dry during construction timeframes. In the event that any intermittent or ephemeral streams have active flow at the time of construction, EPA recommends that a commitment be made to directionally bore, rather than open-trench through open stream flow. This commitment should be made in the Final EIS.

Financial Assurance

84 The Draft EIS indicates the lifespan of Phase IV will most likely be 20-22 years. An obligation to decommission the facility and perform reclamation was discussed in detail. However, information regarding financial assurance for decommissioning and reclamation was not included in the Draft EIS. Additionally, information regarding financial assurance for mitigation, monitoring, and the adaptive management portions of the HCP was not discussed in the Draft EIS. EPA recommends the Final EIS include a discussion focused on USFWS' regulatory authority under the ESA to require financial assurance from an applicant to meet their responsibilities as stated in the HCP.

Reclamation

85 The Geology and Soils Section of the Draft EIS indicates that areas subject to temporary disturbance will be re-vegetated in accordance with the Erosion and Sediment Control Plan. In non-cultivated areas, re-vegetation will involve reseeding with native vegetation or other suitable seed mix based on land use and mulching to encourage growth. We recommend referring to the Indiana Department of Natural Resources' Native Plant List for Northern Indiana to prepare a list of plants suitable for use during re-vegetation. Please include this list as an appendix to the Final EIS.

Best Management Practices (BMPs)

86 BMPs are mentioned in various sections of the DEIS as a way to minimize impacts to a particular resource. We recommend the Final EIS contain typical BMPs that could be implemented to reduce impacts, particularly during construction and decommissioning. For example, Section 5.12.6, Mitigation for Impacts to Air Quality and Climate, contains a statement that BMPs (e.g., watering roads) would be implemented to reduce the amount of fugitive dust generated during construction and decommissioning. Expanding on the idea of BMPs to include a list of typical measures (i.e., cover construction materials and stockpiled soils, cover concrete batch materials, minimize disturbed areas, and other dust abatement techniques) would provide reviewers with a better understanding of

the actions that could be employed to reduce impacts. EPA recommends the Final EIS include examples of BMPs typically used for this type of project.

Final Road Preparation, Erosion Control, and Reclamation and Decommissioning

The Draft EIS indicates that, during reclamation and decommissioning, all unused construction materials and waste will be picked up and removed from the project area and waste materials will be disposed of at approved and appropriate landfills. Likewise, if decommissioning is undertaken after the useful life of the turbines is complete, turbines, infrastructure, and facilities will be removed. Most components and materials will be removed, recycled, or disposed of in an approved and appropriate waste management facility. EPA recommends the Final EIS be revised to indicate that
87 any and all materials from the construction and/or the decommissioning phase will be removed from the project site, recycled, or disposed of appropriately.

Other Sources of Mortality During Operation

Section 5.5.3, Operation Effects, Other Sources of Mortality During Operation, discusses impacts to birds from meteorological towers (MET towers). Direct avian mortality appears to be the primary impact associated with these structures depending on tower height, lighting, color, structure, and the presence of guy wires (The Ornithological Council 2007). According to The Ornithological Council, white strobe lighting typically results in the lowest mortality rate. Seven permanent, un-guyed MET towers, fitted with red strobe lighting, are located within the FRWF project area, and a maximum of three additional permanent, unguyed MET towers will be constructed for Phase IV, and, presumably,
88 fitted with red strobe lighting. **We recommend the use of white strobe lighting on MET towers be discussed with the Federal Aviation Administration (FAA) to reduce avian mortality in the project area**. If the use of white strobe lighting is not permissible, we recommend the Final EIS include the rationale behind the continued use of red strobe lighting at FRWF.

We commend the various measures the Applicant has incorporated to avoid and minimize impacts to birds, including equipping the Project substation with downward facing shields on all lights. Additionally, all operators and technicians on-site are required to turn off internal lights in turbines at night when lights are not required for safety or compliance purposes. According to the Draft EIS, of particular concern relative to bird collisions with all types of structures are episodic events involving large numbers of one or a few bird species during migration. These have been recorded at multiple locations, and are associated with lighting that attracts or disorients birds. Weather conditions and the location of the carcasses suggested that the birds were attracted to bright sodium vapor lights present at a substation located adjacent to three turbines. After these lights were extinguished, no other episodic events occurred at the substation or adjacent turbines (Kerns and Kerlinger 2004). Similarly, in September 2011 at the Mount Storm Wind Energy Facility in West Virginia, 59 bird carcasses were found on one day, 31 of which were found at one turbine whose internal nacelle light had been inadvertently left on overnight; the nacelle light was thought to have attracted the birds to the turbine during foggy weather conditions. Based on the above findings, we recommend use of
89 motion-detection lights that will shut off automatically after a pre-determined amount of time when no human movement is detected. For a nominal cost, this type of device will ensure avian impacts are reduced from unnecessary lighting at night.

Draft Eagle Conservation Plan Guidance

On February 18, 2011, USFWS announced the availability of Draft Eagle Conservation Plan Guidance (Guidance). The draft Guidance provides a means of compliance with the Bald and Golden Eagle Protection Act by providing recommendations for: 1) conducting early

pre-construction assessments to identify important eagle use areas; 2) avoiding, minimizing, and/or compensating for potential adverse effects to eagles; and 3) monitoring for impacts to eagles during construction and operation. As stated in the Draft EIS, the Draft Eagle Conservation Plan Guidance interprets and clarifies the permit requirements in the regulations at 50 C.F.R. 22.26 and 22.27, but does not impose any binding requirements beyond those specified in the regulations.

Per the February, 2011 guidance regarding eagle conservation plans for wind energy facilities, an eagle risk assessment was conducted for the proposed project. As stated in the Draft EIS, "The public comment period on the draft Guidance ended on May 19, 2011. The Service anticipates having final guidance available in 2012." We recommend the Final EIS indicate whether this
90 Guidance has been finalized and whether all relevant Guidance changes have been included in a revised bald and golden eagle management plan included in the Bird and Bat Conservation Strategy for the proposed project.

Whooping Crane Risk Assessment

According to the Draft EIS, approximately 94.6 acres of wetlands were identified in the vicinity of the project area with marginal habitat quality for whooping cranes. Approximately 38 acres of open water, primarily small ponds, were identified within the project area. It is possible that migrating whooping cranes may occasionally stopover in Benton County. A risk assessment determined that direct mortality during Project construction is very unlikely, especially when construction occurs outside of the spring and fall migration periods. Direct mortality was also determined to be unlikely during the steady migratory flight, since whooping cranes migrate at an altitude much higher than the rotor swept area of the turbines. The risk assessment identified greater potential for collision with turbines and/or the proposed project's transmission line during stopover periods when whooping cranes fly between foraging and roosting sites at sunset and sunrise under low-light conditions. Inclement weather was also determined to increase the chance of collision.

According to the Draft EIS, the potential for adverse effects to whooping cranes, particularly from turbines, cannot be reduced to discountable or insignificant levels. The risk assessment concluded that, for this reason, if the flock was protected under the ESA, the appropriate determination would be that operation of the proposed project is likely to adversely affect whooping cranes. Due to the presence of marginal stopover habitat in the proposed project area, the risk assessment considered the potential for disturbance and displacement of whooping cranes to be possible. Even through the overall risk to whooping cranes at RWF was determined to be low, based on the small total population size of the flock (~100 cranes) and the marginal quality of the habitat within the proposed project area, the Draft EIS indicated that marking power lines reduces collision rates. Based on the
91 above, we recommend the Final EIS indicate whether the applicant will mark power lines to reduce adverse effects to whooping cranes using the project area during stopover periods when whooping cranes fly between foraging and roosting sites at sunset and sunrise.

We appreciate the opportunity to review this Draft EIS. If you have any questions or comments regarding the contents of this letter, I can be reached via telephone at 312-886-2910 or via email at westlake.kenneth@epa.gov; Kathy Kowal of my staff can be reached at 312-353-5206 or via email at kowal.kathleen@epa.gov.

Sincerely,

Kenneth A. Westlake, Chief
NEPA Implementation Section
Office of Enforcement and Compliance Assurance

Enclosure – Summary of Rating Definitions

cc: Forest Clark, USFWS-Bloomington
Aaron Damrill, Michiana Branch, Detroit District
Laban Lindley, Indianapolis Field Office (Louisville District)
Matt Buffington, IDNR-Division of Fish and Wildlife
Markita Shepherdson, IDNR-Division of Water
Samantha Gross, IDEM-401 WQC Program

received via e-mail

From: **Buffington, Matt** <MBuffington@dnr.in.gov>
Date: Mon, Jun 24, 2013 at 10:41 AM
Subject: Fowler DEIS
To: Forest_Clark@fws.gov

Forest,

For some reason, we did not receive the Fowler DEIS for review and only learned of it when EPA forwarded their comments to us. (Or maybe it did get to us but was lost somehow.) One staff made a quick read through and I tried to get through it but only got about half way. I know the comment period has passed but thought I would pass along a couple things.

92 I mentioned to Marissa that I wasn't sure how involved we were with the Wyandotte mitigation discussion. Hopefully heavily involved given this is one of our properties. I don't know the condition of the existing Wyandotte gate. I think we would like to see as much summer habitat protection/restoration as possible as it can benefit numerous bat species. Also, we weren't sure if all the mitigation numbers for bats were taking WNS into account or not.

93 In the FEIS, you may want to correct Table 1.2. The DNR, Division of Water, is in charge of the Flood Control Act, with Fish and Wildlife doing a review of the potential impacts to fish, wildlife, and plants for those permits.

94 According to the State Land Office website, there are state-owned properties in Benton Co. Not parks, but still public land. http://www.in.gov/idoa/StateLandOffice/. This is correctly stated at 4.5.2.7 but the section about public use lands (4.2.2.7) suggests there is no state owned land. So technically correct but perhaps a slight misleading at first when the document states there is no state owned land in the project limits.

95 Under 4.4.3.3 and 5.4.2.3 Floodplain, not all floodplains are mapped. Just because a FEMA map does not show a floodplain does not mean one does not exist, or that actions could not affect floodwater attenuation. Every stream has a floodplain and anything with a floodplain can be altered to affect flooding conditions.

Matt Buffington

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Appendix J FEIS Edits Resulting from Reduction in Permit Term Length

This addendum contains specific modifications and updates to the Fowler Ridge Wind Farm Draft EIS published in March 2013. These revisions were made in response to a reduction in the proposed ITP term length from 22 years to 21 years. As a result of the reduction in ITP term length, the proposed permit term, or life of the project, is now **21 years**. The change in permit term length affects the bird and bat, including Indiana bat, mortality estimates presented in the DEIS. In all cases, the impact is less than that presented in the DEIS, resulting in less take of birds and bats, including Indiana bats. The change in permit term length affects only bird and bat resources and does not affect other resources evaluated in the EIS.

Substantive revisions resulting from the change in permit term length are shown below by FEIS section and page. Where text has been modified or added, the new text appears in red print. Deleted text appears with a ~~strikeout line~~ through the text.

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Mortality, No Action Alternative, 2nd Paragraph (Page 111)

The 3rd sentence should read:

Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~28,173~~ 26,909 bats not listed under the ESA ([1,264 bats x ~~2~~ 1 year~~s~~] + [1,598 bats x 15 years] + [335 bats x 5 years]) would be killed under the No Action Alternative (Table 5.3).

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Table 5.3 (Page 112)

Table 5.1 Predicted Fatalities of Bats Not Listed Under the ESA over the ~~22~~ 21-Year Life of Fowler Ridge Wind Farm by EIS Alternative

Alternative	Bat Fatalities[1]
No Operational Adjustment Scenario[2]	~~266,572~~ 254,616
No Action Alternative[3]	~~28,173~~ 26,909
3.5m/s Cut-In Speed (Feathered) Alternative	~~180,776~~ 172,668
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	~~147,458~~ 139,093
6.5m/s Cut-In Speed Alternative	~~80,649~~ 77,032

[1]Fatalities = (total bats killed per year Phases I - III (355 turbines) x ~~2~~ 1 year~~s~~) + (total bats killed per year Phases I - IV (449 turbines) x 15 years) + (total bats killed per year Phase IV x 5 years)
[2]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes
[3]No nightly operation during the fall migration period (August 1-October 15).

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Mortality, 3.5 m/s Cut-In Speed (Feathered) Alternative, 2nd Paragraph (Page 113)

The 2nd sentence should read:

Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~180,776~~ 172,668 bats not listed under the ESA ([8,108 bats x ~~2~~ 1 year~~s~~] + [10,255 bats x 15 years] + [2,147 bats x 5 years]) would be killed under the 3.5 m/s Cut-In Speed (Feathered) Alternative (Table 5.3).

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Mortality, 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) Alternative, 2nd Paragraph (Page 114)

The 2nd sentence should read:

Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~147,458~~ 139,093 bats not listed under the ESA ([6,614 bats x ~~2~~ 1 year~~s~~] + [8,365 bats x 15 years] + [1,751 bats x 5 years]) would be killed under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (Table 5.3).

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Mortality, 6.5 m/s Cut-In Speed Alternative, 2nd Paragraph (Page 114)

The 2nd sentence should read:

Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~80,649~~ 77,030 bats not listed under the ESA ([3,617 bats x ~~2~~ 1 year~~s~~] + [4,575 bats x 15 years] + [958 bats x 5 years]) would be killed under the 6.5 m/s Cut-In Speed Alternative (Table 5.3).

Section 5.5.3.3 Operation Effects on Bats Not listed Under the ESA, Population Level Effects of Operation on Bats Not Listed Under ESA (Page 115)

The 3rd sentence should read:

The impact of between ~~28,173~~ 26,909 (No Action Alternative) and ~~180,776~~ 172,668 (3.5 Cut-In Alternative) primarily tree bat fatalities over the course of ~~22~~ 21 years at FRWF (Table 5.3) is unknown, in part because accurate estimates of most bat populations do not exist.

Section 5.5.3.4 Operation Effects on Birds, Turbine Related Mortality, 3rd Paragraph (Page 117)

The 3rd sentence should read:

Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~41,634~~ 39,767 birds ([1,867 birds x ~~2~~ 1 year~~s~~] + [2,362 birds x 15 years] + [494 birds x 5 years]) would be killed.

Section 5.5.7.2 Birds (Page 124)

The 3rd bullet should read:

- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~41,634~~ 39,767 birds ([1,867 birds x ~~2~~ 1 year~~s~~] + [2,362 birds x 15 years] + [494 birds x 5 years]) would be killed.

Section 5.5.7.3 Bats Not Listed Under ESA (Page 125)

Bullets 6 – 9 should read:

- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~28,173~~ 26,909 bats not listed under the ESA ([1,264 bats x ~~2~~ 1 year~~s~~] + [1,598 bats x 15 years] + [335 bats x 5 years]) would be killed under the **No Action Alternative** (Table 5.3).

- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~180,776~~ 172,668 bats not listed under the ESA ([8,108 bats x ~~2~~ 1 year~~s~~] + [10,255 bats x 15 years] + [2,147 bats x 5 years]) would be killed under the **3.5 m/s Cut-In Speed (Feathered) Alternative** (Table 5.3).

- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~147,458~~ 139,093 bats not listed under the ESA ([6,614 bats x ~~2~~ 1 year~~s~~] + [8,365 bats x 15 years] + [1,751 bats x 5 years]) would be killed under the **5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)** (Table 5.3).
- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~80,649~~ 77,030 bats not listed under the ESA ([3,617 bats x ~~2~~ 1 year~~s~~] + [4,575 bats x 15 years] + [958 bats x 5 years]) would be killed under the **6.5 m/s Cut-In Speed Alternative** (Table 5.3).

Section 5.6.3.2 Operations Effects, Table 5.5 (Page 130)

Table 5.2 Predicted Indiana Bat Fatalities over the ~~22~~ 21-Year Life of Fowler Ridge Wind Farm by EIS Alternative

Alternative	Indiana Bat Take [3]
No Operational Adjustment Scenario[1]	~~381~~ 364
No Action Alternative[2]	0
3.5m/s Cut-In Speed (Feathered) Alternative	~~245~~ 234
5.0m/s Cut-In Speed Alternative (Applicant Proposed Action)	~~193~~ 184
6.5m/s Cut-In Speed Alternative	~~86~~ 82

[1]No curtailment, no feathering below 3.5 m/s wind speed. Not an alternative under consideration. Included only for comparison purposes.
[2]No nightly operation during the fall migration period (August 1-October 15).
[3]Take = (total bats killed per year Phases I - III (355 turbines) x ~~2~~ 1 year~~s~~) + (total bats killed per year Phases I - IV (449 turbines) x 15 years) + (total bats killed per year Phase IV x 5 years)

Section 5.6.3.2 Operations Effects, 3.5 m/s Cut-In Speed (Feathered) Alternative (Page 130)

Paragraphs 2 – 3 should read:

Based on post-construction mortality data collected at FRWF, total Indiana bat take under the 3.5 m/s alternative is predicted to be approximately 10.9 Indiana bats per year when Phases I - III are operating (355 turbines), 13.9 Indiana bats per year when Phases I - IV are operating (449 turbines), and 2.9 Indiana bats per year when only Phase IV is operating (94 turbines) (Table 5.4). Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~245~~ 234 Indiana bats would be killed under the 3.5 m/s Cut-In Speed (Feathered) Alternative (Table 5.5).

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of ~~184~~ 176 females taken by the Project is estimated as potentially contributing an additional ~~202~~ 194 bats to the population by Year ~~22~~ 21 of the Project. Thus, the total impact of the taking under this alternative would be ~~447~~ 428 Indiana bats over the life of the Project, or 20.~~3~~4 bats per year on average. The loss of 20.~~3~~4 Indiana bats per year would represent a loss of 0.007% of the estimated 2011 population of the MRU (305,297 Indiana bats) (USFWS 2012d). The loss to the rangewide population would be 0.005%, based on the 2011 estimated population size of 424,708 Indiana bats (USFWS 2012d). Losses of this magnitude across the range of the Indiana bat or within the MRU would not in itself pose a threat to any population or the species as a whole. How these impacts are distributed among maternity colonies and hibernacula are, however, important to consider.

Section 5.6.3.2 Operations Effects, 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (Page 132)

Paragraphs 2 – 3 should read:

Total Indiana bat take under the 5.0 m/s alternative is predicted to be approximately 8.6 Indiana bats per year when Phases I-III are operating (355 turbines), 10.9 Indiana bats per year when Phases I-IV are operating (449 turbines), and 2.3 Indiana bats per year when only Phase IV is operating (94 turbines) Table 5.4). Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~193~~ 184 Indiana bats would be killed under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action) (Table 5.5). Actual Indiana bat mortality is likely to be lower than these estimates, because they were based on the minimum reductions in mortality that were observed in studies using similar operational adjustments.

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of ~~145~~ 138 females taken by the Project is estimated as potentially contributing an additional ~~160~~ 152 bats to the population by Year ~~22~~ 21 of the Project. Thus, the total impact of the taking under this alternative would be ~~353~~ 336 Indiana bats over the life of the Project, or 16.0 bats per year on average.

Section 5.6.3.2 Operations Effects, 6.5 m/s Cut-In Speed Alternative (Page 133)

Paragraphs 2 – 3 should read:

Based on post-construction mortality data collected at FRWF, total Indiana bat take under the 6.5 m/s alternative is predicted to be approximately 3.9 Indiana bats per year when Phases I - III are operating (355 turbines), 4.9 Indiana bats per year when Phases I - IV are operating (449 turbines), and 1.0 Indiana bats per year when only Phase IV is operating (94 turbines) (Table 5.4). Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~86~~ 82 Indiana bats would be killed under the 6.5 m/s Cut-In Speed Alternative (Table 5.5).

It is predicted that 75% of the Indiana bats killed at FRWF would be adult females (see Section 4.2 of the HCP); the reproductive capacity of ~~65~~ 62 females taken by the Project is estimated as potentially contributing an additional ~~72~~ 68 bats to the population by Year ~~22~~ 21 of the Project. Thus, the total impact of the taking under this alternative would be ~~158~~ 150 Indiana bats over the life of the Project, or 7.~~2~~1 bats per year on average.

Section 5.6.3.5 Mitigation for Take of Indiana Bats (Page 134)

The 1st paragraph should read:

Mitigation would not occur under the No Action Alternative. Mitigation for Indiana bats is described below for the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). Mitigation under the 3.5 m/s Cut-In Speed (Feathered) Alternative and the 6.5 m/s Cut-In Speed Alternative would be qualitatively similar to that described for the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action). Mitigation proposed by the HCP is designed to compensate for the ~~353~~ 336 total Indiana bats expected to be lost from the population (from

direct take and consequent reproductive loss) as a result of Project operation. It is expected that the summer habitat mitigation, described below, would be sufficient to mitigate the take of ~~131~~ 114 Indiana bats (~~37~~ 34% of the total affected bats) and that the winter habitat mitigation would be sufficient to mitigate the take of the remaining 222 Indiana bats (~~63~~ 66% of the total affected bats).

Section 5.6.3.5 Mitigation for Take of Indiana Bats, Summer Habitat Mitigation (Page 135)

The 2nd paragraph should read:

Mitigation Bank Option. FRWF has the option to utilize any mitigation bank that has been set up and approved by the USFWS for mitigation of Indiana bats in the MRU that includes lands within Indiana provided such a bank is operational at the time FRWF must meet its mitigation obligations. FRWF may have the option to contribute to the mitigation bank at a level sufficient to offset the impacts of taking ~~131~~ 114[59] Indiana bats.

Section 5.6.3.5 Mitigation for Take of Indiana Bats (Page 135)

Footnote 59 should read:

[59] Under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), a total of ~~353~~ 336 Indiana bats would need to be mitigated for (i.e., impact of taking). The ~~131~~ 114 bats equates to ~~37~~ 34% of that impact, which is the amount accounted for by summer mitigation. The other 222 bats (~~63~~ 66%) would be mitigated for by the Wyandotte Cave gating.

Section 5.6.4 Summary of Effects to Rare, Threatened and Endangered Species (Page 137)

Bullets 6 – 8 should read:

- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~245~~ 234 Indiana bats would be killed under the **3.5 m/s Cut-In Speed (Feathered) Alternative** (Table 5.5). The total impact of the taking (females + pups) would be ~~447~~ 428 Indiana bats over the life of the Project, or 20.~~3~~4 bats per year on average.
- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~193~~ 184 Indiana bats would be killed under the **5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action)** (Table 5.5). The total impact of the taking (females + pups) would be ~~353~~ 336 Indiana bats over the life of the Project, or 16.0 bats per year on average.
- Over the ~~22~~ 21-year life of the Project, it is estimated that approximately ~~86~~ 82 Indiana bats would be killed under the **6.5 m/s Cut-In Speed Alternative** (Table 5.5). The total impact of the taking (females + pups) would be ~~158~~ 150 Indiana bats over the life of the Project, or 7.~~2~~1 bats per year on average.

Section 5.15.3.2 Wind Energy Development, PIF Region 31 (Page 172)

The 3rd paragraph should read:

Applying the current regional average bird mortality rate to the expected level of build-out in ~~22~~ 21 years results in an estimated 213,288 total birds killed annually at other wind energy facilities across PIF Region 31 at the end of the life of the Project. Although the rate at which wind energy development would occur over the next ~~22~~ 21 years is difficult to predict, averaging the expected maximum rate of bird mortality (213,288 birds/year at the ~~22~~ 21-year maximum build-out capacity) with the current rate of bird mortality (5,858 birds/year at the currently-installed capacity) indicates that an average of 109,573 total birds may be killed in PIF Region 31 each year for the next ~~22~~ 21 years, for an overall total of ~~2,410,606~~ 2,301,033 birds killed in PIF Region 31 during the life of FRWF. In addition to this mortality, FRWF will contribute over its lifespan a total of approximately ~~41,634~~ 39,767 birds, entailing an increase of 1.73% to the overall mortality of birds at wind energy facilities over the next ~~22~~ 21 years in PIF Region 31. Compared to other anthropogenic sources of avian mortality (see Section 5.15.3.3 below), the effect of avian mortality at wind energy facilities in PIF Region 31 is expected to be minor and unlikely to cause population level effects.

Section 5.15.4.1 Wind Energy Development, Bats Not Listed Under the ESA (Pages 176 – 177)

Paragraphs 2 – 4 should read:

Applying the current regional average bat mortality rate to the expected level of build-out in ~~22~~ 21 years results in an estimated 4,902,000 total bats killed annually at other wind energy facilities across the region at the end of the life of the Project. Although the rate at which wind energy development will occur over the next ~~22~~ 21 years is difficult to predict, averaging the expected maximum rate of bat mortality (4,902,000 bats/year at the ~~22~~ 21-year maximum build-out capacity) with the current rate of bat mortality (131,736 bats/year at the currently-installed capacity) indicates that an average of 2,516,870 total bats may be killed in the region each year for the next ~~22~~ 21 years, for an overall total of ~~55,371,140~~ 52,854,270 bats killed in Region 3 during the life of FRWF. In addition to this mortality, FRWF would contribute over its lifespan a total of ~~180,776~~ 172,668 bats under the 3.5 m/s Cut-In Speed (Feathered) Alternative, ~~147,458~~ 139,093 total bats under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), ~~80,649~~ 77,032 bats under the 6.5 m/s Cut-In Speed Alternative, and ~~28,173~~ 26,909 bats under the No Action Alternative. FRWF's mortality contribution would entail an increase of 0.33%, ~~0.27~~ 0.26%, 0.15%, or 0.05%, under the Project Alternatives, respectively, to the overall mortality of bats not listed under the ESA over the next ~~22~~ 21 years in Region 3. Therefore, mortality of bat species not listed under the ESA at FRWF is not expected to be a significant addition to the overall level of bat mortality at wind energy facilities in Region 3, particularly under the adjustment alternatives.

The actual level of bat mortality across the region may be lower, as many wind energy facilities in Region 3 now implement at least some degree of modified turbine operations during the fall bat migration season, although several older facilities in the region remain unregulated under ESA or state laws. Additionally, a growing body of research and improved understanding of the factors affecting bat mortality risk at wind energy facilities is likely to increase the effectiveness

of future turbine operational protocols at reducing bat mortality. If all wind energy facilities in the region implemented modified turbine operations that reduced bat mortality by 50%, the cumulative impacts of wind energy development on bat species not listed under the ESA in Region 3 would be greatly reduced. Predicted bat mortality would decrease to approximately 1,258,435 bats per year on average, or approximately ~~27,685,570~~ 26,427,135 bats killed in Region 3 during the life of the FRWF. FRWF's mortality would contribute an increase of ~~0.66~~ 0.65%, ~~0.54~~ 0.53%, ~~0.30~~ 0.29%, or 0.10%, under the Project alternatives, respectively, to this reduced level of overall mortality of bats not listed under the ESA over the next ~~22~~ 21 years in Region 3. FRWF's mortality contribution would therefore still not entail a significant addition to overall bat mortality in the region.

As discussed above, based on current data, fatalities at industrial wind facilities are heavily skewed toward the three species of migratory tree bats. If the build-out scenarios are implemented and the estimates based on current post-construction monitoring remain more or less the same, millions of tree bats would die at wind facilities in Region 3 alone. Because we do not have good population estimates for most bat species including migratory tree bats, it is unclear how either the cumulative mortality under no curtailment (~~55,371,140~~ 52,854,270 bats), under 50% curtailment (~~27,685,570~~ 26,427,135 bats), or some scenario in-between would impact the various affected bat species. As far as we understand, bat species potentially impacted by wind development in Region 3 have an evolutionary strategy focused on high adult survival and low fecundity. This suggests that a high level of adult loss could be detrimental to the affected populations. The loss of millions of tree bats over the life of the project is unknown but may be unsustainable. Kunz, et al. (2007b) essentially characterized the current state of our understanding in their 2007 article on the ecological impacts of wind development: "Our current knowledge and the projected future development of wind energy facilities in the U.S. suggest the potential for a substantial population impact to bats." Research is ongoing to estimate population levels and the potential impacts of wind facilities focused on migratory tree bats.

Section 5.15.4.1 Wind Energy Development, Indiana Bat (Page 178)

The 3rd paragraph should read:

Applying the recovery unit's current estimated baseline Indiana bat mortality rate to the expected level of build-out in ~~22~~ 21 years (64,920.40 MW) results in an estimated 3,246 total Indiana bats killed annually at wind energy facilities across the recovery unit at the end of the life of the Project. Although the rate at which wind energy development would occur over the next ~~22~~ 21 years is difficult to predict, averaging the expected maximum rate of Indiana bat mortality (3,246 Indiana bats/year at the ~~22~~ 21-year maximum build-out capacity) with the current rate of Indiana bat mortality (41 Indiana bats/year at the currently-installed capacity) indicates that an average of 1,644 Indiana bats may be killed in the recovery unit each year for the next ~~22~~ 21 years, representing 0.54% of the MRU's 2011 population. At this rate, a total of ~~36,168~~ 34,524 Indiana bats would be killed in the MRU during the life of FRWF, assuming no operational adjustments are implemented. In addition to this mortality, FWRF would contribute over its lifespan a total of ~~245~~ 234 Indiana bat fatalities under the 3.5 m/s Cut-In Speed (Feathered) Alternative, ~~193~~ 184 Indiana bat fatalities under the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), ~~86~~ 82 Indiana bat fatalities under the 6.5 m/s Cut-In Speed Alternative, and zero (0) Indiana bat fatalities under the No Action Alternative. FRWF's mortality contribution would entail an increase of 0.68%, 0.53%, 0.24%, or 0.00%, under the

Project alternatives, respectively, to the overall mortality of Indiana bats over the next ~~22~~ 21 years in the MRU. However, mitigation measures designed to fully compensate for the level of expected take and the associated loss in reproduction would be implemented as a part of the HCP under the 3.5 m/s Cut-In Speed (Feathered) Alternative, the 5.0 m/s Cut-In Speed Alternative (Applicant Proposed Action), and the 6.5 m/s Cut-In Speed Alternative. Therefore, mortality of Indiana bats at FRWF is not expected to be a significant addition to the overall level of Indiana bat mortality at wind energy facilities in the MRU. The loss of 1,644 Indiana bats each year during the ~~22~~ 21 year life of the Project would be distributed across many maternity colonies and hibernacula. In the absence of other major threats, we would not expect this level of impact to negatively affect either the MRU population or specific maternity or hibernating populations. We do not yet fully understand the impacts of WNS on the MRU; however, this may alter the dynamics of the MRU population (see Section 5.15.4.2 for a discussion of WNS).

Section 5.15.4.5 Summary of Cumulative Effects to Bats, Indiana Bats (Page 183)

The 2nd paragraph should read:

To understand the implications of cumulative bat mortality requires knowledge of baseline populations. Unfortunately, there is little information on current population estimates for most bat species in North America at local, regional, or continental scales (O'Shea et al. 2004, Kunz et al. 2007a). We have a better understanding of past and current population levels for Indiana bats than for any other species, which is largely an artifact of their long-standing endangered status and the ability to monitor populations through hibernacula counts. The total impact of the taking (~~353~~ 336 Indiana bats) over the ~~22~~ 21-year life of the FRWF sought by the Applicant is roughly 0.1% of the 2011 MRU Indiana bat population. Additionally, the Applicant's strategy for addressing changed circumstances, including population declines associated with WNS, provide further mechanisms for reducing the Project's contribution to cumulative effects to Indiana bats.

Section 5.16.1 No Action Alternative (Page 184)

Paragraphs 1 – 2 should read:

Construction of Phase IV under the No Action Alternative would result in an irreversible or irretrievable alteration of 78.2 acres of prime and unique farmland. However, turbines would be removed during decommissioning (after a ~~22~~ 21-year operation life), and the land would be restored to agricultural use.

Operation of the Project under the No Action Alternative would result in the incidental take of 0 Indiana bats over the life of the Project (see Section 5.6.7). Up to ~~41,634~~ 39,767 birds and ~~28,173~~ 26,909 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

Section 5.16.2 3.5 m/s Cut-in Speed (Feathered) (Page 184)

The 2nd paragraph should read:

Operation of the Project under the 3.5 m/s Cut-in Speed (Feathered) Alternative would result in the incidental take of approximately ~~245~~ 234 Indiana bats over the life of the Project (see Section 5.6.7). Additionally, up to ~~41,634~~ 39,767 birds and ~~180,776~~ 172,668 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

Section 5.16.3 5.0 m/s Cut-in Speed (Applicant Proposed Action) (Page 184)

The 2nd paragraph should read:

Operation of the Project under the 5.0 m/s Cut-In Speed Alternative would result in the incidental take of approximately ~~193~~ 184 Indiana bats over the life of the Project (see Section 5.6.7). Additionally up to ~~41,634~~ 39,767 birds and ~~147,458~~ 139,093 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).

Section 5.16.4 6.5 m/s Cut-in Speed (Page 184)

The 2nd paragraph should read:

Operation of the Project under the 6.5 m/s Cut-in Speed Alternative would result in the incidental take of approximately ~~86~~ 82 Indiana bats over the life of the Project (see Section 5.6.7). Additionally, up to ~~41,634~~ 39,767 birds and ~~80,649~~ 77,032 bats not listed under the ESA may be incidentally taken during the life of the Project (see Section 5.5.7).