

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 Health 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)

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? <i>If no, the FPPA does not apply - do not complete additional parts of this form.</i>		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 256,012 % 98	Acres Irrigated	Average Farm Size 378
Name Of Land Evaluation System Used LCSA	Name Of Local Site Assessment System	Amount Of Farmland As Defined In FPPA Acres: 252,327 % 97	
		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 <input type="checkbox"/> No <input type="checkbox"/>	
Reason For Selection:			

¹Estimate 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

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);

Reference: Initial Noise Modeling Results, Fowler Ridge Wind Farm Phase IV

- 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	1/4 th as loud
Leaves Rustling	20	1/8 th as loud
Breathing	10	1/16 th 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.

Reference: Initial Noise Modeling Results, Fowler Ridge Wind Farm Phase IV

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 boundaries 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



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

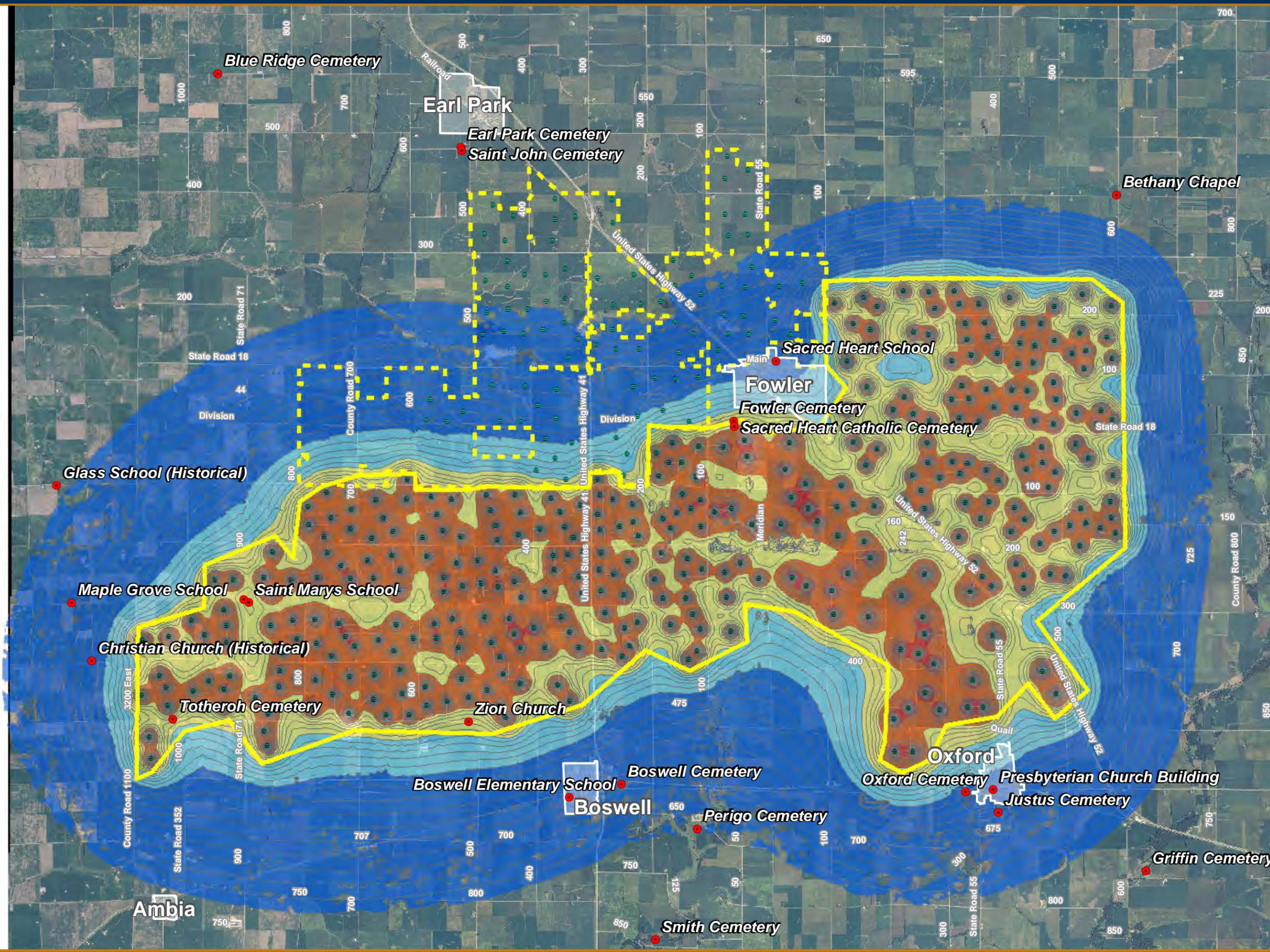
- 50+ dBA
- 45 - 50
- 40 - 45
- 35 - 40
- < 35 dBA

Data Sources: IDNR, ILDNR, USGS, ESRI
Imagery: 2010 NAIP



Stantec Consulting
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Noise Studies

Phases I, II, III, and IV
Fowler Ridge Wind Project



Location

Benton County, IN



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

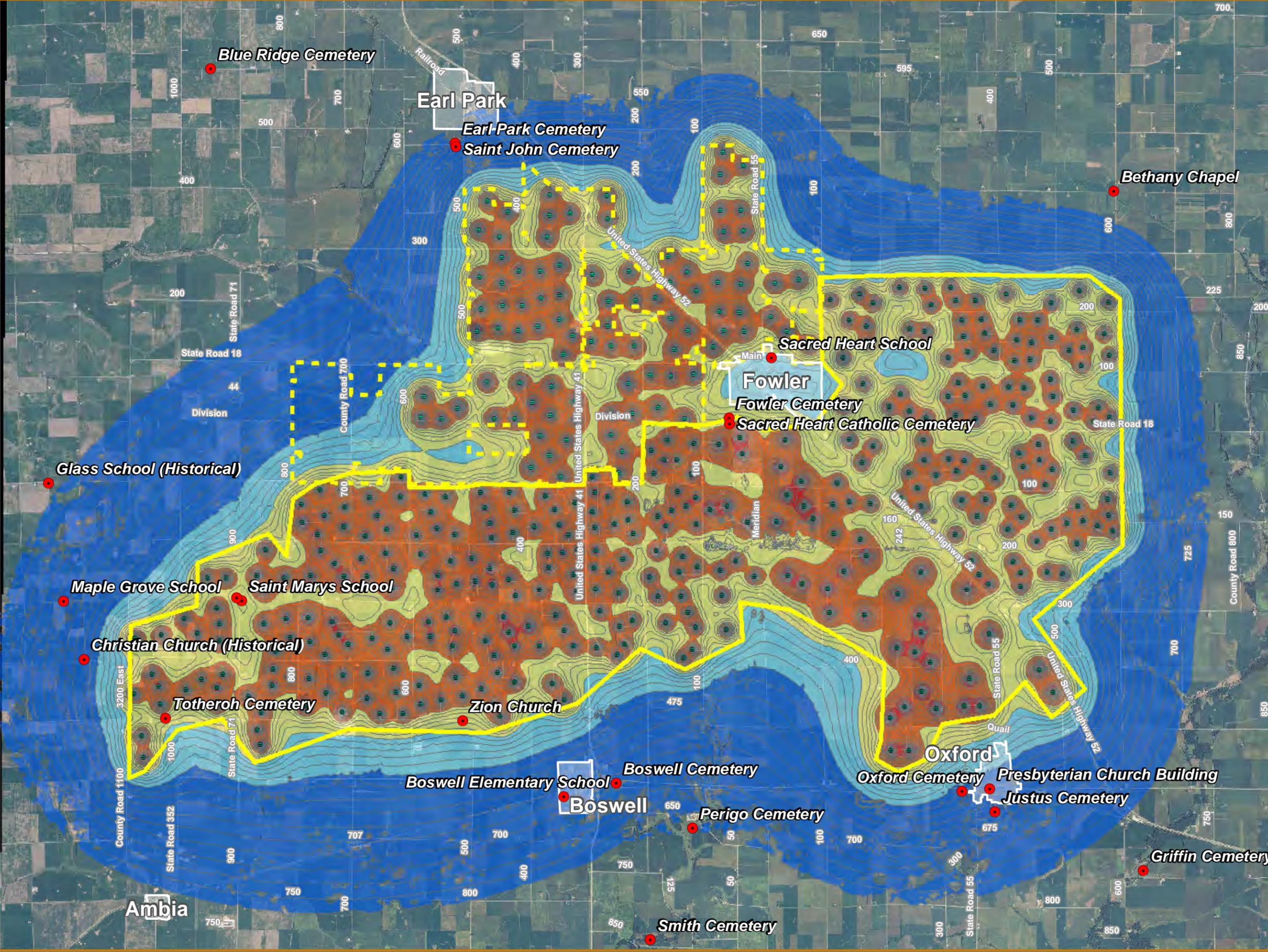
- 50 + dBA
- 45 - 50
- 40 - 45
- 35 - 40
- < 35 dBA

Data Sources: IDNR, ILDNR, USGS, ESRI
Imagery: 2010 NAIP



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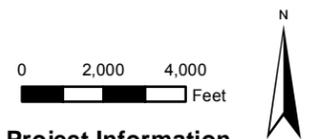
Noise Studies

Phases IV
Fowler Ridge Wind Project



Location

Benton County, IN



Project Information

Project Number : 193701150
Modified November 15, 2011

Legend

- Sensitive Receptors (schools, hospitals, cemeteries)
- Fowler Phase IV Project Boundary
- Fowler Phase IV Microsite 110801
- 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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