

Exhibit 08-9
Avian Risk Assessment
(2010)



PN: 1865.006

June 2010

**AVIAN RISK ASSESSMENT
FOR THE
HARDIN COUNTY HOG CREEK WIND FARM,
PHASES 1 & 2
DUNKIRK AND DOLA, OHIO**

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EXECUTIVE SUMMARY

The Hog Creek Wind Farm site (Project Area) is privately owned farmland that has been leased for development of a wind farm. Present uses will continue after wind farm development on over 97 percent of the land. The terrain on the site is nearly flat. Paved and gravel roads intersect the Project Area as well as a single set of railroad tracks. The area was effectively drained in the 1940s and 6-8 feet deep linear drainage ditches cross the site and feed into Hog Creek Ditch, which drains the site to the west. The Project Area is almost entirely managed for soybean and corn agriculture. Nine small woodlots are interspersed over the 5,621 acre Hog Creek Wind Farm.

During the fall raptor migration survey and spring northern harrier nest survey, no federally endangered or threatened species were observed on or within 0.4 kilometer (km; 0.25 mile [mi]) of the Project perimeter. The state endangered northern harrier (*Circus cyaneus*) and state species of concern sharp-shinned hawk (*Accipiter striatus*) were observed flying through the area well below the height of the proposed rotor swept area. During spring raptor surveys, sharp-shinned hawks were observed passing through the Project Area. Nest searches for northern harriers produced no breeding birds. Habitat is not suitable for sharp-shinned hawk nesting. A query of the Ohio Department of Natural Resources Natural Heritage Database revealed no records of federally endangered or threatened species on or within 5 mi of the Project Area. State listed species were three or more miles from the Project Area and will not be affected by the wind farm construction.

Nothing in the literature, databases, or an examination of the habitats on the site suggests that the site is an important nesting, foraging, or migratory stop-over site for federal or Ohio state-listed species. There was no indication that the proposed wind farm site harbored large numbers of migrating or wintering birds or that the site is situated along a major migratory pathway.

Due to the intensive agricultural practices, there was no indication of high densities or abundant availability of prey species that could attract raptor species. No topographic features exist that would produce updrafts that might attract raptor migrants.

The results of the site visits, literature reviews, database searches, and survey of the avian species that utilize the site compared with what is known about avian risk factors at wind farms in North America indicate that the risk to avian species at the Hog Creek Wind Farm site is low. Avian mortality will likely be as low as or lower than mortality recorded at other Midwestern wind farms that are dominated by row crop agriculture.

1.0 INTRODUCTION

1.1 PROPOSED PROJECT

Hog Creek Wind Farm, LLC (JW) of Cleveland, Ohio, proposes construction of the Hog Creek Wind Farm II (Hog Creek II) wind energy generation facility in Hardin County, Ohio (Figure 1). The Hog Creek Wind Farm (Project) consists of two phases: Hog Creek Wind Farm I (Hog Creek I) and Hog Creek II. Hog Creek I (formerly known as Hardin County North Wind Farm) has already received a siting certificate from the Ohio Power Siting Board (OPSB) on March 22, 2010. Hog Creek II is a proposed eastern addition to Hog Creek I. This purpose of this document is to assess the risk to bird species as a result of the construction of the entire project (both phases combined). This Avian Risk Assessment includes the additional proposed footprint of Hog Creek II and incorporates new available information into the original risk assessment.

Both phases are located in northern Hardin County, near the border with Hancock County, Ohio. Hog Creek I spans 1,356 hectares (ha; 3,351 acres [ac]) between the towns of Ada and Dola. Hog Creek II spans 718 ha (1,775 ac) between the towns of Dola and Dunkirk. Combined, Hog Creek will span 2,074 ha (5,126 ac) (Figures 1 and 2). The Project area represents the maximum area considered for placement of turbines and facility infrastructure. The actual area occupied by the turbines and access roads that will comprise the facility will be a very small percentage of the Project area (about 2.95 percent).

In total, the Hog Creek Wind Farm will erect 29 Siemens SWT 2.3-101 wind turbines (Hog Creek I = 21 turbines; Hog Creek II = 8 turbines). The turbines will have a nameplate generating capacity of 2.3 megawatts (MW), yielding a total nameplate project capacity of 66.7 MW. Hog Creek I was approved for 48.3 MW and shares part of its eastern border with Hog Creek II. Hog Creek II will generate 18.4 MW. The proposed hub height is about 100 meters (m; 328 feet [ft]) above ground level (agl). Rotor diameter will be approximately 101 m (331 ft) and individual blades will be approximately 50.5 m (166 ft) long. With the rotor tip in the 12 o'clock position, the wind turbines will reach a maximum height of approximately 150.5 m (494 ft) agl. At the 6 o'clock position, the rotor tip will be approximately 49.5 m (163 ft) agl. The turbine rotor will turn at a maximum operating speed of 16 rotations per minute (rpm). The turbines have a nominal "cut-in speed" of 4 meters per second (m/s; 8.9 miles per hour [mph]). Wind speeds above 4 m/s will result in blade speeds of 6 to 16 rpm, depending upon wind speeds.

The turbines will be lit with red strobe-like or incandescent flashing lights. Lighting will be limited to the minimum number required by the Federal Aviation Administration (FAA) for aircraft safety.

Each turbine tower will be set upon a concrete pad with an aboveground diameter of approximately 4.5 m (15 ft). Nominally, crops and other vegetation within approximately 61 m (200 ft) of each tower site will be cleared, yielding a maximum of 29, 1.2-ha (2.9-ac) openings (34.8 ha or 84.1 ac of clearing for tower sites). Infrastructure (access roads, cabling, substation) will total another 27.3 ha (67.4 ac). The total cleared area required for erection of turbines will be approximately 61.3 ha (151.5 ac) or 2.95 percent of the total Project area. As tree cover is sparse within the Project area and most land use is cropland, little or no tree removal is expected to be necessary for construction of turbines or access roads.



Figure 1. Overview of the Hog Creek Wind Farm I and proposed expansion, Hog Creek Wind Farm II, Hardin County, Ohio.

| | | |
|----------------------|--|-------------------------------------|
| | | June 2010 |
| Project No. 1865.006 | | Basemap: NAIP Aerial Imagery (2006) |
| | | |

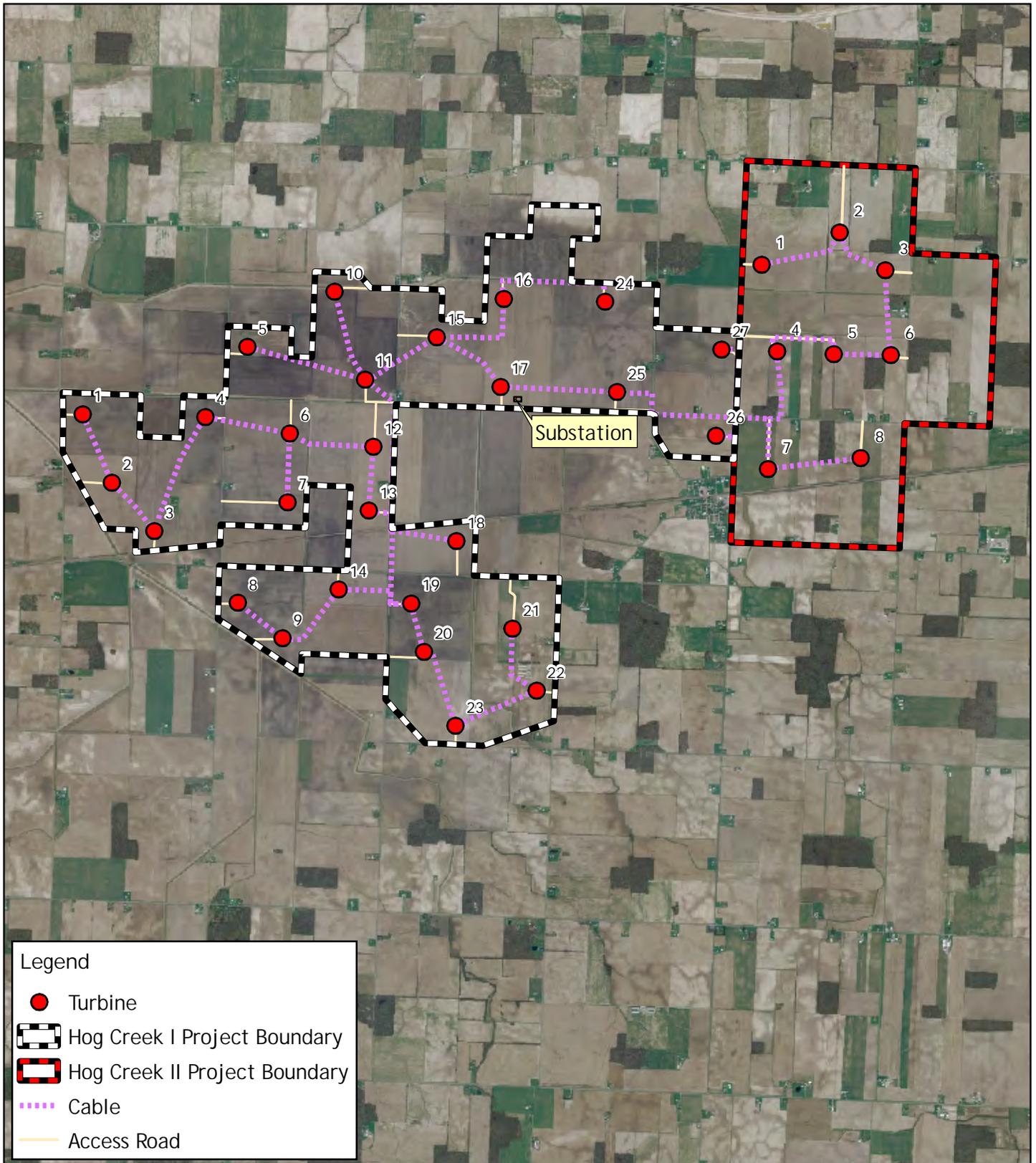


Figure 2. Project boundary and turbine layout for the Hog Creek Wind Farm I and proposed expansion, Hog Creek Wind Farm II, Hardin County, Ohio.

| | | | |
|-----------------------------|--|------------------|--|
| | <p>Feet</p> | <p>June 2010</p> | |
| <p>Project No. 1865.006</p> | <p>Basemap: OSIP (Ohio Statewide Imagery Program) - 2006</p> | | |

1.2 TOPOGRAPHIC/PHYSIOGRAPHIC AND HABITAT DESCRIPTION

Habitat at the Hog Creek Project can be broadly characterized through a review of the ecoregion type. An ecoregion is an area with similar or related physiography, where communities or associations of plants and animals, both common and rare, have adapted to that particular environment. Climate, soils, drainage, and anthropogenic factors may have an effect on biological communities and ecoregions.

The following text describes the ecological region in which the proposed Hog Creek wind energy generation facility occurs. This description is useful in understanding the nature and important ecological aspects of the area.

The Project lies within the Eastern Broadleaf Forest (Continental) Ecological Province of the United States (USFS 1994). Within this Province, the Project is located in Ecoregion Section 222H—Central Till Plains, Beech-Maple (Figure 3). Of all the wind energy generation facilities at which bird mortality studies have been completed, none are within this same Ecological Province or Ecoregion Section. Ecological aspects of Crescent Ridge, Top of Iowa, Rosiere and WPS, and Buffalo Ridge (four Midwestern operating wind energy generation facilities at which bird mortality studies have been completed) are shown in Appendix A for comparison. These wind energy generation facilities occupy areas dominated by agriculture and cropland comparable to the Hog Creek Project area.

Ecoregion Section 222H comprises part of the Central Lowlands geomorphic province and is characterized by flat to gently rolling till-plain, broad bottomlands, shallow entrenchment of drainages, and a few major river valleys. Section 222H is predominantly Wisconsin glacial till and dominant soils include Udalfs and Aqualfs (USFS 1994).

The potential natural vegetation of Section 222H is beech-maple forests with some oak-hickory forests and bluestem prairie. Most of the land in Section 222H is now highly productive farmland, with most forest stands in small, isolated tracts less than 101 ha (250 ac) in size (USFS 1994).

Precipitation averages 900 to 1030 millimeters (mm; 35 to 40 inches [in]) per year. Mean annual temperature is approximately 10 to 13 °C (50 to 55 °F). The growing season ranges from 155 to 180 days (USFS 1994).

Approximately 28 percent of Hardin County is forested (12 percent coniferous, 11 percent deciduous, 3 percent forested wetlands, and 2 percent mixed forest; USGS 2001).

Over 89.6 percent of the Hog Creek II Project Area is devoted to intensive row crop agriculture production with occasional woodlots that comprise 4.6 percent of the Project Area (Table 1). The adjacent Hog Creek I area is over 95 percent agricultural land use. Because Hog Creek I and II will be integrated into a single wind farm, data collected for Hog Creek I is incorporated into this report, as appropriate.

2.0 METHODS

Literature and database searches were completed, including a review of relevant printed, published, unpublished, and electronic material such as US Geological Survey (USGS) Breeding

Table 1. National land use/land cover acreages on the Hog Creek Wind Farm I and II, Hardin County Ohio.

| Land Use/Land Cover | Hog Creek I | Percent | Hog Creek II | Percent | Total | Percent |
|--------------------------|----------------|--------------|----------------|------------|----------------|-------------|
| Cropland | 3,212.5 | 96.0 | 1,590.3 | 89.6 | 4,802.8 | 93.7 |
| Developed Open Space* | 127 | 3.8 | 85.1 | 4.8 | 212.1 | 4.1 |
| Deciduous Forest | 7.2 | 0.2 | 74.9 | 4.2 | 82.1 | 1.6 |
| Herbaceous | 4.3 | 0.1 | 10.2 | 0.6 | 14.5 | 0.2 |
| Hay/Pasture | 0 | 0 | 12.9 | 0.7 | 12.9 | 0.2 |
| Developed, Low Intensity | 0 | 0 | 1.5 | <0.1 | 1.5 | <0.1 |
| TOTAL | 3,351.0 | 100.1 | 1,775.0 | 100 | 5,126.0 | 99.9 |

*Includes roads, roadsides, railroad right of way, and drainage ditches.

Bird Surveys, Ohio Breeding Bird Atlas, Audubon Christmas Bird Counts, hawk migration literature, Ohio Natural Heritage Inventory, Ohio Department of Natural Resources (ODNR) information, US Fish and Wildlife Service (USFWS) information, and other sources of information concerning the birds that may forage-, rest-, or nest in, migrate through, or use the site as a wintering area.

Coordination was sought from the ODNR and USFWS. Field investigation methods were based upon agency input, study intensity maps included within the ODNR "On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio," and queries of agency databases (Appendix A).

Vegetation and habitats were surveyed October 30 and 31, 2008 for the initial Hog Creek I Wind Farm Project Area. Vegetation and habitat were surveyed again on May 6, 7, and 18, 2010 for the Hog Creek II expansion. The survey area included the Hog Creek II Project Area as well as a 0.4 km (0.25 mi) surrounding buffer. Pedestrian surveys of the representative ditches and woodlots identified the dominant vegetation in each habitat type. An automobile survey was conducted throughout the Project Area to ensure that no habitat features were excluded and to survey the agricultural areas.

Avian surveys were conducted two days per week from October 9 to 31, 2008 for Hog Creek I. For this update, an avian survey was conducted on May 6, 7, and 18, 2010. These surveys were conducted with the aid of 10 magnification binoculars and included periods of stationary observation, pedestrian-, and automobile surveys. Ditch bottoms were inspected for bird tracks and other identifying signs.

Raptor migration surveys were conducted October 9 to 31, 2008 for Hog Creek I and the surrounding area that included the area of Hog Creek II. The counts occurred from 0900 to 1600 hours, two days per week. Estimated raptor flight height above ground level was recorded to assess usage of air space within the turbine rotor swept zone. Methods used were consistent with Section 2.2 Diurnal Bird/Raptor Migration Monitoring of the *On-Shore Bird and Bat Pre- and Post- Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio*, (Protocol) issued by ODNR, except surveys were conducted one day less per week and did not start by the date recommended (September 1).

As requested by ODNR, nest searches for the northern harrier (*Circus cyaneus*), an Ohio state-listed endangered species, were conducted March 26 and 27 and April 28 and 29, 2009 for Hog Creek I. Due to the distinctive flight patterns exhibited by northern harriers during hunting and courtship, searches for this species were conducted from points along public roads where expanses of potentially suitable habitat were viewable. Though not requested by agencies (Appendix A), northern harriers were sought during May 2010 Hog Creek II avian surveys.

3.0 RESULTS

3.1 LITERATURE REVIEW

3.1.1 Winter Birds: National Audubon Society Christmas Bird Count

The National Audubon Society's Christmas Bird Count has provided valuable information to scientists for over 100 years as they are able to track changes in the populations of avian species over time. In addition, the count may be used as an aid in efforts to characterize winter avian use of a particular site. The protocol for the annual Christmas Bird Count asks for the tally of all birds detected within a 24 km (15 mi) diameter circle on a single day (24 hrs) between December 14 and January 5.

The closest count circle to the Project Area is the Killdeer Plains Wildlife Area circle, approximately 32 km (20 mi) to the southeast. The Killdeer Plains Wildlife Area circle encompasses portions of Wyandot and Marion counties. During the 110th Christmas Bird Count, conducted last year, eight Ohio state-listed species were detected (Table 2).

3.1.2 Breeding Birds

3.1.2.1 USGS Breeding Bird Survey

Each summer a large-scale roadside survey of North American birds is conducted for the USGS. The survey encompasses most of the continental United States and southern Canada, and includes parts of Alaska, and northern Mexico. The Breeding Bird Surveys (BBS) are conducted by experienced birders each May or June when breeding birds are at the peak of song production. Each route is 39.4 km (24.5 mi) long, and includes 50 stops located at 0.8 km (0.5 mi) intervals. Data from the BBS provide researchers with valuable information regarding both long- and short-term population trends of many bird species and can help characterize breeding at a particular site.

The closest route to the Project Area is the Kenton Route (66033), which runs north-south through portions of Hardin, Hancock, and Wood counties, approximately 6.4 km (4 mi) east from the Project Area at its closest point. Five Ohio state-listed species have been detected along this BBS route (Table 3): the state endangered black tern (*Chlidonias niger*); the state threatened bald eagle (*Haliaeetus leucocephalus*); the state species of concern northern bobwhite (*Colinus virginianus*); the state species of special interest blue grosbeak (*Passerina caerulea*); and western meadowlark (*Sturnella neglecta*). No federally listed species were detected.

3.1.2.2 Breeding Bird Atlas

Breeding Bird Atlas (BBA) projects are grid-based surveys used to document the status and distribution of all bird species that breed within a given country, state, or county. Most atlas

Table 2. Bird species observed on the 110th Christmas Bird Count (2009-2010) by observers within the Killdeer Plains Wildlife Area circle, Wyandot and Marion Counties, Ohio.

| Common Name | Number ^a | Number Per Hour ^b | Listed Species? ^c |
|-----------------------------------|---------------------|------------------------------|------------------------------|
| Canada Goose | 2547 | 74.36 | |
| Trumpeter Swan | 9 | 0.26 | SE |
| Tundra Swan | 53 | 1.55 | |
| Wood Duck | 2 | 0.06 | |
| American Wigeon | 6 | 0.18 | SOSI |
| American Black Duck | 58 | 1.69 | |
| Mallard | 1099 | 32.09 | |
| Northern Pintail | 8 | 0.23 | SOSI |
| Great Blue Heron (Blue form) | 2 | 0.06 | |
| Bald Eagle | 15 | 0.44 | ST |
| Northern Harrier | 22 | 0.64 | SE |
| Cooper's Hawk | 5 | 0.15 | |
| Red-shouldered Hawk | 1 | 0.03 | |
| Red-tailed Hawk | 30 | 0.88 | |
| Rough-legged Hawk | 1 | 0.03 | |
| American Kestrel | 20 | 0.58 | |
| Ring-billed Gull | 4 | 0.12 | |
| Rock Pigeon | 72 | 2.10 | |
| Mourning Dove | 74 | 2.16 | |
| Eastern Screech-Owl | 7 | 0.20 | |
| Great Horned Owl | 1 | 0.03 | |
| Barred Owl | 5 | 0.15 | |
| Short-eared Owl | 14 | 0.41 | SOSI |
| Red-headed Woodpecker | 25 | 0.73 | |
| Red-bellied Woodpecker | 34 | 0.99 | |
| Downy Woodpecker | 43 | 1.26 | |
| Northern (Yellow-shafted) Flicker | 37 | 1.08 | |
| Blue Jay | 129 | 3.77 | |
| American Crow | 36 | 1.05 | |
| Horned Lark | 46 | 1.34 | |
| chickadee sp. | 27 | 0.79 | |
| Tufted Titmouse | 38 | 1.11 | |
| White-breasted Nuthatch | 60 | 1.75 | |
| Brown Creeper | 7 | 0.20 | |
| Golden-crowned Kinglet | 2 | 0.06 | SOSI |
| Eastern Bluebird | 8 | 0.23 | |

Table 2. Bird species observed on the 110th Christmas Bird Count (2009-2010) by observers within the Killdeer Plains Wildlife Area circle, Wyandot and Marion Counties, Ohio.

| Common Name | Number ^a | Number Per Hour ^b | Listed Species? ^c |
|---------------------------------|---------------------|------------------------------|------------------------------|
| American Robin | 4 | 0.12 | |
| European Starling | 1738 | 50.74 | |
| Eastern Towhee | 2 | 0.06 | |
| American Tree Sparrow | 428 | 12.50 | |
| Song Sparrow | 36 | 1.05 | |
| Swamp Sparrow | 11 | 0.32 | |
| White-crowned Sparrow | 4 | 0.12 | |
| Dark-eyed (Slate-colored) Junco | 34 | 0.99 | ST |
| Lapland Longspur | 3 | 0.09 | |
| Northern Cardinal | 59 | 1.72 | |
| Common Grackle | 9 | 0.26 | |
| House Finch | 15 | 0.44 | |
| American Goldfinch | 49 | 1.43 | |
| House Sparrow | 180 | 5.26 | |

^a Indicates total number seen by all counters within circle area.

^b Indicates number seen per observer hour on all counts within circle area.

^c Federally endangered (FE), federally threatened (FT), federally listed as a candidate for listing (FC), Ohio state endangered (SE), Ohio state threatened (ST), Ohio state species of concern (SOC), Ohio state species of special interest (SOSI).

Table 3. Species encountered while conducting the Kenton, Ohio Breeding Bird Survey Route (66033; 1966-2007) located 4 miles east of Hog Creek Wind Farm II.

| | | |
|--------------------------------|-------------------------------|---------------------------------|
| Canada Goose | Northern Flicker | Brown Thrasher |
| Wood Duck | Eastern Wood-Pewee | European Starling |
| Mallard | Acadian Flycatcher | Cedar Waxwing |
| Ring-necked Pheasant | Willow Flycatcher | Yellow Warbler |
| Northern Bobwhite ^a | Eastern Phoebe | Common Yellowthroat |
| Great Blue Heron | Great Crested Flycatcher | Yellow-breasted Chat |
| Green Heron | Eastern Kingbird | Scarlet Tanager |
| Turkey Vulture | White-eyed Vireo | Eastern Towhee |
| Bald Eagle ^b | Yellow-throated Vireo | Chipping Sparrow |
| Cooper's Hawk | Warbling Vireo | Field Sparrow |
| Red-tailed Hawk | Red-eyed Vireo | Vesper Sparrow |
| American Kestrel | Blue Jay | Savannah Sparrow |
| Killdeer | American Crow | Grasshopper Sparrow |
| Upland Sandpiper | Horned Lark | Song Sparrow |
| Ring-billed Gull | Purple Martin | Northern Cardinal |
| Black Tern ^c | Tree Swallow | Rose-breasted Grosbeak |
| Rock Pigeon | Northern Rough-winged Swallow | Blue Grosbeak ^d |
| Mourning Dove | Barn Swallow | Indigo Bunting |
| Black-billed Cuckoo | Carolina Chickadee | Dickcissel |
| Yellow-billed Cuckoo | Black-capped Chickadee | Bobolink |
| Great Horned Owl | Tufted Titmouse | Red-winged Blackbird |
| Barred Owl | White-breasted Nuthatch | Eastern Meadowlark |
| Common Nighthawk | Carolina Wren | Western Meadowlark ^d |
| Chimney Swift | House Wren | Common Grackle |
| Ruby-throated Hummingbird | Blue-gray Gnatcatcher | Brown-headed Cowbird |
| Belted Kingfisher | Eastern Bluebird | Orchard Oriole |
| Red-headed Woodpecker | Wood Thrush | Baltimore Oriole |
| Red-bellied Woodpecker | American Robin | House Finch |
| Downy Woodpecker | Gray Catbird | American Goldfinch |
| Hairy Woodpecker | Northern Mockingbird | House Sparrow |

^a This species is listed by the state of Ohio as a Species of Concern.

^b This species is listed by the state of Ohio as Threatened.

^c This species is listed by the state of Ohio as Endangered.

^d This species is listed by the state of Ohio as a Species of Special Interest.

projects base their survey grid on 7.5-minute USGS topographic maps. As is typical of most, the Ohio Breeding Bird Atlas survey "blocks" were defined by dividing topographic maps into six areas of equal size (approximately 16 km² [10 mi²] each). Volunteers place each species observed into one of three breeding categories: possible, probable, or confirmed. Atlas projects typically require 5 to 6 years, but can vary in length.

Two Breeding Bird Atlas blocks are near the Project Area: the Forest 2 Block, and the Dunkirk 4 Block. The Forest 2 Block lies approximately 6.4 km (4 mi) east of the Project Area and the Dunkirk 4 Block lies approximately 1.6 km (1 mi) north of the Project Area. One Ohio state-listed species was documented during the breeding season in the Forest 2 Block. The state species of concern, cerulean warbler (*Dendroica cerulea*), was assigned a breeding status of "probable" during the 1982-1987 survey effort but it has not been found in the 2006-2010 effort (Table 4). Two Ohio state-listed species were documented during the breeding season in the Dunkirk 4 Block. The state species of concern, northern bobwhite, was assigned a breeding status of "confirmed" during the 1982-1987 effort, and the state species of concern, bobolink (*Dolichonyx oryzivorus*), was assigned a breeding status of "confirmed" during the 1982-1987 effort (Table 5). Neither the northern bobwhite nor the bobolink has been found in the block during the current effort.

3.1.3 Migrating Birds

3.1.3.1 Habitat Types Attractive to Migratory Birds

Habitats that attract migrant birds such as forests, wetlands, hedge rows, and shrubby thickets account for only a small portion of the Project Area. There are a series of forest patches within the Project Area, but these habitat types are limited in size and will not concentrate large numbers of migratory birds.

Large farm fields are attractive to horned larks (*Eremophila alpestris*), snow buntings (*Plectrophenax nivalis*), and other grassland adapted migrants, primarily in winter. There is extensive acreage of this habitat type throughout the Midwest, so the habitat within and surrounding the Project Area is unlikely to harbor large numbers of these migrant species.

3.1.3.2 Nocturnal Songbird Migration

It is generally accepted that passerine (songbird) migration occurs along a broad front, which suggests that any area may be over-flown by migrating songbirds. Many songbird species migrate at night. There have been a number of studies concerning the potential risk of wind-energy development on nocturnally migrating songbirds (Kunz et al. 2007; GAO 2005; National Academy of Sciences 2007). Erickson et al. (2001) reviewed 31 studies of bird fatalities at commercial wind energy projects and found that 78 percent of the avian fatalities were passerines, of which approximately half were nocturnal migrants.

The National Academy of Sciences (2007) summarized previously conducted studies concerning the effects of wind farms on birds and found that bird mortality varied across regions. Collision fatalities averaged 1.98 birds/turbine/year in the Pacific Northwest, 1.5 birds/turbine/year in the Rocky Mountain region, and 2.22 birds/turbine/year in the Upper Midwest. The highest levels of avian mortality were recorded at wind farms in the Appalachian Mountains where an average 4.27 birds/turbine/year were fatalities.

Table 4. Bird species observed by Breeding Bird Atlas volunteers within the Forest 2 Block (46B4CW) Hardin and Hancock Counties, Ohio (1982-1987 and 2006-2010) located approximately 4 mi east of the Project Area.

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|--|------------------------------|---|
| Canada Goose (<i>Branta canadensis</i>) | Confirmed | Possible |
| Wood Duck (<i>Aix sponsa</i>) | Probable | |
| Mallard (<i>Anas platyrhynchos</i>) | Possible | |
| Ring-necked Pheasant (<i>Phasianus colchicus</i>) | Possible | Probable |
| Great Blue Heron (<i>Ardea Herodias</i>) | | Possible |
| Green Heron (<i>Butorides virescens</i>) | Possible | |
| Turkey Vulture (<i>Cathartes aura</i>) | Possible | Possible |
| Red-tailed Hawk (<i>Buteo jamaicensis</i>) | Probable | Confirmed |
| American Kestrel (<i>Falco sparverius</i>) | Possible | Confirmed |
| Killdeer (<i>Charadrius vociferus</i>) | Confirmed | Confirmed |
| Rock Pigeon (<i>Columba livia</i>) | Probable | |
| Mourning Dove (<i>Zenaida macroura</i>) | Possible | Probable |
| Yellow-billed Cuckoo (<i>Coccyzus americanus</i>) | Possible | Possible |
| Eastern Screech-Owl (<i>Megascops asio</i>) | Probable | |
| Chimney Swift (<i>Chaetura pelagica</i>) | Possible | |
| Ruby-throated Hummingbird (<i>Archilochus colubris</i>) | Possible | |
| Belted Kingfisher (<i>Megaceryle alcyon</i>) | Probable | |
| Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>) | Probable | Possible |
| Red-bellied Woodpecker (<i>Melanerpes carolinus</i>) | Possible | Possible |
| Downy Woodpecker (<i>Picoides pubescens</i>) | Confirmed | Probable |
| Hairy Woodpecker (<i>Picoides villosus</i>) | Confirmed | Possible |
| Northern Flicker (<i>Colaptes auratus</i>) | Confirmed | Probable |
| Pileated Woodpecker (<i>Dryocopus pileatus</i>) | | Possible |
| Eastern Wood-Pewee (<i>Contopus virens</i>) | Confirmed | Probable |
| Acadian Flycatcher (<i>Empidonax virescens</i>) | Confirmed | |
| Willow Flycatcher (<i>Empidonax traillii</i>) | Probable | Probable |
| Eastern Phoebe (<i>Sayornis phoebe</i>) | Confirmed | |
| Great Crested Flycatcher (<i>Myiarchus crinitus</i>) | Confirmed | Possible |
| Eastern Kingbird (<i>Tyrannus tyrannus</i>) | Confirmed | Confirmed |
| White-eyed Vireo (<i>Vireo griseus</i>) | Confirmed | |
| Yellow-throated Vireo (<i>Vireo flavifrons</i>) | Probable | Possible |
| Warbling Vireo (<i>Vireo gilvus</i>) | Probable | |
| Red-eyed Vireo (<i>Vireo olivaceus</i>) | Confirmed | Probable |
| Blue Jay (<i>Cyanocitta cristata</i>) | Probable | Probable |
| American Crow (<i>Corvus brachyrhynchos</i>) | Possible | Probable |

Table 4. Bird species observed by Breeding Bird Atlas volunteers within the Forest 2 Block (46B4CW) Hardin and Hancock Counties, Ohio (1982-1987 and 2006-2010) located approximately 4 mi east of the Project Area.

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|--|------------------------------|---|
| Horned Lark (<i>Eremophila alpestris</i>) | Confirmed | Probable |
| Tree Swallow (<i>Tachycineta bicolor</i>) | Possible | |
| Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>) | Probable | |
| Barn Swallow (<i>Hirundo rustica</i>) | Confirmed | Confirmed |
| Carolina Chickadee (<i>Poecile carolinensis</i>) | Probable | Probable |
| Tufted Titmouse (<i>Baeolophus bicolor</i>) | Confirmed | Probable |
| White-breasted Nuthatch (<i>Sitta carolinensis</i>) | Confirmed | Possible |
| House Wren (<i>Troglodytes aedon</i>) | Confirmed | Probable |
| Blue-gray Gnatcatcher (<i>Poliophtila caerulea</i>) | Probable | |
| Eastern Bluebird (<i>Sialia sialis</i>) | Confirmed | Confirmed |
| Wood Thrush (<i>Hylocichla mustelina</i>) | Probable | Possible |
| American Robin (<i>Turdus migratorius</i>) | Confirmed | Confirmed |
| Gray Catbird (<i>Dumetella carolinensis</i>) | Confirmed | Confirmed |
| Northern Mockingbird (<i>Mimus polyglottos</i>) | | Confirmed |
| Brown Thrasher (<i>Toxostoma rufum</i>) | Probable | Possible |
| European Starling (<i>Sturnus vulgaris</i>) | Confirmed | Confirmed |
| Cedar Waxwing (<i>Bombycilla cedrorum</i>) | Probable | Probable |
| Yellow Warbler (<i>Dendroica petechia</i>) | Possible | Probable |
| Cerulean Warbler (<i>Dendroica cerulean</i>) ^b | Probable | |
| American Redstart (<i>Setophaga ruticilla</i>) | Probable | |
| Ovenbird (<i>Seiurus aurocapillus</i>) | Confirmed | |
| Kentucky Warbler (<i>Oporornis formosus</i>) | Possible | |
| Common Yellowthroat (<i>Geothlypis trichas</i>) | Confirmed | Probable |
| Yellow-breasted Chat (<i>Icteria virens</i>) | Probable | |
| Scarlet Tanager (<i>Piranga olivacea</i>) | Probable | |
| Eastern Towhee (<i>Pipilo erythrophthalmus</i>) | Probable | |
| Chipping Sparrow (<i>Spizella passerina</i>) | Probable | Confirmed |
| Field Sparrow (<i>Spizella pusilla</i>) | Confirmed | Probable |
| Vesper Sparrow (<i>Pooecetes gramineus</i>) | Probable | Probable |
| Savannah Sparrow (<i>Passerculus sandwichensis</i>) | Confirmed | Confirmed |
| Grasshopper Sparrow (<i>Ammodramus savannarum</i>) | Confirmed | Probable |
| Song Sparrow (<i>Melospiza melodia</i>) | Confirmed | Probable |
| Northern Cardinal (<i>Cardinalis cardinalis</i>) | Confirmed | Probable |
| Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>) | Probable | |
| Indigo Bunting (<i>Passerina cyanea</i>) | Confirmed | Probable |

Table 4. Bird species observed by Breeding Bird Atlas volunteers within the Forest 2 Block (46B4CW) Hardin and Hancock Counties, Ohio (1982-1987 and 2006-2010) located approximately 4 mi east of the Project Area.

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|---|------------------------------|---|
| Bobolink (<i>Dolichonyx oryzivorus</i>) | Possible | |
| Red-winged Blackbird (<i>Agelaius phoeniceus</i>) | Confirmed | Confirmed |
| Eastern Meadowlark (<i>Sturnella magna</i>) | Confirmed | Possible |
| Common Grackle (<i>Quiscalus quiscula</i>) | Confirmed | Confirmed |
| Brown-headed Cowbird (<i>Molothrus ater</i>) | Probable | Possible |
| Orchard Oriole (<i>Icterus spurius</i>) | Probable | Probable |
| Baltimore Oriole (<i>Icterus galbula</i>) | Confirmed | Confirmed |
| House Finch (<i>Carpodacus mexicanus</i>) | | Probable |
| American Goldfinch (<i>Carduelis tristis</i>) | Probable | Probable |
| House Sparrow (<i>Passer domesticus</i>) | | Confirmed |

^a Results of the 2006-2010 effort are incomplete.

^b This species is listed by the state of Ohio as a Species of Concern.

Table 5. Bird species observed by Breeding Bird Atlas volunteers within the Dunkirk 4 Block (46B3NE), Hancock County, Ohio (1982-1987 and 2006-2010 located approximately one mi north of the Project Area..

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|--|------------------------------|---|
| Canada Goose (<i>Branta canadensis</i>) | Confirmed | |
| Ring-necked Pheasant (<i>Phasianus colchicus</i>) | Confirmed | |
| Northern Bobwhite (<i>Colinus virginianus</i>) ^b | Confirmed | |
| Great Blue Heron (<i>Ardea Herodias</i>) | | Possible |
| Turkey Vulture (<i>Cathartes aura</i>) | Possible | Probable |
| Cooper's Hawk (<i>Accipiter cooperii</i>) | Possible | |
| Red-tailed Hawk (<i>Buteo jamaicensis</i>) | Confirmed | Confirmed |
| American Kestrel (<i>Falco sparverius</i>) | Confirmed | Possible |
| Killdeer (<i>Charadrius vociferus</i>) | Confirmed | Probable |
| Spotted Sandpiper (<i>Actitis macularius</i>) | Possible | |
| American Woodcock (<i>Scolopax minor</i>) | Probable | Confirmed |
| Rock Pigeon (<i>Columba livia</i>) | Confirmed | Possible |
| Mourning Dove (<i>Zenaida macroura</i>) | Confirmed | Probable |
| Yellow-billed Cuckoo (<i>Coccyzus americanus</i>) | Confirmed | Probable |
| Black-billed Cuckoo (<i>Coccyzus erythrophthalmus</i>) | Confirmed | |
| Eastern Screech-Owl (<i>Megascops asio</i>) | Probable | Probable |
| Great Horned Owl (<i>Bubo virginianus</i>) | Possible | |
| Chimney Swift (<i>Chaetura pelagica</i>) | Confirmed | Probable |
| Ruby-throated Hummingbird (<i>Archilochus colubris</i>) | Confirmed | |
| Belted Kingfisher (<i>Megaceryle alcyon</i>) | Probable | Possible |
| Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>) | Confirmed | Possible |
| Red-bellied Woodpecker (<i>Melanerpes carolinus</i>) | Confirmed | Confirmed |
| Downy Woodpecker (<i>Picoides pubescens</i>) | Confirmed | Confirmed |
| Hairy Woodpecker (<i>Picoides villosus</i>) | Confirmed | |
| Northern Flicker (<i>Colaptes auratus</i>) | Confirmed | Possible |
| Pileated Woodpecker (<i>Dryocopus pileatus</i>) | Confirmed | Possible |
| Eastern Wood-Pewee (<i>Contopus virens</i>) | Probable | Probable |
| Acadian Flycatcher (<i>Empidonax virescens</i>) | Probable | Possible |
| Willow Flycatcher (<i>Empidonax traillii</i>) | Probable | Probable |
| Eastern Phoebe (<i>Sayornis phoebe</i>) | Probable | Confirmed |
| Great Crested Flycatcher (<i>Myiarchus crinitus</i>) | Probable | |
| Eastern Kingbird (<i>Tyrannus tyrannus</i>) | Confirmed | Confirmed |
| White-eyed Vireo (<i>Vireo griseus</i>) | Confirmed | |
| Yellow-throated Vireo (<i>Vireo flavifrons</i>) | | Possible |
| Warbling Vireo (<i>Vireo gilvus</i>) | Confirmed | Probable |

Table 5. Bird species observed by Breeding Bird Atlas volunteers within the Dunkirk 4 Block (46B3NE), Hancock County, Ohio (1982-1987 and 2006-2010 located approximately one mi north of the Project Area..

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|--|------------------------------|---|
| Red-eyed Vireo (<i>Vireo olivaceus</i>) | Probable | Probable |
| Blue Jay (<i>Cyanocitta cristata</i>) | Confirmed | Probable |
| American Crow (<i>Corvus brachyrhynchos</i>) | Confirmed | Probable |
| Horned Lark (<i>Eremophila alpestris</i>) | Confirmed | Probable |
| Tree Swallow (<i>Tachycineta bicolor</i>) | Confirmed | Possible |
| Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>) | Confirmed | Probable |
| Barn Swallow (<i>Hirundo rustica</i>) | Confirmed | Probable |
| Carolina Chickadee (<i>Poecile carolinensis</i>) | | Possible |
| Black-capped Chickadee (<i>Poecile atricapillus</i>) | Confirmed | Probable |
| Tufted Titmouse (<i>Baeolophus bicolor</i>) | Probable | Confirmed |
| White-breasted Nuthatch (<i>Sitta carolinensis</i>) | Confirmed | Probable |
| Carolina Wren (<i>Thryothorus ludovicianus</i>) | | Probable |
| House Wren (<i>Troglodytes aedon</i>) | Confirmed | Confirmed |
| Blue-gray Gnatcatcher (<i>Poliophtila caerulea</i>) | Probable | Possible |
| Eastern Bluebird (<i>Sialia sialis</i>) | Confirmed | Confirmed |
| Veery (<i>Catharus fuscescens</i>) | Possible | |
| Wood Thrush (<i>Hylocichla mustelina</i>) | Probable | Probable |
| American Robin (<i>Turdus migratorius</i>) | Confirmed | Confirmed |
| Gray Catbird (<i>Dumetella carolinensis</i>) | Confirmed | Confirmed |
| Northern Mockingbird (<i>Mimus polyglottos</i>) | Probable | Possible |
| Brown Thrasher (<i>Toxostoma rufum</i>) | Confirmed | Probable |
| European Starling (<i>Sturnus vulgaris</i>) | Confirmed | Confirmed |
| Cedar Waxwing (<i>Bombycilla cedrorum</i>) | Probable | Confirmed |
| Yellow Warbler (<i>Dendroica petechia</i>) | Confirmed | Probable |
| Chestnut-sided Warbler (<i>Dendroica pennsylvanica</i>) | | Possible |
| American Redstart (<i>Setophaga ruticilla</i>) | | Probable |
| Common Yellowthroat (<i>Geothlypis trichas</i>) | Confirmed | Probable |
| Scarlet Tanager (<i>Piranga olivacea</i>) | Probable | Possible |
| Chipping Sparrow (<i>Spizella passerina</i>) | Confirmed | Probable |
| Field Sparrow (<i>Spizella pusilla</i>) | Confirmed | Confirmed |
| Vesper Sparrow (<i>Poecetes gramineus</i>) | Confirmed | Probable |
| Savannah Sparrow (<i>Passerculus sandwichensis</i>) | Probable | Probable |
| Grasshopper Sparrow (<i>Ammodramus savannarum</i>) | Confirmed | Possible |
| Song Sparrow (<i>Melospiza melodia</i>) | Confirmed | Confirmed |
| Northern Cardinal (<i>Cardinalis cardinalis</i>) | Confirmed | Confirmed |

Table 5. Bird species observed by Breeding Bird Atlas volunteers within the Dunkirk 4 Block (46B3NE), Hancock County, Ohio (1982-1987 and 2006-2010 located approximately one mi north of the Project Area..

| Species | Breeding Status 1982-1987 | Breeding Status 2006-2010 ^a |
|---|---------------------------|--|
| Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>) | Probable | Probable |
| Indigo Bunting (<i>Passerina cyanea</i>) | Confirmed | Confirmed |
| Dickcissel (<i>Spiza Americana</i>) | | Probable |
| Bobolink (<i>Dolichonyx oryzivorus</i>) ^b | Confirmed | |
| Red-winged Blackbird (<i>Agelaius phoeniceus</i>) | Confirmed | Probable |
| Eastern Meadowlark (<i>Sturnella magna</i>) | Confirmed | Possible |
| Common Grackle (<i>Quiscalus quiscula</i>) | Confirmed | Confirmed |
| Brown-headed Cowbird (<i>Molothrus ater</i>) | Confirmed | Confirmed |
| Orchard Oriole (<i>Icterus spurius</i>) | Confirmed | Probable |
| Baltimore Oriole (<i>Icterus galbula</i>) | Confirmed | Possible |
| House Finch (<i>Carpodacus mexicanus</i>) | Possible | |
| American Goldfinch (<i>Carduelis tristis</i>) | Confirmed | Probable |
| House Sparrow (<i>Passer domesticus</i>) | Confirmed | Probable |

^a Results of the 2006-2010 effort are incomplete.

^b This species is listed by the state of Ohio as a Species of Concern.

3.1.3.3 Raptor Migration

Throughout the Midwest, hawk migration normally occurs along a broad front. Topographic features, linear ridges, large water bodies, or coastlines sometimes concentrate large numbers of migrating hawks, but these conditions are seldom found in the Midwestern states, with the exception of along and between the Great Lakes. However, fall and spring raptor migration pathways may intersect the Project Area. At the request of ODNR, surveys of raptor migrations were conducted weekly between October 9 and 31, 2008 (BHE 2009). No additional studies were requested by the agencies for Hog Creek II (Appendix A).

3.1.3.4 Waterbirds

A review of wetland inventories and land cover data showed water resources in the Project Area to be limited. Water on the proposed Wind Farm is restricted to small forested wetlands, Hog Creek Ditch, and the drainage systems (Figure 3). The limited acreage of this habitat type will not attract significant numbers of waterfowl or wetland associated bird species. Limited field observation revealed few waterbirds.

3.2 IMPORTANT BIRD AREAS, FEDERAL AND STATE WILDLIFE REFUGES, AND PRIVATE PROTECTED AREAS

A query of the ODNR Natural Heritage Database showed no designated conservation or natural resources areas within 8 km (5 mi) of the Project Area.

Two Important Bird Areas are located in the general vicinity of the proposed Hog Creek Wind Farm: the Metzger/Ferguson Reservoirs, approximately 40 km (25 mi) west of the Project Area near Lima, Ohio, and Lawrence Woods, approximately 24 km (15 mi) southeast of the site. Lawrence Woods is identified as an Ohio State Natural Area under the jurisdiction of the ODNR.

The Big Darby Nature Reserve is located approximately 48 km (30 mi) southeast of the proposed Project Area. The Reserve is owned and operated by the Nature Conservancy. In conjunction with the Nature Conservancy's Nature Reserve, neighboring properties are also protected.

No National Wildlife Refuges are in the vicinity of the Project Area.

3.3 SITE VISIT AND SURVEY RESULTS

Observations of the birds on or immediately adjacent to the proposed Hog Creek I and II wind farm site yielded a total of 61 species. These surveys were conducted during fall (2008) and spring (2009) migration and very early in the breeding season in (2010) as described in the Methods section of this report. Photos from the site visit are in Appendix B. Of the 61 species observed in the Project Area (Tables 6 and 7), six are listed by the state of Ohio: the northern harrier is listed as endangered; the least flycatcher (*Empidonax minimus*) and the dark-eyed junco (*Junco hyemalis*) are listed as threatened; the sharp-shinned hawk (*Accipiter striatus*) is listed as a species of concern; and the winter wren (*Troglodytes troglodytes*) and blue grosbeak are listed as species of special interest. Northern harriers and sharp-shinned hawks were seen migrating through the site at low altitude and did not stop in the Project Area. Preferred breeding habitat for these species is limited or lacking on the site. The dark-eyed junco and winter wren were either migrating through or spending the winter in the

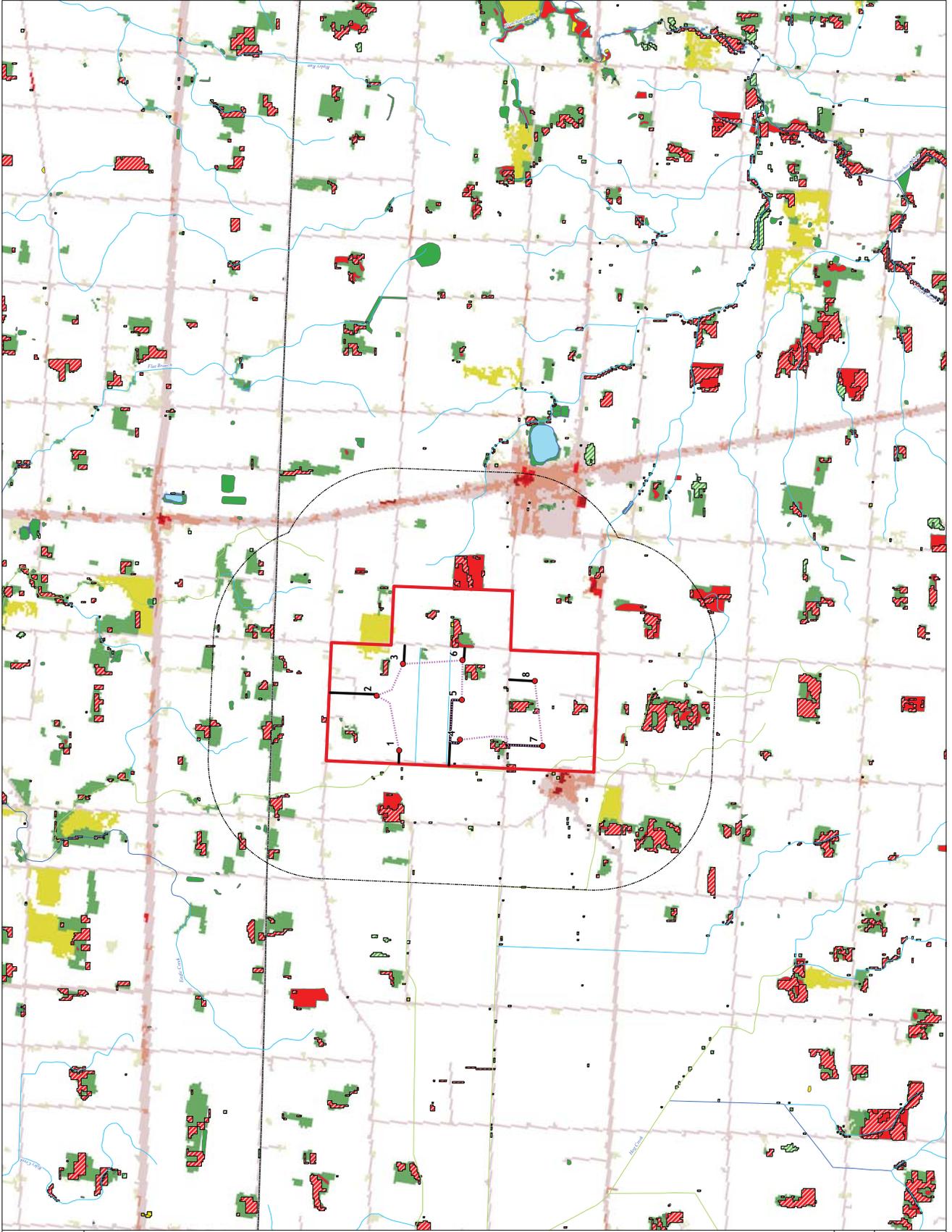
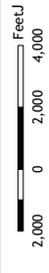


Figure 3. Ecological Data Map for Hog Creek Wind Farm II, Hardin County, Ohio.

Legend

- Turbine
- Substation
- Collection Station
- ~ Cable
- Access Road
- Project Boundary
- Half-mile buffer
- County Boundary
- Canal/Ditch
- Stream/River - Perennial
- Stream/River - Intermittent
- Lake/Pond - Perennial
- Woods on Hydric Soil (OWI)
- Shrub/Scrub (OWI)
- Nonforested Wetland (OWI)
- Palustrine Forested Wetland (NWI)
- Palustrine Scrub-Shrub Wetland (NWI)
- Nonforested Wetland (NWI)
- Barren Land
- Cultivated Crops
- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Emergent Herbaceous Wetlands
- Evergreen Forest
- Hay/Pasture
- Herbaceous
- Mixed Forest
- Open Water



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Project No. 1865.006

Table 6. Birds observed at Hog Creek Wind Farm II Project Area, Hardin County, Ohio, during site visit May 6 and 7, 2010.¹

| Species | Location | Comments |
|--------------------------|-----------------------------------|--|
| Mallard | Flooded ditches | Several adult males and females in flooded ditches |
| Great Blue Heron | Flying over | Several individuals |
| Turkey Vulture | Over woodlot | Several individuals |
| Red-tailed Hawk | Over woodlot | Pair circling low over woodlot |
| Killdeer | Roadsides and agricultural fields | 3-5 individuals |
| Yellow-billed Cuckoo | Woodlots | Several heard singing |
| Mourning Dove | Telephone wires and woodlots | 5-10 individuals |
| Barred Owl | Woodlots | Several vocalizing |
| Red-bellied Woodpecker | Woodlots | 3-5 individuals foraging throughout woodlots |
| Downy Woodpecker | Woodlots | One adult observed foraging |
| Northern Flicker | Woodlots | Several heard calling |
| Blue Jay | Woodlots | Several seen and heard |
| Horned Lark | Roadsides and agricultural fields | Numerous pairs and individuals heard and seen |
| Barn Swallow | Flooded ditches | Flocks of 5-15 individuals foraging over water |
| Great Crested Flycatcher | Woodlots | Several heard calling |
| Eastern Wood Pewee | Woodlots | Several heard singing and calling |
| Least Flycatcher a | Woodlot | One heard singing and calling |
| Black-capped Chickadee | Woodlots | Seen foraging and calling |
| Tufted Titmouse | Woodlots | Numerous individuals singing and calling |
| White-breasted Nuthatch | Woodlots | Several heard calling |
| Winter Wren b | Woodlot | One heard singing in woodlot |
| House Wren | Woodlots | Numerous individuals heard singing |
| Species | Location | Comments |
| Birds (Cont.) | | |
| American Robin | Throughout | Numerous seen and heard |
| Wood Thrush | Woodlots | Several singing and calling |
| Swainson's Thrush | Woodlots | Two heard singing and calling |
| Gray Catbird | Woodlots | Several singing |
| European Starling c | Throughout | Numerous seen and heard |
| Red-eyed Vireo | Woodlots | Several heard singing |
| Yellow Warbler | Woodlots | Several heard singing |
| Nashville Warbler | Woodlot | One heard singing |

Table 6. Birds observed at Hog Creek Wind Farm II Project Area, Hardin County, Ohio, during site visit May 6 and 7, 2010.¹

| Species | Location | Comments |
|------------------------------|------------------------------|--|
| Black-throated Green Warbler | Woodlots | Several heard singing |
| Ovenbird | Woodlot | One heard singing |
| Field Sparrow | Edge of woodlot | Several heard singing |
| Vesper Sparrow | Edge of woodlot | One heard singing |
| Song Sparrow | Woodlots | Several individuals seen and heard singing |
| Swamp Sparrow | Woodlots | Several heard singing |
| Scarlet Tanager | Woodlots | Several seen and heard singing and calling |
| Northern Cardinal | Woodlots | 5-7 individuals seen and heard singing |
| Rose-breasted Grosbeak | Woodlots | Several heard singing and calling |
| Blue Grosbeak b | Woodlot | One heard singing |
| Red-winged Blackbird | Woodlots and telephone wires | Numerous individuals singing and calling |
| Common Grackle | Woodlots | Numerous individuals singing and calling |
| Baltimore Oriole | Woodlots | Numerous individuals singing and calling |
| Brown-headed Cowbird | Woodlots | Several heard calling |
| Indigo Bunting | Woodlots | Several heard singing |
| American Goldfinch | Woodlots | Several seen and heard singing |
| House Sparrow c | Near buildings | Numerous individuals seen and heard |

¹ All bird species observed during the May 6 and 7 site visit are protected by provisions set forth in the US Migratory Bird Treaty Act of 1918 (MBTA; two introduced species, European Starling and House Sparrow, are exceptions).

a This species is Ohio state listed by the Division of Wildlife as Threatened.

b This species is Ohio state listed by the Division of Wildlife as a Species of Special Interest.

c This is an introduced species and is not protected by the MBTA.

Table 7. Birds observed at Hog Creek Wind Farm I and II Project Areas, Hardin County, Ohio, during October 2008, March 2009, and May 2010.

| Species ¹ | Location observed | Comments | Season of occurrence | Potential breeding status |
|-------------------------------|--|---|---------------------------------|---------------------------|
| Wood Duck | Flooded ditches | Adult males and females | Spring, summer, fall | |
| Mallard | Flooded ditches | Adult males and females | Year-round | probable breeder |
| Great Blue Heron | Flooded ditches | Several individuals | Year-round | |
| Turkey Vulture | Over woodlots and fields | Numerous individuals | Year-round | |
| Northern Harrier ^a | Over fields | 5 individuals seen during migration | Year-round | |
| Sharp-shinned Hawk b | Woodlots and fields | 3 individuals seen during migration | Year-round | possible breeder |
| Cooper's Hawk | Along railroad | 6 individuals seen during migration | Year-round | possible breeder |
| Red-tailed Hawk | Woodlots Telephone wires/poles | Numerous individuals and at least one resident pair | Year-round | possible breeder |
| American Kestrel | Telephone wires agricultural fields | At least 5 individuals seen | Year-round | probable breeder |
| Killdeer | Roadsides and agricultural fields | 3-5 individuals | Year-round | probable breeder |
| American Golden Plover | Agricultural fields | Stop-over migrant | Spring, fall | |
| Yellow-billed Cuckoo | Woodlots | Several heard singing | Late spring, summer, early fall | probable breeder |
| Rock Pigeon | Telephone wires agricultural fields near buildings | Small flock and individuals | Year-round | possible breeder |
| Mourning Dove | Telephone wires and woodlots | 5-10 individuals | Year-round | probable breeder |
| Barred Owl | Woodlots | Several vocalizing | Year-round | probable breeder |
| Red-bellied Woodpecker | Woodlots | 3-5 individuals foraging throughout woodlots | Year-round | probable breeder |
| Downy Woodpecker | Woodlots | One adult observed foraging | Year-round | probable breeder |
| Northern Flicker | Woodlots | Several heard calling | Year-round | probable breeder |

Table 7. Birds observed at Hog Creek Wind Farm I and II Project Areas, Hardin County, Ohio, during October 2008, March 2009, and May 2010.

| Species ¹ | Location observed | Comments | Season of occurrence | Potential breeding status |
|-----------------------------|--------------------------------------|--|---------------------------------------|---------------------------|
| Blue Jay | Woodlots | Several seen and heard | Year-round | probable breeder |
| American Crow | Woodlots agricultural fields | Seen or heard | Year-round | possible breeder |
| Horned Lark | Roadsides and agricultural fields | Numerous pairs and individuals heard and seen | Year-round | probable breeder |
| Barn Swallow | Flooded ditches | Flocks of 5-15 individuals foraging over water | Spring, summer, early fall | probable breeder |
| Great Crested Flycatcher | Woodlots | Several heard calling | Late spring, summer, early fall | probable breeder |
| Eastern Wood Pewee | Woodlots | Several heard singing and calling | Late spring, summer, early fall | probable breeder |
| Least Flycatcher c | Woodlot | One heard singing and calling | Late spring, summer, early fall | probable breeder |
| Carolina Chickadee | Woodlot | Identified by song and calls | Year-round | probable breeder |
| Black-capped Chickadee | Woodlots | Identified by song and calls | Year-round | probable breeder |
| Tufted Titmouse | Woodlots | Numerous individuals singing and calling | Year-round | probable breeder |
| White-breasted Nuthatch | Woodlots | Several heard calling | Year-round | probable breeder |
| Winter Wren d | Woodlot | One heard singing in woodlot | Spring, Fall | |
| House Wren | Woodlots | Numerous individuals heard singing | Late spring, summer, early fall | probable breeder |
| Eastern Bluebird | Woodlots and, fields | Seen or heard | Year-round | probable breeder |
| American Robin | Throughout | Numerous seen and heard | Year-round | probable breeder |
| Wood Thrush | Woodlots | Several singing and calling | Late spring, summer, early fall | probable breeder |
| Swainson's Thrush | Woodlots | Two heard singing and calling | Spring, Fall | |

Table 7. Birds observed at Hog Creek Wind Farm I and II Project Areas, Hardin County, Ohio, during October 2008, March 2009, and May 2010.

| Species ¹ | Location observed | Comments | Season of occurrence | Potential breeding status |
|------------------------------|-----------------------------|--|---------------------------------|---------------------------|
| Gray Catbird | Woodlots | Several singing | Late spring, summer, early fall | probable breeder |
| European Starling | Throughout | Numerous seen and heard | Year-round | probable breeder |
| Cedar Waxwing | Woodlots | Seen or heard | Year-round | Possible breeder |
| Red-eyed Vireo | Woodlots | Several heard singing | Late spring, summer, early fall | probable breeder |
| Yellow-rumped Warbler | Along railroad right-of-way | Stop-over migrant | Fall, winter, spring | |
| Yellow Warbler | Woodlots | Several heard singing | Late spring, summer, early fall | probable breeder |
| Nashville Warbler | Woodlot | One heard singing | Spring, Fall | |
| Black-throated Green Warbler | Woodlots | Several heard singing | Spring, Fall | |
| Ovenbird | Woodlot | One heard singing | Late spring, summer, early fall | probable breeder |
| Field Sparrow | Edge of woodlot | Several heard singing | Year-round | probable breeder |
| Vesper Sparrow | Edge of woodlot | One heard singing | Spring, summer, fall | probable breeder |
| Song Sparrow | Woodlots and ditches | Several individuals seen and heard singing | Year-round | probable breeder |
| Swamp Sparrow | Woodlots and ditches | Several heard singing | Year-round | probable breeder |
| White-throated Sparrow | Along railroad right-of-way | Stop-over migrant and winter resident | Fall, winter, spring | |
| White-crowned Sparrow | Along railroad right-of-way | Stop-over migrant and winter resident | Fall, winter, spring | |
| Dark-eyed Junco c | Woodlots, fields, roadsides | Stop-over migrant and winter resident | Fall, winter, spring | |
| Snow Bunting | Fields, roadsides | Individuals seen | Fall, winter | |
| Scarlet Tanager | Woodlots | Several singing and calling | Late spring, summer, early fall | probable breeder |

Table 7. Birds observed at Hog Creek Wind Farm I and II Project Areas, Hardin County, Ohio, during October 2008, March 2009, and May 2010.

| Species ¹ | Location observed | Comments | Season of occurrence | Potential breeding status |
|------------------------|---|--|---------------------------------|---------------------------|
| Northern Cardinal | Woodlots | 5-7 individuals seen and heard singing | Year-round | probable breeder |
| Rose-breasted Grosbeak | Woodlots | Several heard singing and calling | Late spring, summer, early fall | probable breeder |
| Blue Grosbeak d | Woodlot | One heard singing | Late spring, summer, early fall | |
| Eastern Meadowlark | Fields | Seen and heard | Spring, summer, fall | |
| Red-winged Blackbird | Woodlots and telephone wires | Numerous individuals singing and calling | | probable breeder |
| Common Grackle | Woodlots | Numerous individuals singing and calling | Year-round | probable breeder |
| Baltimore Oriole | Woodlots | Numerous individuals singing and calling | Late spring, summer, early fall | probable breeder |
| Brown-headed Cowbird | Woodlots | Several heard calling | Year-round | Brood parasite |
| Indigo Bunting | Woodlots | Several heard singing | Late spring, summer, early fall | probable breeder |
| House Finch | Woodlots telephone wires near buildings | Seen or heard | Year-round | probable breeder |
| American Goldfinch | Woodlots | Several seen and heard singing | Year-round | probable breeder |
| House Sparrow e | Near buildings | Numerous individuals seen and heard | Year-round | probable breeder |

¹ All bird species observed during site visits are protected by provisions set forth in the US Migratory Bird Treaty Act of 1918 (MBTA; two introduced species, European Starling and House Sparrow, are exceptions).

a This species is Ohio state listed by the Division of Wildlife as Endangered.

b This species is Ohio state listed by the Division of Wildlife as a Species of Concern.

c This species is Ohio state listed by the Division of Wildlife as Threatened.

d This species is Ohio state listed by the Division of Wildlife as a Species of Special Interest.

e This is an introduced species and is not protected by the MBTA.

Project Area. These two species are known to nest only in hemlock dominated forests in the extreme northeastern part of the state. Known to nest in small forest patches, the least flycatcher may have been attempting to breed in the Project Area, but it was more likely stopping over during its migration north to breed. The least flycatcher very rarely nests in extreme northwestern Ohio, but it is common further north. The blue grosbeak is typically found farther south and is known to nest in Ohio rarely and only in several counties along the Ohio River.

3.3.1 Habitat Descriptions and Birds Present

3.3.1.1 Agricultural Fields

Between 1869 and 1946, a network of drainage ditches was constructed throughout the area surrounding, what are now, the Hog Creek I and II project locations, in order to make the land suitable for agriculture. The creation of these drainage systems resulted in the removal of extensive wetlands that once covered the area. At present, 89.6percent (1,590 ac) of the 1,775 ac Hog Creek II Project Area is used for agriculture for the cultivation of corn and soybeans (Table 1). Consistent with the Hog Creek I Project Area, intensive agricultural practices and associated herbicide application has suppressed the diversity of vegetation currently found within the Project Area.

Horned larks, killdeer (*Charadrius vociferous*), and red-winged blackbirds (*Agelaius phoeniceus*) were the birds most commonly observed in the agricultural lands. All three of these species are common throughout a large range.

3.3.1.2 Drainage Ditches

Ditches were estimated to comprise 20.2 ac within the Hog Creek I Project Area and 7.3 ac in Hog Creek II for a total of 27.5 ac. These ditches, averaging approximately 6-8 ft deep, run parallel to roads and section lines before ultimately emptying into Hog Creek to the west and southwest. Water quality in the ditches appeared poor due to the amount of sediment present. Ditch substrate is composed of mud, and no aquatic stream structure such as riffles, sand bars, or gravel bars are present. Some wetland plant species (Tables 2 - 4) were found in the ditches, including reed canarygrass (*Phalaris arundinacea*), narrowleaf cattail (*Typha angustifolia*), and duckweed (*Lemna minor*). Hydrophytic shrub species and high quality wildlife food species were entirely lacking.

Wetlands are uncommon in both project areas although more common in the Hog Creek II Project Area (Table 8). The majority of areas mapped on the Ohio wetland inventory are woods on hydric soils that will not be disturbed by wind farm construction. Two to three stream crossings will be installed across the drainage ditches at Hog Creek.

Bird species identified using the ditches were great blue heron (*Ardea herodias*), song sparrow (*Melospiza melodia*), swamp sparrow (*Melospiza georgiana*), wood duck (*Aix sponsa*), and mallard (*Anas platyrhynchos*). The two species of waterbirds (wood duck and mallard) were seen in extremely small numbers (1-2 birds) during the migratory season.

3.3.1.3 Railroad Bed

An active set of railroad tracks crosses the southern portion of the Hog creek II Project Area. The elevated railroad bed is the highest location on the property and supports a variety of upland plant species that comprise less than an acre. Like Hog Creek I, dominant plants

Table 8. Acreage of wetland types from the Ohio Wetland Inventory on the Hog Creek I and II Project Areas, Hardin County, Ohio.

| Wetland Type | Hog Creek II | Hog Creek I | Total |
|----------------------|--------------|-------------|-------------|
| Woods on Hydric Soil | 43.8 | 6.6 | 50.4 |
| Shrub/Scrub Wetland | 1.6 | 1.3 | 2.9 |
| Non-forested Wetland | 0.7 | 4.1 | 4.8 |
| Total | 46.1 | 12 | 58.1 |

observed along the railroad tracks included common milkweed (*Asclepias syriaca*), giant foxtail (*Setaria faberi*), and tall fescue (*Festuca arundinacea*). Scattered shrubs such as elderberry (*Sambucus canadensis*) and young eastern cottonwood (*Populus deltoides*) added limited vertical habitat and provided some perching, feeding, and nesting opportunities for birds and wildlife.

Other birds identified along the railroad tracks were the song sparrow, Cooper’s hawk (*Accipiter cooperii*), and northern cardinal (*Cardinalis cardinalis*). During migration, the cover and feeding potential offered by this habitat type attracted a few fall migrants such as the white-throated sparrow (*Zonotrichia albicollis*), white-crowned sparrow (*Zonotrichia leucophrys*), and yellow-rumped warbler (*Dendroica coronata*). White-throated sparrows and yellow-rumped warblers are transient and migrate to wintering grounds further south.

3.3.1.4 Woodlots

Nine small woodlots lie scattered throughout the Project Area and another one sits immediately adjacent to the eastern boundary of the site (Figure 3). These woodlots fall almost entirely under the categories, woods on hydric soil, or forested wetland. The canopy in these woodland patches was dominated by swamp white oak (*Quercus bicolor*), red oak (*Quercus rubra*), white oak (*Quercus alba*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), shellbark hickory (*Carya laciniosa*), eastern cottonwood (*Populus deltoides*), common hackberry (*Celtis occidentalis*), and American basswood (*Tilia americana*) trees. The subcanopy and shrub layer was largely composed of young silver maple, red maple, box elder (*Acer negundo*), elm (*Ulmus* sp.), viburnum (*Viburnum* sp.), serviceberry (*Amelanchier arborea*), wild plum (*Prunus Americana*), blackberry (*Rubus* sp.), and wild hydrangea (*Hydrangea arborescens*). The ground cover was largely composed of garlic mustard (*Alliaria petiolata*), bedstraw (*Gallium* sp.), waterleaf (*Hydrophyllum* sp.), Virginia creeper (*Parthenocissus quinquefolia*), various sedge species (*Carex* sp.), and included extensive patches of trout lily (*Erythronium americanum*), trillium (*Trillium* sp.), mayapple (*Podophyllum peltatum*), jewelweed (*Impatiens* sp.), wild hyacinth (*Camassia scilloides*), false Solomon’s seal (*Smilacina racemosa*), and wild ginger (*Asarum canadense*).

Fifty species of birds were detected in the woodlots (Table 7). Of these, 38 species are likely to nest there.

3.3.2 Species Specific Surveys

3.3.2.1 Raptor Migration

The most common species observed during raptor migration surveys was the turkey vulture (*Cathartes aura*). The highest count in a single day was 381 turkey vultures (October 16, 2008), flying at an estimated altitude of 305 m (1,000 ft) agl. Twenty-four red-tailed hawks were observed (average = three birds/day) soaring at approximately 7 to 61 m (25 to 200 ft) agl. Red-tails were also observed perched on telephone poles and in trees located in the Project Area. Five northern harriers were observed (average = 0.6 birds/ day) flying low through the Project Area (an average of approximately 3 m [10 ft] agl). Six Cooper's hawks and three sharp-shinned hawks were observed (average = 0.7- and 0.4 birds/day respectively). The Cooper's- and sharp-shinned hawks were observed flying at low altitudes through the site (less than an estimated 7 m [25 ft] agl). Another raptor commonly observed in the Project Area was the American kestrel (*Falco sparverius*; 5 individuals, average = 0.6 birds/day). Kestrels were observed perched on power lines and flying at heights of approximately 15 to 30 m (50 to 100 ft) agl.

Results of this survey indicate that the proposed Hog Creek Wind Farm site is not located along an important autumn migratory pathway. Northern harriers and sharp-shinned hawks, while both species of concern in Ohio, were observed in very low numbers. When observed, these species flew low (< 10 m or 33 ft agl) over the Project Area but did not stop, instead, continuing in a southerly direction.

USFWS Hawk Migration Maps show that the Hog Creek Wind Farm is located along a migratory flight path for the broad-winged hawk (*Buteo platypterus*); however, they migrate at very high altitudes and were not observed during surveys. These maps are included as Appendix C.

3.3.2.2 Northern Harrier Nesting Survey

Northern harriers were not observed during nesting surveys, presumably due to a lack of preferred nesting habitat on-site.

4.0 RISK ANALYSIS FOR THE PROPOSED PROJECT

4.1 REVIEW OF POTENTIAL RISKS TO BIRDS AT OTHER WIND POWER PROJECTS

Collisions between birds and other aerial manmade structures are well documented. Numerous impacts with television towers, other communication towers, large buildings, power lines, and fences have been reported (NAS 2007). Interactions between wind turbines and birds are a known and documented occurrence, as well. Utility-scale wind turbines can directly and indirectly affect birds that occur in or migrate through the wind energy generation facility. However, as is discussed below, bird mortality at wind farms is generally only a few birds per turbine distributed among many species and is influenced by factors that are largely lacking at the Hog Creek Wind Farm location.

4.1.1 Disturbance and Displacement

4.1.1.1 Construction Impacts

The footprint of wind turbines typically represents a very small portion of a Project Area. For example, only 2.95 percent of the Hog Creek Project Area will be disturbed during construction and less than 1 percent of the land will remain in wind energy production during operation. Construction is often completed in 6 to 12 months depending on the size of the project and topography of the site. Construction can temporarily impact avian nesting near a wind energy facility depending upon the location and configuration of the facility relative to the quality, location and proximity of the habitat. This effect is typically minor.

4.1.1.2 Operational Impacts

Studies detailing the conclusive displacement of birds due to the presence of wind turbines are lacking. Leddy et al. (1999) found increased densities of breeding grassland passerines at increased distances from wind turbines in Minnesota, and higher densities in a control plot than in areas close to turbines. Larsen and Madsen (2000) showed pink-footed geese (*Anser brachyrhynchos*) were displaced from areas 100-200 m from turbines at a wind farm in Denmark. Breeding and migrating waterfowl and shorebirds have been displaced by wind turbines Drewitt and Langston (2006). Avian grassland and wetland habitats are virtually absent in the Hog Creek Wind Farm Project Area.

4.1.2 Collision Risk Factors

4.1.2.1 Perch Availability

Older lattice towers have caused significantly higher bird fatalities than the tower designs currently favored (Orloff and Flannery 1992, 1996). Many birds, especially raptors, perch on the lattice towers while scanning for prey; however, modern turbines are mounted on tubular towers that lack perches. Turbines in the Project Area will be constructed with tubular towers, thereby eliminating perch availability and reducing the risk of birds colliding with rotating blades.

4.1.2.2 Rotor and Blade Tip Speed

The rapidly rotating rotors on older wind turbines are believed responsible for increased rates of collision by birds (Orlander and Flannery 1996; Thelander and Ruge 2001). Researchers have hypothesized that older turbine designs with higher rotation rates and smaller diameter rotors are less visible and therefore present an increased risk to flying birds (Tucker 1996; Curry 2006). Modern turbines such as those proposed by the Applicant for use at the Hog Creek Project Area will rotate at slower speeds, thereby reducing the collision risk for birds. For example, the Siemens turbine under consideration rotates at only 6 to 16 rpm compared to 72 rpm for older turbines.

4.1.2.3 Turbine Number and Spacing

With only 29 turbines proposed for the entire Hog Creek Project Area, the collision risk for birds should be lower than much larger 100-200 MW developments proposed for Ohio. Moreover, the spacing of modern turbine arrays at more than 213 m (700 ft) may allow birds sufficient space to maneuver and, thereby, avoid collisions.

4.1.2.4 Rotor Height

Rotating wind-turbine blades may be most dangerous to birds, particularly raptors, at the lowest point of rotor blade sweep. Curry and Kerlinger (2006) recorded 65.7 percent of 571 raptor flights below 10 m (33 ft), and an additional 23.1 percent ranging from 10 to 30 m (33 to 98 ft). Therefore, 88.8 percent of all raptor flights observed were at less than or equal to 30 m agl. They also recorded 98 percent of flights by 32 different species on the site at below 30 m (98 ft) agl. Smallwood and Thelander (2004) suggest that rotor heights in excess of 28 m (92 ft) agl could substantially reduce raptor mortality. The hub heights under consideration for the Facility will be 100 m (262 to 328 ft), with a rotor diameter of 101 m (331 ft), which may lessen risk to raptors. Conversely, increased rotor height may increase risk to migrant songbirds (NAS 2007).

4.1.2.5 Tower Lighting

Lighting on the turbines will likely consist of flashing red lights. At present, there is no evidence that FAA compliant flashing red lights will attract birds or that these lights are a causal factor in large scale fatality events at wind turbines. Kerlinger (2000) documented that flashing red strobe lights (L-864), the type recommended by the FAA and most often used on wind turbines, do not attract migrants like the combination of these lights with L-810 steady burning red lights. In fact, communication towers may pose a greater risk to nocturnally migrating songbirds due to the common usage of steady burning red lights and guy wires (Avery et al. 1980). Lighting on the turbines in the Project Area will follow FAA recommendations that reduce the risk of attracting birds.

4.1.2.6 Topography and Physiography

The topography associated with wind turbine location may influence the risk of avian collisions. Studies suggest that siting turbines on the edge of steep slopes or within depressions increases collision risk, especially for raptor species (Orloff and Flannery 1992, 1996; Thelander and Ruggie 2001; Smallwood and Thelander 2004). The flat and very sparsely forested farmland in the Project Area should present a reduced risk of rotor collision.

4.1.2.7 Prey Availability and Density

When wind turbines are placed in habitats that are attractive to raptors (e.g., those with high densities of prey species) the risk of raptors colliding with rotors may be greatly increased (Orloff and Flannery 1992). Densities of small mammals, which are attractive to many raptors, are typically low in areas subjected to intensive farming practices and cultivation (Smallwood and Thelander 2004; Kerlinger et al. 2006). The proposed wind turbine locations at the Hog Creek Wind Farm are in areas currently undergoing intensive farming practices that should reduce the prey base and therefore also reduce risk of raptors colliding with the turbines.

4.1.3 Mortality Studies

In 2001, the National Wind Coordinating Committee (NWCC) commissioned Erickson et al. to produce a resource document entitled *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to other sources of Avian Collision Mortality in the US*. This document reviewed the existing research concerning avian collision mortality, its causes and recommendations. Highlights of this resource document are as follows:

- Data indicated an average of 2.19 avian fatalities/turbine/year in the US for all species combined and 0.033 raptor fatalities/turbine/year.
- Data collected outside California indicated 1.83 avian fatalities/turbine/year and 0.006 raptor fatalities/turbine/year.
- Estimates of avian collision fatalities at wind farms likely represented 0.01- 0.02 percent of the annual avian collision fatalities in the US. Data suggested that while turbines were generally below the flight altitude of most nocturnally migrating birds, weather and other factors that reduce bird flight altitudes may result in collisions with wind turbines as well as other artificial structures.
- For all avian species combined, outside California, estimates of the number of bird fatalities/turbine/year from individual studies have ranged from zero at Searsburg, Vermont (Kerlinger 1998) and Algona, Iowa (Demastes & Trainer 2000), to 4.45 on the Buffalo Ridge, Minnesota Phase III site (Johnson et al. 2000).
- An estimated 488 raptors are killed annually by turbines in the US, nearly all in California, and particularly at the Altamont Pass Wind Resource Area.
- Estimates at meteorological towers were 7.5 bird fatalities/tower/year, whereas those at wind turbines were 1.8 bird fatalities/turbine/year at Foote Creek Rim, Wyoming (Johnson et al. 2001). The reason for the difference was attributed to guy wires on the meteorological towers, as both the towers and wind turbines were approximately 60 m (200 ft) in height.
- Raptor collisions with wind turbines seemed more likely to occur while raptors are concentrating on foraging or diving towards a prey item. A dense or abundant prey base within a wind resource area may attract a greater number of raptors within the vicinity of wind turbines, subsequently increasing collision fatality potential among raptor species.
- Water within the vicinity of wind turbines may attract waterfowl, seabirds, and shorebirds, increasing collision potential for these species. Other factors such as adjacent habitat and movement patterns may also greatly influence mortality near these water sources.

In 2005, the US Government Accountability Office (GAO) reviewed bird and bat mortality studies at wind energy facilities around the country (GAO 2005). The review stated that "studies show that bird and bat mortality from wind power in other parts of the country is comparatively lower than in California or Appalachia."

Overall bird fatalities from wind power ranged from 0 to 7.28 birds/turbine/year. The high rate of 7.28 birds per turbine occurred at a facility of only three turbines.

In 2007, the National Academy of Sciences (NAS) reported an average of 2.22 bird fatalities/turbine/year from wind energy facilities in the upper Midwest, the region most comparable to the Hog Creek Project Area. If the Project Area were to produce similar mortality, it could total 60 birds/ year distributed among a large number of species, so no more than a few individuals of any one species would likely be lost to the turbines. To put this number of potential fatalities in context, the NAS (2007) stated:

"Collisions with buildings kill 97 to 976 million birds annually; collisions with high-tension lines kill at least 130 million birds, perhaps more than one billion; collisions with communications towers kill between 4 and 5 million based on

'conservative estimates,' but could be as high as 50 million; cars may kill 80 million birds per year; and collisions with wind turbines killed an estimated at 20,000 to 37,000 birds per year in 2003, with all but 9,200 of those deaths occurring in California. Toxic chemicals, including pesticides, kill more than 72 million birds each year, while domestic cats are estimated to kill hundreds of millions of songbirds and other species each year. Erickson et al. (2005) estimate that total cumulative bird mortality in the United States "may easily approach 1 billion birds per year." Clearly, bird deaths caused by wind turbines are a minute fraction of the total anthropogenic bird deaths—less than 0.003% in 2003 based on the estimates of Erickson et al. (2005). "... In a review of bird collisions reported in 31 studies at wind-energy facilities, Erickson et al. (2001) reported that 78% of the carcasses found at facilities outside of California were protected passerines (i.e., songbirds protected by the Migratory Bird Treaty Reform Act of 2005). The remainder of the fatalities included waterfowl (5.3%), waterbirds (3.3%), shorebirds (0.7%), diurnal raptors (2.7%), owls (0.5%), fowl-like (galliform) birds (4.0%), other (2.7%), and non-protected birds (e.g., starling, house sparrow, rock dove or feral pigeon) (3.3%)."

Based upon published and unpublished information available at this time, it is likely that mortality resulting from the Project will be most similar to that at the Crescent Ridge site in Illinois, the Top of Iowa site in Iowa, the Lincoln site in Wisconsin, and the Buffalo Ridge site in Minnesota. Annual mortality estimates based upon post-construction monitoring studies were 1.3 birds/ turbine/ year at Top of Iowa, Lincoln, and Crescent Ridge. Results from multi-year mortality studies conducted at Buffalo Ridge, Minnesota, have ranged from 1.0 to 4.5 birds/turbine/year. With 33 turbines located amidst intensive agricultural land, the Crescent Ridge, Illinois wind farm site is the most similar to the Hog Creek Project.

4.2 AVIAN RISK ASSESSMENT AT HOG CREEK WIND FARM

4.2.1 Disturbance and Displacement Risk

The proposed Hog Creek Wind Farm Project Area has limited forest and scrub nesting habitat and a near absence of grassland habitat. The site is currently under intensive agricultural management and presents little diversity of habitat. The proposed wind farm should result in little habitat fragmentation, because there is little habitat to fragment.

4.2.2 Collision Risk

As found in the previously cited mortality studies, wind power presents at least some collision risk to birds. The proposed Hog Creek Wind Farm is located in an area with limited avian habitat. The Project will use modern turbine and tower designs that have been demonstrated to reduce collision risk. The site most similar to the Hog Creek Project is the Crescent Ridge Wind Farm in central Illinois where results indicated 1.3 bird fatalities/turbine/year. If similar mortality occurs at Hog Creek, using the 29 turbine layout, it would result in an estimated mortality of 37.7 birds per year. The effect upon birds at this rate would be minimal, particularly in light of the fact that fatalities would be distributed among species.

4.2.2.1 Nocturnal Songbird Migrants

The NAS (2007) found the most common avian fatalities are passerines (songbirds) with an estimated 75 percent of all avian fatalities at wind farms recorded as night migrant songbird species; and, of this number, half were estimated to suffer mortality during migration. It

appears the vast majority of songbirds migrate above the height of most wind turbines (NAS 2007). A radar study by Able (1970) indicated that a mean height for a majority of migratory passerines was between 579 m (1,900 ft) agl and 925 m (3,037 ft) agl on clear nights during the fall migration. Kerlinger and Moore (1989) and Bruderer et al. (1995) concluded that atmospheric structure (wind speed and direction) is the primary factor affecting flight direction and height of assumed migrating passerines. This is supported by Gauthreaux (1991) who found that birds crossing the Gulf of Mexico appear to fly at altitudes where favorable winds exist. So while songbirds are susceptible to wind turbine collision, their migration behavior most likely prevents large numbers of them collide with wind turbines.

Several factors were identified by the NAS (2007) as affecting the level of songbird mortality: abundance and quality of stopover habitat that tends to concentrate birds during migration; high flight altitude during migration; and weather such as fog and rain that causes songbirds to migrate at lower altitudes.

Risk factors are generally lacking at the Hog Creek site, therein reducing the potential for concentrations (and thus reducing risk) of nocturnal migrant passerines collisions with turbines. Grassland, forest, and wetland habitats that can attract and concentrate birds for migratory stopover to rest and forage are minimal in the Project Area. No topographical or landscape features such as rivers, lakes, large ponds are present that would be a habitat magnet for migrating songbirds exist in or near to the Hog Creek Wind Farm project area.

4.2.2.2 Raptors

Low numbers of raptors were observed within or near the Project Area. Some raptors migrate through the site, but most were observed well above the rotor swept area. Northern harriers, sharp-shinned hawks, Cooper's hawks, and American kestrels were observed below the rotor swept area of the proposed turbines. Aside from one red-tailed hawk nest in the small woodlot in the north central portion of the site, nesting by raptor species is limited. Due to the low use of the Project Area by raptors, the risk of raptors colliding with wind turbines at the proposed Hog Creek Wind Farm should be low.

4.2.2.3 Waterbirds

Wetland habitat suitable for waterbirds in the proposed Hog Creek Wind Farm is restricted to Hog Creek Ditch and the drainage systems. The limited acreage of this habitat type should keep waterfowl or wetland-associated bird species usage of Hog Creek Wind Farm at very low numbers. Land-based wind farm studies results show low rates of waterbird and waterfowl mortality (Everaert 2003).

4.2.2.4 Wintering Resident Birds

Ohio agricultural fields are not important avian wintering areas. A majority of the wintering bird species observed on the site were horned larks and snow buntings. As these are predominantly ground dwelling species, the collision risk to wintering and resident species is low at the Hog Creek Wind Farm.

4.2.2.5 Listed Species

No federally listed species were observed on or near the proposed Project Area. No species of concern identified by the National Audubon Society Watch List or the Partners in Flight List were identified on the proposed wind farm site. The ODNR has no records of listed species on or within 8 km (5 mi) of the Project Area. Northern harriers, an Ohio endangered species,

and sharp-shinned hawk, classified as a species of concern by ODNR, were observed migrating through the site. Both species were seen flying directly through the Project Area and at heights well below the rotor swept area of the proposed turbines. Collision risk to these species is considered negligible at the Hog Creek Wind Farm.

5.0 CONCLUSIONS

Results of this Avian Risk Assessment suggest that the potential for avian collisions with the proposed turbines should be as low as or lower than other Midwestern wind farms where the landscape is dominated by row crop agriculture.

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APPENDIX A
Agency Coordination

HOG CREEK II



May 14, 2010

Ohio Department of Natural Resources
Division of Natural Areas and Preserves
Attn: Brian Mitch
2045 Morse Road
Building F-1
Columbus, OH 43229

RE: Natural Heritage Database Search and Request for Natural Resources Data Update for the Hog Creek Wind Farm (formerly the Hardin County North Wind Farm) Expansion

Dear Mr. Mitch:

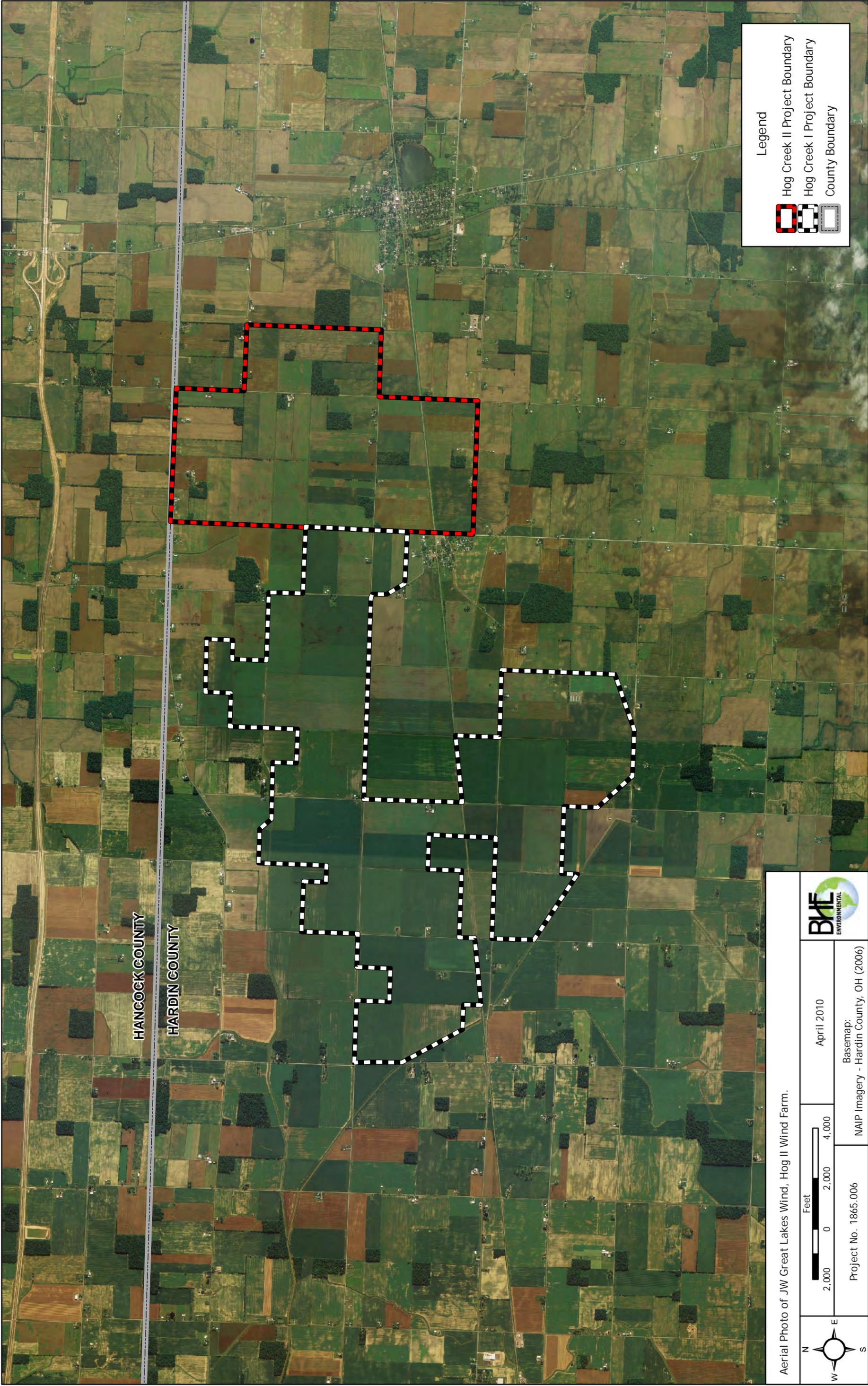
BHE Environmental, Inc.'s client has been completing scoping for a study area located in Hardin County, Ohio as depicted on the attached aerial photo. The project area is located entirely within Hardin County, but the 5 mile surrounding area included in this request includes Hancock County to the north. BHE's client is considering this area for expansion of its Hog Creek Wind Farm that has received a siting certificate from the Ohio Power Siting Board. This expansion called Hog Creek 2 proposes to erect 8 wind turbines on approximately 1500 acres. Land disturbance to construct the facility is estimated at less than 25 acres.

We know that prior coordination and database requests have been made for the adjacent project area (shown on attached map), but would like to have the most up to date data to assure any permit applications reflect the most recent information. Therefore, we would like to request a Natural Heritage database search for federally and state-listed species, protected wildlife, unique habitats, natural areas, and other ecologically sensitive resources on and within **5 miles** of the study area. We would also like to request your comments on the same and any other sensitive natural resources on and within **5 miles** of the study area from the other ODNR divisions, as well as any other general information about the study area that you feel may be pertinent.

If possible, please provide us with hard copies as well as latitude/longitude locations so that we may include this information on environmental constraints base maps that will be produced for the project. I have also provided GIS shapefiles and a map of the project boundary to help expedite the process.

Please contact Mike Sponsler at 614-856-4681 or msponsler@bheenvironmental.com if you have any questions about this data request. Thank you in advance for your timely response.

Sincerely,



HANCOCK COUNTY

HARDIN COUNTY

Legend

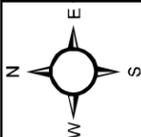


Hog Creek II Project Boundary

Hog Creek I Project Boundary

County Boundary

Aerial Photo of JW Great Lakes Wind, Hog II Wind Farm.



April 2010

Project No. 1865.006
NAIP Imagery - Hardin County, OH (2006)
Basemap:



From: [Mitch, Brian](#)
To: [Mike Sponsler](#)
Subject: 10-0152; Hog Creek Wind Farm Expansion
Date: Tuesday, June 15, 2010 2:16:51 PM
Attachments: [oledata.mso](#)
[image001.gif](#)
[10-0152.jpg](#)



ODNR COMMENTS TO Mike Sponsler, BHE Environmental, 5300 East Main Street, Suite 101, Columbus, Ohio 43213.

Project: The project involves the installation of 8 wind turbines on approximately 1500 acres. The new turbines would be an expansion to the existing Hog Creek Wind farm which has already received a siting certificate from the Ohio Power Siting Board.

Location: The proposed expansion area is located within Hardin County, adjacent to the existing Hog Creek Wind Farm.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced project. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Rare and Endangered Species: The ODNR, Division of Natural Areas and Preserves, Natural Heritage Database contains the following animal data for this project, including a five mile radius, as shown on the attached map. There are no rare plants located directly within the project area. A five mile search around the proposed project boundary was not performed for rare plants. No managed areas were found within the five mile radius.

1. Great Blue Heron Rookery
2. Great Blue Heron Rookery
3. *Pleurobema sintoxia* - Round Pigtoe, SC
Pleurobema clava - Clubshell, E, FE
Villosa fabalis - Rayed Bean, E
Toxolasma lividus - Purple Lilliput, E
Orconectes virilis - Northern Crayfish, SC
4. *Lasmigona compressa* - Creek Heelsplitter, SC
5. Breeding Amphibian Site
6. *Uniomerus tetralasmus* - Pondhorn, T

Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area.

Fish and Wildlife: The ODNR, Division of Wildlife (DOW) has the following comments.

This proposed expansion is completely encompassed within the original project boundaries that were previously provided to DOW. The wildlife surveying which was conducted for the original project boundaries incorporated this additional area. The DOW provided comments on the original project boundaries in our memo dated September 30, 2009.

This project is in an extensively agricultural area, and thus lacks suitable stop-over or breeding habitat for most species. The results from the applicant's pre-construction monitoring showed no indication that this site would pose an unacceptable level of risk to wildlife. JW Great Lakes is also a signatory to the Cooperative Agreement indicating their willingness to work with the DOW to address any unexpected mortalities.

Currently the DOW has no post-construction mortality information from any turbines located within the state, and even though we believe this is low risk we would like to see a post-construction study included as a condition of the permit. As a signatory of the Cooperative Agreement JW Great Lakes has agreed to undertake minimization measures if the number of mortalities exceeds a threshold established by the DOW. This information will also validate DOW's current protocols, which will hopefully allow DOW to predict potential impacts of future projects. The post-construction study must be conducted in accordance with the "*On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio.*" These call for two years of monitoring with the potential for the second year to be reduced (focusing on the period of time when mortalities were observed the previous year) or eliminated at the discretion of the DOW.

The Natural Heritage Database (NHD) has records near the project area for the round pigtoe (*Pleurobema sintoxia*), a state mussel species of concern, the clubshell (*Pleurobema clava*), a state and federally endangered mussel, the rayed bean (*Villosa fabalis*), a state endangered and federal candidate mussel species, the creek heelsplitter (*Lasmigona compressa*), a state mussel species of concern, the pondhorn (*Uniomerus tetralasmus*), a state threatened mussels species, and the purple lilliput (*Toxolasma lividus*), a state endangered mussel. If there is a history of mussels near the proposed project area, it may be necessary for a professional malacologist approved by the DOW to conduct a mussel survey in the project area. If no in-water work is proposed, the project is not likely to impact these species.

The project is within the range of the copperbelly water snake (*Nerodia erythrogaster neglecta*), a state endangered and federally threatened species, and the Eastern massasauga (*Sistrurus catenatus*), a state endangered and a federal candidate snake species. Due to the habitat requirements of these species, the project is not likely to impact these species.

The NHD has a record within the project area for a breeding amphibian site. Depending on the type of work to be done near the location of the breeding amphibian site, consultation with the DOW during construction of this project may be necessary to reduce impacts to this breeding amphibian site.

The NHD has a record near the project area for the Northern crayfish (*Orconectes virilis*), a state species of concern. Due to the status of this species, the project is not likely to impact this species.

The NHD has records near the project area for a great blue heron rookery. The results from the applicant's pre-construction monitoring showed no indication that this site would pose an unacceptable level of risk to wildlife. JW Great Lakes is also a signatory to the Cooperative Agreement indicating their willingness to work with the DOW to address any unexpected mortalities. Therefore, the project is not likely to impact this species.

ODNR appreciates the opportunity to provide these comments. Please contact Brian Mitch at (614) 265-6378 if you have questions about these comments or need additional information.

Brian Mitch, Environmental Review Manager
Ohio Department of Natural Resources
Environmental Services Section
2045 Morse Road, Building F-3
Columbus, Ohio 43229-6693

Office: (614) 265-6378

Fax: (614) 262-2197

brian.mitch@dnr.state.oh.us

Hancock, Wyandot &
Hardin Cos., 10-0152

project
area

1

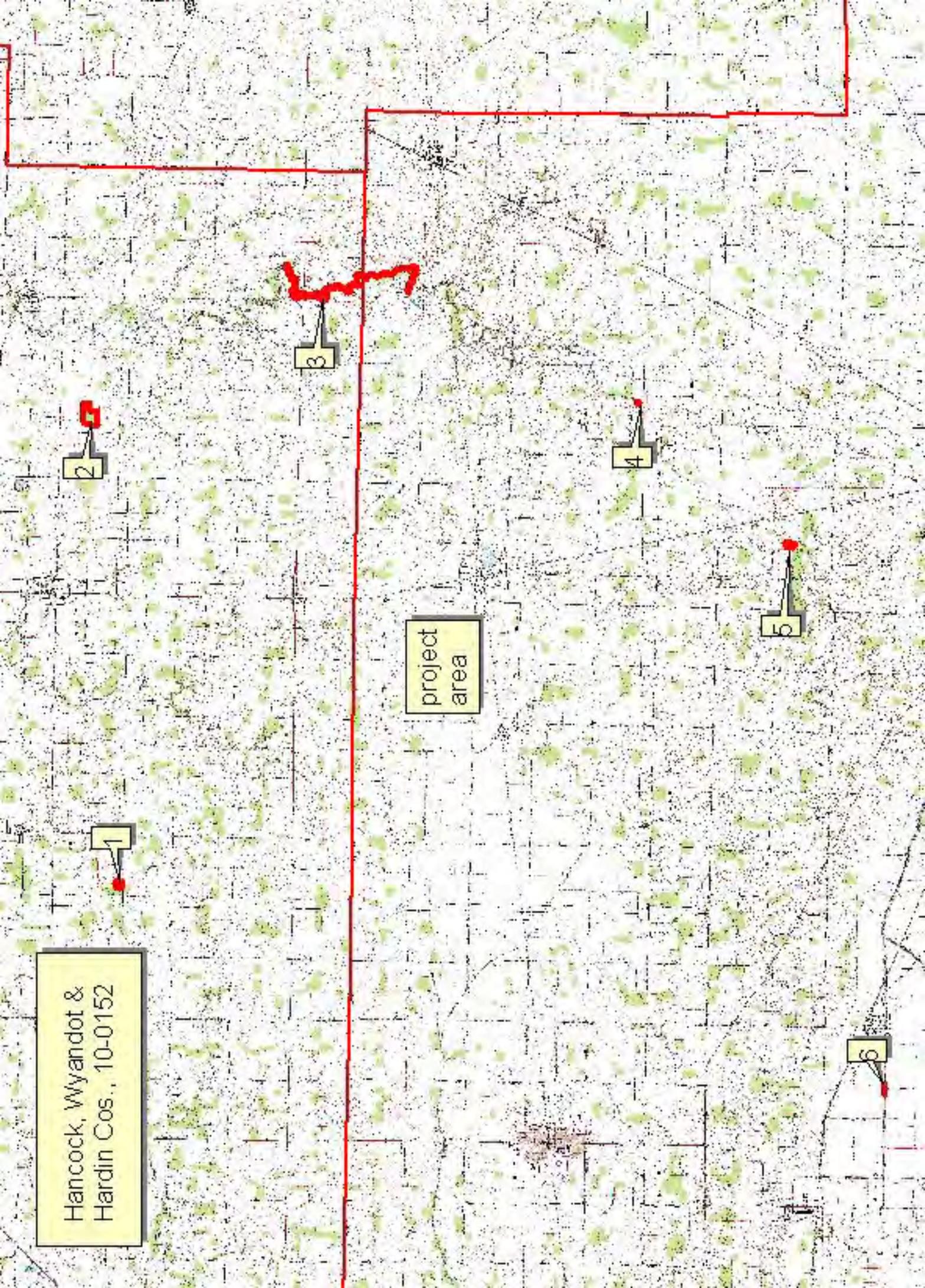
2

3

4

5

6



From: [Mitch, Brian](#)
To: [Mike Sponsler](#)
Cc: Donald.Rostofer@puc.state.oh.us
Subject: 10-0152; Hog Creek Wind Farm Expansion Amphibian Breeding site
Date: Thursday, June 24, 2010 11:00:43 AM

Mike,

The amphibian breeding site listed in our comments dated June 15th, 2010 regarding the Hog Creek Wind Farm Expansion Project came from the Ohio EPA Pool Breeding Amphibian Database. The site was sampled 3 times in 1996 by OEPA and the following species were observed:

Ambystoma jeffersonianum

A. maculatum

A. texanum

A. spp.

Rana pipiens

Based on the location of this breeding site in relation to the proposed wind farm, ODNR does not believe there will be adverse impacts to this resource as a result of the proposed wind farm expansion.

Please let me know if you have any additional questions.

Brian Mitch, Environmental Review Manager

Ohio Department of Natural Resources

Division of Engineering

Environmental Services Section

2045 Morse Rd., Building F-3

Columbus, OH 43229-6693

Office: (614) 265-6378

Fax: (614) 262-2197

brian.mitch@dnr.state.oh.us

From: Megan_Seymour@fws.gov
To: [Endres, Peter](#)
Cc: [Almady, Joseph](#); [Lott, Keith](#); [Mike Sponsler](#)
Subject: Re: Follow up and proposed scope
Date: Tuesday, April 20, 2010 1:56:14 PM
Attachments: [graycol.gif](#)
[pic03548.gif](#)
[ecblank.gif](#)
[HG2 Wildlife study plan.docx](#)

Thanks for checking in with us Pete. I agree that the document attached does reflect the pre-construction discussion for the proposed expansion of the Hog Creek Wind Farm we had last week. I believe Keith noted that the proposed expansion area was included in the original project boundary that you provided to us for analysis when the Hardin wind project was first evaluated. This is the primary reason no additional surveys were requested. Also, as indicated on the call, as currently proposed the same post-construction protocols would apply to these 8 turbines as apply to the original project (cut-in speeds and post-construction monitoring). Based on this, we have no general objections or substantial comments.

As I did mention on the call, the Service is evaluating the need to and appropriate methods of addressing the potential take of migratory Indiana bats at wind power sites in agricultural settings. As these discussions progress I will keep you informed as to what our recommendations may be, as they may apply to this project.

We look forward to reviewing your application. Please contact me if you have any questions.

Sincerely,
Megan

Megan Seymour
Wildlife Biologist
U.S. Fish & Wildlife Service
4625 Morse Rd.
Suite 104
Columbus, OH 43230
(614) 416-8993 ext. 16
(614) 416-8994 fax

 "Endres, Peter" <Endres@juwi.com>

"Endres, Peter"
<Endres@juwi.com>

04/15/2010 05:59 PM

To "Megan_Seymour@fws.gov"
<Megan_Seymour@fws.gov>, "Lott, Keith"
<Keith.Lott@dnr.state.oh.us>
ccMike Sponsler
<msponsler@bheenvironmental.com>,
"Almady, Joseph" <almady@juwi.com>
SubjectFollow up and proposed scope

Keith and Megan,

Thank you again for your comments and participation on the call yesterday. We understand

from the conversation that neither ODNR nor USFWS have any general objections to the proposed siting for the additional eight turbines in the Hog Creek Wind Farm.

We have prepared the attached scope of work that we intend to complete to support the OPSB application for the Hog Creek expansion.

Please advise with any comments or objections to the proposed scope of work.

Thank you,
Pete

Peter K. Endres
Director, Project Development US

juwi Wind US Corp. · 1900 Superior Avenue, Suite 333 · Cleveland, Ohio 44114-2148
· USA
office +1.216.344.9305 · fax. +1.216.344.9306
mobile +1.216.538.5420 · endres@juwi.com · www.juwi.com

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Hog Creek Wind Farm, Phase 2 Wildlife Study Plan

- Vegetation/habitat survey of project and surrounding one-quarter mile area as per OPSB rule.
 - o Habitats will be identified.
 - o Search for presence of T&E plant species and habitats with emphasis on woodlots and wetlands.
 - o Woodlots on site will receive a pedestrian survey; woodlots in the one-quarter mile buffer will receive a pedestrian survey where access is allowed. Where access is not allowed, roadside observations will be made with an emphasis on use by raptors.
 - o Wetland habitats, if any, on-site will receive a pedestrian survey for sensitive plant species.
- Animal life/major species survey of project and surrounding one-quarter mile area as per OPSB rule.
 - o Visual and aural signs for wildlife such as tracks, dens, nests, scat, songs, drumming will be recorded.
 - o Search for presence of T&E animal species and habitats with emphasis on woodlots and wetlands.
- Per our teleconference April 14 2010 (juwi, BHE, Keith Lott, Megan Seymour), no additional wildlife monitoring beyond what's been completed for the first phase will be conducted
- Results of the Hog Creek 2 survey will be used to supplement/update previous surveys and reports for inclusion with the OPSB application

HOG CREEK I

(formerly named Hardin County North Wind Farm)



11733 Chesterdale Road, Cincinnati, Ohio 45246 513.326.1500 / Fax 513.326.1178



June 24, 2009

Ohio Department of Natural Resources
Division of Natural Areas and Preserves
Attn: Butch Grieszmer
2045 Morse Road
Building F-1
Columbus, OH 43229

RE: Natural Heritage Database Search update for the Hardin County North Wind Farm

Dear Mr. Grieszmer:

BHE Environmental, Inc.'s client has been completing scoping for a study area located in Hardin County, Ohio as depicted on the attached USGS topographic map (study area is located entirely within Hardin County). BHE's client is considering this area for development of a wind power electric generating plant and associated facilities and will encompass approximately 3,400 acres.

We know that prior coordination and database requests have been made for the project but would like to have the most up to date data to assure any permit applications reflect the most recent information. Therefore, we would like to request a Natural Heritage database search for federally and state-listed species, protected wildlife, unique habitats, natural areas, and other ecologically sensitive resources within 5 miles of the study area. We would also like to request your comments on wildlife species likely to be present within 5 miles of the study area and any other general information about the study area that you feel may be pertinent.

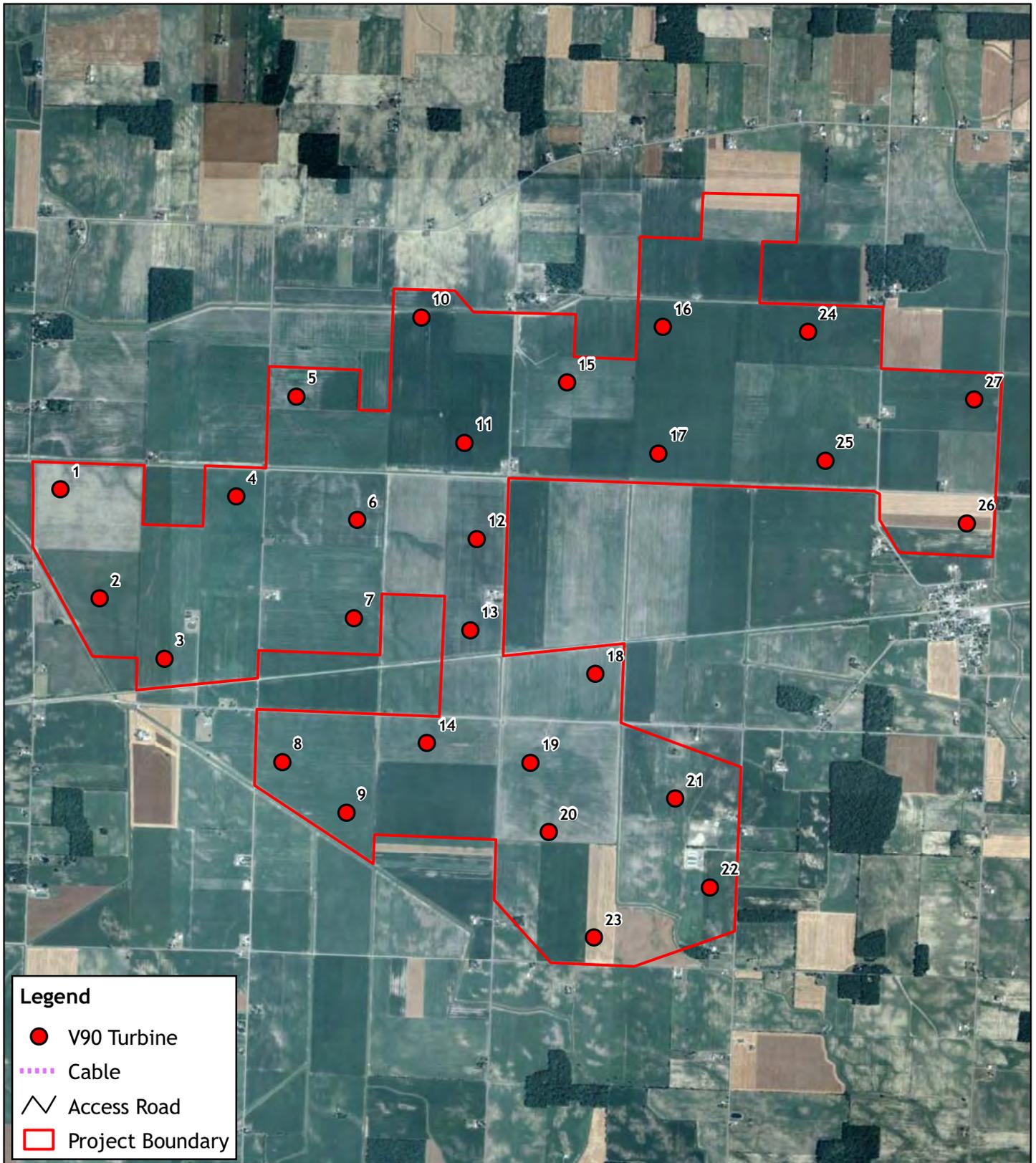
If possible, please provide us with hard copies as well as latitude/longitude locations so that we may include this information on environmental constraints base maps that will be produced for the project. I have also provided GIS shapefiles and a map of the project boundary to help expedite the process.

Please contact Mike Sponsler at 614-856-4681 or msponsler@bheenvironmental.com if you have any questions about this data request. Thank you in advance for your timely response.

Sincerely,

Mike Sponsler
Director

Cc: P. Endres



Legend

- V90 Turbine
- ⋯ Cable
- ∧ Access Road
- Project Boundary

Figure 1. Project boundary based on V90 turbine layout for JW Great Lakes Wind, Hardin County North Project, Ohio.

| | | | |
|--|-----------------------------|--|--|
| | <p>Feet</p> | <p>May 2009</p> | |
| | <p>Project No. 1865.004</p> | <p>Basemap: Microsoft Virtual Earth Imagery © 2009</p> | |



Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR

SEAN D. LOGAN, DIRECTOR

Division of Natural Areas & Preserves

Steven D. Maurer, Chief

2045 Morse Road, F-1

Columbus, OH 43229-6693

Phone: (614) 265-6453 Fax: (614) 267-3096

July 15, 2009

Mike Sponsler
BHE Environmental, Inc.
5300 E. Main St., Suite 101
Columbus, OH 43224

Dear Mr. Sponsler:

After reviewing our Natural Heritage maps and files, I find the Division of Natural Areas and Preserves has no records of rare or endangered species within 5 miles of the BHE Environmental, Inc. Hardin County North Wind Farm project #1865.004. The site is located in Secs. 8, 9, 10, 16, 17, 18, 20, and 21, Washington Twp., Hardin Co., Ada and Dunkirk Quadrangles.

There are no existing or proposed state nature preserves within 5 miles of the project site. We are also unaware of any unique ecological sites, geologic features, breeding or non-breeding animal concentrations, state parks, state forests, scenic rivers, or wildlife areas within 5 miles of the project area.

Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Although we inventory all types of plant communities, we only maintain records on the highest quality areas.

Please contact me at (614) 265-6409 if I can be of further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Butch Grieszmer".

Butch Grieszmer, Data Specialist
Resource Services Group

ohiodnr.com





Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR

SEAN D. LOGAN, DIRECTOR

Division of Wildlife
David M. Graham, Chief
2045 Morse Rd., Bldg. G
Columbus, OH 43229-6693
Phone: (614) 265-6300

February 1, 2010

To all interested parties,

As a signatory to the ODNR Voluntary Cooperative Agreement JW Great Lakes (JWGL) has committed to working with the Division of Wildlife (DOW) to minimize potential impacts to Ohio's wildlife resources at their proposed Hardin North wind energy facility. In spring 2009 the DOW provide wildlife surveying recommendations to JWGL. These recommendations are based upon available habitat within the project area, potential focal areas of bird and bat activity, migratory corridors, staging areas, or Audubon Important Bird Areas. Based upon a review of the project boundaries and accompanying site visit, the DOW determined that this project would require the "minimum" level of surveying effort. These recommendations included surveys for protected species of raptor (bald eagle, northern harrier, osprey, and peregrine falcons) nests, and acoustic monitoring to document bat activity. Typically these surveys also include breeding bird surveys, but because JWGL agreed to site their turbines within active agricultural lands, which are not considered suitable habitat for most species of bird, and away from patches of forest, these were waived.

The "On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocols for Commercial Wind Energy Facilities in Ohio" stipulates that signatories to the Cooperative Agreement whose proposed projects are located with areas categorized as requiring the "minimum" level of surveying effort have the option to forgo conducting acoustic monitoring of bats. In exchange the developer agrees to undertake operational curtailments to minimize the likelihood of impacts to bats. JWGL has agreed to feather (i.e., not operate) their turbines when wind speeds are ≤ 4 meters/second (as measured within the rotor-swept area) from dusk to dawn, July 1 to October 31 annually, for the lifetime of the facility.

Given this stipulation, and the lack of suitable habitat within the project boundary, the DOW feels as though this site poses a minimum threat to Ohio's wildlife resources. After reviewing the proposal submitted by JWGL and the responses provided by BHE regarding the Hardin North wind energy facility, the DOW has no further objection to this application. Additionally, JW Great Lakes and the DOW have agreed to work cooperatively to address any unexpected wildlife conflicts.

Sincerely,

Keith Lott

Wind Energy Wildlife Biologist
Ohio Department of Natural Resources Division of Wildlife
419-602-3141



11733 Chesterdale Road, Cincinnati, Ohio 45246 513.326.1500 / Fax 513.326.1178



July 14, 2009

Ms. Angela Boyer
U.S. Fish and Wildlife Service
6950 American Parkway
Suite H
Reynoldsburg, OH 43068-4127

RE: Data Update for a Study Area in Hardin County, Ohio.

Dear Ms. Boyer:

BHE Environmental, Inc.'s client has been completing scoping for a study area located in Hardin County, Ohio as depicted on the attached USGS topographic map (study area is located entirely within Hardin County). BHE's client is considering this area for development of a wind power electric generating plant and associated facilities and will encompass approximately 3,400 acres.

We know that prior coordination and database requests have been made for the project but would like to have the most up to date data. Therefore, we would like to request any data your agency can provide regarding rare/sensitive habitat or natural features and communities within 0.25 miles of the study area. In addition, please provide information regarding federally listed endangered, threatened, and candidate species and critical habitat that may be present within the study area proper or within 0.25 miles of the study area. We understand recent Indiana bat captures have occurred in Ohio as part of wind farm siting studies. Please advise whether this data is relevant to JW's proposed project area.

If possible, please provide us with hard copies as well as latitude/longitude locations so that we may include this information on environmental constraints base maps that will be produced for the project. It would be greatly appreciated if we could get a quick response to this request. I have provided GIS shapefiles of the project boundary to help expedite the process.

Please contact Mike Sponsler at 614-856-4681 or msponsler@bheenvironmental.com if you have any questions about this data request. Thank you in advance for your timely response.

Sincerely,

Mike Sponsler
Director



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / FAX (614) 416-8994

September 18, 2009

TAILS # 31420-2009-TA-1035

Mr. Jim O'Dell
Ohio Power Siting Board
180 East Broad St.
Columbus, OH 43215-3793

Re: Hardin County North Wind Farm, 09-277-EL-BGN

Dear Mr. O'Dell:

This is in reference to the proposed Hardin County North Wind Farm, to be located entirely in Washington Township, Hardin County, Ohio. This application was submitted by JW Great Lakes Wind, LLC, and seeks issuance of a Certificate of Environmental Compatibility and Public Need. The project involves the installation of up to 50 MW of wind power capacity, including between 19-27 wind turbines (depending on model selected), access roads, electrical infrastructure, construction staging areas, and an operations and maintenance facility. The project area is dominated by intensive agriculture. No forested areas exist within the project boundary. Several channelized streams/drainage ditches exist within the project area, and may be impacted by culvert crossings, authorized by a Nationwide Permit. No wetlands exist within the project area aside from those areas within the channel of the ditches.

The Service received your August 17, 2009 letter requesting our review of the application for informational completeness, and we submit this letter in response.

The U.S. Fish and Wildlife Service (Service), JW Great Lakes Wind, LLC, their representatives, and the Ohio Department of Natural Resources (ODNR) have been involved in site planning and review of the proposal for approximately two years. We have participated in multiple meetings, we conducted a site visit on July 18, 2008, and engaged in multiple discussions and e-mails regarding proposed wildlife (bird and bat) survey protocols for this project. We submit this information to you to document that JW Great Lakes Wind, LLC has been working collaboratively with the Service to address potential wildlife, habitat, and natural resource issues in advance of applying to the Ohio Power Siting Board for certification.

As noted above, we agree that the bird and bat surveys implemented by JW Great Lakes Wind, LLC were sufficient to document wildlife use of the project area. All agreed-upon surveys have been completed as requested by ODNR and the Service, and reports summarizing the results of those surveys were included in the application package. Wildlife habitat within the project area is extremely limited by the intensive agricultural nature of the project area. There are no woodlots, grasslands, wetlands, or other suitable habitat within the project area. Wildlife species typically observed during the surveys included common bird and mammal species typically found in agricultural settings.

ENDANGERED SPECIES COMMENTS: No federally-listed species were documented within the project area, and no suitable habitat for federally-listed species occurs in the project area.

The project lies within the range of the Indiana bat (*Myotis sodalis*), a federally listed endangered species.

Indiana bats were recently documented within eastern Hardin County. During winter, Indiana bats hibernate in caves and abandoned mines. Summer habitat requirements for the species are not well defined but the following are considered important:

- (1) dead or live trees and snags with peeling or exfoliating bark, split tree trunk and/or branches, or cavities, which may be used as maternity roost areas;
- (2) live trees (such as shagbark hickory and oaks) which have exfoliating bark;
- (3) stream corridors, riparian areas, and upland woodlots which provide forage sites.

The project area does not provide any suitable Indiana bat habitat. No forested areas or streams with forested riparian corridors, nor caves or mines are present within the project area. The Service firmly believes that as the project is currently proposed, Indiana bats are unlikely to occur within the project area, and that take of Indiana bats will not occur. At this time, we do not believe that additional consultation relative to the Indiana bat is warranted for this project.

Although we do not anticipate take of Indiana bats at this project, we believe it is likely that mortality of non-listed bat species will occur, and recommend post-construction monitoring be implemented, as specified in ODNR's "On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio," to assess impacts to non-listed bat species. JW Great Lakes Wind LLC is a signatory to ODNR's Voluntary Cooperative Agreement, and has agreed to curtail all operations during night time hours (sunset-sunrise) from July 1 through October 31 when wind speeds are less than or equal to four (≤ 4) meters per second for the life of the facility to avoid and minimize potential impacts to bats. We request this both post-construction mortality monitoring and operational curtailment as described above be made conditions of any issued certificate.

MIGRATORY BIRD COMMENTS: 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 bald eagles are known to occur in Hardin County, none are within 5 miles of the project area. Therefore, we do not anticipate any impact on this species. Based on the proposed location of this project, the general lack of suitable habitat for migratory birds, the disturbed nature of the project area, and the results of the bird surveys conducted by the applicant, we do not believe this site poses a substantial threat to migratory birds or their habitat, though a limited amount of mortality to migratory birds should be expected to occur.

We appreciate your conscientious efforts to protect the Indiana bat and other natural resources within the Hardin County North Wind Farm project area. If you have questions, or if we may be of further assistance in this matter, please contact Megan Seymour at extension 16 in this office.

Sincerely,



Mary Knapp, Ph.D.
Field Supervisor

cc: Keith Lott, ODNR, 2514 Cleveland Road East, Huron, OH 44839

APPENDIX B
Site Photographs

Photographs taken by BHE Environmental, Inc. during Site Visits to Hog Creek Wind Farms I and II

October 31, 2008 Site Visit to Hog Creek I

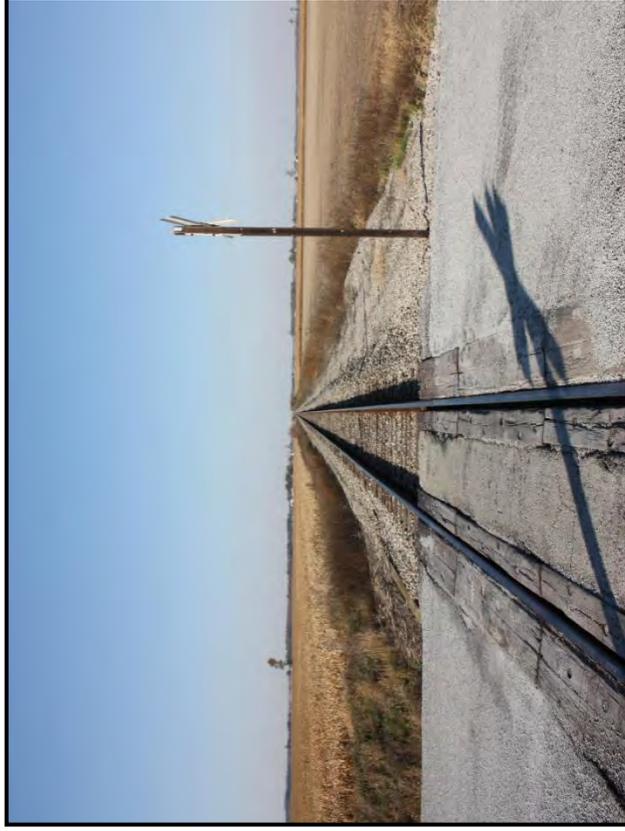


Photo 1. Grassy vegetation along rail road through the project area.

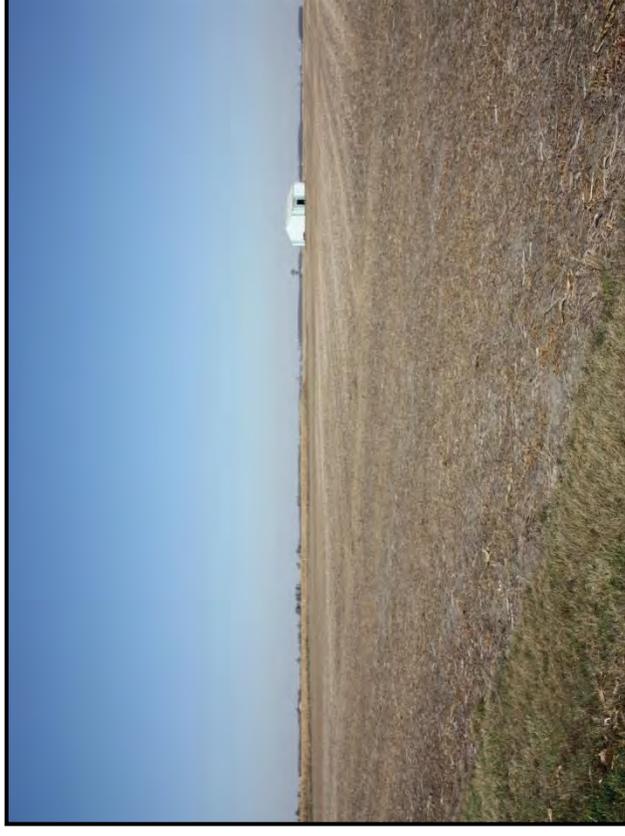


Photo 2. Typical agricultural land use.

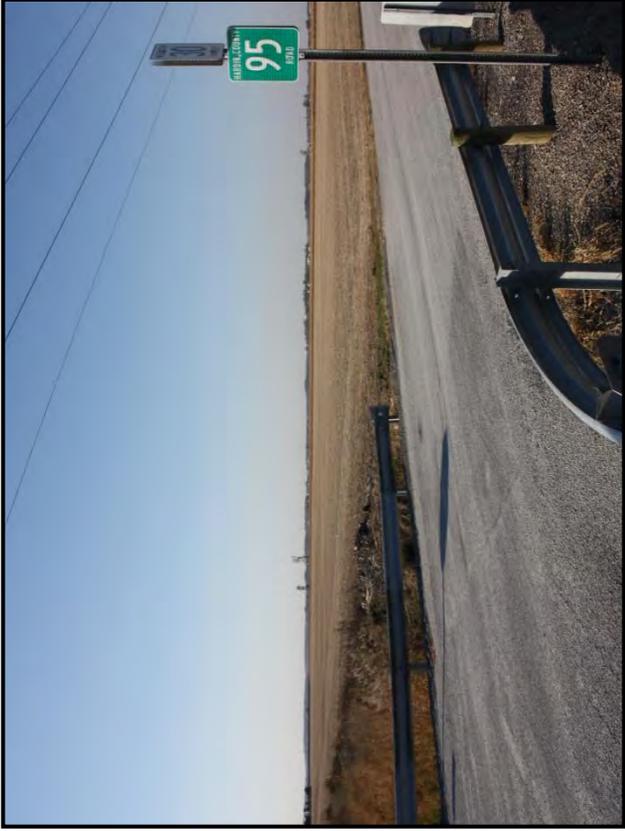


Photo 3. Typical agricultural land use.

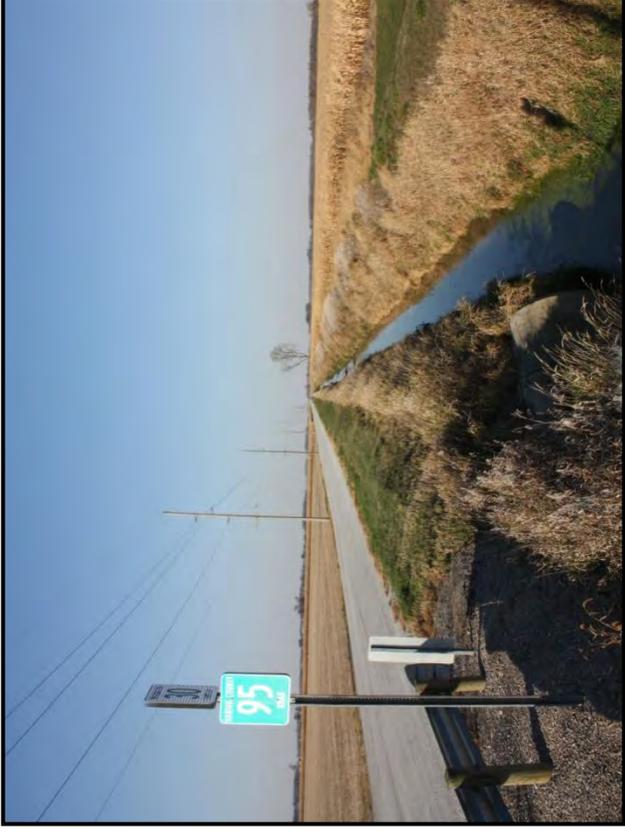


Photo 4. Typical degraded, channeled/grassy watercourse.



Photo 5. Shrubby vegetation along a road.



Photo 6. Typical degraded, channeled/grassy watercourse.



Photo 7. Typical degraded, channeled/grassy watercourse and typical isolated woodlot.



Photo 8. Typical isolated woodlot and trees clustered in a yard.



Photo 9. Trees clustered in a yard.



Photo 10. Typical woodlot.

May 18, 2010 Site Visit to Hog Creek II



Photo 11. Typical agricultural land use.

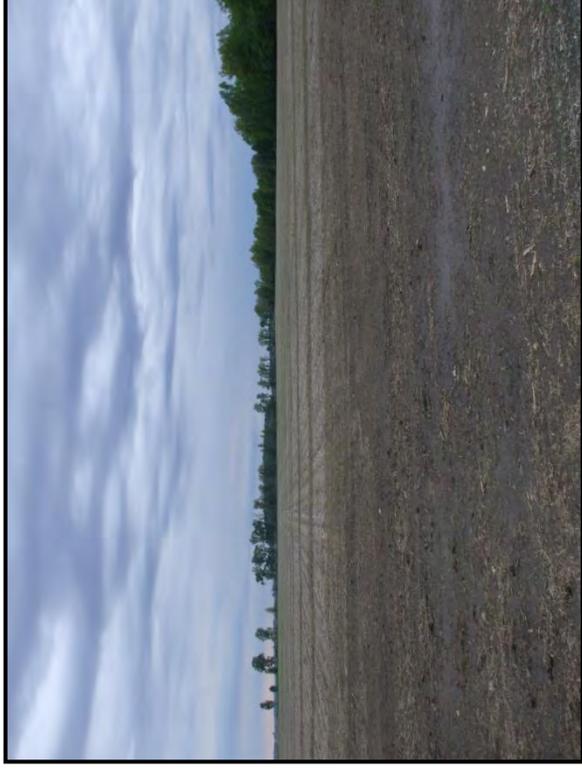


Photo 12. Typical tree line and woodlot edge along an open agricultural field.



Photo 13. Typical degraded, channeled/grassy watercourse.



Photo 14. Typical degraded, channeled/grassy watercourse.



Photo 15. Typical degraded, channelled/grassy watercourse.



Photo 16. Typical isolated woodlot.



Photo 17. Typical tree line.



Photo 18. Typical tree line.



Photo 19. Young woodlot with open canopy.

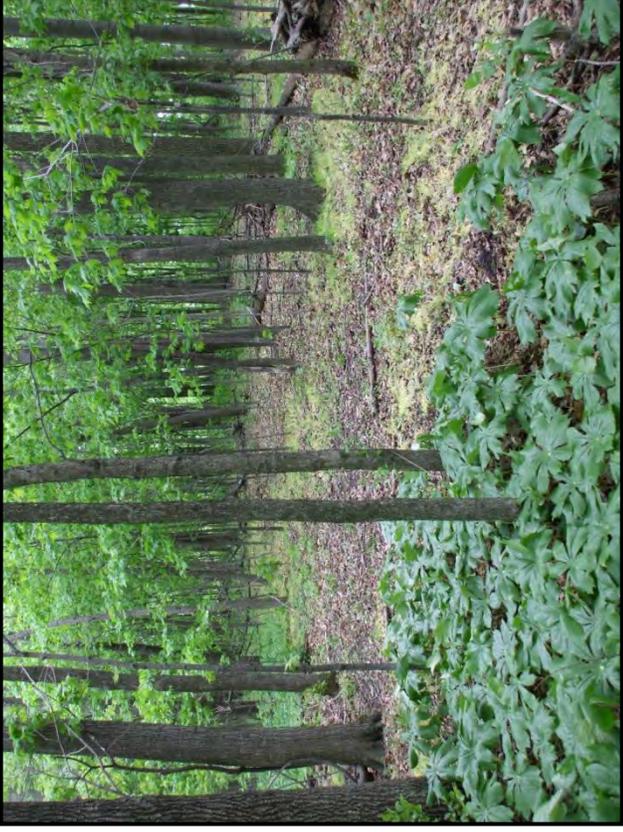


Photo 20. Woodlot with low understory density.

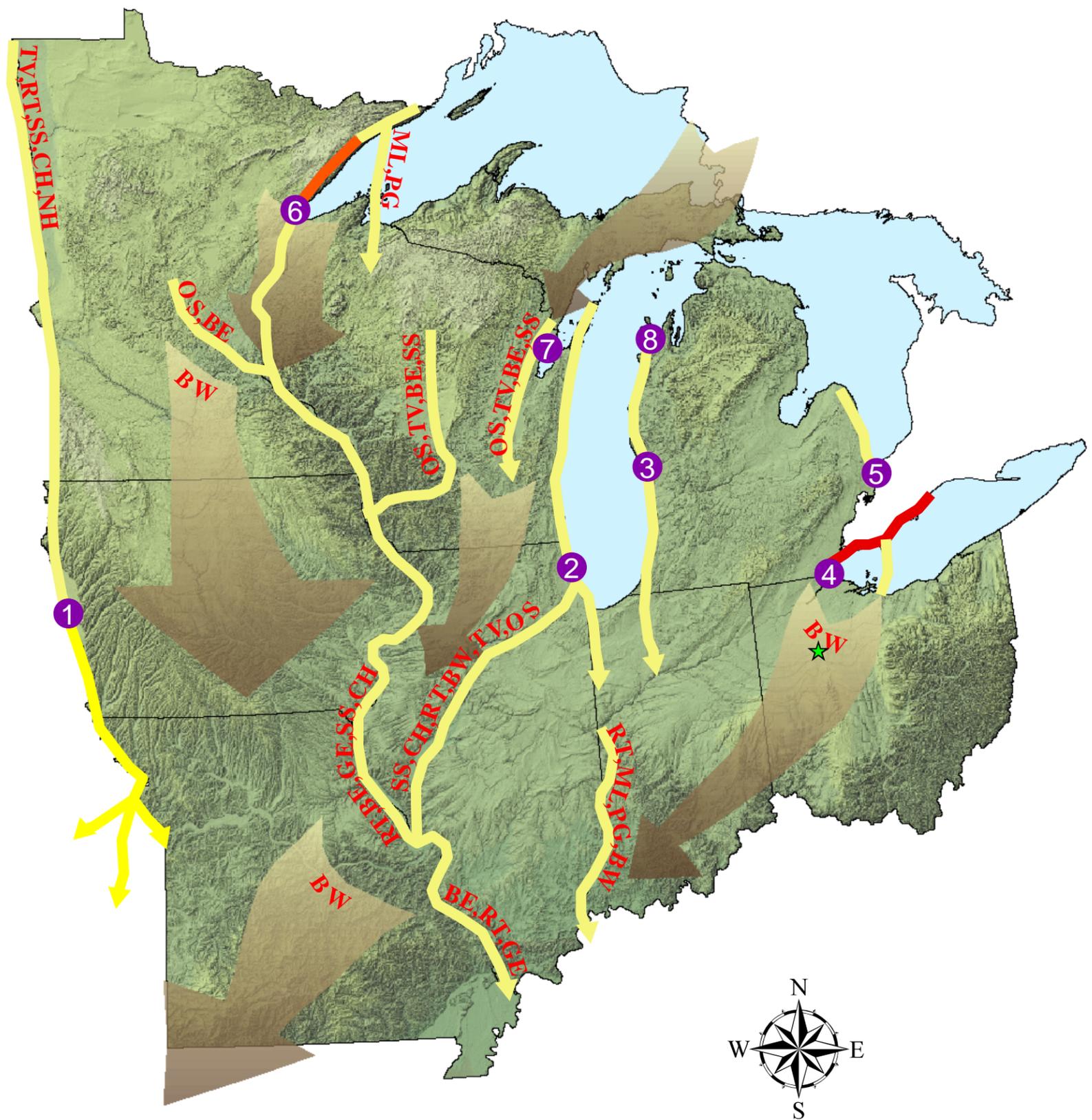


Photo 21. Typical woodlot.



Photo 22. Farm track through woodlot.

APPENDIX C
Ohio Raptor Migration Maps



FALL RAPTOR MIGRATION ROUTES

| SYMBOL | COMMON NAME |
|--------|-----------------------|
| AK | American Kestrel |
| BE | Bald Eagle |
| BO | Boreal Owl |
| BW | Broadwing |
| CH | Cooper's Hawk |
| GE | Golden Eagle |
| LEO | Long-eared Owl |
| ML | Merlin |
| NG | Northern Goshawk |
| NH | Northern Harrier |
| NSWO | Northern Saw-whet Owl |
| OS | Osprey |
| PG | Peregrine Falcon |
| RL | Rough-legged Hawk |
| RS | Red-shouldered Hawk |
| RT | Red-tailed Hawk |
| SEO | Short-eared Owl |
| SS | Sharp-shinned Hawk |
| TV | Turkey Vulture |

Major Raptor Migration Observation Sites

- ① Hitchcock Nature Area (CH,RT,SS,TV,SW,NH)
- ② Illinois Dunes State Park (ML,NH,PG,SEO)
- ③ Muskegon State Park (SS,RL,RT)
- ④ Lake Erie Metropark (TV,OS,BE,NH,SS,CH,RT,RL,GE,AK,ME,PG)
- ⑤ Port Huron (PG,ML)
- ⑥ Hawk Ridge, Duluth (TV,OS,BE,NH,SS,BW,NG,RT,RL,AK,ML,PG,BO,NSWO,LEO)
- ⑦ Little Suemico (SS,BW,NSWO)
- ⑧ Sleeping Bear Dunes NL (RL,RT,SS)
- ★ Rt qlgev' Ct gc

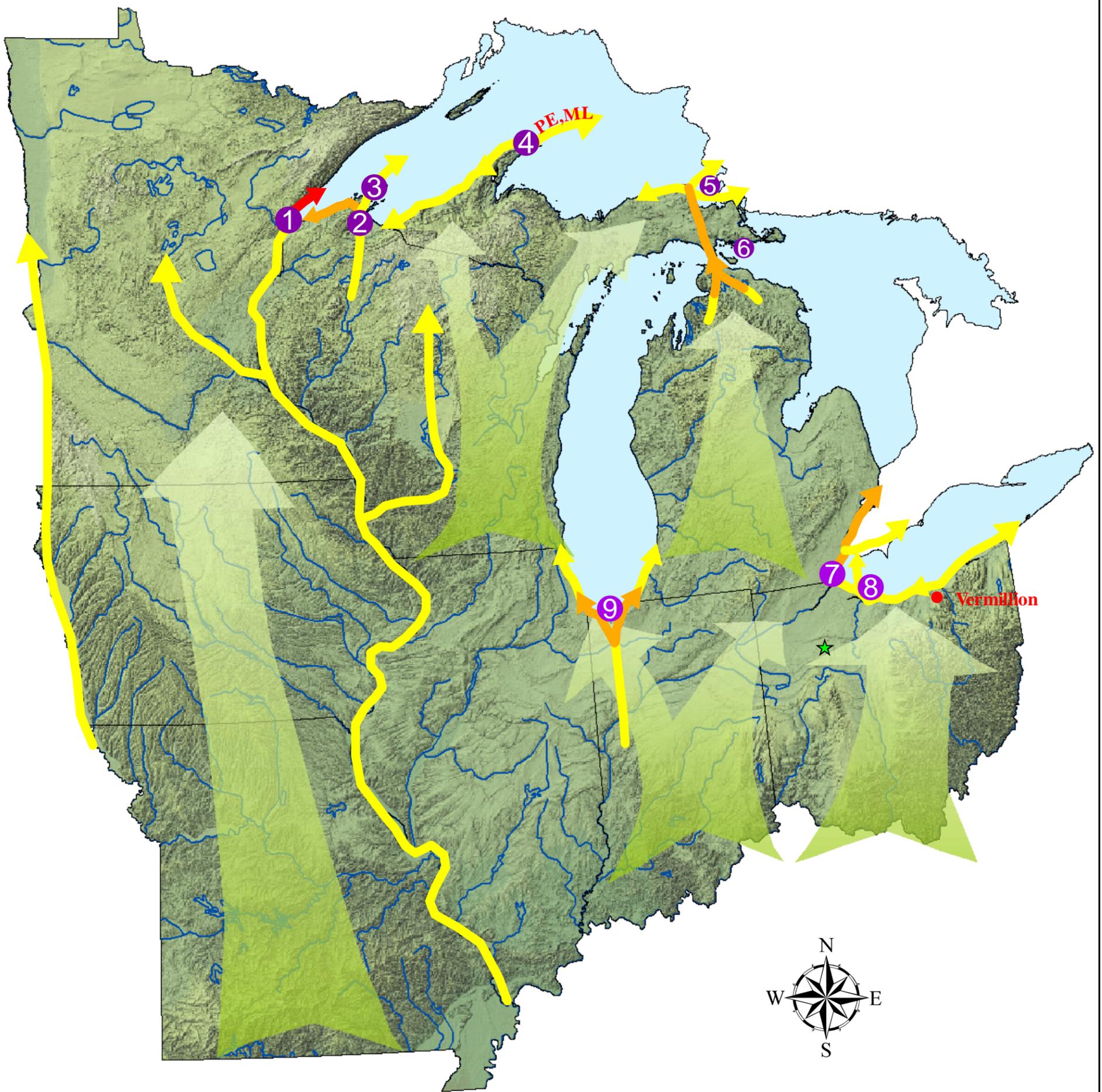
Legend Number of Birds

- 2,500 - 25,000
- 25,000 - 50,000
- 50,000 - 100,000
- >100,000

Map Created for: Division of Migratory Birds
October, 2006
Fall Migratory Bird Information provided by
USFWS Migratory Bird Biologist Bob Russell



U.S. Fish & Wildlife Service
Region 3 NWRS
Division of Conservation Planning
Twin Cities, Minnesota 55111



SPRING RAPTOR MIGRATION ROUTES

| SYMBOL | COMMON NAME |
|--------|-----------------------|
| AK | American Kestrel |
| BE | Bald Eagle |
| BO | Boreal Owl |
| BW | Broadwing |
| CH | Cooper's Hawk |
| GE | Golden Eagle |
| LEO | Long-eared Owl |
| ML | Merlin |
| NG | Northern Goshawk |
| NH | Northern Harrier |
| NSWO | Northern Saw-whet Owl |
| OS | Osprey |
| PG | Peregrine Falcon |
| RL | Rough-legged Hawk |
| RS | Red-shouldered Hawk |
| RT | Red-tailed Hawk |
| SEO | Short-eared Owl |
| SS | Sharp-shinned Hawk |
| TV | Turkey Vulture |

Major Raptor Migration Observation Sites

- ① West Skyline Observatory, Duluth (TV,OS,BE,SS, BW,RT,RL,GE)
- ② Chequamegon Bay, Ashland (TV,SS,BW,RT,GE,BE)
- ③ Apostle Islands (AK,ML,PG)
- ④ Manitou Island/Keewenaw Peninsula (OS,SS,RL, NH,BE,PE,ML)
- ⑤ Whitefish Point (TV,BE,NH,SS,RS,BW,RT,RL,GE, AK,ML,PG,NSWO,BO,LEO)
- ⑥ Straits of Mackinac (TV,BE,SS,CH,RS, RT,RL,BW,GE)
- ⑦ Port Huron (TV,SS,RS,RT,BW)
- ⑧ Lake Erie Islands (TV,SS,BE,NH,OS,ML,PG)
- ⑨ Indiana Dunes NL (OS,NH,SS,RS,BW,RT,AK)
- ★ Rt qlgev'Ct gc

Legend Number of Birds

- █ 2,500 - 5,000
- █ 5,000 - 10,000
- █ 10,000 - 20,000
- █ >20,000

Map Created for: Division of Migratory Birds
October, 2006
Fall Migratory Bird Information provided by
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