Chapter 4

Affected Environment

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4 Affected Environment

This chapter of the DEIS describes the existing conditions at and in the vicinity of the Project[1]. For the purposes of this chapter and Chapter 5 (Environmental Consequences), resources were assessed within different spatial extents depending on the character of the resource and the extent to which the Project could have effects. This approach is consistent with the USFWS' regulations implementing NEPA, which indicate that the scope of analysis is dependent on the extent of reasonably foreseeable Project-related impacts (USFWS 2003). The spatial extent of analysis for each resource is documented at the start of its discussion in this chapter.

The following terms define the primary analysis areas for this DEIS:

- Action Area – The Action Area is defined as the area that could be affected by the Proposed Action, which extends beyond the physical locations of Project facilities. The Action Area encompasses 32,395 ha (80,051 ac) within portions of Union, Wayne, Urbana, Salem, Rush, and Goshen Townships in Champaign County, Ohio and is roughly bounded by State Route 245 to the north, State Route 559 to the east, State Route 4 to the south, and State Route 54 and U.S. Route 68 to the west (see Figure 1-1).
- Project Area – The Project Area includes those sites within the Action Area where Project components (described in Chapter 3) would be located, plus a 305-m (1,000-ft) buffer or setback from turbine locations (see Figure 1-2). Such components include wind turbines and workspaces, access roads, buried electrical interconnects, overhead electrical interconnects, operations and maintenance buildings, a storage yard, meteorological towers, staging areas, crane paths, and a substation. As the locations for only 52 turbines and associated infrastructure are currently known, in some cases only these areas have been fully evaluated. In these cases, the maximum impact expected for the full 100 turbine build-out is described along with the evaluation methods, avoidance, minimization, and mitigation measures.
- Mitigation Area – The Proposed Action includes mitigation to offset the impacts of incidental taking of Indiana bats. The mitigation site(s) (Mitigation Area) is not located within the Action Area and will consist of 88 ha (217 ac) of land within 11 km (7 mi) of a Priority 2 hibernaculum in Ohio. The Mitigation Area will not necessarily be a continuous tract of land depending on the choice of location for the mitigation acres within the Mitigation Area. The Mitigation Area and Action Area combined constitute the Covered Lands for the HCP (see HCP in Appendix B). Alternatively, the mitigation plan could utilize any mitigation bank that has been set up and approved by the USFWS for mitigation of Indiana bats in the Midwest RU. Any mitigation bank utilized must have a geographical range that includes the Project and include lands within Ohio.
- Direct and Visual Areas of Potential Effect (APEs) – APE is the standard terminology used by cultural resources agencies and professionals to describe impacts on archaeological and architectural resources. The direct APE refers to the actual footprint

[1] Resources considered for analysis in the DEIS included: geology and soils, water resources, air quality including greenhouse gases and climate change, noise, biological resources including vegetation, wildlife, and threatened and endangered species, land use, recreation, tourism, visual resources, socioeconomics and environmental justice, cultural resources, transportation, and safety.

of the project including all turbines, collection lines, substations, and other structures. The visual APE refers to the area from which Project infrastructure will be visible. In the case of this DEIS, the visual APE includes a 8 km (5 mi) buffer from the Project Area boundary.

- Five-County Analysis Area – The Five-County Analysis Area includes the counties that overlap with and/or surround the Action Area including Champaign, Clark, Logan, Madison, and Union Counties. This analysis area is used in the context of the potential Project interaction with broader regional systems, such as socioeconomics and transportation, that spread beyond the boundaries of the Action Area.

Scientific names of plants and animals discussed in this and the following DEIS chapters are listed in Appendix E.

4.1 Soils and Geology

4.1.1 Scope of Analysis

This section presents a description of the existing soil and geologic resources in the Action Area, including topography, bedrock features, and seismicity. The soils and geology analysis in this DEIS is based on information from a geotechnical review conducted for the Action Area (Hull 2009a) and publicly available online databases and/or documents produced by the following federal and state agencies: United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), United States Geological Survey (USGS), and ODNR.

4.1.2 Existing Conditions

4.1.2.1 Soils

Based on the Soil Survey for Champaign County (USDA-NRCS 1979), soils in the Action Area are primarily composed of Celina, Fox, and Miami silt loams. Celina and Miami silt loams are well-drained, have a moderately high capacity to transmit water (0.51 to 1.52 cm/hr [0.20 to 0.60 inch/hour [in/hr]]), with the depth to water table being 61 to 91 cm (24 to 36 in) below surface. The Fox silt loams are well-drained and have a moderately-high to high capacity to transmit water (1.52 to 5.1 cm/hr [0.60 to 2.0 in/hr]), with the depth to water table being more than 203 cm (80 in) below surface. Celina, Fox, and Miami silt loams do not frequently flood or pond surface water runoff (USDA-SCS 1971). All three soils satisfy the USDA criteria for prime farmland (NRCS 2009a).

4.1.2.2 Topography and Geology

The Project components in relation to geological features including bedrock contours, karst areas, and known and speculated deep seismic structures within the Action Area are depicted in Figure 4.1-1. As shown on the map, features labeled the “Bellefontaine Outlier Faults” are located within the granitic basement rock underlying the Action Area (Hull 2009a). According to ODNR seismic data, three seismic events have been recorded in the history of Champaign County: one in 1843 (estimated 3.0-3.9 magnitude) and the other in 1875 (estimated 4.0-4.9 magnitude; ODNR 2006). A recent 5.8 magnitude earthquake that occurred on August 23, 2011

with an epicenter in Virginia was felt in Champaign County but no damage was reported (ODNR 2012).

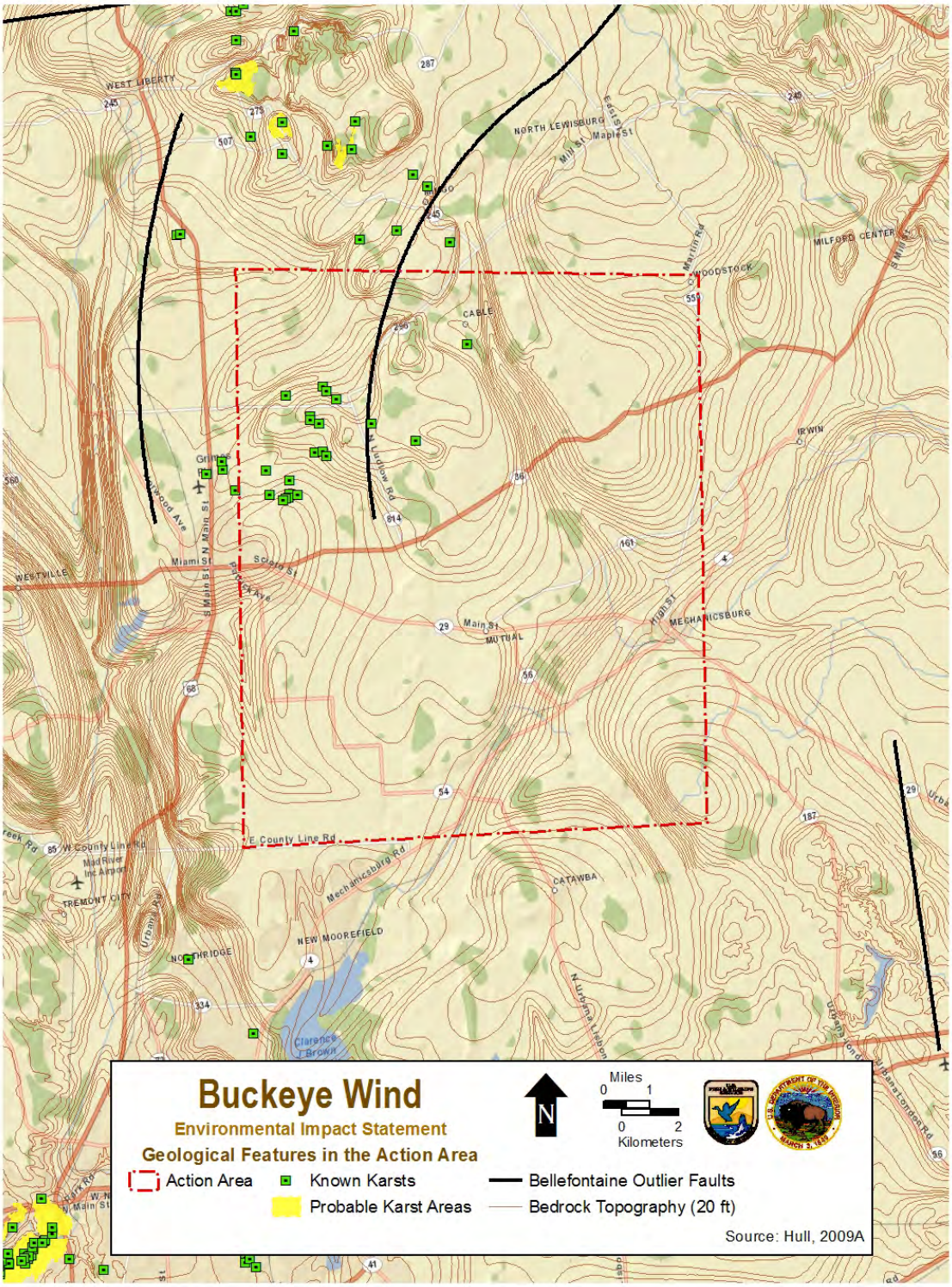
The Action Area is located in the glaciated Till Plains Section of the Central Lowland Physiographic Province. The topography is characterized by gently rolling hills and moderate slopes with elevations ranging from 396 to 549 m (1,300 to 1,800 ft) above mean sea level. Typical of west-central Ohio, the area experienced both the Illinoian and Wisconsinan glaciers and the surface topography is the result of glacial end moraine deposits (i.e., the Cable and Springfield Moraine complexes; EDR 2009a).

The Cable Moraine is characterized by thick deposits of glacial till intermixed with relatively thin sand or sand and gravel layers. Glacial till is a heterogeneous mixture of all sizes of soil particles inclusive of clay, silt, sand, and gravel, with occasional cobbles and boulders. Glacial till deposits may also contain streaks, seams, layers, or lenses of sand and gravel, which may or may not be water-bearing. Discontinuous, very thin to moderate lenses of sand and gravel deposits are common in this region. The till associated with the Cable Moraine is generally thicker in the southern portion of the Action Area and thins to the north, but typically exceeds 61 m (200 ft) in thickness throughout the Action Area. The Springfield Moraine is much thinner than the Cable Moraine (often less than 3 m [10 ft] in thickness), and overlies an outwash deposit called the Kennard Outwash. Outwash typically consists of coarser grained material, such as sand and gravel, deposited by the flowing water from melting ice. The Kennard Outwash is located between the two moraine complexes in the east-central portion of Champaign County and extends northward into the extreme southern portion of Logan County.

The uppermost bedrock within the majority of the Action Area is comprised primarily of limestone and dolomite, although shale with interbedded limestone is the uppermost bedrock in the northern-most portion of the Action Area. The depth to bedrock is highly variable.

According to well information included in the Ground-Water Resources of Champaign County (Schmidt 1985), limestone was encountered at a depth of approximately 105 m (345 ft) in a domestic well located to the north of Mechanicsburg. These well logs also indicate that the subsurface soils are a combination of clay, sand, and gravel that extend to underlying limestone bedrock, encountered at depths in excess of 30 m (100 ft). As part of the final Project design, a geotechnical engineer will conduct geotechnical surveys within the footprint of Project facilities.

Figure 4.1-1 Geological Features in the Action Area



4.1.2.3 Caves

Caves are hollow passages under or into the earth, generally having an opening to the surface. Caves can be natural or man-made. Caves are formed naturally when water-soluble rocks (e.g., limestone or sandstone) dissolve over time due to exposure of water in underground rivers or aquifers. Caves that form in water-soluble rocks are known as karst caves. Caves are also created by human activities such as mining. Numerous bat species, including Indiana bats, use man-made and natural caves for hibernation during winter. Sites used for hibernation are referred to as hibernaculum (singular) or hibernacula (plural). The largest known bat hibernaculum in Ohio occurs in a man-made cave system, Lewisburg Limestone Mine, located approximately 101 km (63 mi) southwest of the Action Area. In January 2012, it was reported that 9,243 Indiana bats used the Lewisburg Limestone Mine for hibernaculum, down from 9,594 the year before (M. Seymour, USFWS, personal communication). Unpublished data from a USFWS survey in 2005 found that approximately 30 percent (136,410 bats) of the rangewide population of Indiana bats hibernated in man-made hibernacula, including 24 mines, while the remainder (320,964 bats) hibernated in natural caves (USFWS 2009).

Some portions of the Action Area are underlain by karst geological features, and there are several caves in the vicinity, including Sanborn's Cave and a nearby unnamed cave (about 6.3 km [3.9 mi] north of the Action Area), where bat hibernacula and swarm surveys took place in 2008 (see Section 4.4.2).

4.2 Water Resources

4.2.1 Scope of Analysis

Water resources include groundwater and surface water. Groundwater is the subsurface hydrologic resource that is used for potable water consumption, agricultural irrigation, and industrial applications and is described in this DEIS in terms of depth to aquifer, aquifer or well capacity, and surrounding geologic composition. Surface water resources described in this DEIS include watersheds, streams, wetlands, and floodplains.

Water resources that could be affected by the Project extend beyond the geographical boundaries of the Project Area. Therefore, they are described at the Action Area scale.

The water resources analysis in this DEIS is based on information from publicly available online databases and/or documents produced by the following federal, state, and local agencies: USGS, Federal Environmental Management Agency (FEMA), ODNR, OEPA, Champaign County Engineer and Health District, and the Ohio State University Agricultural Extension Office. Focused studies undertaken to support the Project design and the Project's OPSB Application supplied additional information for this analysis. These studies included a groundwater and hydrogeology study (Hull 2009b), a route evaluation study (Hull 2009c), and a delineation of surface water features (Hull 2009d).

4.2.2 Existing Conditions

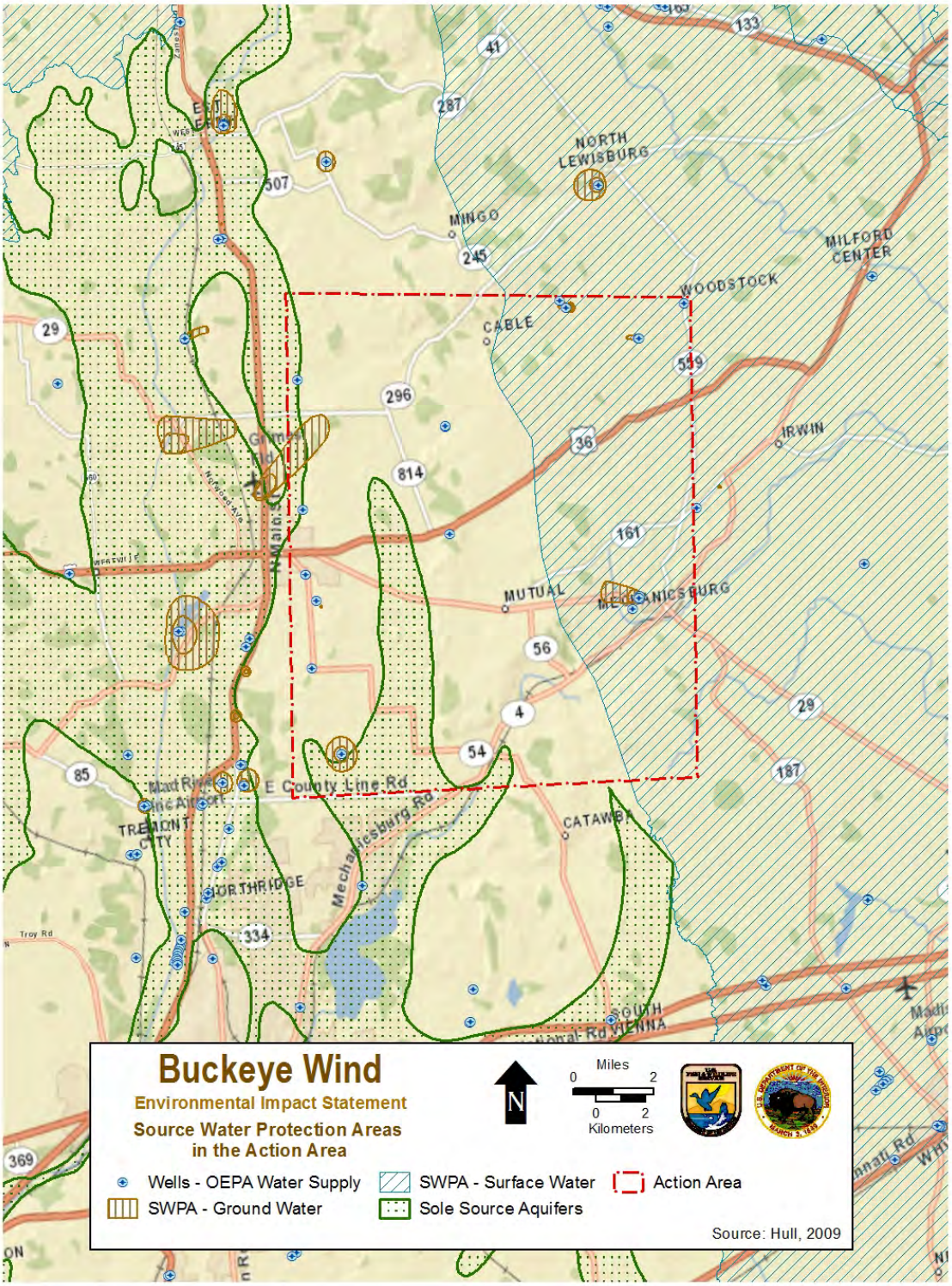
4.2.2.1 Groundwater

Groundwater resources exist in aquifers, which can be broadly defined as distinct water-bearing geologic features. The Greater Miami Sole Source Aquifer is a buried valley aquifer system underlying the Great Miami, Little Miami, and Mill Creek watersheds in the western portion of the Action Area (Figure 4.2-1). The "sole source" designation indicates that an aquifer supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, and represents the only feasible source of drinking water for the local population. The Greater Miami Sole Source Aquifer provides drinking water to 1.6 million people (Hull 2009b). Depth to groundwater is less than 6 m (20 ft) in most parts of the aquifer, and supply wells in sand and gravel deposits within the aquifer commonly yield more than 3,785 liters per minute (L/min) (1,000 gallons per minute [gpm]) (USGS 1997).

The portion of the aquifer that underlies much of the Action Area is designated as a Class I aquifer, indicating that it has high to high-intermediate potential productivity based on aquifer characteristics and proximity to recharge (MVRPC 2005). Characteristics of the groundwater supply in the Action Area are discussed in Section 4.2.2.2.

Source Water Protection Areas (SWPAs) are areas where certain land uses and activities are regulated for the purposes of preserving water quality. SWPAs may be designated for protection of either groundwater or surface water resources. Multiple groundwater SWPAs exist in the eastern portion of Champaign County. Two groundwater SWPAs occur entirely within the Action Area: one in the eastern portion of the Action Area north of Route 4 and another in the southwestern corner of the Action Area southwest of Route 54. A third groundwater SWPA is located on the western boundary of the Action Area south of Route 296 (Figure 4.2-1) (Hull 2009b). Most of the eastern portion of the Action Area is within a surface water SWPA (Figure 4.2-1).

Figure 4.2-1 Source Water Protection Areas in the Action Area



4.2.2.2 Public and Private Groundwater Supply

Because of the rural nature of the Action Area, municipal water is generally unavailable. Rural residents rely upon private wells for drinking water and agricultural uses, such as watering livestock and irrigating crops. Based on a landowner survey, the majority of respondents indicated they have at least one well, with several landowners indicating the presence of two or three wells in order to provide additional water for livestock (Hull 2009b). None of the responding property owners indicated they were connected to a municipal water supply.

Based on the information provided in the landowner survey, wells completed at depths shallower than 30 m (100 ft) were, for the most part, installed in sand and gravel deposits (Hull 2009b). Half of the wells at depths between 30 and 61 m (100 and 200 ft) were completed in sand and gravel deposits, and half were completed in bedrock. Generally speaking, wells completed below 61 m (200 ft) were installed in bedrock. Flowing springs were noted at a property located near Mechanicsburg, and yields are reportedly sufficient to provide water for livestock.

Groundwater was typically encountered at depths ranging from 5 to 15 m (15 to 50 ft) in the wells completed in sand and gravel. The typical yield in these wells was reportedly between 19 and 132 L/min (5 and 35 gpm), although at least three of the wells had yields in excess of 379 L/min (100 gpm). Groundwater depths within the bedrock were typically deeper; of the six bedrock wells for which depth to water information was included, none had groundwater levels shallower than 30 m (100 ft). An estimated yield for one bedrock well was approximately 57 L/min (15 gpm) (Hull 2009b). Based on responses in the landowner survey, it did not appear that property owners have experienced problems related to lowered water tables or lower yields from their wells (Hull 2009b).

4.2.2.3 Watersheds

The Action Area lies within the Upper Scioto River and Upper Great Miami River drainages, both of which drain to the Ohio River (USGS 2008, as cited in EDR 2009a). These drainage basins can be divided into smaller sub-watersheds using the USGS hydrologic classification system in which hydrologic units are divided into successively smaller hydrologic units. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) based on four levels of classification in the hydrologic unit system. Table 4.2-1 presents the 12-digit hydrologic units in the Action Area at the catalog unit or watershed level.

Table 4.2-1 Watersheds as Classified by the USGS 12-digit Hydrologic Unit Codes (HUC)[1] within the Action Area

12-Digit HUC Number	Waterbody Name	12-Digit HUC Name	Watershed Relationship
050600011902	Spain Creek (includes Pleasant Run)	Spain Creek – Big Darby Creek	Big Darby Creek to Scioto River
050600012001	Treacle Creek	Headwaters Treacle Creek	Little Darby Creek to Big Darby Creek to Scioto River
050600012002	Proctor Run	Proctor Run – Treacle Creek	Little Darby Creek to Big Darby Creek to Scioto River
050600012003	Little Darby Creek (includes Clover Run, Jumping Run, Lake Run)	Headwaters Little Darby Creek	Little Darby Creek to Big Darby Creek to Scioto River
050600012004	Spring Fork	Spring Fork	Little Darby Creek to Big Darby Creek to Scioto River
050800011501	Macochee Creek	Macochee Creek	Mad River to Great Miami River
050800011503	King's Creek	King's Creek	Mad River to Great Miami River
050800011602	Dugan Run	Dugan Run	Mad River-Nettle Creek to Mad River to Great Miami River
050800011701	East Fork Buck Creek	East Fork Buck Creek	Buck Creek to Mad River to Great Miami River
050800011702	Buck Creek	Headwaters Buck Creek	Buck Creek to Mad River to Great Miami River

[1] All watersheds drain into the Ohio River.

The OEPA identifies HUC watershed segments with impaired ambient water quality in the State of Ohio (OEPA 2008 as cited in EDR 2009a). The Big Darby Creek, Little Darby Creek, Mad River, and Buck Creek watersheds have all been designated impaired for both Aquatic Life Use and Recreation. Big Darby Creek has been impaired by organic enrichment, metals, nutrients, siltation, and direct habitat and flow alterations. In Little Darby Creek, impairment is attributed to unknown toxicity sources, siltation, and nutrient and organic enrichment. Above the confluence of King's Creek, major causes of impairment in the Mad River are direct habitat alterations. Below King's Creek, impairment is largely the result of organic enrichment, metals, nutrients, priority organics, siltation, and direct habitat alterations. In Buck Creek, habitat and flow alterations are the major causes of impairment.

The Big Darby Creek SWPA comprises the entire extent of the Big Darby Creek Watershed that falls within the Action Area. According to information provided by OEPA, this portion of the Big Darby Creek SWPA represents a small fraction of the Cincinnati Public Water Supply SWPA, which also includes the entirety of the Ohio River drainage basin upstream of the City of Cincinnati (Hull 2009b).

4.2.2.4 Streams

The surface water delineation (Hull 2009d and Hull 2011) identified 43 streams within the Action Area (Figures 4.2-2, 4.2-3, and 4.2-4), all of which appear to meet the definition of jurisdictional Waters of the United States (as per 33 CFR 328), but have yet to be verified by USACE. Table 4.2-2 summarizes the characteristics of the streams: most streams in the Action Area are generally small. Larger streams with deep pools include Dugan Run and the East Fork of Buck Creek.

Hull (2009d and 2011) delineated and described the streams located within 100 feet of Project components in the Action Area based on fluvial morphological characteristics. Hull evaluated streams using the Ohio Qualitative Habitat Evaluation Index (QHEI) scoring method or the Ohio Headwater Habitat Evaluation Index (HHEI) where applicable. Both methods are used to estimate the probable aquatic life in each stream. An additional survey method, the Visual Encounter Survey (VES), was used in a few streams thought to have physical aspects of higher-value headwater streams. Surface waters will be delineated in the same manner as described here for the additional 48 turbines.

The HHEI is used on primary headwater habitat (PHWH) streams with a drainage area less than 2.6 square km (1 square mi) and with maximum pool depths less than 40 cm (15.7 in). The OEPA (2003) defines a headwater stream as a stream with a watershed less than or equal to 52 square km (20 square mi). Many streams and drainage ways have a watershed of less than 2.6 square km (1 square mi). There are three possible categories to which PHWH streams may be assigned (OEPA 2003):

- Class I PHWH Streams – Lowest value; warm water intermittent or ephemeral; may contain ephemeral warm water communities, but are often dry for long periods of time.
- Class II PHWH Streams – Middle value; perennial or intermittent streams with warm water conditions; generally contain animal species adapted to warm water streams, including certain amphibians and pioneering fish species along with invertebrates such as odonate larvae.
- Class III PHWH Streams – High value; cold water perennial streams; often groundwater fed; contain animal species adapted to year-round cool water conditions, including certain amphibians or fish species, along with invertebrates such as mayflies, stoneflies, and caddisflies.

In addition to natural channels, there are many primary headwater streams that have been modified through channelization and/or riparian removal as part of activities related to agricultural activities and urban/suburban development. Such modification is the origin of habitat degradation in smaller streams and a leading source of impairment in larger streams into which they flow (OEPA 2003).

Figure 4.2-2 Perennial Streams and Wetlands in the Action Area

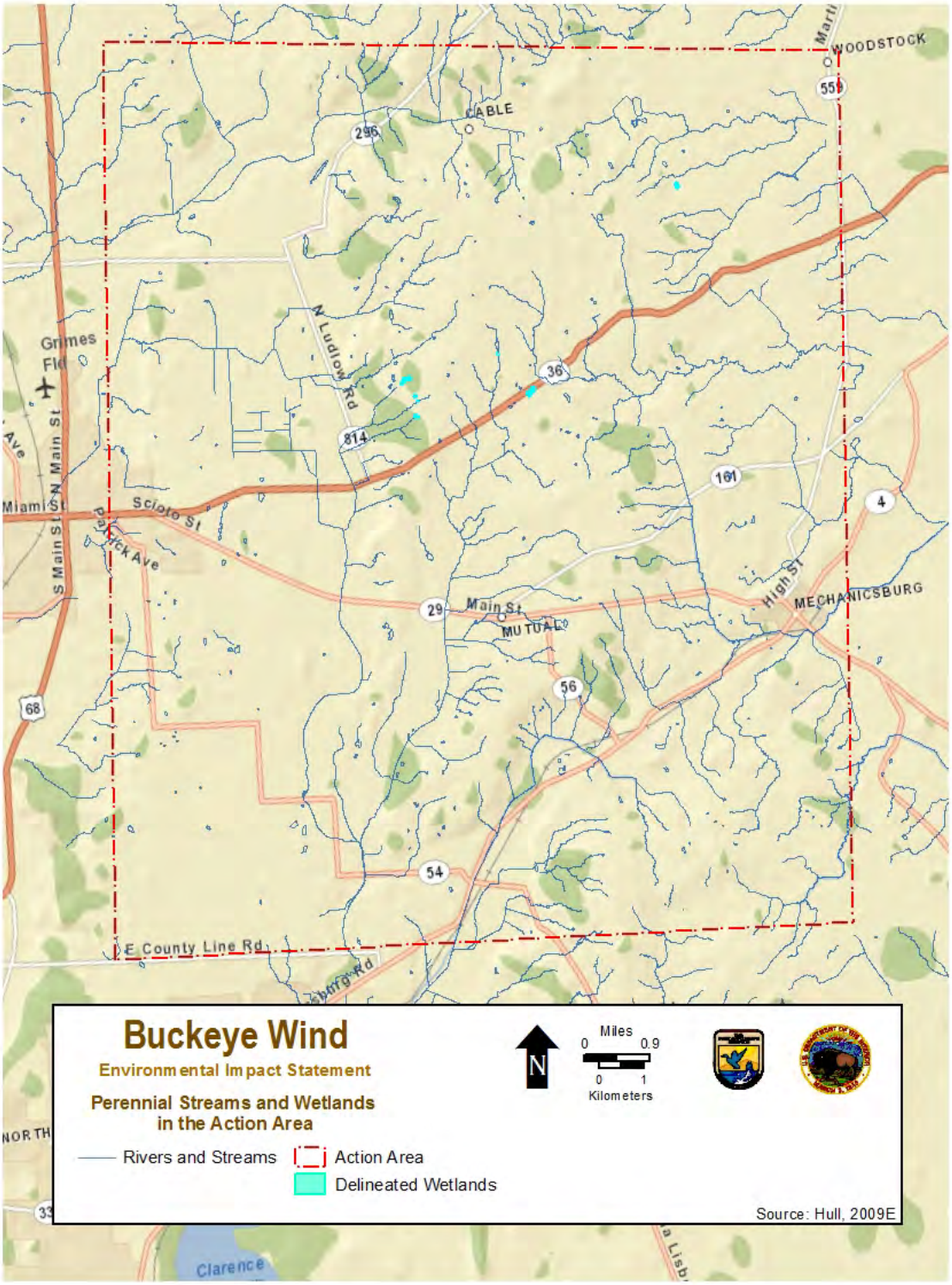
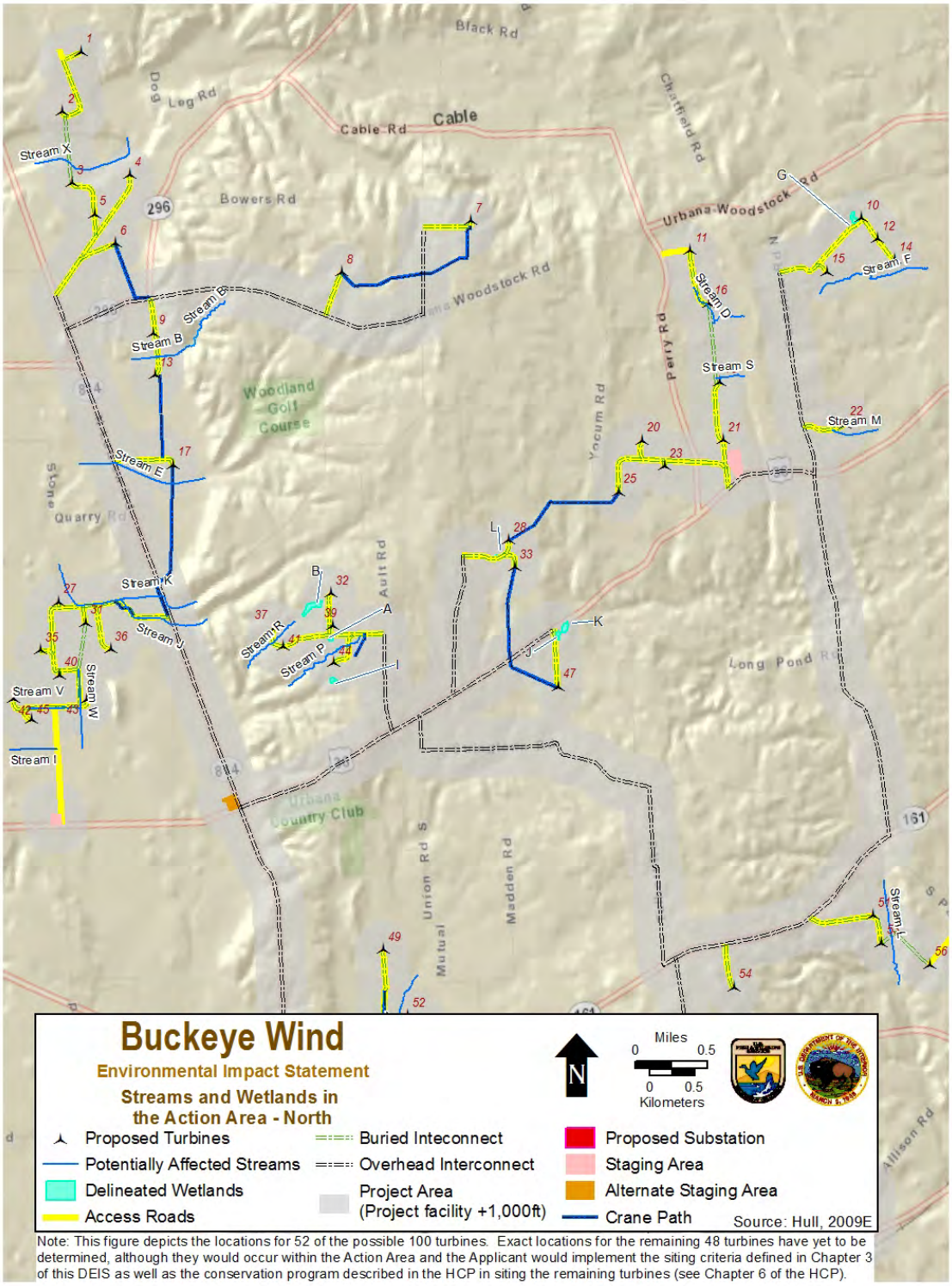
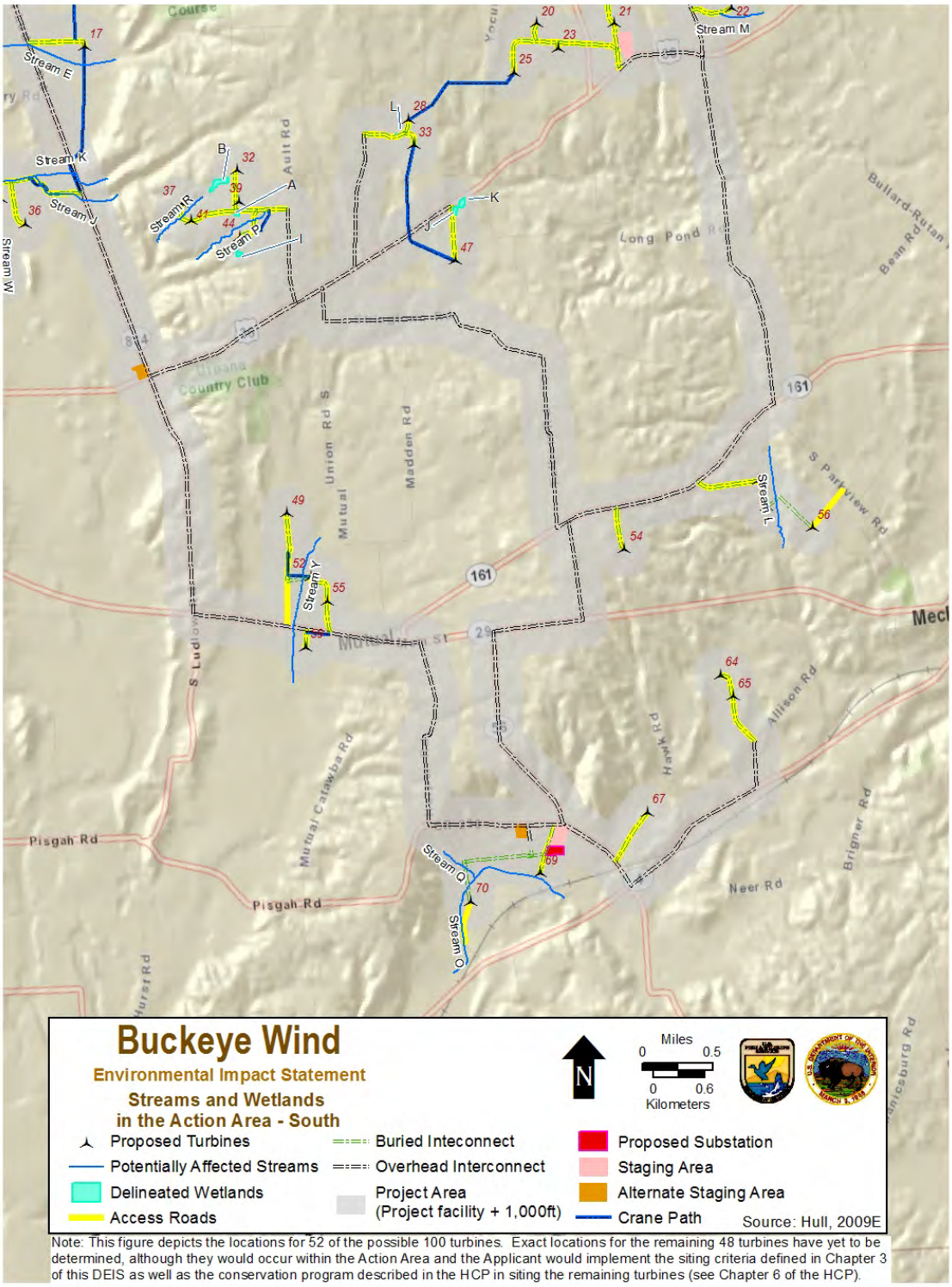


Figure 4.2-3 Streams and Wetlands in the Action Area - North



Note: This figure depicts the locations for 52 of the possible 100 turbines. Exact locations for the remaining 48 turbines have yet to be determined, although they would occur within the Action Area and the Applicant would implement the siting criteria defined in Chapter 3 of this DEIS as well as the conservation program described in the HCP in siting the remaining turbines (see Chapter 6 of the HCP).

Figure 4.2-4 Streams and Wetlands in the Action Area – South



Note: This figure depicts the locations for 52 of the possible 100 turbines. Exact locations for the remaining 48 turbines have yet to be determined, although they would occur within the Action Area and the Applicant would implement the siting criteria defined in Chapter 3 of this DEIS as well as the conservation program described in the HCP in siting the remaining turbines (see Chapter 6 of the HCP).

The QHEI is used for streams with drainage areas typically greater than 2.6 square km (1 square mi). These larger streams have sufficient amounts of water throughout the year to support fish communities. This index was designed to provide a measure of habitat quality that corresponds to physical factors that affect communities of fish and aquatic invertebrates. Physical parameters include substrate, instream cover, channel morphology, channel and bank condition, pool and riffle quality, and gradient (Rankin 1989). Based on scores from the QHEI, each stream with a watershed size greater than 2.6 square km (1 square mi) was assigned one or more of the following aquatic life use designations as defined by the Ohio Water Quality Standards Water Use Designations (OAC 3745-1-07):

- Warmwater Habitat (WWH) – Capable of supporting and maintaining a balanced community of warmwater aquatic organisms. This is the most widely applied use designation assigned to rivers and streams in Ohio.
- Limited Warmwater Habitat (LWWH) – Does not meet specific warmwater habitat criteria (note: this aquatic life use designation is being phased out).
- Exceptional Warmwater Habitat (EWH) – Capable of supporting and maintaining an exceptional or unusual community of warmwater aquatic organisms.
- Modified Warmwater Habitat (MWH) – Incapable of supporting and maintaining a balanced community of warmwater aquatic organisms because of extensive and irretrievable modifications to the physical habitat.
- Seasonal Salmonid Habitat (SSH) – Capable of supporting the passage of salmonids from October to May, and large enough to support recreational fishing.
- Coldwater Habitat (CWH) – Capable of supporting populations of coldwater aquatic organisms on an annual basis.
- Limited Resource Water (LRW) – Incapable of supporting and maintaining a balanced community of aquatic organisms because of natural background conditions or irretrievable human-induced conditions.

Table 4.2-2 Jurisdictional Streams within the Action Area[1]

Stream ID	Stream Name	Flow Regime	Watershed Area (km^2) [mi^2]	Aquatic Life Use Designation[2]
B	Unnamed stream south of Kings Creek	Perennial	1.2 [0.46]	Modified Class II PHWH
B-2	Unnamed stream	Ephemeral	0.83 [0.32]	Modified Class II PHWH
D	Unnamed tributary to Treacle Creek	Ephemeral	0.60 [0.23]	Modified Class I PHWH
D-2	Unnamed stream	Ephemeral	1.4 [0.55]	Modified Class II PHWH
E	Dugan Run North Fork	Intermittent	7.07 [2.73]	Modified Class II PHWH
F	Unnamed tributary to Treacle Creek	Perennial	0.62 [0.24]	Modified Class II PHWH
I	Unnamed tributary to Dugan Run	Perennial	1.1 [0.43]	Modified Class II PHWH
J	Dugan Run South Fork	Intermittent	2.72 [1.05]	Modified Class II PHWH

Stream ID	Stream Name	Flow Regime	Watershed Area (km^2) [mi^2]	Aquatic Life Use Designation[2]
J-2	Unnamed stream	Intermittent	1.7 [0.65]	WWH
K	Unnamed tributary to Dugan Run South Fork	Ephemeral	0.62 [0.24]	Modified Class I PHWH
L	Little Darby Creek	Perennial	5.05 [1.95]	EWH and CWH
M	Unnamed tributary to Treacle Creek	Ephemeral	0.18 [0.07]	Modified Class I PHWH
O	East Fork Buck Creek	Perennial	10.6 [4.11]	CWH
O-2	East Fork Buck Creek	Perennial	10.3 [3.98]	CWH
P	Unnamed tributary to West Fork Buck Creek	Ephemeral	0.18 [0.07]	Modified Class I PHWH
Q	Unnamed tributary to East Fork Buck Creek	Intermittent	0.18 [0.07]	Modified Class II PHWH
R	Unnamed tributary to West Fork Buck Creek	Intermittent	0.31 [0.12]	Class II PHWH
S	Unnamed tributary to Treacle Creek	Ephemeral	0.21 [0.08]	Modified Class I PHWH
T	Unnamed tributary to Treacle Creek	Intermittent	0.21 [0.08]	Modified Class II PHWH
V	Unnamed tributary to Dugan Run	Perennial	0.31 [0.12]	Modified Class II PHWH
W	Unnamed tributary to Dugan Run	Perennial	0.39 [0.15]	Modified Class II PHWH
X	Kings Creek	Perennial	20.1 [7.75]	CWH
Y	Buck Creek	Intermittent	14.4 [5.56]	CWH
Y-2	Buck Creek	Intermittent	9.09 [3.51]	CWH
Y-3	Buck Creek	Intermittent	4.83 [1.87]	CWH
AA	Buck Creek	Intermittent	0.67 [0.26]	CWH
BB	Treacle Creek	Intermittent	2.87 [1.11]	EWH
CC	Unnamed stream	Ephemeral	1.6 [0.63]	Modified Class I PHWH
DD	Unnamed stream	Ephemeral	0.176 [0.068]	Modified Class I PHWH
EE	Unnamed stream	Ephemeral	0.80 [0.31]	Modified Class II PHWH
FF	Dugan Ditch	Intermittent	2.72 [1.05]	CWH
GG	Unnamed stream	Ephemeral	0.49 [0.19]	Modified Class II PHWH
HH	Unnamed stream	Ephemeral	0.65 [0.25]	Modified Class I PHWH
II	Unnamed stream	Ephemeral	0.10 [0.04]	Modified Class I PHWH
JJ	Unnamed stream	Intermittent	2.80 [1.08]	Modified WWH
KK	Unnamed stream	Ephemeral	0.5 [0.2]	Class III PHWH
LL	Unnamed stream	Ephemeral	0.13 [0.05]	Class II PHWH
MM	Unnamed stream	Ephemeral	0.34 [0.13]	Modified Class I PHWH
NN	Unnamed stream	Ephemeral	1.3 [0.51]	Modified Class II PHWH
OO	Unnamed stream	Ephemeral	1.8 [0.69]	Modified Class II PHWH
WW	Unnamed stream	Ephemeral	1.1 [0.42]	Modified Class II PHWH

Stream ID	Stream Name	Flow Regime	Watershed Area (km^2) [mi^2]	Aquatic Life Use Designation[2]
XX	Unnamed stream	Ephemeral	0.03 [0.01]	Modified Class II PHWH
AAA	Unnamed stream	Ephemeral	0.13 [0.05]	Modified Class II PHWH

[1] As described in Hull 2009d and 2011
[2] PHWH = Primary headwater habitat; EWH = Exceptional warmwater habitat; CWH = Coldwater habitat

4.2.2.5 Wetlands

An update to the National Wetlands Inventory (NWI) database, conducted by Ducks Unlimited using current (i.e., 2005 to 2007) aerial photographs, identifies 668 ha (1,651 ac) of wetlands in the Action Area (Ducks Unlimited 2009; Table 4.2-3). Most of the NWI wetlands are emergent or open water types characterized by low-lying herbaceous vegetation and open water, while approximately 24% of the NWI wetland area consists of forested or forested/emergent wetlands.

Table 4.2-3 Description and Size of Wetlands in the Action Area as Identified by the Ducks Unlimited 2009 Update to the National Wetlands Inventory (NWI) Database[1]

NWI System/Class Code	Wetland Classification	Hectares (Acres)
PAB	Palustrine Aquatic Bed	4.45 (11)
PUB	Palustrine Unconsolidated Bottom	155.0 (383)
L1UB	Lacustrine/Limnetic Unconsolidated Bottom	9.31 (23)
PEM	Palustrine Emergent	290.6 (718)
PFO	Palustrine Forested	152.6 (377)
PFO/PEM	Palustrine Forested/Emergent	4.86 (12)
PSS	Palustrine Scrub-Shrub	42.9 (106)
PSS/PEM	Palustrine Scrub-Shrub/Emergent	8.50 (21)
Total		668 (1,651)

The surface water delineation conducted for the 52 turbines and associated infrastructure (Hull 2009d) provided more detailed data on wetlands near the portions of the Project that have been sited to date. Another delineation will be performed to identify surface waters, including wetlands, in the vicinity of the additional 48 turbines and associated infrastructure once siting for these structures is complete. All practical measures to avoid and minimize all surface waters will be taken such that the total impacts will not exceed those described and evaluated in Section 5.2. The Hull 2009d study included wetland surveys within 100 ft of Project components, including the 52 known turbine locations, access roads, buried and above-ground electrical interconnect lines, and the substation (Hull 2009d). Wetlands and other surface waters were identified in accordance with the USACE *Wetlands Delineation Manual* (Environmental Laboratory 1987), subsequent regulatory guidance issued by the USACE, and the OEPA guidance on evaluation of streams and wetlands. Wetland functions and values were evaluated using the Ohio Rapid Assessment Method for Wetlands (OEPA 2001). This method involves a scoring system that assigns each wetland to the appropriate category of the Ohio Antidegradation Policy for

Wetlands (OAC 3745-1-54). There are three possible Ohio Wetland Antidegradation categories that may be assigned (OAC Rule 3745-1-54(C)):

- Category 1 Wetlands – Low value; low species diversity, no significant habitat or wildlife use, limited potential to achieve beneficial wetland functions, and/or a predominance of non-native species.
- Category 2 Wetlands – Middle value; wetlands in this category are of moderate diversity but do not contain rare, threatened or endangered species. They are generally degraded, but are capable of attaining higher value. Most wetlands in Ohio are expected to fall into this category.
    - Modified (also referred to as Degraded but Restorable) Category 2 Wetlands – Low to middle value: "...wetlands which are degraded but have a reasonable potential for reestablishing lost wetland functions."
- Category 3 Wetlands – High value; typified by high levels of diversity, a high proportion of native species, and/or high functional values. Category 3 wetlands include wetlands which contain or provide habitat for threatened or endangered species, are high quality mature forested wetlands, vernal pools, bogs, fens, or are scarce regionally and/or statewide.

The surface water delineation (Hull 2009d and Hull 2011) documented 23 wetlands totaling roughly 12.18 ha (30.1 ac) in the 52-turbine area (Figures 4.2-3 and 4.2-4). These 23 wetlands included 14 Category 1 wetlands, seven Modified Category 2 wetlands, and two Category 2 wetlands. No Category 3 wetlands were identified in the 52-turbine area. All wetlands were either emergent, emergent/scrub-shrub, emergent/forested, forested/scrub-shrub, scrub-shrub/ponded, or ponded; none of the delineated wetlands were classed as only forested, but several were classified as forested with another vegetation class (e.g., emergent/forested). Of the 23 wetlands, 16 were found to be non-isolated and under the Clean Water Act jurisdiction of federal and state government. Seven wetlands were found to be isolated and under the sole jurisdiction of the Ohio Isolated Wetland Permitting Program. The delineation report was used to categorize the wetlands as either isolated or jurisdictional, but status must ultimately be verified by USACE. Table 4.2-4 describes the delineated wetlands. Another delineation will be performed to identify wetlands in the vicinity of the additional 48 turbines once siting for these turbines is complete.

Table 4.2-4 Delineated Wetlands in the 52-Turbine Area*

Wetland ID	Nearest Turbine	Wetland Type[1]	Area (ha) [ac]	Ohio Category	Isolation Status	Wetland Type based on Field Observation
A	39	PEM/PSS	0.16 (0.39)	Modified 2	Isolated	Emergent with small shrub component
B	32	PEM/PSS	1.17 (2.90)	Modified 2	Non-isolated	Emergent/ Scrub-shrub
G	10	PEM/PSS	0.465 (1.15)	1	Non-isolated	Emergent/ Scrub-shrub
H	44	PEM	0.008 (0.02)	Modified 2	Non-isolated	Emergent
I	44	POW	0.27 (0.66)	Modified 2	Non-isolated	Ponded
J	47	PEM	0.30 (0.74)	1	Isolated	Emergent
K	47	PEM	0.583 (1.44)	1	Non-isolated	Emergent
L	28	PEM	< 0.004 (0.01)	Modified 2[2]	Non-isolated	Emergent
M	28	PEM	0.08 (0.19)	1	Isolated	Emergent
N	28	PEM	0.008 (0.02)	1	Non-isolated	Emergent
O	21	PEM	0.016 (0.04)	1	Isolated	Emergent
P	8	PEM/PFO	0.06 (0.15)	Modified 2	Non-isolated	Emergent/Forest ed
Q	120	PEM	0.016 (0.04)	1	Non-isolated	Emergent
R	9	PEM	0.28 (0.68)	1	Non-isolated	Emergent
S	16	PEM/PSS	0.12 (0.30)	1	Non-isolated	Emergent/Shrub scrub
T	90	PEM	0.08 (0.20)	1	Isolated	Emergent
U	54	PEM	0.028 (0.07)	1	Isolated	Emergent
V	67	PEM	0.08 (0.20)	Modified 2	Isolated	Emergent
X	120	PEM	0.036 (0.09)	1	Non-isolated	Emergent
JJ	18	PEM	0.08 (0.19)	1	Non-isolated	Emergent
KK	15	PFO/PSS	0.12 (0.30)	2	Non-isolated	Forested/Shrub scrub
NN	54	PSS/PUB	0.12 (0.30)	1	Non-isolated	Shrub scrub/Ponded
OO[3]	43	PEM/PSS	~8.09 (20.0)	2	Non-isolated	Emergent/Shurb scrub

Source: Modified from Hull 2009d and Hull 2011
*Wetland delineations have been completed at the Project Area scale (specifically within 30.5 m (100 ft) of the 52 known turbine sites and related Project infrastructure) rather than the Action Area scale. Once the additional 48 turbines have been sited, Buckeye Wind will follow the same approach for delineating wetlands in these areas.
[1] Based on Cowardin et al. 1979 classification
[2] Category not definitive as per Hull 2009d
[3] Wetland delineated using NWI and aerial imagery instead of using field wetland delineation methods as described in Section 4.2.2.5 (H. Crowell, Hull & Associates, Inc., personal communication)
PUBFh = palustrine, unconsolidated bottom, semi-permanently flooded, diked/impounded
PEMCd = palustrine, emergent, seasonally flooded, partially drained/ditched
PEMC = palustrine, emergent, seasonally flooded
PUBGh = palustrine, unconsolidated bottom, intermittently exposed, diked/impounded
PEMA = palustrine, emergent, temporarily flooded

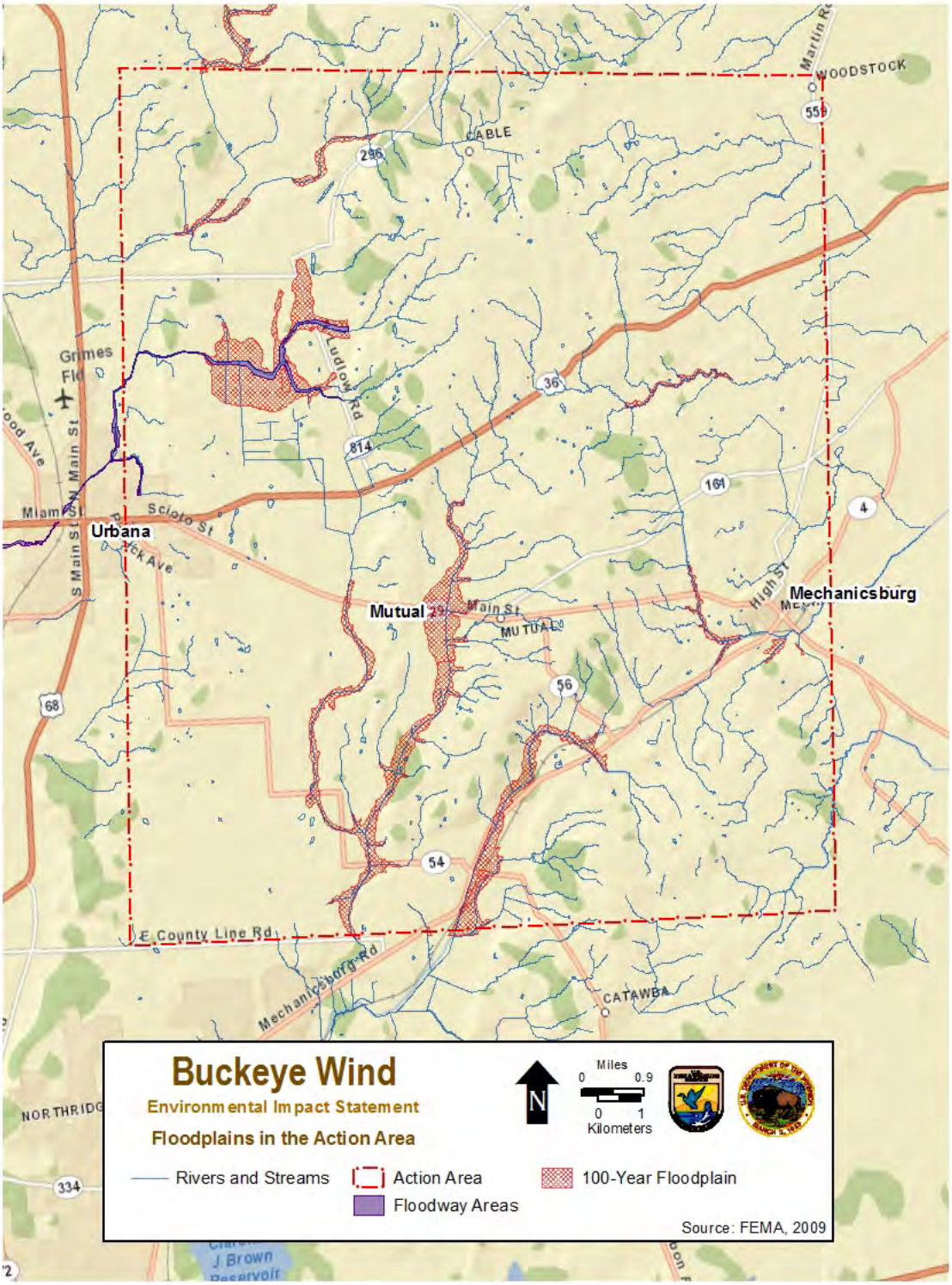
4.2.2.6 Floodplains

A floodplain is flat land adjacent to a stream or river that experiences occasional or periodic flooding. There are several FEMA-mapped floodplains in the Action Area (Figure 4.2-5). For regulatory purposes, the floodplain is divided into two areas: the floodway[2] and flood fringe. The floodway includes the channel and the portion of the adjacent floodplain required to pass the 100-year flood without increasing flood heights. Typically, this is the most hazardous portion of the floodplain where the fastest flow of water occurs. The flood fringe is the portion of the floodplain outside of the floodway, which is covered by floodwater during the 100-year discharge and is commonly referred to as the 100-year floodplain. Most floodplain regulations prohibit development within the floodway that could block the free flow of flood water. Most floodplain regulations allow development to occur in the flood fringe and 100-year floodplain, but require protection from floodwaters through flood proofing so that water cannot enter structures.

Based on the digital Flood Insurance Rate Map Database for Champaign County (FEMA 2007), the Action Area contains some floodways and flood fringe immediately adjacent to streams, particularly along Buck Creek, Dugan Run, and King's Creek (Figure 4.2-5).

[2] A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Development is regulated in these floodways to ensure that there are no increases in upstream flood elevations.

Figure 4.2-5 Floodplains in the Action Area



4.3 Vegetation

4.3.1 Scope of Analysis

The vegetation analysis in this DEIS provides a spatial overview of vegetative cover at the Action Area scale and describes, in more detail, the characteristics of the major vegetative communities within the Project Area. This section does not discuss rare, threatened, or endangered plant species: these species are discussed in Section 4.5 of this DEIS. The vegetation analysis in this DEIS is based on information from publicly available databases and documents produced by USGS, ODNR, Ducks Unlimited, and OEPA. The surface water delineation conducted for the Project provided site-specific vegetation information (Hull 2009d).

4.3.2 Existing Conditions

The Action Area is located in the south-central portion of Ohio, in the Bellefontaine Uplands physiographic region, a sub-region of the Central Ohio Till Plains. This region is characterized by low to moderate relief hills formed by glacial processes. Prior to European settlement, Champaign County was a mix of woodlands, plains, and tall-grass prairies. Due to the rich soils, much of the county was converted to agriculture by the mid-19th century. Currently, the Action Area is characterized by flat and rolling terrain that is comprised largely of active agricultural lands (producing mostly corn and soybean crops) and pastures (agricultural lands and pastures collectively comprise approximately 82 percent of the Action Area), interspersed with relatively small, scattered stands of deciduous forest that have an average size of approximately 3.6 ha (9 ac) (approximately nine percent of the Action Area) (Figure 4.3-1 and Table 4.3-1). Remaining native vegetation cover types (e.g., grassland/ herbaceous, evergreen and mixed forest, and emergent wetland) each make up one percent or less of the Action Area (Hull 2009d).

Most of the land within the Action Area that is not cultivated cropland occurs in a patchwork of hayfields, pastures, and forest that forms a wide band across the eastern half of the Action Area. This band of non-cropland is centered between the north-central boundary of the Action Area and Mechanicsburg and south from Mechanicsburg on both sides of County Route 451 (Figure 4.3-1).

Figure 4.3-1 Vegetation Cover in the Action Area

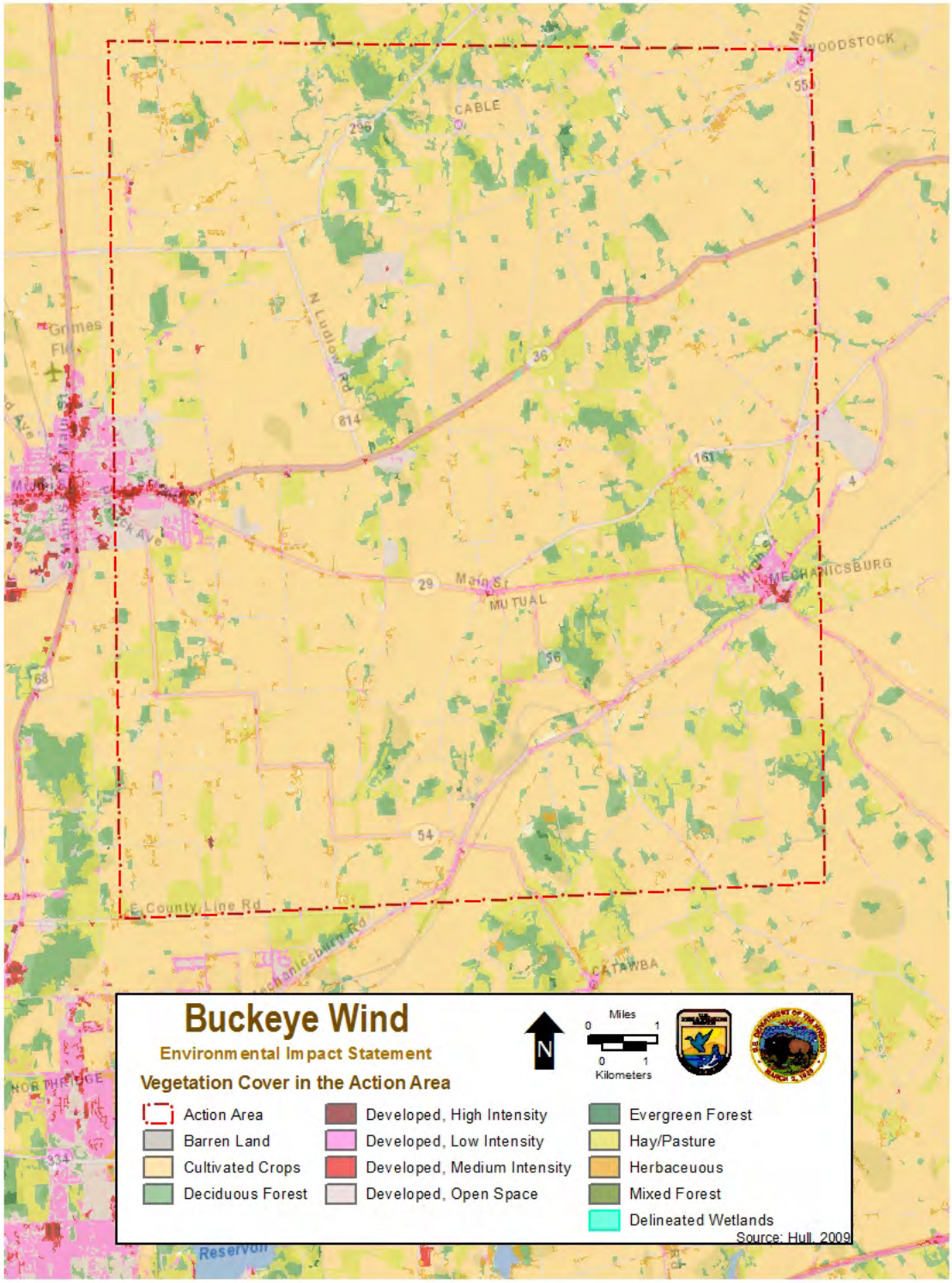


Table 4.3-1 National Land Cover Database Vegetation Cover Types in the Action Area

	Action Area	
Land Cover Type	**Hectares (Acres)**	**Percent of Action Area**
Cultivated crop	22,408.2 (55,371.9)	69.2
Hay/pasture	4,163.1 (10,287.2)	12.9
Deciduous forest	2,743.5 (6,779.4)	8.5
Developed, open space[1]	1,962.5 (4,849.4)	6.1
Grassland/Herbaceous	444.9 (1,099.3)	1.4
Developed, low intensity[2]	421.7 (1,042)	1.3
Open water	84.13 (207.9)	0.3
Developed, medium intensity[3]	54.6 (135)	0.2
Emergent herbaceous wetland	40.3[5] (99.6[5])	0.1
Evergreen forest	30.6 (75.7)	0.1
Developed, high intensity[4]	26.2 (64.7)	0.1
Barren land	13.2 (32.7)	<0.1
Mixed forest	2.35 (5.8)	<0.1
Unclassified		
TOTAL	32,395.33 (80,050.6)	100

Source: USGS 2001

[1] Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses; most commonly includes large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings. Impervious surfaces account for less than 20 percent of total cover.

[2] Includes areas with a mixture of constructed materials and vegetation; most commonly includes single-family housing units. Impervious surfaces account for 20-49 percent of the total cover.

[3] Includes areas with a mixture of constructed materials and vegetation; most commonly includes single-family housing units. Impervious surfaces account for 50-79 percent of the total cover.

[4] Includes highly developed areas where people reside or work in high numbers, such as apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to100 percent of the total cover.

[5] Acreage of emergent wetlands presented in this table differs from Table 4.2-3 above due to the different mapping methodologies (NWI vs. National Land Cover data) and resulting different categorizations of vegetation cover and wetland types.

The following paragraphs describe the primary natural (non-agricultural or developed) vegetation communities that occur within the Action Area. Agricultural lands, specifically those enrolled by landowners in the Conservation Reserve Program (CRP), are discussed in Section 4.7.

4.3.2.1 Deciduous Forest

The deciduous forest habitat makes up approximately nine percent of the Action Area and includes a range of successional stages from early-successional scrub-shrub/forest to mature stands. Average forest age in the Action Area is approximately 30 to 50 years. The approximately 766 individual forest stands that fall entirely within the Action Area vary in patch size (0.08 ha to 106.4 ha [0.2 ac to 263 ac]), and are primarily bordered by agricultural fields. Eighty-two percent of the forest patches are less than 4.05 ha (10 ac) in size, and only 2% are larger than 40.5 ha (100 ac). Canopy species of these deciduous forests typically include honey locust, white oak, shagbark hickory, green ash, ironwood, American elm, black cherry, cottonwood, tupelo, white ash, osage orange, burr oak, sugar maple, red oak, and post oak, while the shrub layer is dominated by honeysuckle shrubs (Hull 2009d).

4.3.2.2 Hay/Pasture and Grassland/Herbaceous

Hayfields and pasturelands account for roughly 13 percent of the Action Area. These areas contain a variety of grass and forb species such as alfalfa, clover, orchardgrass, Kentucky bluegrass, ryegrass, tall fescue, timothy, switchgrass, and Eastern gamagrass. Grassland/herbaceous vegetation communities occur throughout the Action Area largely on land abandoned from agriculture and make up between one and two percent of the Action Area. This community type is dominated by upland herbaceous and grass species including goldenrods, Queen Anne's lace, teasel, asters, ragweeds, thistles, and upland grasses (Hull 2009d).

4.3.2.3 Wetlands

Wetlands in the Action Area primarily contain hydrophytic (growing wholly or partially in water), herbaceous and scrub-shrub vegetation, and emergent vegetation. Dominant herbaceous species include calico aster, beggar's ticks, red top, fox sedge, yellow nut sedge, reed canary grass, and broad-leaved cattails. The dominant scrub-shrub species include black willow, sand bar willow, and gray dogwood. One open water/ponded wetland dominated by duck weed also occurs within the Project Area. No wetlands will be impacted during implementation of the HCP. Section 4.2 of this DEIS contains more detailed information on wetlands (Hull 2009d).

4.3.2.4 Evergreen Forest

The Action Area contains several stands of nearly monotypic (dominated by a single species), coniferous forest dominated by pine, particularly red pine and eastern white pine (Hull 2009d).

4.4 Wildlife and Fisheries

4.4.1 Scope of Analysis

This DEIS describes the existing wildlife and fisheries resources within the Action Area. This section does not discuss rare, threatened, or endangered wildlife species: these species are discussed in Section 4.5 of this DEIS. The wildlife and fisheries analysis in this DEIS is based on data from the ODNR Division of Natural Areas and Preserves (DNAP) Natural Heritage Database (2010); the Ohio Breeding Bird Atlas II (2009); the Ohio Aquatic Gap Analysis Program (Covert et al. 2007); site-specific biological surveys; and standard biological literature for the region (Natureserve 2007). In order to establish baseline information regarding wildlife use of the Action Area and to evaluate the potential impacts from construction and operation of the Project, a number of wildlife studies were conducted (Stantec 2008a; Stantec 2008b; Stantec 2008c; Stantec 2009) according to survey plans that were developed in coordination with ODNR and USFWS, which are summarized in the following sections. A summary of the results of pre-construction bird and bat studies can be found in the ABPP (Appendix C) and detailed descriptions of survey methods, results, and discussion can be found in the respective seasonal reports (Appendix G). Figure 4.4-1 depicts the area that was surveyed during the pre-construction bird and bat studies, which encompassed the current Action Area and an area to the north ("initial study area").

4.4.2 Existing Conditions

4.4.2.1 Terrestrial Wildlife

Vertebrate animals likely to use the Action Area are represented by those often detected in highly fragmented landscapes dominated by agriculture. Many of the animal species expected to occur are common and widely distributed throughout Ohio. Appendix E lists the common terrestrial and aquatic animals likely to use available habitat types in the Action Area and its vicinity. Most of the known biological effects of wind turbine facilities relate to flying animals; therefore, the terrestrial part of this section focuses on birds and bats but also includes a summary of other wildlife use of the Action Area.

Birds

North America contains four primary bird migration flyways: the Atlantic, Mississippi, Central, and Pacific (USGS 2006). Each of these flyways represents a generalized area rather than an exact course and the flyways often merge or overlap. Within and around these flyways, migrating birds have highly variable flight paths within a broad area. Typically, an individual bird's migratory pathway falls within an area that is roughly equal to the full width of their breeding range (USGS 2006). The Action Area lies within the Atlantic and Mississippi flyways, which include the majority of eastern and mid-western states (36 states and the District of Columbia), as well as the Great Lakes (Figure 4.4-2). The Atlantic and Mississippi flyways cover the migratory ranges of many bird species.

In addition to migratory bird use, the Action Area is also used by breeding birds that favor agricultural habitats and small woodlands. Accordingly, several studies of migratory and breeding bird use of the Action Area and surrounding region have been conducted, the results of which are described below. Full reports for these studies are included in Appendix G of this DEIS.

Figure 4.4-1 Buckeye Wind Pre-construction Survey Locations

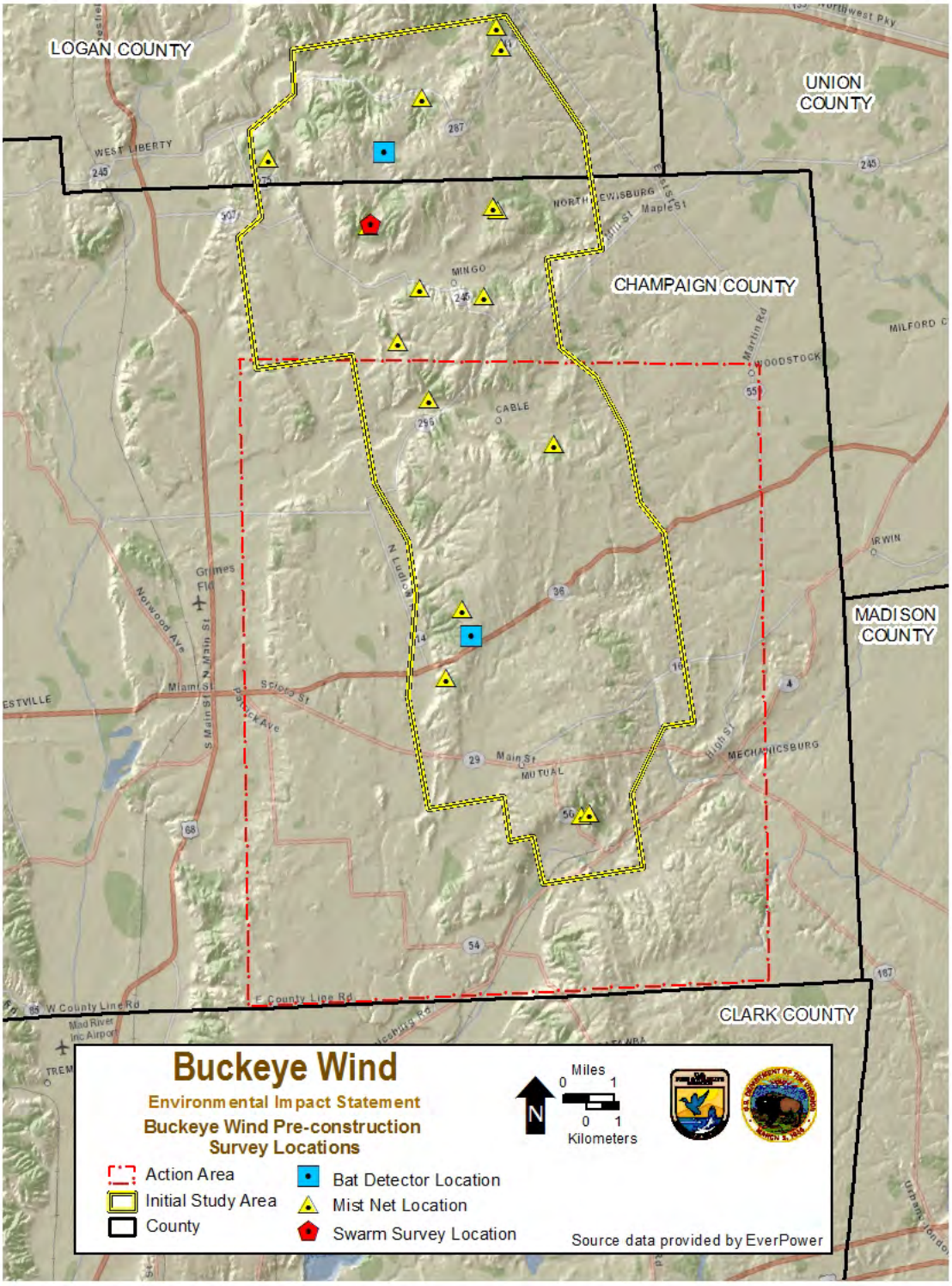
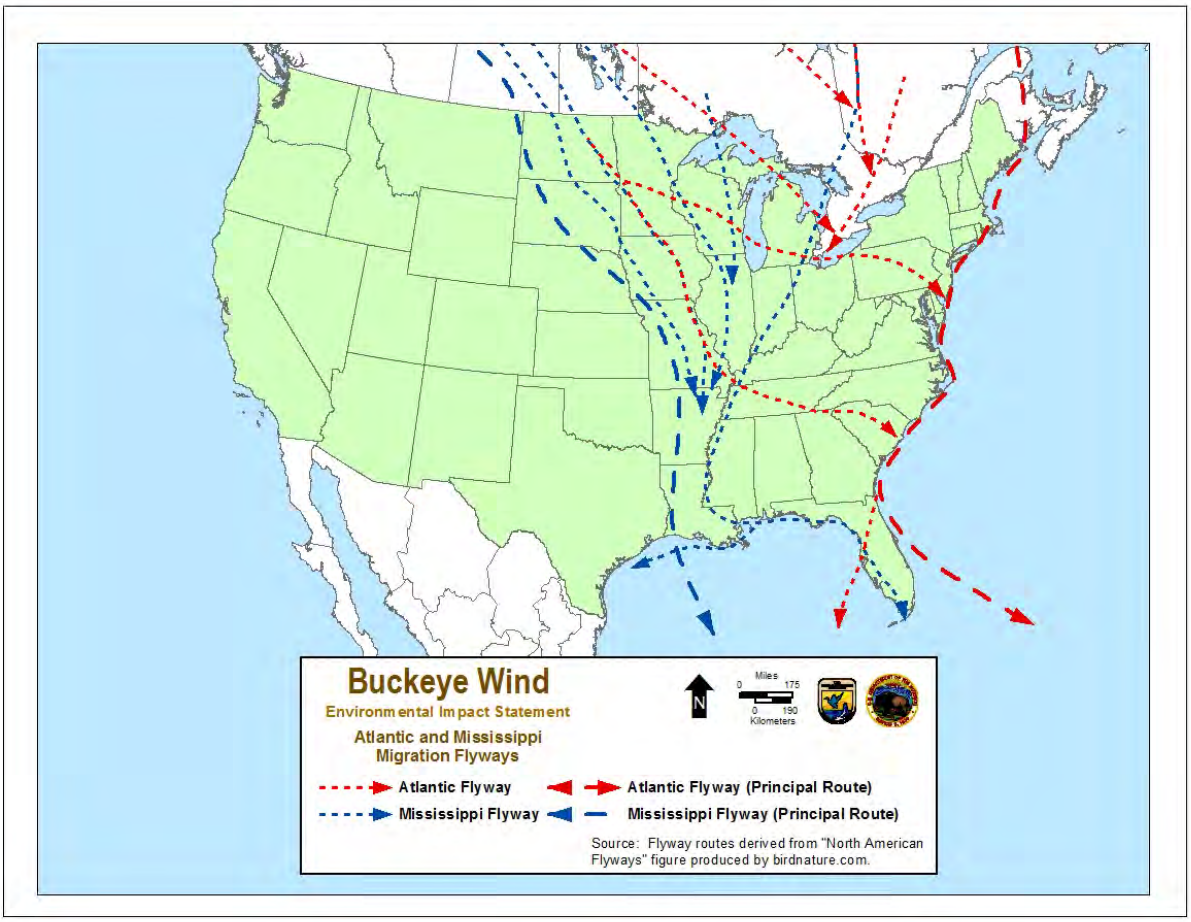


Figure 4.4-2 Atlantic and Mississippi Migration Flyways



Migratory Bird Use of the Action Area

Passerines

A fall 2007 radar survey was conducted from September 1 to October 15, 2007 and included 30 nights of sampling to detect night migrating birds (Stantec 2008a). The radar was positioned approximately 6.4 km (4 mi) north of the Action Area near the Champaign-Logan County line. Although outside the Action Area, this sampling location has similar habitat conditions and landscape features to the Action Area so data collected there were considered to be representative of the Action Area. Moreover, birds migrate across a broad front, covering hundreds of miles each night, so the location of the survey point generally reflects the use patterns of the surrounding area. Surveys were conducted from sunset to sunrise using X-band radar, on nights when weather conditions permitted radar operation, to adequately document bird movements.

The overall passage rate for the entire survey period, measured as mean ± standard error, was 74 ± 15 targets/km/hr (t/km/hr) (119 ± 24 targets/mi/hr). Nocturnal passage rates were highly variable among nights, ranging from 0 to 404 t/km/hr (0 to 650 t/mi/hr). The mean flight direction through the survey area was 194° ± 144° (i.e., slightly southwest). The mean flight altitude of all targets observed on the radar was 393 m ± 12 m (1290 ft ± 39 ft) above ground level (agl) (Table 4.4-1). The average nightly flight altitude ranged from 252 m ± 43 m (828 ft ± 140 ft) agl to 506 m ± 27 m (1661 ft ± 88 ft) agl. The percentage of targets observed flying below 150 m (492 ft) agl (maximum turbine height) varied by night from 2 to 38 percent; however, on only four out of the 30 nights did it exceed 10 percent (Table 4.4-1). The survey period average for targets flying below 150 m (492 ft) was five percent (Table 4.4-1).

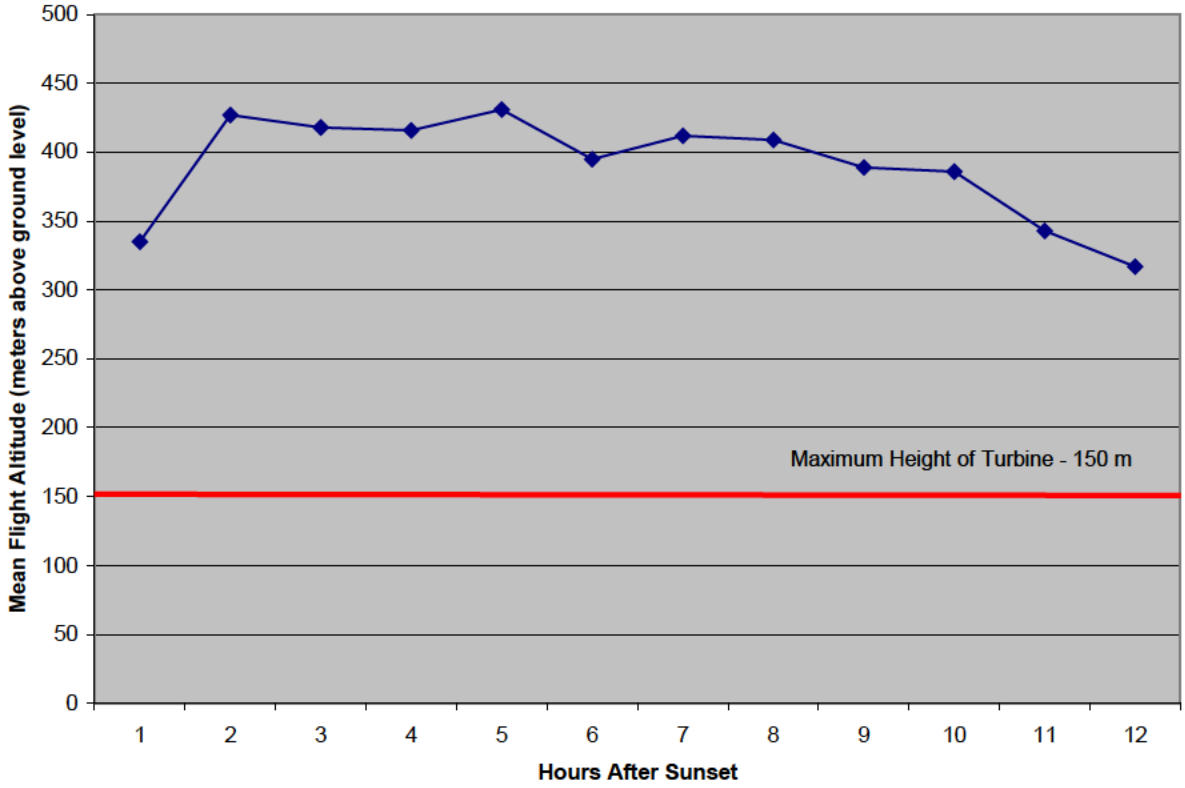
The results of the radar analysis indicate that passage rates were low when compared to other sites in the U.S. with publicly available data (Appendices F and G). Additionally, the mean flight altitude of night migrating passerines was well above the maximum height of the wind turbines (Table 4.4-1). Figure 4.4-3 shows that the hourly average was typically 200 m (656 ft) or more above the maximum height of the turbines.

Table 4.4-1 Summary of Mean Flight Altitudes of Night Migrating Passerines Recorded During 2007 Surveys Conducted Immediately North of the Action Area

Sample Night	Mean Altitude (m) [ft]	Standard Error (m) [ft]	Percent of targets below 150 m [492 ft]
9/5/2007	506 [1,660]	27 [88.6]	4%
9/6/2007	455 [1,493]	10 [32.8]	2%
9/9/2007	485 [1,591]	13 [42.7]	2%
9/10/2007	466 [1,529]	32 [105.0]	8%
9/11/2007	490 [1,608]	22 [72.2]	4%
9/12/2007	395 [1,296]	36 [118.1]	10%
9/13/2007	445 [1,460]	17 [55.8]	3%
9/14/2007	444 [1,457]	15 [49.2]	2%
9/15/2007	387 [1,270]	16 [52.5]	5%
9/16/2007	284 [932]	48 [157.5]	33%
9/17/2007	268 [879]	32 [105.0]	38%
9/18/2007	421 [1,381]	16 [52.5]	2%
9/21/2007	415 [1,362]	16 [52.5]	7%
9/22/2007	376 [1,234]	20 [65.6]	6%
9/23/2007	382 [1,253]	32 [105.0]	14%
9/24/2007	409 [1,342]	22 [72.2]	5%
9/25/2007	396 [1,299]	12 [39.4]	5%
9/27/2007	399 [1,309]	23 [75.5]	2%
10/1/2007	346 [1,135]	12 [39.4]	5%
10/2/2007	382 [1,253]	8 [26.2]	4%
10/3/2007	424 [1,391]	23 [75.5]	3%
10/4/2007	408 [1,339]	16 [52.5]	7%
10/5/2007	389 [1,276]	9 [29.5]	7%
10/6/2007	396 [1,299]	14 [45.9]	3%
10/7/2007	441 [1,447]	18 [59.1]	3%
10/9/2007	378 [1,240]	19 [62.3]	5%
10/10/2007	252 [827]	43 [141.1]	19%
10/11/2007	372 [1,220]	6 [20]	4%
10/12/2007	292 [958]	7 [23]	6%
10/13/2007	296 [971]	21 [68.9]	8%
Entire Sampling Period	**393 [1,289]**	**10 [32.8]**	**5%**

Source: Based on data provided in Stantec 2008a.

Figure 4.4-3 Mean Flight Altitude (Hourly Average) of Night Migrating Passerines Recorded During 2007 Surveys Conducted Immediately North of the Action Area



Raptors

Raptors are typically diurnal (i.e., daytime) migrants that use weather systems and topographic features to assist in migration. Daytime raptor surveys were conducted in fall 2007 and spring and fall 2008 (refer to Table 4.4-2 for survey dates) to document raptor species migrating through the Action Area, as well as behavioral characteristics such as flight altitude and direction (Table 4.4-2; Stantec 2009). In fall 2007 and 2008, a combined total of 35 days (233 hours) of survey were conducted. In spring 2008, 32 days (216 hours) of surveys were conducted. Continuous observation surveys were conducted on non-consecutive days on an open hillside in the central portion of the Action Area near the town of Mingo. A nearby communication tower provided a reference for raptor flight altitudes. Raptors also were counted during a sandhill crane survey conducted from November 16 through December 15, 2008 (Table 4.4-2; Stantec 2009).

Table 4.4-2 Summary of Raptor Observations from Four Surveys Conducted in the Action Area

	No. of observation days	No. of raptors observed	No. of Species	Observation rate (total survey hours)	Raptors observed at < 150 m (492 ft) AGL (%)
Fall 2007 Aug 30 – Oct 29	11	421	8	6.4 birds/hr (66)	84
Spring 2008 Mar 1 – May 15	32	1,476	12	6.8 birds/hr (216)	95
Fall 2008 Sept 1- Nov 15	24	481	7	3.5 birds/hr (167)	93
Fall 2008 Nov 16 – Dec 15 Sandhill Crane Survey	12	27	6	0.3 birds/hr (84)	96

Source: Stantec 2009

The majority of raptors observed during the survey periods were turkey vultures (fall 2007 n=380, 90% of total observed; spring 2008 n=1,347, 91%; fall 2008 n=527, 91%). Red-tailed hawks were the second most commonly observed species (fall 2007 n=14, 3%; spring 2008 n=98, 7%; fall 2008 n=32, 6%). Appendix G contains the full results of the raptor survey.

The overall number of raptors observed during the raptor surveys conducted in the Action Area was relatively low compared to numbers observed at several regional Hawk Migration Association of North America (HMANA) sites. Observation rates at regional HMANA sites ranged from 5.2 to 3,082.8 birds/hour during fall 2008 (Stantec 2009). The most active site was at Detroit River Hawk Watch (DRHW), Pointe Mouillee, Michigan, which is also the closest hawk watch site to the Action Area (approximately 217 km [135 mi] north from the center of the Action Area). At DRHW, a total of 323,691 raptors were counted during 105 survey hours (3,082.8 birds/hour) during fall 2008 (Hawk Watch 2008). This was likely due to the close proximity of the site to Lake Erie, which is historically known to concentrate large numbers of raptors.

When compared to 14 other publicly available spring pre-construction raptor surveys conducted from 1999 to 2006 for wind projects in the Northeast (Stantec 2009, Appendix B, Table 5), the passage rate observed for the Project in spring 2008 (6.8 birds/hr) was similar to that of many projects in agricultural settings. The average passage rate for these sites was 5.2 birds/hr (rate range 0.9-25.6 birds/hr) in spring. When compared to passage rates for 17 other fall pre-construction surveys conducted from 1996 to 2007 for wind projects (Stantec 2009, Appendix B, Table 6), the passage rate for the Action Area in fall 2008 (3.5 birds/hr) is among the lowest. Passage rates for other fall surveys averaged 4.4 birds/hr (range of 3.0-12.7 birds/hr). Appendix G contains full survey results.

Geographical location and topography can affect the magnitude of raptor migration at a particular site. Two geographical features primarily used by raptors during migration are ridgelines and the shorelines of large bodies of water. Updrafts formed as the wind hits the ridges and thermals created over land (and not water) make for energy-efficient travel over long distances (Liguori 2005). For this reason raptors tend to follow corridors or pathways, such as prominent ridges with defined edges or shorelines, during migration. The lower passage rate at

the Action Area is likely due to a lack of prominent landscape features that concentrate raptor migration.

Waterbirds

The limited amount of wetlands, streams, and other open water habitats in the Action Area limits use of the area by waterbird species, and few waterbird species were observed during breeding bird surveys conducted in spring and summer 2008 (May 3 –July 29, 2008) (Stantec 2009; Hull 2009d). Canada geese, mallard, wood duck, and great blue heron were occasionally detected flying overhead or on the streams within the Action Area (Stantec 2009; Hull 2009d), and Canada goose is the only waterbird species commonly detected on the breeding bird survey (BBS) route within the Action Area. Suitable waterbird habitat is sparsely distributed within the Action Area, and there are very few large perennial bodies of open water. Larger perennial streams include Kings Creek, Buck Creek, Dugan Run, and Little Darby Creek. There are no lakes or large ponds within the Action Area.

Breeding Birds

A breeding bird survey was conducted from May 3 to July 29, 2008 at 90 point count locations within and in the vicinity of the Action Area (Stantec 2009). Point count locations were sampled four times throughout the breeding season. A total of 5,947 individual birds representing 97 species were documented during the breeding bird survey. The most commonly observed species were red-winged blackbird, horned lark, American robin, song sparrow, American crow, and European starling. Appendix E contains the complete results of the breeding bird survey.

In addition to the breeding bird data collected for the Project, other available breeding bird data for the Action Area were available through the BBS. The BBS is a cooperative effort between the USGS's Patuxent Wildlife Research Center and Environment Canada's Canadian Wildlife Service to monitor the status and trends of North American bird populations. Following a rigorous protocol, BBS data are collected annually along thousands of randomly established roadside routes throughout the continent. One BBS route occurs within the Action Area: Route 66031 passes through the northwest corner of the Action Area near Kings Creek. Seventy-six species of birds have been documented on this route at least once within the most recent 15 years of available data (1992 to 2007) (USGS 2007). The 13 most frequently observed species include: red-winged blackbird, European starling, American robin, house sparrow, common grackle, mourning dove, song sparrow, Canada goose, eastern meadowlark, American crow, horned lark, barn swallow, and savannah sparrow. Each of the most frequently observed species was observed an average of 15 or more times per year since 1993. The results of the breeding bird surveys conducted for the Project (Stantec 2009) are consistent with the BBS data.

Ohio Breeding Bird Atlas maps (OBBA 2010) depict the diversity of species found within the Action Area over the course of the past 25 years. The OBBA conducts surveys on a grid, and tracks the number of species observed in each grid square, or block. The Action Area encompasses all or part of 22 OBBA blocks, and the total number of species in each block varied from the 37 to 74 (Table 4.4-3). Bordering the Action Area to the west and south are blocks where more than 75 individual species have been observed. The OBBA identifies priority blocks that contain high species diversity, sensitive habitats, and/or species of concern. All or part of three priority blocks fall within the Action Area, one in the southwest corner, one in the northwest corner, and a small portion of one along the eastern boundary (OBBA 2010).

Table 4.4-3 Summary of Ohio Breeding Bird Atlas Surveys

Block name	Block ID	Number of Species				
		Observed	Possible	Probable	Confirmed	Total
Kingscreek 2	56C3CW	0	9	48	15	72
Kingscreek 3	56C3SW	0	6	32	1	39
Kingscreek 5	56C3CE	0	7	30	7	44
Kingscreek 6	56C3SE	0	6	31	6	43
Mechanicsburg 1	56D4NW	0	10	28	5	43
Mechanicsburg 2	56D4CW	0	8	42	9	59
Mechanicsburg 3	56D4SW	0	11	30	8	49
Mechanicsburg 4	57D4NE	1	7	38	19	65
Mechanicsburg 5	57D4CE	0	12	24	4	40
Mechanicsburg 6	57D4SE	0	7	32	3	42
North Lewisburg 2	56C4CW	0	11	36	7	54
North Lewisburg 3	56C4SW	0	7	37	3	47
North Lewisburg 5	57C4CE	1	13	33	11	58
North Lewisburg 6	57C4SE	0	11	18	8	37
Urbana East 1	56D3NW	0	7	29	8	44
Urbana East 2	56D3CW	0	12	50	12	74
Urbana East 3	56D3SW	0	10	55	9	74
Urbana East 4	56D3NE	0	6	35	8	49
Urbana East 5	56D3CE	0	11	40	7	58
Urbana East 6	56D3SE	0	1	43	2	46
Urbana West 5	56D2CE	0	25	46	24	95
Urbana West 6	56D2SE	0	8	60	6	74

Source: Ohio Breeding Bird Atlas II 2012: http://www.ohiobirds.org/obba2/

Bats

Several studies of bat use of the Action Area have been conducted, including acoustic surveys, radar studies, mist net surveys, and swarming surveys (Stantec 2008a; Stantec 2009). The following paragraphs summarize the results of these studies (Appendix G of this DEIS contains the complete study reports).

Acoustic Surveys and Radar Studies

Acoustic bat calls were recorded using three Anabat SD1 detectors at each of two meteorological (met) towers during the periods from August 28 to October 29, 2007 and March 29 to September 3, 2008 (Stantec 2008a and 2009; Appendix G). One met tower was located in the central portion of the Action Area and one was located 4 km (2.5 mi) north of the Action Area. The three acoustic bat detectors were placed at each of the two met towers at the following heights: 2 m (7 ft), 20 m (66 ft), and 40 m (131 ft).

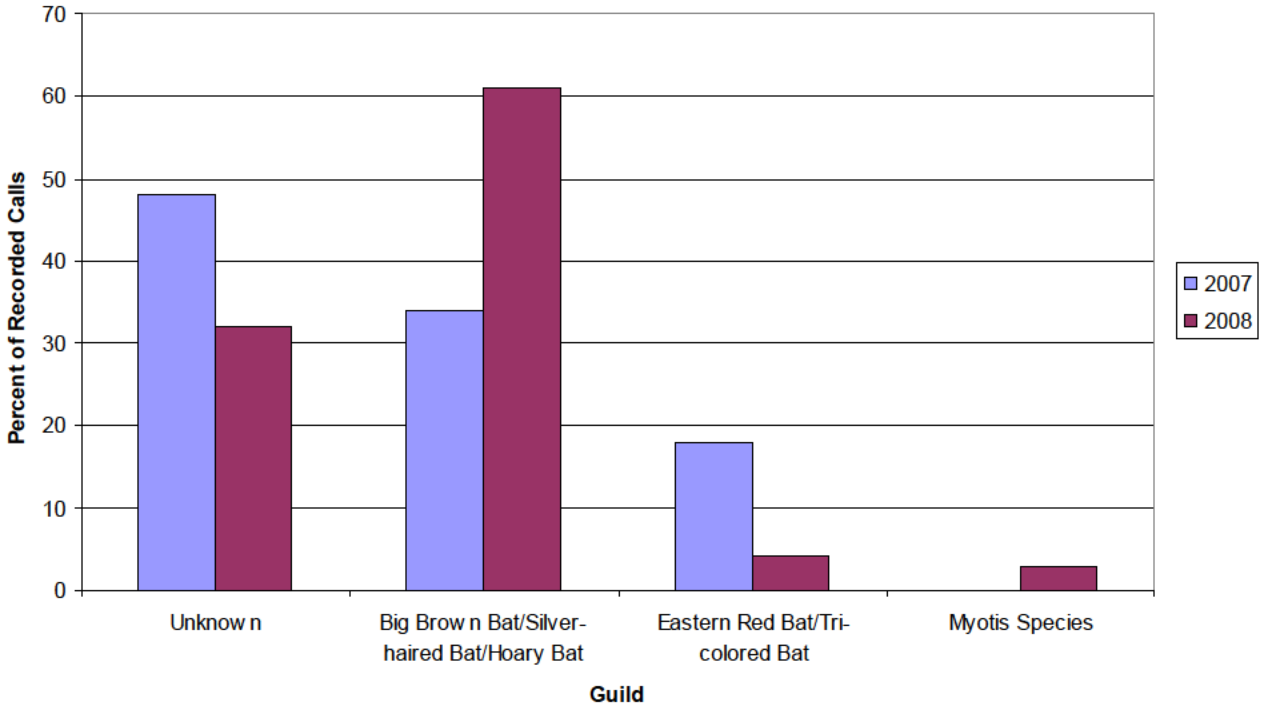
During the 2007 fall survey, a total of 1,522 bat call sequences were recorded, with a mean nightly detection rate of 6.7 call sequences/detector/night (s/d/n) for the entire survey period (Stantec 2008a). The majority of the recorded bat call sequences (48 percent) were identified to the UNKN (unknown) guild, followed by those identified to the BBSHHB (big brown bat/silver-

haired bat/hoary bat) guild (34 percent), the RBTB (eastern red bat/tri-colored bat) guild (18 percent), and the MYSP (*Myotis* spp.) guild (< 1 percent) (Figure 4.4-4).

During the spring through fall 2008 survey period, a total of 18,715 bat call sequences were recorded, with a mean nightly detection rate of 23.7 s/d/n for the entire survey period (Stantec 2009). The majority of the recorded bat call sequences (60 percent) were identified as the BBSH (big brown/silver-haired bat) guild, followed by those identified to the UNKN guild (32 percent), the RBTB guild (4 percent), the MYSP guild (3 percent), and the HB (hoary bat) guild (separated from the BBSHHB guild in 2008; 1 percent), respectively. Mean nightly detection rate was variable across seasons, with the highest rates recorded during the fall sampling period (August 15 to September 3, 2008) (Figure 4.4-4).

Nocturnal radar surveys and hourly ceilometer surveys were conducted concurrently with the acoustic bat monitoring on 25 nights during the fall 2007 sampling period. Eleven bats were observed during the course of 276 five-minute ceilometer observation periods conducted during the course of the radar surveys. Analysis of the radar survey video data documented that, of the total 4,183 targets, 0.19 percent were identified as potential bats. Bat detections were generally evenly distributed throughout the sampling period (Stantec 2008a).

Figure 4.4-4 Summary of Bat Species Detected During Acoustic Surveys Conducted in 2007 and 2008 in the Action Area and Immediate Vicinity



Source: Based on Data Provided in Stantec 2008a and 2009

Mist Net Surveys

Bat mist netting surveys were conducted on 75 net-nights between June 17 and July 25, 2008 at 13 mist-net sites distributed within the Action Area and four mist net sites immediately north of the Action Area (Stantec 2009). The average capture rate was 4.0 bats per net per night (b/n/n). Two hundred and ninety-eight bats representing seven species were captured: little brown bat, northern bat, big brown bat, tri-colored bat, hoary bat, eastern red bat, and Indiana bat. The full mist netting report can be found in Appendix G. Two reproductive adult female Indiana bats and one non-reproductive adult male Indiana bat were captured and radio-tagged north of the Action Area, with the closest capture location approximately 7.7 km (4.8 mi) north, in Logan County.

Fifty bats were captured during mist-net surveys conducted in summer 2009 for an unrelated wind power project in an area that overlapped with the Action Area. Mist-netting was conducted at 17 net sites for 136 net nights, from June 15, 2009 to July 6, 2009. Big brown bats made up 44% of individuals captured and northern bats made up 34%, Indiana bats 10%, eastern red bats 8%, and little brown bats 4% (Jackson Environmental Consulting Services, LLC, 2009).

Swarming Surveys

Bat swarming surveys were conducted in fall 2008 at two cave openings located approximately 4 km (2.5 mi) north of the Action Area (Stantec 2009). Bats were captured during five capture events from September 15 to October 27, 2008. Bats were captured using harp traps placed at cave openings and using mist-nets placed across a nearby stream (during one capture event). A total of 884 bats were captured including 653 northern, 201 little brown, 18 tri-colored, and 12 big brown bats (Stantec 2009; Appendix G). Northern bats were the most common species captured during swarming surveys (74%), with males representing 58% of all northern bats captured. The second most frequently captured species was the little brown bat, representing 23% of all bats captured. Males represented the majority (82%) of all little brown bats captured. The least frequently captured bats were tri-colored bats (2%) and big brown bats (1%). No Indiana bats were captured during the fall 2008 swarming surveys. In addition to the 2 caves openings that underwent swarming surveys, 14 other areas in the Action Area were identified as having potential karst geological features, according to the Ohio Natural Diversity Heritage Database. Ten of these features were visited during a 2008 survey and no features capable of hosting bats were documented at any of those other areas surveyed.

Other Terrestrial Wildlife

Other terrestrial wildlife that inhabit the Action Area include mammals, amphibians, and reptiles. The white-tailed deer is the most commonly observed mammal in the Action Area and this species uses the croplands and fields as foraging and resting areas, particularly in the fall and winter. Other species likely to occur in grasslands or abandoned farmlands include white-footed mouse, short-tailed shrew, eastern mole, and meadow vole. The patches of deciduous forest provide habitat for the Virginia opossum, striped skunk, southern flying squirrel, eastern gray squirrel, eastern fox squirrel, eastern chipmunk, and groundhog. The Ohio GAP Analysis Project documents several amphibian species occurring in the Action Area, especially in wetland or other areas near water, including the redback salamander, eastern tiger salamander, Northern two-lined salamander, longtail salamander, four-toed salamander, American toad, Fowler's toad,

eastern cricket frog, gray treefrog, Northern spring peeper, green frog, pickerel frog, and northern leopard frog (USGS 2010).

Reptiles expected to occur in the Action Area include the midland painted turtle, northern brownsnake, and eastern gartersnake (USGS 2010). The painted turtle is found along most bodies of water, and the northern brown snake is often found under stones, logs, and old boards, so it is likely to be observed around farm outbuildings. The eastern gartersnake is found in various habitats across the state.

State-listed Species of Concern and Special Interest Species

ODNR maintains a list of species, designated as species of concern or special interest, that currently do not warrant designation as threatened or endangered under the Ohio Endangered Species law (ORC Chapter 1518.01–99; 1531.25, 1531.99), but that could become threatened under continued or increased stress (designated as species of concern), or are at low breeding densities within the state (typically because Ohio is at the edge of the species' natural range, designated as special interest).

Nineteen bird species, six bat, two small mammal, and two amphibian species listed as special concern or special interest have been documented within the Action Area (Stantec 2008a; Stantec 2009; and USGS 2010) (Table 4.4-4). One state species of concern, the northern bat, has been petitioned for federal listing by the Center for Biological Diversity. A status assessment of a second state species of concern, the little brown bat, is being completed to determine if threats to the species warrant federal listing.

Table 4.4-4 State Species of Concern and Special Interest Species Known to Occur in the Action Area and Vicinity

Species	General Habitat Description	Occurrence within Action Area and Vicinity
State Species of Concern		
Sharp-shinned hawk *Accipiter striatus*	Forests, agricultural, and suburban areas	• Possible breeding records 1982-1987 and 2006-2010 in 5-county area [a] • Observed in Action Area during migration [b] • Not observed on the BBS survey route that crosses the northern portion of the Action Area during 15 years of survey (1992-2007) [c]
Henslow's sparrow* *Ammodramus henslowii*	Large, continuous blocks of grassland habitat	• Rare in Champaign County, some records in Clark, Union, and Madison counties [a] • Not detected during surveys within and near the Action Area from 2007- 2009 [b] • Not observed on the BBS survey route that crosses the northern portion of the Action Area during 15 years of survey (1992-2007) [c]
Northern bobwhite *Colinus virginianus*	Forested edges	• Confirmed breeding record 1982-1987 and probable breeding records 2006-2010 in 5-county area and recent records exist for Champaign County [a] • Not detected during surveys within and near the Action Area from 2007- 2009 [b] • Observed on the BBS survey route that crosses the northern portion of the Action Area [c]

Species	General Habitat Description	Occurrence within Action Area and Vicinity
Black vulture *Coragypus atratus*	Lowlands along rivers and open landscapes	• Possible breeding records 2006-2010 in 5-county area [a] • Observed in Action Area during migration season [b] • Not observed on the BBS survey route that crosses the northern portion of the Action Area during 15 years of survey (1992-2007) [c]
Bobolink *Dolichonyx oryzivorus*	Grassy fields, hayfields, wet prairies, grassy marshes	• Confirmed breeding records 2006-2010 in 5-county area [a] • Observed in Action Area during breeding season [b] • Observed on the BBS survey route that crosses the northern portion of the Action Area [c]
Great egret *Ardea alba*	Shrubs and trees near freshwater pools and lakes, marshes	• Observed in Action Area during surveys for other wind project [d]
Tri-colored bat *Perimyotis subflavus*	Edge habitats near mixed agricultural use areas; roost in foliage or tree cavities. Hibernate in caves and mines in winter	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Big brown bat *Eptesicus fuscus*	Feed over water, fields, forest openings, urban and suburban areas; roost on buildings and under bridges. Hibernate in caves and mines in winter	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Northern bat* *Myotis septentrionalis*	Caves and mines are used for hibernation in winter and tree cavities are used in summer	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Little brown bat *Myotis lucifugus*	Caves and mines are used for hibernation in winter and tree cavities are used in summer	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Eastern red bat *Lasiurus borealis*	Trees, shrubs, and clusters of weeds are used for roosting in summer and trees and tree cavities are used for hibernation in winter	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Hoary bat *Lasiurus cinereus*	Forested habitat with small open areas. Trees in edge habitat are used during summer. Overwinter in coastal areas	• Observed 6.4 km (4 mi) north of Action Area during fall [b] • Observed in Action Area during summer, reproductive females documented [b]
Four-toed salamander *Hemidactylium scutatum*	Mature swamp forests, undisturbed vernal ponds, and surrounding forests during breeding season. During non-breeding season, lives in underground burrows or under logs and other debris	• Ohio Gap Analysis documents species within Action Area [e]
Eastern cricket frog *Acris crepitans crepitans*	Perennial ponds and streams heavily vegetated with weeds	• Ohio Gap Analysis documents species within Action Area [e]

Species	General Habitat Description	Occurrence within Action Area and Vicinity
State Species of Special Interest		
Blackburnian warbler *Dendroica fusca*	Forests	• Observed in Action Area during breeding season [b] • Not observed on the BBS survey route that crosses the northern portion of the Action Area during 15 years of survey (1992-2007) [c]
Magnolia warbler *Dendroica magnolia*	Forests	• Observed in Action Area during breeding season [b] • Not observed on the BBS survey route that crosses the northern portion of the Action Area during 15 years of survey (1992-2007) [c]
Brown creeper *Certhia americana*	Forests	• Observed in Action Area during surveys for other wind project [d]
Northern waterthrush *Parkesia noveboracensis*	Forests, generally near water	• Observed in Action Area during surveys for other wind project [d]
Golden-crowned kinglet *Regulus satrapa*	Forests	• Observed in Action Area during surveys for other wind project [d]
Pine siskin *Spinus pinus*	Open woodland	• Observed in Action Area during surveys for other wind project [d]
Winter wren *Troglodytes troglodytes*	Forests	• Observed in Action Area during surveys for other wind project [d]
Wilson's snipe *Gallinago delicata*	Marshlands	• Observed in Action Area during surveys for other wind project [d]
Western meadowlark *Sturnella neglecta*	Open grasslands, prairies, meadows, and some agricultural fields	• Observed in Action Area during surveys for other wind project [d]
Mourning warbler *Geothlypis philadelphia*	Disturbed second-growth forested areas, with moderately closed canopy and thick understory	• Observed in Action Area during surveys for other wind project [d]
Purple finch *Carpodacus purpureus*	Forests	• Observed in Action Area during surveys for other wind project [d]
Red-breasted nuthatch *Sitta canadensis*	Forests	• Observed in Action Area during surveys for other wind project [d]

[*] Federal Species of Concern
[a] Ohio Breeding Bird Atlas (2009)
[b] Based on pre-construction surveys conducted for Project (Stantec 2008a, 2009)
[c] BBS data for Route 66031 from 1992-2007 (USGS 2010)
[d] West 2010
[e] USGS 2010

4.4.2.2 Aquatic Wildlife

Information from the Ohio Aquatic Gap Analysis Program and ODNR database, as well as known species ranges and existing habitat conditions, indicate that approximately 70 fish species and 25 mollusk species have the potential to occur in the Action Area (Appendix E). Most of these species are common in the region, although several of the fish and mollusk species with potential to occur are federally- or state-listed as endangered, threatened, or other special-status (see Section 4.5).

4.5 Rare, Threatened, and Endangered Species

4.5.1 Scope of Analysis

The species analysis in this DEIS considers plant and animal species that are federally-listed as threatened, endangered, candidate, proposed, and species of concern; species that are state-listed as threatened, endangered, species of concern, and species of special interest; and/or species that receive specific protection defined in federal or state legislation. This analysis considered species that could potentially occur within the Action Area and the surrounding vicinity because most wildlife resources are highly mobile and can move in and out of the Action Area.

Information collected or reviewed for this analysis includes ODNR's Natural Heritage Database (2010); Ohio Breeding Bird Atlas II (2009); and biological data for the region (Natureserve 2007). In addition, as discussed in Section 4.4 above, site-specific surveys were conducted in and around the Action Area from 2007 to 2009 to determine the presence of threatened and endangered species and their habitats (Hull 2009d; Stantec 2008a; Stantec 2009). Wildlife surveys conducted in the Action Area for another wind project (West 2010) also provided other information for this analysis.

4.5.2 Existing Conditions

There are four federally-listed species, two candidate species for federal listing, two Federal Species of Concern, and 22 state-listed wildlife species with the potential to occur in the Action Area (note that there are a total of 22 species due to dual federal and state listing status of five species). Table 4.5-1 lists these wildlife species and summarizes their habitat preferences and known or potential occurrence within the Action Area. Of these 22 species, 12 are not expected to occur in the Action Area or are expected to occur only as transients due to lack of suitable habitat (Table 4.5-1).

Table 4.5-1 Federal- and State-listed Threatened and Endangered Wildlife Species with Potential to Occur in the Vicinity of the Action Area

Species [a]	Listing Status	General Habitat Description [a]	Occurrence in Action Area Vicinity
Indiana bat *Myotis sodalis*	FE SE	Winter hibernacula are in caves and abandoned mines and summer roosts are in trees and tree hollows.	Maternity colonies documented in Logan County and in Champaign County.[b] Captured during summer 2009 mist net surveys in Action Area.[c]
Clubshell mussel *Pleurobema clava*	FE SE	Coarse sand and gravel areas of runs and riffles within streams and small rivers.	Once suspected to potentially occur in the Action Area in Little Darby Creek. However in January 2011, the USFWS removed this species from the list of federally listed or proposed species potentially present in Champaign County because current distribution and habitat data for Little Darby Creek within Champaign County indicate it is not suitable for this species. **Not expected to occur in Action Area.**
Eastern massasauga *Sistrurus catenatus*	FC SE	Wetlands, wet prairie, or nearby woodland or shrub edge habitat. Occurs seasonally in shallow wet lowlands and drier upland areas with gasses and forbs.	Documented to occur in Champaign County, limited suitable habitat occurs in the Action Area. One wetland has been identified in the Action Area as suitable habitat. Measures will be taken to avoid potential impacts to the species in this area.
Rabbitsfoot mussel *Quadrula cylindrica cylindrical*	FC SE	Small to medium-sized streams and some larger rivers in shallow areas along the bank and adjacent runs and shoals where the water velocity is reduced. Sometimes occupy deep water runs (2.7 – 3.7 m [9 – 12 ft]). Bottom substrate is typically sand and gravel.	Once suspected to potentially occur in the Action Area in Little Darby Creek. However in January 2011, the USFWS removed this species from the list of federally listed or proposed species potentially present in Champaign County because current distribution and habitat data for Little Darby Creek within Champaign County indicate it is not suitable for this species. **Not expected to occur in Action Area.**
Rayed bean mussel *Villosa fabalis*	FE SE	Smaller headwater streams, shoal or riffle areas with gravel and sand substrate, and shallow, wave-washed areas of lakes.	Historically known from Big and Little Darby Creeks, and may occur in these creeks or other perennial streams within the Action Area.[d]
Snuffbox mussel *Epioblasma triquetra*	FE SE	Swift currents of riffles and shoals over gravel and sand with occasional cobble and boulders.	Once suspected to potentially occur in the Action Area in Little Darby Creek. However in January 2011, the USFWS removed this species from the list of federally listed or proposed species potentially present in Champaign County because current distribution and habitat data for Little Darby Creek within Champaign County indicate it is not suitable for this species. **Not expected to occur in Action Area.**
Bobcat *Lynx rufus*	SE	Variety of habitat from forested mountain areas to lowland swamps. In Ohio they occur in forested areas near pastures and cultivated fields.	The known range for this species includes the Action Area, but they were extirpated from Ohio in 1850, and now have only rare occurrences throughout the state.[a]

Species [a]	Listing Status	General Habitat Description [a]	Occurrence in Action Area Vicinity
			Not expected to occur in Action Area.
Northern harrier *Circus cyaneus*	SE	Large contiguous grasslands, marshes, low intensity agriculture and pasture/hayfields.	Not observed on BBS survey route in Action Area during 15 years of survey (1992-2007).[e] Observed in Action Area during spring and fall 2007 and 2008.[c]
Sandhill crane *Grus Canadensis*	SE	Large contiguous wetlands, shallow/standing water, agricultural land.	Observed in the Action Area during migration.[c] Marginal habitat for this species exists within the Action Area. **Not expected to regularly occur or breed in Action Area or Mitigation Area – transient use only.**
Loggerhead shrike *Lanius ludovicianua*	SE FSC	Large, relatively contiguous grasslands and open areas with scattered trees.	One breeding record since 1980 in 5-county area.[e] Not observed on BBS survey route in Action Area during 15 years of survey (1992-2007).[e] Marginal habitat for this species exists within the Action Area. **Not expected to regularly occur or breed in Action Area – transient use only.**
Yellow-bellied sapsucker *Sphyrapicus varius*	SE	Breeds in young forests and along streams, especially in aspen and birch. Winters in variety of forests, especially semi open forests.	Incidental observations recorded in Action Area during surveys for another wind project.[f]
Seepage dancer damselfly *Argia bipunctulata*	SE	Sunny sphagnum seepages, small lakes, ponds, and streams.	Known range for this species includes the Action Area but habitat in the Action Area is generally unsuitable for this species. **Not expected to occur in Action Area.**
Elfin skimmer dragonfly *Nannothemis bella*	SE	Bogs and calcareous fens.	Known range for this species includes the Action Area but the Action Area does not contain any suitable habitat (bogs or fens) for this species. **Not expected to occur in Action Area.**
Upland sandpiper *Bartramia longicauda*	ST	Large expanses of grasslands, pastures, unkempt agricultural land with a mosaic of old fields and crop lands, grassy expanses of airports.	Recent records of probable nesting in Clark County.[e] Not observed on BBS survey route in Action Area during 15 years of survey (1992-2007).[e] Marginal habitat for this species exists within the Action Area. **Not expected to occur in Action Area.**
Least flycatcher *Empidonax minimus*	ST	Deciduous forests.	Possible breeding records 1982-1987 and 2006-2010 in 5-county area. Not observed on BBS survey route in Action Area during 15 years of survey (1992-2007)[e] but observed in Action Area during breeding season in 2007 and 2008.[c]
Bald eagle *Haliaeetus leucocephalus*	ST FSC	Lakes, reservoirs, rivers.	Observed in Action Area during the spring 2008 and fall 2008 migration surveys.[c] Marginal habitat for this species exists within the Action Area.
Black-crowned night heron *Nycticorax nycticorax*	ST	Various wetland habitats, including salt, brackish, and freshwater marshes, streams, lakes, and agricultural fields.	As cited in West 2010, this species was observed during BBS although no nesting was documented.[f] **Not expected to regularly occur or breed in Action Area – transient use only.**

Species [a]	Listing Status	General Habitat Description [a]	Occurrence in Action Area Vicinity
Dark-eyed junco *Junco hyemalis*	ST	Breed in coniferous and deciduous forests. During winter and migration they use a variety of habitats including open woodlands, grasslands/pasture, roadsides, and gardens.	Incidental sightings recorded in migration period in Action Area during surveys for another wind project.[f]
Hermit thrush *Catharus guttatus*	ST	Open areas inside forests, such as trails, pond edges, or areas partially opened up by fallen trees. In winter, this species occupies forests with dense understory and berry bushes.	Incidental sightings recorded in migration period in Action Area during surveys for another wind project.[f]
Osprey *Pandion haliaetus*	ST	Nest platform or forest near (within 19 km [12 mi]) shallow, fish-filled water, including rivers, lakes, reservoirs, lagoons, swamps, and marshes.	Incidental sightings recorded in migration period in Action Area during surveys for another wind project.[f] **Not expected to regularly occur or breed in Action Area – transient use only.**
Western tonguetied minnow *Exoglossum laurae hubbsi*	ST	Cool to warm clear creeks and small to medium rivers.	Historically occurred in King Creek, which flows west through the northern half of the Action Area.[d]
Lake chubsucker *Erimyzon sucetta*	ST	Ponds, lakes, impoundments, swamps, and other clear waters with little or no flow. In Ohio, generally occurs in glacially formed lakes (potholes, kettle lakes).	Known to occur in small pothole lakes between Bellefontaine and Urbana, west of the Action Area. No suitable habitat for this species in the Action Area. **Not expected to occur in Action Area.**

Listing Status: FE = Federally Endangered, FT = Federally Threatened, FC = Candidate for Federal Listing, FSC = Federal Species of Concern, SE = State Endangered, ST = State Threatened
[a] Species status and habitat descriptions based on ODNR Division of Wildlife (ODNR 2008)
[b] K. Lott, ODNR, personal communication
[c] Based on pre-construction surveys conducted for Project (Stantec 2008a, 2009)
[d] Hull 2009d
[e] Ohio Breeding Bird Atlas (2009) and BBS data for Route 66031 from 1992-2007
[f] West 2010

4.5.2.1 Federally Threatened, Endangered and Candidate Species

The only federally-listed threatened or endangered species known to occur in the Action Area is the Indiana bat, which is federally- and state-listed as endangered (USFWS 2011c). The Action Area lies within the geographic ranges of the clubshell mussel, rayed bean mussel, and snuffbox mussel, which are federal endangered species; and two candidate species for federal listing, the eastern massasauga rattlesnake and the rabbitsfoot mussel (USFWS 2011c). The following sections discuss these five species and their potential to occur in the Action Area. Section 3.2.1 of the HCP (Appendix B to this DEIS) contains additional information on these species.

Indiana Bat

The Indiana bat is a small (0.25 – 0.35 ounce [7-10 grams]), insectivorous bat. It is physically very similar to the little brown bat, but can be distinguished by its short, inconspicuous toe hairs; smaller foot; keeled calcar; more uniform colored fur; and pinkish colored pug-nose (Whitaker and Hamilton 1998).

Population Status

Indiana bat populations have experienced marked population declines since the 1960s. From 1965 to 2001, there was a decline of approximately 57 percent in the range-wide population (USFWS 2007). The known population of Indiana bats has fluctuated since then, but overall has increased from 328,526 bats in 2001 to 424,708 bats in 2011 (USFWS 2012). Specifically, in the four USFWS-designated Recovery Units (RUs) identified in the Indiana bat Recovery Plan (USFWS 2007) - Ozark-Central, Midwest, Appalachian Mountains, and Northeast - the Indiana bat populations are as follows: Appalachian Mountains RU 32,529 bats; Midwest RU 305,297 bats; Ozark-Central RU 70,822 bats; and Northeast RU16,060 bats) (USFWS 2012).

This species was first listed as being in danger of extinction in 1967 under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967) because of large decreases in population size and an apparent lack of critical habitat in winter (USFWS 1983, 1999). It was listed as an endangered species under the ESA following its enactment in 1973. The Indiana bat Recovery Plan, first published in 1983 (USFWS 1983) and updated in 1999 and 2007 (USFWS 1999, USFWS 2007), outlines the Indiana bat's habitat requirements, critical habitat, potential causes for declines, and recovery objectives. The 2007 Draft Recovery Plan identifies the Recovery Priority for the Indiana bat as an 8, meaning that the species has a moderate degree of threat and high recovery potential. Recovery of the species initially focused on minimizing disturbance at hibernacula and efforts were made to protect all major hibernacula in the years following its listing. Despite this protection, the species continued to decline in number, suggesting that issues on its summer range or other factors were also contributing to its decline (USFWS 2007).

Several factors have contributed to the decline in the number of Indiana bats, including the loss and degradation of suitable hibernacula, human disturbance during hibernation, pesticides, and the loss, fragmentation, and degradation of forested habitat, particularly stands of large, mature trees (USFWS 2007). Within the last several years, another source of mortality has been white-nose syndrome (WNS). WNS is a condition of hibernating bats that, to date, has been responsible for the death of 5.7-6.7 million bats (six species, including Indiana bats) in the eastern U.S. (USFWS 2012b). A newly-described psychrophilic (cold-loving) fungus (*Geomyces destructans*) that grows on noses, faces, ears, and/or wing membranes of the majority of affected bats has been demonstrated to cause WNS (USGS 2011). WNS was first documented in bats in eastern New York at four sites in the winter of 2006-2007 and has been associated with substantial mortality of Indiana bats in Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, Virginia, and West Virginia during the three winters following its discovery. During winter 2010-2011, WNS was confirmed in one hibernaculum in southern Ohio (Ironton Mine, known to support Indiana bats), as well as at sites in Indiana and Kentucky. As of winter 2010-2011, 74 hibernacula supporting 37.7% of the 2011 Indiana bat rangewide population were known or suspected of being infected by WNS (A. King, USFWS, personal communication). As of winter 2012, WNS has been confirmed in at least six counties in Ohio (Butchkoski 2012). While substantial Indiana bat population increases were observed range-wide between 2001-2007, since the onset of WNS in 2006-2007 significant population declines have been observed in the Northeast RU (70% decline between 2007-2011) (USFWS 2012). If mortality rates due to WNS at recently infected hibernacula (e.g., hibernacula in IN, KY, WV) are similar to those observed at hibernacula in the Northeast RU, substantial population declines range-wide may occur over the next few years.

Life History

During the winter (generally early November through mid April) Indiana bats hibernate in underground habitat such as caves and mines, in large colonies sometimes numbering over 100,000 individuals. In spring (April through May), Indiana bats leave the hibernacula and migrate to their summer habitat. Individuals have been documented to travel as far as 575 km (357 mi) between hibernacula and summer habitat (Winhold and Kurta 2006), although some individuals may migrate only a few kilometers. Summer roosts are typically under the exfoliating bark of dead or live trees or in tree cavities, although some males may remain in underground habitat year-round (Whitaker and Brack 2002). Roost trees may be in open areas, forests, riparian habitat, or even residential developments.

Some males may remain near the hibernacula throughout the year, move short distances to other caves or mines, or migrate to distant areas (Whitaker and Brack 2002).

At their summer roosts, pregnant Indiana bats form maternity colonies (also referred to as maternity roosts) of between 25 and 100 bats (although sometimes more), and typically give birth to one pup. Pups are normally born in late June and early July and grow quickly, becoming capable of flight between early July and early August. Indiana bats begin their autumn migration to their hibernation sites beginning in late August.

Range-wide Distribution

The Indiana bat occurs from Iowa, Oklahoma, and Wisconsin, northeast to Vermont, and south to northwestern Florida and northern Arkansas (Barbour and Davis 1969). Figures 4.5-1, 4.5-2, and 4.5-3 show the winter and summer population distribution and the major migratory corridors for the Indiana bat. The largest hibernating populations of Indiana bats occur in the limestone cave regions of Kentucky, Missouri, and Indiana. Recently however, large hibernating colonies have been found in abandoned underground mines in Illinois, Ohio, New Jersey, and New York. Approximately 86 percent of the estimated rangewide population in 2005 was known from hibernacula in just four states: Indiana (49.0%), Kentucky (14.8%), Illinois (13.7%), and New York (8.4%). Currently, the USFWS has designated critical habitat for the Indiana bat at 11 caves and two non-coal mines: six in Missouri, two each in Indiana and Kentucky; and one each in Illinois, Tennessee, and West Virginia (USFWS 2007).

Figure 4.5-1 Indiana Bat Winter Population Distribution

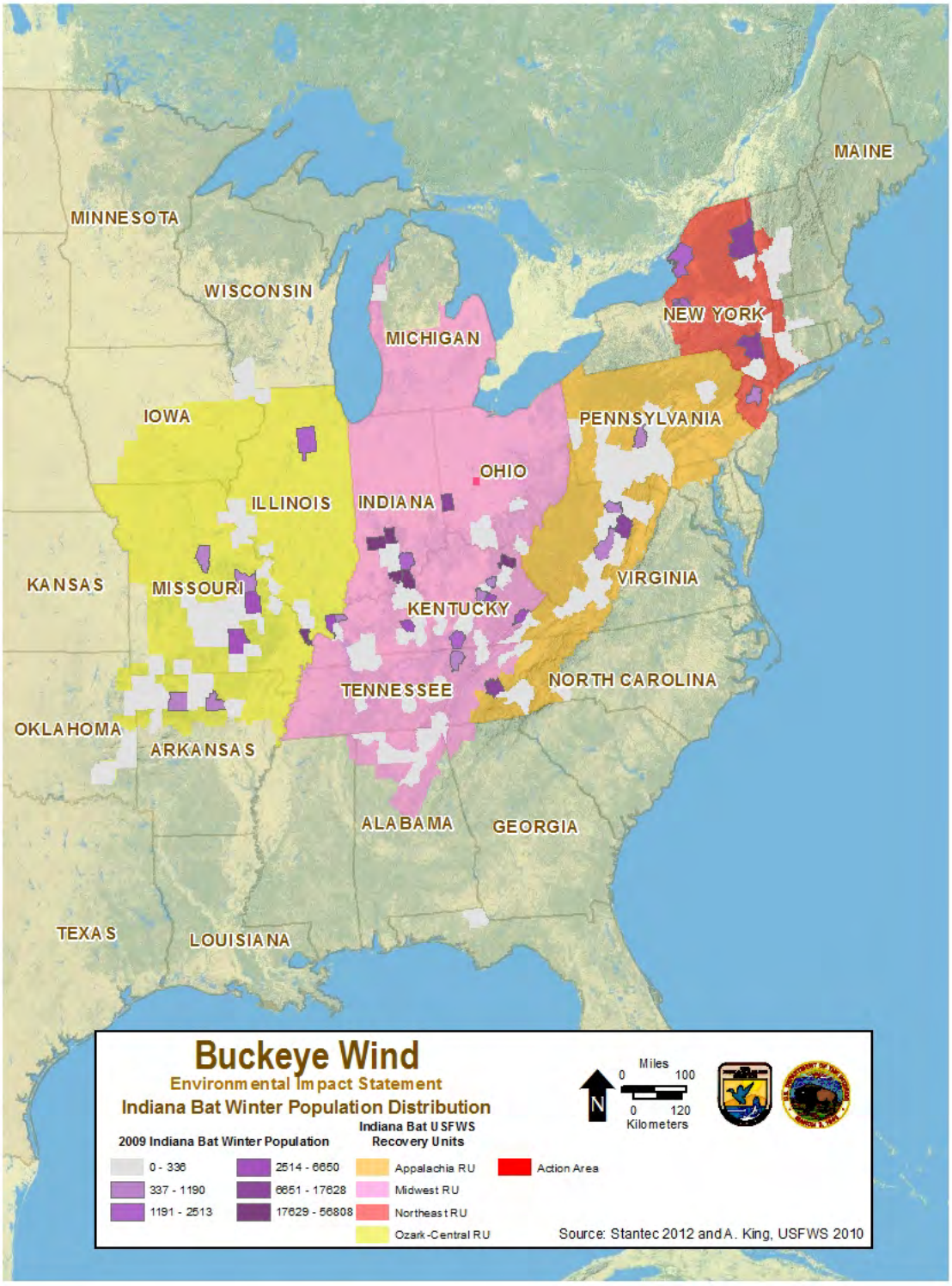


Figure 4.5-2 Indiana Bat Summer Records

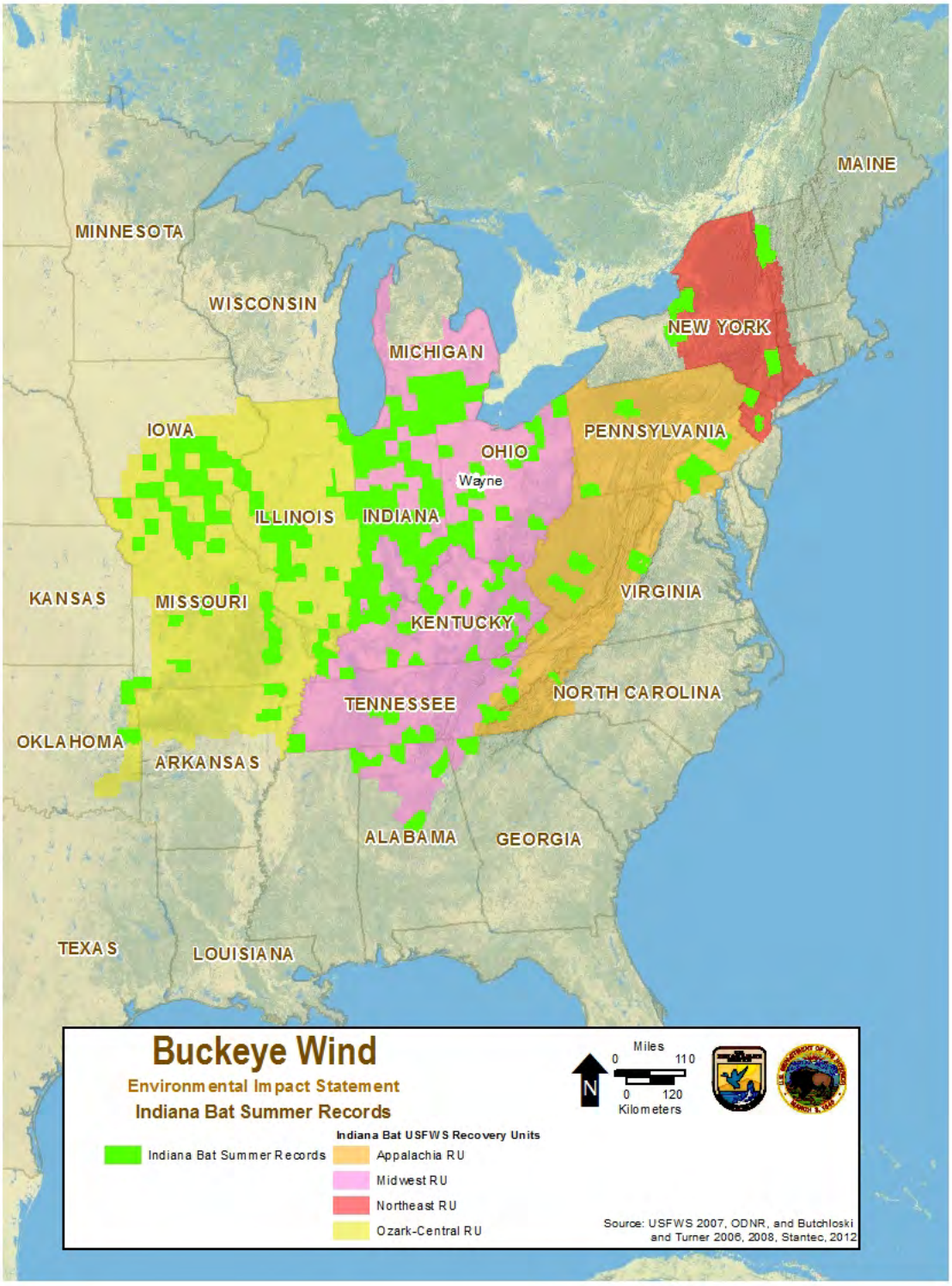
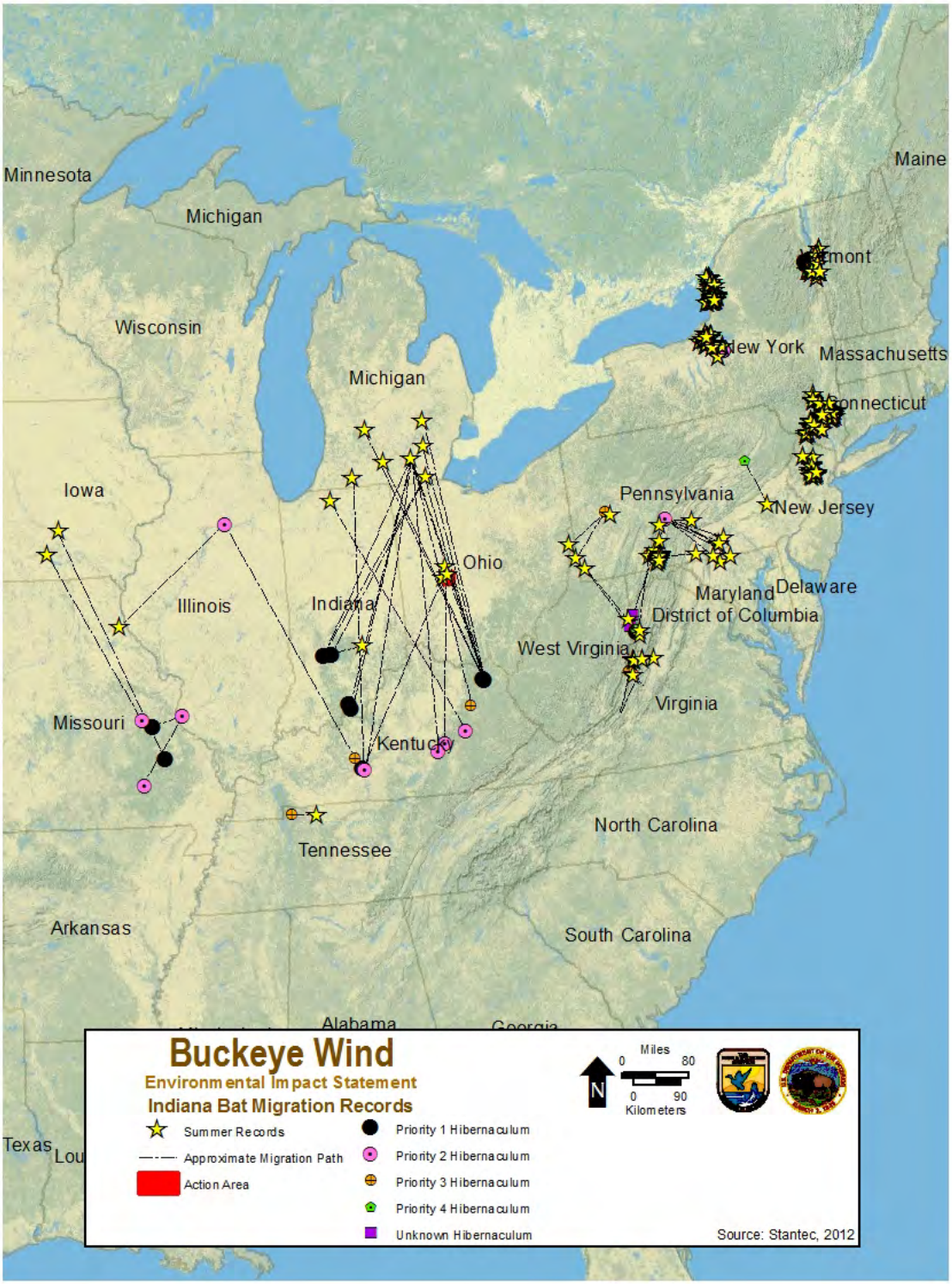


Figure 4.5-3 Indiana Bat Migration Records



There are two known major bat winter hibernacula within the state of Ohio: the Lewisburg Limestone Mine in Preble County, Ohio's largest known Indiana bat hibernaculum, and the Ironton Mine in Lawrence County. These sites support roughly two percent of the range-wide population. The 2011 population estimate for the Ironton Mine was 276 Indiana bats and for the Lewisburg Limestone Mine was 9,594 Indiana bats (M. Seymour, USFWS, personal communication). The Action Area is approximately 100.6 km (62.5 mi) southwest of the Lewisburg Limestone Mine and 164 km (102 mi) northwest of the Ironton Mine.

The distribution of Indiana bats expands during the spring and summer. Based on current records, the core Indiana bat summer range includes southern Iowa, northern Missouri, northern Illinois, northern Indiana, southern Michigan, and western Ohio. As of 2011, evidence of Indiana bat maternity colonies has been documented in 25 Ohio counties (M. Seymour, USFWS, personal communication).

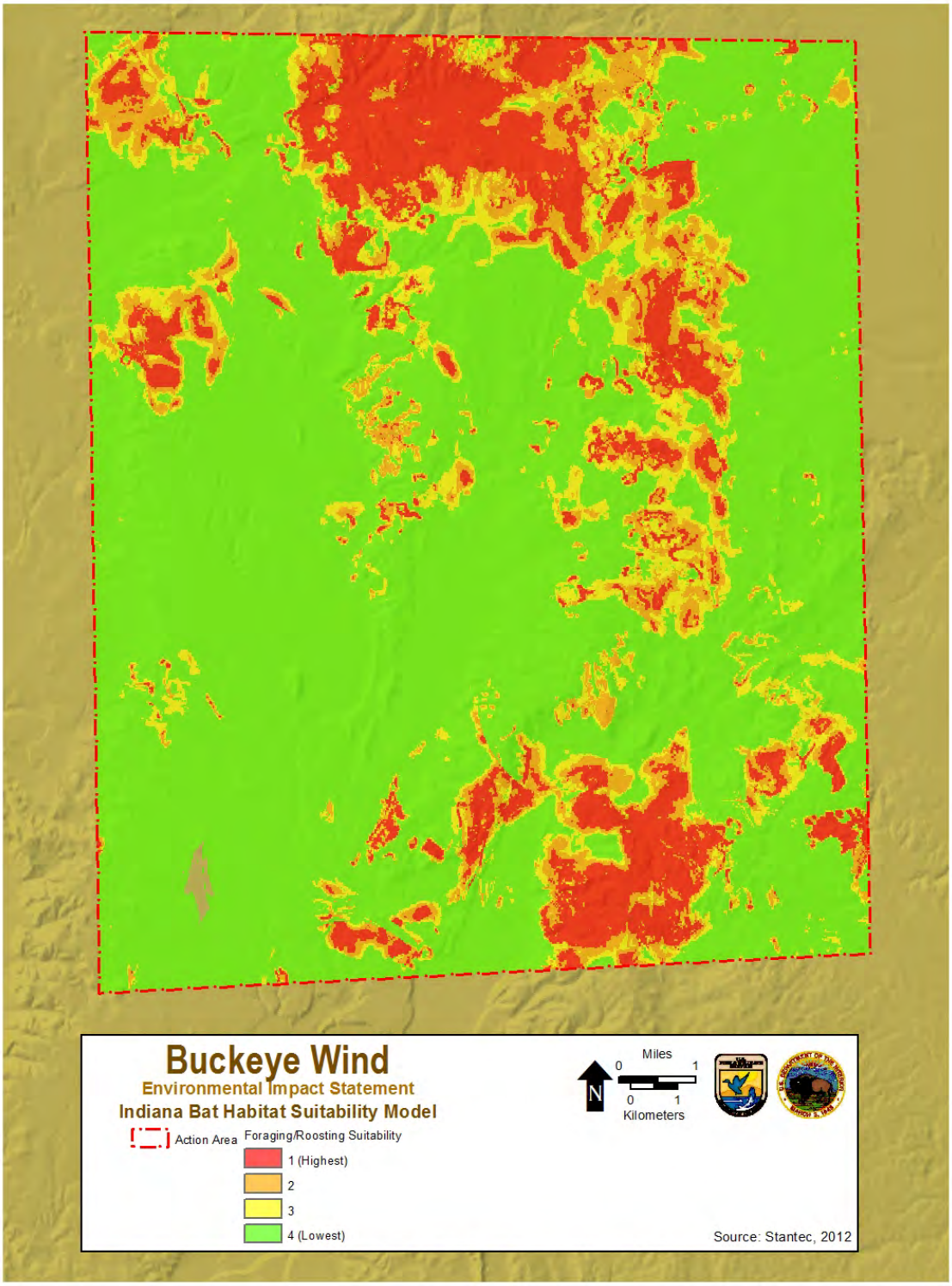
Distribution within the Action Area

Limited data exist on the presence of Indiana bats in west-central Ohio during summer. In 2008-2009, summer reproductive records were documented for Champaign, Hardin, and Logan Counties during mist-netting surveys for proposed wind power projects, including the proposed project (Stantec 2008a; K. Lott, ODNR, personal communication). Twenty-six Indiana bats (n=24 females, n= 2 males) were captured and 43 roost trees were identified in 2008 and 2009 in an area known as the Bellefontaine Ridge, which overlaps part of the northern portion of the Action Area (Stantec 2008a, K. Lott, ODNR, personal communication). Four female Indiana bats were captured within the Action Area during 2009 summer mist net surveys, and one additional Indiana bat escaped as it was being removed from the net. Three of these females were determined to have summer maternity roosts in the Action Area. The fourth Indiana bat roosted in a tree that was 2.4 km (1.5 mi) east of the Action Area, where her transmitter signal was subsequently lost. Through radio telemetry studies and an estimate of their summer home range using the minimum convex polygon (MCP) method (described in the HCP in Appendix B), it was determined that 93% of the summer home range[3] for the three bats that roost in the Action Area lies within an area constituting approximately three percent of the Action Area. Suitable Indiana bat summer foraging and maternity habitat is distributed throughout the Action Area (see Figure 4.5-2 and Appendix B).

In addition to summer use, Indiana bats may occasionally travel or roost throughout the Action Area during fall migration (approximately August 1 through October 31) and spring migration (approximately April 1 through May 31), and the species is assumed present throughout the entire Action Area (Figure 4.5-4). Appendix B of this DEIS contains more detailed information on the results of these surveys and on Indiana bat use of the Action Area.

[3] The "home range" for an Indiana bat is the area where an Indiana bat forages, commutes, night-roosts, and drinks. This range varies from individual to individual, based on factors such as sex, age, habitat, and reproductive status.

Figure 4.5-4 Indiana Bat Habitat Suitability Model



Clubshell Mussel

The clubshell mussel is a federally-listed endangered species and an Ohio State endangered species. This mussel can be found in coarse sand and gravel areas of runs and riffles within perennial streams and small rivers and is known from the Little Darby Creek watershed. According to the USFWS, the clubshell was formerly suspected to occur in portions of Little Darby Creek within Champaign County. However, in January 2011, the USFWS removed clubshell mussel from the list of species potentially present in Champaign County because current distribution and habitat data for Little Darby Creek within Champaign County indicate it is not suitable for the species (USFWS 2011d).

Eastern Massasauga

The eastern massasauga rattlesnake is a candidate for federal listing and is an Ohio State endangered species. Since designated as a candidate species in 1999, it has declined significantly throughout its range, and populations in Ohio that were once spread throughout glaciated portions of the state are now small and isolated. Several factors have contributed to the decline of the species including habitat loss and fragmentation, indiscriminate killing, collection, gene pool contamination and incompatible land use practices.

Eastern massasaugas use both upland and wetland habitat and these habitats differ by season. During the winter, massasaugas hibernate in low wet areas, primarily in crayfish burrows, but may use other structures. Presence of a water table near the surface is important for a suitable hibernaculum. In the summer, massasaugas use drier, open areas that contain a mix of grasses and forbs such as goldenrods and other prairie plants that may be intermixed with trees or shrubs. Adjoining lowland and upland habitat with variable elevations between are critical for the species to travel back and forth seasonally.

There are records of this species in Champaign County outside of the Action Area (USFWS pers. comm. September 23, 2010). While there are no known occurrences of eastern massasauga rattlesnakes in the Action Area (M. Seymour, USFWS, personal communication), a desktop habitat assessment was conducted using recent aerial photographs, NWI wetland mapping, and field delineated wetland boundaries, to determine if suitable habitat for the massasauga is present within the Action Area. Specifically, emergent or scrub-shrub wetlands located immediately adjacent to upland grassland (e.g. native grassland, pasture, hayfield, etc.) were identified as potential habitat. Potential habitat areas identified during the desktop assessment were field-verified to determine if suitable habitat is present. The desktop assessment revealed that the majority of the small number of wetlands present in the Action Area do not have any adjacent grassland, and at those sites that do, the grassland present is very limited. Furthermore, while wetlands are present within the Action Area, there are no wetland impacts proposed as a result of construction, operation, and decommissioning of the Project (see Section 5.2). However, a field review was conducted by USFWS and Ohio State eastern massasauga experts who identified one area of suitable habitat at one location within the Action Area. Project facilities avoid that habitat and no loss of potential habitat would occur as a result of the Project; however construction activities will occur near that habitat. In addition, Buckeye Wind worked with USFWS and ODNR DOW to relocate an access road that was previously located in close proximity to the wetland. In order to evaluate the potential for impacts to massasauga, Buckeye Wind may elect to complete a massasauga survey to document the presence or likely absence of the species within this area, or they may assume that the species is present within this area. If a

survey is completed and no massasaugas are found, they would be assumed absent from the area, no additional measures to protect the species would be warranted, and the project would have no effect on the species. If the survey documents the presence of the species, or if no survey is completed and presence of the species is assumed, multiple avoidance and minimization measures will be implemented such that the project is not likely to adversely affect the species (see Section 5.5).

Rayed Bean Mussel

The rayed bean mussel is a federally-listed endangered species and an Ohio endangered species. This species is generally known from smaller headwater creeks, although records also exist of occurrence in larger rivers and lakes. These mussels are usually found in or near shoal or riffle areas, and in the shallow, wave-washed areas of lakes. Favored substrates typically include gravel and sand, and they are often associated with, and buried under the roots of, vegetation, including water willow and water milfoil. Historically the rayed bean mussel occurred throughout much of the Ohio River system, including Big and Little Darby Creeks which flow through portions of the Action Area. Recent records (less than 30 years old) indicate that only relic shells are in these two creeks, and field investigations carried out in 2008 found the stream bed to be dry and the stream reach for this part of Little Darby Creek was scored as 46 using the Headwaters Habitat Evaluation Index (HHEI), indicating that the reach is Class II intermittent headwaters habitat and the substrate is dominated by cobble and sand (Hull 2009d). The required perennial base flow and the preferred substrates of the rayed bean are not present in this reach of Little Darby Creek.

The rayed bean has the potential to occur in other perennial streams with suitable habitat within the Action Area. Buckeye Wind will directionally drill beneath or otherwise avoid in-water work for any Ohio designated Exceptional Warmwater Habitat or Cold Water habitat streams[4] in the Action Area (i.e., underground crossings for electric collection lines) to avoid and minimize impacts to aquatic habitats. For perennial stream corridors that have the required base flow and substrate to support rayed bean mussels and would be crossed by access roads, crane paths and/or collection lines resulting in in-water work, a survey may be performed to detect the presence or absence of the rayed bean mussel, or presence of the species may be assumed. If no rayed bean are detected during the survey, the species will be assumed absent, no additional measures to protect the species would be warranted, and the project would have no effect on the species. If rayed bean are determined to be present or if no survey is performed and they are assumed present, in-water work would be avoided either through directional drilling, access road re-routing, arched bridge structures or temporary crossings such that the Project is not likely to adversely affect the rayed bean (see Section 5.5).

[4] According to Ohio Revised Code 3745-1-07, Exceptional Warmwater Habitat streams are capable of maintaining an exceptional or unusual community of warmwater aquatic organisms with the general characteristics of being highly intolerant of adverse water quality conditions and/or being rare, threatened, endangered, or species of special status. This is the most protective use designation assigned to warmwater rivers and streams in Ohio. A Coldwater Habitat stream is capable of supporting populations of coldwater aquatic organisms on an annual basis and/or put-and-take salmonid fishing. These water bodies are not necessarily capable of supporting the successful reproduction of salmonids and may be periodically stocked with these species. Both are afforded special protections under Ohio's CWA provisions.

Rabbitsfoot Mussel

The rabbitsfoot mussel is a candidate for federal listing under the ESA and an Ohio endangered species. The rabbitsfoot is primarily an inhabitant of small to medium-sized streams and some larger rivers. It usually occurs in shallow areas along the bank and adjacent runs and shoals where the water velocity is reduced. Specimens may also occupy deep water runs, having been reported in 2.7 – 3.7 m (9 – 12 ft) of water. Bottom substrates generally include sand and gravel. The Nature Conservancy has established bioreserves along several stream systems harboring extant populations of the rabbitsfoot, including Big and Little Darby Creeks. In Big Darby Creek, there is an extant population of rabbitsfoot at one site, and in Little Darby Creek, it is extant in several sites. According to the USFWS, it is unlikely to occur in the Action Area (M. Seymour, USFWS, personal communication), and therefore the project will have no effect on the rabbitsfoot mussel.

Snuffbox Mussel

The snuffbox mussel is listed as endangered under the ESA and is an Ohio endangered species. The snuffbox mussel occurs in freshwater swift currents of riffles and shoals over gravel and sand with occasional cobble and boulders. This species is known to be present in some portions of Little Darby Creek or drainages where preferred habitat exists. According to the USFWS, suitable habitat for this species formerly occurred within portions of Little Darby Creek that fall within the Action Area, but as of January 2011, the portion of Little Darby Creek within Champaign County has been determined as unsuitable for the snuffbox mussel (M. Seymour, USFWS, personal communication) and therefore the project will have no effect on the snuffbox mussel.

4.5.2.2 State Threatened and Endangered Species

In addition to the federally-listed species discussed above (five of which are also state-listed), sixteen other wildlife species listed by the ODNR as endangered or threatened are historically known from Champaign County and/or have the potential to occur within or in the vicinity of the Action Area (ODNR undated; ODNR 2009a) (Table 4.5-1). Five of these 16 species are not expected to occur in the Action Area due to unsuitable habitat (Table 4.5-1). Six of these 16 species were observed in the Action Area during wildlife surveys conducted in 2007 and 2008 (Stantec 2008a; Stantec 2009) and 2010 (West 2010) or are historically known from the area and have the potential to occur more frequently than transient use: bald eagles, northern harrier, yellow-bellied sapsucker, least flycatcher, dark-eyed junco, hermit thrush, and Western tonguetied minnow (Table 4.5-1).

Bald and Golden Eagles

In response to successful recovery efforts, the bald eagle was fully delisted from the ESA on July 9, 2007 (72 FR 37345, July 9, 2007). However, bald eagles continue to be afforded federal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq*.). The bald eagle is also state-listed as a threatened species and a Federal Species of Concern. Bald eagle nesting sites often occur in mature riparian habitat near lakes, rivers, or sea coasts (USFWS 2010). Features influencing nest location include distance to nearest water; diversity, abundance, and vulnerability of prey base; and absence of human development and disturbance (USFWS 2010). Migrant and wintering congregations of bald eagles also favor aquatic habitats with

abundant food sources, and will use forested areas for roosting (USFWS 2010). No bald eagles were observed during breeding bird surveys conducted at 90 observation points located within and in the vicinity of the Action Area that were each sampled four times during May, June, and July 2008, and there are no known bald eagle nests within the Project vicinity (Stantec 2009). The nearest known bald eagle nest site is approximately 15.3 km (9.5 mi) from the Action Area in Logan County along the Mad River (M. Seymour, USFWS, personal communication, as cited in Stantec 2011). According to the Avian Knowledge Network database, no winter bald eagle records were found for Champaign County for December through February from 1991 to 2011 (Munson et al. 2011).

Golden eagles are not a federally-listed threatened or endangered species, but are protected under the Bald and Golden Eagle Protection Act, the Migratory Bird Act, and the Lacey Act. The Action Area is not within the breeding range for golden eagles; however, low densities of golden eagles may migrate through Ohio, or winter in Ohio, but they are a transient species in the region and are not expected to occur regularly in the Action Area.

Raptor migration surveys conducted in 2008 for the Buckeye Wind Project (Stantec 2009) documented a single bald eagle and single golden eagle in the Action Area during both the spring and fall 2008. Similarly, diurnal bird/raptor migration surveys were conducted during the fall 2008, 2009, and spring 2009 for an unrelated project within the Action Area and ten bald eagles were documented during the fall migration period.

The USFWS provided Buckeye Wind with documentation that private landowners observed two juvenile bald eagles within the southwestern portion of the Action Area during the spring and summer of 2011 and an adult bald eagle was reported in November 2011. Two adult bald eagles were reported east of Mutual by the public in April of 2012. One adult eagle was reported by a resident within the Action Area in May 2012. Additionally, a local newspaper reported an adult bald eagle within the Action Area during fall 2009. The USFWS further investigated specific areas from the local reports of bald eagle activity and searched for potential nests by conducting an on-site visual field inspection in October 2011. No bald eagle nests or activity were observed (M. Cota, USFWS, personal communication, as cited in Stantec 2011). Buckeye Wind has taken steps to proactively avoid or minimize impacts to eagles. These measures are described in more detail in Chapter 5.0 of the ABPP (Stantec 2011a). Should new information regarding eagle use of the Action Area become available from post-construction Breeding Bird surveys conducted by Buckeye Wind in accordance with ODNR Protocol, or from other verifiable information from public agencies during the 30-year term of the ITP, Buckeye Wind will work with USFWS to determine if potential risk exists and if an ITP under BGEPA is appropriate.

4.6 Cultural and Historic Resources

Cultural resources include material remains of past human activities, both from historic and Pre-European contact. In addition, cultural resources include traditional cultural properties, such as areas used for ceremonies or other cultural activities that may leave no material traces, and may have on-going use important to the maintenance of cultural practices. Cultural resources management seeks to identify and protect all of these types of cultural resources with the goals of enhancing understanding of human behavior and protecting cultural practices. This section of the DEIS describes the cultural history of Ohio and the Action Area. Throughout this section, the term “historic property” is used as a cultural resource considered eligible for listing on the

National Register of Historic Places (NRHP) and requiring consideration of potential effects by federal agencies, per the NHPA (36CFR800) (see Chapter 1).

The cultural and historic resources analysis in this DEIS is based on information from literature on the cultural background of the region and site-specific desktop and field studies. Cultural resources studies related to the Project that have been completed to date include a literature review conducted by ASC Group, Inc. in March of 2009 (Tonetti and Terpstra 2009) and two field studies conducted by Cultural Resource Analysts, Inc. (CRA) in 2010 (CRA 2011a and 2011b). The two field studies conducted by CRA include a Phase 1 archaeological survey in the immediate vicinity of Project facilities and a survey for historic structures (i.e., architecture survey) within the viewshed of the Project. Final reports on the results of the CRA surveys were submitted to OHPO in May 2011, and consultation is ongoing (CRA 2011a and 2011b).

4.6.1 Scope of Analysis

The standard methodology for assessment of cultural resources uses two distinct study areas: 1) the direct Area of Potential Effect (APE), which includes any areas of ground disturbance caused by project-related activities; and 2) the visual APE, which includes the viewshed of a project, or the area within which project facilities can be viewed. APE is the standard terminology used by cultural resources agencies and professionals to describe impacts on archaeological and architectural resources. For this Project, the direct APE studied by CRA in their Phase I archaeological survey was the Project Area, specifically including the 52 known turbine locations, Project access roads and buried interconnect lines, the three construction staging areas, and the substation location. For the known turbine locations, a 61-m (200-ft) radius around the proposed turbine center point was studied. Access roads and interconnects were studied using 16.8- and 4.6-m (55- and 15-ft) wide corridors, respectively (CRA 2011a). The visual APE employed by CRA in their historic structure survey was the area within 8 km (5 mi) of Project facilities in accordance with typical visual impact assessment practice in areas where topography is not a controlling factor in defining the viewshed. Within this area, research and survey attempted to identify historic properties that might be affected by the Project (CRA 2011b). CRA's field studies to identify archaeological sites were planned around the 52 known turbine locations and associated Project appurtenances. Following siting of the additional 48 turbines, additional archaeological identification efforts will be conducted as necessary, with plans and reports submitted to OHPO for review, and findings reported through the OPSB process (see Section 1.2.1). In a letter from OHPO dated 27 October 2011, it was confirmed that the architectural studies conducted sufficiently encompassed the Action Area, and additional surveys would not be required for the additional 48 turbines.

4.6.2 Cultural Background

The Paleo-Indian period (ca. 15,000BC to 8,500BC) is traditionally considered the earliest period of human occupation in Ohio. Prior to 15,000BC, Ohio was largely covered by the Wisconsin glacier. As the ice receded and Pleistocene megafauna moved into Ohio, so did Paleo-Indians. The Paleo-Indians were organized in small nomadic hunting and gathering bands, and brought with them the technology and skill necessary to exploit the local resources (Blank 1982). Archaeological remains suggest that seasonal rounds were followed, exploiting hill, bluff, and terrace locations, and, very rarely, caves as campsites. These sites are recognized by archaeologists by scatters of lanceolate projectile points (Prufer and Baby 1963).

The Paleo-Indian people were followed by the Archaic people (ca. 8,500BC to 1,000BC). The Archaic period in Ohio shows a continuation of Paleo-Indian lifeways, modified to accommodate the disappearance of Pleistocene megafauna. A wide variety of small fauna were exploited within a more restricted seasonal round. Archaic tool kits differ significantly from Paleo-Indian tool kits. Projectile points of stemmed, corner-notched, and bifurcate base forms prevail (Prufer and Long 1984).

The Early Archaic (8,000BC-6,000BC) tool kit shows a continued emphasis on hide working and hunting. Wood-working tools, groundstone tools, and atlatl weights become more prevalent in the Middle Archaic (6,000BC-3,500BC) tool kit (Fiedel 1987). Middle Archaic sites also show an apparent increase in fishing, as suggested by net sinkers (Fowler 1959; Funk 1978; Griffin 1983). Regional diversity flourishes in the Late Archaic (3,500BC-1,000BC) archaeological record (Funk 1982; Griffin 1983; Feidel 1987). Modern climate, environment, flora, and fauna were established in Ohio by ca. 4,000BC (Blank 1970; Funk 1978). Populations grew during the Late Archaic as regional cultures adapted to local conditions (Tuck 1977).

The transition from the Archaic to the Woodland period in Ohio is evidenced archaeologically by broad spear points (Shane 1967). The Woodland period (ca. 1,000BC to AD1,600) is distinguished archaeologically by continuously occupied habitation sites, horticulture, agriculture, and grit-tempered cord-marked ceramics. Burial practices are more elaborate than during the Archaic period.

The Early Woodland or Adena Phase (ca. 1,000BC to 100BC) is characterized by elaborate mortuary practices and circular earthworks. The Middle Woodland, or Hopewellian Phase (ca. 100BC to AD600) is characterized by burial mound clusters, geometric earthworks, exotic artifacts and raw materials. The Late Woodland period (AD600-1,600) shows continuation of Hopewellian Phase subsistence strategies, but not of the elaborate mortuary practices. Large nucleated village sites develop as maize agriculture becomes more important, and hunting less important.

At the end of the Woodland period, populations in Ohio began to decrease. While there is no conclusive evidence of the reason for this general population decline, the transmission of European diseases inland from the East Coast through trade goods and inter-group contact is a likely cause (Griffin 1978). Early historic records of which Native American groups had legitimate claim to territories in Ohio during the early contact period are not conclusive (Wallace 1969).

In the 1730s to the 1750s, the Shawnee, Wyandot, and Delaware moved into Ohio. This region was beyond the strongest reach of the Iroquois and served as a refuge for tribes avoiding the Iroquois (Hurt 1996). At this time, the French and the British were vying for control of the Ohio area. The allegiance of the Native American tribes in the area was sought by both the French and the British, not only for the capital gains to be made in trade, but also for military support. The British strategy for obtaining Native American support included generous trading practices. The French, on the other hand, were viewed by the Native Americans as greedy in trade, but they were more willing to take up arms alongside the tribes, or even against them if they were displeased. The balance of power, and the allegiance of the Ohio tribes, swung back and forth between the British and French in the early history of Ohio (Hurt 1996).

4.6.3 Existing Conditions

A literature review (Tonetti and Terpstra 2009) identified known cultural resources in or near the Action Area that may be historically significant using the following records available from the OHPO:

- Online Geographic Information Mapping System;
- NRHP;
- NRHP formal determination of eligibility list;
- NRHP preliminary and consensus determination of eligibility lists;
- Ohio Historic Inventory (OHI);
- Ohio Cemeteries: 1803–2003 (Troutman 2003 as cited in Tonetti and Terpstra 2009); and
- Ohio Archaeological Inventory (OAI).

In summary, the literature review revealed 33 cultural resources listed in the NRHP, including four historic districts, 29 historic sites, and one NRHP determination of eligibility within the Action Area (Tonetti and Terpstra 2009). There are also 839 OHI and 397 OAI records, and 70 cemeteries within the visual APE (Tonetti and Terpstra 2009). OHI and OAI properties have been recorded by cultural resources management professionals and non-professionals and may or may not have an agency determination regarding eligibility for listing on the NRHP.

4.6.3.1 Preliminary Results of Archaeological and Architectural Field Studies

Archaeology

The archaeological survey report (CRA 2011a) states that the survey identified four historic period archaeological sites, five prehistoric sites, and five prehistoric isolated finds (Table 4.6-1). Of these 14 sites, only one (33CH0415) is considered potentially eligible for inclusion in the NRHP (CRA 2011a). The other 13 sites are not considered eligible for inclusion in the NRHP because they are isolated finds or small sites with low number of artifacts that lack historic significance or integrity and so are not likely to yield information important in prehistory (Table 4.6-1).

Archaeological site 33CH0415 is an historic site represented by a variety of artifacts and a cultural feature. An artifact is an object that has been used by humans. A cultural feature is a modification of the physical setting by humans—in this case, an excavated area representing a root cellar or storage pit. The site is located on small knob on a ground moraine overlooking Little Darby Creek. Seven shovel test probes (STPs) were excavated, of which three produced artifacts. The site appears to represent domestic remains, plus the associated pit feature or root cellar. A range of artifacts was recovered, totaling 54 pieces, including Architecture group artifacts such as brick, nails, and window glass; Domestic group artifacts such as ceramic ware and glass ware; and a Faunal group artifact--a single piece of animal bone. Since the site includes a range of artifact groups and a cultural feature, CRA recommended the site potentially eligible, and proposed that further study be conducted to determine the potential eligibility of the site for the NRHP if it cannot be avoided by Project-related activities (CRA 2010a).

The recommendations regarding potential NRHP eligibility of the identified sites presented in this DEIS are considered preliminary until confirmed by the OHPO. In a letter dated October 27, 2011, OHPO concurred with the assessment that additional field work is needed at 33CH0415 and recommended further consultation to consider what treatment measures will be used at the site. Consultation with OHPO is ongoing.

Table 4.6-1 Preliminary Information Regarding Archaeological Sites Identified During the Phase 1 Archaeological Survey

Site Number	Description	Preliminary Finding
33CH0408	Late Woodland / Late Prehistoric site measuring 15 m (49.2 ft) N-S and 5 m (16.4 ft) E-W on terrace. Five STPs excavated to define site boundaries; of these, one STP produced 11 lithic artifacts including 10 pieces of lithic debitage and one flaked stone tool fragment.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0409	Prehistoric site dating to an unknown temporal period measuring 20 m (65.6 ft) N-S and 10 m (32.8 ft) E-W. Four prehistoric lithic artifacts were recovered by pedestrian survey--four pieces of lithic debitage.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0410	Late Woodland to the Late Prehistoric period site measuring 15 m (49.2 ft) N-S and 75 m (246 ft) E-W. Four prehistoric lithic artifacts were recovered within four STPs--three pieces of lithic debitage and one formal flaked stone tool fragment.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0411	Historic site dating to the early to mid-nineteenth century, measuring 30 m (98.4 ft) N-S and 30 m (98.4 ft) E-W. The site assemblage consists of 21 historic artifacts, all recovered from three STPs, including Architecture, Domestic, and Maintenance/ Subsistence groups.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0412	Historic site dating to the early nineteenth century, measuring 35 m (115 ft) N-S and 15 m (49.2 ft) E-W. The artifact assemblage consists of 115 artifacts, all recovered from pedestrian survey, including Architecture, Domestic, Faunal, and Personal groups. Heavily disturbed through agricultural and amateur archaeological excavation activities.	Site has been heavily disturbed through agricultural and amateur archaeological excavation activities, but lacks a comprehensive analysis and write-up to determine if it has the potential to yield new and important information; however, given the preservation objectives established for this project, no further action is recommended.
33CH0413	Prehistoric site of unknown cultural affiliation measuring 40 m (131 ft) N-S and 30 m (98.4 ft) E-W. Four prehistoric lithic artifacts were recovered within four STPs--lithic debitage.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0414	Prehistoric site of unknown cultural affiliation measuring 40 m (131 ft) N-S and 50 m (164 ft) E-W. Fourteen prehistoric lithic artifacts were recovered within six STPs--13 pieces of lithic debitage and one core fragment.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0415	Historic site represented by a variety of artifacts and a cultural feature--a root cellar or storage pit. Seven STPs were excavated, of which three produced 54 artifacts--domestic remains including construction and kitchen materials and associated pit feature or root cellar.	Site includes a range of artifact groups and a cultural feature. Further study should be conducted to determine the potential eligibility of the site for the NRHP if it cannot be avoided by Project-related activities.

Site Number	Description	Preliminary Finding
33CH0416	Prehistoric isolated find site located, from which a fragment of a prehistoric ground and pecked axe bit was recovered. The site was identified by pedestrian survey.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0417	Middle Woodland prehistoric isolated find--a projectile point. The site was identified by pedestrian survey.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0418	Prehistoric isolated find consisting of one formal flaked stone tool recovered during pedestrian survey.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0419	Prehistoric isolated find consisting of one formal flaked stone tool, a projectile point fragment, recovered during pedestrian survey.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0420	Prehistoric isolated find consisting of one informal flaked stone tool recovered during pedestrian survey.	Not considered eligible due to limited size and low number of artifacts; no further action recommended.
33CH0421	Historic site represented by an abandoned mid-nineteenth to twentieth-century railroad bed. The site dimensions are defined as 1400 m x 15 m (4,593 ft x 49.2 ft). The rails and railroad ties have been removed; the feature is no longer in use as a railroad route.	Due to disturbance the site does not have the potential to provide useful data for interpreting history so it is not considered eligible for listing on the NRHP; no further action needed.

Source: Data summarized from CRA 2010a.

Architecture

The architectural report (CRA 2011b) states that 1,475 historic properties were identified within the visual APE (within 8 km [5 mi] of the Project). In addition, portions of Urbana and Mechanicsburg were surveyed for historic district potential. Property types encountered include farmsteads, schoolhouses, cemeteries, churches, crossroads communities, and potential historic districts in Urbana and Mechanicsburg (CRA 2011b). OHPO, in a letter dated October 27, 2011, stated that several buildings and structures warrant further evaluation to determine their eligibility for the NRHP, along with several main street districts listed by name in the letter. OHPO also stated in this letter that no further surveys are required within the area surveyed for additional phases of construction for the Project.

The records search conducted prior to the architectural survey identified 839 resources with assigned OHI numbers and 70 previously recorded cemeteries within the visual APE. The results show that the majority of the previously recorded OHI properties, NRHP listed, or NRHP eligible properties are located along the U.S. 68 corridor, as well as within, or within the vicinity of, Urbana and Mechanicsburg. The previously recorded cemeteries are scattered throughout the survey area. Per the work plan for the architectural survey, not all of these identified properties will be surveyed.

Based on preliminary observations, mid-nineteenth to mid-twentieth century rural residences and farmsteads make up the majority of the surveyed properties. Though most of the farmsteads have undergone some change over the years, including changes to dwellings or the introduction of prefabricated ancillary structures that utilize different materials and are built at a different scale than the historic structures, Champaign County's agricultural pattern of development remains apparent on the landscape. Additionally, the preliminary survey concluded that many of the rural residences and farmsteads appear to retain sufficient integrity to illustrate their historic associations.

The architectural work plan called for the further evaluation of both Urbana and Mechanicsburg for the presence of potential historic districts. Presently, Urbana contains two NRHP-listed historic districts; the Urbana Monument Square Historic District and Scioto Street Historic District. The survey documented a potential historic district along South Main Street comprised of nineteenth and early twentieth-century residences. Mechanicsburg has one NRHP historic district and a Multiple Resource Area (MRA); the Mechanicsburg Commercial Historic District and the Mechanicsburg MRA. The architectural survey identified additional nineteenth and early twentieth-century buildings, mainly residences, which could potentially be eligible for inclusion into the MRA or into a new historic district.

Tribal Resources

While the Project Area is on private land, a state recognized tribe, the Piqua Shawnee Tribe, has historical connections to a burial mound located within the Action Area that was used by ancestors of the Shawnee nation. This mound is known to the Tribe and the local inhabitants of Champaign County as "Indian Mound" and is recorded in Mills' Archaeological Atlas of Ohio, and it also appears on the 1916, 1944, and modern USGS 7.5 minute topographic maps. Pursuant to the American Indian Religious Freedom Act (AIRFA), the USFWS has an obligation to consult with the Piqua Shawnee Tribe regarding the potential impacts of the Project on "Indian Mound." There are no known archaeological artifacts associated with the mound reported in the OAI.

Buckeye Wind and CRA staff met with Piqua Shawnee Tribe representatives to discuss their concerns related to the Project in August 2010, and the Tribe stated that visual impacts to the mound are not a concern to the Tribe—only direct impacts to the mound itself (Michael Anslinger, CRA, Pers. Communication). Construction and operation of the Project would have no direct impact on the mound. In a press release dated September 7, 2010, an elder of the Piqua Shawnee Tribe expressed support for the 52-turbine Project described in the OPSB application, and stated that the Project poses no threat to the mound (Parks 2010).

Pursuant to the NHPA and AIRFA, and in an effort to identify other significant cultural resources that may be affected by the Project, USFWS has initiated consultation with the following tribes, inviting them to comment on whether they attach any religious or cultural significance to the Project location:

- Absentee-Shawnee Tribe of Oklahoma;
- Eastern Shawnee Tribe of Oklahoma;
- Miami Tribe of Oklahoma;
- Ottawa Tribe of Oklahoma;
- Piqua Shawnee Tribe; and
- Shawnee Tribe.

At the time of this DEIS, only the Eastern Shawnee Tribe of Oklahoma indicated an interest in this Project and consultation with this Tribe is ongoing. Also, discussions with the Piqua Shawnee Tribe have been initiated, as described above.

4.7 Land Use and Recreation

4.7.1 Scope of Analysis

The land use and recreation analysis for the DEIS provides a discussion of current and future land use; state, regional, county, and municipal comprehensive plans and regulations; residential structures; agricultural programming; and recreation within the Action Area and the immediate surrounding area. This analysis area was used because the Project has the potential to affect land use patterns and recreational resources beyond the Action Area.

The land use analysis in this DEIS is based on publicly available state, regional, county, and municipal-level planning documents, as well as U.S. Census Bureau and USDA data and information provided in the Buckeye Facility Socioeconomic Report prepared by Saratoga Associates (Saratoga 2009).

4.7.2 Existing Conditions

4.7.2.1 Current Land Use

The Project would be located in portions of the Townships of Goshen, Rush, Salem, Union, Urbana, and Wayne in Champaign County (hereafter "host townships"). In addition, eleven townships, one city, five villages, one census designated place (CDP), and portions of four other counties lie within the Action Area and immediate vicinity. These jurisdictions are listed in Section 4.9.

Table 4.7-1 summarizes land use, by hectare (acre), in the host townships and the townships and communities within and immediately adjacent to the Action Area. Agriculture is the predominant land use. Residential is the largest non-agricultural land use, followed by vacant land and government land (which includes parks, schools, recreation, and other public facilities).

Table 4.7-1 Land Use within and in the Immediate Vicinity of the Action Area

Land Use Classification	Townships Hosting Project		Townships and Communities within and Immediately Adjacent to the Action Area	
	Total Hectares (Acres)	Land Use Percentage	Total Hectares (Acres)	Land Use Percentage
Agricultural	51,493 (127,243)	86.8	72,408 (178,923)	80.4
Commercial	319 (789)	0.5	668 (1,651)	0.7
Forestry	85 (211)	0.1	303 (749)	0.3
Government	851 (2,104)	1.4	2,453 (6,062)	2.7
Manufacturing	37.6 (93)	0.1	1,008 (2,491)	1.1
Minerals and Oil	94 (232)	0.2	0 (0)	0.0
Non-Commercial	52 (128)	0.1	206 (508)	0.2
Residential	4,778 (11,806)	8.1	9,428 (23,298)	10.5
Utilities	0 (0)	0.0	0 (0)	0.0
Vacant[1]	1,640 (4,052)	2.8	3,096 (7,650)	3.4
Undesignated	0 (0)	0.0	513 (1,267)	0.6

[1] Defined as unused agricultural, commercial, industrial, or residential land.
Saratoga Associates 2009

Residential development within 8 km (5 mi) of the Project consists almost entirely of single-family homesteads located on rural roads. Construction and operation of the Project would involve leasing privately owned predominantly agricultural land from between 100 and 140 landowners. The relatively small amount of land being used for commercial and industrial properties is consistent with the rural characteristics of the communities within the immediate vicinity of the Action Area.

4.7.2.2 State, Regional, and Local Land Use Planning

Within the State of Ohio, land use planning occurs at multiple levels of government, including state, region, county, township, and municipal jurisdictions. The goals and objectives stated in comprehensive plans and regulations written by these agencies provide indications of community values and attitudes relevant to new development and the use of the land. The plans and regulations provide guidance for important land use decisions that have the ability to affect more than one jurisdiction, such as wind energy.

State Land Use Planning

The Ohio Power Siting Board

The OPSB regulates all proposed wind power projects in Ohio capable of generating five or more MW of electricity (OPSB 2008). With regard to land use, OPSB siting requirements include, but are not limited to: an analysis of land use within a 8 km (5 mi) radius of the facility; a determination of the number of residential structures within 305 m (1,000 ft) of the boundary of the facility; a description of the turbine locations in relation to property lines; and an evaluation of established setbacks (OPSB 2008). The 52-turbine Project received its OPSB Certificate on March 22, 2010. In September of 2011, an appeal was filed with the Supreme Court of Ohio by Goshen, Union and Salem Townships and Champaign County and by the Union Neighbors United against the certification. On March 6 2012, the Ohio Supreme Court upheld OPSB's certification of the Project. Refer to Section 1 and Appendix A of this DEIS for a more detailed record of the OPSB process related to the Project.

Champaign Wind LLC has initiated the OPSB application procedure for the Buckeye II Wind Project, consisting of about 56 turbines (no more than 100 total turbines will be constructed between the already certificated turbines plus those proposed for the Buckeye II Wind Project). The Buckeye II Wind Project will be transferred to Buckeye Wind prior to construction. A public information meeting for Champaign Wind LLC was held on January 24, 2012. Champaign Wind LLC's record of public interaction is available through the PUCO Docketing Information System (http://dis.puc.state.oh.us/CaseRecord.aspx?CaseNo=12-0160-EL-BGN).

State Zoning and Land Use Controls

Cities and villages (i.e., incorporated areas) in Ohio have the authority to administer zoning and regulate their own land use. These geographic areas are not reliant upon a state board to assist in this regulation. However, these regulations must be consistent with the Ohio Revised Code (ORC) unless they have adopted a charter, which can give the municipality broader zoning and other powers (Stamm 1999).

Townships administer zoning in unincorporated areas (outside incorporated cities and villages) unless the township has voted to let the county administer zoning, which is called county zoning. Approximately 16 percent of counties in Ohio have county zoning in at least one township. Like municipalities, townships and counties must administer zoning according to the ORC (Stamm 1999).

While these zoning regulations generally apply within the Action Area, wind facilities that have capacity over 5 MW and receive OPSB certification are exempt from local regulatory oversight. While local approvals are not required for construction and operation of the Project, zoning regulations provide insight into future development of the region. Accordingly, the remainder of this section discusses regional and local land use planning.

Regional Land Use Planning

Regional/metropolitan planning councils provide assistance to local government agencies for land use decisions. These organizations assist member counties with land use planning by providing technical assistance and assuring that land use and development are compatible with community needs that extend beyond local jurisdictions. These organizations are also useful repositories of community statistics.

Champaign County is a part of the Logan-Union-Champaign Regional Planning Commission (LUCRPC). The LUCRPC is charged under Ohio Law with certain responsibilities for its member counties. Among them are the review and approval of subdivisions located in unincorporated areas and the review and recommendation to township zoning commissions concerning zoning amendments. The Commission also acts as an Area-Wide Clearinghouse for applicants who request federal and state assistance for selected projects. The LUCRPC has a number of committees that address specific land use topics. For instance, the Agricultural Zoning/Farmland Preservation Committee provides assistance with agricultural model zoning regulations to help the conservation of this type of land (LUCRPC 2006).

Madison and Union Counties are members of the Mid-Ohio Regional Planning Commission (MORPC), which serves the metropolitan Columbus area. MORPC provides similar services for its member counties as the LUCRPC.

While the LUCRPC and the MORPC do not regulate land use within the individual counties, the organizations can assist in coordinating the development of wind farms that cross jurisdictional boundaries, especially among member counties.

Local Land Use Planning

The following sections describe land use planning within Champaign County, the Project's host county, as well as Clark, Logan, Madison, and Union Counties which fall partially within 8 km (5 mi) of the Project. Most county and local land use regulations, including zoning ordinances, apply to wind farms with a capacity under 5 MW and thus do not apply to the Project.

Champaign County

Like much of Central Ohio, Champaign County is primarily rural. According to its 2004 Comprehensive Plan update, however, one of the greatest challenges within the county is managing growth and development, while maintaining a rural character. The county is

surrounded by six other counties, which include the Dayton-Springfield and Columbus metropolitan statistical areas (MSAs). These areas have spawned extensive urban and suburban growth, which has affected the development of Champaign County. Consequently, the County's Comprehensive Plan focuses on creating a development strategy to preserve the county's rural character (Champaign County 2004). This plan is a publicly accepted document used to guide future land use decisions.

Among the host townships, only Goshen and Union Townships have local ordinances related to wind power facilities. While these ordinances only apply to facilities generating less than 5 MW (and are thus not applicable to the Project), the Applicant has attempted to incorporate design standards, setback requirements, and other characteristics that are consistent with the intent of these local regulations. For instance, setback requirements from parcel lines for Union Township are 180 m (590 ft), whereas Chapter 4906-17-08(C)(1)(c)(i) of the OPSB requirements suggest that setbacks from parcel lines must be at least 165 m (541 ft). As indicated in the application for the OPSB Certificate, all known turbine locations in Union Township would comply with this township setback, unless exempted by waiver agreements with landowners (EDR 2009a). Buckeye Wind II will also comply with the required OPSB setback, at a minimum.

Clark County

Similar to other counties within the Action Area and overlapping counties, Clark County's 1999 Comprehensive Plan is intended to help the county guide their land use decisions and capital improvements. As stated within the Comprehensive Plan, the "essence of the Plan is to manage the County's growth while preserving farmland and open space, diversifying the economic base and ensuring sufficient utility services." Consequently, two of the primary goals of this plan are to conserve agricultural land and to focus growth and development in appropriate areas of the county (Clark County 1999).

Logan County

Logan County released an update to their county comprehensive plan in 2007. The majority of the land in the county is zoned U-1 Rural Undeveloped District. This designation is for land that is suitable for agriculture, conservation, very low-density residential and public and quasi-public purposes. Consequently, many of the county's land use goals involve preserving the rural character of the county, sustainable land use, the conservation of agricultural land, and respecting the integrity of the natural environment through land use decisions (Logan County Soil & Water Conservation District and Logan County Commissioners 2007).

Madison County

According to the 2005 Madison County Comprehensive Plan, the general character of land use in the County is predominantly agricultural—accounting for some 94 percent of the County's land area. Given the predominant agricultural land use, many of the county's primary land use goals involve the conservation of agricultural land and respecting the integrity of the natural environment through land use decisions (Madison County Commissioners 2005).

Union County

In Union County, the overall land use goal is to "…establish a coordinated and consistent land use system based on intergovernmental cooperation, planned controlled growth and innovative land use controls that facilitate and strengthen rural character, small towns and Union County's quality of life" (Union County 1999). Like Champaign County, Union County does not provide zoning regulations at the county level. However, as part of the comprehensive plan, township zoning is encouraged to provide for agricultural conservation. This is in part due to the importance of agriculture for the county economy (Union County 1999). According to the 1999 Comprehensive Plan, agricultural/vacant land use encompasses the largest land use category in the county. For instance, along the U.S. 33 corridor, agricultural/vacant land accounts for approximately 97 percent of the land use. The County also encompasses federal and state scenic rivers, including the Big and Little Darby Creeks (Union County 1999).

Local Comprehensive Plans – Future Land Use

Comprehensive land use plans for Champaign, Clark, and Madison Counties do not recommend changes to the rural-agricultural land use pattern. The land use policies in these plans emphasize the need to preserve and protect agricultural lands and open space. In particular, the comprehensive plans seek to ensure viability of agricultural economy by limiting development that takes agricultural land out of production, limiting costly public infrastructure, and limiting land-intensive sprawling development patterns (Clark County 1999, Champaign County 2004, Madison County 2005).

4.7.2.3 Residential Structures

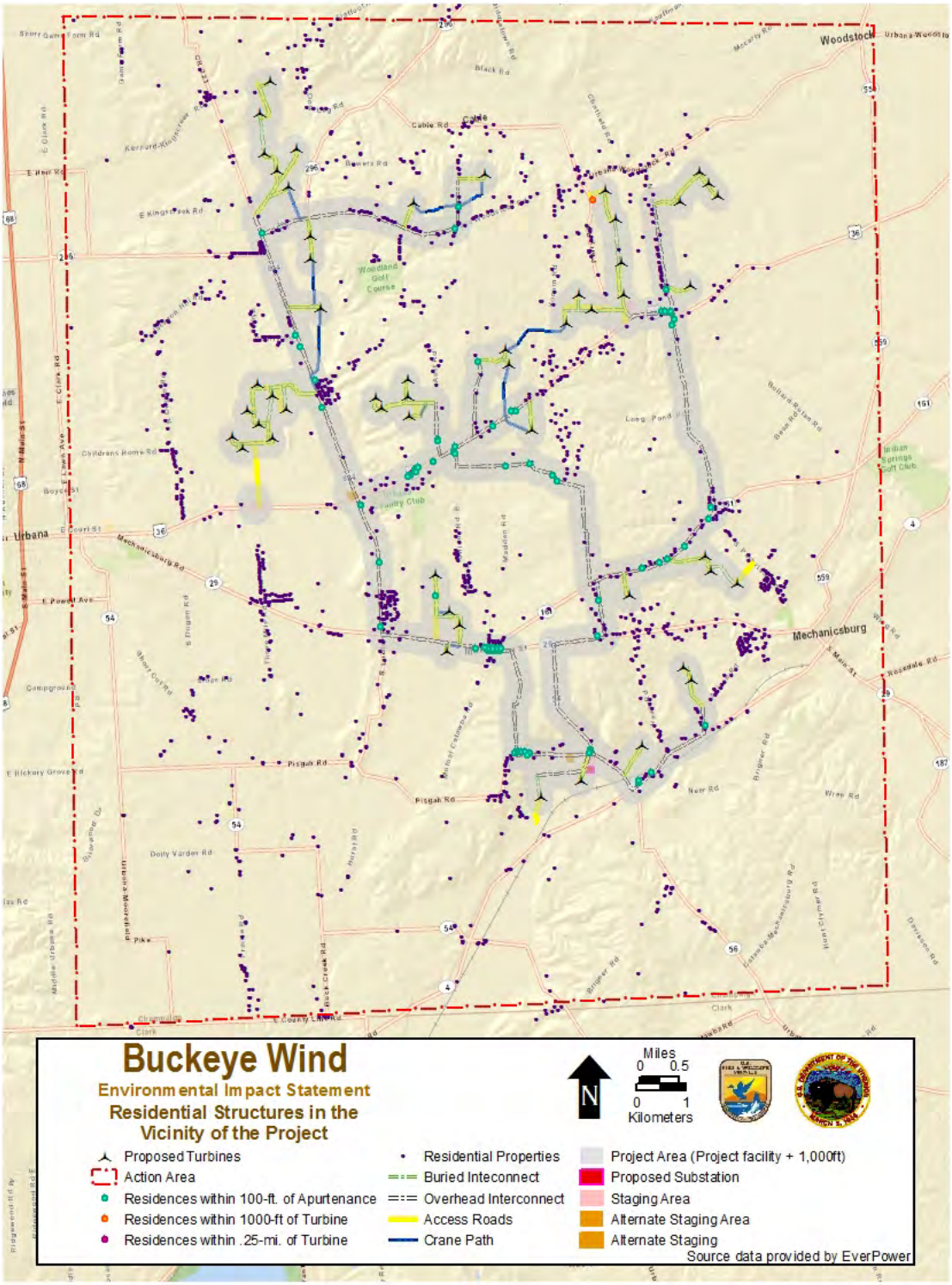
Because the Project is subject to the OPSB Certificate, local zoning and land use controls are not applicable. Therefore, property lines and residential structures are discussed in relation to the Project Area boundary, pursuant to OAC Section 4906-17-08(C)(1)(b-c) (EDR 2009a). Key OAC requirements include:

- OAC Section 4906-17-08(C)(1)(c)(i) requires that "the distance from a wind turbine base to the property line of the wind farm shall be at least 1.1 times the total height of the turbine structure as measured from its tower's base (excluding the subsurface foundation) to the tip of its highest blade" (Stantec 2010b). Based on a turbine height of 150 m [492 ft], the approximate distance to the property line should be approximately 165 m (541 ft) (i.e., 150 m [492 ft] multiplied by 1.1).
- OAC Section 4906-17-08(C)(1)(c)(ii) requires that "the wind turbine shall be at least 750 ft in horizontal distance from the tip of the turbine's nearest blade at ninety degrees to the exterior of the nearest habitable residential structure, if any, located on adjacent property at the time of Certificate Application." The maximum rotor diameter of a turbine under consideration for the Project is 100 m (328 ft). If the turbine blade was at 90 degrees (i.e., parallel with the ground), the tip would extend from the base of the tower one-half the length of the rotor diameter, or 50 m (164 ft), which added to 228.6 m (750 ft), yields a total setback of 278.6 m (914 ft) (Stantec 2010b).

In compliance with OAC requirements, the Project has been designed so that all turbines would be a minimum of 278.6 m (914 ft) from the nearest permanent residential structure and 180 m (590 ft) from the nearest property line. Specifically, the distance between residential structures

and the closest turbine ranges from 284 m (932 ft) to 1,373 m (4,503 ft) (Figure 4.7-1). Buckeye Wind II must also comply with required setbacks from property lines and residential structures.

Figure 4.7-1 Residential Structures in the Vicinity of the Project



4.7.2.4 Agricultural Preservation

The Action Area contains parcels of land enrolled by landowners in the Conservation Reserve Program (CRP), managed by the Farm Service Agency (FSA) of the USDA. Farmers with land enrolled in the CRP can receive financial reimbursements for the withdrawal of farmland from production for conservation purposes (FSA 2009b). For Champaign County, the average CRP rental payment was $243.99 per ha ($98.74 per ac) in fiscal year (FY) 2010, with 1,847 ha (4,563 ac) enrolled (FSA 2012).

As of August 2010, CRP enrolled land in the host townships containing the Action Area totaled 1,253 ha (3,096 ac), distributed as follows (USDA, 2010):

- Goshen Township – 480.90 ha (1,188.34 ac);
- Rush Township – 177.94 ha (439.69 ac);
- Salem Township – 26.56 ha (65.62 ac);
- Union Township – 255.72 ha (631.89 ac);
- Urbana Township – 26.52 ha (65.54 ac); and
- Wayne Township – 285.32 ha (705.05 ac).

CRP's national policy allows the construction and operation of wind turbines on formally enrolled properties. County CRP Committees may approve up to 2 ha (5 ac) of wind-powered generation devices per CRP contract. The 2 ha (5 ac) per contract threshold is a cumulative figure that is calculated by totaling the square footage of land area devoted to the footprint of the wind-powered generation device and any firebreak installed around the footprint. Access roads, transformers, and other ancillary equipment associated with the turbines are not considered part of the footprint, and may need to be withdrawn from CRP. Doing so may involve financial penalties, such as returning all CRP payments to USDA, including annual rental payments, interest, cost share plus interest, and liquidated damages (FSA 2009b). The CRP participant may also choose to remove the wind turbine's footprint from CRP (FSA 2009b).

Table 4.7-2 indicates the average crop rental payments per hectare (per acre) for FY 2007-2010, and Table 4.7-3 shows the number of hectares (acres) under contract during the period from 2006–2011. Within the Action Area, four landowners have lands currently under CRP contract, encompassing approximately1,253 ha (3,096 ac) (USDA 2010).

Table 4.7-2 Average Conservation Reserve Program Rental Payments ($ per hectare [$ per acre]) by County

County	FY 2007	FY 2008	FY 2009	FY 2010
Champaign	230.62 (93.33)	236.28 (95.62)	241.40 (97.69)	243.99 (98.74)
Clark	247.90 (100.32)	260.55 (105.44)	265.74 (107.54)	269.15 (108.92)
Logan	194.08 (78.54)	209.62 (84.83)	213.40 (86.36)	215.82 (87.34)
Madison	337.69 (136.66)	374.83 (151.69)	388.00 (157.02)	393.84 (159.38)
Union	265.44 (107.42)	300.48 (121.60)	322.92 (130.68)	340.26 (137.70)

Source: FSA 2012

Table 4.7-3 Hectares (acres) within the Conservation Reserve Program by County[1]

County	2006	2007	2008	2009	2010	2011
Champaign	1,942 (4,798)	2,056 (5,080)	2,006 (4,956)	1,955 (4,831)	1,847 (4,563)	1,966 (4,859)
Clark	606 (1,497)	616 (1,522)	567 (1,402)	652 (1,388)	558 (1,379)	564 (1,394)
Logan	4,910 (12,132)	4,964 (12,266)	3,973 (9,817)	3,764 (9,302)	3,677 (9,086)	3,620 (8,945)
Madison	2,647 (6,540)	3,194 (7,892)	3,073 (7,593)	2,894 (7,150)	2,849 (7,039)	2,694 (6,656)
Union	2,705 (6,685)	3,647 (9,013)	3,822 (9,445)	3,921 (9,688)	4,055 (10,019)	4,159 (10,278)

Source: FSA 2012
[1] Hectares (acres) under Contract as of September 30, 2011

4.7.2.5 Recreation

Recreational resources within the Action Area and immediate vicinity include state and municipal parks, state nature preserves, country clubs and golf courses, and lakes and waterways. A total of 16 designated recreational facilities have been identified within this area. In addition, the roads and trails within the area may be used by residents for recreational biking, walking, or running. No designated hiking trails or off-road vehicle (ORV) trails are located in close proximity to the Project (Stantec 2010b).

Figure 4.7-2 shows the location of the recreational facilities within the Action Area and immediate vicinity and Table 4.7-4 lists these recreational facilities. Detailed information is available only for some of the recreational parks and is provided in the section below.

Figure 4.7-2 Recreation Facilities in the Action Area and Immediate Vicinity

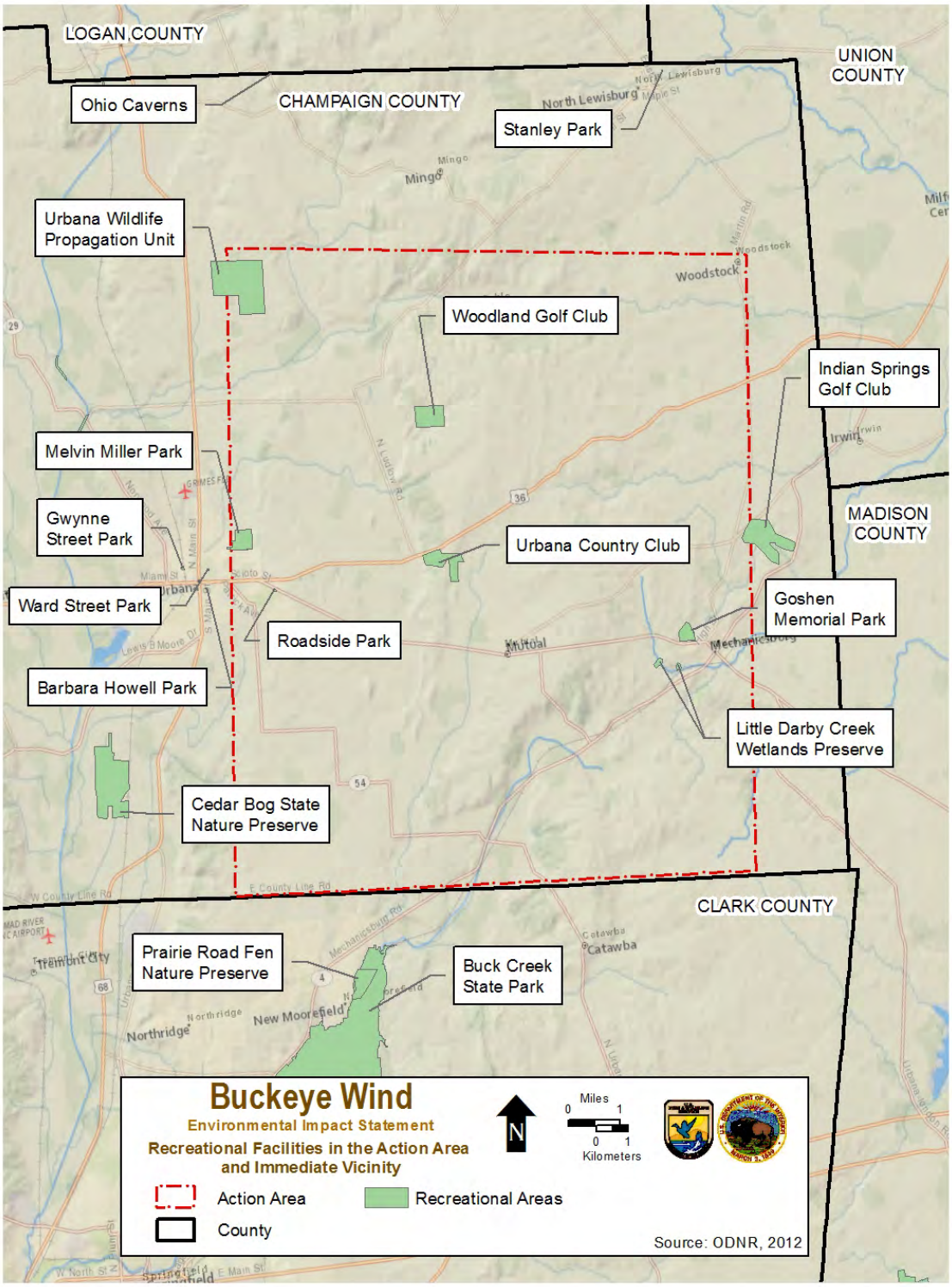


Table 4.7-4 Recreational Areas within and in the Immediate Vicinity of the Action Area

Recreational Area	Location and Approximate Distance to Project	Area Description
Barbara Howell Park	City of Urbana, Champaign County 0.8 km (0;5 mi) from Action Area	Small city park
Buck Creek State Park	Buck Creek Lane in Springfield Town of Monroe, Clark County 3.3 km (2.0 mi) from Action Area	858-ha (2,120-ac) reservoir with cottages, camping, boating, hunting, fishing, picnicking, hiking, sporting fields, disc golf owned by Ohio State Parks
Cedar Bog State Nature Preserve	Woodburn Road City of Urbana, Champaign County 3.7 km (2.3 mi) from Action Area	173-ha (427-ac) boreal and prairie fen complex owned by Ohio Historical Society
Little Darby Creek Wetlands Preserve	Mechanicsburg Town of Goshen, Champaign County Within Action Area	12-ha (30-ac) conservation easement protected by the Nature Conservancy
Goshen Memorial Park	Parkview Road in Mechanicsburg Town of Goshen, Champaign County Within Action Area	Public park with sporting fields, tennis courts, playground, picnic areas, pavilion, multi-purpose building, amphitheater
Gwynne Street Park	City of Urbana, Champaign County 1.5 km (0.94 mi) from Action Area	Small city park
Indian Springs Golf Club	State Route 161 in Mechanicsburg Town of Goshen, Champaign County Portions within Action Area	Public, 18-hole golf course
Melvin Miller Park	City of Urbana, Champaign County Within Action Area	City park including pond, municipal pool, sporting fields, tennis courts, basketball courts, playgrounds
Ohio Caverns	State Route 245 in West Liberty Town of Salem, Champaign County 4.3 km (2.7 mi) from Action Area	14-ha (35-ac) private park with 400 million-year old limestone caverns
Prairie Road Fen Nature Preserve	Town of Moorefield, Clark County 2.5 km (1.5 mi) from Action Area	38-ha (94-ac) state preserve; access by permit only
Roadside Park	City of Urbana, Champaign County Within Action Area	Small city park
Stanley Park	Village of North Lewisburg Champaign County 4.6 km (2.9 mi) from Action Area	Small village park
Urbana Country Club	US Highway 36 in Urbana Town of Union, Champaign County Within Action Area	Private facility with 18-hole golf course, swimming pool, tennis courts, restaurant, clubhouse
Ward Street Park	City of Urbana Champaign County 0.7 km (0.5 mi) from Action Area	Small city park
Woodland Golf Club	Swisher Road in Cable Town of Union, Champaign County Within Action Area	Public, 18-hole golf course
Urbana Wildlife Propagation Unit	Short Game Farm Road in Urbana Champaign County Within Action Area	Wildlife research area managed by ODNR

Parks

Parks within the Action Area and immediate vicinity include one state park, three nature preserves, and seven city or village parks (Figure 4.7-2). Privately owned caverns and a state wildlife breeding facility are also located within the analysis area. Larger parks, such as the Buck Creek State Park, offer a variety of recreational resources. Smaller parks, such as municipal parks, generally provide playgrounds and sport fields.

Buck Creek State Park is one of the largest recreational facilities in the area. The park includes a 855-ha (2,120–ac) lake surrounded by 767 ha (1,896 ac) of land. Only the northern section of the park is located within the area analyzed. Cottages and campground areas are available at the Buck Creek State Park, and recreational activities include boating, swimming, hunting (from October 15 to March 1), fishing, picnicking, biking, hiking, and bird watching. In wintertime, recreational activities permitted at the park include snowmobiling, sledding, ice fishing and cross-country skiing (ODNR 2010e).

Cedar Bog Nature Preserve comprises 173 ha (427 ac) of boreal and prairie fen habitat (ODNR 2010b). Boardwalks and gravel trails extend through the preserve, providing opportunities for wildlife and nature viewing. The preserve is open daily between April and September, and by appointment only from October through March (CBA 2004).

Goshen Memorial Park offers a variety of recreational facilities, including tennis courts, horseshoe pits, picnic tables, and grills. The park has two shelters, a multi-purpose building, a stage, a natural amphitheater, and a large shelter house (Champaign CVB 2010).

Melvin Miller Park is the City of Urbana's main park. It contains a pond, the Wendell Stokes Municipal Pool, 13 ball fields, 13 soccer fields, eight tennis courts, two basketball parks, a skate park, and several playgrounds. The Champaign County Arts Council sponsors Concerts in the Park here (Champaign CVB 2010).

Ohio Caverns are the largest cave system in Ohio and are open year-round to the public. Guided tours are offered through two sections of the caverns. A 14-ha (35-ac) park is located above the caverns and contains a shelter house and picnic tables (Ohio Caverns 2010).

Golf Courses

Three golf facilities are located within 8 km (5 mi) of the Project (Figure 4.7-2). The Indian Springs Golf Club offers a public 18-hole golf course and driving range located near the city of Mechanicsburg. The Urbana Country Club is a private 18-hole golf course that also contains tennis courts, a pool, and a club house with a restaurant (UCC 2010). The Woodlands Golf Course is a public 18-hole course with a driving range and a putting green. It also offers banquet facilities for groups of 40 to 160 people (Woodland 2010).

Waterbodies

The majority of water features within 8 km (5 mi) of the Project are small streams and ponds that occur on private land that receive little recreational use. The C.J. Brown Reservoir, located within the Buck Creek State Park, provides public access to the 858-ha (2,120-ac) lake through a four-lane launch ramp, as well as a marina with 186 seasonal dock spaces. Boating is considered

a popular activity and the lake is used by power boats, sail boats, kayaks, and fishing boats (Buck Creek 2009).

Bike Trails

Simon Kenton Bike Path is a 28.8-km (17.9-mi) paved bike trail that connects the cities of Urbana and Springfield. Around 1.5 mi of the northeastern end of the trail falls within the Action Area. The trail follows the abandoned Erie-Lackawanna rail line, paralleling U.S. Route 68. Approximately 13 km (8 mi) of the trail are located in Champaign County, with the remainder of the trail located in Clark County. The trail connects with other bike trails beyond the Action Area and vicinity, and is adjacent to the Melvin Miller Park and the Cedar Bog State Nature Preserve (Miami Valley Trails 2010).

Hunting

Hunting within the State of Ohio is allowed (with a license, appropriate permits, and permission from landowners) on both public and private land. As in other states, annual limits may govern when and how much wildlife can be harvested (ODNR 2010c).

The following animals may be hunted during the appropriate season: white-tailed deer, wild turkey, waterfowl, mourning dove, ruffed grouse, ringneck pheasant, northern bobwhite quail, eastern cottontail rabbit, squirrel, fox, raccoon, opossum, skunk, weasel, crow, coyote, wild boar, and groundhog. Fur-bearing animals that may be trapped include fox, raccoon, opossum, skunk, weasel, mink, muskrat, beaver, and river otter (ODNR 2010c).

Buck Creek State Park provides hunting opportunities on public land during the park's hunting season that runs from October 15 to March 1. No Wildlife Areas designated for hunting are located within 8 km (5 mi) of the Project (ODNR 2010a).

ODNR hunting statistics are limited for the five counties surrounding the Project. In 2011, 87 wild turkeys were noted in the spring harvest in Champaign County; 17 in Clark County; 159 in Logan County; four in Madison County; and 37 in Union County. These counties are not open to fall hunting of wild turkeys (ODNR 2010d and ODNR 2011a). During the 2010-2011 deer hunting seasons, 1,704 deer were harvested in Champaign County; 967 in Clark County; 2,315 in Logan County; 592 in Madison County; and 967 in Union County (ODNR 2011b).

Fishing

A fishing license is required to take fish, frogs, or turtles from Ohio waters. Fishing is also permitted in privately owned ponds, lakes, or reservoirs. In locations where fish do not migrate, licenses are not required to participate in fishing activities. For example, the C.J. Brown Reservoir, located in the Buck Creek State Park, is a public fishing lake stocked with walleye, channel catfish, and white crappies. A number of other species are also present. In addition to the C.J. Brown Reservoir, the streams and rivers located within 8 km (5 mi) of the Project may be used by recreational fishermen, although data on specific fishing efforts were not available.

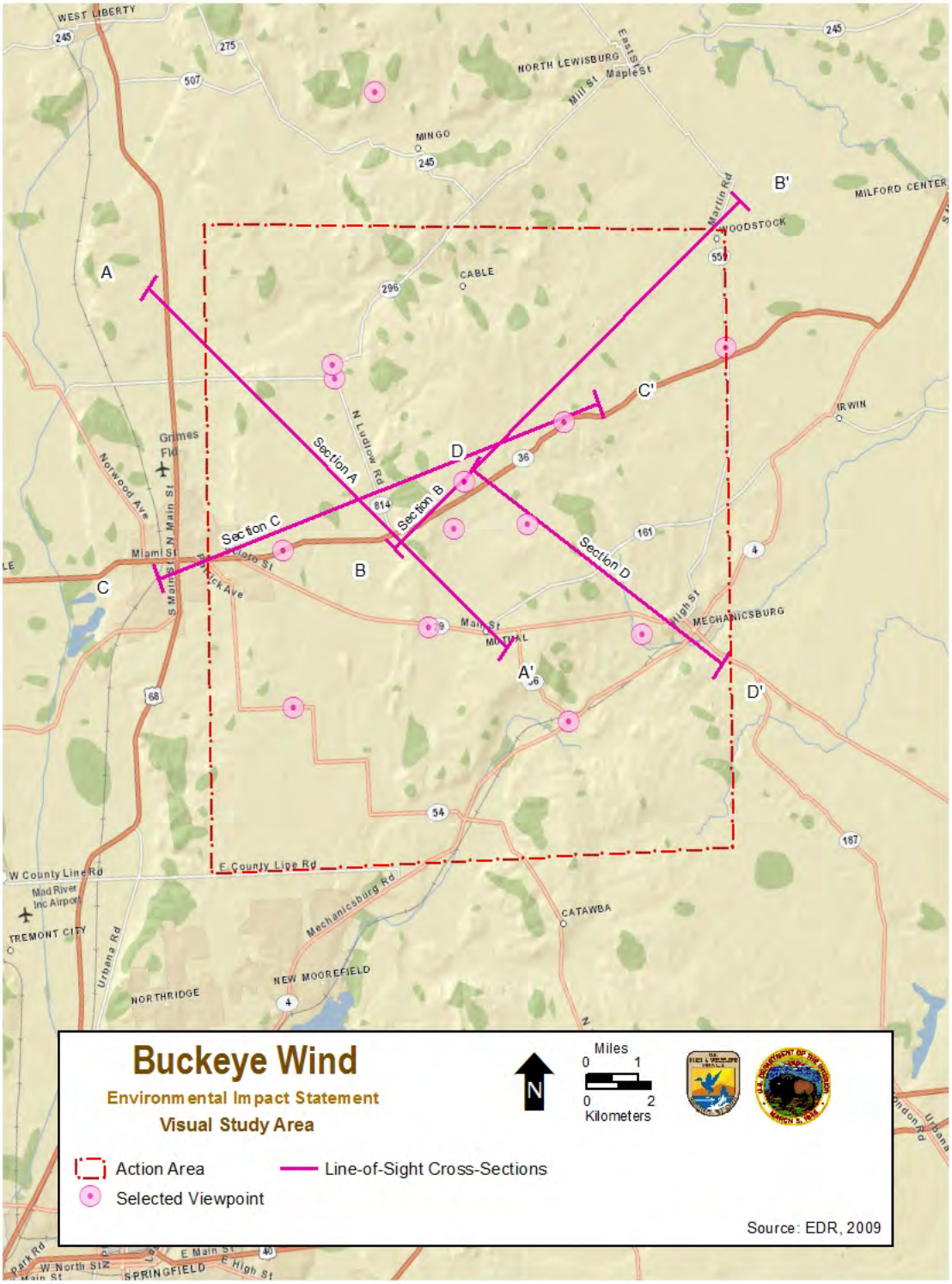
4.8 Visual Resources

4.8.1 Scope of Analysis

The following section describes the landscape and visual resources/receptors within the Action Area and the surrounding visual study area. This area encompasses a 5-mile radius around the proposed turbine sites, and includes much of eastern Champaign County and is illustrated in Figure 4.8-1. The analysis of visual resources in this DEIS was conducted within the Action Area and surrounding viewshed, in accordance with typical visual impact assessment practice in areas where topography is not a controlling factor in defining the visual study area. This analysis is based on information gathered from review of aerial photography, site photographs, and the site-specific Visual Impact Assessment (VIA) conducted for the Project (EDR 2009b; Appendix H).

While the VIA conducted by EDR in 2009 focused on the 70 turbines that were included in the original OPSB Application, the general conclusions can be broadly applied to an incrementally larger 100 turbine Project in the same area. In addition, Buckeye Wind will include a VIA in any application to the OPSB for the additional turbine locations. The architectural studies completed for compliance with NHPA consider a 100 turbine layout, providing further assessment of the visual resources of the area (see Section 4.6).

Figure 4.8-1 Visual Study Area



4.8.2 Existing Conditions

4.8.2.1 Landform and Vegetation

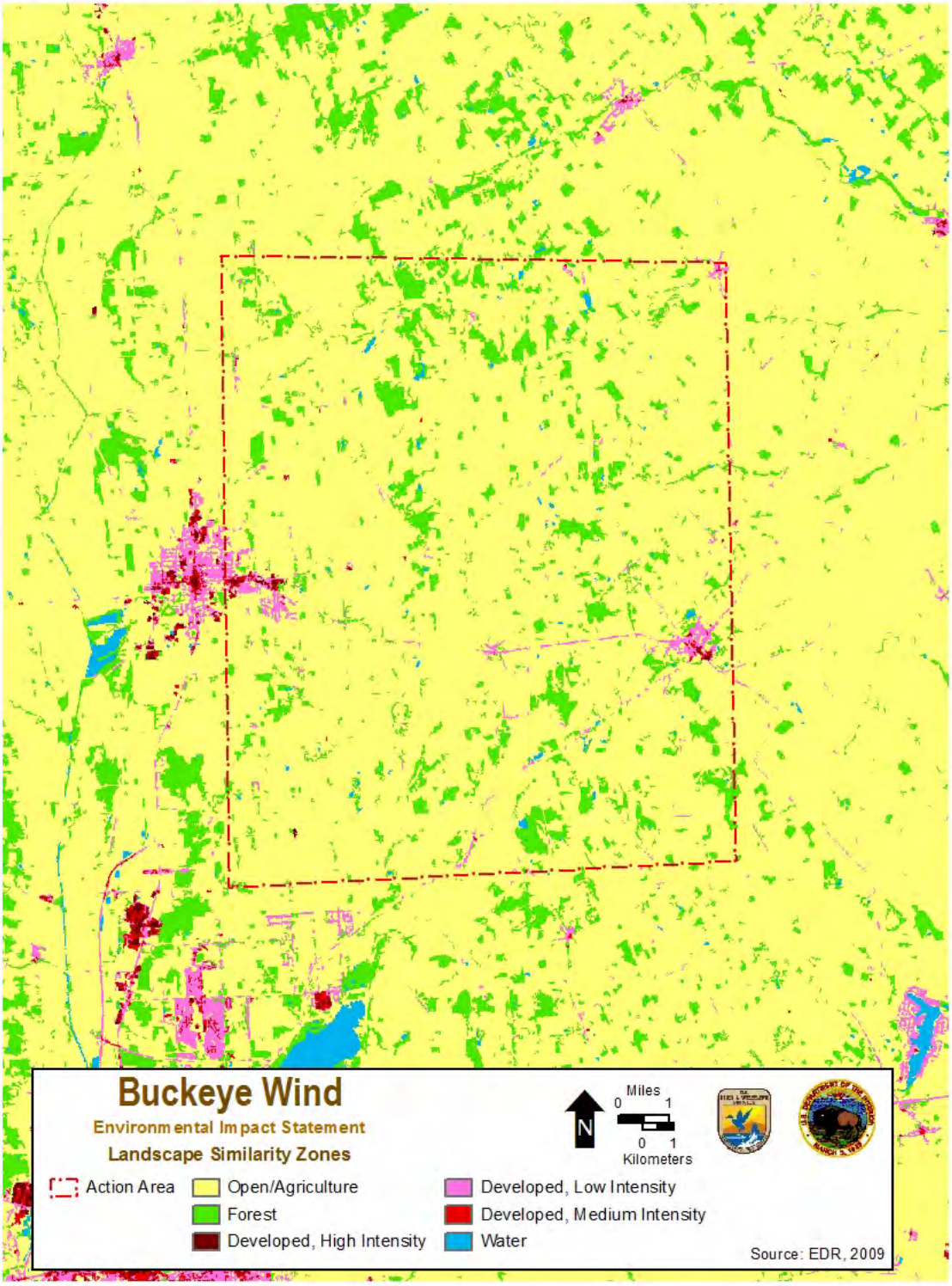
The Action Area and surrounding visual study area (VSA) is generally characterized by rolling hills and moderate slopes. Higher elevation land occurs along a dissected plateau that is oriented in a north-south direction through the central portion of the study area. Level, lower elevation plains occur to the east and west, and broad valleys associated with the Mad River and Buck Creek occur to the southwest and south, respectively.

The predominance of agricultural activity, typically pasture and crops such as soybeans, corn, wheat, and hay, defines the vegetation pattern in much of the Action Area and surrounding landscape. Forest and shrub land is interspersed through the Action Area and surrounding visual study area, frequently following water bodies or along steeper slopes. The city and villages are generally characterized by a main street business district surrounded by traditional residential neighborhoods with some commercial development along the outskirts. Hamlets within the study area are relatively small points of development within a rural/agricultural landscape. Suburban residential and commercial development occurs outside the cities and villages, primarily in the southwestern portion of the study area. Outside the areas of concentrated human settlement, commercial/industrial uses within the study area occur along certain portions of state and county highways in the area. These include automobile dealerships, retail/convenience stores, farm suppliers, and equipment yards (EDR 2009b).

4.8.2.2 Landscape Similarity Zones

Using criteria established by various federal agencies, there are several Landscape Similarity Zones (LSZs) within the Action Area and the surrounding visual study area. The LSZ "represents a physiographic area of land that has common characteristics of landform, water resources, vegetation/ecosystems, land use, and land use intensity" (Smarden et al. 1988). The major LSZs include Rural Residential – Agricultural; City – Village; Suburban Residential; and Hamlet (Figure 4.8-2). Descriptions of these LSZs, as presented in the Project Visual Impact Assessment (EDR 2009b), are provided below.

Figure 4.8-2 Landscape Similarity Zones



Rural Residential – Agricultural LSZ

The Rural Residential – Agricultural LSZ dominates the landscape and occurs throughout the Study Area. The landscape is characterized by level to gently rolling topography with a mix of farms and rural residences, open fields, hedgerows, and small woodlots. Open fields tend to occur on level ground while woodlots and bands of forest vegetation occur more commonly on steeper slopes and poorly drained areas. Due to the presence of open fields, views within this LSZ are more open and expansive compared to other zones. These views typically include a level to gently sloping foreground landscape with woodland vegetation in the background.

Typical View in the Rural Residential - Agricultural LSZ (source EDR 2009b)

City – Village LSZ

The City – Village LSZ includes the City of Urbana and various villages. This zone is characterized by high to medium-density residential and commercial development. Buildings (typically 2-3 stories tall) and other man-made features dominate the landscape. These features are highly variable in their size, architectural style, and arrangement. Views within this zone are typically focused on the roadways and adjacent structures. Outward views occur most often at open road corridors, across yards and adjacent fields, and at the edges of the City – Village LSZ where structures and vegetation density decrease and screening is reduced.

Typical View in the City – Village LSZ (Source: EDR 2009b)

Suburban Residential LSZ

The Suburban Residential LSZ is dominated by low- to medium-density residential neighborhood development that typically occurs along the main road frontage or in cul-de-sacs. Examples can be found on the outskirts of the City of Urbana and in Northridge (a northern suburb of Springfield, Ohio). Buildings tend to be of relatively new construction, one to two stories in height, and are more spread out than in the City – Village LSZ. Open views are more available than in the City – Village LSZ, yet are generally more restricted than in the Rural Residential – Agricultural LSZ. The effect of vegetation on visibility is highly variable in the Suburban Residential LSZ. Adjacent agricultural fields offer open views in some places while hedgerows, woodlots, and yard trees significantly block views in others. Land use in this zone is almost exclusively residential; this suggests a relatively high sensitivity to visual quality and change.

Typical View in the Suburban Residential LSZ (Source: EDR 2009b)

Hamlet LSZ

The Hamlet LSZ generally consists of a cluster of residential and municipal structures often at the intersection of two or more highways. Houses are a mix of traditional and more modern architectural styles with spacing similar to that in a village setting. However, they also tend to have larger backyards and may border active or inactive agricultural land and/or woodlots. Occasional commercial establishments, churches, and historic structures are found in some of the Hamlet LSZs. Views within this zone are typically focused on the highway and adjacent structures; outward views occur across yards and adjacent fields. Extensive views occur from the edges of the Hamlet LSZ, where housing and vegetation density decrease and screening is reduced.

Typical View in the Hamlet LSZ (Source: EDR 2009b)

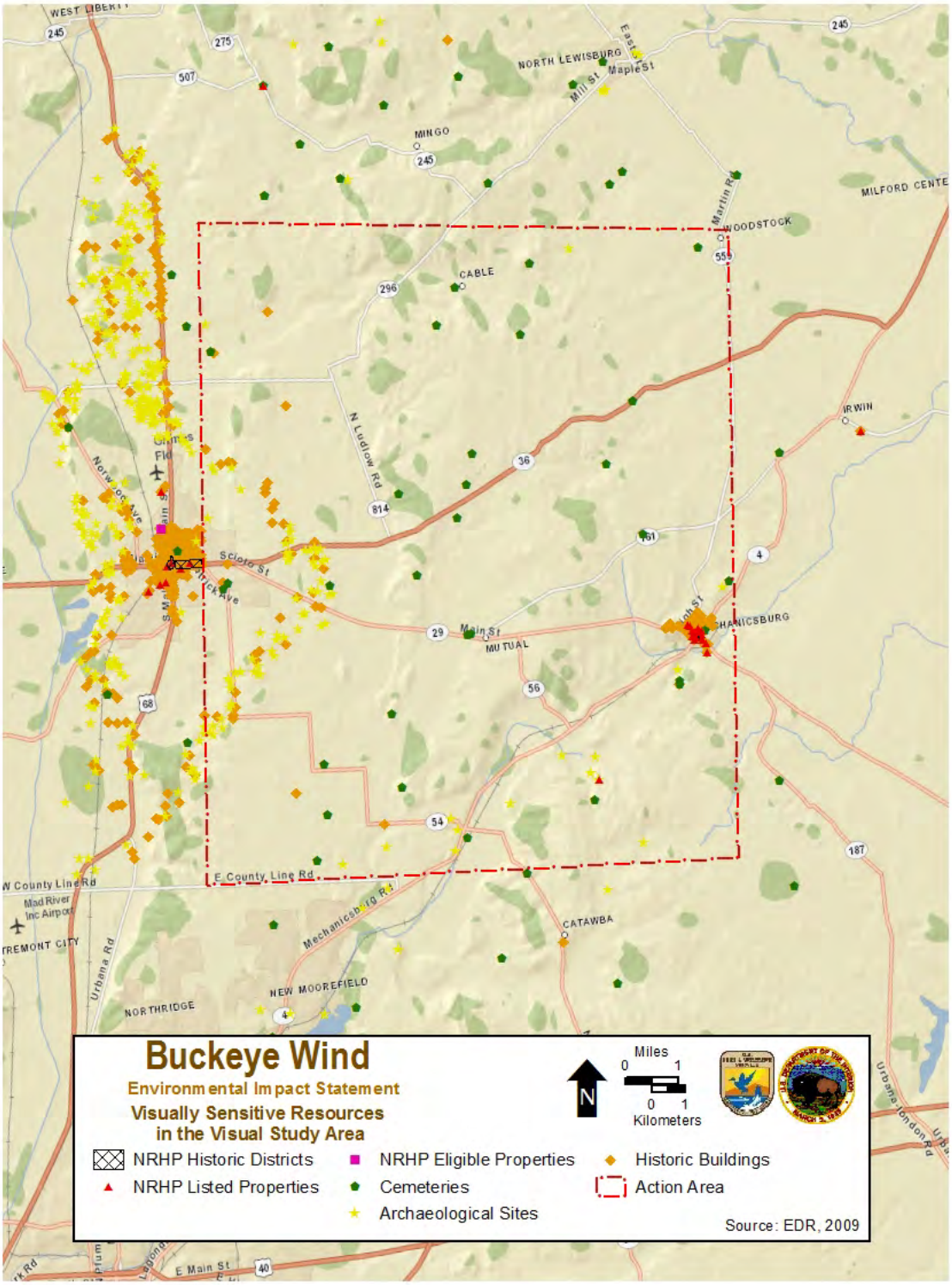
4.8.2.3 Visually Sensitive Resources

The Action Area and surrounding visual study area includes numerous resources (sites and locations) that are potentially sensitive to changes in the visual landscape. These are depicted in Figure 4.8-3:

- Historic Sites: At least 34 sites or districts are listed on the NRHP (see Section 4.6.3 for further detail). Of these sites, the vast majority are located in the City of Urbana and in the Village of Mechanicsburg.
- Numerous resources that are regionally or locally significant, such as schools, waterbodies, churches, and cemeteries.

While various recreational activities occur throughout the Action Area and surrounding viewshed, there are no State Forests; National Wildlife Refuges; National Park Service Lands; designated State or Federal trails; designated wild, scenic, or recreational rivers; or designated scenic roads or overlooks.

Figure 4.8-3 Visually Sensitive Resources in the Visual Study Area



4.8.2.4 Potential Viewers

The affected environment for visual resources includes the individuals or groups who would likely view the Project within the Visual Setting described above.

Local Residents

Local residents, those who live and work within and adjacent to the Action Area, generally view the landscape from their yards, homes, local roads, and places of employment. Except when involved in local travel, residents are likely to be stationary and have frequent or prolonged views of the landscape. Residents' sensitivity to visual quality is variable, and it is assumed that residents may be very sensitive to changes to particular views that are important to them (EDR 2009b).

Commuters and Through Travelers

Commuters and through travelers are typically moving, have a relatively narrow field of view, and are destination-oriented. Drivers on major roads in the area are generally focused on the road and traffic conditions, but do have the opportunity to observe roadside scenery. Passengers in moving vehicles have greater opportunities for prolonged off-road views than will drivers, and accordingly, may have greater perception of changes in the visual environment (EDR 2009b).

Recreational Users

Recreational users and tourists include bicyclists, hikers, recreational boaters, hunters, fishermen, and those involved in more passive recreational activities (e.g., picnicking, sightseeing, or walking), along with individuals visiting historic and cultural sites. There is not a significant concentration of recreational areas in the Action Area and surrounding visual study area. Most recreational viewers and tourists view the surrounding landscape from ground-level vantage points.

4.9 Socioeconomics and Environmental Justice

4.9.1 Scope of Analysis

This section of the DEIS describes the population, housing, employment, income, tax structure, and property values within and outside the Action Area. In addition to socioeconomic resources, this evaluation also provides a discussion of environmental justice issues including information on minority and low-income populations.

Demographic, economic, and housing data were examined within five geographic areas (hereafter referred to as the "relevant geographies") to provide the context used to benchmark characteristics and trends in central Ohio: 1) the Project Area (the host townships); 2) the Action Area; 3) Champaign County; 4) the Five-County Analysis Area (five counties that partially overlap the Action Area); and 5) the State of Ohio. These study areas are used in the context of socioeconomics due to Project interaction with and potential impact on broader regional systems

that spread beyond the boundaries of the Action Area. Communities within geographies #2 and #4 above include:

- Champaign County: Townships of Concord and Mad River, the City of Urbana, as well as the Villages of Mutual, Mechanicsburg, North Lewisburg and Woodstock;
- Clark County: the Townships of Moorefield, Pleasant and Northridge, and the Village of Catawba;
- Logan County: the Townships of Monroe and Zane;
- Madison County: the Townships of Pike and Somerford; and
- Union County: the Townships of Allen and Union.

The socioeconomic and environmental justice analysis in this DEIS draws upon publicly available information from the counties and townships listed above, the Ohio Office of Policy Research and Strategic Planning (OPRSP), U.S. Census Bureau (decennial censuses and American Community Surveys), as well as information provided in the Buckeye Facility Socioeconomic Report prepared by Saratoga Associates (Saratoga 2009), a copy of which is provided in Appendix I of this DEIS.

4.9.2 Existing Conditions

4.9.1.1 Population Characteristics

Population Growth

Table 4.9-1 provides a summary of recorded, estimated, and projected population within 8 km (5 mi) of the Action Area. The townships that would host the Project—Goshen, Rush, Salem, Union, Urbana, and Wayne in Champaign County—were home to approximately 25,302 residents in 1990, 27,017 in 2000, and 27,662 in 2010. These townships grew by 6.8 percent from 1990 to 2000 and another 2.4 percent from 2000 to 2010. Champaign County, where the Project would be located, experienced a population growth of 8.0 percent from 1990 to 2000 and 3.1 percent from 2000 to 2010 (U.S. Census Bureau 1990, 2000, 2010a). The county is projected to grow by another 9.9 percent between 2010 and 2020 (ODD n.d.).

Townships and communities in the Action Area have also experienced substantial growth since 1990 (10.4 percent from 1990 to 2000, and 4.6 percent from 2000 to 2010). Counties within the Five-County Analysis Area also grew in the 1990s and 2000s, albeit at a steadier pace. Collectively, these counties grew by 5.4 percent from 1990 to 2000, 3 percent between 2000 and 2010, and are projected to grow by 8.4 percent from 2010 to 2020 (U.S. Census Bureau 1990, 2000, 2010; ODD n.d.).

Table 4.9-1 Community Populations within 8 km (5 mi) of the Action Area

Governmental Unit	Population 1990 [1]	2000 [1]	2010 [1]	2020 Projected[2]	Percentage Change 1990-2000	2000-2010	2010-2020
Champaign County	36,020	38,890	40,097	44,050	8.0	3.1	9.9
Township of Goshen	3,172	3,383	3,696		6.7	9.3	
Township of Concord	1,122	1,408	1,422		25.5	1.0	
Township of Mad River	2,353	2,650	2,821		12.6	6.5	
Township of Rush	2,248	2,779	2,613		23.6	-6.0	
Township of Salem	2,045	2,307	2,539		12.8	10.1	
Township of Union	1,651	1,920	2,210		16.3	15.1	
Township of Urbana	14,770	14,968	14,795	n/a	1.3	-1.2	n/a
Township of Wayne	1,416	1,660	1,809		17.2	9.0	
City of Urbana	11,353	11,613	11,793		2.3	1.5	
Village of Mechanicsburg	1,803	1,744	1,644		-3.3	-5.7	
Village of Mutual	126	132	104		4.8	-21.2	
Village of North Lewisburg	1,160	1,588	1,490		36.9	-6.2	
Village of Woodstock	296	317	305		7.1	-3.8	
Clark County	147,548	144,742	138,333	141,660	-1.9	-4.4	2.4
Township Moorefield	9,621	11,402	12,436		18.5	9.1	
Township of Pleasant	2,700	3,134	3,238	n/a	16.1	3.3	n/a
Village of Catawba	268	312	272		16.4	-12.8	
Logan County	42,310	46,005	45,858	51,340	8.7	-0.3	12.0
Township of Monroe	1,274	1,503	1,739	n/a	18.0	15.7	n/a
Township of Zane	704	968	1,140		37.5	17.8	
Madison County	37,068	40,213	43,435	45,190	8.5	8.0	4.0
Township of Pike	506	531	580	n/a	4.9	9.2	n/a
Township of Somerford	2,544	2,939	2,898		15.5	-1.4	
Union County	31,969	40,909	52,300	64,570	28.0	27.8	23.5
Township of Allen	901	1,518	2,263	n/a	68.5	49.1	n/a
Township of Union	1,658	1,565	1,763		-5.6	12.7	
Action Area[3]	63,691	70,341	73,570	n/a	10.4	4.6	n/a
Host Townships[4]	25,302	27,017	27,662	n/a	6.8	2.4	n/a
Five County Analysis Area[5]	294,915	310,759	320,023	346,810	5.4	3.0	8.4

Notes:
[1] Source: U.S. Census Bureau, Decennial Census
[2] Source: Ohio Department of Development (ODD), Office of Strategic Research
[3] Includes all jurisdictions in Table 4.9-1 except counties
[4] Includes Goshen, Rush, Salem, Union, Urbana, and Wayne in Champaign County
[5] Includes Champaign, Clark, Logan, Madison, and Union Counties

Age Cohorts

Evaluating population age cohorts helps to understand the types of development that a community might demand or prefer in the future. Age cohort data is also used in evaluating whether an action could have disproportionate adverse health or safety risk effects on children. Age cohort information for various geographies in the vicinity of the Project is shown in Table 4.9-2. This analysis shows that the host townships, Champaign County, and jurisdictions in the Action Area have slightly higher proportions of preschool and school age children than the state as a whole. The Action Area has the highest proportion of residents between the ages 55-64, while the host townships have the lowest proportion of Empty Nesters (U.S. Census Bureau 2010).

Table 4.9-2 Age Cohort Profile: 2010

Cohort (age in years)	Host Townships	Action Area	Champaign County	Five County Analysis Area	State of Ohio
Preschool (Under 5)	6.5%	6.0%	6.3%	6.4%	6.2%
School Age (5- 19)	21.1%	21.1%	21.6%	20.8%	20.3%
College Age (20-24)	6.1%	5.5%	5.6%	5.7%	6.6%
Working Adults (25 to 54)	39.4%	39.1%	39.5%	40.4%	40.2%
Empty Nesters (55 to 64)	12.3%	13.1%	12.7%	12.7%	12.6%
Seniors (65+)	14.7%	15.3%	14.4%	14.1%	14.1%
Median Age (years)	39.5	40.4	39.7	39.5	38.8

Source: U.S. Census Bureau, Census 2010

4.9.1.2 Housing Characteristics

Table 4.9-3 summarizes the number, tenure, and occupancy status of housing units in the relevant geographies in 2000 and 2010, while Table 4.9-4 summarizes housing unit value. The townships hosting the Project added housing at a slower rate than the state and the Five-County Analysis Area. However, jurisdictions in the Action Area collectively added housing at a rate similar to that of the region and state, and had lower vacancy rates. The percentage of occupied housing units and home ownership rates in the host townships, Action Area, Champaign County, and Five-County Analysis Area were consistently higher than in the state as a whole (U.S. Census Bureau 2000, 2010a).

Housing values in the host townships are similar to housing values in Champaign County, but are lower than housing values in the Action Area, Five-County Analysis Area, and the state. The median monthly rent in the host townships is the lowest among the five analysis categories. Housing values in the Action Area are higher than the host townships and the surrounding counties. This can be partially attributed to the substantially higher median housing values in the Townships of Somerford (Madison County) and Allen (Union County), which are $209,800 and $190,100, respectively (U.S. Census Bureau 2010b).

Table 4.9-3 Housing Characteristics: 2000 – 2010

		Host Townships		Action Area		Champaign County		Five-County Analysis Area		State of Ohio	
		2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Total Housing Units		11,283	11,756	29,029	31,149	15,890	16,755	128,132	136,723	4,783,051	5,127,508
Change, 2000-2010	**Number**		473		2,120		865		8,591		344,457
	Percent		4.2%		7.3%		5.4%		6.7%		7.2%
Occupied		93.3%	90.9%	94.3%	91.6%	94.1%	91.5%	91.8%	88.9%	92.9%	89.8%
Homeowner		72.8%	70.9%	75.7%	74.5%	75.9%	74.6%	73.5%	71.9%	69.1%	67.6%
Renter		27.2%	29.1%	24.3%	25.5%	24.1%	25.4%	26.5%	28.1%	30.9%	32.4%
Vacant		6.7%	9.1%	5.7%	8.4%	5.9%	8.5%	8.2%	11.1%	7.1%	10.2%

Source: U.S. Census Bureau, Census 2000 and 2010

Table 4.9-4 Housing Values and Median Monthly Rents: 2010

	Host Townships	Action Area	Champaign County	Five-County Analysis Area	State of Ohio
Median Housing Value (Owner-Occupied Units)	$123,928	$132,614	$122,800	$129,228	$136,400
Median Monthly Rent (Renter-Occupied Units)	$604	$608	$623	$656	$678

Source: U.S. Census Bureau, 2010 American Community Survey

4.9.1.3 Income Characteristics

Table 4.9-5 shows median household and per capita income information for the relevant geographies. While the median household incomes in the Action Area, Champaign County and the Five-County Analysis Area are higher than those for the state as a whole, the median household income in the host townships is lower than the median household income for the state or nearby counties. Per capita incomes in the host townships, Champaign County and the Five-County Analysis Area are lower compared to the state value. This indicates the presence of a relatively small number of high-income households, set amidst a community with average to slightly below-average income characteristics.

Table 4.9-5 Income Characteristics

	Host Townships	Action Area	Champaign County	Five-County Analysis Area	State of Ohio
Median Household Income	$45,656	$52,052	$48,315	$48,523	$47,358
Per Capita Income	$22,282 (2010)	$25,217 (2010)	$22,928 (2010)	$22,904 (2010)	$25,113 (2010)

Source: U.S. Census Bureau, 2010 American Community Survey

4.9.1.4 Employment Characteristics

Table 4.9-6 shows the types of jobs, by industry, in the Five-County Analysis Area. The region's three leading industries are manufacturing, health care and social assistance, and retail trade. The manufacturing industry is by far the largest industry in Champaign, Logan, Madison, and Union Counties. Manufacturing provided 25,000 to 30,000 jobs in the Five-County Analysis Area, one-quarter of the approximately 105,000 total existing jobs in that region in 2008. Health care provided some 15,000 jobs (14 percent). The retail trade sector has the greatest number of establishments in each county—nearly 1,000 establishments in the Five-County Analysis Area, or 16 percent of all establishments in that region—and provided more than 13,500 jobs.

4.9.1.5 Tax Value of Land Use

As part of the Applicant's analysis of socioeconomic trends, GIS land use data were evaluated to determine the local tax base composition, as a function of land use type. Table 4.9-7 summarizes the findings of this analysis. The Applicant's analysis indicates that, by hectares (acres), agriculture is the predominant revenue-generating land use in the host townships, but that residential land uses generate far more tax revenue than any other land use (Saratoga Associates 2009).

Table 4.9-6 Employment in the Five-County Analysis Area, 2008

	Champaign County				Clark County				Logan County			
	Employees[1]		Establishments		Employees[1]		Establishments		Employees[1]		Establishments	
Industry	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**
Forestry, Fishing, Hunting, Ag. Support	a	<1	2	0.3	a	<1	1	0.1	-	-	-	-
Mining	a	<1	2	0.3	b	<1	6	0.2	b	<1	5	0.6
Utilities	a	<1	3	0.4	c	<1	6	0.2	b	<1	3	0.3
Construction	344	3.2	77	11.5	1,134	2.6	204	8.0	546	3.0	78	8.6
Manufacturing	3,866	36.3	47	7.0	6,311	14.7	176	6.9	i	27-55	54	5.9
Wholesale Trade	258	2.4	37	5.5	1,911	4.5	99	3.9	1,068	5.9	33	3.6
Retail Trade	1,145	10.7	109	16.3	6,417	15.0	458	17.8	1,935	10.7	156	17.2
Transportation and Warehousing	208	2.0	24	3.6	1,438	3.4	61	2.4	541	3.0	41	4.5
Information	89	0.9	7	1.1	429	1.0	30	1.2	c	<2	10	1.1
Finance and Insurance	243	2.3	47	7.0	2,543	5.9	161	6.3	354	1.9	62	6.8
Real Estate, Rental and Leasing	65	0.6	20	3.0	458	1.1	105	4.1	171	0.9	34	3.7
Prof., Scientific, Tech. Services	126	1.2	40	6.0	1,013	2.4	168	6.5	927	5.1	48	5.3
Mgmt. of Companies and Enterprises	b	<1	3	0.5	1,973	4.6	19	0.7	53	0.3	4	0.4
Admin., Support, Waste Mgmt and Remediation Services	682	6.4	31	4.6	1,716	4.0	104	4.1	1,707	9.4	46	5.1
Educational Services	e	2-5	3	0.4	g	2-6	19	0.7	a	<1	6	0.7
Health Care and Social Assistance	2,042	19.2	51	7.6	8,221	19.2	322	12.5	2,027	11.2	89	9.8
Arts, Entertainment and Recreation	62	0.6	12	1.8	479	1.1	42	1.6	471	2.6	22	2.4
Accommodation and Food Services	689	6.5	60	9.0	4,629	10.8	238	9.3	1,364	7.5	98	10.8
Other Services	493	4.6	92	13.8	2,050	4.8	344	13.4	722	4.0	119	13.1
Unclassified Establishments	a	<1	2	0.3	a	<1	3	0.1	a	<1	1	0.1
Total	**10,657**	**100.0**	**669**	**100.0**	**42,869**	**100.0**	**2,566**	**100.0**	**18,154**	**100.0**	**909**	**100.0**

Table 4.9-6 Employment in the Five-County Analysis Area, 2008 (Continued)

	Madison County				Union County			
	Employees[1]		Establishments		Employees[1]		Establishments	
Industry	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**	**Num.**	**Pct.**
Forestry, Fishing, Hunting, Ag. Support	b	0.5	2	0.3	a	<1	2	0.2
Mining	-	-	-	-	b	<1	3	0.3
Utilities	a	<1	1	0.1	b	<1	2	0.2
Construction	446	4.1	100	13.8	799	3.4	133	12.6
Manufacturing	2,866	26.3	46	6.3	7,208	30.9	54	5.1
Wholesale Trade	265	2.4	33	4.5	954	4.1	69	6.6
Retail Trade	1,814	16.7	113	15.5	2,250	9.6	140	13.3
Transportation and Warehousing	1,125	10.3	39	5.4	f	2-4	45	4.3
Information	51	0.5	7	1.0	106	0.5	12	1.1
Finance and Insurance	c	<3	44	6.1	274	1.2	54	5.1
Real Estate, Rental and Leasing	95	0.9	32	4.4	157	0.7	43	4.1
Prof., Scientific, Tech. Services	f	5-9	49	6.7	g	4-10	96	9.1
Mgmt. of Companies and Enterprises	a	<1	2	0.3	g	4-10	4	0.4
Admin., Support, Waste Mgmt and Remediation Svcs.	664	6.1	30	4.1	2,934	12.6	98	9.3
Educational Services	37	0.3	5	0.7	122	0.5	8	0.8
Health Care and Social Assistance	1,223	11.2	71	9.8	1,634	7.0	76	7.2
Arts, Entertainment and Recreation	41	0.4	12	1.7	199	0.9	23	2.2
Accommodation and Food Services	1,091	10.0	58	8.0	1,432	6.1	73	6.9
Other Services	373	3.4	81	11.1	817	3.5	117	11.1
Unclassified Establishments	a	<1	2	0.3	a	<1	1	0.1
Total	**10,884**	**100.0**	**727**	**100.0**	**23,361**	**100.0**	**1,053**	**100.0**

Notes:
Source: U.S. Census Bureau, 2008 County Business Patterns
[1] Exact employment data not provided due to confidentiality. a = 0-19 employees; b = 20-99 employees; c = 100-249 employees; e = 250-499 employees; f = 500-999 employees; g = 1,000-2,499 employees; i = 5,000-9,000 employees

Table 4.9-7 Total Hectares (Acres) and Assessed Valuation by Land Use Classification: Fiscal Year 2007

Land Use Classification	Host Townships		Action Area		Champaign County		Five-County Analysis Area	
	Total Hectares (Acres)	Assessed Valuation	Total Hectares (Acres)	Assessed Valuation	Total Hectares (Acres)	Assessed Valuation	Total Hectares (Acres)	Assessed Valuation
Agricultural	51,493 (127,243)	$152,025,230	72,408 (178,923)	$258,484,300	96,259 (237,861)	$303,286,440	464,122 (1,146,870)	$1,386,480,740
Commercial	319 (789)	$27,688,440	668 (1,651)	$110,360,770	469 (1,160)	$106,724,130	6,431 (15,892)	$776,169,190
Forestry	85 (211)	$231,880	303 (749)	$1,698,500	468 (1,157)	$2,856,280	630 (1,557)	$3,061,050
Government	851 (2,104)	$40,009,670	2,453 (6,062)	$59,878,160	1,544 (3,816)	$70,845,260	9,840 (24,315)	$654,065,060
Manufacturing	38 (93)	$10,145,330	1,008 (2,491)	$212,544,200	225 (557)	$83,634,670	4,735 (11,701)	$2,152,926,910
Minerals and Oil	94 (232)	$1,277,990	0 (0)	$0	94 (232)	$1,277,990	468 (1,157)	$4,681,440
Non-Commercial	52 (128)	$6,497,690	206 (508)	$47,513,120	164 (406)	$44,235,060	3,971 (9,813)	$331,159,480
Residential	4,778 (11,806)	$594,926,780	9,428 (23,298)	$1,382,140,460	9,328 (23,051)	$1,462,671,310	50,194 (124,031)	$6,973,052,240
Utilities	0 (0)	$1	0 (0)	$21,410	0 (0)	$21,410	99 (245)	$3,797,610
Vacant	1,640 (4,052)	$14,495,150	3,096 (7,650)	$31,111,160	2,714 (6,707)	$31,493,200	20,225 (49,978)	$214,337,910
Not Designated	0 (0)	$0	513 (1,267)	$2,619,810	0 (0)	$0	3,324 (8,213)	$6,346,340
Total	59,350 (146,658)	$847,298,161	90,083 (222,599)	$2,106,371,890	111,267 (274,948)	$2,116.045,750	564,040 (1,393,772)	$12,506,077,970

Source: Saratoga Associates 2009

4.9.1.6 Property Values

Property values are determined by a combination of property characteristics and local market trends. Property characteristics that affect overall value include size, age, condition, and any additional special features and amenities within a residential structure. Local market trends are determined from detailed analysis of property sales within a given area. For example, if individual property sales decrease in locations where wind turbines are present, other properties in the same area or comparable areas, even if they are not directly adjacent or in sight of the wind turbines, may be impacted.

There is a wide body of both professional and academic literature on the subject of wind turbines and residential property values. These studies do not establish a consensus as to whether property values are impacted by the presence of wind turbines (Appendix I). Instead, other factors and considerations, such as property type and condition, existing amenities, and distance to and size of wind turbines appear to be equally, if not more important when buyers evaluate property.

4.9.1.7 Socioeconomic Data Relevant to Environmental Justice Concerns

In response to Executive Order 12898, federal agencies are required to address potential environmental justice impacts to minority and low income populations. The information in this section provides the necessary background for the analysis—in Section 5.9—of whether the Project would have a disproportionately high and adverse effect on minority and low income populations. Except where noted, data for this section are from the 2010 U.S. Census (the most recent data available from public sources for all relevant jurisdictions) for all of the relevant geographies, as well as the state of Ohio.

Minority Populations

Table 4.9-8 summarizes the racial composition of the populations in the relevant geographies. The percentage of the population identified as Caucasian was higher than the state average in all the townships in the Action Area.

Low Income Populations

Table 4.9-9 shows the number of individuals below the poverty level and the percentage of the population within each geographic area. While median household income and per capita income (Table 4.9-6) help to depict the financial state of a community, poverty levels are used to determine whether or not there is economic hardship or need. In the American Community Survey (U.S. Census Bureau 2010b), poverty is determined through a sample of household or family income against a series of federal thresholds that take into account age, family size, and the presence of children. As shown in Table 4.9-9, the Action Area, Champaign County, and the Five-County Analysis Area had lower poverty rates (fewer individuals below the poverty rate) than the state as a whole. The combined poverty rate of the host townships is almost the same as that of the state.

Table 4.9-8 Minority Population, 2010

Jurisdiction		Total Population	One Race	Caucasian	African-American	Native American/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Other	Multiple Races	Total Minority	Hispanic/ Latino
State of Ohio	Number	11,536,504	11,298,739	9,539,437	1,407,681	25,292	192,233	4,066	130,030	237,765	1,997,067	354,674
	Percent	100%	97.9%	82.7%	12.2%	0.2%	1.7%	0.0%	1.1%	2.1%	17.3%	3.1%
Host Townships												
Goshen Township	Number	3,696	3,630	3,568	37	15	2	2	6	66	128	24
	Percent	100%	98.2%	96.5%	1.0%	0.4%	0.1%	0.1%	0.2%	1.8%	3.5%	0.6%
Rush Township	Number	2,613	2,557	2,519	12	12	12	0	2	56	94	15
	Percent	100%	97.9%	96.4%	0.5%	0.5%	0.5%	0.0%	0.1%	2.1%	3.6%	0.6%
Salem Township	Number	2,539	2,511	2,455	33	12	4	0	7	28	84	16
	Percent	100%	98.9%	96.7%	1.3%	0.5%	0.2%	0.0%	0.3%	1.1%	3.3%	0.6%
Union Township	Number	2,210	2,190	2,147	24	1	10	3	5	20	63	19
	Percent	100%	99.1%	97.1%	1.1%	0.0%	0.5%	0.1%	0.2%	0.9%	2.9%	0.9%
Urbana Township	Number	14,795	14,378	13,420	711	65	89	1	92	417	1,375	270
	Percent	100%	97.2%	90.7%	4.8%	0.4%	0.6%	0.0%	0.6%	2.8%	9.3%	1.8%
Wayne Township	Number	1,809	1,781	1,740	22	8	8	0	3	28	69	13
	Percent	100%	98.5%	96.2%	1.2%	0.4%	0.4%	0.0%	0.2%	1.5%	3.8%	0.7%
Total, Host Townships	**Number**	**27,662**	**27,047**	**25,849**	**839**	**113**	**125**	**6**	**115**	**615**	**1,813**	**357**
	Percent	**100%**	**97.8%**	**93.4%**	**3.0%**	**0.4%**	**0.5%**	**0.0%**	**0.4%**	**2.2%**	**6.6%**	**1.3%**
Counties in the Five-County Analysis Area												
Champaign County	Number	40,097	39,335	37,986	892	143	153	13	148	762	2111	451
	Percent	100%	98.1%	94.7%	2.2%	0.4%	0.4%	0.0%	0.4%	1.9%	5.3%	1.1%
Clark County	Number	138,333	134,824	119,440	12,128	351	858	51	1996	3,509	18,893	3,805
	Percent	100%	97.5%	86.3%	8.8%	0.3%	0.6%	0.0%	1.4%	2.5%	13.7%	2.8%
Logan County	Number	45,858	44,981	43,722	742	115	242	16	144	877	2136	539
	Percent	100%	98.1%	95.3%	1.6%	0.3%	0.5%	0.0%	0.3%	1.9%	4.7%	1.2%
Madison County	Number	43,435	42,787	39,364	2,862	105	232	10	214	648	4,071	622
	Percent	100%	98.5%	90.6%	6.6%	0.2%	0.5%	0.0%	0.5%	1.5%	9.4%	1.4%
Union County	Number	52,300	51,558	48,587	1,231	119	1,428	19	174	742	3,713	661
	Percent	100%	98.6%	92.9%	2.4%	0.2%	2.7%	0.0%	0.3%	1.4%	7.1%	1.3%
Total, Counties	**Number**	**320,023**	**313,485**	**289,099**	**17,855**	**833**	**2,913**	**109**	**2,676**	**6,538**	**30,924**	**6,078**
	Percent	**100%**	**98.0%**	**90.3%**	**5.6%**	**0.3%**	**0.9%**	**0.0%**	**0.8%**	**2.0%**	**9.7%**	**1.9%**

Source: US Census Bureau, Census 2010

Table 4.9-9 Poverty Status of Individuals, 2010

	Host Townships	Action Area	Champaign County	Five-County Analysis Area	State of Ohio
Individuals below Poverty (2010)	3,948	8,106	4,562	43,765	1,586,292
Percent of Population below Poverty (2010)	14.3%	11.0%	11.5%	13.7%	14.2%

Source: US Census Bureau, 2010 American Community Survey

4.10 Noise

Noise is generally defined as unwanted sound. Sound travels in mechanical wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels (dB), representing the logarithmic increase in sound energy relative to a reference energy level. Sound measurement is further refined by using an A-weighted decibel (dBA) scale to emphasize the range of sound frequencies that are most audible to the human ear (i.e., between 1,000 and 8,000 cycles per second). The dBA scale weighs the various components of noise based on the response of the human ear. Therefore, unless otherwise noted, all decibel measurements presented in this DEIS are dBA. Because sound levels are expressed as relative intensities, multiple sound sources are not directly additive. Rather, the total noise is primarily a result of the source of highest intensity. For example, two sources, each having a noise rating of 50 dBA, will together be heard as 53 dBA, not 100 dBA.

4.10.1 Scope of Analysis

The noise analysis presented in this DEIS covers the Action Area, with focus on the nearest potentially sensitive receptors to the wind turbine generators. The noise analysis is based on information from scientific literature, a background sound level survey that was conducted within and around the Action Area, and a sound modeling program (Hessler 2009).

4.10.2 Existing Conditions

The Project terrain consists mostly of gently rolling hills with some relatively flat areas. The area is primarily open farmland interrupted by a few scattered wooded areas. Although the area is composed of fairly large farms, a number of homes exist on smaller parcels of land among the larger properties. Private residences are more or less evenly distributed over the entire site area with intermittent areas of greater density around the small towns and other localities in the area. Turbines are planned throughout the Action Area on large tracts of open land between the residences. The noise analysis covers representative areas of the Action Area (see plots in Appendix J).

Review of aerial photography indicates that there are some noise sensitive areas such as residences, churches, schools, and recreational areas (two golf courses and a local park) within 1.6 km (1 mi) of Project facilities. Other noise sensitive areas such as schools, libraries, hospitals, and nursing homes are located more than 1.6 km (1 mi) away from Project Facilities. The plots in Appendix J show the locations of these noise sensitive areas.

4.10.2.1 Background Sound Level Survey

A background sound level survey was conducted to establish baseline noise levels at five locations evenly distributed within the Action Area and three locations north of the Action Area (Hessler 2009).[5] Seven of these locations were near residential houses, usually surrounded by open farm fields or adjacent to roads. The last location was near a church located close to a large open field. Sound level meters were placed at these eight locations and left to run continuously for 14 days from noon on January 11, 2008 to noon on January 25, 2008. Background sound levels are normally lowest at this time of the year (winter) because wind-induced leaf rustle noise is absent and no insects are present. During the survey, the only noticeable background sound was natural wind-induced sound.

Monitors recorded a number of statistical parameters in 10-minute increments, such as the average (L_{eq}), minimum, maximum, and residual (L_{90}) sound levels. Of these, the average (L_{eq}) and residual (L_{90}) levels are the most meaningful. The average, or equivalent energy sound level, is the average sound level over each measurement interval. This is the "typical" sound level most likely to be observed at any given moment. The L_{90} statistical sound level, on the other hand, is commonly used to conservatively quantify background sound levels. The L_{90} is the sound level exceeded during 90 percent of the measurement interval and has the quality of filtering out sporadic, short-duration noise events (such as cars passing by or tractor activity in a neighboring field), thereby capturing the quiet lulls between such events. It is this consistently present background level that forms a conservative or "worst-case" basis for evaluating the audibility of a new source since it represents essentially the lowest amount of masking sound.

Weather conditions during the survey period were observed at a weather station within the Action Area near the village of Cable. The weather conditions were mostly clear and cold with very little precipitation. Detailed records of wind speed at the site were measured at the project's two meteorological towers (met towers).

Background sounds such as natural tree and grass rustle mask potential wind turbine noise as a function of wind speed. Wind turbines operate and produce noise when the wind exceeds a minimum cut-in speed of roughly 3 to 4 m/s (10 to 13 ft/s) at hub height. Turbine sound levels increase with wind speeds up to about 8 to 10 m/s (26 to 33 ft/s) (measured at a standard elevation of 10 m [33 ft]) when the sound produced generally reaches a maximum and no longer increases with wind speed. Consequently, at moderate to high wind speeds, when turbine noise is most significant, the level of natural masking noise also is relatively high due to tree or grass rustle and will continue to increase with increasing wind speed, thus reducing the perceptibility of noise from the turbines. In order to quantify this effect, wind speed was measured over the entire sound level survey period at two on-site met towers for later correlation to the sound data.

The L_{90} sound levels recorded at the eight widely distributed monitoring locations closely followed the same trends. Sound levels increased with increasing wind speed regardless of time of the day. In general, the nighttime levels have a greater dependency on wind, and reach extremely low levels in the 20 to 25 dBA range during calm wind conditions. Daytime levels remain relatively elevated during low wind conditions, likely due to other ambient sounds. At higher wind speeds the daytime and nighttime sound levels are nearly the same. Table 4.10-1

[5] Originally nine locations were monitored, but one of the meters malfunctioned, and the data were eliminated from the analysis.

summarizes the residual (L_{90}) background levels that characterize the site environment over the range of wind speeds relevant to turbine operation. Appendix J includes detailed information on measurement locations, methodology, instrumentation, and weather conditions.

Table 4.10-1 Measured L_{90} Worst-case Background Sound Levels

Wind Speed at Height of 10 m [33 ft] (m/s) [ft/s]	Daytime L_{90} Sound Level (dBA)	Nighttime L_{90} Sound Level (dBA)
4 (13)	32	26
5 (16)	34	29
6 (20)	35	32
7 (23)	37	35
8 (26)	39	38
9 (30)	40	41
10 (33)	42	43

Source: Hessler 2009

As described above, the L_{90} sound levels displayed in Table 4.10-1 can be considered "worst-case" because these background levels represent the lowest levels that are likely to be observed. These low levels only occur during brief, intermittent lulls in all forms of environmental sound (both natural and man-made). By definition, the L_{90} sound level does not occur over long periods and does not characterize the sound level that is most commonly present. The sound level that is more likely to exist most of the time is the average, or L_{eq}, sound level, which may be regarded as the "typical" sound level. Like the L_{90} measurements, L_{eq} sound levels are also dependent on wind speed, with higher sound levels at higher wind speeds. Table 4.10-2 summarizes the average background sound levels that characterize the site environment over the range of wind speeds relevant to turbine operation.

Table 4.10-2 Measured L_{eq} Typical Background Sound Levels

Wind Speed at Height of 10 m [33 ft] (m/s) [ft/s]	Daytime L_{eq} Sound Level (dBA)	Nighttime L_{eq} Sound Level (dBA)
4 (13)	42	35
5 (16)	43	38
6 (20)	44	40
7 (23)	45	42
8 (26)	46	44
9 (30)	47	46
10 (33)	48	48

Source: Hessler 2009

4.11 Air Quality

This section describes the current ambient air quality concentrations for selected pollutants as well as the current major sources of air emissions within the Action Area and surrounding region.

4.11.1 Scope of Analysis

No air monitoring sites are located in Champaign County. Therefore, the air quality analysis presented in this DEIS includes portions of four of the six counties adjacent to Champaign County (Clark, Madison, Miami, and Logan) because these counties contain the closest air monitoring stations to the Action Area. The land use type in Champaign County and these adjacent counties are similar (i.e., mostly rural and suburban); therefore, ambient concentrations obtained from these stations were assumed to be representative of the ambient concentrations in the Action Area. The air quality analysis in this DEIS is based on the air quality data described above and information from publicly available online databases and/or documents produced by the USEPA, the primary federal agency mandated with protecting and regulating air quality in the U.S.

4.11.2 Existing Conditions

The most current ambient pollutant concentrations (2011 data) within the Action Area and overlapping counties were taken from the USEPA AirData website (USEPA 2012). Pollutants monitored in nearby counties include particulate matter with less than 2.5 microns in diameter ($PM_{2.5}$) (Clark County), particulate matter with less than 10 microns in diameter (PM_{10}) (Franklin County), sulfur dioxide (SO_2) (Clark County), ozone (O_3) (Clark, Madison, and Miami Counties) and carbon monoxide (Franklin County). The most conservative or "worst-case" ambient air quality data for 2011 are presented in Tables 4.11-1 to 4.11-5. Except for O_3, none of the pollutants measured at the monitoring stations exceeded the National Ambient Air Quality Standards (NAAQS). Table 4.11-1 shows that the 8-hour average concentration for O_3 (0.077 parts per million) slightly exceeds the NAAQS. There were no monitoring stations for nitrogen dioxide (1-hour and annual) and lead (rolling 3-month average) within the Project vicinity.

Air emissions in the Action Area and overlapping counties are related primarily to farm operations, vehicular travel, and manufacturing. Vehicles traveling on area roads and farm equipment both produce exhaust emissions, along with dust from unpaved road surfaces. In addition, routine odors are associated with certain farming practices (e.g., manure-spreading). The largest sources of manufacturing emissions in the vicinity of the Action Area originate from the Honda Plant in Logan County, Trutec Industries in Clark County, and Scotts Company in Union County, located approximately 14, 16, and 23 km (9, 10, and 14 mi) from the Action Area, respectively (USEPA 2009).

Table 4.11-1 Ambient Air Quality Monitoring for Ozone at Site 390230003, Spangler Road, Clark County, Ohio in 2011

Criterion	Maximums	Monitoring Data (ppm)	NAAQS Criteria (ppm)
1-hour averages[1]	4th Highest Daily Maximum	0.088	0.12
8-hour averages[2]	4th Highest Daily Maximum	0.077	0.075

Source: USEPA 2012
ppm = parts per million
[1] USEPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding"). The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.
[2] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

Table 4.11-2 Ambient Air Quality Monitoring for Sulfur Dioxide at Site 390230003, Spangler Road, Clark County, Ohio in 2011

Criterion	Maximums/ Mean	Monitoring Data (ppm)	NAAQS Criteria (ppm)
1-hour averages[1]	99th Percentile	0.022	0.075
3-hour averages[2]	Daily Maximum	Not monitored	0.5

Source: USEPA 2012
ppm = parts per million
[1] The final rule for the new NAAQS criterion for 1-hour SO2 was signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 parts per billion (ppb) or 0.075 ppm. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking.
[2] Maximum concentrations not to be exceeded more than once per year.

Table 4.11-3 Ambient Air Quality Monitoring for Particulate Matter ($PM_{2.5}$) at Site 390230005, Fountain Avenue, Clark County, Ohio in 2011

Criterion	Percentile/ Mean	Monitoring Data (µg/m³)	NAAQS Criteria (µg/m³)
24-hour averages[1]	98th Percentile	28	35
Annual[2]	Mean	Not monitored	15

Source: USEPA 2012
µg/m³ = micrograms per cubic meters
[1] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).
[2] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m³.

Table 4.11-4 Ambient Air Quality Monitoring for Particulate Matter (PM_{10}) at Site 390490024, State Fairgrounds, Franklin County, Ohio in 2011

Criterion	Percentile/ Mean	Monitoring Data (µg/m³)	NAAQS Criteria (µg/m³)
24-hour averages[1]	Daily Maximum	86	150

Source: USEPA 2012
µg/m³ = micrograms per cubic meters
[1] Maximum concentrations not to be exceeded more than once per year on average over three years.

Table 4.11-5 Ambient Air Quality Monitoring for Carbon Monoxide (CO) at Site 390490005, Morse Road, Franklin County, Ohio in 2012

Criterion	Percentile/ Mean	Monitoring Data (ppm)	NAAQS Criteria (ppm)
1-hour averages[1]	Daily Maximum	2	9
8-hour averages[1]	Daily Maximum	2	35

Source: USEPA 2012
ppm = parts per million
[1] Maximum concentrations not to be exceeded more than once per year.

4.11.3 Greenhouse Gases

Greenhouse gases (GHGs) are gases that warm the earth's atmosphere by absorbing solar radiation reflected from the earth's surface. The most common greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro-fluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

The atmospheric buildup of carbon dioxide and other greenhouse gases is largely the result of human activities such as the burning of fossil fuels (USEPA 2000). In the United States, more than 90 percent of greenhouse gas emissions come from the combustion of fossil fuels (USEPA

2000). Global carbon emissions from fossil fuels have significantly increased since 1900. Emissions increased by over 16 times between 1900 and 2008 and by about 1.5 times between 1990 and 2008 (USEPA 2012). According to USEPA (2009), scientists know with virtual certainty that increasing greenhouse gas concentrations are warming the planet and that rising temperatures may, in turn, produce changes in precipitation patterns, storm severity, and sea level, commonly referred to as "climate change." According to the Intergovernmental Panel on Climate Change (2007), the total temperature increase from 1850–1899 to 2001–2005 is 0.76°C and most of the observed increase in temperatures since the mid-20th century is likely due to the observed increase in anthropogenic greenhouse gas concentrations. Combustion of fossil fuels also produces air pollutants, such as nitrogen oxides, sulfur dioxide, volatile organic compounds and heavy metals, which negatively affect human health and air and water quality.

Nationwide, the United States currently obtains 71 percent of its electricity from fossil fuels, with 49 percent coming from coal. Coal has the highest carbon dioxide content per unit of electricity produced of all fossil fuels used to provide electricity in the United States (EIA 2007 as cited in EDR 2009a). Emissions from coal-fired power plants account for approximately 80 percent of carbon dioxide emissions by electric power plants (EIA 2010). Ohio is particularly heavily dependent upon coal for its electrical generation, with 86 percent of electricity generated from coal (PUCO 2008), and ranks fourth in terms of tons of carbon dioxide emissions produced annually, following California, Pennsylvania, and Texas.

Carbon dioxide emissions by domestic electric generating facilities were estimated to be 2,359 million metric tons (MMT) in 2008 (EIA 2009). Every 10,000 MW of wind energy installed can reduce carbon dioxide emissions by approximately 33 MMT annually, if it replaces coal-fired generating capacity, or 21 MMT, if it replaces generation from the United States average fuel mix (San Martin 1989).

4.12 Transportation

4.12.1 Scope of Analysis

This section of the DEIS describes the conditions of and activity on transportation facilities within five miles of the Action Area. This analysis area was used to account for the potential regional effects of the Project on transportation infrastructure.

The transportation analysis in this DEIS is based on review of maps and satellite imagery and publicly available information from ODOT and Champaign County.

4.12.2 Existing Conditions

4.12.2.1 Road Facilities

The Project would consist of up to 100 wind turbines, along with associated roads, electric transmission lines and an electric substation, located in a large portion of eastern Champaign County, Ohio. Major Project components, including sections of the turbines and construction materials (such as concrete), would be delivered to the site via truck. These components would arrive in the vicinity of the Action Area via Interstate 70, and/or U.S. Route 33. Deliveries to the

Action Area would be via U.S. Route 36 and State Route (SR) 56, with other state and local roads used to access specific turbine sites or other Project facilities. Table 4.12-1 summarizes the characteristics of Interstate, U.S., and state roads that would likely be affected, including the Average Annual Daily Traffic (AADT) in 2008 (the most recent year for which traffic data are available from ODOT) and the percentage of trucks in the traffic stream in 2008. Figure 4.12-1 shows the affected roads and other roads within the Action Area.

Table 4.12-1 Affected Roads

Road, Location	County	Lanes	2008 AADT[1]	Truck Percentage[2]
I-70, West of SR 56 [3]	Clark	4 eastbound; 3 westbound	49,280	35.7%
US 33, at US 36/SR 245 [3]	Madison	2 each direction	33,350	12.3%
US 36 at Milford Center [3]	Union	2	4,910	15.7%
US 36 at SR 559	Champaign	2	1,970	11.7%
US 36 at SR 814	Champaign	2	2,840	11.6%
SR 56 at SR 4	Champaign	2	1,060	2.8%
SR 56 at SR 29	Champaign	2	970	3.1%
SR 4 at SR 56	Champaign	2	4,060	15.5%
SR 29 in Mutual	Champaign	2	4,140	7.2%
SR 814 at US 36	Champaign	2	2,880	10.4%

Source for AADT: ODOT 2008
[1] AADT = Average Annual Daily Traffic. 2008 is the most recent year for which ODOT provides AADT information, except for I-70, which is from 2007.
[2] This category includes, "single unit trucks, tractor with semi-trailers, trucks with trailers, recreational vehicles, and school and commercial buses…FHWA 'Scheme F' Classes 4-13." Source: ODOT n.d.
[3] These locations are outside of the Action Area, but are part of the likely delivery route of Project materials, and are therefore included for reference.

4.12.2.2 Interstate Highways

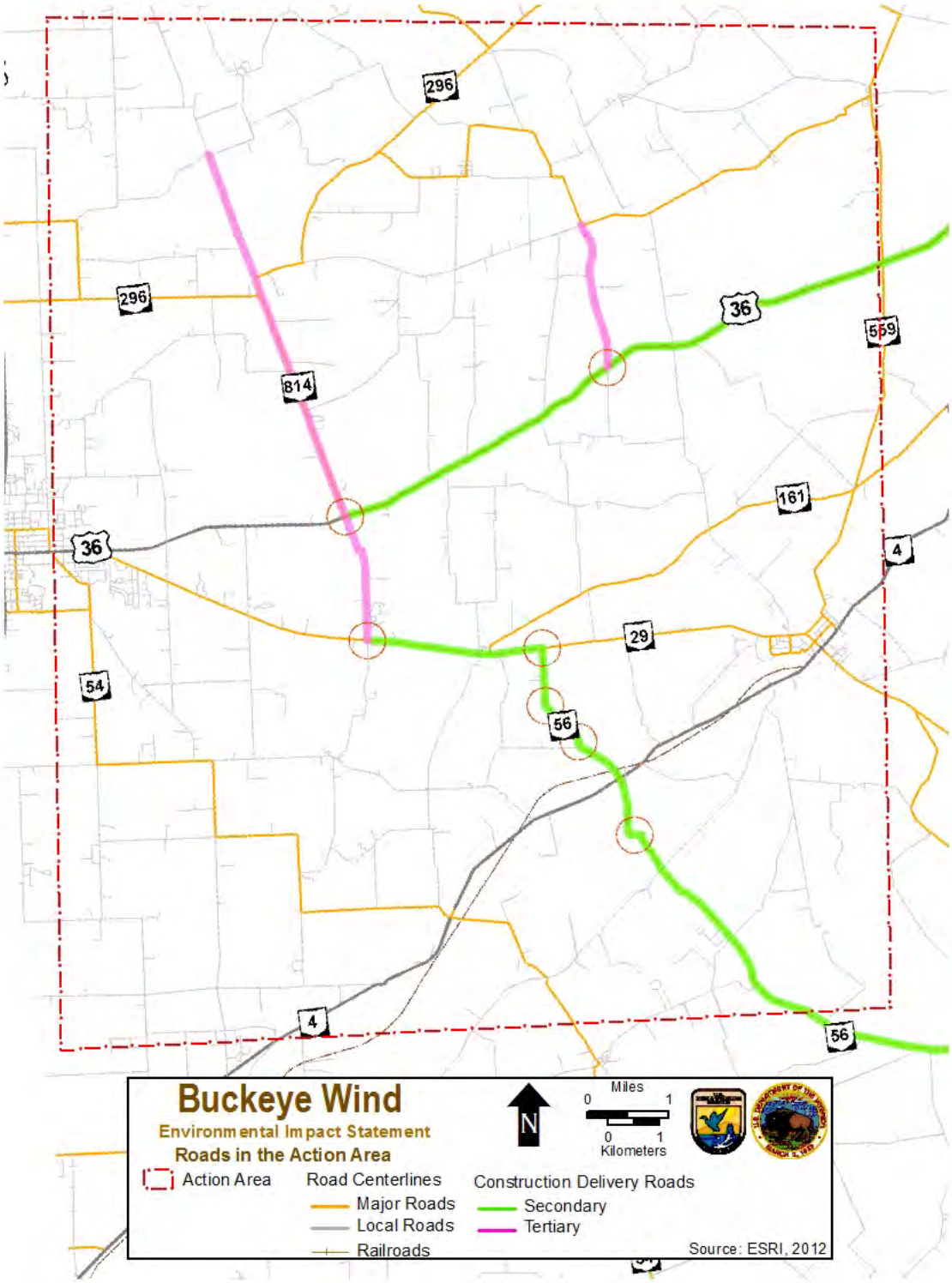
I-70 would likely be the primary route by which turbine components and other Project-related traffic would enter east-central Ohio and the Action Area. This highway is a very wide, multi-lane facility that is a major component of the nation's interstate highway system, stretching from Baltimore to Utah. As shown in Table 4.12-1 above, I-70 has a very large amount of truck traffic. Project-related traffic arriving from the west would likely exit I-70 at SR 56, while traffic arriving from the east would divert to I-270 and U.S. 33, before exiting at U.S. 36.

4.12.2.3 U.S. Routes

U.S. 33 is a four-lane freeway (no at-grade intersections or traffic signals) from I-270 (the beltway around Columbus, Ohio) to Marysville, Ohio, where Project-related traffic would exit at U.S. 36. Traffic volumes on U.S. 33 are somewhat lower than on I-70, but are still characteristic of a freeway environment. The percentage of trucks in the traffic stream is far lower on U.S. 33 than on I-70.

U.S. 36 is a much lower-capacity road of just one lane in each direction with at-grade intersections and some turn lanes, with a typical pavement width of 6 m (20 ft) (Stantec 2010b). Traffic on U.S. 36 is quite low. Except for its formal designation as a U.S. Route, U.S. 36 is very similar to other State Roads in the Action Area in terms of road character, traffic volume, and truck volume.

Figure 4.12-1 Roads in the Action Area



4.12.2.4 Other Roads

Numerous state roads would likely be used for Project-related traffic. The Applicant lists SR 56 as a primary access road for deliveries from the south and west. SR 56 is a two-lane road with at-grade intersections and a typical pavement width of 6-7 m (20-22 ft) (Stantec 2010b). Other State, County, Township, and local roads, including but not limited to those listed in Table 4.12-1 above, are similar in character (including width), traffic volume, and truck volume. All have low overall traffic volumes and relatively low truck traffic volumes.

Typical conditions on SR 56 and other Action Area roads (Source: Hull 2009c).

4.12.2.5 Planned or Potential Road Upgrades

Aside from resurfacing and drainage projects, there are no significant planned upgrades to State Roads in the Action Area. Ongoing rehabilitation of I-70 in Clark County (to the south of the Action Area) is expected to be completed by 2012 (ODOT n.d.).

4.12.2.6 Railroads

The Applicant has stated that all turbine components and other materials would likely be delivered via truck, and that railroads are not expected to be used. A segment of the Indiana and Ohio Railway (operated by RailAmerica) operates from Springfield, Ohio to Mechanicsburg, paralleling SR 4 in the Action Area (RailAmerica 2010).

Three CSX-operated rail lines also run through the Action Area and surrounding 8 km (5 mi). The first CSX line follows Interstate Highway 75 south, running north of the site through Marysville towards Columbus. Connection to this rail exists in Bellefontaine via a CSX

connecting line. This provides the area with a transit and freight link to and from various regional locations. The second CSX line follows Interstates 40 and 70 south of the site, running from Columbus and points east through Springfield and Dayton before continuing west. The final CSX line runs between Bellefontaine and Urbana, providing a freight and passenger connection between the two cities.

The closest passenger rail (Amtrak) service is in Cincinnati, approximately 145 km (90 mi) away.

4.12.2.7 Airports

There are several small public or public-use airports within 8 km (5 mi) of the Action Area. The nearest airports with scheduled commercial service are located in Dayton (approximately 42 km [30 mi] away) and Columbus (approximately 72 km [45 mi] away). Table 4.12-2 summarizes the location and characteristics of these airports. Note that Weller Field is within the Action Area.

Table 4.12-2 Airports in the Vicinity of the Action Area

Airport	Location	Function	Distance, km (mi)[1]
Dayton International Airport	Dayton	Commercial Airport	45 (28)
Port Columbus International Airport	Columbus	Commercial Airport	56 (35)
Rickenbacker International Airport	Columbus	Commercial Airport	56 (35)
Bolton Field	Columbus	General Aviation/ Commercial Reliever	37 (23)
Ohio State University Airport	Columbus	General Aviation	40 (25)
Dayton-Wright Brothers Airport	Dayton	General Aviation	61 (38)
Wright-Patterson Air Force Base	Dayton	Military Airfield	32 (20)
Grimes Field	Urbana	General Aviation	< 1.6 (1.0)
Weller Airstrip	Urbana	Privately-Owned Public-Use	0 (0)

[1] Distances are calculated from the nearest edge of the Action Area using Google Earth.

4.12.2.8 Non-Motorized Transportation Facilities

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

The ODNR's statewide trail plan, Trails for Ohioans, shows a "Potential" segment of the North Country National Scenic Trail (NOCO) - which is administered by the National Park Service in conjunction with state and local authorities - passing through Urbana and Champaign County, roughly following U.S. 68 from Clark County and U.S. 36 into Miami County (ODNR 2005). This route would take NOCO within approximately 5 km (3 mi) of the nearest turbine.

However, National Park Service mapping of NOCO shows a "Potential" route that avoids Urbana entirely. There is no indication of when this potential route might be fully developed and permanently mapped.

4.13 Communications

4.13.1 Scope of Analysis

The analysis of communications facilities in this DEIS describes the communications facilities and transmissions in the Action Area and vicinity, including radio and television broadcasts, microwave, and cellular/PCS telephone communications (Comsearch 2008a, b, c, 2009, 2011).

4.13.2 Existing Conditions

4.13.2.1 Over-The-Air Television

Over-the-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna. There are 180 over-the-air television stations within 161 km (100 mi) of the center of the Action Area (Comsearch 2008a). The television stations most likely to produce over-the-air coverage to Champaign County are those at a distance of 64 km (40 mi) or less.

Of the 41 licensed stations identified within 64 km (40 mi) of the Action Area, 22 are fully operational television stations. Six of the operating television stations are translators, or stations that transmit at low power, with limited range and limited programming. As of 2008, there were five full-power analog television stations and four full-power digital television stations servicing the area. There were also three low-power analog television stations with full programming, and four full-power digital television stations operating on temporary Special Transmit Authority from the Federal Communications Commission (FCC) (Comsearch 2008a). The full-power analog stations have converted to digital broadcast, in accordance with federal law (FCC 2010). It is not known how many low-power analog stations have converted to digital broadcast.

Full-power channels provide a wide variety of over-the-air television to local communities, and are supplemented by the full-service, low-power analog channels, and the low-power, limited programming translator stations in the area. Based on the number of over-the-air television channels available, it appears that over-the-air television is an important method of reception for communities in the area.

4.13.2.2 AM/FM Broadcast

Comsearch (2008b) also found records of six AM stations and 16 FM stations licensed within 32 km (20 mi) of the approximate center of the Action Area. Two of the AM stations (WBLL and WULM) each have two database records indicating that they both operate at two distinct transmission intensities. This effectively increases the number of AM stations near the Action Area to eight. The distance of the closest AM station antenna would be approximately 24 km (15 mi) from the center of the Action Area.

Of the 16 FM station records, 10 stations are licensed and operational, with the remainder under application or otherwise non-operational. Two of the operational FM stations are full power stations (>10 kW), two are medium-power stations (between 1 and 10 kW), and six are very-low-power stations (<0.1 kW). Of the six non-operational stations, one will likely be a full-power station, while the other five are expected to be very-low-power stations. The distance of the closest FM station antenna would be approximately 16 km (10 mi) from the center of the Action Area.

4.13.2.3 Microwave Paths

Microwave telecommunication systems are wireless point-to-point links that communicate between two antennas and require clear line-of-sight conditions between each antenna. Comsearch identified 14 microwave paths in or near the Action Area (Comsearch 2011).

4.13.2.4 Cellular/PCS Telephone

Cellular and Personal Communication System (PCS) telephone coverage in the vicinity of the Project is based on the underlying counties. Champaign County is in Cellular Market Area 180 (Springfield, Ohio). For PCS coverage, Champaign County falls within Basic Trading Area 106 and Market Trading Area 018. Table 4.13-1 lists the cellular and PCS telephone operators in Champaign County.

Table 4.13-1 Cellular and PCS Telephone Operators in Champaign County, Ohio

Operator	Band of Operation	License
Cellular Telephone		
Verizon	A	KNKA641
AT&T	A	KNKA445
PCS Telephone		
Cincinnati Bell	A	WPOI243
AT&T	A	KNLF235
T-Mobile	B	KNLF236
Verizon	B	WPQN807
Verizon	C3	WQEM938
AT&T	C4	WQDU926
Spring Nextel	C5	WQDN639
Spring Nextel	D	KNLH509
T-Mobile	E	KNLG800
Cricket/Leap	F	KNLF998

Source: Comsearch 2008c

4.13.2.5 Military and Other Communications

At the Applicant's request, the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce provided plans for the Project to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which include the Department of Defense, Department of Education, Department of Justice, and Federal Aviation Administration. NTIA's response states that IRAC agencies "have not identified any concerns regarding blockage of their radio frequency transmission" (NTIA 2008).

4.14 Health and Safety

4.14.1 Scope of Analysis

The analysis of health and safely in this DEIS examines the issues related to public health and safety as they relate to a wind turbine facility such as the Project. Where applicable, discussion of Project-specific health and safety conditions is also included. The safety issues described in this section are related to operation and/or failure of one or more Project components. Therefore, this analysis is limited to the Action Area. The health and safely analysis in this DEIS is based on information from scientific studies and data generated from wind projects currently operating in the U.S.

4.14.2 Existing Conditions—Generalized Issues

Public safety concerns associated with a wind farm arise during project construction, operation, and decommissioning. Construction-related safety issues are those typically associated with construction of tall structures, such as the potential for injuries to workers and the general public from the movement of construction vehicles, equipment, and materials; falls from structures or into open excavations; and electrocution. These types of incidents are generally well understood and background information is not presented here. However, several potential health and safety concerns associated with the operation of a wind energy facility are unique to this type of facility and merit further background discussion.

In general, wind farms are safer than other forms of energy production since combustible fuel sources and fuel storage are not required. In comparison to other types of generating facilities, the use and/or generation of toxic or hazardous materials are minor. However, risks to public health and safety can be associated with wind farms because they are generally more accessible to the public. Public safety concerns associated with wind projects are largely related to potential injury or death associated with falling overhead objects. In particular, examples of such safety concerns include ice shedding, tower collapse and blade failure, stray voltage, fire, and lightning strikes. Public safety concerns surrounding overexposure to shadow flicker are also addressed. Potential public health impacts related to noise are addressed in Section 5.10.

4.14.2.1 Ice Shedding

Ice shedding, or ice throw, refers to the phenomenon that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. There are two common types of ice formation that can occur in cold climates that may impact wind turbine operations: glaze ice and rime ice. Glaze ice forms as a result of rain freezing on cold surfaces at temperatures close to 0 ºC (32 ºF). Glaze ice is typically transparent and forms sheets of ice over large surfaces. Rime ice results when super-cooled moisture in the atmosphere contacts cold surfaces at or below 0 ºC (32 ºF). Under such conditions, ice would build up on the rotor blades and/or sensors, slowing its rotational speed and potentially creating an imbalance in the weights of the blades. Turbine control systems are designed to sense such effects of ice accumulation and to shut down the turbine until the ice melts.

Ice buildup can occur on the towers, rotors and on the nacelle. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and ice thaws from

the rotor blades. Therefore, the tendency is for pieces of ice to drop off the rotors and land near the base of the tower (Morgan et al. 1998). Potential impacts from ice shedding may result if the wind turbine remains in operation when ice has built up on the rotors or when the turbine is shut down or idling. When a turbine is in operational mode, ice can potentially be "thrown" from the rotating blades to areas outside of the area directly underneath the wind turbine rotor. The potential safety hazard from ice shedding is people and/or property being struck by fragments of ice that could fall from the turbines. Blades with ice build up turn slowly (only a few revolutions per minute) because the blade air foil has been compromised by the ice, and the blades are unable to pick up any speed until the ice is shed. Several observational studies and mathematical models examining this phenomenon have calculated how far ice potentially can be thrown from a moving rotor blade before hitting the ground (Morgan and Bossanyi 1996). The distance traveled by a piece of ice depends on a number of factors, including the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), and the prevailing wind speed.

4.14.2.2 Tower Collapse and Blade Shear

The possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle is another potential safety concern for both the general public and site workers. These are rare occurrences, although tower collapses have been documented in Ohio and other parts of the country including at the Weatherford Wind Power Project in Oklahoma in May 2005 and at the Klondike III Wind Farm east of The Dalles, Oregon in August 2007 (Reuters 2007; Associated Press 2007). In Ohio in early 2012, two blades broke off of a 1.5 MW turbine at the Timber Road EDP Renewables facility. In April 2011, a turbine located on the Western Reserve High School campus collapsed. Two years prior, multiple blades broke off of the three turbines located at Perkins High School near Sandusky, Ohio (Buckeye Power 2012).

The reasons for a turbine collapse or blade failure vary depending on conditions and tower type. Past occurrences of these incidents have generally been the result of design defects during manufacturing, poor maintenance, wind gusts that exceeded the maximum design load of the turbine structure, or lightning strikes. Most instances of blade failure and turbine collapse on large turbines were reported during the early years of the wind industry and were often attributed to human error in interfacing with the control system. Occurrences of blade shear have been reduced significantly due to changes in the operating system that limit human adjustments in the field, better turbine design, and mandatory international engineering and safety standards that ensure a high level of operational reliability and include ratings for withstanding different levels of hurricane-strength winds, among other criteria (AWEA 2010). Although blade failure from lightning strikes occurs infrequently, recent occurrences of blade shear have been associated with lightning strikes, as was the case for a small turbine failure in Huron, Ohio (Morning Journal 2010).

4.14.2.3 Stray Voltage

Stray voltage is a natural phenomenon that can be found at low levels between two contact points on any property where electricity is grounded. Studied since at least the 1960s, it has been a concern of farmers in particular. Stray voltage typically originates from low levels of alternating current voltage on the grounded conductors of a wiring system. These voltages are termed "stray

voltage" when they are large enough to form a circuit when a person or an animal simultaneously touches two objects which are part of the electrical system. Stray voltage may result from damaged, corroded or poorly connected wiring, or damaged insulation. It can also develop on incoming metallic pipes such as utility lines through induction from transmission lines if the transmission lines are in parallel with the utility lines over some distance. Such induced currents/voltages on utility lines can be transferred into surrounding buildings. Wind power projects and other electrical facilities can create stray voltage to varying degrees, based on factors such as operating voltage, geometry, shielding, rock/soil electrical resistivity, and proximity. Stray voltage from such facilities usually only occurs if the system is poorly grounded and located in proximity to ungrounded or poorly grounded metal objects (e.g. fences, buildings). Incorporating proper grounding techniques within and around project components can eliminate the occurrence of stray voltage.

4.14.2.4 Fire and Fuels

Emergency response at wind turbines can be challenging for local emergency service providers and fire departments due to their height, physical dimensions, and complexity. Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with storage and use of various oils, including diesel fuels, lubricating oils, and hydraulic fluids, can create the potential for fire or medical emergencies within the tower or the nacelle, or in places where these oils may be stored such as the substation, electrical transmission structures, staging area(s), and the operations and maintenance building.

> *Historically, a small number of fires have been directly or indirectly attributed to operating wind turbines. The suspected causes of such fires include sparks or flames resulting from substandard machine maintenance, improper welding practices, electrical shorts, equipment striking power lines, and lightning. Instances of electromechanical failures in wind turbine generators that resulted in fire have also been documented. For the most part, they have been traced to the electrical systems of the turbines (AWEA 2008).*

The fire risks associated with Project operations and maintenance are similar to risks associated with other industrial and storage facilities. Wind turbine operations and maintenance personnel for the Project would be trained in fire safety and response.

4.14.2.5 Lightning Strikes

Wind turbines are susceptible to lightning strikes due to their height and metal/carbon components. The powerful energy discharge during lightning strikes can cause severe damage to blades and can subsequently lead to complete blade failure, although blade failure from lightning strikes is uncommon. Over a nine-year period from 1990 to 1998, statistics show that lightning caused four to eight electrical faults per 100 turbine-years in northern Europe (Hansen and Korsgaard 2005). In August 2011 in Conneaut, Ohio, lightning struck at a NexGen Energy facility and hit a 400 kW tower, shattering the blades (Buckeye Power 2012). Most lightning strikes hit the rotor and their effect is highly variable, ranging from minor surface damage to complete blade failure. All modern wind turbines include lightning protection systems which are

designed to prevent catastrophic blade failure. However, lightning strikes are occasionally the cause of fires in wind turbines, as described above.

4.14.2.6 Shadow Flicker

Shadow flicker from wind turbines can occur when moving turbine blades pass in front of the sun, creating alternating changes in light intensity or shadows. These flickering shadows can cause an annoyance when cast on nearby residences ("receptors"). The spatial relationship between a wind turbine and a receptor, along with weather characteristics such as wind direction and sunshine probability, are key factors related to shadow-flicker impacts. Shadow flicker becomes much less noticeable at distances beyond about 305 m (1,000 ft), except at sunrise and sunset when shadows are long (NRC 2007).

There is some public concern that flickering light can have negative health effects, such as triggering seizures in people with epilepsy. According to the British Epilepsy Foundation (2008), approximately 5 percent of individuals with epilepsy have sensitivity to light. Most people with photosensitive epilepsy are sensitive to flickering around 16-25 hertz (Hz, or flashes per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60Hz. Because the maximum wind turbine rotor speed of 15 rotations per minute (rpm) translates to a blade pass frequency of 0.8 Hz (less than one flash per second), health effects to individuals with photosensitive epilepsy are not typically associated with wind facilities comparable to the Project.

No state or national standards exist for frequency or duration of shadow flicker from wind turbine projects. However, international studies/guidelines from Europe and Australia have suggested 30 hrs of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (Dobesch and Kury 2001; Sustainable Energy Authority Victoria 2003 as cited in EDR 2009b).

4.14.2.7 Wind Turbine Syndrome

Wind Turbine Syndrome is a term created by Dr. Nina Pierpont to describe the collection of symptoms reported to her during interviews with people who live near wind turbines (2009, pre-publication draft). It has been suggested that the reported symptoms (sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, concentration and memory problems, and panic episodes) are related to the infrasound (below 20 Hz) emitted from wind turbines during operation. Although wind turbine syndrome is not a recognized medical diagnosis, the topic has led to health concerns over wind power projects.

Pierpont hypothesized that wind turbine syndrome is caused by the combined effect of (1) airborne infrasound from wind turbines at frequencies of 1 to 2 Hz affecting the body's vestibular system; and (2) airborne infrasound from wind turbines at frequencies 4 to 8 Hz entering the lungs and transmitting vibrations throughout internal organs. The combined effect of these frequencies is hypothesized to send confusing information to the position and motion detectors of the body, causing the symptoms (Pierpont 2009, pre-publication draft; Colby et al., 2009).