Visual Impact Assessment

Buckeye II Wind Project
Champaign County, Ohio

Prepared for:

Everpower Wind Holdings, Inc.
44 East 30th Street – 10th Floor
New York, New York 10016
Telephone: (212) 647-8111
Facsimile: (212) 647-9433

Prepared by:

217 Montgomery Street, Suite 1000
Syracuse, New York 13202
P: 315.471.0688
F: 315.471.1061
www.edrcompanies.com

March 2012

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1.0 Introduction

edr Environmental Services, LLC (edr) was retained by Champaign Wind LLC, a wholly owned subsidy of EverPower Wind Holdings, Inc., ("the Applicant") to prepare a Visual Impact Assessment (VIA) for the proposed Buckeye II Wind Project (the Project) located in Champaign County, Ohio. The purpose of this VIA is to:

- Describe the appearance of the visible components of the proposed Project.
- Define the visual character of the Project study area.
- Inventory and evaluate existing visual resources and viewer groups.
- Evaluate potential Project visibility within the study area.
- Identify key views for visual assessment.
- Assess the visual impacts associated with the proposed action.

This VIA was prepared with oversight provided by a registered landscape architect[1] licensed in the State of Ohio and experienced in the preparation of visual impact assessments. It is also consistent with the policies, procedures, and guidelines contained in established visual impact assessment methodologies (see Literature Cited/References section).

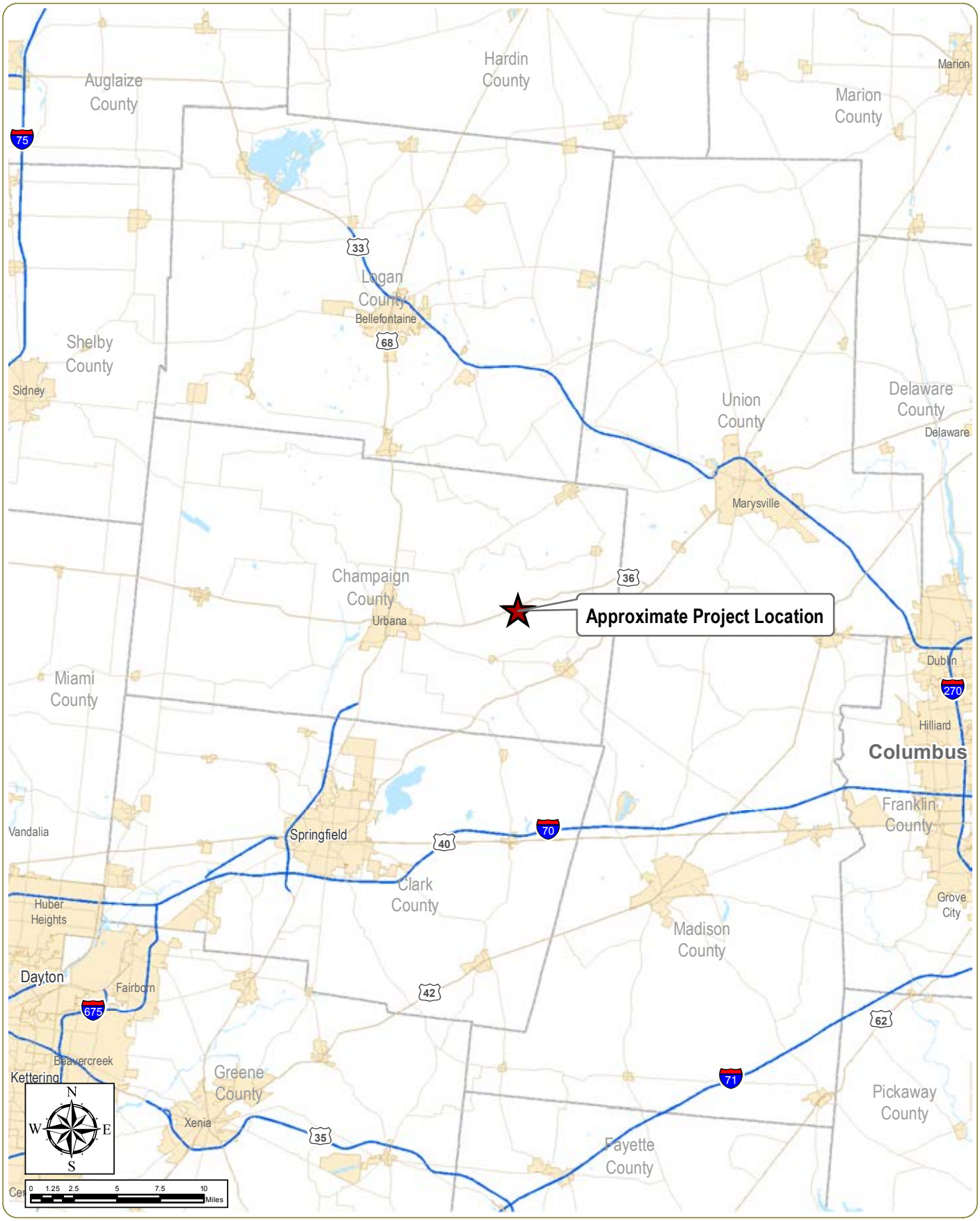
[1]Mr. Douglas Brackett: registered by the State Education Departments to practice Landscape Architecture in the States of New York, Pennsylvania, and Ohio.

2.0 Project Description

2.1 Project Site

The Project site includes approximately 13,500 acres of leased private land in the Towns of Salem, Wayne, Rush, Goshen, Urbana, and Union in Champaign County, Ohio (Figure 1). The site is roughly bounded by State Route 245 to the north, State Route 559 to the east, State Route 4 to the south, and U.S. Route 68 to the west. The site is located approximately 2 miles south and east of the City of Urbana, 0.5 mile north and west of the Village of Mechanicsburg, 4.5 miles southwest of the Village of North Lewisburg, 5.5 miles northeast of the City of Springfield, and 8 miles southeast of the Village of West Liberty (as measured to the nearest turbine). It is approximately 20 miles west of Columbus, and 24 miles northeast of Dayton.

The Project site is located on an elevated plateau that is characterized by level to gently-rolling topography with elevation ranging between 800 and 1,350 feet above mean sea level (amsl). Land use within the Project site is dominated by active agriculture, with farms and single-family rural residences generally occurring along the road frontage (see representative photos in Appendix C).



Buckeye II Wind Project

Goshen, Rush, Salem, Union, Urbana, and Wayne Townships - Champaign County, Ohio

Visual Impact Assessment

Figure 1: Regional Project Location

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Notes: Base Map: ESRI StreetMap North America, 2008.

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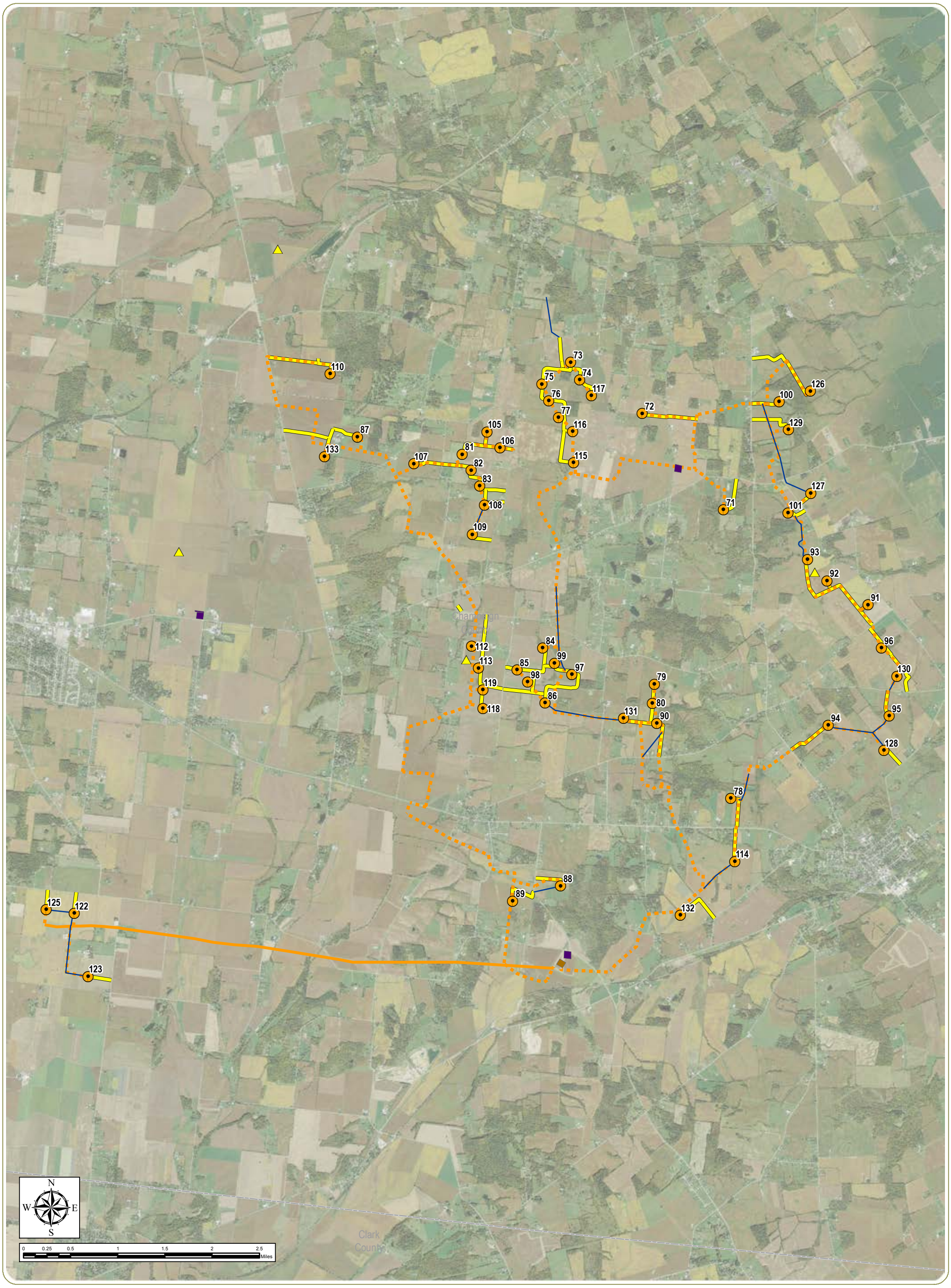
2.2 Proposed Project

The proposed Project evaluated in this VIA is a wind-powered electric generating facility, consisting of up to 56 wind turbine generators, each with a nameplate capacity rating of 1.6 to 2.5 MW (depending on the final turbine model selected), and a total generating capacity of between 89.6 to 140 MW. Fewer than 56 turbines may actually be constructed, depending on the model of turbine selected. However, to allow for flexibility on final site selection (e.g., selecting one turbine site over another based on additional collection of site-specific wind data and/or if a cultural resource is discovered upon excavation), the Applicant seeks approval for a maximum of 56 turbine sites. Along with the turbines, the Project includes associated support facilities including roads, overhead/buried electrical interconnect cable, meteorological towers, a substation, and an operations and maintenance building. Project configuration/layout is illustrated in Figure 2. The major components of the proposed Project are described below:

2.2.1 Wind Turbines

Although several turbine models are being considered, for the purpose of the VIA, it was assumed that the Nordex N100 turbine will be utilized on the Project. This turbine is among the largest models that are being considered and therefore presents a worst case assessment of Project visibility. Each wind turbine consists of three major components; the tower, the nacelle, and the rotor, all of which will be white in color. The height of the tower, or "hub height" (height from foundation to top of tower) will be approximately 328 feet (100 m). The nacelle sits atop the tower, and the rotor hub is mounted to the nacelle. Assuming a 100 m rotor diameter, the total turbine height (i.e., height at the highest blade tip position) will be approximately 492 feet (150 m). A computer model illustrating the appearance of the proposed turbine is shown in Figure 3.



Buckeye II Wind Project

Goshen, Rush, Salem, Union, Urbana, and Wayne Townships - Champaign County, Ohio

Visual Impact Assessment
Figure 2: Proposed Project Layout

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Notes: Base Map: One-meter resolution orthoimagery, 2011.

- Wind Turbine
- Met Tower
- Overhead Interconnect
- Buried Interconnect
- Access Road
- Crane Path
- Substation
- Staging Area

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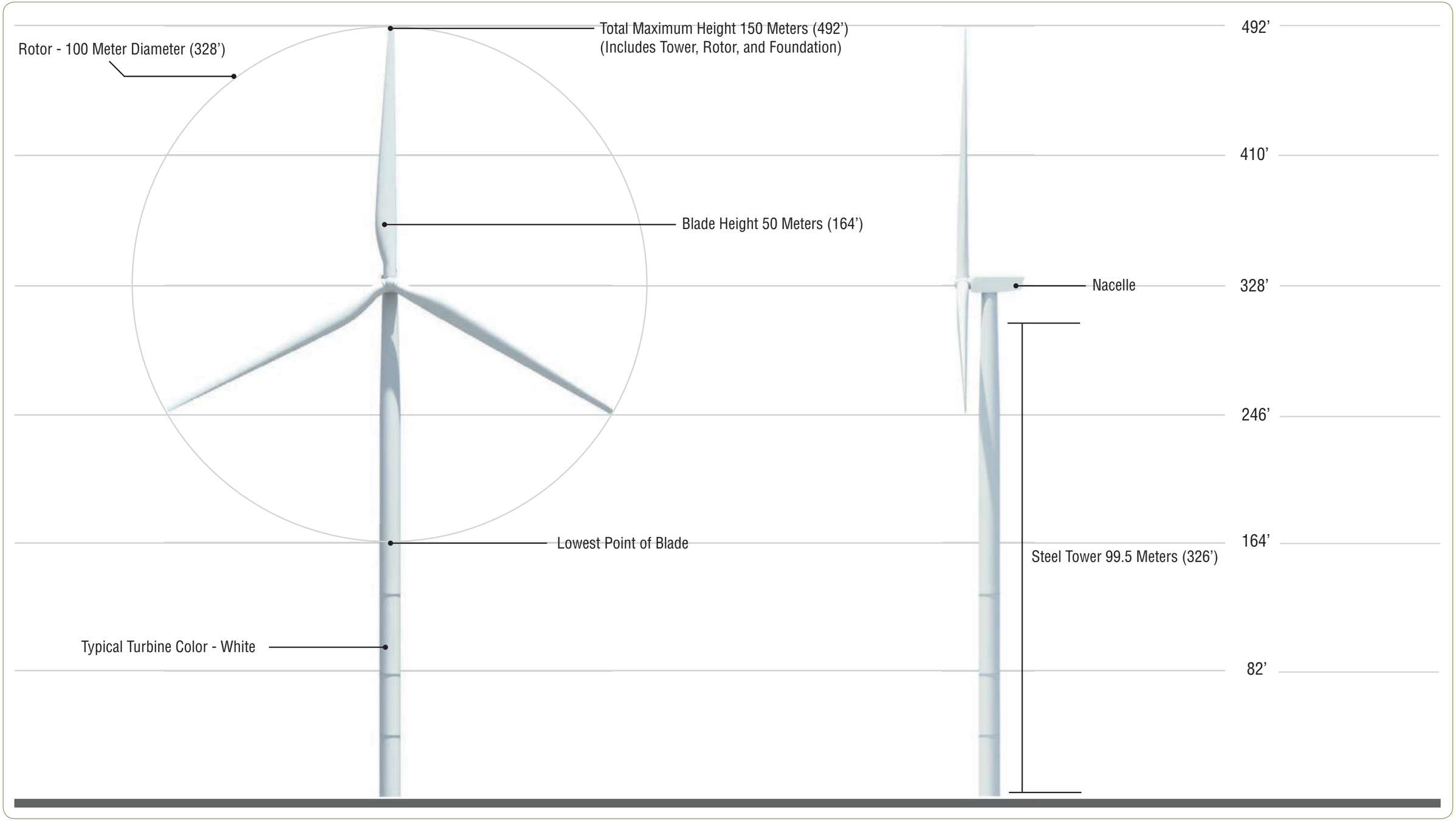

Buckeye II Wind Project
Goshen, Salem, Rush, Union, Urbana, and Wayne Townships - Champaign County, Ohio
Visual Impact Assessment. Figure 3: Computer Model of Proposed Wind Turbine: Siemens Nordex N100
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Descriptions of each of the turbine components are provided below.

Tower: The towers used for this Project are conical steel structures manufactured in five sections. The towers have a base diameter of approximately 14 feet and a top diameter of approximately 10 feet. Each tower will have an access door, internal lighting, and an internal safety ladder to access the nacelle.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is approximately 35 feet long, 13 feet tall, and 11 feet wide. Attached to the top of up to approximately half of the nacelles, per specifications of the Federal Aviation Administration (FAA), will be a single aviation warning light. These will be medium intensity flashing red lights (L864) and operated only at night. For the purposes of this study, it is assumed that the nacelle will include no obvious lettering, logo, or other exterior marking.

Rotor: A rotor assembly is mounted on the nacelle to operate upwind of the tower. The rotor consists of three fiberglass composite blades, each approximately 160 feet (48.8 m) in length. The rotor is attached to the drive shaft at the front of the nacelle. The pitch of each blade is varied according to wind speed by electro servomotors within the rotor hub. The wind turbines begin generating at wind speeds as low as 6.7 mph and automatically shut down at wind speeds above 45 mph. Maximum rotor speed is approximately 15 revolutions per minute.

2.2.2 Electrical System

The proposed Project will have an electrical system that consists of 1) a system of buried and above-ground 34.5 kilovolt (kV) cables that will collect power from each wind turbine, and 2) a substation that steps up and transfers the power from the 34.5 kV cables to the existing Urbana-Mechanicsburg-Darby 138 kV transmission line and regional power grid. Each of these components is described below.

Collection System: A transformer located at the base of each turbine raises the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the collection system. From the transformer, cables will join the collector circuit and turbine communication cables to form the electrical collection system. A total of approximately 47 miles of cable will be installed (41.6 miles underground and 5.4 miles overhead). The appearance of the overhead lines has yet to be determined. Compared to the wind turbine, these lines are a very minor visual component of the Project. In addition, 34.5 kV lines often

run along rural roadways and will generally not appear out of place in this setting (see examples of typical 34.5 kV lines in Appendix E). Consequently, this component of the Project is not the subject of further evaluation in this visual impact study.

Substation: The substation will be located near the intersection of Pisgah Road and Route 56 in the Town of Union, adjacent to the Givens to Mechanicsburg section of the Urbana – Mechanicsburg – Darby 138 kV transmission line. The substation will step up voltage from 34.5 kV to 138 kV to allow connection with the existing transmission line. The substation will be approximately 715 by 315 feet in size, enclosed by a chain link fence, and accessed from Pisgah Road by a new gravel-surfaced road approximately 0.1 mile in length. The substation control building will require utility service (phone and electrical) that will be run from the nearest existing local utility lines. Design of the proposed substation has not yet been finalized, but examples from other wind power projects showing the typical appearance of such facilities are included in Appendix E. As these examples illustrate, although they present contrast with the existing landscape in line, color, texture and form, substation components are relatively low in height and have limited solid mass. Consequently, they are generally only visible from foreground locations (i.e., within 0.5 mile) where natural screening is lacking. Their visual impact is thus limited, and is not the subject of further evaluation in this study.

2.2.3 Access Roads

The Project site includes an extensive network of existing state, county and local roads. Therefore, existing roads will be used as the primary means of accessing the proposed Project. While, it is possible that some existing public roads will need to be improved to facilitate Project construction, although the location and extent of these public road improvements is currently unknown, and they are not anticipated to significantly change the character of the existing roads. Minor improvements to existing roads are therefore are not evaluated in this study.

In addition to using the existing public roads, the Project will require the construction of new or improved private roads to access individual turbine sites. The proposed location of Project access roads is shown in Figure 2. The total length of access roads required to service all proposed wind turbine locations is approximately 25.25 miles, the majority of which will be upgrades to existing farm lanes. The roads will be gravel-surfaced and up to 40 feet in width (including side slopes) during Project construction. Each road will be individually designed for site-specific engineering and environmental constraints, therefore as-built road widths may vary. Following construction, Project access roads will be reduced in width to approximately 20 feet, and will receive very limited use. Although included

in any simulations where they may be visible, these access roads take on the appearance of farm lanes, and generally do not have a significant long-term visual impact. Consequently, the visibility and visual impact of Project access roads, on their own, are not evaluated in this study.

2.2.4 Meteorological Towers

Up to four 80-meter (262.5-foot) or 95-meter (312-foot) permanent meteorological wind measurement towers will be installed to collect wind data and support performance testing of the turbines. The Applicant anticipates that these towers will be galvanized steel structures equipped with wind velocity directional measuring instruments at three different elevations and a red aviation warning lighting mounted at the top. It is anticipated that each tower will be self-supporting. Meteorological towers typically have limited visibility and visual impact relative to the adjacent turbines. Consequently, this component of the Project is not addressed in this study.

2.2.5 Operations and Maintenance Facility

An O&M building and associated storage yard will be required to house operations personnel, equipment, and materials, and to provide operations staff parking. It is anticipated that an existing structure in the vicinity of the Facility will be purchased or leased and refurbished for O&M activities. If a new building is needed, it is not expected to exceed 6,000 square feet in total size, or permanently disturb an area of greater than 2 acres. The Applicant will incorporate motifs and design elements into the construction of the O&M building to ensure that it blends with the area's agricultural landscape. Likewise, if necessary, the Applicant will provide visual screening (e.g. vegetation, berms, etc.) to reduce the visual impact of the associated storage yard. Consequently, the O&M facility should be compatible with the existing landscape, and is not evaluated as part of this study.

3.0 Existing Visual Character

Based on established visual assessment methodology (USDA Forest Service, 1974; USDoI Bureau of Land Management, 1980; USDoT Federal Highway Administration, 1981; NYSDEC, not dated, 2000; APA, not dated; Smarden *et al.*, 1988) the visual study area for the Project was defined as the area within a 5-mile radius of each of the proposed wind turbines. Chapter 4906-17 of the Ohio Administrative Code (OAC), Application Filing Requirements for Wind-Powered Electrical Generation Facilities, section (D)(1), also indicates that a 5-mile radius is the appropriate study area for the identification of scenic and historic resources (OPSB, 2009). The study area encompasses approximately 234 square miles, primarily within Champaign County but also including portions of Union, Madison, and Clark Counties. This area includes all or portions of the Townships of Goshen, Mad River, Rush, Salem, Union, Urbana, and Wayne in Champaign County; Union Township in Union County; Monroe, Pike, and Somerford Townships in Madison County; and German, Moorefield, and Pleasant Townships in Clark County. Named settlements within the study area include the City of Urbana; the Villages of Catawba, Mechanicsburg, Mutual, North Lewisburg, and Woodstock; the census designated place of Northridge; and the hamlets of Cable, Fountain Park, Kennard, Middletown, and Mingo. The location and extent of the visual study area is illustrated in Figure 4.

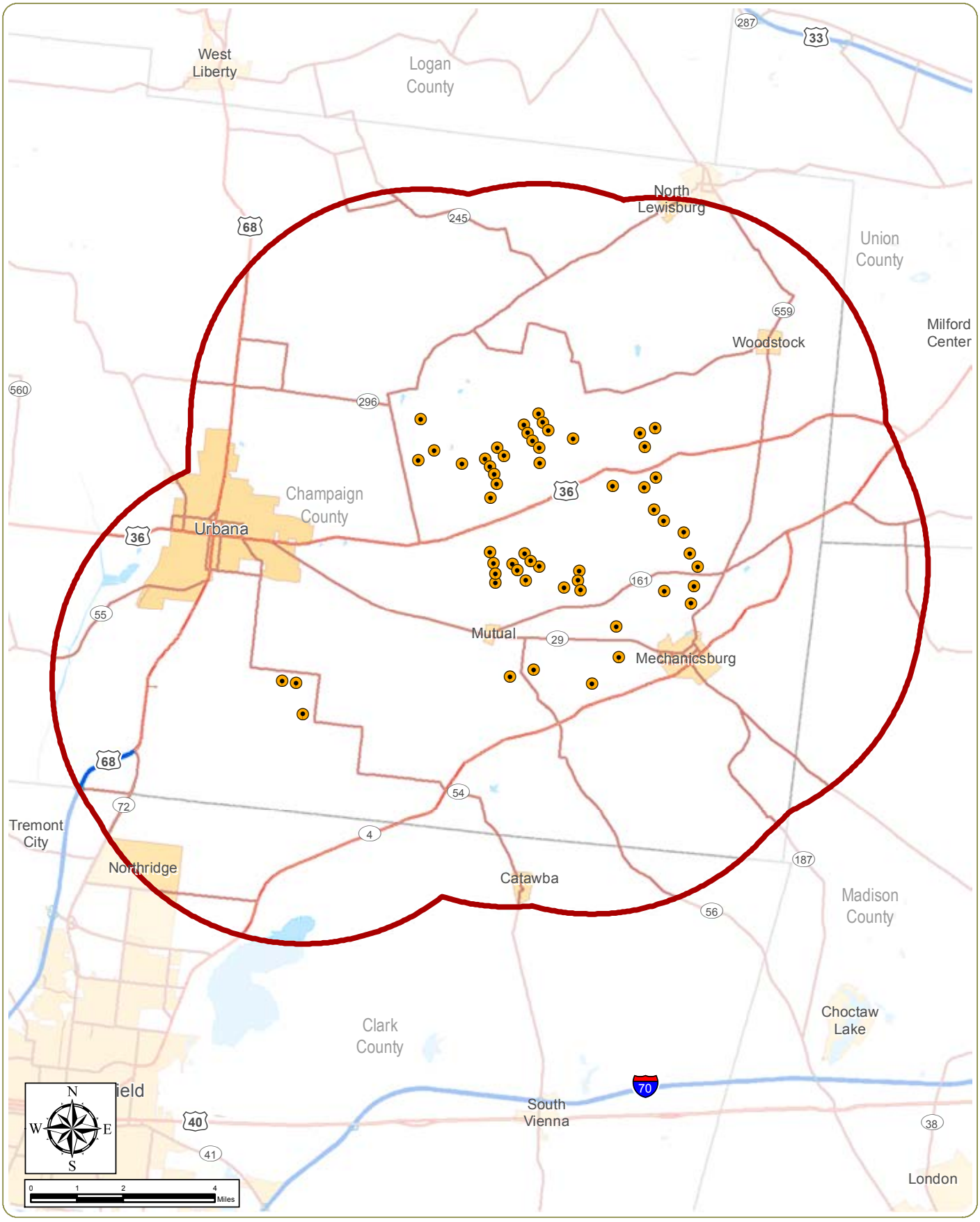

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Figure 4: Visual Study Area
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Notes: Base Map: ESRI StreetMap North America, 2008.

Wind Turbine
5-Mile Study Area

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3.1 Physiographic/Visual Setting

3.1.1 Landform and Vegetation

The visual study area is in the Bellefontaine Uplands physiographic sub-region of the Central Ohio Till Plains. This area is distinguished by gently rolling hills and moderate slopes formed as a result of glacial processes. Elevations within the study area range from approximately 950 to 1,375 feet amsl. 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, Buck Creek and Little Darby Creek occur to the west, south and east, respectively.

Vegetation in the study area is dominated by active agricultural land (pasture and active crop fields) with scattered areas of upland and riparian forest and some successional shrub land. Open fields are often interspersed with and bordered by hedgerows and small woodlots. Significant blocks of forest (upland and riparian) occur primarily on steeper slopes and in stream valleys scattered through the central and eastern portions of the study area and concentrated along the Mad River Valley in the southwest portion of the study area. Forest vegetation is primarily deciduous (oak-hickory and northern hardwoods).

3.1.2 Land Use

Land use within the 5 mile-radius visual study area is dominated by agricultural land, farms, and rural and suburban style residences. Farms in the area are typically large (average size over 200 acres), with soybeans, corn, wheat and hay being the primary agricultural crops grown in the area. Higher density residential and commercial development is concentrated in the City of Urbana, the Villages of North Lewisburg, Woodstock, Mechanicsburg, Catawba, and Mutual, and several small settlements including the hamlets of Mingo, Kennard, Fountain Park, Cable, and Middletown. The study area also includes a portion of Northridge, which is a suburb located immediately north of the City of Springfield. The city and villages are generally characterized by a main street business district, surrounded by traditional residential neighborhoods, with some commercial frontage development along the outskirts. Hamlets within the study area are relatively small pockets of development within a primarily 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.

3.1.3 Water Features

Water features within a 5-mile radius of the Project site are primarily the headwaters and tributaries of Big Darby Creek, Mad River, and Deer Creek. The study area also includes Muzzy's Lake, located just west of the City of Urbana, as well as the C.J. Brown Reservoir within Buck Creek State Park, in the southern portion of the visual study area. The majority of the water features within the study area are small streams and ponds that occur on private land, and therefore receive very limited recreational use. However, public access to the C.J. Brown Reservoir is available, and this water body receives considerable recreational use, including boating, swimming, and fishing. Most of the streams within the study area are not major visual components of the landscape, and typically can only be seen at, or in proximity to public road crossings.

3.2 Landscape Similarity Zones

Within the 5-mile radius visual study area, four major landscape similarity zones (LSZ) were defined. The USGS Land Cover Data used to help define the location of these zones is illustrated in Figure 5 (Sheet 1), along with representative photos of each (Sheets 2 and 3). The general landscape character, use, and potential views to the proposed Project within each of the LSZs that occur within the study area are described below.

3.2.1 Zone 1: Rural Residential/Agricultural Zone

The Rural Residential/Agricultural LSZ is the dominant landscape type, 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 the more level ground, while woodlots and bands of forest vegetation occur more commonly on steeper slopes and poorly drained areas. Dominant agricultural uses include crop farming (primarily soybeans, corn, wheat and hay) along with pasture. Due to the presence of open fields, views within this LSZ are more open and long distance than those available in other zones within the study area. These views typically include a level to gently sloping foreground landscape, with woodland vegetation in the background, and, in places, crossing or framing the view. Views in the Rural Residential/Agricultural LSZ include widely scattered homes, barns and silos, with working farm equipment occasionally seen in the fields. Due to the location of the turbines on an elevated plateau, the abundance of open fields, and the proposed location of turbines exclusively within this zone, foreground (0-0.5 mile), mid-ground (0.5-3.5 miles), and background (>3.5 miles) views of the proposed Project will be available from many areas within the Rural Residential/Agricultural LSZ.

3.2.2 Zone 2. City/Village Zone

This LSZ includes the City of Urbana and the various villages within the visual study area. This zone is characterized by high to moderate-density residential and commercial development. Vegetation and landform contribute to visual character in the city and village areas, but within the majority of this zone, 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. Activities within this zone are primarily associated with business and residential uses, as well as local travel. Views within this zone are typically focused on the roadways and adjacent structures, although outward views across yards and adjacent fields are available at the outskirts of these areas. Views of the Project will generally be screened by structures, but could occasionally be available from open road corridors and the edges of the City/Village zone, where structures and vegetation density decrease and therefore screening is reduced.

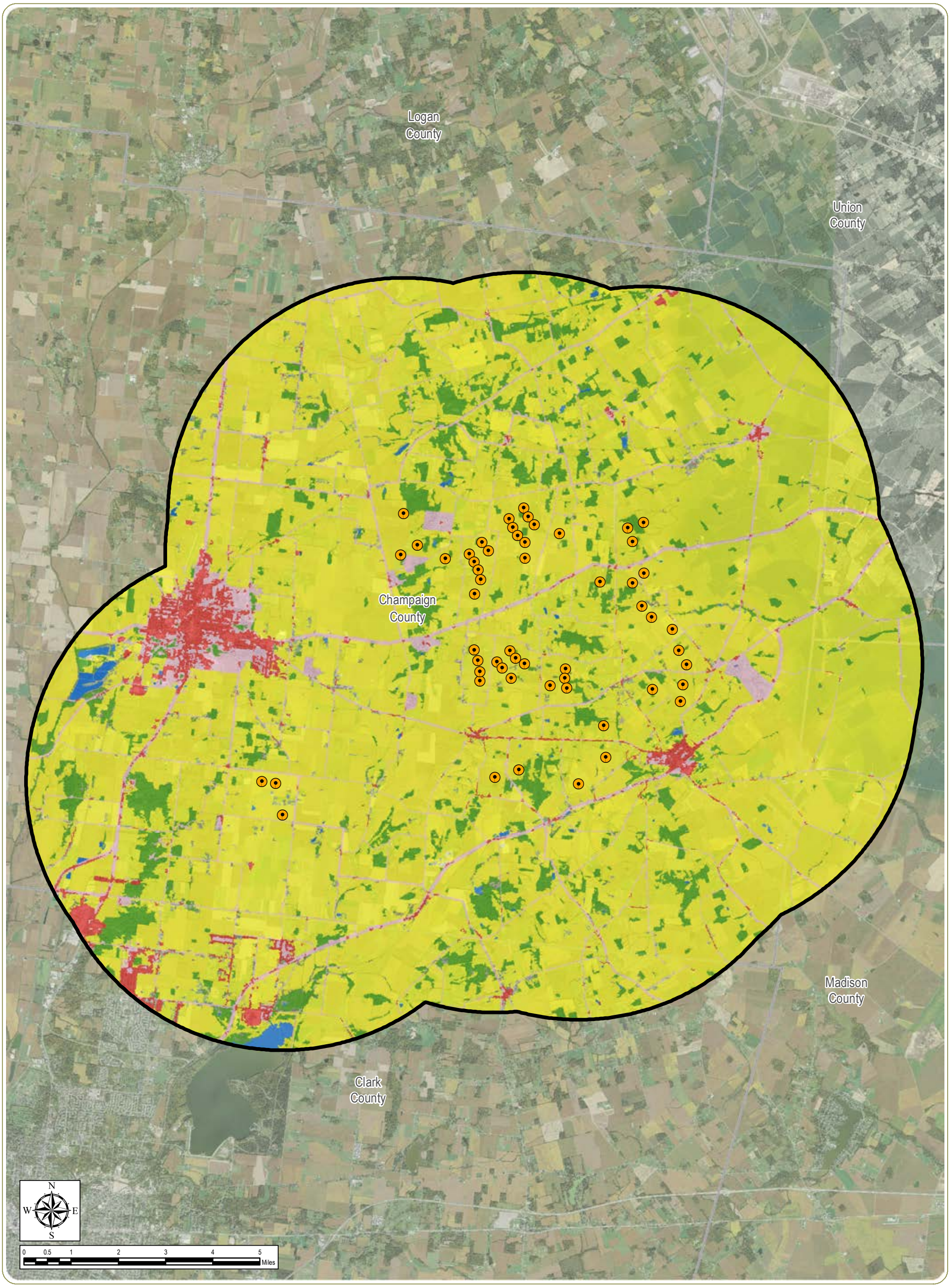
3.2.3 Zone 3. Suburban Residential Zone

This zone is dominated by low to medium-density residential neighborhood development that typically occurs along the main road frontage or in cul-de-sacs spurring off the main roads. Buildings tend to be relatively new construction, 1-2 stories in height, and more spread out than in a village setting. Consequently, open views to the surrounding landscape are generally more restricted than in open agricultural areas, but more available than in areas of more concentrated human settlement. The effect of vegetation on visibility is highly variable in this LSZ, with adjacent agricultural fields offering open views in some areas, and hedgerows, woodlots and yard trees significantly blocking views in others. Land use in this zone is almost exclusively residential, suggesting a relatively high sensitivity to visual quality and visual change. Examples of this zone can be found on the outskirts of the City of Urbana and the suburb of Northridge.

3.2.4 Zone 4. Hamlet Zone

This zone includes the hamlets of Middletown, Fountain Park, Kennard, Cable and Mingo. The hamlets generally consist 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, these houses tend to have larger backyards and may border on active or inactive agricultural land and/or woodlots. Occasional commercial establishments, churches, and historic structures are found in some of these areas. Activities are primarily associated with residential use and local travel, although some small scale commercial

businesses and limited agricultural activity also occur in some areas. Views within this zone are typically focused on the highway and adjacent structures, although outward views across yards and adjacent fields are also available. Views are most likely from the edges of the hamlet zone, where housing and vegetation density decrease and therefore screening is reduced. Potential Project visibility will vary based on distance between the hamlets and the proposed Project.



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Goshen, Rush, Salem, Union, Urbana, and Wayne Townships - Champaign County, Ohio

Visual Impact Assessment
Figure 5: Landscape Similarity Zones

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Notes: Base Map: NAIP one meter resolution orthoimagery, 2004 and 2011.

Wind Turbine
5-Mile Study Area

Land Cover
Agricultural
Forest
Developed
Intensely Developed
Water

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Photo 01

Rural Residential/Agriculture Zone

Photo 02

City/Village Zone

Photo 03

Suburban Residential Zone

Photo 04

Hamlet Zone

3.3 Viewer/User Groups

Three categories of viewer/user groups were identified within the visual study area. These include the following:

3.3.1 Local Residents

Local residents include those who live and work within the visual study area. They generally view the landscape from their yards, homes, local roads and places of employment. Residents are concentrated in and around the City of Urbana, and the various villages and hamlets, but occur throughout the visual study area. Except when involved in local travel, residents are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or elevated viewpoints (typically upper floors/stories of homes). Residents' sensitivity to visual quality is variable, however, it is assumed that some residents may be very sensitive to changes in particular views that are important to them.

3.3.2 Through Travelers/Commuters

Commuters and travelers passing through the area view the landscape from motor vehicles on their way to work or other destinations. 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 (e.g., U.S. Routes 36 and 68, and State Routes 559, 245, 296, 814, 187, 161, 29, 56, 54, 55, 4, and 72) will generally be focused on the road and traffic conditions, but do have the opportunity to observe roadside scenery. Passengers in moving vehicles will have greater opportunities for prolonged off-road views than will drivers, and accordingly, may have greater perception of changes in the visual environment.

3.3.3 Tourists/Recreational Users

Recreational users and tourists include local residents and out-of-town visitors involved in cultural and recreational activities at parks, recreational facilities, and historic sites, as well as in undeveloped natural settings such as forests and fields. These viewers are concentrated in the recreational facilities/cultural sites located within and adjacent to the visual study area, including the Ohio Caverns, Buck Creek State Park, C.J. Brown Reservoir, various local parks and golf courses, as well as historic sites in Urbana and Mechanicsburg. Members of this group may view the landscape from area highways while on their way to these destinations, or from the sites themselves. This group includes, bicyclists, hikers, recreational boaters, hunters, fishermen and those involved in more passive recreational

activities (e.g., picnicking, sight seeing, or walking). Visual quality may or may not be an important part of the recreational experience for these viewers. However, for some, scenery will be a very important part of their experience, and in almost all cases enhances the quality of recreational experiences. Recreational users and tourists will often have continuous views of landscape features over relatively long periods of time, and will typically only view the surrounding landscape from ground-level vantage points. However, it is worth noting that there is not a significant concentration of recreational areas/facilities in the visual study area.

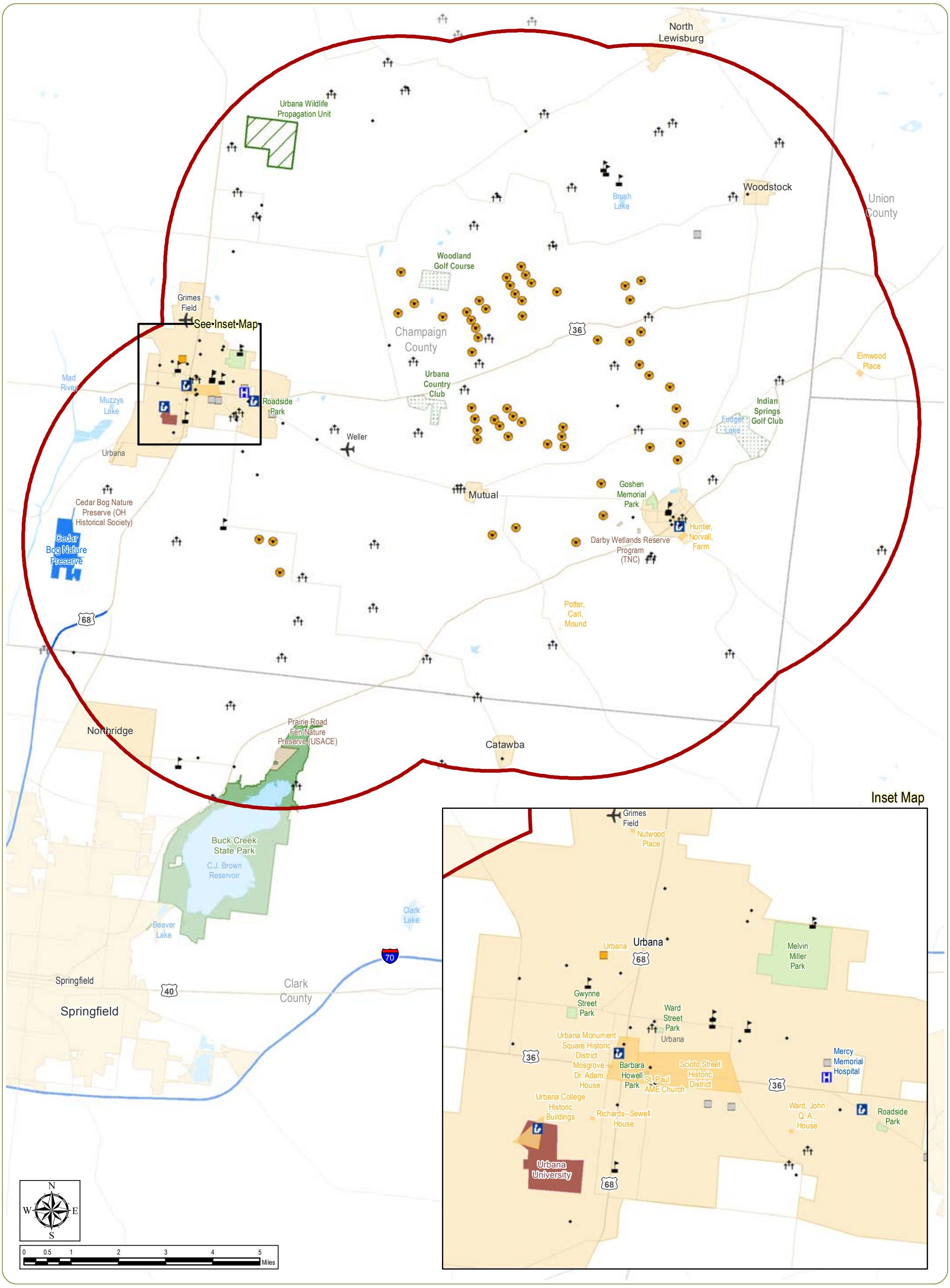
3.4 Visually Sensitive Resources

The 5-mile radius visual study area includes several sites that could be considered scenic resources of statewide significance. These include 31 sites/districts listed on the National Register of Historic Places (including 21 in Mechanicsburg and eight in Urbana), plus one additional site in Urbana that has been determined eligible for listing. Within the study area, there are also 23 state historic markers, one State Park (Buck Creek State Park), one State Wildlife Management Area (Urbana Wildlife Propagation Unit), one State Nature Preserve (Prairie Road Fen), one parcel of Nature Conservancy land (Darby Wetlands Reserve), and one National Natural Landmark (Cedar Bog Nature Preserve). There are no State Forests, National Wildlife Refuges, National Park Service Lands, designated State or Federal trails, or designated scenic roads or scenic overlooks within the visual study area.

There are also no state or federally designated wild, scenic, or recreational rivers within the visual study area. However, outside of the 5-mile radius study area, portions of both Big and Little Darby Creek are designated as state and national scenic rivers. The Little Darby Creek designation starts at the Lafayette-Plain City Road Bridge (approximately 10 miles from the nearest proposed turbine), while the Big Darby Creek designation starts at the Champaign-Union County line (approximately 6 miles from the nearest proposed turbine). The National Park Service also maintains the National Rivers Inventory (NRI), a national listing of "potentially eligible river segments," as required by the Wild and Scenic Rivers Act of 1968. A river segment may be listed on the NRI if it is free-flowing and has one or more "outstandingly remarkable values" (ORVs). The kinds of ORVs that can qualify a river for listing include: exceptional scenery, fishing or boating, unusual geological formations, rare plant and animal life, and cultural or historical artifacts that are judged to be of more than local or regional significance. The NRI website for Ohio (NPS, 2009) indicates that Big Darby Creek is listed as potentially eligible from its source, with ORVs for recreation, fish, and wildlife. This segment of Big Darby Creek is approximately 6 miles away from the nearest proposed turbine. The next closest potentially eligible river segment is the Mad River in Clark County (only listed up to Tremont City), approximately 6 miles from the nearest turbine.

Beyond these scenic resources of statewide significance, the 5-mile radius study area also includes areas that are regionally or locally significant/sensitive, due to the type or intensity of land use they receive. These include the C.J. Brown Reservoir, and various golf courses, local parks, schools, waterbodies, churches, cemeteries, areas of concentrated human settlement (City of Urbana and various villages and hamlets), and heavily traveled highways.

All inventoried scenic/sensitive resources are listed in Table B in Appendix B. The location of mapped visually sensitive resources within the visual study area is illustrated in Figure 6, and on the large-scale viewshed maps included in Appendix B.



Buckeye II Wind Project

Goshen, Rush, Salem, Union, Urbana, and Wayne Townships - Champaign County, Ohio

Visual Impact Assessment
Figure 6: Visually Sensitive Resources

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Notes: Base Map: ESRI StreetMap North America, 2008.

- Wind Turbine
- Airport
- Cemetery
- Place of Worship
- Hospital
- Library
- Nursing Home
- School
- NRHP-Eligible Site
- NRHP-Listed Site
- State Park
- State Wildlife Area
- Golf Course
- Local Park
- National Natural Landmark
- Nature Preserve
- College
- 5-Mile Study Area

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4.0 Visual Impact Assessment Methodology

The Visual Impact Assessment (VIA) procedures used for this study are consistent with methodologies developed by the U.S. Department of the Interior, Bureau of Land Management (1980), U.S. Department of Agriculture, National Forest Service (1974), the U.S. Department of Transportation, Federal Highway Administration (1981), and the NYS Department of Environmental Conservation (not dated). Methodologies employed are also consistent with European guidance developed specifically for wind farms (University of New Castle, 2002; Enviros Consulting, 2005; Horner & Maclennan and Envision, 2006) and are widely accepted as standard visual impact methodology for wind energy projects (CEIWEP, 2007). The specific techniques used to assess potential Project visibility and visual impacts are described in the following section.

4.1 Project Visibility

An analysis of Project visibility was undertaken to identify those locations within the visual study area where there is potential for the proposed wind turbines to be seen from ground-level vantage points. This analysis included identifying potentially visible areas on viewshed maps and verifying visibility in the field. The methodology employed for each of these assessment techniques is described below.

4.1.1 Viewshed Analysis

Topographic viewshed maps for the Project were prepared using USGS digital elevation model (DEM) data (7.5-minute series), the location and height of all proposed turbines (see Figure 2), and ESRI ArcGIS® software with the Spatial Analyst extension. Two 5-mile radius topographic viewsheds were mapped; one to illustrate "worst case" daytime visibility (based on a maximum blade tip height of 492 feet above existing grade) and the other to illustrate potential visibility of turbine lights (based on a FAA warning light height of 101.5 meters, or 333 feet, above existing grade). The turbine light (i.e., 333-foot) viewshed analysis was based on the conservative assumption that all turbines could be equipped with FAA warning lights. This analysis likely overstates Project nighttime visibility because the actual lighting of turbines will be in conformance with FAA lighting guidelines (FAA, 2005), which typically result in aviation warning lights on only about one third to one half of the turbines in a given project.

The ArcGIS program defines the viewshed (using topography only) by reading every cell of the DEM data and assigning a value based upon the number of turbines visible from observation points throughout the 5-mile study area. The resulting topographic viewshed maps define the maximum area from which any turbine within the

completed Project could potentially be seen within the study area during both daytime and nighttime hours (ignoring the screening effects of existing vegetation and structures). Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewsheds represent a "worst case" assessment of potential Project visibility. The results of this analysis are then grouped by number of turbines potentially visible. Three turbine count groups were defined to create an even distribution of turbines within each group, and to allow easy interpretation of the final map.

In addition, a vegetation viewshed analysis was also prepared to better illustrate the potential screening effect of forest vegetation. The vegetation viewshed utilized a base vegetation layer created with 2006 USGS National Land Cover Data with forested areas assigned an assumed elevation of 40 feet. This layer was added to the digital elevation model to produce a base layer for the viewshed analysis, as described above (using the blade tip and nacelle heights as input data). Once the viewshed analysis was completed, the areas covered by the forest vegetation layer were designated as “not visible” on the resulting data layer to reflect the fact that views from within forested areas will be screened.

It is worth noting that because characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.) are not into taken consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility.

4.1.2 Field Verification

Visibility of the proposed Project was also evaluated in the field during site visits conducted on January 24-25, 2008 and October 11, 2011. The purpose of these site visits was to verify potential turbine visibility as indicated by viewshed analysis and to obtain photographs for subsequent use in the development of visual simulations. A mix of weather conditions, which ranged from clear skies and high clouds to mostly overcast, resulting in photographs that collectively depict a representative variety of sky/lighting conditions. The photographs also depict the study area during both autumn and winter conditions.

During the field verification, an edr field crew drove public roads and visited public vantage points within the 5-mile radius study area to document points from which the turbines would likely be visible, partially screened, or fully screened. This determination was made based on the visibility of existing structures located in proximity to the proposed turbine sites (communication towers, silos, houses, roads, etc.), which served as locational and scale references. Photos were taken from 172 representative viewpoints within the study area. All photos were obtained

using Nikon D200 digital SLR camera with a focal length between 28 and 35 mm (equivalent to between 45 and 55 mm on a standard 35 mm film camera). This focal length most closely approximates normal human eyesight relative to scale. Viewpoint locations were determined using hand-held global positioning system (GPS) units and high resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment (camera, GPS unit, etc.) and noted on field maps and data sheets (see Appendix C). Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project.

4.2 Project Visual Impact

Beyond evaluating potential Project visibility, the VIA also examined the visual impact of the proposed wind turbines on the aesthetic resources and viewers within the Project study area. This assessment involved creating computer models of the proposed Project turbines and layout, selecting representative viewpoints within the study area, and preparing computer-assisted visual simulations of the proposed Project. These simulations were then used to characterize the type and extent of visual impact resulting from Project construction. Details of the visual impact assessment procedures are described below.

4.2.1 Viewpoint Selection

From the photo documentation conducted during field verification, edr selected a total of 10 viewpoints for development of visual simulations. These viewpoints were selected based upon the following criteria:

1. They provide clear, unobstructed views of the Project (as determined through field verification).
2. They illustrate Project visibility from sensitive sites/resources with the visual study area.
3. They illustrate typical views from landscape similarity zones where views of the Project will be available.
4. They illustrate typical views of the proposed Project that will be available to representative viewer/user groups within the visual study area.
5. They illustrate typical views of different numbers of turbines, from a variety of viewer distances, and under different lighting conditions, to illustrate the range of visual change that will occur with the Project in place.

Location of the selected viewpoints is indicated in Figure 8. Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 1, below:

Table 1. Viewpoints Selected for Simulation and Evaluation

Viewpoint Number	Location	LSZ Represented	Viewer Group Represented	Viewing Distance	View Orientation[1]
21	Madden Road	Rural Residential/ Agricultural	Residents	0.4 mile	SE
28	North Ludlow Road	Rural Residential/ Agricultural	Residents	0.4 mile	SE
41	U.S. Route 36	Rural Residential/ Agricultural	Travelers, Residents, & Tourists	2.9 miles	ENE
85	County Route 130 at South Kennard Road	Rural Residential/ Agricultural	Residents	2.9 miles	S
145	Urbana-Moorefield Pike and Knight Road	Rural & Suburban	Residents	1.4 miles	NE
154	State Routes 4 and 161	Rural & Suburban	Travelers, Residents, & Tourists	2.1 miles	WSW
158	State Route 161	Rural Residential/ Agricultural	Residents	0.9 mile	N
159	County Route 10	Rural Residential/ Agricultural	Residents	0.9 mile	E
168	Triad Middle School Athletic Fields	Rural Residential/ Agricultural	Travelers & Residents	2.7 miles	SW
172	South Ludlow Road	Rural Residential/ Agricultural	Residents	2.1 miles	NE

[1]N = North, S = South, E = East, W = West

4.2.2 Visual Simulations

To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the completed turbines from each of the 10 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model of the proposed turbine and turbine layout based on turbine specifications and survey coordinates provided by the Applicant. For the purposes of this analysis, it was assumed that all new turbines would be Nordex N100 machines. Simulation methodology and accuracy is outlined in Appendix A, and the computer model used in this VIA is shown in Figure 3.

The next step in this process involved utilizing aerial photographs and GPS data collected in the field to create an AutoCAD Civil 3D 2011® drawing. The two dimensional AutoCAD data was then imported into AutoDesk 3ds MAX 2010® and three-dimensional components (cameras, modeled turbines, etc.) were added. These data were superimposed over photographs from each of the viewpoints, and minor camera changes (height, roll, precise lens setting) made to align all known reference points within the view. This process ensures that Project elements are

shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions and locations of the proposed structures will be accurate and true in their relationship to other landscape features in the photo (see Appendix A).

At this point, a "wire frame" model of the facility and known reference points is shown on each of the photographs. The proposed exterior color/finish of the turbines is then added to the model and the appropriate sun angle is simulated based on the specific date, time and location (latitude and longitude) at which each photo was taken. This information allows the computer to accurately illustrate highlights, shading and shadows for each individual turbine shown in the view. All simulations show the turbines with rotors oriented toward the southwest, which is generally the prevailing wind direction in the area.

4.2.3 Visual Impact Evaluation

To evaluate anticipated visual changes associated with the proposed Project, the photographic simulations of the completed Project (as described above) were compared to photos of existing conditions. These "before" and "after" photographs, identical in every respect except for the Project components shown in the simulated views, were prepared as 11 x 17 inch color prints, and a licensed **edr** landscape architect was asked to determine the effect of the proposed Project on the existing visual conditions in terms of its contrast with existing components of the landscape. For each simulated viewpoint, the landscape architect provided a numerical score indicating the level of contrast for each view in the categories of landform, vegetation, land use, water, sky, and viewer activity. Contrast scores ranged between 0 and 4, with a score of 0 indicating no contrast, 1 indicating minimal contrast, 2 indicating moderate contrast, 3 indicating appreciable contrast, and 4 indicating strong contrast. The scores for each category (landform, vegetation, etc.) were then averaged to generate an average overall contrast rating for the viewpoint. The landscape architect also provided comments on variable factors that may have affected the rating (such as atmospheric conditions or the season) as well as comments regarding the perceived effect of the Project on scenic quality and/or viewer enjoyment.

5.0 Visual Impact Assessment Results

5.1 Project Visibility

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in Figure 7 and summarized in Table 2. As indicated by the topographic blade tip analysis, the proposed Project could potentially be visible in approximately 95.6% of the 5-mile study area. This "worst case" assessment of potential visibility indicates the area where any portion of any turbine could possibly be seen without considering the screening effect of existing vegetation and structures. Areas where there is no possibility of seeing the Project are generally limited to the backside of hills and some stream valleys, primarily in the vicinity of Mingo and Catawba and along the far western edge of the study area. Based on blade tip height and the screening effect of topography alone, the vast majority of the visually sensitive sites within the 5-mile study area are indicated as having potential views of the Project (see Table B in Appendix B).

Table 2. Viewshed Results Summary

Type of Viewshed	5-mile Radius Study Area[1]	
	Visible Area (Square Miles)	%
Blade Tip - Topo Only		
0 Visible	10.6	4.4
1-14 Turbines Visible	22.3	9.2
15-28 Turbines Visible	18.7	7.7
29-42 Turbines Visible	26.9	11.1
43-56 Turbines Visible	164.1	67.7
Nacelle/Lighting - Topo Only		
0 Visible	16.4	6.8
1-14 Turbines Visible	31.5	13.0
15-28 Turbines Visible	24.2	10.0
29-42 Turbines Visible	42.5	17.5
43-56 Turbines Visible	128.0	52.8
Blade Tip - Topo & Vegetation		
0 Visible	37.8	15.6
1-14 Turbines Visible	32.9	13.6
15-28 Turbines Visible	26.8	11.0
29-42 Turbines Visible	37.9	15.6
43-56 Turbines Visible	107.2	44.2
Nacelle/Lighting - Topo & Vegetation		
0 Visible	45.0	18.5
1-14 Turbines Visible	44.3	18.3
15-28 Turbines Visible	33.5	13.8
29-42 Turbines Visible	47.9	19.7
43-56 Turbines Visible	71.9	29.7

[1]Five-mile radius study area is approximately 242.6 square miles in size.

As indicated by the turbine count analysis in Table 2, in most areas where potential blade tip visibility is indicated by the topographic viewshed analysis, views to the majority (29-56) of the proposed turbines could be available. Only about 21% of the 5-mile radius study area has the potential for views that include fewer than 29 turbines (if screening by trees is not considered). Areas of potential nighttime visibility based on the topographic viewshed analysis (Figure 7, Sheet 2) cover approximately 93.2% of the 5-mile radius study area, and are indicated in roughly the same locations shown by the blade tip analysis. However, areas where more than 28 turbine lights could potentially be visible are reduced from approximately 79% to 70% of the study area, and areas where fewer than 29 turbines could be visible are increased from approximately 21% to 30% of the study area. It is worth repeating that the nighttime viewshed analysis was based on the conservative assumption that all turbines could be equipped with FAA warning lights. This analysis likely overstates Project nighttime visibility because the actual lighting of turbines will be in conformance with FAA lighting guidelines (FAA, 2005), which typically result in aviation warning lights on only about one third to one half of the turbines in a given project. The number of lights actually visible is therefore expected to be less than indicated in the viewshed analysis.

Factoring vegetation into the viewshed analysis reduces potential Project visibility, and is a more accurate reflection of what the actual extent of Project visibility is likely to be (Figure 7, Sheet 3 and 4). Within a 5-mile radius, the vegetative viewshed analysis indicates that approximately 84.4% of the area will have potential views of some portion of the Project. Visibility will be eliminated in small areas throughout the study area where blocks of forest vegetation occur. These areas occur in the northern (west of North Lewisburg) and southwestern (southwest of Urbana) parts of the study area. Compared to the topographic blade tip viewshed, areas where fewer than 29 turbines could potentially be visible increases from 21% to 40% of the study area by factoring in the screening effect of vegetation. Similarly, the amount of area with potential nighttime visibility of less than half of the proposed turbines also increases (from 30% to 50% of the study area) when comparing the vegetation and topographic viewshed analysis of the FAA lighting (see Table 2). As indicated in Appendix B, considering the screening effect of vegetation in the viewshed analysis reduces potential Project visibility from sensitive sites, but the majority of these sites are still indicated as having the potential for at least partial visibility of the Project.

As mentioned previously, areas of actual visibility are anticipated to be much more limited than indicated by the viewshed analysis, due to the slender profile of the turbines (especially the blade, which make up the top 160 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures, which are not considered in the viewshed analysis.

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Visual Impact Assessment
Figure 7: Viewshed Analysis

Sheet 1 of 4: Blade Tip Visibility Based on Topography Only

March 2012

North Lewisburg
Milford Center
Woodstock
Urbana
Mutual
Mechanicsburg
Tremont City
Northridge
Catawba

68 559 296 4 560 814 36 161 55 4 29 187 72 56 334 54 38

0 0.5 1 2 Miles

- Wind Turbine
- 5-Mile Study Area

Potential Visibility

- 1-14 Turbines Visible
- 15-28 Turbines Visible
- 29-42 Turbines Visible
- 43-56 Turbines Visible

Notes:

1. Base Map: Hillshade map derived from USGS Digital Elevation Model; ESRI StreetMap North America, 2008.
2. Potential turbine visibility based on topography only. Screening effects of buildings, trees or other factors are not accounted for.
3. Analysis based on the maximum blade tip height of 150 meters.

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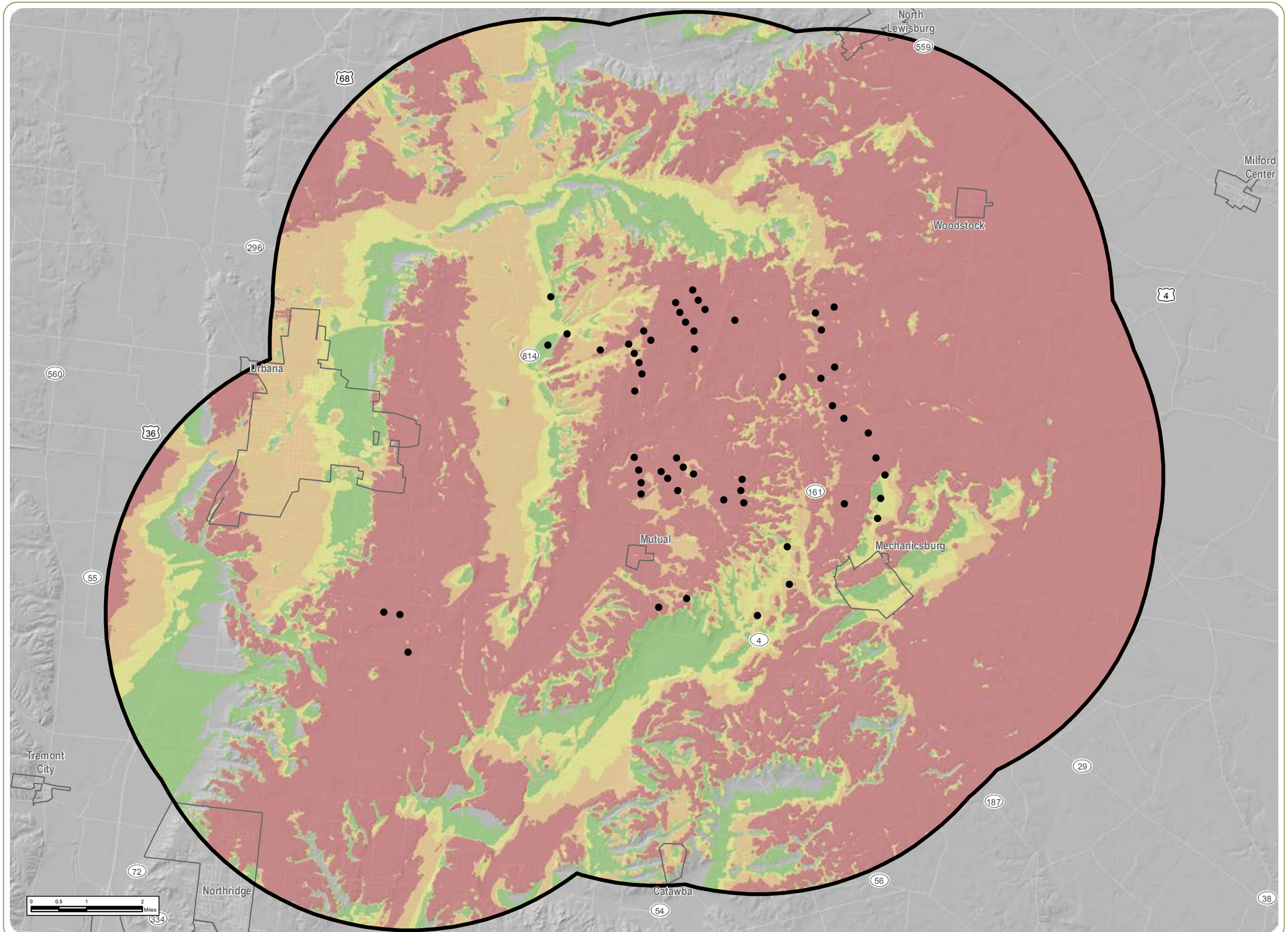
Visual Impact Assessment
Figure 7: Viewshed Analysis
Sheet 2 of 4: FAA Warning Light Visibility Based on Topography Only

March 2012



- Wind Turbine
- 5-Mile Study Area

Potential Visibility

- 1-14 Turbines Visible
- 15-28 Turbines Visible
- 29-42 Turbines Visible
- 43-56 Turbines Visible

Notes:

1. Base Map: Hillshade map derived from USGS Digital Elevation Model; ESRI StreetMap North America, 2008.
2. Potential turbine visibility based on topography only. Screening effects of buildings, trees or other factors are not accounted for.
3. Analysis based on the FAA warning light height of 101.5 meters.

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Visual Impact Assessment
Figure 7: Viewshed Analysis
Sheet 3 of 4: Blade Tip Visibility Based on Vegetation and Topography

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- Wind Turbine
- 5-Mile Study Area

Potential Visibility
- 1-14 Turbines Visible
- 15-28 Turbines Visible
- 29-42 Turbines Visible
- 43-56 Turbines Visible

Notes:
1. Base Map: Hillshade map derived from USGS Digital Elevation Model; ESRI StreetMap North America, 2008.
2. Potential turbine visibility accounts for topography and potential screening by mapped forest vegetation (with an assumed height of 40 ft).
3. Analysis based on the maximum blade tip height of 150 meters.

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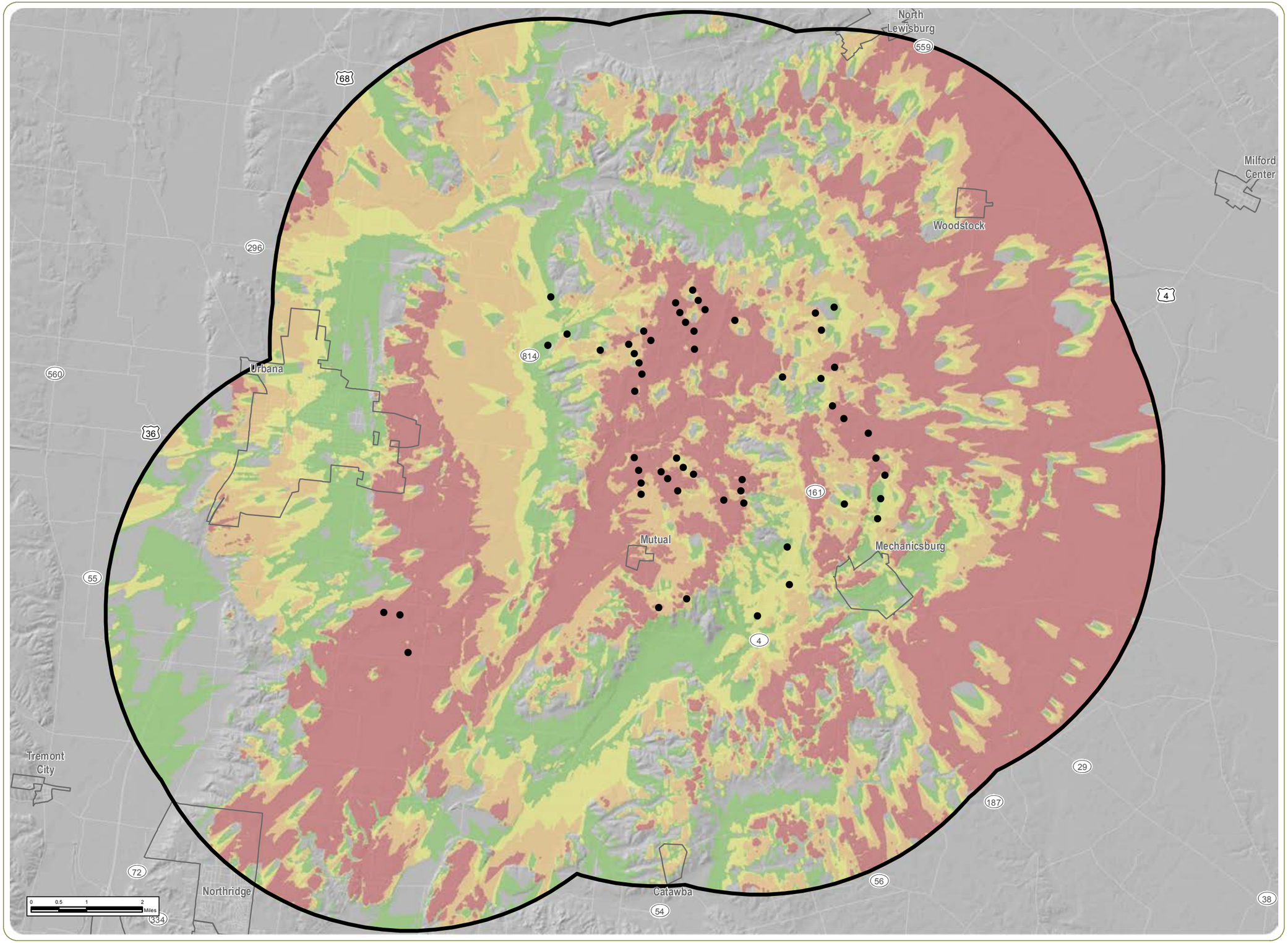
Visual Impact Assessment
Figure 7: Viewshed Analysis
Sheet 4 of 4: FAA Warning Light Visibility Based on Vegetation and Topography

March 2012



- Wind Turbine
- 5-Mile Study Area

Potential Visibility
- 1-14 Turbines Visible
- 15-28 Turbines Visible
- 29-42 Turbines Visible
- 43-56 Turbines Visible

Notes:
1. Base Map: Hillshade map derived from USGS Digital Elevation Model; ESRI StreetMap North America, 2008.
2. Potential turbine visibility accounts for topography and potential screening by mapped forest vegetation (with an assumed height of 40 ft).
3. Analysis based on the FAA warning light height of 101.5 meters.

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Field review suggested that actual Project visibility is likely to be more limited than suggested by viewshed mapping. This is due to the fact that screening provided by buildings and trees within the study area is more extensive and effective than assumed in these analyses (e.g., vegetation is more extensive than indicated on the USGS maps, and often taller than 40 feet in height). The result is that certain sites/areas where "potential" visibility was indicated by viewshed mapping were actually well screened from views of the proposed Project. Field review confirmed a lack of visibility from areas that were screened by structures and street/yard trees, particularly developed areas such as the City Urbana and the various villages (including Mechanicsburg, Woodstock, and Catawba) within the study area. Consequently, views of the Project from the majority of residences and historic sites within these areas are anticipated to be fully or partially screened. In general, only on the outskirts of these developed areas, where open fields adjoined residential areas, were open views available in the direction of the Project site. Even in the more rural/agricultural portions of the study area, hedgerows and trees not indicated on the USGS maps often blocked/interrupted views toward the Project site in many areas. However, open views that include at least some of the proposed turbines will be available from a broad range of distances/locations within the Rural Residential/Agricultural LSZ.

A comprehensive summary of potential Project visibility from sensitive sites is presented in the Table B in Appendix B.

5.2 Analysis of Existing and Proposed Views

To illustrate anticipated visual changes associated with the proposed Project, photographic simulations of the completed Project from each of the 10 viewpoints indicated in Figure 8 were used to evaluate Project visibility and appearance. Review of these images, along with photos of the existing view, allowed for comparison of the aesthetic character of each view with and without the proposed Project in place. Results of this evaluation are presented below.

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Visual Impact Assessment
Figure 8: Viewpoint Location Map

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Notes: Base Map: ESRI StreetMap North America, 2008.

- Simulated Viewpoint
- October 2011 Viewpoint
- January 2008 Viewpoint
- Wind Turbine
- 5-Mile Study Area

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Viewpoint 21 (Figure 9)

Existing View

This view from Madden Road in Union Township features an agricultural landscape in winter. The view is to the southeast and is approximately 0.4 mile from the nearest turbine that would be visible in this view. The open agricultural field in the foreground is relatively flat and featureless, and ends at a hedgerow approximately 0.5 mile from the viewer that extends across the field of view and for the most part defines the visible horizon. The silhouette of the top of a hill or ridge rises above the hedgerow in the center-left side of the view. The only apparent man-made feature is a communication tower rising from the ridge beyond the hedgerow near the left side of the view. A light dusting of white snow provides some contrast with the muted light brown and olive tones of the field. The hedgerow and more distant ridge are medium to dark gray and establish a distinct boundary between the field and sky, which ranges from blue-gray in the upper left part of the view to cloudy, harshly lit, and white at the right side of the view. With the exception of the glare provided by the low, late afternoon soon on the right side of this view, the overall effect is very neutral in tone, open and horizontal, with no distinctive features that attract the viewer's attention.

Proposed Project

With the Project in place, three turbines occupy the foreground and near mid-ground in the center of the view. A fourth, more distant, turbine can be seen rising above the hedgerow on the right hand side of the view. Due to the proximity of the viewer details of the foreground turbines can be seen clearly and their scale is in marked contrast to available scale references in this view (e.g., the vegetation in the hedgerow and communication tower). The white color of the turbines is consonant with the color of the snow and clouds and therefore compatible with the palette of the winter view. During the growing season, the color of the turbines will likely stand out more against the green of the foliage and crops, as well as the blue sky. From this particular viewpoint the spacing of the turbines appears neat and orderly, and the decreasing size of the turbines from the right to left side of the view emphasizes the effect of distance on the perceived scale of the turbines. The presence of the turbines does not alter the agricultural character of the landscape. However, while the turbines appear appropriate, the overall contrast they create is strong, owing primarily to their strong vertical line and the scale contrast resulting from the proximity of the viewer to the nearest turbine.

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Visual Impact Assessment
Figure 9:
Existing View
Madden Road

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Viewpoint 21:
Representative land-use within the study area.

View southeast from Madden Road in the Town of Union, Champaign, County, Ohio

Note:
The photograph from Viewpoint 21 was altered to lower the horizon line, which required interpolating the appearance of the upper portions of the sky, so that the nearest turbine in the view could be shown within the available field of view.

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Visual Impact Assessment
Figure 9:
Visual Simulation
Madden Road

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Viewpoint 21:
Representative land-use within the study area with a foreground view of the project.

View southeast from Madden Road in the Town of Union, Champaign, County, Ohio

Note:
The photograph from Viewpoint 21 was altered to lower the horizon line, which required interpolating the appearance of the upper portions of the sky, so that the nearest turbine in the view could be shown within the available field of view.

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Viewpoint 28 (Figure 10)

Existing View

This view from North Ludlow Road in Union Township faces east and is approximately 0.4 mile from the nearest turbine that would be visible in this view. The view is of a farm landscape in winter. The immediate foreground features an open, harvested cornfield. The crop rows create strong sense of order with horizontal lines that recede from the viewer, offset by vertical lines of the low, golden-yellow corn stalks against the snow-covered white ground. On the right side of the view the cornfield terminates at the base of a wooded slope, which features muted grayish-brown deciduous trees (without foliage). On the left, the cornfield extends further to a complex of clean, white, brightly lit barns and agricultural buildings, which provide a focal point for the view. Another woodlot rises behind these barns at the left side of the view. The horizon, formed by the crest of the low hill that extends across the mid-ground of the view, is interrupted by six silos that rise from behind the barn complex in the center-left of the view. These include five lower, beige-colored silos and one taller, navy blue silo – each capped with a dome-shaped, shining, silver-colored roof (or cap). A traditional, white farmhouse flanked by mature evergreens occupies the crest of the hill in the center of the mid ground. The sky is predominantly cloudy, with rolling gray and white stratocumulus clouds interrupted by patches of medium-to-dark blue sky. The front-lighting effect of the bright, clear light on the snow covered field, white barns, farmhouse, and silos results in an overall feeling of an orderly, well-maintained, and attractive working agricultural landscape.

Proposed Project

With the Project in place, two turbines are featured prominently in the center of the view, with a larger (nearer) turbine in the center-right with a smaller (further away) turbine slightly to the left. Due to their proximity and lack of foreground screening, the turbines replace the farmstead as the dominant focal point within this view. The proximity of the house and agricultural buildings to the turbines accentuates their large size and scale contrast. A single blade of a third turbine is partially visible through the hedgerow vegetation at the far right side of the view, which illustrates the potential screening effect of vegetation on more distant views. The white color of the turbines is compatible with the snow and white color of the farm buildings in this winter view. However, the dark sky and effect of front lighting accentuate the color contrast of the white turbines against the sky and draw the attention of the viewer to the turbines. The access road to the nearest turbine is apparent as a narrow white stripe extending horizontally across the field to the left from the turbine, but does not significantly affect the view. Similar to the previous viewpoint, the presence of the turbines does not alter the agricultural character of the landscape. However, the overall contrast they create is strong, owing primarily to the lighting/sky conditions in the photo (which result in strong color contrast) and viewer proximity, which results in appreciable scale contrast.

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Visual Impact Assessment
Figure 10:
Existing View
North Ludlow Road/
State Route 814

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Viewpoint 28:
Representative land-use within the study area.

View west from North Ludlow Road/State Route 314 in the Town of Union, Champaign County, Ohio

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Visual Impact Assessment
Figure 10:
Visual Simulation
North Ludlow Road/
State Route 814

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Viewpoint 28:
Representative land-use within the study area with a foreground view of the Project.

View west from North Ludlow Road/State Route 314 in the Town of Union, Champaign County, Ohio

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Viewpoint 41 (Figure 11)

Existing View

This view from U.S. Route 36 in Urbana Township (just beyond the Urbana City limits) faces northeast and is approximately 2.9 miles from the nearest turbine that would be visible in this view. A rural roadway occupies the near foreground, crossing diagonally to exit the view on the right. A post and wire fence, and a sign run along the road's shoulder in the foreground. A line of wooden utility poles, whose receding size gives this view a strong sense of perspective depth, accentuates the strong converging lines of the road. The rest of the view shows agricultural fields dusted with snow, separated by hedgerows of filigreed trees screening isolated rural structures. The distant horizon in this view is a low, even ridge that stretches across the entire view. The ridge is mostly in shadow, backlit by the pink light of the morning sun. The upper half of the view is open sky, interrupted only by the utility poles and the crowns of the bare trees.

Proposed Project

With the proposed Project in place, portions of 18 turbines can be counted in this view. Due to the low sun angle, they are back-lit, their forms appearing dark gray against the pink sky. The turbines are compatible with the existing agricultural land use, though they are clearly taller than the existing vegetation. However, at this distance their form appears both smaller and more delicate relative to the existing utility poles in the foreground. Overall, the effect on the view is moderate, owing to the number of turbines which creates a certain degree of visual clutter. However, the cluttering effect of the turbines is reduced by their perceived scale at this distance, as well as the existing utility poles and road signs in the foreground of the view.

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Visual Impact Assessment
Figure 11:
Existing View
U.S. Highway 36

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Viewpoint 41:
Representative land-use within the study area transportation corridor.

View west-northwest from U.S. Highway 36 in the Town of Urbana, Champaign County, Ohio

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Visual Impact Assessment
Figure 11:
Visual Simulation
U.S. Highway 36

March 2012

Viewpoint 41:
Representative land-use within the study area transportation corridor with a mid-ground view of the Project.

View west-northwest from U.S. Highway 36 in the Town of Urbana, Champaign County, Ohio

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Viewpoint 85 (Figure 12)

Existing View

This view from County Route 130 at South Kennard Road in Wayne Township is approximately 2.9 miles north of the nearest turbine that would be visible in this view. The view features an open agricultural field in winter, with plow furrows that extend away from the viewer and terminate at a low hedgerow in the mid-ground. A gently-sloped ridge in the background forms a uniform, level horizon across the field of view. A narrow strip of roadway runs along the right side of the view, flanked by narrow wooden utility poles at regular intervals. Another line of three utility poles, evenly spaced across the view, suggest the presence of another road running perpendicular to the view in the distant foreground. A cluster of farm buildings, including a farmhouse, barns, and silos, interrupts the horizon at the far right side of the view and adds some visual interest. The effect of the low sun on the partially overcast sky results in a mix of soft, light blue areas and patches of bright, washed out sky. The sky is interrupted by four thin lines, representing overhead electrical wires, which descend from the center to the right side of the view. The dark brown ground plane, dusting of white snow, russet color of the vegetation in its bare-branched condition, and washed out sky combine to result in a muted color palette.

Proposed Project

With the Project in place, portions of 12 turbines are visible in the distant mid-ground and background, on and behind the ridge that forms the horizon line in this view. Overall the Project's impact on the view is minimal. The effect of distance results in minimal scale contrast, and the presence of the utility poles and agricultural buildings in the foreground and mid-ground offset the cluttering effect of the turbines. These features are also consistent with the turbines vertical lines, and provide a scale reference that makes the turbines appear to be in scale with existing structures. Due to the effect of backlighting and hazy sky conditions the turbines appear somewhat washed out, and present minimal color contrast. However, during a different season or under different sky/lighting conditions the turbines could stand out more against the sky.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 12:
Existing View
S. Kennard-Kingscreek Road/

March 2012

Viewpoint 85:
Representative land-use within the study area.

View southeast from S. Kennard-Kingscreek Road/County Highway 10 in the Town of Salem, Champaign County, Ohio

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Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 12:
Visual Simulation
S. Kennard-Kingscreek Road/

March 2012

Viewpoint 85:
Representative land-use within the study area with a mid-ground view of the Project.

View southeast from Kennard-Kingscreek Road/County Highway 10 in the Town of Salem, Champaign County, Ohio

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Viewpoint 145 (Figure 13)

Existing View

This view from Urbana-Moorefield Pike and Knight Road in Urbana Township faces northeast and is approximately 1.4 miles from the nearest turbine that would be visible in this view. The view features two strongly contrasting, horizontally aligned halves, consisting of a bare agricultural field on the bottom, with rich brown and gold colors indicative of late autumn, contrasted with a hazy, overcast sky with areas of bright, harshly lit white and washed out gray. The open field features tight, horizontal, parallel rows of soil and crop stubble, suggesting that the field is recently harvested. A farm complex, consisting of a traditional white farm house (with a black roof and one brick wall), a red barn, and three white outbuildings, nested within a cluster of deciduous trees interrupts the horizon at the left side of the view. The foliage of these trees varies between dark green and rusty orange. Another similar cluster of trees and buildings is visible at the horizon in the distant mid-ground on the center-right side of the view. The harshly lit, washed out sky gives the view in an overall muted, bleak character and contributes to a sense of openness and relative emptiness.

Proposed Project

With the proposed Project in place, this view provided unobstructed mid-ground views of two turbines, located at the center-left and right sides of the view. A single blade from a third turbine of comparable scale (i.e., at a comparable distance) extends upward from behind the yard vegetation that surrounds the farmhouse and associated agricultural buildings. More than 20 additional turbines are visible in the background. The turbines appear soft and backlit against the overcast sky and under different (more clear) conditions would be more prominent. Due to their perceived size relative to the buildings and vegetation in the view, the overall effect of the mid-ground turbines on the view is moderate. The turbines appear to be purposefully placed in relation to the existing vegetation and provide an orderly composition to the view. The more distant turbines are relatively faint due to the overcast sky, appear commensurate in scale with existing vegetation and hedgerows in the mid-ground of the view, and do not have a significant effect on the view.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 13:
Existing View
Urbana Morefield Pike/Knight Road

March 2012

Viewpoint 145:
Representative land-use within the study area.

View northeast from Urbana Morefield Pike/ Knight Road in the Town of Urbana, Champaign County, Ohio

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Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 13:
Visual Simulation
Urbana Morefield Pike/Knight Road

March 2012

Viewpoint 145: Representative land-use within the study area with a mid-ground view of the Project.

View northeast from Urbana Morefield Pike/ Knight Road in the Town of Urbana, Champaign County, Ohio

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Viewpoint 154 (Figure 14)

Existing View

This view is from State Routes 4 and 161 in Goshen Township. It is oriented to the west-southwest and is approximately 2.1 miles from the nearest turbine that would be visible in this view. The paved roadway of Route 161 extends diagonally from the lower left corner toward the center of the view, takes a slight curve to the left and proceeds away from the viewer and into the mid-ground. The road signs and overhead utility poles that flank the roadway provide a scale reference and depth perspective. Tall mature hardwoods at the far left side of the view, on the left side of the road at the curve in the highway, anchor the view. The center-right side of the view features an open, level, green lawn extending away from the viewer. The lawn ends at a bare agricultural field, which extends to a one-and-a-half to two-story, brown, frame commercial structure and adjacent substation. Mixed hardwoods, some without leaves and others in a variety of muted shades of green, yellow, and russet (that indicate the fall season), in a hedgerow behind these structures define the visible horizon and extend across the entire view. The sky in this view is overcast and mostly gray, and crisscrossed by multiple overhead lines. The view is representative of the view experienced by a typical passenger in a vehicle along a well-traveled state highway.

Proposed Project

With the proposed Project in place, five turbines can be seen in the mid-ground and three additional turbines can be seen in the background of the view. All of the turbines are partially screened by the existing hedgerow vegetation in the mid-ground. The five mid-ground turbines are relatively evenly spaced across the view, and appear comparable in height to the existing utility poles and vegetation in both the foreground and mid-ground. The background turbines are faint against the overcast sky and are for the most part screened by vegetation, even though many of the trees have already shed their leaves. Because of the presence of the existing utility poles and substation, and the regular spacing of the turbines relative to these elements, the overall effect on the view is minimal. The turbines appear compatible with the existing land use in the view, which features significant energy infrastructure.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 14:
Existing View
State Route 161 & 4

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Viewpoint 154:
Representative land-use within the study area transportation corridor.

View west from the intersection of State Route 161 and 4 in the Town of Goshen, Champaign County, Ohio

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Viewpoint 154:
Representative land-use within the study area transportation corridor with a mid-ground view of the Project.

View west from the intersection of State Route 161 and 4 in the Town of Goshen, Champaign County, Ohio

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 14:
Viusal Simulation
State Routes 161 & 4

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Viewpoint 158 (Figure 15)

Existing View

This view of a broad, open agricultural field is from State Route 161 in Goshen Township. The view is oriented to the north, approximately 0.9 mile from the nearest turbine that would be visible in this view. The agricultural field is relatively uniform in terms of color and texture, consisting of mature grain stalks in muted gold-tones with occasional olive green accents. The field terminates at a hedgerow of mixed evergreens and hardwoods (in a mix of muted autumn tones) in the distant mid-ground, which forms the horizon across the center and right side of the view. Another hedgerow extends across the left side of the field in the near mid-ground. These bands of trees create a strong horizontal line that separates the broad expanses of open field and sky. A cluster of farm buildings, including three silos, occurs at the edge of the field on the right side of the view in the near mid-ground. Two additional residential structures are partially visible through gaps in the hedgerow vegetation on the left side of the view. The sky is expansive and mostly cloudy, with banks of white stratus or strato-cumulus clouds, interrupted by a few patches of blue in the upper atmosphere.

Proposed Project

With the proposed Project in place, seven turbines appear in the view. The nearest turbine, at the right side of the view, appears to be located in close proximity to the farm buildings. The hedgerow at the left side of the view partially screens the bases of the other three turbines in the mid-ground. The other four turbines are located in the background in the center of the view. The proximity of the nearest turbines to the viewer results in the turbines appearing out of scale with the existing structures and vegetation, and the vertical lines of the turbines interrupt the strong horizontal character of the view. However, the openness of the agricultural field helps to absorb the vertical lines of the turbines, and their color is compatible with the cloudy sky and soft autumn tones. As with the other viewpoints featuring agricultural fields, the turbines do not conflict with the working agricultural character of the landscape.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 15:
Existing View
State Route 161

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Viewpoint 158:
Representative land-use within the study area.

View north-northwest from State Route 161 in the Town of Goshen, Champaign County, Ohio.

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Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 15:
Visual Simulation
State Route 161

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Viewpoint 158:
Representative land-use within the study area with a mid-ground view of the Project.

View north-northwest from State Route 161 in the Town of Goshen, Champaign County, Ohio.

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Viewpoint 159 (Figure 16)

Existing View

This picturesque view to the east from County Route 10 (Mechanicsburg Bellefontaine Road) in Goshen Township is approximately 0.9 mile from the nearest turbine that would be visible in this view. The lower left hand corner of the view features a hand-painted white sign (mounted on two posts decorated with cornstalks and depicting horses, a fence, and apple tree) in the immediate foreground. A long driveway, paved with very pale grey crushed-stone or gravel, extends away from the viewer along the right side of the view. The focal point of the view is a white farmhouse, surrounded by mature trees, at the end of driveway. An adjacent red barn with a metal roof also draws the viewer's eye. A weathered gray split rail fence runs along the left side of the driveway and provides scale and distance reference within the view. A freshly cut, bright green lawn (or pasture) extends from the viewer to the house. Cornfields, with neat rows of pale yellow stalks indicative of late autumn, flank both sides of the green lawn/pasture at the right and left sides of the view. Three horses are visible grazing in the pasture in the distant foreground. Woodlots and hedgerows at various distances in the mid-ground and background form the horizon for this view, interrupted in some areas by the house, barn, and stalks of corn affixed to the sign in the foreground. The whole scene is brightly lit and features rich colors, including a medium-toned blue sky streaked with gray and white stratus clouds.

Proposed Project

With the proposed Project in place, two turbines are present in the mid-ground of the view – one in the center and one at the far left side of the view. The proximity of the turbines results in appreciable line and scale contrast with the relatively flat landform and vegetation. However, the vertical lines of the turbines echo the form and orderly spacing of other vertical elements in the view, such as the sign posts, fence posts, and utility poles along the driveway. The turbines appear relatively compatible with the land use and viewer activity on the farm, and do not disrupt the pleasant composition in this view. The small number of visible turbines and their appearance among many other man-made features also serves to minimize their impact. The overall effect on this view is considered moderate only because of the perceived size of the turbines relative to other elements in the view.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 16:
Existing View
Parkview Road/
County Route 10

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Viewpoint 159:
Representative land-use within the study area.

View northeast from Parkview Road/County Route 10 in the Town of Goshen, Champaign County, Ohio.

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Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 16:
Visual Simulation
Parkview Road/

March 2012

Viewpoint 159:
Representative land-use within the study area with a mid-ground view of the Project.

View northeast from Parkview Road/County Route 10 in the Town of Goshen, Champaign County, Ohio.

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Viewpoint 168 (Figure 17)

Existing View

This view is from the bleachers at the Triad Middle School athletic fields in Wayne Township. The view is to the southwest, approximately 2.7 miles from the nearest turbine that would be visible in this view. In the immediate foreground of the view, rows of red bench seating set on terraced concrete steps extend away from the viewer on a slight diagonal toward the right. At the base of the bleachers, on the left side of the view, a narrow strip of mowed, bright green lawn, a chain link fence, and bare dirt running track separate the bleachers from the adjacent athletic field. A tall wooden pole affixed with spotlights and speakers set between the fence and the track establishes a strong scale reference in the view. A yellow set of goal posts, football players in red jerseys and white helmets, and an empty section of metal bleachers at the far end of the athletic field provide a strong sense of context and user activity. A low hedgerow consisting of widely spaced shrubs and deciduous trees (with their leaves off) separates the football field from a cornfield, which extends across the entire view and recedes into the mid-ground. A continuous line of deciduous trees in a mix of muted autumn colors (including green, yellow, russet, and red) form the horizon across the view at the far end of the cornfield. The sky is for the most part overcast, with patches of blue in the upper left hand part of the view.

Proposed Project

With the proposed Project in place, portions of at least 12 turbines are visible above the vegetation in the distant mid-ground and background. All of the turbines are at least partially screened by vegetation, and their form, spacing, and scale exhibit minimal contrast with the trees in the foreground and mid-ground. The vertical lines of the turbine are also consistent with the light pole, goal posts, and tree trunks in the foreground of the view. The turbines appear gray and somewhat indistinct due to hazy overcast sky conditions and the effect of being backlit. Under these conditions, they echo the color and from of the leafless branches of trees in the foreground and mid-ground. Due to their distance from the athletic field, the turbines will not interfere with or distract from the land use or activity in this view. Overall, the effect on the view is minimal due to the distance from the turbines and the variety of man-made features and activities in the foreground.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
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Visual Impact Assessment
Figure 17:
Existing View
Triad Middle School Athletic Fields

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Viewpoint 168:
Triad Middle School Athletic Fields.

View south-southwest in the Town of Wayne, Champaign County, Ohio.

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Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 17:
Viusal Simulation
Triad Middle School Athletic Fields

March 2012

Viewpoint 168:
Triad Middle School Athletic Fields with a mid-ground view of the Project.

View south-southwest in the Town of Wayne, Champaign County, Ohio.

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Viewpoint 172 (Figure 18)

Existing View

This view from South Ludlow Road in Union Township is oriented to the northeast, approximately 2.1 miles from the nearest turbine that would be visible in this view. The grain field in the foreground is broad and open, and relatively uniform in terms of color and texture, consisting of mature stalks in muted tan and gold-tones. The corner of another field and a road shoulder (both characterized by bright green grass), on the left side of the view in the immediate foreground interrupts the uniformity of the grain field. With the exception of a very low hill or slight rise in the field on the left, the topography is relatively flat. The field ends at a sparse hedgerow, through which additional fields, clusters of agricultural buildings, and patches of forestland (small woodlots) are visible. A low, wooded ridgeline in the distance mid-ground forms the horizon for the view. A communication tower on this ridge interrupts the horizon at the center right side of the view and provides a scale reference for objects in the distant mid-ground. However, because of its distance and narrow profile, this tower does not affect the overall sense of flatness and openness that characterize this view. The color palette is soft and muted, with an overcast sky that includes areas of pale gray and white clouds as well patches of pale blue.

Proposed Project

With the proposed Project in place, portions of 11 turbines appear in the mid-ground and background on the horizon in the center and left side of the view. Some of the turbines are substantially screened by the low hill on the left side of the view, and the bases of all the remaining turbines are screened by mid-ground and background trees. The perceived scale of the turbines in the mid-ground results in moderate contrast with the landform, vegetation, and sky. The vertical lines and form of the turbines also stand out against the strong horizontal lines in the view. However, at this distance, the turbines do not appear substantially out of scale, and actually add visual interest in otherwise relatively featureless landscape. The gray, partially overcast skies cause the turbines to appear washed out – on a clear day the white color of the turbines would be more pronounced. The turbines are generally compatible with the land use and palette of this working agricultural landscape, and the openness of the landscape is able to absorb the number of visible turbines. Overall, the impact is moderate due to the line and form contrast presented by the turbines, and their location on the horizon.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
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Visual Impact Assessment
Figure 18:
Existing View
Ludlow Road/
Township Highway

March 2012

Viewpoint 172:
Representative land-use within the study area.

View northeast from Ludlow Road in the Town of Urbana, Champaign County, Ohio.

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Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
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Visual Impact Assessment
Figure 18:
Visual Simulation
Ludlow Road/
Township Highway

March 2012

Viewpoint 172:
Representative land-use within the study area with a mid-ground view of the Project.

View northeast from Ludlow Road in the Town of Urbana, Champaign County, Ohio.

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Evaluation of the simulations of the proposed Project by an edr landscape architect indicated that overall impact on scenic quality is variable and dependent on the distance from the viewer to the nearest turbine, the presence or lack of screening afforded by foreground vegetation, and the number of turbines visible. Of the 10 simulations evaluated, four simulations had a composite contrast rating greater than 3.0 (appreciable) on a scale of 0 (insignificant) to 4 (strong). The remaining six views had a composite contrast rating of 3.0 or less (see Table 3).

Table 3. Visual Simulations Contrast Rating Summary

Viewpoint Number	Nearest Turbine	Scenic Quality	Contrast Rating[1]					
			Landform	Vegetation	Land Use	Sky	Viewer Activity	Average
21	0.4 mi	Low to Medium	4	4	3	3	3.5	3.50
28	0.4 mi	Medium	4	4	3	3.5	3.5	3.60
41	2.9 mi	Low to Medium	2.5	2.5	1.5	3	3	2.50
85	2.9 mi	Low to Medium	0.5	0.5	0.5	1.0	0.5	0.60
145	1.4 mi	Medium	2.5	2.5	1.5	2	2	2.10
154	2.1 mi	Low to Medium	1	1	1.5	1	1.5	1.20
158	0.9 mi	Medium	3	4	3	3	2.5	3.10
159	0.9 mi	Medium	3	3	2	2	1.5	2.30
168	2.7 mi	Low to Medium	1	1.5	1	1.5	1	1.20
172	2.1 mi	Medium	2.5	3	2.0	2.5	2.0	2.40

[1] Contrast ratings scale: 0 (insignificant), 1 (minimal), 2 (moderate), 3 (appreciable), and 4 (strong).

In the simulated views where a moderate to strong overall contrast was noted (i.e., those receiving scores over 3.0), the greatest impact was related to the turbines' scale and line contrast with the existing landform and vegetation. Contrast ratings in these categories ranged from 3 to 4, with Viewpoint 21 and 28 receiving scores of 4 (strong contrast) in both categories. Viewpoints 21, 28, and 158 received the highest overall contrast ratings. In these views the Project was generally considered to present appreciable to strong contrast with all components of the existing landscape. All of these viewpoints were located within 1.0 mile of the nearest turbine shown in the view (Table 3). The higher contrast ratings for these views are attributable to the proximity of the turbines, the substantial number of turbines in the view, and lack of any vegetative screening.

Viewpoints 21 and 28, both of which have foreground views of the nearest turbine in each view, received the highest overall contrast ratings (3.5 and 3.6, respectively), indicating an appreciable-strong to strong visual contrast. In both instances, this is due to the proximity of the nearest turbine (0.4-mile for both), the lack of any vegetative or other screening elements, and the perceived scale contrast of the turbines relative to existing trees and structures (in the

case of Viewpoint 28) in the mid-ground of each view. It is worth noting that these two views include relatively small numbers of turbines – in Viewpoint 21 a total of four turbines are visible and in Viewpoint 28 two turbines, and a single baked from a third, are visible. In these instances, proximity and scale, not the number of turbines in the view, are the most significant factors that determine overall visual effect.

Viewpoints 158 and 159, both of which have near mid-ground views of the Project (i.e., between approximately 0.5 and 1.0-mile), received moderate to appreciable contrast ratings. For the most part the overall contrast in these views derived from scale and line contrast due to the proximity of the turbines. However, other elements or attributes of these views, such as the openness of the agricultural landscape and presence of existing man-made features, help to reduce the overall impact of the turbines. For Viewpoint 158, the sense of openness created by the broad, flat agricultural field in the foreground of this view is able to absorb the vertical lines of the turbines. For Viewpoint 159, the presence of existing vertical landscape elements, such as fence posts and overhead utility poles, in the foreground reduces the perceived line and scale contrast and establishes a visual pattern within the landscape that is compatible with the proposed turbines.

From views at greater distances, the contrast/impact of the Project was significantly reduced. Viewpoints located greater than 1.0-mile from the nearest proposed turbine (Viewpoints 41, 85, 145, 154, 168, and 172) received overall contrast ratings in the range of minimal to moderate. In these views, the effect of distance significantly reduces the perceived scale contrast presented by the turbines, although the greater numbers of turbines visible in the mid-ground and background results in a greater sense of visual clutter. The affected landscape in these views is generally composed of vast open spaces with views defined by repeating, flat, horizontal lines. In some cases, the vast openness of the agricultural landscape is able to absorb the turbines and reduce their contrast (e.g., Viewpoints 145, 158, and 172). The presence of existing vertical line elements, such as overhead utility poles and/or transmission lines, in the foreground and mid-ground of some views (e.g., Viewpoints 27, 72, and 227) also reduces the perceived line and scale contrast, and reduces the extent to which the turbines contribute to a cluttered feeling in the view.

As a group, the simulations indicate that the Project will result in appreciable to strong visual contrast from open viewpoints within 1.0 mile of the nearest turbine. At greater distances and with more screening, the contrast/impact of the Project should be significantly reduced. This is consistent with edr's findings on other projects where project contrast ratings were highly correlated with viewer distance and number of visible turbines.

It is worth noting that the lack of topographic and vegetative variability in the Rural Residential/Agricultural LSZ, which dominates the study area, generally results in low-to-medium aesthetic quality in much of the area surrounding the proposed Project. In such settings, the proposed Project, although at times offering appreciable contrast with the landscape, will not necessarily be perceived by many viewers as having an adverse visual impact.

Wind turbines are unlike most other energy/infrastructure facilities, such as transmission lines or conventional power plants, which are almost universally viewed as aesthetic liabilities. Wind turbines have a clean sculptural form that is considered attractive by some viewers (Pasqualetti et al., 2002). Operating wind power projects in a variety of settings have been documented as receiving a generally positive public reaction following their construction. For instance, a survey conducted in Lewis County, New York (location of the 195-turbine Maple Ridge Wind Power Project in operation since 2006) revealed strong community support for wind power. The primary goal of this survey (the Second Annual Lewis County Survey of the Community, conducted in 2008 by The Center for Community Studies at Jefferson Community College) was to collect data regarding quality of life issues of importance to the local citizens. The survey consisted of 393 telephone interviews of Lewis County residents who were asked a series of 80 questions, 5 of which were related to wind power. A majority of residents surveyed indicated that wind farms have had a positive impact on Lewis County (70.7% of participants) and indicated that wind farms should be expanded in Lewis County (79.2% of participants). Of the individuals participating in the survey, only 9.2% have turbines on land owned by themselves or a family member, and 37.4% reported that they were able to see and/or hear wind turbines from their home. The survey further characterizes the individuals that were able to see and/or hear turbines from their homes to reveal that 77.1% of these individuals indicated that the wind farms have had a positive impact on Lewis County. Additionally, only 7.5% of participants who live within 1 mile of the nearest wind turbine felt that wind farms have had a negative impact (Jefferson County Community College, 2008). These results are consistent with the results of a study of public perception of wind power in Scotland and Ireland (Warren et. al., 2005), which concluded the following:

> *"A remarkably consistent picture is emerging from surveys of public attitudes to wind power, and the case studies provide further evidence that this picture is a representative one. Large majorities of people are strongly in favour of their local windfarm, their personal experience having engendered positive attitudes. Moreover, although some of those living near proposed windfarm sites are less convinced of their merits, large majorities nevertheless favour their construction. This stands in marked contrast with the impression conveyed in much media coverage, which typically portrays massive grassroots opposition to windfarms."*

As noted by Firestone et al. (2009), a number of studies have found increased local support for wind projects once they are constructed and become operational, while other studies have shown that public support follows a "U"

pattern, in which acceptance is initially high, drops during the planning and construction, and then rebounds after the wind farm commences operation, and impacts are found to be less detrimental than feared.

5.3 Nighttime Impacts

Nighttime photos from the Fenner (New York) Wind Power Project (Figure 19), illustrate the type of nighttime visual impact that could occur from certain viewpoints within the Buckeye II Project study area due to the turbines' FAA aviation warning lights. Although lighting of every turbine, (as was the case in Fenner) will not be required on this project, as shown in this photo, the contrast of the aviation warning lights with the night sky can be strong in dark, rural settings, and their presence suggests a more commercial/industrial land use. Viewer attention is drawn by the flashing of the lights, and any positive reaction that wind turbines engender (due to their graceful form, association with clean energy, etc.) is lost at night. It is worth noting that the visual study area includes communication towers, grain elevators, and water towers equipped with FAA warning lights. While not disturbing (or even strongly perceptible) from roads and other public viewpoints, turbine lighting may be perceived negatively by area residents who may be able to view these lights from their homes and yards.

5.4 Cumulative Visual Impacts

The proposed Buckeye II Wind Project is located in close proximity to the previously proposed Buckeye I Wind Project (edr, 2009; Figure 20). The turbine layouts for the two projects are intermingled within the same general area, and frequently occupy adjacent parcels. The proposed Buckeye I Project will include up to 52 turbines and the proposed Buckeye II Project will include up to 56 turbines. As a result, if both projects were built, the two projects combined would include a total of up to 108 wind turbines. Although not required for permitting purposes, edr prepared a cumulative viewshed analysis and visual simulations to address possible concerns regarding the potential cumulative visual impact of both projects.

Cumulative Viewshed Analysis

The 5-mile radius topographic viewshed (based on maximum blade-tip height) for the Buckeye I and II Projects were plotted on a base map (Figure 21). The cumulative viewshed analysis was prepared using the same methods described in Section 4.1.1, except for that the analysis included all of the turbines proposed for both the Buckeye I and Buckeye II Projects. The turbine visibility counts for the two projects were then combined.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships - Champaign County, Ohio

Visual Impact Assessment. Figure 19: Representative Evening/Nighttime Photos

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Note: Images in this figure are not from the Buckeye II Wind Farm Project

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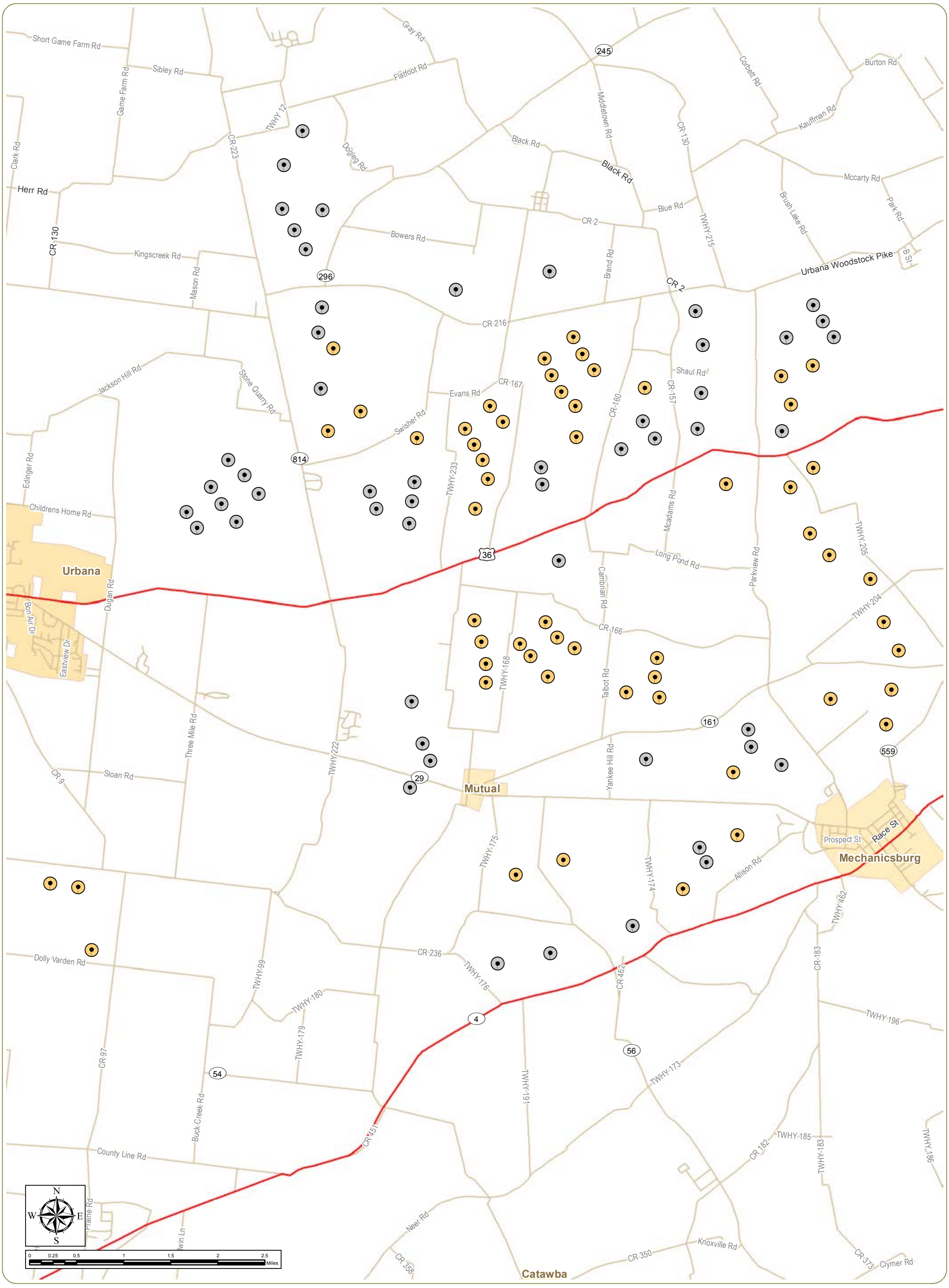

Buckeye II Wind Project

Goshen, Rush, Salem, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 20: Combined Turbine Layouts for the Buckeye I and II Projects

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Notes: Base Map: ESRI StreetMap North America, 2008.

Buckeye I Wind Turbine

Buckeye II Wind Turbine

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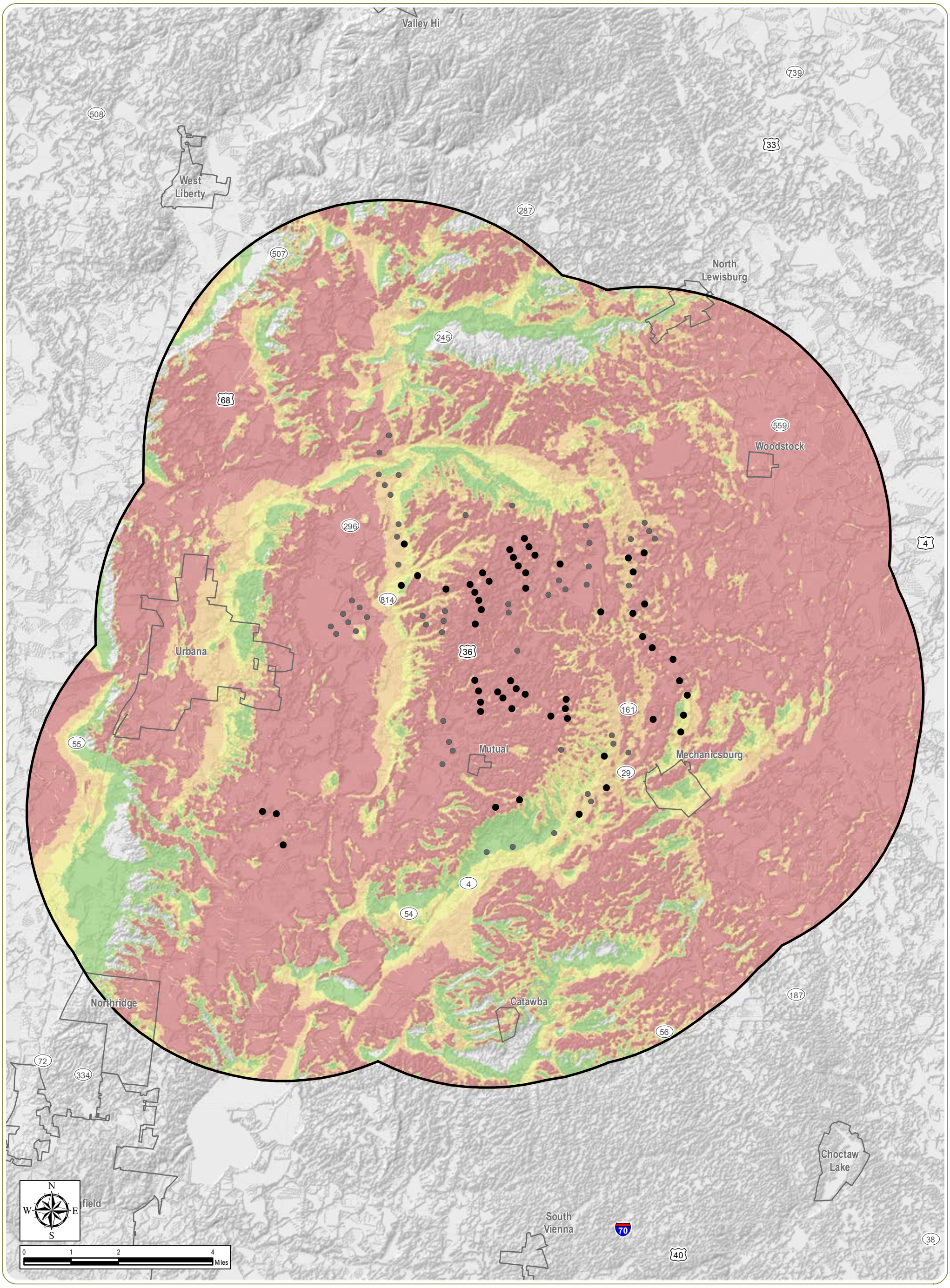

Buckeye II Wind Project

Goshen, Rush, Salem, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 21: Cumulative Viewshed Analysis for the Buckeye I and II Projects

March 2012

Notes: 1. Base Map: Hillshade map derived from USGS Digital Elevation Model; ESRI StreetMap North America, 2008.
2. Potential turbine visibility accounts for topography only.
3. Analysis based on the blade tip height of 150 meters.

- Buckeye I Wind Turbine
- Buckeye II Wind Turbine
- Cumulative 5-Mile Study Area

Potential Visibility
- 1-27 Turbines Visible
- 28-54 Turbines Visible
- 55-81 Turbines Visible
- 82-108 Turbines Visible

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The results of the cumulative topographic viewshed analysis (based on blade-tip height) are depicted on Figure F2 and summarized in Table 4. The results of the cumulative viewshed analysis are essentially identical to the results of each individual project: the proposed Projects would be largely visible from approximately 94.8% of the combined 5–mile-radius study areas. Furthermore, the analysis indicates that more than 55 turbines (from the combined projects) could potentially be visible in 70.6% of the cumulative study area (i.e., the area within 5 miles of all turbines proposed.as part of the Buckeye I and Buckeye II Projects).

Table 4. Cumulative Viewshed Analysis Results Summary

Blade Tip - Topo Only Viewshed	Cumulative 5-mile Radius Study Area[1]	
	Visible Area (Square Miles)	%
0 Visible	14.2	5.2
1-27 Turbines Visible	33.2	12.1
28-54 Turbines Visible	33.3	12.1
55-81 Turbines Visible	64.1	23.4
82-108 Turbines Visible	129.4	47.2

[1]Cumulative five-mile radius study area is approximately 274.3 square miles in size.

Given the similarity of the results of the cumulative topographic blade-tip viewshed analysis to the comparable analyses for each individual project, it is reasonable to assume that the nacelle and vegetation viewsheds would result in comparable reduction of visibility (or lack thereof) for the combined projects. Overall, the cumulative viewshed prepared for the Buckeye I and II Projects (Figure 21; Table 4) indicates that the change in visibility resulting from the construction of both projects would be a change in degree (i.e., number of turbines visible) but not a change in kind (i.e., whether or not turbines would be visible from any particular vantage point).

Cumulative Visual Simulations

Simulations prepared for Viewpoints 41, 85, and 158 included views that show the combined effect of the two projects. Theses simulations were prepared using the same methods described in Section 4.2.2, except for that the Project model included all of the turbines proposed for both the Buckeye I and Buckeye II Projects. Additionally, to illustrate the full expanse of the Project that may be perceived from certain viewpoints, a panoramic simulation was created for Viewpoint 41. This image was created by stitching together two 50 mm photos to illustrate an approximately 60-degree field of view (see Figure 22). The cumulative simulations are described below:

Viewpoint 41 – Cumulative Simulation (Figure 22)

Cumulative Effect of Buckeye I and Buckeye II Projects

Adding simulations of the proposed Buckeye I Project (edr, 2009) to the simulation of the Buckeye II Project allows for consideration of the cumulative effect of these two projects. This view was previously evaluated as Viewpoint 41 in the VIA prepared for the Buckeye I Project. To better illustrate the cumulative effect of both projects, two photographs from Viewpoint 41 were stitched together to create a panoramic view. With both projects in place, over 40 turbines are included in the panoramic view. The additional (Buckeye I) turbines are more prominent in the near mid-ground of the view, and the turbines extend across the horizon. The effect of adding the Buckeye I Project to the view results in a greater sense of visual clutter and increases the overall contrast, owing primarily to the number of visible turbines, proximity of the turbines to the viewer, and their spacing across the entire field of view. Although, the cluttering effect of the turbines remains somewhat offset by the existing utility poles and other man-made structures/objects in the view, the turbines now clearly dominate the view.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
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Visual Impact Assessment
Figure 22:
Existing View
U.S. Highway 36

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Viewpoint 41:
Cumulative Effect of Buckeye I & II Wind Farm Projects.

View west-northwest from U.S. Highway 36 in the Town of Urbana, Champaign County, Ohio

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Viewpoint 41:
Cumulative Effect of Buckeye I & II Wind Farm Projects.

View west-northwest from U.S. Highway 36 in the Town of Urbana, Champaign County, Ohio

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 22:
Visual Simulation
U.S. Highway 36

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Viewpoint 85 – Cumulative Simulation (Figure 23)

Cumulative Effect of Buckeye I and Buckeye II Projects

Adding a simulation of the proposed Buckeye I Project (edr, 2009) to the simulation of the Buckeye II Project allows for consideration of the cumulative effect of these two projects. With both projects in place, portions of at least 30 turbines are visible extending from the near mid-ground to the background. The additional (Buckeye I) turbines are closer and more prominent, resulting in greater scale contrast. The overall effect on this view is appreciable, owing primarily to the greater scale contrast presented by the foreground turbines and the cluttering effect resulting from the greater number of turbines in the view. Similar to Viewpoint 41, the cluttering effect of the turbines is lessened somewhat by the existing utility poles and other man-made structures/objects in the view.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 23:
Visual Simulation
S. Kennard-Kingscreek Road/

March 2012

Viewpoint 85:
Cumulative Effect of Buckeye I & II Wind Farm Projects.

View southeast from Kennard-Kingscreek Road/County Highway 10 in the Town of Salem, Champaign County, Ohio

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Viewpoint 158 – Cumulative Simulation (Figure 24)

Cumulative Effect of Buckeye I and Buckeye II Projects

Adding a simulation of the proposed Buckeye I Project (edr, 2009) to the simulation of the Buckeye II Project allows for consideration of the cumulative effect of these two projects. With both projects in place, portions of 18 turbines are visible extending from the near mid-ground to the background. The additional (Buckeye I) turbines are intermixed amongst the Buckeye II turbines in the distant mid-ground and background. Although the view features more turbines, the spacing and variable distances of the turbines retain a sense of openness and do not result in a substantially greater sense of clutter than the view that features on Buckeye II turbines. Because of their greater distance from the viewer the additional turbines do not noticeably increase line or scale contrast presented by the Buckeye II turbines. The overall effect on the view is not significantly changed with the addition of the Buckeye I turbines.

Buckeye II Wind Project

Goshen, Salem, Rush, Union, Urbana, and Wayne Townships
Champaign County, Ohio

Visual Impact Assessment
Figure 24:
Visual Simulation
State Route 161

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Viewpoint 158:
Cumulative Effect of Buckeye I & II Wind Farm Projects.

View north-northwest from State Route 161 in the Town of Goshen, Champaign County, Ohio.

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The cumulative simulations were evaluated by an edr landscape architect in accordance with the methods outlined in Section 4.2.3. Contrast ratings for the viewpoints for which a cumulative simulation (i.e., showing both the Buckeye I and II projects) are summarized in Table 5.

Table 5. Cumulative Visual Simulations Contrast Rating Summary

Viewpoint Number	Nearest Turbine	Scenic Quality	Contrast Rating[1]					
			Landform	Vegetation	Land Use	Sky	Viewer Activity	Average
41 (Buckeye II only)	2.9 mi	Low to Medium	2.5	2.5	1.5	3	3	2.50
41C (cumulative)	1.0 mi	Low to Medium	3.5	3.5	3	3.5	3.5	3.40
85 (Buckeye II only)	2.9 mi	Low to Medium	0.5	0.5	0.5	1.0	0.5	0.60
85C (cumulative)	0.6 mi	Low to Medium	3.5	4	3	3	2.5	3.20
158 (Buckeye II only)	0.9 mi	Medium	3	4	3	3	2.5	3.10
158C (cumulative)	0.9 mi	Medium	3	4	3	3	2.5	3.10

[1] Contrast ratings scale: 0 (insignificant), 1 (minimal), 2 (moderate), 3 (appreciable), and 4 (strong).

Adding the Buckeye I turbines to Viewpoints 41 and 85 places turbines in the near mid-ground of each view and significantly increases the number of turbines in the view, resulting in greater scale and line contrast and in a greater sense of visual clutter. It is worth noting that the cumulative simulation for Viewpoint 41 was also a panoramic image, which increases the field of view, and number of turbines in the view, and is therefore not directly comparable to the other simulations. Regardless, the cumulative effect of the two projects in these two views is greater than the visual impact of only the Buckeye II Project by itself. From Viewpoint 158, the effect of adding the Buckeye I Project to the view does not change or increase the visual contrast resulting from the Buckeye II Project by itself, due primarily to the distance of both projects from the viewer. Consequently, the cumulative visual impact of both projects on this view is not considered significantly different that the effect of just the Buckeye II Project.

As noted previously for the simulations that depict only the Buckeye II Project, the viewpoints with near mid-ground views of both projects (i.e., between approximately 0.5 and 1.0-mile) received appreciable to strong contrast ratings. These included the cumulative simulations from Viewpoints 41, 85, and 158 that show both the Buckeye I and II Projects. For the most part the overall contrast in these views derived from scale and line contrast due to the proximity of the turbines. However, for the cumulative views from Viewpoint 41 and 85, visual impact was associated with primarily the number of visible turbines and their extent across the field of view, which resulted in a sense of

clutter. It is worth noting that for Viewpoint 158 the overall contrast rating did not change between the simulation showing only the Buckeye I project and the cumulative simulation showing both the Buckeye I and II projects. Even though the number of turbines shown in these views more than doubled (from seven to 18), the sense of openness created by the agricultural field in this view is able to absorb the vertical lines of the turbines. In this instance the greater number of turbines in the view did not result in an increased sense of clutter.

In general, the cumulative effects of both projects result in similar levels of contrast and visual impact as either project by itself: the greatest impact typically occurs when numerous turbines are visible and/or where the turbines are close to the viewer. In the opinion of edr, the cumulative effect of constructing both projects is negligible relative to the effect of introducing either project as a visual component of the landscape.

6.0 Conclusions

The VIA for the Buckeye Wind Power Project allows the following conclusions to be drawn:

1. Viewshed mapping and field verification indicate that the Project has the potential to be visible from the majority of the 5-mile radius study area. In most locations where turbines will be visible, significant portions of the overall Project are also likely to be visible. However, field review indicates that in many areas a significant number of the turbines will be at least partially screened by trees and structures. In addition, significant visual effects of wind power projects are generally concentrated within 3.5 miles (6 kilometers) of the Project site (Eyre, 1995). edr's observations on existing wind power projects in New York State indicate that under favorable conditions, views of the wind turbines will likely be available from certain viewpoints well over 10 miles from the Project site. However, visual impact at these distances is typically minimal.

2. Viewshed analysis indicates that views of the Project are likely to be available from the majority of the visually sensitive resources and areas of intensive land use that occur within the 5-mile radius study area. However, for many sensitive sites within the study area, including National Register-listed historic sites and others that occur in the City of Urbana and the various villages, field review suggest that the Project will either not be visible or will be significantly screened by foreground vegetation and structures. As a result, construction of the Project is not expected to result in a significant adverse impact on the visual settings associated with historic properties.

3. Simulations of the proposed Project, indicate that the visibility and visual impact of the wind turbines will be highly variable, based on landscape setting, the extent of natural screening, the presence of other man-made features in the view, and distance of the viewer from the Project.

4. Evaluation by a licensed edr landscape architect indicates that the Project's overall contrast with the visual/aesthetic character of the area will range from minimal to strong. Minimal to moderate contrast was noted for viewpoints located more than 2.0 miles from the Project, particularly where existing vertical elements (such as utility poles) in the foreground or mid-ground reduces the turbines, line and scale contrast with the landscape. More appreciable contrast was noted where foreground and near mid-ground views of turbines (i.e., under 1.0 mile) are available. At these distances the Project's strong scale and line contrast with existing landscape features was noted. However, in most cases the Project appears compatible with the working agricultural landscape that makes up the majority of the visual study area. Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be generally positive, but highly variable

based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power. As Stanton (1996) notes, although a wind power project is a man-made facility, what it represents "may be seen as a positive addition" to the landscape.

5. Based upon the nighttime photos/observations of existing wind power projects, the red flashing lights on the turbines could result in a nighttime visual impact on certain viewers. The actual significance of this impact from a given viewpoint will depend on how many lighted turbines are visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. However, night lighting could be somewhat distracting and have an adverse effect on rural residents that currently experience dark nighttime skies. It should be noted that nighttime visibility/visual impact will be reduced on this Project due to 1) FAA lighting guidelines which typically result in aviation warning lights on only about one third to one half the turbines, 2) the presence of yard trees and hedgerows that screen portions of the Project from many locations, 3) the presence of existing communication towers, grain elevators, and water towers equipped with FAA warning lights, and 4) the concentration of residences in villages, hamlets, and along highways where existing lights already compromise dark skies and compete for viewer attention.

6. Mitigation options are limited, given the nature of the Project and its siting criteria (tall structures typically located in open fields). However, various mitigation measures were considered. These included the following:

   A. Screening. Due do the height of individual turbines and the geographic extent of the proposed Project, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact. However, if adequate natural screening is lacking at the proposed substation site, a planting plan should be developed and implemented to minimize the visibility of this facility.

   B. Relocation. Again, because of the extent of the Project, the number of individual turbines, and the variety of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter visual impact. Where visible from sensitive resources within the study area, (e.g., local parks. cemeteries, and heavily used roadways) numerous turbines are likely to be visible, and relocation of individual machines would have little effect on overall visual impact. Throughout the study area, views of the Project are highly variable and include different turbines at different vantage points. Therefore, turbine relocation would generally not be effective in mitigating visual impacts.

C. Camouflage. The white color of wind turbines (as mandated by the FAA to eliminate the need for day time lighting) minimizes contrast with the sky under most conditions, especially when viewed at distance against the horizon. Consequently it is recommended that this color be utilized on the Buckeye II Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Neilson (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting "is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur."

D. Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. To off-set this decrease, additional turbines would be necessary. There is not adequate land under lease to accommodate a significant number of additional turbines, and a higher number of shorter turbines would not necessarily decrease Project visual impact. In fact, several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer and Freeman, 1987; van de Wardt and Staats, 1988). edr has evaluated this alternative on several proposed wind power projects in New York, and we have typically found that visual impact is not significantly altered by using a larger number of smaller turbines. The visual impact of the electrical collection system is being minimized by installing significant portions of the lines underground.

E. Nonspecular Materials. Where possible, non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare. Where this is not feasible, natural weathering/dulling of any glossy surfaces (on turbine or substation components) will typically occur within one year following installation.

F. Lighting. Turbine lighting will be kept to the minimum allowable by the FAA. Medium intensity red strobes will be used at night, rather than white strobes or steady burning red lights. Lighting at the proposed substation should be kept to a minimum, and turned on only as needed by switch or motion detector.

G. Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Stanton, 1996, Pasqualetti et al., 2002). In addition, the Project operator will establish a decommissioning fund to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.

H. Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. Given the results of this study, off-sets such as removal of existing blighted/derelict structures or restoration and maintenance of neglected cultural resources might be appropriate.

In addition to the mitigation measures described above, other measures that will reduce or mitigate visual impact have been incorporated into the Project design. These include the following:

- All turbines will have uniform design, speed, color, height and rotor diameter.
- The white color of the turbines generally blends well with the sky and horizon, and eliminates the need for daytime FAA warning lights.
- 41.6 miles (88.5%) of the projects electrical collection system will be placed underground.
- The Project operations and maintenance building (although not yet designed) will reflect the vernacular architecture of the area (i.e., resemble an agricultural structure).
- New road construction will be minimized by utilizing existing farm lanes whenever possible.
- The placement of any advertising devices on the turbines will be prohibited.

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