

## **Exhibit AA. Visual Impact Assessment**



# Visual Impact Assessment

## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

### Prepared for:

Republic Wind LLC, A subsidiary of Apex Clean Energy  
310 4<sup>th</sup> Street NE, Suite 200  
Charlottesville, VA 22902

### Prepared by:

Environmental Design & Research  
217 Montgomery St., Suite 1000  
Syracuse, New York 13202  
Contact: Ben Brazell  
P. 315.471.0688



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P: 315.471.0688  
[www.edrdpc.com](http://www.edrdpc.com)

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## ***1.0 Introduction***

On behalf of Republic Wind LLC, Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services, D.P.C. (EDR) prepared this Visual Impact Assessment (VIA) for the proposed Republic Wind Farm (Project). The proposed Project is a 200-megawatt (MW) wind energy generating facility located in the Counties of Sandusky and Seneca, Ohio (Figure 1). The purpose of this VIA is to:

- Describe the appearance of the visible components of the proposed Project.
- Describe 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 by, and with oversight from, a professional with experience in developing visual impact assessments. It is consistent with the policies, procedures, and guidelines contained in established visual impact assessment methodologies and satisfies the requirements of Ohio Administrative Code Chapter 4906-04-08(D)(4) for the Ohio Power Siting Board.



## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 1: Regional Project Location**

- Notes:**
1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
  2. This map was generated in ArcMap on January 9, 2018.
  3. This is a color graphic. Reproduction in grayscale may misrepresent the data.



## **2.0 *Project Description***

A description of the proposed Project site and the visible components of Republic Wind Project is presented below.

### **2.1 Project Site**

The Project Site consists of approximately 35,000 acres of private land in Adams, Pleasant, Reed, Scipio, and Thompson Townships in Seneca County and Green Creek and York Townships in Sandusky County (Figure 2). As measured from the nearest proposed turbine, the Project Site is approximately 2.0 miles southwest of the City of Bellevue, 4.3 miles southeast of the City of Clyde, 9.4 miles southeast of the City of Fremont, 7.0 miles northeast of the City of Tiffin, 5.9 miles northwest of the Village of Attica, 7.5 miles southeast of the Village of Bettsville, 5.0 miles northeast of the Village of Bloomville, 2.9 miles southwest of the Village of Green Springs, 8.0 miles west of the Village of Monroeville, and 1.9 miles northeast of the Village of Republic. The Project Site is bounded on the northeast by Interstate Route 80, on the east by State Route 99, on the south by U.S. Route 224 (Benjamin Franklin Highway), and on the west by the Sandusky River and State Route 53.

### **2.2 Proposed Project**

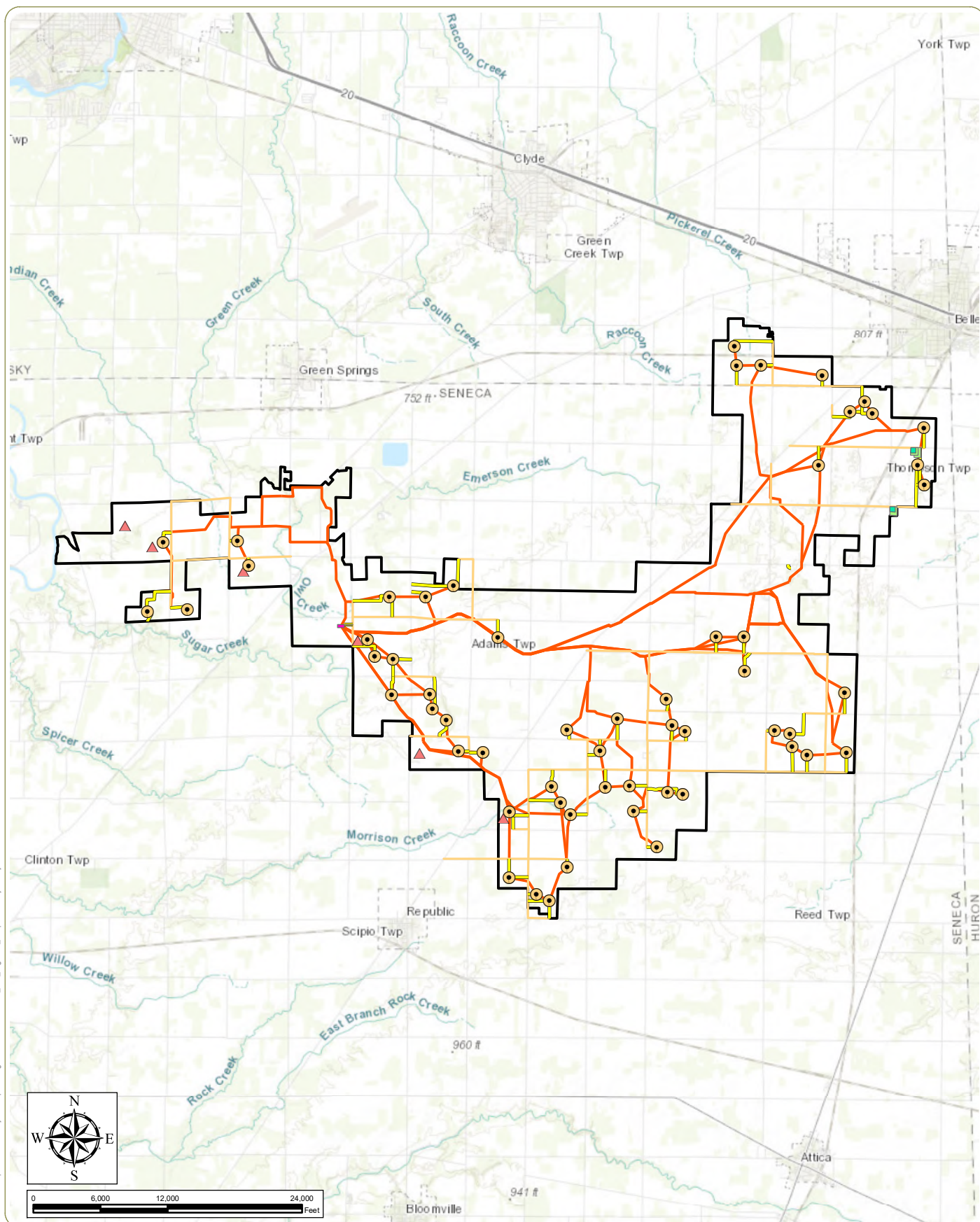
The proposed Project evaluated in this VIA is a wind-powered electric generating facility, consisting of up to 58 wind turbine generators, each with a nameplate capacity rating of 3.3 to 3.63 MW (depending on the final turbine model selected), and a total generating capacity not to exceed 200 MW. Depending on the model of turbine selected, the actual number of turbines constructed could range from 55 to 58. Along with the turbines, the Project includes associated support facilities including roads, buried electrical collection cables, two met towers, a substation, up to two temporary laydown yards, and an O&M building. Project configuration/layout is illustrated in Figure 2. The dimensions and visual appearance of the major components of the proposed Project are described below:

#### **2.2.1 Wind Turbines**

The Applicant has not made a final determination of the wind turbine model or manufacturer. Turbines under consideration include the Acciona AW 132, Vestas V136, and General Electric GE 3.6-137. These models represent the tallest class of turbines and largest rotor diameters under consideration, and any turbine ultimately selected will be essentially equivalent to these in terms of its dimensions, appearance, and electrical output. The turbines are the largest and most visible components of the proposed Project, and therefore are the focus of the VIA. Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The hub height will be a maximum of 367



feet (112 meters). The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. The rotor diameter will be a maximum of 449 feet (137 meters). The Vestas 136 was the greatest maximum turbine height (i.e., the height at the highest blade tip position) at 591 feet (180 meters). Therefore, this turbine is the model evaluated in this study. Descriptions of each of the turbine components are provided below, and a computer model illustrating the appearance of the turbine used in this assessment is shown in Figure 3.



## Republic Wind Farm

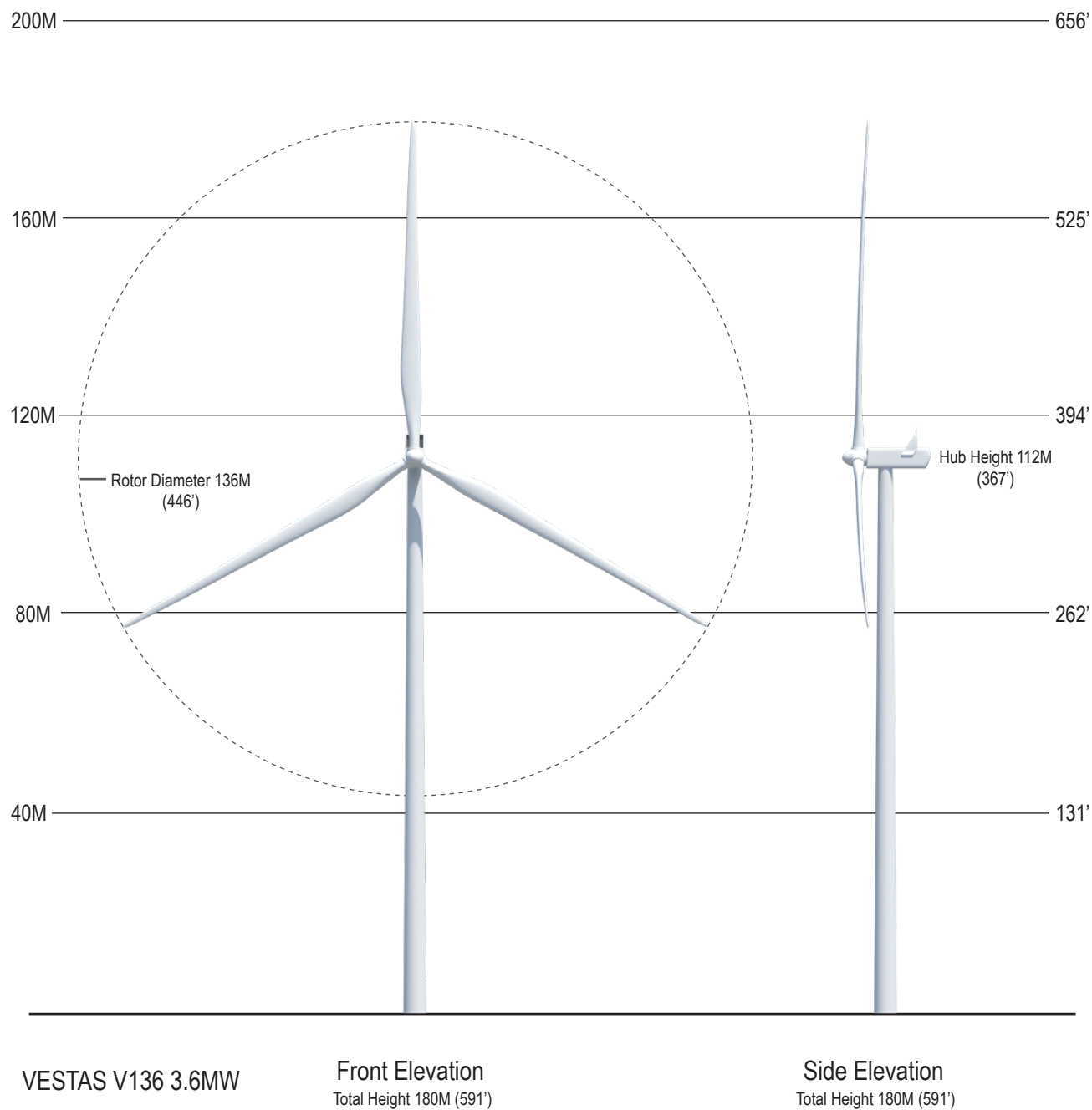
Sandusky and Seneca Counties, Ohio

### Figure 2: Proposed Project Layout

- Notes:**
1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
  2. This map was generated in ArcMap on January 9, 2018.
  3. Only two met tower sites will be selected in the final design.
  4. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- ▲ Potential Met Tower Site
- Wind Turbine
- Access Road
- Collection Line
- Delivery Route
- Collection Substation
- Laydown Yard Option
- O&M Facility
- Project Boundary





J:\15095 Republic Wind Project\Graphics\Figures\VA\NDD\Figures\15095\_VIA\_Figure 3\_Diagram of Proposed Turbine.indd

## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

Figure 3: Computer Model of Proposed Wind Turbine



*Tower:* The towers used for commercial turbines are tubular conical steel structures manufactured in multiple sections and mounted on a concrete foundation that is essentially flush with the ground surface. For the purposes of this study, the tower is assumed to have a base diameter of 15 feet and a top diameter of 9.4 feet at a height of 360.5 feet. Each tower will have an access door in the base section, and be painted white, in accordance with Federal Aviation Administration (FAA) regulations.

*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 41.8 feet long, 22.4 feet tall (including cooling equipment), and 11.0 feet wide, and white in color. The nacelle is equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. Attached to the top of some of the nacelles, per specifications of the FAA, will be a single, medium intensity aviation warning light. These lights are anticipated to be flashing, medium-intensity red strobes (L-864) that operate 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 to the nacelle to operate upwind of the tower. Each rotor consists of three composite blades that will be up to 220 feet (67.2 meters) in length, with a maximum rotor diameter of up to 449 feet (137 meters). The rotor attaches to the drive train at the front of the nacelle. Rotor speed will be in the range of 5.6 to 15.3 revolutions per minute (RPM).

### 2.2.2 Electrical System

The proposed Project will have an electrical system consisting of two parts: (1) a system of 34.5 kV shielded and insulated cables that will collect power from each wind turbine, and (2) a collector substation ("Project substation") that will step up voltage prior to connection with the electric power grid. Each of these electrical system components is described below.

*Collection System:* A transformer at each turbine will raise 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 collection circuit and turbine communication cables to form the electrical collection system. Collection cables will be buried to a minimum depth of 36 inches below the surface. Appendix E, illustrates typical underground collection system trench and cabling during construction. The location of the proposed collection system is depicted on Figure 2. This 34.5 kV collection system will connect the individual turbines to the collection

substation. The total length of the buried 34.5 kV collection lines carrying electricity to the Project substation will be approximately 84 miles. A cleared corridor up to 25 feet wide<sup>1</sup> is typically required for installation of the buried cables. Restoration of these disturbed areas will be completed through seeding and mulching of all exposed soils, or by other appropriate farming methods in active agricultural fields. While the cables themselves will not be visible, any clearing associated with the installation of the buried collection lines is shown in the simulations prepared for this VIA.

*Collection Substation:* The collection substation will be located south of Hoppes Road and west of Town Highway 175 in Adams Township in Seneca County. The substation will step up voltage from 34.5 kV to 138 kV, so it can be delivered to the existing power grid. The substation will include dead-end structures, circuit breakers, air break switches, metering units, relaying, communication equipment, and a control house. The collection substation will be approximately 467 by 467 feet in size and enclosed by a chain link fence. Lightning masts will be the tallest component of the substation and be approximately 60 feet tall. The station will be accessed via a 0.1-mile, gravel-surfaced access road from Town Highway 175. At the time of submittal, details regarding the size and design of the substation were not available. Therefore, this component of the project was not evaluated in the VIA.

### 2.2.3 Access Roads

The Facility will require the construction of new or improved roads to provide access to the proposed turbines. The proposed location of Facility access roads is shown on Figure 2. The total length of private access roads required to service all proposed wind turbine locations is approximately 22.7 miles. During construction, access road installation and use could result in temporary soil disturbance to a maximum width of 36 feet. Wherever feasible, existing farm drives will be upgraded for use as Facility access roads, in order to minimize impacts. Once construction is complete, temporarily disturbed areas will be restored to their approximate pre-construction contours. For the purposes of this study and the accompanying visual simulations, the roads are assumed to be gravel-surfaced with a finished width of 16 feet. Although not specifically evaluated in the VIA, any access roads, or vegetation clearing necessary to accommodate these roads, are shown in the simulations, if visible.

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<sup>1</sup> Some sections of buried electrical cable will be wider than 25 feet because of the number of collection strings that need to convene (run parallel) near the Project substation. However, in many other locations the disturbance will be substantially less than 25 feet, resulting in an overall average disturbance width of 25 feet across the Project Site.

#### 2.2.4 Meteorological Towers

Two 295-foot (90-meter) permanent wind measurement (met) towers will be installed to collect wind data and support performance testing of the Facility. 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. Each tower will be self-supporting (i.e., they will be un-guyed, free standing structures). Six possible locations for the met towers have been identified, all of which are on agricultural land (see Figure 2). For the purposes of this study met towers are shown in any of the simulations that include one or more of the six possible sites (although no more than the two closest towers are shown in any simulation).

#### 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 or permanently disturb an area of greater than 3 acres. Because the O&M building is anticipated to utilize an existing structure or be similar in size and design to existing agricultural buildings in the area, it is not addressed in this study, nor represented in the visual simulations.

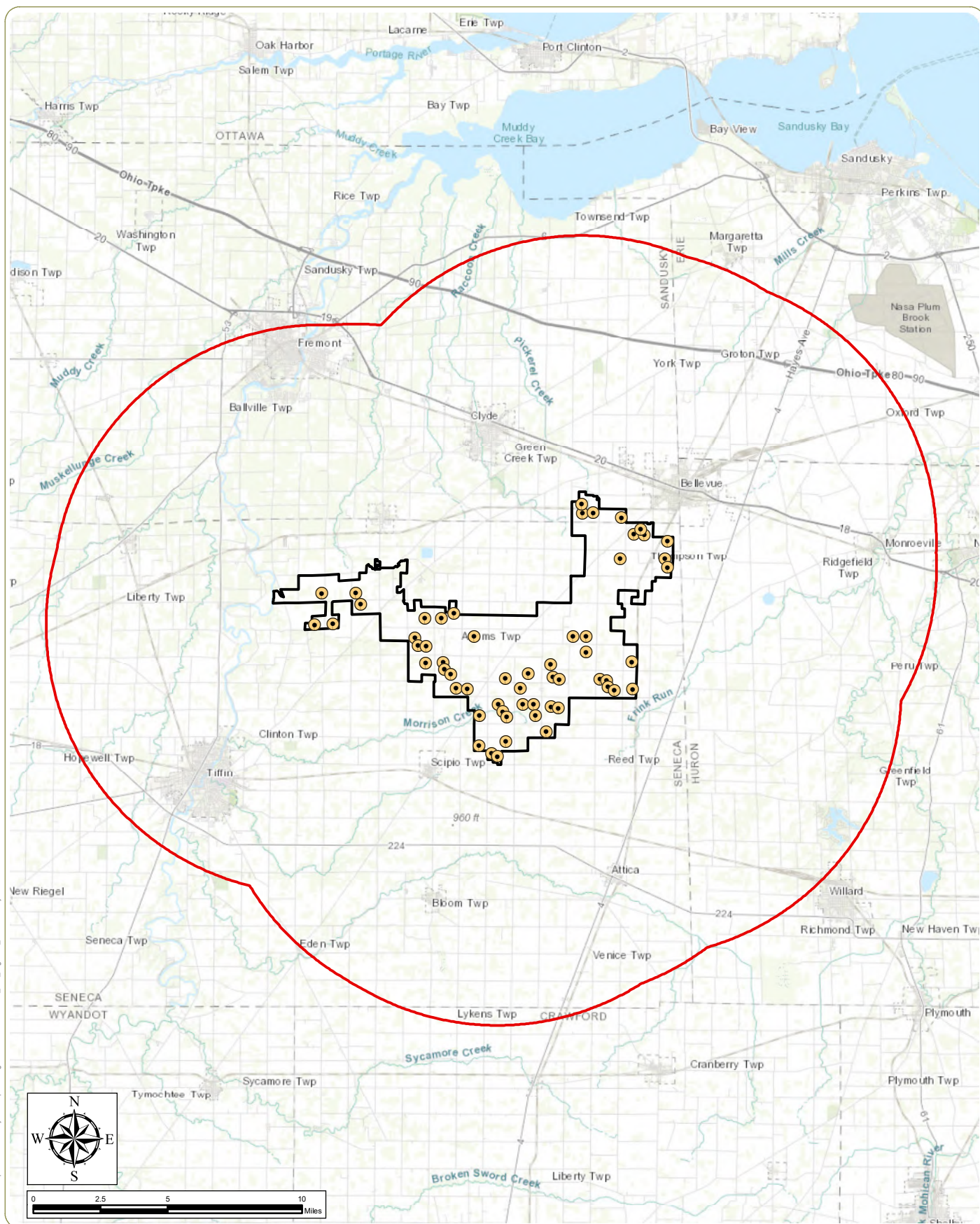
#### 2.2.6 Laydown Yards

Facility construction will require the development of a temporary laydown yard for construction staging, to be located on leased private lands. The laydown yard will accommodate material and equipment storage, parking for construction workers, and construction management trailers. The area of the laydown yards will not exceed approximately 12 acres. No lighting of the laydown areas is currently proposed, but may be added as needed (e.g., to resolve safety issues due to poor visibility or if other problems such as vandalism arise). Three possible locations for the laydown yard have been identified, all of which are on agricultural land (see Figure 2). Because the laydown yards are temporary and will be removed/restored at the end of construction, they are not represented in the visual simulations or evaluated as part of this study.

### ***3.0 Visual Study Area***

Chapter 4906-17 of the Ohio Administrative Code (OAC), Application Filing Requirements for Wind-Powered Electrical Generation Facilities, section (D)(1), indicates that a 10-mile radius is the appropriate study area for the identification of scenic and historic resources (OPSB, 2009). The 10-mile radius visual study area (study area) for the Republic Wind Farm encompasses approximately 728 square miles, and includes portions of Erie, Huron, Sandusky, and Seneca Counties. Municipalities that occur within ten miles of the proposed Facility include three cities (Bellevue, in Erie, Sandusky and Huron Counties, Clyde in Sandusky County, and Tiffin in Seneca County); two villages (Green Springs in Sandusky and Seneca Counties and Republic in Seneca County); and 16 townships (Groton in Erie County, Lyne, Norwich, and Sherman in Huron County, Ballville, Green Creek, and York in Sandusky County, and Adams, Bloom, Clinton, Liberty, Pleasant, Reed, Thompson, Scipio, and Venice in Seneca County). The location and extent of the visual study area is illustrated in Figure 4.








## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

### Figure 4: Visual Study Area

- Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 9, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

-  Wind Turbine
-  10-Mile Study Area
-  Project Boundary





### 3.1 Physiographic/Visual Setting

#### 3.1.1 Landform and Vegetation

The visual study area occurs within the Huron-Erie Lake Plains Section of the Central Lowland Physiographic Province in Ohio. The majority of the study area lies within the Bellevue-Castalia Karst Plains, which is characterized as a hummocky plain of rock knobs and numerous sinkholes, large solution features, springs and caves, thinly mantled by glacial drift. Surface elevations in this region range from 570 feet to 825 feet above mean sea level (amsl). The northwestern portion of the study area occurs within the Maumee Lake Plains Region and is characterized as a flat-lying Ice-Age lake basin containing beach ridges, bars, dunes, deltas, and clay flats. The region formerly contained the Black Swamp, which was a regional wetland extending southwest from present-day western Lake Erie through northwest Ohio into extreme northeastern Indiana. The Black Swamp consisted of extensive swamps and marshes, with some higher dry ground interspersed. Low physiographic relief (generally less than 5 feet) is present in the region, which has been slightly dissected by modern streams. Surface elevations in the Maumee Lake Plain Region range from approximately 570 to 800 feet amsl (Hull, 2017).

Vegetation in the study area is dominated by active agricultural land (crop fields), followed by maintained/open space (residences/yards), and some deciduous forest areas (woodlots). Many of the fields and roadsides are bordered by ditches and narrow waste areas characterized by unmowed herbaceous vegetation. Forested areas are limited to isolated woodlots between crop fields and along some roads. The woodlots are comprised primarily of native deciduous trees, including maples (*Acer* spp.), oaks (*Quercus* spp.), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), and shagbark hickory (*Carya ovata*).

#### 3.1.2 Land Use

Land use within the visual study area is dominated by agricultural land, farms, and rural and suburban residential development. Farms in the area are typically large, with soybeans and corn being the primary agricultural crops grown. Rural residential development occurs at a very low density throughout the study area. Hamlets occur as relatively small pockets of development within a primarily rural/agricultural landscape. Higher density residential and commercial development is concentrated in the Cities of Bellevue, Clyde, and Tiffin, and the Villages of Green Springs and Republic. The cities and villages are generally characterized by a main street business district, surrounded by traditional residential neighborhoods, with some commercial frontage development along the outskirts. Some suburban residential and commercial development occurs around the periphery of the city and villages in the study area.

Commercial/industrial uses within the study area also occur on the outskirts of the city and villages, and 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

The entire study area is located within the Lake Erie Drainage Basin. Surface water bodies present within the study area include several small streams, ditches, ponds, and above ground reservoirs. The streams generally flow from the southeast to the northwest. The majority of the surface water inside the study area flows into Emerson Creek and Royer Ditch, located in the central northern portion of the study area. These water bodies connect to Beaver Creek, which flows into Green Creek, which discharges into Lake Erie. Several small un-named tributaries in the southwestern portion of the study area, connect to the Sandusky River, which parallels the western border of the study area, before discharging into Lake Erie. 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. These water bodies are also 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

The definition of landscape types found in the study area provides a useful framework for the analysis of available visual resources and viewer circumstances. These landscape types, referred to in this report as Landscape Similarity Zones (LSZs), are defined based on the similarity of landscape features such as landform, vegetation, water, and land use patterns, as well as characteristics that affect visual sensitivity, such as the availability of open views, scenic quality and user activity. These generally homogeneous character zones were identified in accordance with established visual assessment methodologies (Smardon et al., 1988; USDA Forest Service, 1995; USDOT Federal Highway Administration, 1981; USDOI Bureau of Land Management, 1980). The U.S. Geological Survey (USGS) National Land Cover Dataset (NLCD) used to help define the location of these zones is illustrated in Figure 5. The general landscape character, land use, and types of views available from each of the four identified LSZs that occur within the study area are described below, and include the following:

- Rural Residential/Agricultural Zone
- City/Village/Hamlet Zone
- Suburban Residential Zone
- Transportation Corridor Zone

The USGS Land Cover Data used to help define the location of these zones is illustrated in Figure 5. 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



**Inset 1. Representative Photograph of the interaction between Agriculture and Residential uses as viewed from the Rural Residential/Agricultural Landscape Similarity Zone.**

State Route 412, west of County Road 306 (Teems Road), Township of Townsend, Ohio (Viewpoint 15).

The Rural Residential/Agricultural LSZ is the dominant landscape type that occurs throughout the study area and is visually recognizable by its working landscape characteristics. The landscape in this zone is characterized by uniformly level topography with a mix of farms and associated crop fields, rural residences, hedgerows, small woodlots, and occasional water features. The dominant land use is crop farming (primarily soybeans and corn), along with small amounts of pasture. Due to the presence of open fields, views within this LSZ are more open and longer in distance than those available in other zones within the study area. These views typically include a level foreground field, 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. Scenic quality generally ranges from low to moderate depending on the variety and arrangement of landscape features in the view. Due to the abundance of open fields, and the proposed location of turbines exclusively within this zone, open foreground (0-0.5 mile), midground (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. In some areas of this LSZ water is present in the form of streams, rivers, small ponds, and larger reservoirs. Views toward the Project site from water resources are most likely to be available from the reservoirs, due to their elevated earthen embankments and the larger expanse of open water. Open views from the Sandusky River are extremely rare, due to the shoreline vegetation that effectively screens outward views.



**Inset 2. Representative Photographs of the Rural Residential/Agricultural Landscape Similarity Zone.**

Top Left: State Route 510 (North Main Street), north of the City of Clyde at Crossing of Buck Creek, Township of St Greek Creek, Ohio (Viewpoint 66);

Top Right: County Road 138 (East Township Road 138, at the Miller Conservation Farm, Township of Adams, Ohio (Viewpoint 72);

Bottom Left: Clinton Nature Preserve, Sandusky Scenic River Access, Township of Adams, Ohio (Viewpoint 73);

Bottom Right: Beaver Creek Reservoir, Boat launch, Township of Adams, Ohio (Viewpoint 52);



### 3.2.2 Zone 2. City/Village/Hamlet Zone



**Inset 3. Representative Photographs of the City/Village/Hamlet Zone.**

Top Left: Intersection of Center Street and Washington Street, Village of Republic, Ohio (Viewpoint 81);

Top Right: U.S. Route 20 (West State Street), City of Fremont, Ohio (Viewpoint 62);

Bottom Left: State Route 53 (South Sandusky Street), City of Tiffin, Ohio (Viewpoint 75);

Bottom Right: State Route 162 (East Jefferson Street), at East Street, Township of Scipio, Ohio (Viewpoint 80);

This LSZ includes the downtown portion of the Cities of Bellevue, Clyde, Fremont, and Tiffin; and the Villages of Attica, Bettsville, Bloomville, Green Springs, Monroeville, and Republic. 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, but are typically dominated by masonry or wood-sided buildings fronting on an organized grid of local streets. Scenic quality is generally moderate and influenced largely by the arrangement and condition of built structures in the view. The majority of the sensitive sites identified in the study area, including one of the historic sites identified specifically for its

setting or scenic qualities (the National Orphans Home/Junior Order United American Mechanics grounds), fall within the City/Village/Hamlet LSZ. Activities within this zone are primarily associated with local 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, where structures and vegetation density decrease and therefore screening is reduced. Views of the Project will generally be screened by structures but could occasionally be available from open road corridors oriented toward the Project site.

### 3.2.3 Zone 3. Suburban Residential Zone



**Inset 4. Representative Photographs of the Suburban Residential Landscape Similarity Zone.**

Left: State Route 18 (North Greenfield Road), at intersection with North Township Road 15, Township of Clinton, Ohio (Viewpoint 77);

Right: State Route 269, South of the Village of Castalia, Ohio (Viewpoint 12);

This zone is dominated by low to medium-density residential neighborhood development that typically occurs on the outskirts of the Cities of Bellevue, Clyde, Fremont, and Tiffin; and the Villages of Attica, Bettsville, Bloomville, Green Springs, Monroeville, and Republic. Buildings tend to be of more recent vintage, 1-2 stories in height, and more spread out than in a village setting. Scenic quality is unremarkable, although homes and yards generally appear neat and well maintained. Open views to the surrounding landscape are generally more restricted than in open agricultural areas, but more available than in the cities and villages due to the wider spacing of the homes and yards. 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.

### 3.2.4 Zone 4. Transportation Corridor Zone



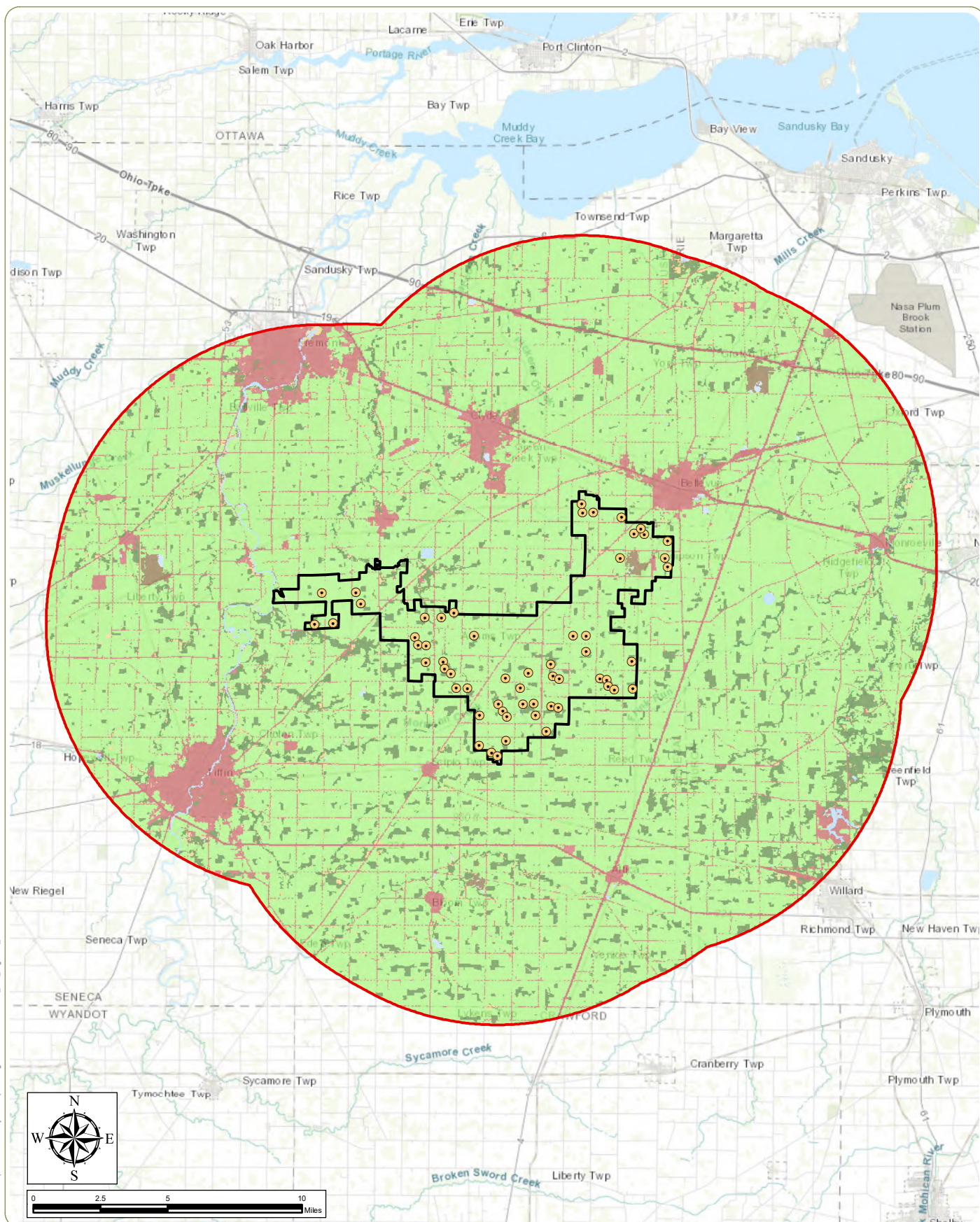
**Inset 5. Representative Photographs of the Transportation Landscape Similarity Zone.**

Left: State Route 238 (Gibbs Road) at Interstate 80/90 overpass, Township of Townsend, Ohio (Viewpoint 19);

Right: State Route 53, at intersection with Sean Street, City of Fremont, Ohio (Viewpoint 57);

The Transportation Corridor LSZ includes divided, multi-lane highways with limited access and heavily used state highways. These include Interstate 80/90, U.S. Route 20, and State Routes 4, 16, 53, 510, and 101. Views along these transportation corridors are dominated by automobiles, pavement, guard rails, and signs in the foreground. Surrounding land use is variable, ranging from high density commercial development to open agricultural land and farms, with intermittent forest stands in the background. Scenic quality is largely defined by the surrounding landscape but is generally compromised by the abundance of transportation infrastructure in the view.





## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 5: Land Use**

**Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. Land cover derived from 2011 USGS NLCD data.  
3. This map was generated in ArcMap on January 9, 2018.  
4. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- Wind Turbine
- 10-Mile Study Area
- Project Boundary
- Agricultural Land
- Disturbed/Developed Land
- Forestland
- Grassland/Shrubland/Wetland
- Open Water
- Quarry/Barren Land





### 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 Cities of Bellevue, Clyde, Fremont, and Tiffin; and the Villages of Attica, Bettsville, Bloomville, Green Springs, Monroeville, and Republic. However, rural residents 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 residents may be 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., Interstate 80/90, U.S. Routes 6 and 20, and State Routes 4, 12, 18, 19, 53, see table 3 for traffic counts) 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.

#### 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 state wildlife areas. These viewers are concentrated in the recreational facilities/cultural sites located within and adjacent to the visual study area, including the various state wildlife areas, the Sandusky County Park system, the Sandusky River and a variety of local parks, golf courses, and historic sites. 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,

sightseeing, or walking). 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.

### 3.4 Visually Sensitive Resources

There are no National Parks, National Forests, National Wildlife Refuges, National Natural Landmarks, State Nature Preserves, State Parks, State Forests or federally designated scenic rivers or trails, within the visual study area. However, the study area includes several sites that could be considered scenic resources of statewide significance. These include historic sites, state wildlife management areas, county parks, a state-designated scenic river, a state bike route, and a pedestrian trail. Descriptions of these resources are presented below.

#### 3.4.1 Historic Sites

The study area includes 51 sites listed on the National Register of Historic Places (NRHP), one of which (Spiegel Grove) is a national historic landmark, and five NRHP-listed historic districts. These historic sites include 16 residences, four farms, 12 Heidelberg College buildings, one school, four churches, one jail, one bridge, one parkway, two mills, and nine commercial businesses within the City of Tiffin. There are four residential historic districts (Fort Ball Historic District, Hunts Corners Historic District, North Sandusky Street Historic District, and Northeast Tiffin Historic District) and one commercial historic district (Downtown Tiffin Historic District). Other historic resources within the visual study area include 23 sites determined to be eligible for listing on the NRHP and 11 state historic markers. In addition, the Cultural Resources Records Review identified 390 Ohio Historic Inventory (OHI) properties and 698 Ohio Archaeological Inventory (OAI) properties within 5 miles of the Project Site (EDR, 2017).

NRHP-listed sites and districts most likely to experience views of the Project are those located within 5 miles of the Facility. These include the Henny Barn, Heter Farm, Tremont House, Pleasant Ridge United Methodist Church and Cemetery, Omar Chapel, Umsted Farm, John Wright Mansion, Major General James B McPherson House, Junior Order of the United American Mechanics National Orphans' Home, and Hunts Corners Historic District. Eight of the 10 listed sites do not warrant any visual analysis, as their listing is based on aspects and features associated with the property that do not include the setting or surrounding views. However, for two of the sites; the Pleasant Ridge United Methodist Church and Cemetery, and the Junior Order of the United American Mechanics National Orphans' Home, the setting and views are mentioned as reasons for their listing on the NRHP. Descriptions of these two sites are presented below.

*Pleasant Ridge United Methodist Church and Cemetery (93000880):* Pleasant Ridge United Methodist Church and Cemetery, located 2.1 miles from the nearest proposed turbine, are excellent examples of a nineteenth century rural or country church and associated burial ground. The complex also symbolized the transition of ecclesiastical architecture during the nineteenth century, from simple meeting houses to complex, stylistic buildings dictated by the increasing denominational pluralism of protestants and the growing availability of standardized church plans. The complex is located at the crest of a prehistoric sand or beach ridge, for which the church was named. Built in 1890, the church was built in the neo-Gothic style, of red brick, and sits on a rusticated stone foundation (Harper, 1993).

This site is located in the Rural Residential/Agricultural LSZ, and a medium-sized parking area is located adjacent to State Route 101 (Portland Road) and serves the church and associated grounds. To the north and west, expansive open views are available across open agricultural land that is bordered by mature hedgerows in the background. To the east and south, intervening mature vegetation immediately adjacent to the site screens any views into the midground and background.



**Inset 6. Representative Photograph from the Junior Order of the United American Mechanics National Orphans' Home campus.** Huss Street and internal circulation road, City of Tiffin, Ohio (Viewpoint 74).

*Junior Order of the United American Mechanics National Orphans' Home (90001499):* The Junior Order of the United American National Orphans' Home (the Junior Home), located 4.5 miles from the nearest proposed turbine on a broad plain, which rises from the Sandusky River. The complex consists of 648 acres, including a central campus, farmland

and woods. The central campus, approximately 200 acres in size, is typified by brick buildings along curving roadways. The Junior Home was established in 1896, with the purchase of 117 acres, then known as Bretz-Kellar farm. It was meant to serve as a self-sufficient residential community with residence cottages, a chapel, gymnasium, grade and high schools, trade school, hospital, dining hall, nursery, library, laundry, cannery, general store, band building, greenhouse, power plant, and administration building. The complex is significant in American history as an example of the self-contained residential institution and meets National Register Criteria A as a place that is associated with events that have made a significant contribution to the broad patterns of American history and Criteria C as a place that embodies the distinctive characteristics of a type, period, or method of construction. In addition, the complex is laid out as a cottage plan, rather than a single residential building. The cottage plan allowed for creating a family life by housing orphans in separate units overseen by couples that served as surrogate parents, rather than the former single residential building that was institutional and did not provide individualized care (Ligibel and Valentine, 1990).

Located in the City/Village/Hamlet LSZ, potential open views from the living quarters are screened by intervening buildings and vegetation, as is typical within this LSZ. However, because this site is a large parcel that includes open grounds, the potential for long distance views is greater than typically found in the cities and villages within the study area.

#### 3.4.2 Wildlife Management Areas

The following state wildlife management areas are located within 5 miles of the Project Site and have the greatest potential for views of the proposed Project.

Knobbys Prairie Wildlife Area, located 0.6 mile from the nearest proposed turbine, is a 47-acre wildlife management area primarily consisting of grassland with a small portion of brushland (ODNR, 2017a). A small informal parking area is located at the wildlife area off of County Route 15, which provides access to a few, informal trailheads. Located in the Rural Residential /Agricultural LSZ, open views are available from this area where foreground vegetation remains relatively low.

Sugar Creek Wildlife Area, located 1.1 miles from the nearest proposed turbine, is a 125-acre wildlife management area with a mix of grassland and brushland (ODNR, 2017a). A designated parking area for 7-10 cars is located at the intersection of North Township Road 157 and Township Road 148 (Dunkard Church Road), adjacent to a collection of three residential properties. Informal trails lead from the parking area into a forested area. This site is located in the Rural Residential /Agricultural LSZ but is dominated by a combination of mature forest and successional scrubland.

Open outward views are not available from forested portions of the property and are partially screened by 10-15-foot vegetation in the scrub areas.

In addition, three wildlife production areas are located within 5 miles of the Project site. These include, Wildlife Production Area 62 (0.3 mile from the nearest proposed turbine), Wildlife Production Area 47 (0.8 mile from the nearest proposed turbine), and Wildlife Production Area 31 (3.5 miles from the nearest proposed turbine). All of these areas are characterized by successional old fields and small woodlots. Designated parking areas and access points to the wildlife production areas are non-existent. Located in the Rural Residential /Agricultural LSZ, open views towards the Project are available from these areas but are insignificant due to the lack of public access.

### 3.4.3 County Parks



**Inset 7. Representative Photograph of the Blue Heron Reserve, Sandusky County Park District.**  
Boardwalk from main parking area, Blue Heron Reserve, Township of Riley, Ohio (Viewpoint 07).

The Sandusky County Park District has facilities that cover approximately 2,500 acres spread out across Sandusky County, with the majority being located within the study area, including the Blue Heron Reserve, Countryside Park, Creek Bend Farm, Mull Covered Bridge, and North Coast Inland Trail. Total park attendance is approx. 150,000 visitors per year with over 300 programs & presentations annually. These resources are located primarily within the Rural Residential /Agricultural LSZ, however open views are generally limited due to intervening mature vegetation in the

form of forest stands and hedgerows. Scenic quality and viewer sensitivity in these areas are relatively high due to their natural character and the recreational use they receive.

The Seneca County Park District has 10 park facilities that cover approximately 650 acres surrounding the City of Tiffin. Within the study area, these include the Bowen, Clinton, Mercy Community, Steyer, Tiffin University and Zimmerman Nature Preserves and Opportunity Park. Over 180 nature programs for all ages are conducted year-round at the District sites with attendance exceeding 4,000 annually. These sites are located primarily within the Rural Residential /Agricultural LSZ, however, similar to the resources located in the Sandusky County Park District, open views are generally limited due to intervening mature vegetation. Scenic quality and viewer sensitivity in these areas are considered to be relatively high.

#### 3.4.4 Scenic Rivers

The Sandusky River was designated an Ohio scenic river in 1970. The river is Ohio's longest river within the Lake Erie watershed, and offers several public access sites that are open for hunting and canoeing, as well as fishing along most of its length. The Seneca and Wyandot Indians lived along the river and the Sandusky River Valley has played an important role in Ohio's history. Four forts were located along the river's banks including Fort Stephenson, where the Americans won a decisive victory during the War of 1812 (ODNR, 2017b).

The Sandusky River occurs primarily within the Rural Residential /Agricultural LSZ, however it courses through the City/Village/Hamlet zone as well. At its closest point to the Project the river is approximately 1.7 miles from a proposed turbine. However, opportunities for open views are generally limited because earthen berms define the shoreline and mature shoreline vegetation screens outward views. These factors also serve to screen views from the numerous designated river access points. The river and its immediate environs represent one of the most scenic portions in the study area. The features that contribute to its scenic quality include the moving water, rock ledges and mature shoreline vegetation.

#### 3.4.5 Bike Routes and Trails

One state bike route, the North Coast Inland Trail, occurs within the visual study area. The bike route traverses the northern portion of the visual study area and comes within approximately 0.8 mile of a proposed turbine at its closest point. The trail is currently 71.8 miles, but when completed the bike trail will extend approximately 105 miles, from Lorain, Ohio to Toledo, Ohio (Ohio Bikeways, 2017).





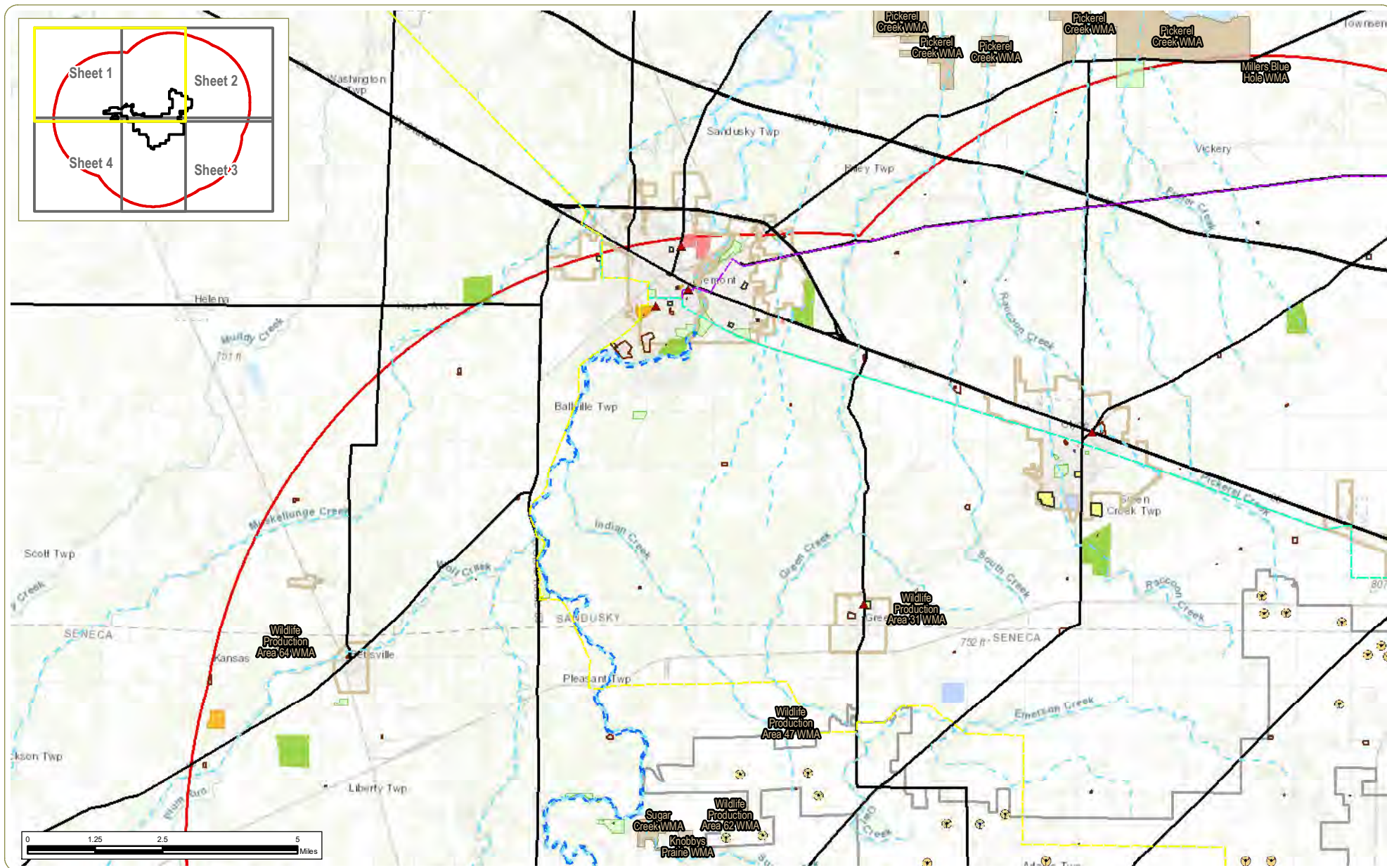
**Inset 8. Representative Photograph of the North Coast Inland Trail, Sandusky County Park District.**  
Recreational Path, Township of Riley, Ohio (Viewpoint 29).

The Buckeye Trail was first proposed by Merrill Gilfillan in 1958. It was originally planned to be a 500-mile path from the Ohio River to Lake Erie, but evolved into the nation's longest loop trail, winding 1,444 miles around Ohio. The trail includes, scenic wetlands and forests across the state, and many historic towns, canal towpaths, and abandoned rail grades. There are 26 sections of the trail, each named for a town or feature within that section. Portions of two sections, Pemberville and Norwalk, pass through the central portion of the 10-mile visual study area (Buckeye Trail Association, 2017). The closest trail segment is located approximately 0.3 mile from a proposed turbine.

The above two resources travel through all of the listed LSZs as they traverse the study area. Views available along these trails will be highly variable. At many locations open long distance views will be available, while in other places views will be entirely screened by intervening vegetation and buildings. The dominant visual character is defined by the working landscape of the Rural Residential/Agriculture LSZ.

Beyond the scenic resources of statewide significance described above, the study area also includes areas that could also be considered regionally or locally significant/sensitive, due to the type or intensity of land use they receive.

All inventoried scenic/sensitive resources are listed in Appendix B. The location of mapped visually sensitive resources within the visual study area is illustrated in Figure 6.



## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

### Figure 6: Visually Sensitive Resources - Sheet 1 of 4

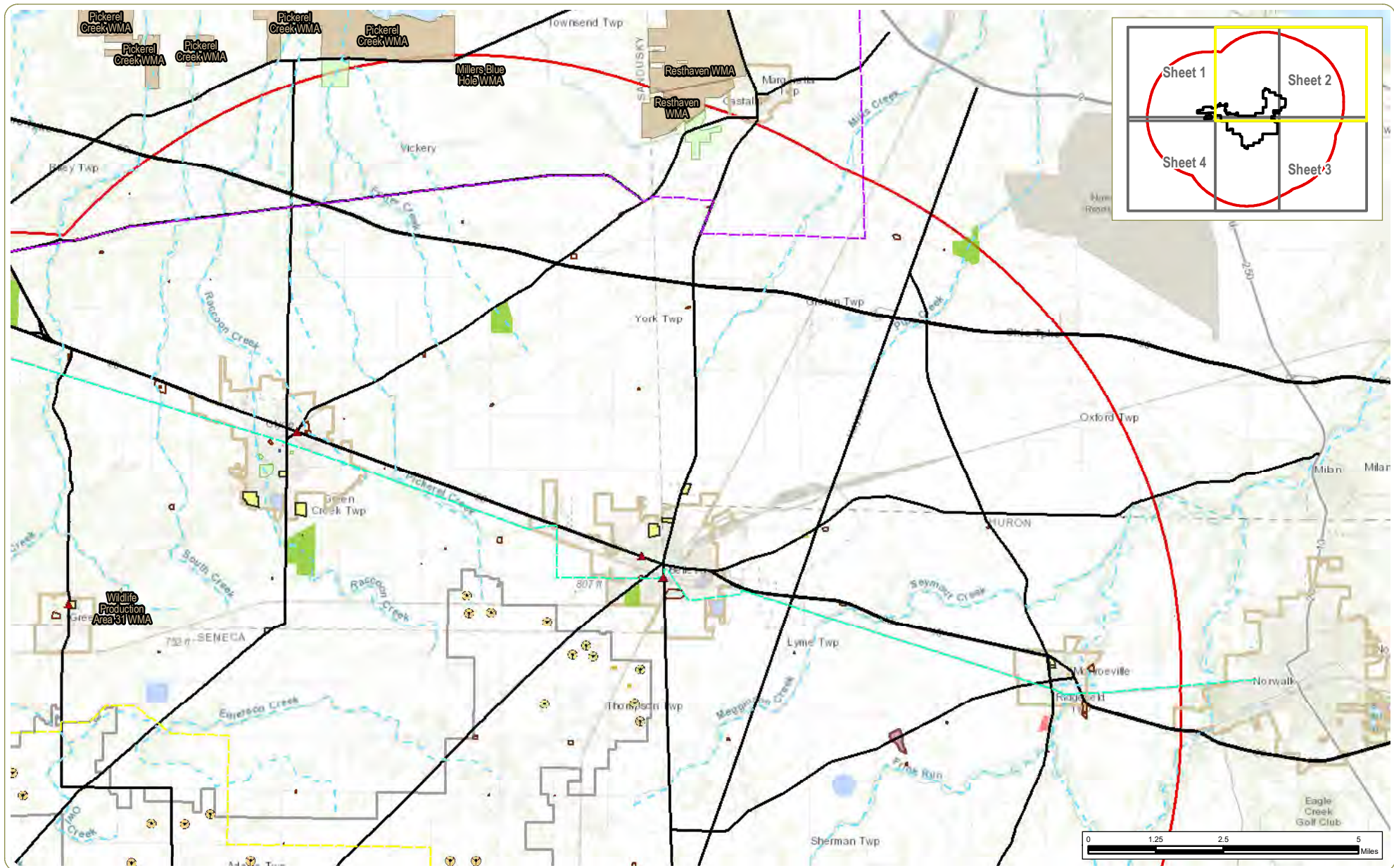
- Notes:**
1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
  2. This map was generated in ArcMap on January 24, 2018.
  3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- |                         |                           |                    |                                |
|-------------------------|---------------------------|--------------------|--------------------------------|
| ▲ State Historic Marker | - - - Wild & Scenic River | Library            | State Wildlife Management Area |
| ○ Wind Turbine          | — Major Road              | Local Park         | School                         |
| — Buckeye Trail         | ☐ Cemetery                | NRHP-Eligible Site | Water Body                     |
| — Local Bike Route      | ☐ City or Village         | NRHP District      | 10-Mile Study Area             |
| — State Bike Route      | ☐ Golf Course             | NRHP-Listed        | Project Boundary               |
| — River & Stream        |                           |                    |                                |



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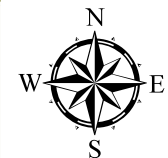


## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 6: Visually Sensitive Resources - Sheet 2 of 4**

**Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 24, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

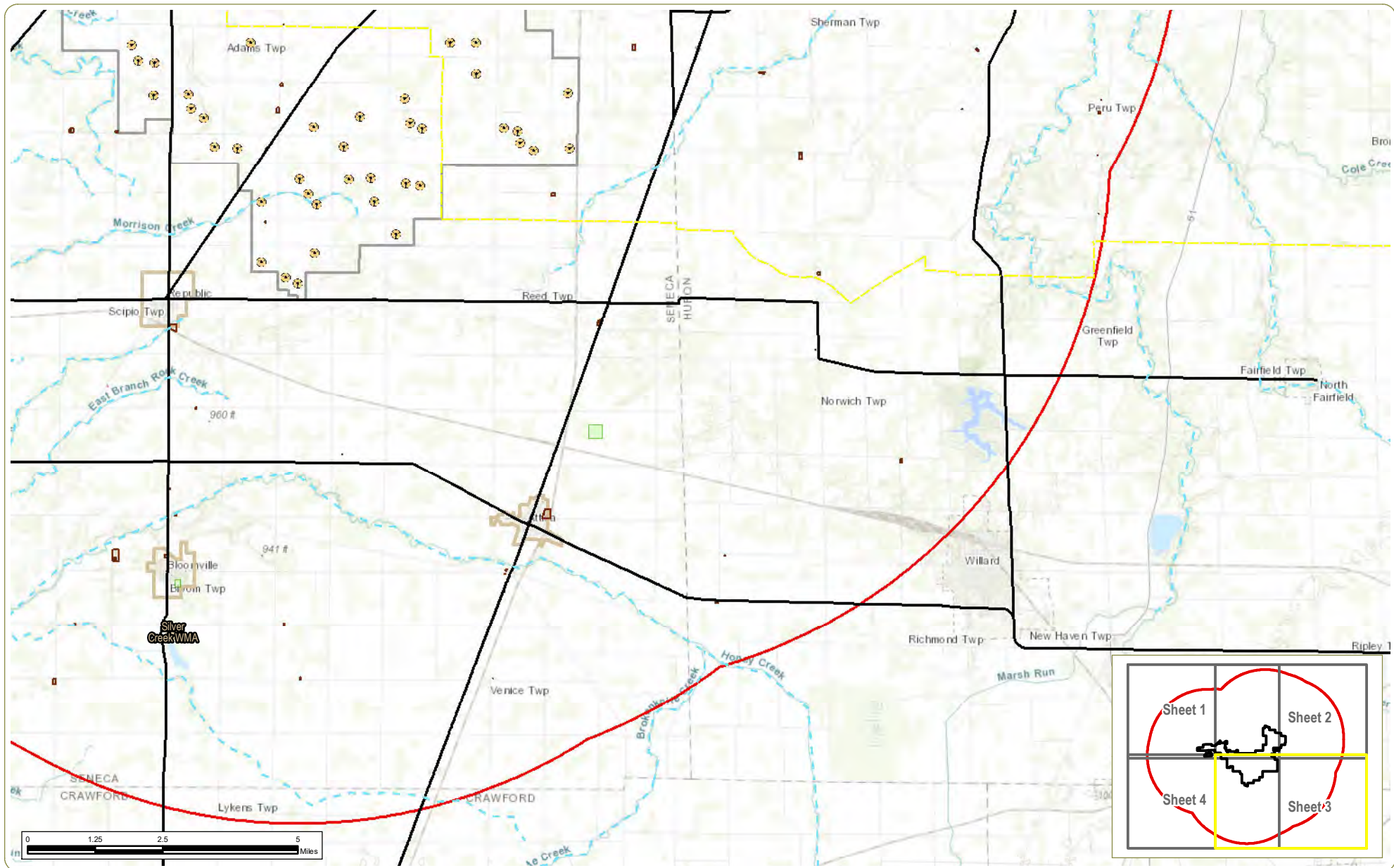


**APEX**  
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## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

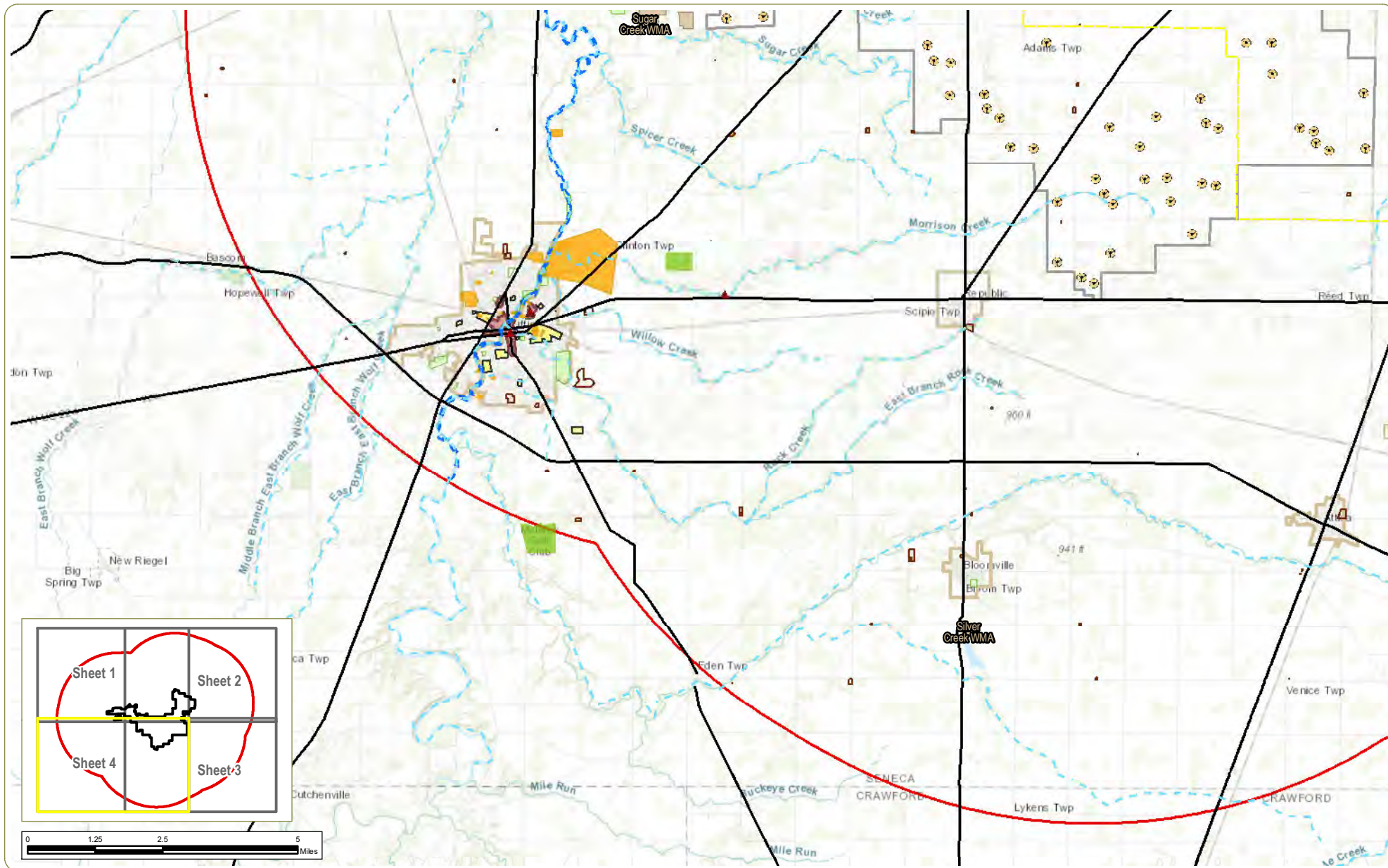
**Figure 6: Visually Sensitive Resources - Sheet 3 of 4**

**Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 24, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- |                         |                         |                    |                                |
|-------------------------|-------------------------|--------------------|--------------------------------|
| ▲ State Historic Marker | --- Wild & Scenic River | Library            | State Wildlife Management Area |
| ○ Wind Turbine          | — Major Road            | Local Park         | School                         |
| --- Buckeye Trail       | Cemetery                | NRHP-Eligible Site | Water Body                     |
| --- Local Bike Route    | City or Village         | NRHP District      | 10-Mile Study Area             |
| --- State Bike Route    | Golf Course             | NRHP-Listed        | Project Boundary               |
| --- River & Stream      |                         |                    |                                |



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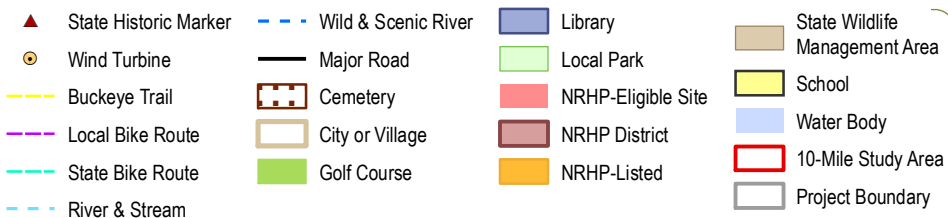


## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 6: Visually Sensitive Resources - Sheet 4 of 4**

**Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 24, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.





## **4.0 Visual Impact Assessment Methodology**

The 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), U.S. Department of Transportation, Federal Highway Administration (1981), and the New York State Department of Environmental Conservation (not dated) and are widely accepted as standard visual impact methodology for wind energy projects (CEIWEF, 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 potential turbine visibility was undertaken to identify those locations within the visual study area where there is potential for the Project 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**

Viewshed analyses were based on the Ohio Statewide Imagery Program's 2007 light detection and ranging (lidar) data for Erie, Huron, Sandusky, and Seneca Counties. Lidar is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the earth to generate precise, three-dimensional information about the shape of the earth and its surface characteristics (NOAA, 2017). It is important to note that the lidar data used in this analysis are from 2007, which raises the concern that the resulting analysis may not reflect landscape conditions as they currently exist. However, based on review of current aerial photography and field review, it does not appear that significant changes have occurred since that time.

##### **Viewshed Analysis – Topography Only**

To determine if certain geographic areas or sensitive resources within the study area would definitely be screened from view of the Project, topographic viewshed maps for the Project were prepared using a lidar-derived bare earth digital terrain model (DTM); the location and height of all proposed turbines (see Figures 2 and 3); an assumed viewer height of 6 feet; and ESRI ArcGIS® software with the Spatial Analyst extension. The topographic viewshed analysis is based upon the existence of a direct, unobstructed line of sight to a proposed turbine from various observation points throughout the study area based on the screening provided by topography only. The resulting topographic viewshed maps define the maximum area from which any turbine could potentially be seen within the study area. Because the

screening provided by vegetation and structures is not considered in this analysis, the topographic viewshed represents a “worst case” assessment of potential Project visibility. Topographic viewshed maps assume that no trees exist, and therefore are very accurate in predicting where visibility will not occur due to topographic interference. However, they are less accurate in identifying areas from which the Project would actually be visible. Trees and buildings can limit or eliminate visibility in areas indicated as having potential Project visibility in the topographic viewshed analysis.

Two 10-mile radius topographic viewsheds were mapped; one to illustrate “worst case” daytime visibility (based on a maximum blade tip height of 591 feet above existing grade) and the other to illustrate potential visibility of turbine lights (based on a FAA warning light height of 383 feet above existing grade). The FAA warning light (i.e., nacelle height) viewshed analysis was based on the assumption that all turbines would be lit, in conformance with FAA lighting guidelines for turbines that exceed a maximum height of 500 feet (FAA, 2016).

#### Viewshed Analysis – Topography, Structures and Vegetation

To provide a more accurate analysis of potential Project visibility within the study area, a second-level viewshed analysis was completed to incorporate the screening effect of structures and vegetation, as captured in the previously referenced 2007 lidar data. A digital surface model (DSM) of the study area was created from the lidar data, which includes the elevations of buildings, trees, and other objects large enough to be measured by the lidar technology. The DSM was then used as a base layer for the viewshed analysis, as described above. Once the viewshed analysis was completed, a conditional statement was used to set Project visibility to zero in locations where the DSM elevation exceeded the bare earth elevation by 6 feet or more. This was done for two reasons; 1) because in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from the vantage point of standing on the tree top or building roof, which is not the intent of this analysis and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding 6 feet in height will generally be screened from views of the Project.

Because it accounts for the screening provided by structures and trees, this second-level analysis is a more accurate representation of potential Project visibility. However, it is worth noting that because characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.) cannot be taken into consideration in the viewshed analyses, being located within the viewshed does not necessarily equate to actual Project visibility. The viewshed analyses help define those areas with the greatest potential for Project visibility within the study area. Field review is required to confirm the accuracy of the viewshed.

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#### 4.1.2 Field Verification

Visibility of the proposed Project was also evaluated in the field during a two-day site visit conducted on July 19-20, 2017. The purpose of this site visit was to verify potential turbine visibility in the field and to obtain photographs for subsequent use in the development of visual simulations. Weather conditions were variable, ranging from clear to partly cloudy, to overcast, thus providing photographs that collectively depict a representative variety of sky/lighting conditions. The photographs depict the study area during summer conditions when the aesthetic quality of the landscape (i.e., with vegetation on the ground and trees with foliage) and outdoor activity by viewers are generally the highest.

During the field verification, public roads were driven, and public vantage points were visited within the study area to document points from which the turbines would likely be visible, partially screened, or fully screened. The determination of Project visibility at a specific location was made based on the visibility of existing structures located in proximity to the proposed turbine sites (communication towers, silos, roads, etc.), which served as locational and scale references. Photos were taken from 97 representative viewpoints within the study area. All photos were obtained using a Nikon D7100 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 is the standard used in visual impact assessment because it most closely approximates normal human perception of spatial relationships and scale in the landscape. 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. Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project from the various LSZs, distances, directions, visually sensitive resources, and areas of high public use throughout the visual study area. Locations of the viewpoints are indicated in Figure 9 and a photo log, including a representative photograph toward the Project Site from each viewpoint, is included as Appendix C.

### 4.2 Project Visual Impact

Beyond evaluating potential Project visibility, the VIA also examined the visual impact of the proposed wind turbines, and any associated clearing, on the aesthetic resources and viewers within the visual study area. At the time of submittal of this VIA design, and layout of the collection substation was not available and is therefore not included. 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 on July 19 and 20, 2017, 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 review and follow-up verification).
2. They illustrate Project visibility from sensitive sites/resources with the visual study area where open views are available.
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 9. 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 and/or Visually Sensitive Resource	LSZ Represented	Viewer Group Represented	Viewing Distance <sup>1</sup>	View Orientation <sup>2</sup>
037	State Route 12 (State Street) at intersection with County Road 118 (Township Line Road), Township of Ballville	Rural Residential/Agricultural Zone	Local Residents	7.0	SE
047	Knobby's Prairie Wildlife Area – Parking Area off of North County Road 15, Township of Pleasant	Rural Residential/Agricultural Zone	Tourists/Recreational Users	0.9	E
049	East County Road 44, east of Township Road 75 (Jopp Road), Township of Pleasant	Rural Residential/Agricultural Zone	Local Residents	0.8	ENE

Viewpoint Number	Location and/or Visually Sensitive Resource	LSZ Represented	Viewer Group Represented	Viewing Distance <sup>1</sup>	View Orientation <sup>2</sup>
050	East State Route 19, west of East County Road 32, Township of Adams	Transportation Corridor Zone	Local Residents	0.7	S
053	Beaver Creek Reservoir – North Parking Area off East County Road 34, Township of Adams	Rural Residential/Agricultural Zone	Tourists/Recreational Users	2.6	S
067	Intersection of State Route 101 (Main Street) and Buckeye, City of Clyde	City/Village/Hamlet Zone	Local Residents, Through Travelers/Commuters	N/A	S
071	East Township Road 148 (Hopkes Road) east of North County Road 43, Township of Adams	Rural Residential/Agricultural Zone	Local Residents	0.7	SE
080	East State Route 162 (East Jefferson Street), East of the Village of Republic	Suburban Residential Zone	Local Residents	2.4	NW
088	East State Route 162, west of North Township Road 81 (Center Heights Road 81) Township of Reed	Rural Residential/Agricultural Zone	Local Residents	2.0	NW
091	East County Road 46 at intersection with State Route 269 (Huron-Seneca County Line Road), Township of Thompson	Suburban Residential Zone	Local Residents	1.9	WSW

<sup>1</sup>Distance from viewpoint to nearest visible turbine (in miles)

<sup>2</sup>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 Project from each of the 10 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model of the proposed 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 Vestas V136 machines. Simulation methodology and accuracy is outlined in Figure 7 and the computer model used in this VIA is shown in Figure 3.

Simulations were created by aligning each photographic viewpoint with the computer model of the proposed turbines and superimposing the models on the photograph. This step involves utilizing aerial imagery and GPS data collected



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in the field to create an AutoCAD Civil 3D® drawing. The two-dimensional AutoCAD data were then imported into Autodesk 3ds MAX® 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, as necessary, 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.

At this point, a “wire frame” model of the facility and known reference points are shown on each of the photographs. The proposed exterior color/finish of the turbines was then added to the model and the appropriate sun angle 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 south-southwest, which is generally the prevailing wind direction in the area.



Photos are selected to illustrate typical views of the proposed project that will be available to representative viewers/user groups from the major landscape similarity zones and sensitive sites within the study area.



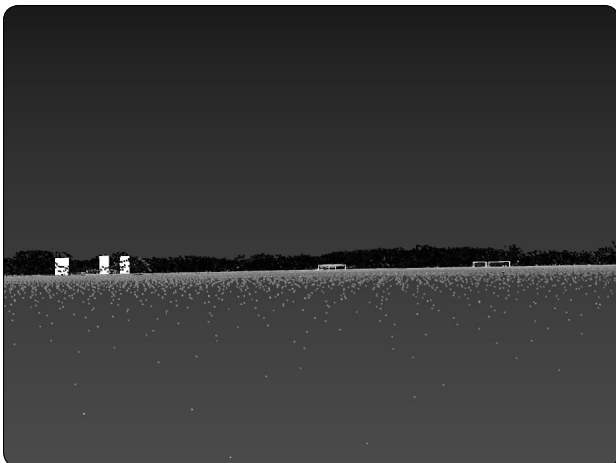
A three-dimensional computer model of the project is built based on proposed turbine specifications and tower site coordinates.



Aerial imagery and GPS data collected in the field are used to create an AutoCAD Civil 3D drawing.



These data are superimposed over photographs from each of the viewpoints, and minor camera changes are made to align all known reference points within the view.



A digital terrain model representing the existing topography is also overlaid on the existing photograph to refine camera alignment, and target elevation.



The proposed exterior color/finish of the turbines was 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.

## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 7: Visual Simulation Methodology**



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## 5.0 *Visual Impact Assessment Results*

### 5.1 Project Visibility

#### 5.1.1 Viewshed Analysis

The topographic viewshed analysis, indicates that areas where there is no possibility of seeing the Project are extremely limited, consisting of a few topographic depressions, such as quarries and portions of river/stream valleys. Based on the screening effect of topography alone, only two of the visually sensitive sites within the study area; NRHP-listed Social Science House and the Village of Castalia, are indicated as being completely screened from views of the proposed wind turbines.

Factoring vegetation and structures into the viewshed analysis, through use of the lidar-derived DSM, provides an accurate reflection of what the actual extent of Project visibility is likely to be (Figure 8). The blade tip viewshed analysis indicates that approximately 60.7% of the study area will have potential views of some portion of a wind turbine. Visibility will be eliminated in small areas throughout the study area where blocks of forest vegetation occur, along forested stream corridors, and is drastically reduced or eliminated in cities and villages due to screening provided by trees and structures. In general, areas of screened views increase in size with distance from the project. Sizable areas of no or limited turbine visibility include the Cities of Tiffin, Fremont, Clyde, and Bellvue; the Sandusky River, Huron River, Wolf Creek, Honey Creek, and Silver Creek corridors; and the northeastern portion of the study area. The viewshed analysis indicates that views of the Project will be fully screened from 192 of the inventoried visually sensitive resources within the 10-mile radius study area. These include 47 NRHP-listed resources, 17 NRHP-eligible resources, nine state historic markers, the Village of Castalia, and 116 other identified resources (see Appendix B). Only 12 of the inventoried visually sensitive resources are indicated as having fully unobstructed open views of the Project, all of which are cemeteries. The remaining 206 identified resources are indicated as having at least partially screened views, depending on the exact location of the viewer within the resources mapped boundary.

The results of the FAA warning light viewshed analysis are very similar to those of the blade tip analysis, except it shows nighttime Project visibility covering a somewhat smaller geographic area. Considering the screening of topography, vegetation, and structures, potential nighttime turbine visibility is indicated within 50.7% of the visual study area.

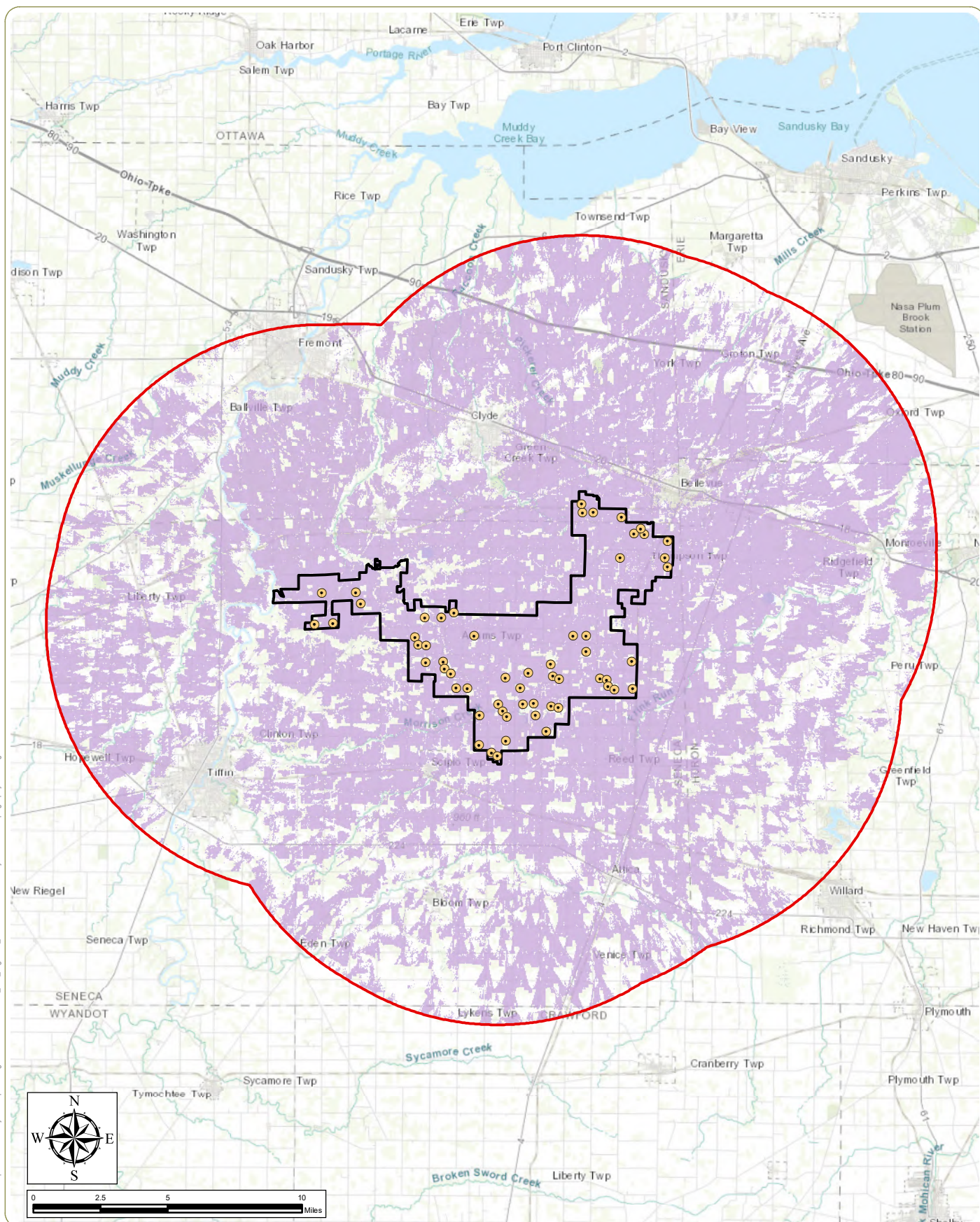
Table 2. Ten-Mile-Radius Study Area Viewshed Results Summary

Number of Turbines Visible	Blade Tip – Structures and Vegetation		FAA Warning Light <sup>1</sup> – Structures and Vegetation	
	Square Miles <sup>2</sup>	% of Study Area	Square Miles	% of Study Area
0	286.5	39.3	358.8	49.3
1 - 15	228.6	31.4	262.6	36.1
16 - 30	118.8	16.3	82.0	11.3
31 - 45	76.8	10.6	24.0	3.3
46 - 58	17.5	2.4	0.8	0.1
<b>Total Visible</b>	<b>441.7</b>	<b>60.7</b>	<b>369.4</b>	<b>50.7</b>

<sup>1</sup>The FAA warning light viewshed is based on the assumption that all 58 turbines will be lit.

<sup>2</sup>The 10-mile radius study area is approximately 728.3 square miles in size.





## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 8: Turbine Viewshed - Sheet 1 of 2**

**Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 24, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

● Wind Turbine

□ 10-Mile Study Area

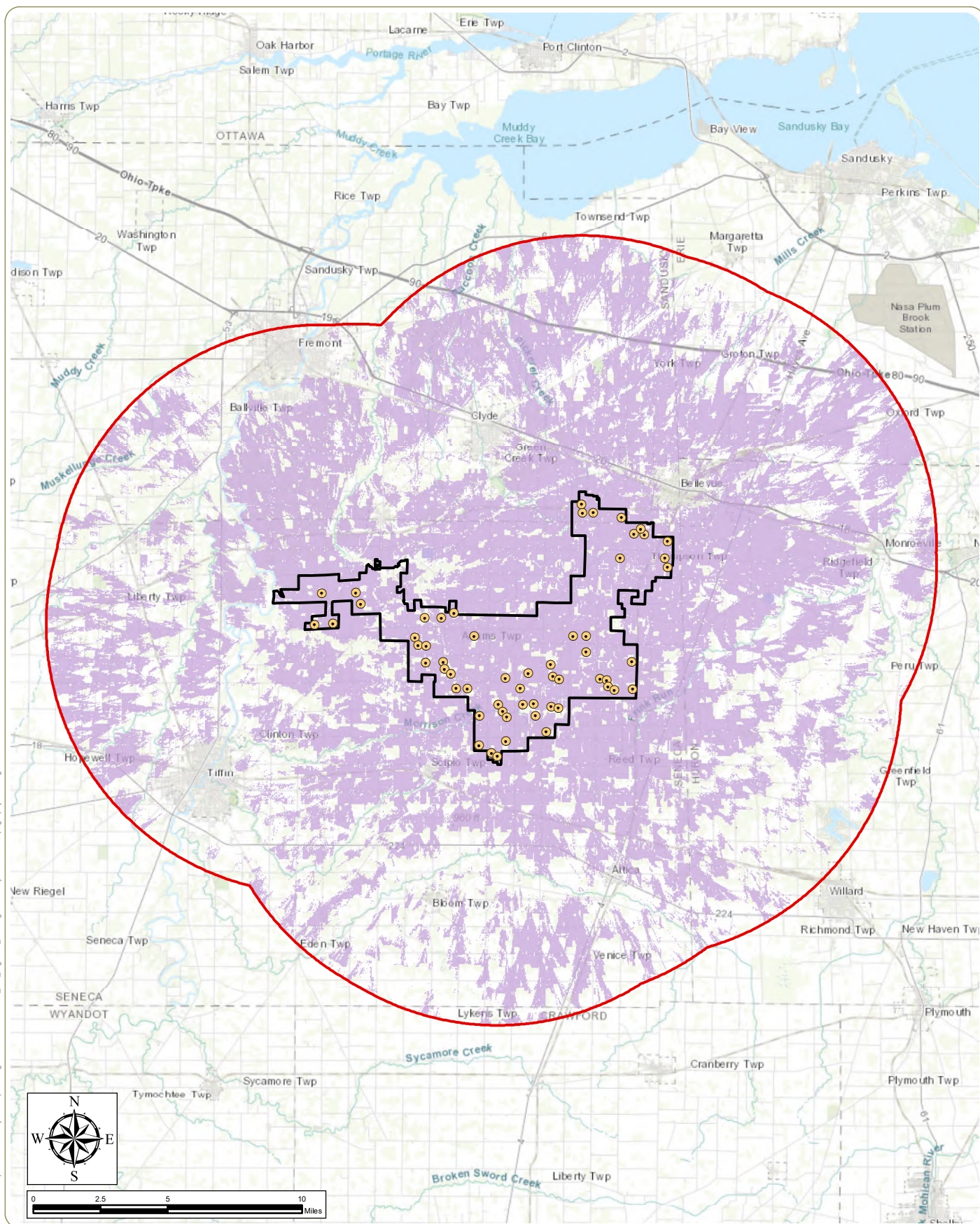
□ Project Boundary

○ Wind Turbine Blade Tip

■ Visibility Based on Topography and Vegetation











## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

**Figure 8: FAA Light Viewshed - Sheet 2 of 2**

- Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.  
2. This map was generated in ArcMap on January 24, 2018.  
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

-  Wind Turbine
-  10-Mile Study Area
-  Project Boundary
-  Wind Turbine FAA Warning Light  
Visibility Based on Topography  
and Vegetation



### 5.1.2 Field Review Analysis

Field review suggested that portions of the Project will be visible throughout most of the study area due to the flat topography and the abundance of open agricultural land. The field review confirmed a general lack of open views toward the Project site from developed areas with an abundance of structures and street/yard trees, particularly in the Cities of Bellevue, Clyde, Fremont, and Tiffin; and the various villages within the study area (including Attica, Bettsville, Bloomville, Green Springs, Monroeville, and Republic). Consequently, views of the Project from the majority of residences and historic sites within these residential 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. However, in some cases, views of the Project will be available to viewers from interior portions of the cities and villages when looking along open road corridors oriented toward the Project site. Views of Project turbines will be most available from the more rural/agricultural portions of the study area. Some screening will be provided by wood lots, hedgerows, farm buildings, rural residences and yard trees. Long distance views are likely to be unavailable where homes and roads are surrounded by vegetation, as the lack of topography allows the foreground and midground vegetation to screen the view. Field review also confirmed that the Project will be visible from most of the transportation corridors in the study area. However, because of the large distance, lack of topography and intervening vegetation the Interstate 80/90 corridor will have very limited visibility if any.

The majority of sensitive sites within the study area occur within the cities and villages. Field review of these areas, confirmed that visibility from the majority of sensitive sites will be partially to fully screened by the surrounding built environment.

Of the two NHRP listed sites with visual significance, field review confirmed that open views toward the Project were unavailable from the areas of viewer concentration at the Junior Order of the United American Mechanics National Orphans' Home. A serpentine road system with large mature street trees and 2-3 story buildings screen outward views in all directions including toward the Project Site. However, as one travels east and enters the agrarian portion of campus, open fields allow for potential views toward the Project site. However, use of this area appears to be limited and the Project is over 5 miles away.

Field review of the Pleasant Ridge United Methodist Church and Cemetery revealed that open views to the north will have visibility of a small portion of the Project (five turbines), and that the adjacent hedgerow located to the north and east of the site will screen the remaining turbines. The distance to the closest visible turbine is 2.2 miles with a mature hedgerow located at a distance from 1.5 – 1.75 miles. Potential Project visibility under these conditions will be similar to the views represented in simulations from Viewpoints 53 and 91 (see Section 5.2).

Both of the Knobbys Prairie and Sugar Creek Wildlife Management Areas were visited and photographed during the site visit. Field review confirmed that views of the Project are likely to be available from the parking area and informal trails located at Knobbys Prairie and from the entrance drive and portions of the parking area at Sugar Creek. During the site visit personnel drove the roadways adjacent to the three wildlife production areas and it was confirmed that no public access, designated or informal, was present. Therefore, potential views towards the Project from these sites were not documented or evaluated.

Portions of the Sandusky County Park System were visited and photographed, including the Blue Heron Reserve and Nature Trails, Countryside Park, and the North Coast Inland Trail. At both the Blue Heron Reserve and Countryside Park, field review could not rule out that the possibility of open views of Project turbines. To further evaluate Project visibility from these two resources “wire frame” simulations were produced and confirmed that views would be completely screened. The open views associated with the loop path and gazebo at Countryside Park are not aligned with the Project, and intervening structures and vegetation will screen the proposed turbines from view. The long distance of this site from the proposed Project (over 9 miles), in combination with the foreground and midground vegetation, screens potential views to the Project.

Resources that are part of the Seneca County Park District were visited and photographed, including the Clinton, and Steyer Nature Preserves. Field review ruled out visibility from the Clinton Nature Preserve but could not rule out the possibility of open views of Project turbines from the Steyer Nature Preserve. To evaluate potential visibility from this resource a “wire frame” simulation was produced that confirmed views would be completely screened from the main parking area, trail heads and trail network. Open views were determined to be available from the Hunter’s Parking Lot and nearby trails, which are located approximately 2 miles from the nearest proposed turbine.

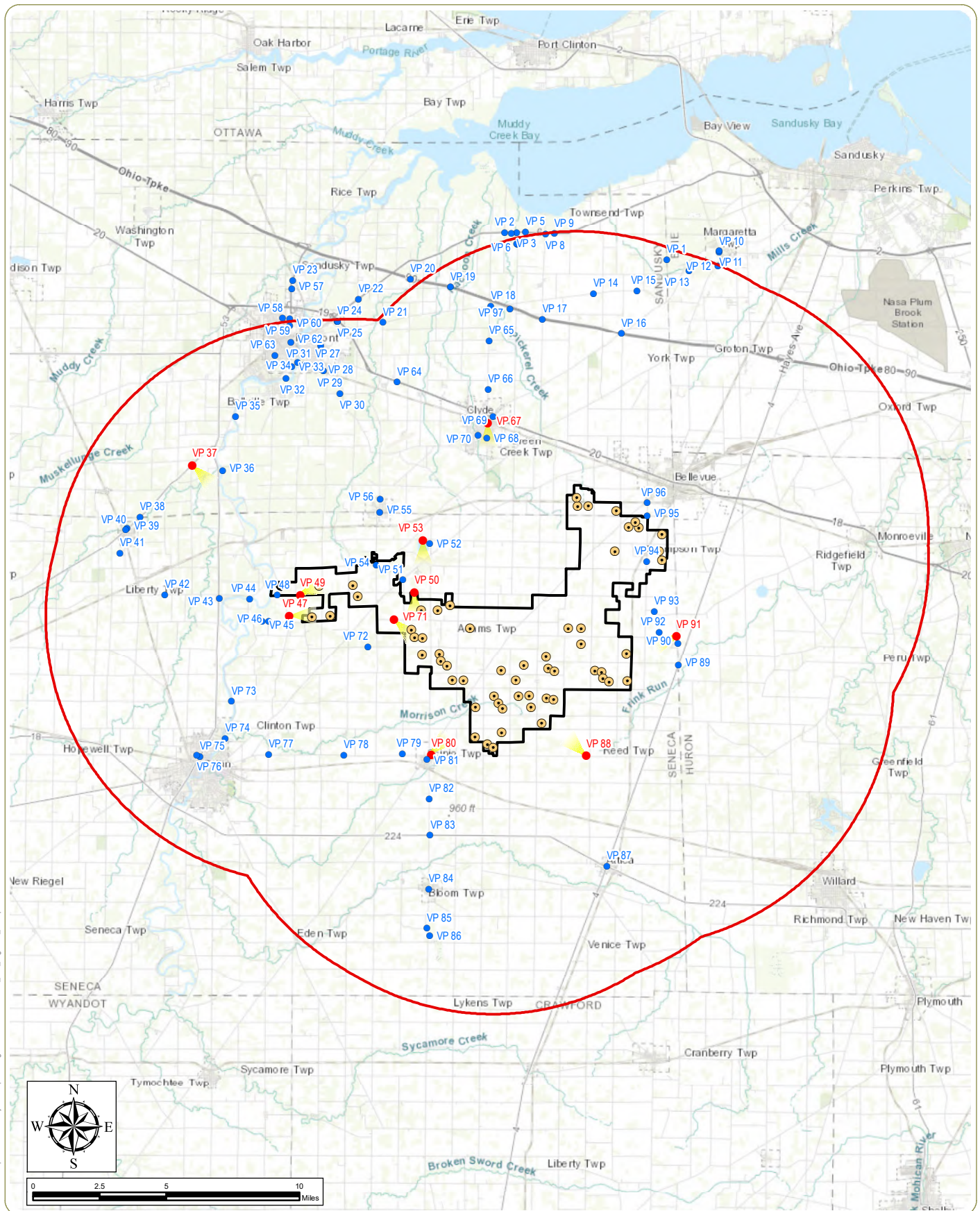
Throughout the field review stops were made at a variety of designated access points to the Sandusky River. This included the Robert Young Memorial Park and the North Coast Inland Trail (both in the City of Fremont), the Abbotts Bridge Scenic River Access/Steyer Nature Preserve, and the boat access located at the Clinton Nature Preserve/Sandusky Scenic River Access. In addition, roadways adjacent to the river were driven to document any areas where potential views could be available from the river. The review confirmed that because of the low elevation of the river’s surface, and abundant shoreline vegetation, open outward views are very limited. Lack of Project visibility was also confirmed through a “wire frame” simulation completed for the Clinton Nature Preserve

The North Coast Inland Trail and the Buckeye Trail, pass through every LSZ within the study area. Consequently, field review confirmed potential Project visibility from portions of both these sensitive resources. The visual simulations presented in Section 5.2 represent the range of potential views from either trail network.

## **5.2 Photographic Simulation 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 selected viewpoints indicated in Figure 9 were used to evaluate Project visibility, appearance, and contrast with the existing landscape. 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. The images used for this analysis are included in the following section and in Appendix D. Results of the evaluation are presented in the following pages.





## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

### Figure 9: Viewpoint Locations

- Notes:**
1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
  2. This map was generated in ArcMap on January 9, 2018.
  3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- ● Simulated Viewpoint Location
- Viewpoint Location
- Wind Turbine
- 10-Mile Study Area
- Project Boundary





Viewpoint 37 (Appendix D – Sheets 1-3)

**Inset 10:** Existing view from State Route 12 (State Street) at intersection with County Road 118 (Township Line Road), Township of Ballville

*Existing Conditions*

Viewpoint 37 is located on State Route 12 at the intersection with County Road 118 (Township Line Road) in Ballville Township. It is representative of the Rural Residential/Agricultural LSZ and located approximately 7 miles from the nearest proposed turbine. The existing view to the southeast (i.e., toward the Project site) includes the edge of an adjacent cornfield in the immediate foreground. Beyond the foreground corn rows, the level field (with lower vegetation) extends away from the viewer to a horizontal band of trees that form the backdrop in this view. A line of widely separated residential and agricultural structures, and roadside utility poles, run along the edge of the tree line. Both the field and the sky are large open spaces, uninterrupted by man-made or natural features. The lack of landscape variability or focal points in this view results in relatively low scenic quality.



**Inset 11:** Visual simulation of proposed view from State Route 12 (State Street) at intersection with County Road 118 (Township Line Road), Township of Ballville

### *Proposed Project*

At this selected viewpoint, a single turbine can be seen projecting above the tree line on the right-hand side of the view. At this distance, the turbine is barely discernable, and appears comparable in scale to the trees in the background. Although its form and color present some degree of contrast with the background sky, it is substantially screened, and does not interrupt the sky line. At this distance, the visible turbine is a very minor component of the landscape. It does not become a visual focal point and has no effect on scenic quality or viewer activity. This simulation demonstrates the significant screening effect that hedgerows and woodlots will have on long distance views (over 5 miles) throughout the study area.

Viewpoint 47 (Appendix D – Sheets 4-6)

**Inset 12:** Existing view from Knobby's Prairie Wildlife Area – Parking area off of North County Road 15, Township of Pleasant

*Existing Conditions*

This viewpoint is located at the parking area of the Knobby's Prairie Wildlife Area off North County Route 15 in the Township of Pleasant. This is a sensitive site that offers near midground views of the Project. The selected viewpoint is approximately 0.9 mile from the nearest proposed turbine. The existing view to the east features a brushy, overgrown field in the foreground, that extends to a band of taller trees in the background. The trees form a level horizon line and block views of more distant landscape features. The horizon line and expanse of open sky is broken by some taller tree saplings within the foreground field. The only man-made features are some distant structures at the base of the tree line (on the far-right side of the view) and some small signs immediately outside the field of view of the selected photo. Due to a lack of focal points or vegetative variability, the scenic quality of this view is low to moderate.





**Inset 13:** Visual simulation of proposed view from Knobby's Prairie Wildlife Area – Parking area off of North County Road 15, Township of Pleasant

### *Proposed Project*

At this selected viewpoint, two turbines are prominent additions to the midground on the right side of the view. These turbines are largely unscreened and extend well into the sky, accentuating their scale contrast with the tree line from which they emerge. Portions of other, more substantially screened, turbines can also be seen above the tree line at various heights across the full field of view. The line, color, and form, of the turbines contrast with the natural vegetation and level, undeveloped character of the landscape. They also become distinctive new focal points in the view. However, the density of visible turbines is not overwhelming, and they add an element of interest to the existing view. Although the natural character of the localized view is altered, the turbines do not reduce the scenic quality or have a direct effect on visitors to the wildlife area.



Viewpoint 49 (Appendix D – Sheets 7-9)

**Inset 14:** Existing view from East County Road 44, east of Township Road 75 (Jopp Road), Township of Pleasant

*Existing Conditions*

Viewpoint 49 is located on East County Route 44, just east of the intersection with Township Road 75 (Jopp Road) in the Township of Pleasant. This viewpoint is representative of the Rural Residential/Agricultural LSZ, and is located approximately 0.8 mile from the nearest proposed turbine. The exiting view to the east from this location features the county road and a line of roadside utility poles proceeding away from the viewer into the distance. In the foreground the road is flanked on both sides by roadside ditches and open, level agricultural fields. A farm complex, featuring red barns and steel grain bins, is a prominent focal point on the left side of the road in the midground. An irregular line of trees extends across the view behind the farm and blocks views of more distant landscape features. The topography is flat, and the sky appears expansive. The agricultural fields and farm complex give the view a strong rural character and moderate to high scenic quality.



**Inset 15:** Visual simulation of proposed view from East County Road 44, east of Township Road 75 (Jopp Road), Township of Pleasant

### *Proposed Project*

At this selected viewpoint, three turbines and a meteorological tower have been added to the view. The two turbines on the right side of the view are partially obscured by the farm complex and roadside utility line. Due to their distance from the viewer, they do not appear out of scale with these existing built features in the landscape. The remaining turbine and the met tower appear larger and more prominent due to their greater proximity and lack of screening. At this distance, details of these structures are clearly visible, and they extend well into the open sky. Their scale contrast with the forest vegetation and nearby utility poles is notable, but their line and color are consistent with the existing utility and agricultural structures already present in the view. Although they present a novel form, they appear compatible with the working agricultural character of the Rural Residential/Agricultural LSZ.

Viewpoint 50 (Appendix D – Sheets 10-12)

**Inset 16:** Existing view from East State Route 19, west of East County Road 32, Township of Adams

*Existing Conditions*

Viewpoint 50 is located on East State Route 19, west of East County Road 32 in Adams Township. This viewpoint is representative of the Rural Residential/Agricultural LSZ, and is located approximately 0.7 mile from the nearest proposed turbine. The existing view to the south from this location includes the edge of Route 19, an unmowed grass shoulder, and an adjacent cornfield. The cornfield is level and extends back to an irregular band of trees that form the backdrop in this view. A wire from an overhead utility line crosses the sky. This wire, along with the band of trees, the field edge, the median and the edge of pavement, create a series of strong horizontal lines in the landscape. The existing view is neat and orderly, but lack of topographic variability and focal points in the view result in low to moderate scenic quality.





**Inset 17** Visual simulation of proposed view from East State Route 19, west of East County Road 32, Township of Adams

### *Proposed Project*

At this selected viewpoint, one turbine extends prominently above the tree line into the sky on the left side of the view. Due to its proximity to the viewer, details of this turbine are clearly visible, and it presents strong contrast with the existing vegetation in terms of scale, color, and form. Its vertical line also contrasts with the strong horizontal lines in the existing landscape. However, the turbine becomes a visual focal point, and will be perceived by some viewers as adding an element of interest to the existing view. It also does not appear out of character with the working agricultural character of the LSZ, and does not diminish the scenic quality of the existing view. The upper portions of several other more distant turbines and a met. tower, are also visible above the trees. However, due to their distance from the viewer, and the significant screening provided by the trees, they do not substantially alter the character of the existing view.



Viewpoint 53 (Appendix D – Sheets 13-15)

**Inset 18:** Existing view from the Beaver Creek Reservoir – North Parking Area, off East County Road 34, Township of Adams

*Existing Conditions*

Viewpoint 53 is located at the north parking area on the Beaver Creek Reservoir in Adams Township. This viewpoint is located at a sensitive site with a visual character that is unique within the study area. It is approximately 2.6 miles from the nearest proposed turbine and offers open midground views toward the Project Site to the south. The existing view in this direction is dominated by a broad expanse of open water. A continuous band of trees lines the far shoreline of the reservoir, which creates a strong horizontal line and blocks views of more distant landscape features. Man-made features are limited to small glimpses of utility poles and structures within the band of midground trees. The presence of the reservoir adds an element of interest and a sense of serenity to the view. However, the lack of focal points or variability in the vegetation and topography result in only moderate scenic quality.



**Inset 19:** Visual simulation of proposed view from the Beaver Creek Reservoir – North Parking Area, off East County Road 34, Township of Adams

### *Proposed Project*

At this selected viewpoint, the upper portions of several turbines can be seen rising above the midground tree line. The towers of two of the turbines are clearly visible, while views of the remaining turbines are limited to only the nacelle and/or blades. Although substantially taller than the trees, at this distance the turbines do not appear significantly out of scale with other features of the existing landscape. They add focal points to the view, but do not substantially alter its character or scenic quality. The open water of the reservoir remains the dominant feature, and it is unlikely the turbines would adversely affect viewer activity or enjoyment of the reservoir at this location. It is also worth noting that views of the turbines will be more substantially screened by shoreline vegetation from the surface of the reservoir itself.

Viewpoint 67 (Appendix D – Sheets 16-18)

**Inset 20:** Existing view from Intersection of State Route 101 (Main Street) and Buckeye Street, City of Clyde

*Existing Conditions*

This viewpoint is located at the intersection of State Route 101 (Main Street) and Buckeye Street in the City of Clyde. It is representative of the City/Village/Hamlet LSZ, and is located approximately 4.25 miles from the nearest proposed turbine. The existing view to the south from this location features the paved surface of Main Street, extending directly away from the viewer into the distance. The street is lined with automobiles, planted street trees, decorative street lights, and brick buildings in the foreground. The street trees parallel the road into the distance and draw the viewer's eye to the road terminus. The uniform building façade, organized arrangement of street trees, lights and cars, and a general lack of overhead utility lines result in an uncluttered view, with moderate to high scenic quality and classic small-town character, typical of this LSZ.



**Inset 21:** Visual simulation of proposed view from Intersection of State Route 101 (Main Street) and Buckeye Street, City of Clyde (screened turbines represented in green)

### *Proposed Project*

At this selected viewpoint, none of the proposed turbines would be visible from this viewpoint. Thus, the Project will have no visual impact on the landscape or viewers in this location. This simulation is representative of viewing conditions in most areas of the City/Village/Hamlet LSZ and the from the historic sites and other sensitive resources that are concentrated within this LSZ.



Viewpoint 71 (Appendix D – Sheets 19-21)

**Inset 22:** Existing view from East Township Road 148 (Hoppes Road) east of North County Road 43, Township of Adams

*Existing Conditions*

Viewpoint 71 is located within the Project Area on East Township Road 148 (Hoppes Road) east of North County Road 43 in Adams Township. It is located in the Rural Residential/Agricultural LSZ, approximately 0.7 mile from the nearest proposed turbine that would be visible in views to the southeast. The existing view in this direction features a large open field planted in corn. The field is backed by an irregular band of forested woodlots and hedgerows interspersed with occasional residential and agricultural structures. The band of midground trees separates broad areas of field and sky, and creates a strong horizontal line across the view. The topography is flat, and the sky is unbroken by foreground trees or man-made structures. The lack of focal points or variability in the landscape result in relatively low scenic quality.



**Inset 23:** Visual simulation of proposed view from East Township Road 148 (Hoppes Road) east of North County Road 43, Township of Adams

### *Proposed Project*

At this selected viewpoint, numerous turbines and a single meteorological tower have been added to the view. The foreground turbines present line, form, and scale contrast with the existing landscape features. These turbines extend well into the sky and break up the strong horizontal lines and open space that characterize the existing view. The more distant turbines present far less scale contrast, and their location along the horizon line reinforces the horizontal line created by the existing trees. However, the density of turbines and their arrangement add an element of visual clutter to the view. They introduce strong new focal points, novel forms, and a sense of motion to the view. Although they do not appear entirely out of place in the working landscape typical of Rural Residential/Agricultural LSZ, the turbines alter the rural character of the view and create a more utilitarian feel.

Viewpoint 80 (Appendix D – Sheets 22-24)

**Inset 24:** Existing view from East State Route 162 (East Jefferson Street), East of the Village of Republic

*Existing Conditions*

This viewpoint is located on East State Route 162 (East Jefferson Street) east of the Village of Republic. It presents characteristics of both the Rural Residential/Agricultural and Suburban Residential LSZs, and is located approximately 2.4 miles from the nearest proposed turbine that would be visible to the northeast. The existing view in this direction includes the road surface and associated roadside signs and overhead utility line in the immediate foreground, backed by an area of mowed lawn and a house. The house and yard are adjacent to an active agricultural field which extends back into the midground of the view. The field terminates at the edge of a woodlot. The trees that make up this woodlot, as well as the nearby house and yard trees, block views of more distant landscape features. The maintained landscape in this view is cleaned and orderly, but lack of variability in topography and vegetation, or the presence of interesting landscape features, results in moderate scenic quality.





**Inset 25:** Visual simulation of proposed view from East State Route 162 (East Jefferson Street), East of the Village of Republic

### *Proposed Project*

At this selected viewpoint, the rotors/blades of three turbines can be seen above the line of trees backing the open field. As will be typical in many midground locations throughout the Rural Residential/Agricultural LSZ, the trees provide significant screening, and under the conditions illustrated in the photograph, the turbines blend well with the partly cloudy sky. The turbines present contrast with the scale and form of other existing landscape features, but are not overly dense or prominent in this view. They do not substantially change the existing character or scenic quality of the view.



Viewpoint 88 (Appendix D – Sheets 25-27)

**Inset 26:** Existing view from East State Route 162, west of North Township Road 81 (Center Heights Road), Township of Reed

*Existing Conditions*

Viewpoint 88 is located on East State Route 162 west of North Township Road 81 (Center Heights Road), and approximately 2.0 miles from the nearest proposed turbine. The existing panoramic view to the north from this location is typical of the Rural Residential/Agricultural LSZ. It features a recently harvested grain field in the immediate foreground, with two farm complexes along the far edge of the field (off of East State Route 162 Road) on the left side of the view. These discrete clusters of structures include homes, barns, grain bins, and associated agricultural buildings and machinery. Open fields continue beyond the farms and extend to the north. The fields are backed by woodlots and hedgerows at varying distances from the viewer that define the visible horizon in this view. The upper portions of some utility structures and buildings can be seen in places among and above the background tree line. The two farm complexes represent focal points in the landscape and define the working agricultural character of the view. Scenic quality is considered moderate.



**Inset 27:** Visual simulation of proposed view from East State Route 162, west of North Township Road 81 (Center Heights Road), Township of Reed

### *Proposed Project*

At this selected viewpoint, the upper portions of several turbines can be seen above the background tree line. The turbines occur across the full field of this panoramic view, and their white color contrasts with the dark forest vegetation and overcast sky. Their novel form and movement will also make them stand out in the landscape. Although clearly taller than other existing landscape elements, at this distance the turbines do not appear significantly out of scale with other natural and built features in the view. Their line and color are also compatible with the existing structures present in this view. However, due to their abundance, the turbines compete for viewer attention and are now co-dominant as focal points with the farm complexes. The turbines are clearly new and different additions to the view, but they reinforce the working agricultural character of the LSZ. They do not substantially affect the scenic quality or viewer enjoyment of this view.

Viewpoint 91 (Appendix D – Sheets 28-30)

**Inset 28:** Existing view from East County Road 46 at the intersection with State Route 269 (Huron-Seneca County Line Road), Township of Thompson

*Existing Conditions*

Viewpoint 91 is located on East County Road 46 at the intersection with State Route 269 (Huron-Seneca County Line Road) in Thompson Township. This viewpoint is approximately 1.9 miles from the nearest proposed turbine. The existing view to the west from this location features the paved road and a line of roadside utility poles progressing away from the viewer. The road is flanked by open agricultural fields and widely separated residences on both sides. Residential properties include homes, outbuildings, and yard trees. These features serve as focal points, and give the landscape a strong rural residential character. Trees in the yards, hedgerows and woodlots occur at variable distances from the viewer and define the visible horizon. Overall scenic quality is considered moderate.



**Inset 29:** Visual simulation of proposed view from East County Road 46 at the intersection with State Route 269 (Huron-Seneca County Line Road), Township of Thompson

### *Proposed Project*

At this selected viewpoint, several turbines can be seen above and between the existing trees and buildings in this view. The nearest turbine, on the left side of the view, is clearly taller than the trees in front of it. However, this turbine does not extend significantly into the sky, and all of the remaining, more distant, turbines appear at or below the height of the existing vegetation and structures. The color and form of the turbines present contrast with the existing landscape. However due to their distance from the viewer and intervening screening, the turbines appear well spread out and integrated with the existing features of the landscape. They become new focal points that will attract viewer attention, but do not substantially change the existing character or scenic quality of the view.



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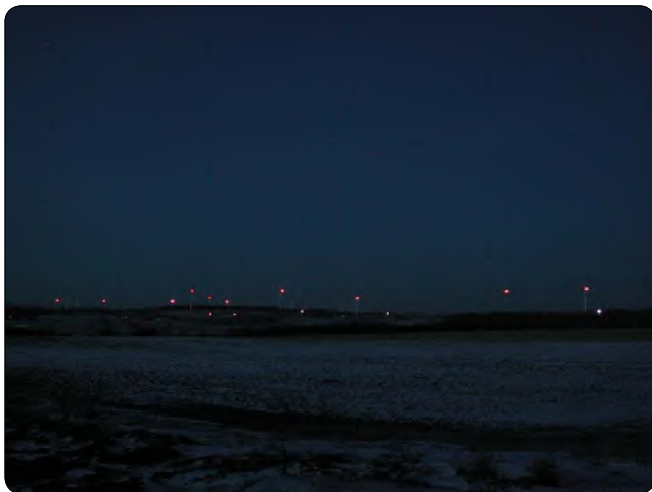
### 5.3 Nighttime Impacts

Representative nighttime photos of an operating wind farm with the same FAA regulated L-864 red light as proposed for Republic Wind are included in Figure 10. The photos illustrate the appearance of lights in a dark sky, and the typical type of nighttime visual impact associated with the turbines' FAA aviation warning lights. Although representative of the appearance of the FAA warning lights, it should be noted that new regulations since the representative photos were obtained require that the turbines associated with the Republic Wind Farm be equipped with two lights per turbine.

As shown in these photos, 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 they present strong contrast with the night sky. As indicated by the viewshed analysis, views of the FAA warning lights on the Republic turbines will generally be well screened for the cities and villages within the study area. Nighttime visual impact will most likely be experienced by viewers in the rural/agricultural portions of the study area. It is worth noting that the visual study area includes communication towers, grain elevators, quarry equipment and water towers equipped with FAA warning lights. While generally not seen or strongly perceptible from roads and other public viewpoints at night, turbine lighting may be perceived negatively by residents that currently experience dark night skies and who may be able to view these lights from their homes and yards.

### 5.4 Cumulative Visual Impacts

At the time of this report no operating wind projects are visible from the Republic Wind Farm study area. Therefore, the Project will not contribute to cumulative visual impacts within the study area.



## Republic Wind Farm

Sandusky and Seneca Counties, Ohio

Figure 10: Representative Evening/Nighttime Photos



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## 6.0 Conclusions

The VIA for the Republic Wind Farm 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 study area. In most locations where turbines will be visible, significant portions of the overall Project are also likely to be visible. The greatest potential for unscreened views of the project will be in the open agricultural areas. However, field review indicates that in more densely residential areas a significant number of the turbines will be at least partially screened by trees and structures.
2. Field review of the project site confirmed that the lack of elevated topographical features limits the long-distance visibility and further strengthens the screening capabilities of intact hedgerows and forest stands found at the borders of many of the agricultural fields present.
3. Views from the defined LSZs vary in quality and availability. The Rural Residential/Agricultural LSZ has the highest potential for an open view of the Project, however the visual characteristics of the working landscape and the agrarian vernacular have the least sensitivity to Project-related visual change. Therefore, the Project will generally not have an adverse visual effect on this zone. The City/Village/Hamlet LSZ has the largest concentration of viewers and sensitive sites. Consequently, for the majority of viewers in this LSZ and the sensitive sites located there, views of the Project will be well screened by intervening structures and vegetation within these more densely populated areas. Because open, long distance views are generally not available from this LSZ, and in turn the number of sensitive sites found within, there will not be a significant adverse visual effect on this zone. The Suburban Residential Zone can be vastly different from home to home or viewpoint to viewpoint. One resident may be screened by adjacent structures and suburban yard vegetation, while their neighbor may have potential views of the proposed turbines. This means that certain viewpoints may experience an adverse visual effect, while others will not. However, the distance of this zone from the proposed turbines will tend to minimize visual impact. The Transportation Corridor LSZ provides for a substantial amount of open long-distance views. However, the lack of sensitive sites within this zone, the abundance of discordant features, and focused viewer activity, limits the amount of visual effect realized. There will generally be no adverse effect from the major transportation corridors within the study area.
4. Sensitive sites identified and evaluated in the study area varied in the availability of open views toward the Project. The two NHRP-listed sites that are significant for their visual setting were evaluated in the field, and it was determined that only the Pleasant Ridge United Methodist Church and Cemetery will have some unobstructed,

open views towards a portion of the Project. However, the majority of the Project will be screened from view by adjacent mature hedgerows. Because the available open views focus on the working landscape, the introduction of the proposed Project will fit within this frame work. Wildlife management areas located at the outskirts of the study area, such as Pickeral Creek and Resthaven, proved to have no significant open views toward the Project, and viewer activity and scenic quality would not be impacted at these sites. Wildlife areas in closer proximity to the Project, such as Sugar Creek and Knobby's Prairie, will have views of individual turbines. However, because available views of the Project from these locations tends to be at the parking areas and not from the trail networks the effect on scenic quality will be minimized. The Sandusky and Seneca County Park System properties proved to have limited Project visibility, with the majority of open views being available from the parking areas rather than the trail networks. Again, this limited Project visibility will reduce the visual impact of the Project on these sites. The Sandusky River will not experience a change in scenic quality as it courses through the study area due to the screening provided by largely uninterrupted shoreline vegetation. Users of the two bike trails within the study area will experience views of the Project turbines, from various distances and landscape settings. However, most of the open views will be available from local roads within the Rural Residential/Agricultural LSZ. The proposed turbines generally appear compatible in this working agricultural landscape, and for some viewers, will add an element of interest to the existing view. No significant scenic features are designated along either trail through the study area, therefore impact on scenic quality and user enjoyment of these recourses will be minimal.

5. Photographic 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. The simulations confirm that woodlots and hedgerows generally provide a backdrop in views across open fields. This vegetation in combination with the level topography will effectively screen views of more distant turbines in many locations. This limits the number of turbines visible from many locations and limits the perceived density and visual clutter created by the Project. In many areas where open views are available, the turbines appear compatible with the working agricultural character of the landscape.
6. The VIA indicates that the Project's overall contrast with the visual/aesthetic character of the area will also be variable. Insignificant to moderate contrast was noted for viewpoints where existing vegetation provides at least partial screening, or where distance reduces the turbines' perceived line and scale contrast with the landscape. More substantial contrast was noted where unscreened foreground and near midground views of turbines are available or where numerous visible turbines result in a perceived change in land use and increased visual clutter. Low to moderate baseline scenic quality, and the working agricultural character of the landscape that makes up



the majority of the visual study area also serve to limit the Project's visual impact. 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.

7. Based upon the nighttime photos/observations of existing wind power projects, the red flashing lights on the turbines could result in a potential nighttime visual impact. 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, as discussed in Section 5.3. It should be noted that nighttime visibility/visual impact will be limited in cities, villages, hamlets, and along highways where existing lights already compromise dark skies and compete for viewer attention.

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## 7.0 Mitigation

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. Views of the proposed turbines from cities and villages, where the majority of the residents and sensitive historic sites are located, are typically well screened by intervening structures and trees. Midground and background views in the more rural portions of the study area, including views from sensitive sites, are generally at least partially screened by hedgerows and woodlots. Due to 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.
- B. Relocation. The proposed turbines will comply with various siting and set-back requirements that help to reduce their visual impact. However, because of the number of individual turbines proposed, and the variety of viewpoints from which they may be visible, additional turbine relocation will generally not significantly alter visual impact. Where visible from sensitive resources within the study area, (e.g., local parks, historic sites, and heavily used roadways), relocation of individual machines would have little effect on overall visual impact. Throughout the study area, available views of the Project include different turbines at different distances from the viewer. 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, use of this color is an appropriate means of limiting visual impact. The size and movement of the wind turbine blades 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). The VIA evaluated the maximum number of the tallest turbine model under consideration for this Project. The actual Project that is built could include fewer and/or somewhat smaller turbines. The visual impact of the electrical collection system is being minimized by installing the lines underground rather than on above-ground poles.

- E. Lighting. Turbine lighting will adhere to FAA regulations. Medium intensity red strobes will be used at night rather than white strobes or steady burning red lights.
- F. Maintenance. The turbines and turbine sites will be maintained to ensure that they are 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).
- G. 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, removal of existing blighted/derelict structures to offset any potential adverse visual impact of the proposed Project does not appear to be warranted.

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