Appendix E
Supplemental Visual Resource Assessment

ARKWRIGHT SUMMIT WIND FARM
SUPPLEMENTAL VISUAL RESOURCE ASSESSMENT

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Arkwright Summit Wind Farm – Supplemental Visual Resource Assessment

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1.0 INTRODUCTION

Arkwright Summit Wind Farm, LLC (Applicant) is proposing to develop a wind-powered electrical-generating facility consisting of up to 44 turbines with a maximum capacity of 79.8 megawatts (MW). The proposed Project will be located, predominately, in the Town of Arkwright, Chautauqua County, New York. All turbines, temporary construction laydown area, access roads, interconnect/ transmission lines, and operations and maintenance building are proposed to be located in the Town of Arkwright. An electrical substation and a small portion of the collection line will be located in the Town of Pomfret.

Since the submission of the New Grange Wind Farm Draft Environmental Impact Statement (DEIS) the Applicant revised the Project layout resulting in fewer turbines. Based on the changes, it was determined that a Supplemental Environmental Impact Statement (SEIS) would be needed; along with the layout changes, the Project was renamed the Arkwright Summit Wind Farm. As part of the SEIS being prepared for the permitting of the Arkwright Summit Wind Farm (Project), Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga) was retained to complete a supplemental Visual Resource Assessment (VRA) of the proposed Project. This supplemental VRA presents, with updates, the information contained in the *New Grange Wind Farm Visual Resource Assessment* (prepared by Saratoga), which was contained as an appendix in the DEIS.[1]

The purpose of this supplemental VRA is to identify potential visual and aesthetic impacts and to provide an objective assessment of the visual character of the Project, using standard accepted methodologies of visual assessment, from which agency decision-makers can render a supportable determination of visual significance.

1.1 METHODOLOGY

Consistent with Visual Resource Assessment (VRA) practice, this report evaluates the potential visibility of the proposed Project and objectively determines the difference between the visual characteristics of the landscape setting with and without the Project in place. The process follows basic New York State Department of Environmental Conservation Program Policy "Assessing and Mitigating Visual Impacts" (NYSDEC 2000) (DEC Visual Policy) and State Environmental Quality Review (SEQRA) criteria to minimize impacts on visual resources. This process provides a practical guide so decision makers and the public can understand the potential visual impacts and make an informed judgment about their significance (aesthetic impact).

There are no specific Federal rules, regulations, or policies governing the evaluation of visual resources. However, the methodology employed herein is based on standards and procedures used by the U.S. Department of Agriculture (National Forest Service, 1974, 1995), U.S. Department of the Interior, Bureau of Land Management (USDOI, 1980), U.S. Department of Transportation, Federal Highway Administration (USDOT, 1981), NYS Department of Transportation (NYSDOT, 1988), and

[1] The VRA contained in the DEIS (*New Grange Wind Farm Visual Resource Assessment,* dated February 18, 2008) was deemed complete on February 27, 2008 by the Town of Arkwright (lead agency).

the NYS Department of Environmental Conservation (NYSDEC, July 31, 2000). This report does include updates and photo simulations requested by the local government, the Town of Arkwright, during the comment period following the submission of the DEIS. The Town of Arkwright is the lead agency in the SEQRA process.

This evaluation includes both quantitative (how much is seen and from what locations; or visual impact) and qualitative (how it will be perceived; aesthetic impact) aspects of visual assessment.

The visual impact assessment includes the following steps:

- Define the existing landscape character/visual setting to establish the baseline visual condition from which visual change is evaluated;
- Conduct a visibility analysis (viewshed mapping and field investigations) to define the geographic area surrounding the proposed facility from which portions of the Project might be seen;
- Identify sensitive aesthetic resources to establish priority places from which further analysis of potential visual impact is conducted;
- Select key receptors from which detailed impact analysis is conducted;
- Depict the appearance of the facility upon completion of construction;
- Evaluate the aesthetic effects of the visual change (qualitative analysis) resulting from Project construction, completion and operation; and,
- Identify opportunities for effective mitigation.

Consistent with the DEC Visual Policy, the visual study area for this VRA generally extends to a 5-mile radius from the outermost turbines (hereafter referred to as the "five-mile radius study area" or "study area"). Beyond this distance it is assumed that natural conditions of atmospheric and linear perspective will significantly mitigate most visual impacts. However, considering the scale of the proposed Project and recognizing the proposed wind turbines will, at times, be visible at distances greater than five miles, site-specific consideration is given to resources of high cultural or scenic importance that are located beyond the typical 5-mile radius.

The five-mile radius study area encompasses the Town of Arkwright and the Villages of Fredonia and Forestville as well as portions of the Towns of Sheridan, Charlotte, Stockton, Hanover, Cherry Creek, Dunkirk, Pomfret and Villanova, the Village of Cassadaga, and the City of Dunkirk.

1.2 Project Description

The Project area is located in Western New York, approximately 57 miles northeast of Erie, PA[2], 52 miles southwest of Buffalo, and 24 miles north of Jamestown. The Project includes up to 44 energy-generating turbines[3] located along undulating hills in the Town of Arkwright. Thirty-seven turbines

[2] Distances to Erie, PA, Buffalo, and Jamestown originated from the hamlet of Arkwright

[3] Up to 44 turbines are being considered for this project. This VRA evaluates the maximum 44 turbines.

are generally bounded by Straight Road to the north, Creek Road/Farrington Hollow Road to the east, County Route 72 (Bard Road) to the south, and Miller Road/Park Road to the west. An additional seven turbines are located south of County Route (CR) 72. Turbines will be located on private land under lease agreement with property owners.

Each turbine will include a tall steel tower, a rotor consisting of three composite blades, and a nacelle, which houses the generator, gearbox and power train. A transformer may be located in the rear of each nacelle, or adjacent to the base of the tower, to raise the voltage of the electricity produced by the turbine generator to the voltage level of the collection system (34.5 kV). The color of the blades, nacelle, and tower will be off-white. The towers will be a tapered tubular steel monopole tower.

The turbine towers will be approximately 263 feet (80 meters) tall from ground to nacelle (hub). The tower will be approximately 15 feet wide at the base and eight (8) feet wide at the top. Each of the three turbine blades will be approximately 148 feet (45 meters) in length with the apex of blade rotation reaching approximately 410 feet (125 meters) above ground elevation. The nominal operating rotational speed of the blades will be approximately 10-15 revolutions per minute (rpm), or approximately one (1) revolution every four (4) to six (6) seconds.

In addition to the wind turbines, the Project will involve the construction of gravel access roads, interconnection cables, meteorological towers, an operation and maintenance facility, and an electrical substation and switchyard. All of these elements will be located in the Towns of Arkwright and Pomfret. The majority of the interconnection cables (between the turbines) will be buried; a small segment(s) will be routed above ground due to engineering and environmental issues.

The operation and maintenance (O&M) facility will occupy approximately eight (8) acres of land just east of proposed Turbine 40R, including the O&M building and adjacent access, parking and storage areas. A separate, temporary equipment laydown area will be located within an 8.3-acre parcel just north of the O&M facility. An approximately 3.9 mile overhead 34.5 kV transmission line will be constructed to connect the turbines with a proposed electrical substation. With few exceptions (e.g. angle/corner structures) the transmission poles will be wooden. The substation and point of interconnection switchyard will be located in the Town of Pomfret.

1.3 Aviation Obstruction Marking and Lighting

According to the Federal Aviation Administration (FAA), daytime lighting of wind turbines, in general, is not necessary. Turbines themselves, due to their solid (i.e. non-skeletal) construction, as well as their moving characteristics, provide sufficient warning to pilots during all daytime conditions and all documented terrain and sky conditions. The FAA recommends that turbines be painted either bright white, or a slight shade from white, to provide the maximum daytime conspicuity.

The FAA requires lighting of perimeter turbines, as well as interior turbines with a maximum gap between lit turbines of no more than ½ mile (2,640 feet). Based on these guidelines and the evaluated 44-turbine layout, approximately 21 of the proposed turbines may be illuminated at night for aviation safety.[4] One aviation obstruction light will be affixed to the rear portion of the nacelle on each turbine to be illuminated.

Lighting may be L-864 red flashing lights, in the form of incandescent or rapid discharge. The FAA recommends red light emitting diode or rapid discharge style L-864 fixtures to minimize impacts on neighboring communities, as the fixtures' exposure time is minimal, thus creating less of a nuisance. All light fixtures within the wind energy Project must flash in unison, thus delineating the Project as one large obstruction to pilots.[5] L-864 red flashing aviation obstruction lights are designed to emit light in an upward direction with maximum visibility for pilots.

The L-864 unit is a low intensity light emitting 2,000 candelas.[6] For comparison purposes, a 50-watt incandescent light bulb used for indoor track lighting emits 510 candelas[7] and vehicular daytime running lamps produce up to 7,000 candela.[8]

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[4] The FEIS will contain a formal lighting plan. The number of lit turbines is subject to change based on this plan.
[5] U.S. Department of Transportation, Federal Aviation Administration, "*Development of Obstruction Lighting Standards for Wind Turbine Farms*" (DOT/FAA/AR-TN05/50, November 2005)
[6] Candela is the unit of luminous intensity, equal to one lumen per steradian (lm/sr).
[7] http://www.gelighting.com - candelas vary base on lightbulb style, wattage, etc.
[8] http://www.nhtsa.dot.gov

2.0 LANDSCAPE CHARACTER/VISUAL SETTING

Landscape character is defined by the basic pattern of landform, vegetation, water features, land use, and human development. This descriptive section offers an overview of the intrinsic visual condition of the study region and establishes the baseline condition from which to evaluate visual change.

The Project area is surrounded by rolling hills of agriculture and forested land. With the exception of the four (4) community centers (City of Dunkirk, Village of Fredonia, Village of Forestville, and Village of Cassadaga), the study area is relatively rural and largely undeveloped. Broad tracts of agricultural land are either actively maintained or brush covered due to inactivity (fallow fields). Mature deciduous woodlands are found throughout the Project area, much of which may be found on State land (i.e. Boutwell Hill State Forest and the Canadaway Creek Wildlife Management Area), typically covering hillsides and hilltops, weaving through farmed areas, and alongside creeks and rivers. Other local land cover includes hedgerows, yards, farmsteads with low-density residential uses, streams and small ponds. With the exception of the City of Dunkirk and more developed villages (Fredonia, Forestville and Cassadaga) built features typically include low-density single-family residential structures and farmsteads. The hills and hillocks are the dominant landscape element and form the visible horizon from the majority of the Project area outside the downtown section of each of the four community centers.

2.1 TOPOGRAPHY AND VEGETATION

The proposed Project occupies a small portion of the northern edge of the Cattaraugus Highlands, which is a subregion of the Allegheny Plateau. The topography within the Project area rises quickly from the gently sloping land bordering Lake Erie, to a series of undulating ridge tops with deeply cut generally north-south aligned ravines and valleys. Uplands are relatively broad, undulating plateaus with elevations generally ranging between 1,725 feet to 2,150 feet above sea level. Terrain consists largely of undulating hills, ridges and areas of smaller rounded hillocks, often bisected by ravines.

Dominant tree species within the study area are representative of the northern hardwood zone found throughout much of the Western New York Region. Species include beech, maple, ash, elm, and hemlock. In addition to these deciduous climax species, isolated plantings of red and white pine are scattered throughout the study area. Coinciding with the mix of open field and woodlots is a significant amount of secondary growth edge habitat. For the most part, this secondary growth takes the form of hedgerows, wood borders, and old fields. Beyond the Project area the landscape remains primarily rural agriculture, with the exceptions of the City of Dunkirk, and the Villages of Fredonia, Cassadaga and Forestville, which each feature greater housing and business density, as well as tree-lined streets.

The areas of highest vegetation density within the study area are the Boutwell Hill State Forest and Canadaway Creek Wildlife Management Area. Within these two State owned lands, which comprise the Boutwell Hill Management Unit, the dominant tree species is northern hardwood, with some Allegheny hardwoods as well. Ninety-four percent of the Boutwell Hill Management Unit is classified as commercial forest.

2.2 Water Features

Water features are not a major component of the visual landscape in the vicinity of the proposed wind farm. The most prominent water resources within the study area include Canadaway Creek, Conewango Creek West Branch, Walnut Creek, and the Fredonia Reservoir. Additional notable resources within the study area, include, but are not limited to, Upper Cassadaga Lake, Black Pond, Pickett Brook, Hyde Creek, and West Mud Lake. Numerous private farm ponds, scattered wetlands, and small streams are also found in the study area.

Is should also be noted, that the largest water feature in the area, Lake Erie, is approximately 5.5 miles from the nearest turbine.

2.3 Transportation

The primary transportation route through the study area is NYS Route 83, which generally runs east to west, originating in the Project area from the Town of Cherry Creek and terminating upon its intersection with NYS Route 60. This road bisects the Project area and the proposed turbines will be present on either side of NYS Route 83.

Another major transportation route in the Project area is Center Road, a two-lane road that runs north to south. Proposed wind turbines will be located to the east and west of Center Road. Center Road intersects with four major routes, US Route 20, NYS Routes 39 and 83 and County Route 72, and crosses through the Hamlet of Griswold and Canadaway Creek WMA.

County Route 72 is an east to west route in the southern portion of the Project area that runs through a portion of Canadaway Creek WMA. The overwhelming majority of proposed wind turbines will be located to the north of County Route 72, with only seven (7) to the south, in the southeastern-most section of the Town of Arkwright.

2.4 Population Centers

Community Centers – Within the study area are one (1) city and three (3) villages. These larger community centers include the City of Dunkirk, and the Villages of Fredonia, Forestville and Cassadaga.

City of Dunkirk – The City of Dunkirk, which is approximately 3.9 miles northwest of the nearest turbine, is located along the shore of Lake Erie, in the Town of Dunkirk. The City maintains a modest grid street pattern including residential houses, churches, a small hospital (Brooks Memorial Hospital), and an assortment of commercial establishments (service facilities and offices). A wide variety of retail and commercial services are scattered throughout the City, with a higher concentration generally found along NYS Route 5 and Central Avenue, just outside the study area. The area surrounding NYS Route 5 is also a popular tourist destination due to its positioning directly across from Lake Erie. Moderate density single-family housing may be found throughout the City. Residential dwellings within the City tend to be older and generally well maintained with mature vegetation lining the roadways. Development density drops sharply as one moves a quarter mile to the east and west of the City boundary. The City also hosts a community college, the Chautauqua County Fairgrounds, and a variety of recreation opportunities (many are north of NYS Route 5, outside the study area).

Activities within the City are generally related to light tourism, business, local shopping, and residential uses. Bordering a portion of the City's southern boundary is the New York State Thruway.

Village of Fredonia – The Village of Fredonia, situated in the Town of Pomfret, is the most populated municipality located entirely within the study area and is approximately 2.6 miles west of the nearest turbine. The Village consists of a modest grid street pattern including residential houses, churches, and an assortment of commercial establishments (service facilities and offices). Retail and commercial services are generally located along Main Street (US Route 20), and in the vicinity of the NYS Route 60 and Vineyard Drive intersection. Moderate density single-family housing may be found throughout the village. Residential dwellings within the village tend to be older and well maintained with mature vegetation lining the roadways. Development density drops sharply as one moves a quarter of a mile outside the Village's east, south and west boundary. Within the Village is an intact National Register Historic District (the Fredonia Commons Historic District), which is in the center of Fredonia, at the crossroads of US Route 20, Temple Street and Water Street

Located in the northwest portion of the Village and south of the NYS Thruway is the State University of New York at Fredonia. This college has an enrollment of approximate 5,406 students[9] and is one of the largest employers in Chautauqua County, with roughly 1,000 employees.[10]

Activities within the Village are generally related to education, small business, local shopping, and residential uses.

Village of Forestville –The Village of Forestville is located in the Town of Hanover, approximately 3.0 miles northeast of the nearest turbine. Roads in this small Village exhibit a less organized structure. The Village includes several main residential roads that connect back to Main Street in a variety of configurations. Commercial establishments (service facilities and offices) are generally clustered along NYS Route 39 (Main Street). The Forestville Elementary, Middle and High Schools are located south of Academy Street. Low to moderate density single-family housing is found within portions of the Village. Residential dwellings tend to be older and well maintained with mature vegetation lining many roadways. Development density drops sharply outside the Village center.

Activities within the Village of Forestville are generally related to small business, local shopping, and residential uses.

[9] http://www.fredonia.edu
[10] Chautauqua County Chamber of Commerce, 7/2006

Village of Cassadaga – The Village of Cassadaga is located in the Town of Stockton, approximately 4.6 miles southwest of the nearest turbine. Commercial establishments are generally clustered along NYS Route 60 (Main Street), with Village government offices located south of Lower Cassadaga Lake. The majority of residential land in the Village of Cassadaga is located outside the study area and is organized in small clusters of housing developments connected by main roads. Cassadaga Lake, which is adjacent to the Village and offers a variety of outdoor recreation opportunities, and the spiritual community of Lily Dale (outside the study area) are each important to local tourism.

Activities within the Village of Forestville are generally related to small business, local shopping, and residential uses.

Rural Residential Areas – Outside of those communities identified above, homes and agricultural support buildings are either clustered at crossroad hamlets (varying in size), such as Sheridan, Black Corners, and Balcom Corners, or are very sparsely located on individual properties. Residences (a mix of old and new) and accessory structures (barns, garages, etc.) are often found in roadside locations, however many are located on isolated lots out of view from local roads. Rural homes range in quality from well maintained single-family frame construction to older housing stock in need of repair. Mobile homes, of varying vintage, located on isolated lots and within parks is also a common housing type.

3.0 VISUAL IMPACT ASSESSMENT

3.1 VIEWSHED MAPPING (ZONE OF VISUAL INFLUENCE)

3.1.1 Viewshed Methodology

The first step in identifying potentially affected visual resources is to determine whether or not the proposed Project would likely be visible from a given location. Viewshed maps are prepared for this purpose. Also known as defining the zone of visual influence, viewshed mapping identifies the geographic area within which there is a relatively high probability that some portion of the proposed Project would be visible.

The overall accuracy of viewshed mapping is dependent on the number and location of control points (study points representing proposed turbines) used in the viewshed calculation. To calculate the maximum range of potential turbine visibility, one control point was established at the turbine high point (i.e. 410' [apex of blade rotation] which is considered a worst-case height) for each of the 44 turbines being evaluated. The resulting composite viewshed identifies the geographic area within the 5-mile study area where some portion of the proposed wind energy Project (the apex of one or more turbine blades) is theoretically visible.

One viewshed map was prepared defining the area within which there would be no visibility of the Project because of the screening effect caused by intervening topography (See Figure 1). This treeless condition analysis is used to identify the maximum potential geographic area within which further investigation is appropriate. A second map was prepared illustrating the probable screening effect of existing mature vegetation. This vegetated condition viewshed, although not considered absolutely definitive, acceptably identifies the geographic area within which one would expect to be substantially screened by intervening forest vegetation (See Figure 2).

Identified viewshed areas are further quantified to illustrate the number of turbines that may be visible from any given area. This cumulative degree of visibility is summarized on each map using the following groupings:

- 1-5 turbines visible;
- 6-10 turbines visible;
- 11-15 turbines visible;
- 16-20 turbines visible;
- 21-30 turbines visible;
- 31-40 turbines visible; and
- 41-44 turbines visible.

By themselves, the viewshed maps do not determine how much of each turbine is visible above intervening landform or vegetation (e.g. 100%, 50%, 10% etc. of total turbine height), or whether a specific wind turbine will actually be visible from any given vantage point, but rather the geographic area within which some portion of the Project would theoretically be visible. Their primary purpose is to assist in determining the potential visibility of the proposed Project from the identified visual resources.

In this evaluation, ArcGIS 9.2 and ArcGIS Spatial Analyst software were used to generate viewshed areas based on publicly available digital topographic and land cover datasets. Viewshed maps were created by first importing a digital elevation model (DEM) of the study area. This DEM, obtained through the United States Geological Survey from its National Elevation Dataset, represents the best publicly available digital elevation data and is sampled at a 10-meter grid cell resolution. In order to run viewshed analyses, this dataset was projected to the Universal Transverse Mercator (UTM) coordinate system with a nominal resolution of 10 meters. The computer then scanned from each control point to all cells within this DEM, distinguishing between grid cells that would be hidden from view and those that would be visible based solely on topography. A conservative offset of 2 meters was applied to each DEM cell to simulate the height of a human observer. All grid cells within the study area were coded based on the number of proposed turbines that would be visible to a theoretical observer whose eye height is two meters above ground level.

Vegetation data was extracted from the National Land Cover Data Set 2001. The NLCD dataset, produced by the Multi-Resolution Land Characteristics Consortium, was developed from a multi-spectral classification of LANDSAT 7 Thematic Mapper (TM) imagery (2001 is the nominal year of image acquisition) sampled to a 30-meter grid cell resolution.[11] The screening effect of vegetation was incorporated by including an additional 40 feet (12.2 meters) of height for those DEM grid cells that are completely forested (according to NLCD dataset) and then repeating the viewshed calculation procedure. Forested areas were then removed from the viewshed to account for areas located within a full forest canopy (where visibility would have been based on an observer two meters above the canopy height). Based on field observation, most trees in forested portions of the study area appear to be taller than 40 feet. This height therefore represents a conservative estimate of the efficacy of vegetative screening.

It is important to note that the NLCD dataset is based on interpretation of forest areas that are clearly distinguishable from multispecteral satellite imagery. As such, the potential screening value of site-specific vegetative cover such as small hedgerows, street trees, individual trees, and other areas of non-forest tree cover may not be represented in the viewshed analysis. Furthermore, the NLCD dataset does not include the screening value of existing structures. This is a particularly important distinction in the populated areas such as the City of Dunkirk, Village of Fredonia, and other commercial and residential areas where existing structures are likely to provide significant screening of distant views. With these conditions, the viewshed map conservatively overestimates potential Project visibility in areas where the Project may be substantially screened from view.

It is noteworthy that untrained reviewers often misinterpret treeless condition viewshed maps to represent wintertime, or leafless condition visibility (Figure 1). In fact, deciduous woodlands provide a

[11] Thirty-meter resolution is the smallest vegetative grid cell increment commonly available for the Proposed Project region. This resolution provides an appropriate degree of accuracy for development of five-mile viewshed maps given the fairly broad patterns of existing land use in the area, as well as the accuracy of mapped topographic data (i.e., 1:24,000-scale USGS topographic maps with 10-foot contour intervals)

substantial visual barrier in all seasons. Since the NLCD dataset generally identifies only larger stands of woodland vegetation that is clearly distinguishable from multispecteral satellite imagery, viewshed maps that include the screening value of existing vegetation are equally representative of both leaf-on and leaf-off seasons (Figure 2). Treeless condition analysis is provided only to assist experienced visual analysts identify the maximum potential geographic area within which further investigation is appropriate. Such topography-only viewshed maps are not generally intended or appropriate for public interpretation of presentation.

Finally, the viewshed maps indicate locations in the surrounding landscape in which one or more turbine highpoints (i.e. apex of blade rotation) might be visible. These maps do not imply the magnitude of visibility (i.e. how much of each turbine is visible), the viewer's distance from each visible turbine or the aesthetic character of what may be seen. Such interpretation is the subject of the next phase of analysis (see section 3.4 below).

3.1.2 Nighttime Visibility

A viewshed map (See Figure 3) was created to assist in evaluating potential nighttime visibility. The vegetated viewshed map was created using the same methodology as described above, however, the map was created using the approximate height (275 feet) of the FAA required lights as the control point for 21 turbines.[12]

3.1.3 Verification of Viewshed Accuracy

Because the viewshed map identifies the geographic area within which one or more of the proposed turbines could theoretically be visible, but does not specify which of the 44 turbines evaluated would be within view, it is not readily feasible to field confirm viewshed accuracy. While it is common practice to field confirm viewshed maps prepared for a single study point through the use of balloon study or more intuitive means, the inability to field confirm viewshed accuracy is unique to analysis of multiple point projects covering a large geographic area, such as wind energy projects.

To help determine the accuracy of the vegetation data used for viewshed development, the NLCD data set was overlaid on color aerial images (2004) of the study area and reviewed for consistency. While minor inconsistencies were noted, including areas of recently cleared lands, areas of inactive/abandoned agricultural land showing a degree of pioneer species growth, and areas of non-forest vegetative cover (e.g. within Village of Fredonia), the vast majority of woodland areas visible on the satellite image were consistent with the NLCD overlay.

3.1.4 Viewshed Interpretation

Table 1 indicates the degree of theoretical visibility illustrated on the viewshed maps within the 5-mile radius study area.

[12] A final FAA layout plan will be included in the FEIS.

Table 1 Viewshed Coverage Summary

	Topography Only Viewshed (See Figure 1*)		Vegetation and Topography Viewshed (See Figure 2)	
	Acres	**Percent Cover**	**Acres**	**Percent Cover**
No Turbines Visible	19,088	18.5%	77,020	74.7%
1 – 5 Turbines Visible	5,853	5.7%	4,704	4.6%
6 – 10 Turbines Visible	6,273	6.1%	4,219	4.1%
11 – 15 Turbines Visible	9,510	9.2%	4,445	4.3%
16 – 20 Turbines Visible	8,537	8.3%	4,153	4.0%
21 – 30 Turbines Visible	20,767	20.1%	5,429	5.3%
31 – 40 Turbines Visible	19,262	18.7%	2,087	2.0%
41 – 44 Turbines Visible	13,780	13.4%	1,013	1.0%
Total	103,070	100.0%	103,070	100.0%

*Table 1 and Figure 1, illustrate that one or more turbine highpoints (i.e. apex of blade rotation) is theoretically visible from approximately 81 percent of the five-mile study area. However, as discussed above, this unrealistic treeless condition analysis is used only to identify the maximum potential geographic area within which further investigation is appropriate. This viewshed is not representative of the anticipated geographic extent of visibility and is not intended for public interpretation. Acreage quantities in Tables 1 and 2 are rounded to nearest whole number.

Table 2 FAA Viewshed Coverage Summary

	Vegetation and Topography Viewshed (See Figure 3)	
	Acres	**Percent Cover**
No Turbine Lights Visible	80,345	78.0%
1 – 2 Turbine Lights	4,245	4.1%
3 – 4 Turbine Lights	4,224	4.1%
5 – 6 Turbine Lights	3,836	3.7%
7 – 10 Turbine Lights	7,508	7.3%
11 – 15 Turbine Lights	1,862	1.8%
16 – 21 Turbine Lights	1,050	1.0%
Total	103,070	100.0%

Table 1 and Figure 2 indicate that one or more of the proposed turbines will be theoretically visible from approximately 25 percent of the five-mile radius study area. Approximately 75 percent of the study area will likely have no visibility of any wind turbines. Visibility is most common in the agricultural uplands from cleared lands with vistas in the direction of turbine groupings.

The viewshed map shows that the Project will be visible within the City of Dunkirk, Villages of Fredonia and Forestville, as well as the hamlets of Arkwright, Black Corners and Griswold. Views of the Project may be possible in open areas (e.g. road corridors); however, most potential views will be partially screened by intervening vegetation and localized structures. Direct and, in some cases, open views are more prevalent on the outskirts of these community centers where localized residential and commercial structures, street trees and site landscaping are less likely to provide a visual barrier. Potential visual impacts from the City of Dunkirk and the Village of Fredonia should be further reduced by the relatively long distance between the community and the Project.

From the downtown sections of the city and villages in the study area, potential Project visibility appears to be minimal, when present at all. In sections of the city and villages that are not immediately in the downtown area, filtered and framed views are occasionally possible through the foreground vegetation and buildings. This is particularly true in the easternmost outskirts of the Village of Fredonia and southwestern-most outskirts of the Village of Forestville.

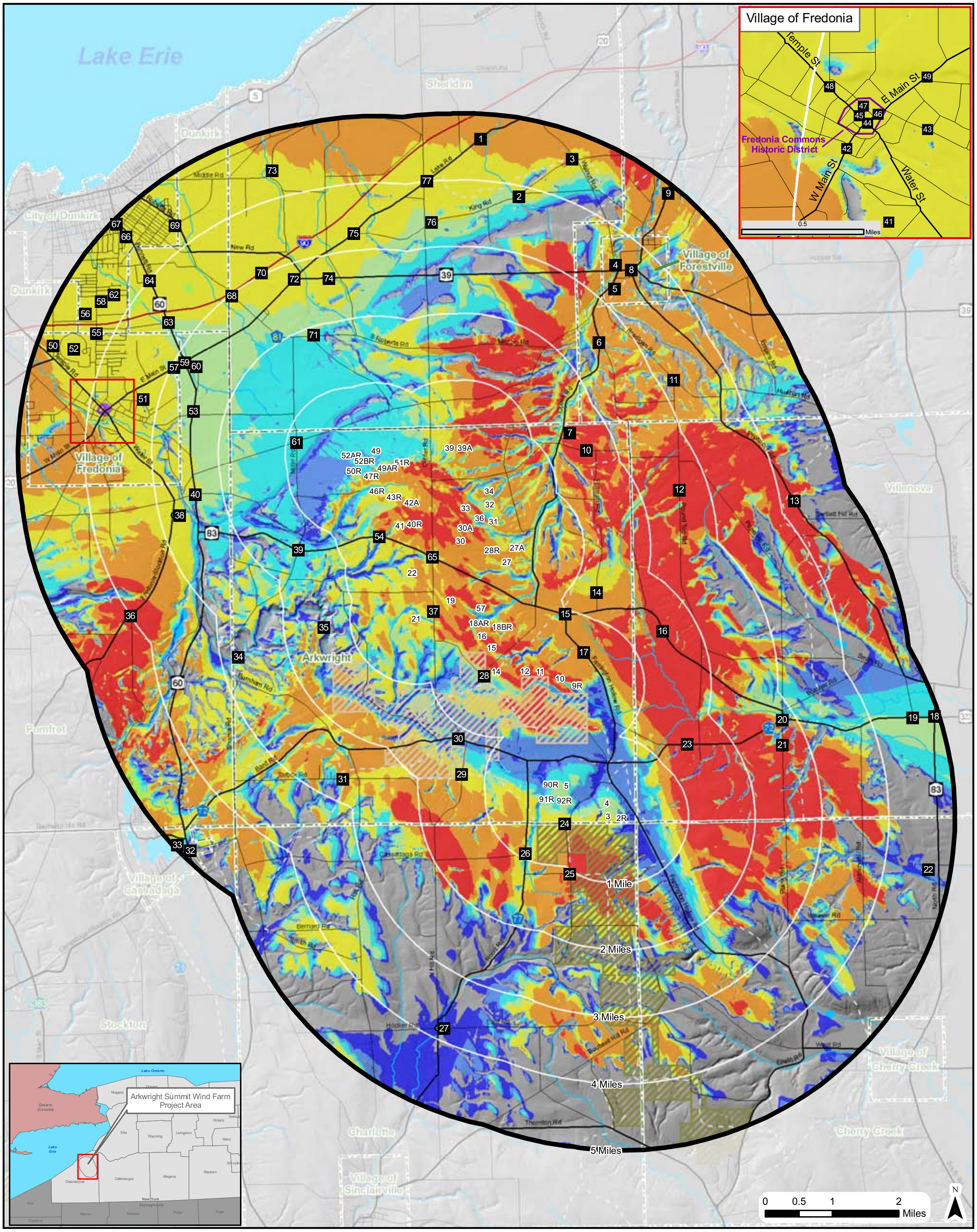
Open views of the Project will be available from many roadways where roadside vegetation is lacking. These roadways would include, but are not limited to, the NYS Thruway, US Route 20, NYS Routes 39, 60, and 83, County Route 72, Farrington Hollow Road, Prospect Road, Round Top Road, Fredonia-Stockton Road, King Road, Bennett Road, and Straight Road. Many of these views may be long distant (background view) and fleeting as viewers pass in vehicles.

The area most directly affected by views of the Project will be where there is significant amount of cleared or agricultural land within immediate proximity of the Project; Project visibility is also notable from higher-elevation within the study area. The rural areas along US Route 20, NYS Route 83, County Route 72, Farrington Hollow Road, Prospect Road, Fredonia-Stockton Road, and other roads in these areas will experience a high degree of visibility. Residents and visitors will regularly encounter proximate views of one or more turbines within the foreground and near-middleground distances (e.g., ½ to 1 ½ miles); the distance where the visual contrast of the turbines will be greatest. Within such close proximity, turbines frequently appear and disappear behind intervening foreground landforms and vegetation as viewers move about the study area.

No views, or limited views will occur on the backside of the many hills and within ravines found throughout the study area. Where topography is oriented toward the turbines, dense forest cover commonly prevents distant views.

As illustrated in Table 2 and Figure 3 - Proposed FAA Viewshed – Vegetated, the viewshed map indicates that one or more of the 21 FAA required light sources will be theoretically visible from approximately 22 percent of the five-mile radius study area. Approximately 78 percent of the study area will likely have no visibility of any proposed light sources. Views of the lit proposed turbines will be possible from sections of the Villages of Fredonia and Forestville, City of Dunkirk, and Hamlets such as Arkwright, Black Corners and Griswold. However, visibility will be most evident in the agricultural uplands from cleared lands with down-slope vistas in the direction of the proposed Project, and participating Project properties with lit turbines. In addition, views of the lit turbines are prominent from a number of roadway segments in the study area, including the NYS Thruway, US

Route 20, NYS Routes 39, 83, and 60, County Route 72, Prospect Road, Pope Hill Road, Round Top Road, Farrington Hollow Road, and Fredonia-Stockton Road.



BLADE TIP VIEWSHED - TOPOGRAPHIC

*Blade tip hight 125 m (410 ft). Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Figure 1
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 12 Proposed Wind Turbine
- 27 Sensitive Receptor
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 30
- 31 - 40
- 41 - 44

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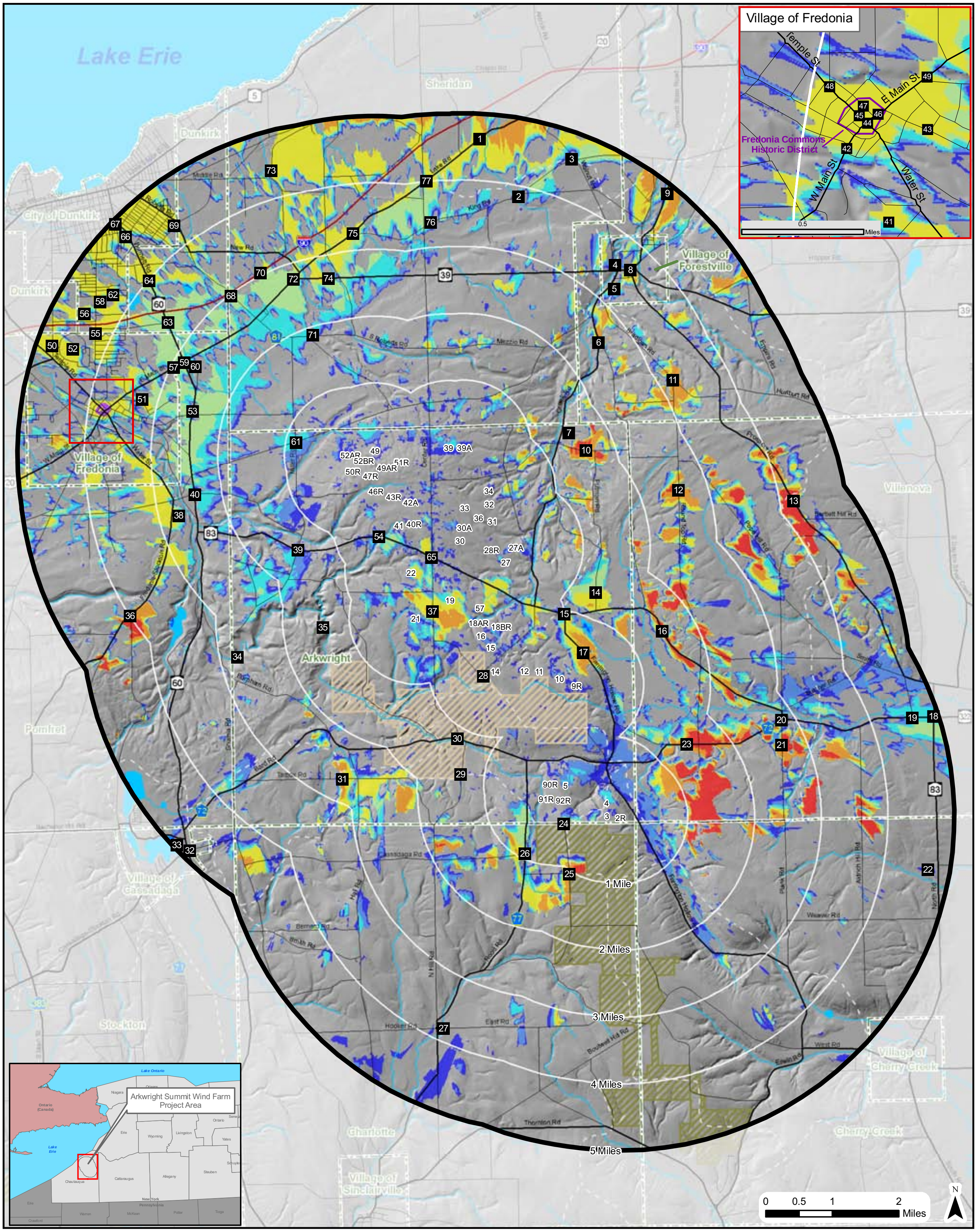
ARKWRIGHT SUMMIT WIND FARM



BLADE TIP VIEWSHED - VEGETATED*

*Blade tip hight 125 m (410 ft). Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Figure 2
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 12 Proposed Wind Turbine
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- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 30
- 31 - 40
- 41 - 44

This map is computer generated using data acquired by Saratoga Associates from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to establish boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required.
File Location: B:\2008\08001\arkwright_viewshed_veg_090305.mxd

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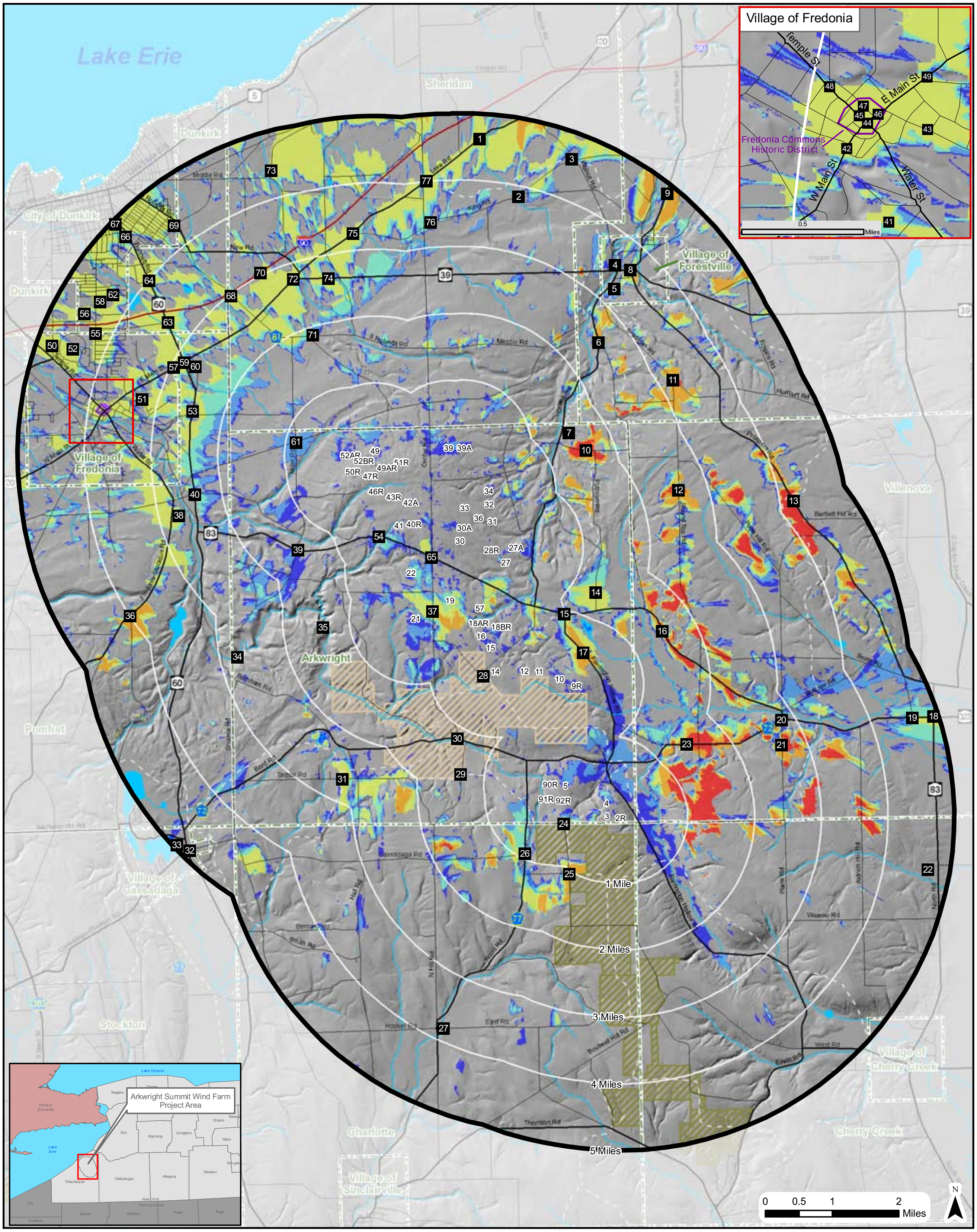
ARKWRIGHT SUMMIT WIND FARM



FAA NAVIGATION LIGHT VIEWSHED - VEGETATED*

* Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Figure 3
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 12 Proposed Wind Turbine
- 27 Sensitive Receptor
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

Number of Navigation Lights Visible

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 10
- 11 - 15
- 16 - 21

PROJECT # 2008 - 2008-001.10M -
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ARKWRIGHT SUMMIT WIND FARM

3.2 Inventory of Visually Sensitive Resources

3.2.1 Inventory Criteria

Because it is not practical to evaluate every conceivable location where the proposed Project might be visible, it is accepted visual assessment practice to limit detailed evaluation of aesthetic impact to locations generally considered by society, through regulatory designation or policy, to be of cultural and/or aesthetic importance. In rural areas where few resources of statewide significance are likely to be found, it is common practice to expand inventory criteria to include places of local sensitivity or high intensity of use.

Resources of Statewide Significance – The DEC Visual Policy requires that all aesthetic resources of statewide significance be identified along with any potential adverse effects on those resources resulting from the proposed Project. Aesthetic resources of statewide significance may be derived from one or more of the following categories:

- A property on or eligible for inclusion in the National or State Register of Historic Places [16 U.S.C. § 470a et seq., Parks, Recreation, and Historic Preservation Law Section 14.07];
- State Parks [Parks, Recreation, and Historic Preservation Law Section 3.09];
- Urban Cultural Parks [Parks, Recreation, and Historic Preservation Law Section 35.15];
- The State Forest Preserve [NYS Constitution Article XIV], Adirondack and Catskill Parks;
- National Wildlife Refuges [16 U.S.C. 668dd], State Game Refuges, and State Wildlife Management Areas [ECL 11-2105];
- National Natural Landmarks [36 CFR Part 62];
- The National Park System, Recreation Areas, Seashores, and Forests [16 U.S.C. 1c];
- Rivers designated as National or State Wild, Scenic, or Recreational [16 U.S.C. Chapter 28, ECL 15-2701 et seq.];
- A site, area, lake, reservoir, or highway designated or eligible for designation as scenic [ECL Article 49 or NYDOT equivalent and Adirondack Park Agency], designated State Highway Roadside;
- Scenic Areas of Statewide Significance [of Article 42 of Executive Law];
- A State or federally designated trail, or one proposed for designation [16 U.S.C. Chapter 27 or equivalent];
- Adirondack Park Scenic Vistas [Adirondack Park Land Use and Development Map];
- State Nature and Historic Preserve Areas [Section 4 of Article XIV of the State Constitution];
- Palisades Park [Palisades Interstate Park Commission]; and
- Bond Act Properties purchased under Exceptional Scenic Beauty or Open Space category.

Resources of Local Interest – Places of local sensitivity or high intensity of use (based on local context) were also inventoried, even though they may not meet the broader statewide threshold. Aesthetic resources of local interest were generally derived from the following general categories:

- Recreation areas including playgrounds, athletic fields, boat launches, fishing access, campgrounds, picnic areas, ski centers, and other recreational facilities/attractions;
- Areas devoted to the conservation or the preservation of natural environmental features (e.g., reforestation areas/forest preserves, wildlife management areas, open space preserves);
- A bicycling, hiking, ski touring, or snowmobiling trail designated as such by a governmental agency;
- Architectural structures and sites of traditional importance as designated by a governmental agency;
- Parkways, highways, or scenic overlooks and vistas designated as such by a governmental agency;
- Important urban landscape including visual corridors, monuments, sculptures, landscape plantings, and urban green space;
- Important architectural elements and structures representing community style and neighborhood character;
- An interstate highway or other high volume (relative to local conditions) road of regional importance;
- A passenger railroad or other mass transit route; and
- A residential area greater than 50 contiguous acres and with a density of more than one dwelling unit per acre.

Other Places for Analysis – Given the rural character of much of the study area, the inventory of aesthetic resources has been further expanded to be conservatively over-inclusive. In several cases, locations not rising to the threshold of statewide significance or local interest have been included to represent visibility along sparsely populated rural roadways; most selected based on field observation of open vistas. Although possibly of interest to local residents, such locations are not considered representative of any aesthetically significant place.

Resources of statewide significance, resources of local interest and other places for analysis were identified though a review of published maps and other paper documents, online research, and windshield survey of publicly accessible locations.

3.2.2 Summary Characteristics of Inventoried Resources

Table 3 Demographic Summary of Study Area Municipalities (2000 Census)

Municipality	Year Round Population	Population Density[13]	Total Housing Units
New York State	*18,976,457*	*402*	
Chautauqua County	*139,750*	*127*	
Town of Dunkirk	14,518	2,304	6,673
City of Dunkirk	*13,131*	2,900	6,071
Town Excluding City	1,387	222	602
Town of Sheridan	*2,838*	76	1,079
Town of Arkwright	1,126	32	509
Town of Villenova	1,121	31	489
Town of Cherry Creek	1,152	31	498
Village of Cherry Creek	551	405	222
Town Excluding Village	601	16	296
Town of Hanover	7,638	155	3,501
Village of Forestville	770	788	324
Town Excluding Village	6,868	139	3,177
Town of Pomfret	14,703	335	5,558
Village of Fredonia	*10,706*	2,062	3,829
Town Excluding Village	3,997	90	1,729
Town of Stockton	2,331	49	1,044
Village of Cassadaga	676	615	315
Town Excluding Village	1,655	35	729
Town of Charlotte	1,713	47	704
Village of Sinclairville	665	416	292
Town Excluding Village	1,048	29	412

Overall Population and Density of Development – The study area varies from being quite rural to the south and increasingly suburban in the northwestern section, closer to Lake Erie. In 2000, the overall population of Chautauqua County was 139,750, with an average population density of 127 people per square mile according to the U.S. Census. While the City of Dunkirk boundary is not completely within the study area, its population of 13,131 makes it the most populated municipality that traverses the 5-mile study area. The Town of Arkwright, where all of the proposed turbines are located, has a population of 1,126 and a population density of 32, which is among the lowest in the study area. The Village of Fredonia (Town of Pomfret) has a population of 10,706 within its 5.2 square miles, giving it the highest population density of any town or village that is completely contained within the study area.

Highway Corridors – Due to its predominately rural agricultural landscape, with a few exceptions (e.g. NYS Thruway I-90) many of the roadways within the study area are relatively lightly traveled. The primary roadways within the study area are NYS Routes 39, 60, and 83, US Route 20, and NYS Thruway I-90.

US Route 20 generally runs east to west along the northern portion of the study area, crossing through Fredonia and paralleling I-90 for several miles east of Fredonia and Dunkirk. At the most heavily traveled section in the study area, between Temple Street and NYS Route 60, US Route 20 receives an average of 13,880 vehicles per day.

NYS Route 39 is an east to west route that enters the study area southeast of Forestville and terminates upon its intersection with US Route 20, just northeast of Fredonia. This road is traveled by roughly 2,000 to 3,000 cars per day.

NYS Route 60 runs north to south, beginning in the City of Dunkirk and exiting the study area just east of Cassadaga Lake. Aside from I-90, NYS Route 60 receives the greatest amount of traffic of any road within the study area, from 24,788 vehicles per day on its most heavily traveled section between

[13] Population density (rounded to the nearest whole number) is calculated by residents per square mile

US Route 20 and the I-90 access road, and 7,344 vehicles on its least heavily traveled section between Maple Avenue in Cassadaga and Sylvester Road in Sinclairville. It should be noted that the majority of the latter section of NYS Route 60 is not within the study area.

NYS Route 83 bisects the study area from east to west, entering the study area between the intersection of NYS Route 322 and the Village of Cherry Creek and terminating upon its intersection with NYS Route 60. This road is the only State highway in the study area from which turbines would be present on either side. It is also the least heavily traveled of all major roads within the study area, with an average of 1,491 to 2,238 vehicles per day.

The NYS Thruway I-90 receives more traffic than any other road within the study area. It runs from east to west, entering the study area near Sheridan and exiting just west of Fredonia and Dunkirk with an average of 23,350 to 29,871 vehicles per day traveling this stretch of road.

Table 4 summarizes the average annual daily traffic (AADT) for-State highways and US Route 20 within the study area. In addition to a number of NYS Routes, US Route 20 and I-90, numerous county and local roads traverse the study area. Generally, these roads are lightly traveled.

Table 4 Annual Average Daily Traffic Volumes for Study Area Highways [14]

Route	Section	AADT
US Route 20	Between West Village Lane (Fredonia) and Temple Street	6,046
US Route 20	Between NYS Route 60 and NYS Route 39	11,245
US Route 20	Between Temple Street and NYS Route 60	13,880
US Route 20	Between NYS Route 39 and CR 79	6,366
NYS Route 39	Between US Route 20 and CR 141 (Forestville)	2,923
NYS Route 39	Between CR 141 Forestville and Cattaraugus County Line	2,060
NYS Route 60	Between Access Road I-90 NYS Thruway and Dunkirk South City Lane	12,927
NYS Route 60	Between Dunkirk South City Lane and NYS Route 5 (end NYS Route 60)	7,583
NYS Route 60	Between CR 56 Maple Ave and NYS Route 83 Laona	9,362
NYS Route 60	Between US Route 20 (Fredonia) and Access Road I-90 NYS Thruway	24,788
NYS Route 60	Between NYS Route 83 and US Route 20 (Fredonia)	14,938
NYS Route 83	Between CR 307 Chicken Tavern and NYS Route 60 Laona (end NYS Route 83)	1,491
NYS Route 83	Between NYS Route 322 (Balcom) and CR 312 Hamlet Road	1,754
NYS Route 83	Between CR 312 Hamlet Road and CR 307 Chicken Tavern	1,740
NYS Route 83	Between CR 70 Southside Avenue East and NYS Route 322 (Balcom)	2,238
NYS Thruway I-90	Between Exit 60 and Exit 59	23,350
NYS Thruway I-90	Between Exit 59 and Exit 58	29,781

Park, Recreation and Open Space Resources – Visitors traveling to this area may enjoy numerous outdoor recreational activities including hiking, biking, hunting, and fishing during the warmer months. Cross-country skiing and snowmobile riding are popular during the winter months. Other passive outdoor pursuits, such as bird watching or a leisurely drive through the county's wine country are also common. The Boutwell Hill Management Unit provides various recreational opportunities, as do a number of municipal parks. Some of the more prominent recreational facilities are discussed below.

[14] http://www.dot.state.ny.us

The majority of the Boutwell Hill Management Unit, which is comprised of the Boutwell Hill State Forest and the Canadaway Creek Wildlife Management Area, is within the study area. The 5,124-acre Unit is a source of numerous types of outdoor activities including hunting, hiking, biking, horseback riding, and snowmobiling. Between Canadaway Creek WMA and Boutwell Hill State Forest, there are 6.2 miles of snowmobile and horse trails in winter and summer respectively. The Unit also includes 8.5 miles of the Earl Cardot Eastside Overland Trail.

> The Boutwell Hill State Forest consists of 2,964 acres of protected forest with numerous multiuse trails, wildlife viewing opportunities and it serves as a significant resource for deer hunters. In addition to its recreational offerings, the Forest also provides raw materials for New York's timber industry.
> The Canadaway Creek Wildlife Management Area, just south of the Town of Arkwright and north of the Boutwell Hill State Forest, is home to 2,160 acres of forest and its main purpose is to provide prime habitat for ruffed grouse. In addition to preservation efforts, the forest serves to provide numerous recreational opportunities including hiking, snowmobiling and bicycling.

The Earl Cardot Eastside Overland Trail offers hiking and biking opportunities to users. It is comprised of 19 miles of trail extending from Twenty-Eighth Road in the Town of Gerry at the southernmost end to the Town of Arkwright in the north. Of the 19 miles, 8.5 of these bisect the Canadaway Creek WMA and Boutwell Hill State Forest. This trail is maintained by Chautauqua County's Department of Public Works, Parks Division and County Park Commission.

Snowmobile trails may be found throughout the study area whether on public/private land or along roadways/seasonal roads. Snowmobiling is a popular activity throughout many sections of western New York and is likely enjoyed by large numbers of participants within the study area during the winter months. State snowmobile trails that bisect the area include, but are not limited to C1, C1C, C1A and S11. A number of these trails have significant portions that go through the different parcels of the Boutwell Hill Management Unit. The trails are generally funded by the State, but maintained by local snowmobile groups such as the Cherry Creek Snowmobile Club.

The Village of Fredonia contains a number of parks, the largest of which, Russell Joy Park, contains a variety of recreational opportunities. In addition to nature trails, the Park features tennis and basketball courts, a playground, a baseball diamond and two pavilions, which are available for rent by local residents and community groups.

Municipal parks, recreational and open space resources include Barker Commons, Houghton Commons, Elm Street Playground, Laona Community Park, Kosciuszko Park, Sheridan Memorial Field, and other small community playgrounds and athletic fields that are scattered throughout the study area.

Tourism – This section of Chautauqua County draws visitors year-round, as it is ideal for a range of activities, including hiking, snowmobiling, cross-country skiing, fishing, sight-seeing, and touring the wine country.

The Chautauqua County wine trail features several wineries in the northern portion of the study area in the Town of Sheridan. While there is not a specific set of roads technically designated as part of the wine trail, some of the roads traveled to reach wineries in the study area include US Route 20, King Road, Center Road, and South Roberts Road. In addition to the wineries that are part of the County wine trail, there are numerous grape-growers whose produce can be seen from roads in the study area.

Cultural Resources – Chautauqua County contains many well-maintained historic resources. Within the study area, three (3) structures and one (1) district listed on the State and National Register of Historic Places were identified. These include:

- Dunkirk Post Office;
- Fredonia Commons Historic District;
- Fredonia Post Office; and
- Fredonia Grange.

The Fredonia Commons Historic District contains at least 80 privately and publicly owned structures of significance. The District is located in the center of the Village of Fredonia, in the northeast corner of the Town of Pomfret. The architecture of the structures located within the district represent a range of styles from Early Republic to Late Victorian and Mid 19th Century Revival. Among the most notable structures within the District are the Fredonia Post Office and the 1891 Fredonia Opera House, which is still in operation. Preservation efforts within Fredonia Commons Historic District are ongoing. In 2006, the District received a grant from NYS OPRHP toward renovation of the 1891 Opera House and Village Hall. The District also features Barker Common, a landscaped public park across from Village Hall that consists of benches, a gazebo and two decorative fountains. During the summer months, Barker Common is home to the Fredonia Farmers' Market. Also in the District is the D.R. Barker Historic Museum and Library, which features research facilities, a children's library and a variety of exhibitions dedicated to the heritage of the Village of Fredonia and Town of Pomfret.

No additional properties, within the study area, were listed on the State and National Register of Historic Places. Historically significant properties within the study area that are or may be eligible will be identified as part of the studies being prepared by the Applicant for the State Historic Preservation Office.

3.2.3 Visibility Evaluation of Inventoried Resources

Each inventoried visual resource was evaluated to determine whether a visual impact might exist. This consisted of reviewing viewshed maps and field observation to determine whether or not individual resources would have a view of the proposed Project.

Table 5 lists 77 visual resources[15] located within the five-mile study area and identifies potential Project visibility. The location of these visual resources is referenced by numeric code within Figures 1 and 2. Of the 77 visual resources inventoried, 11 would likely be screened from the proposed Project by either intervening landform or vegetation/structures and are thus eliminated from further study.

3.2.4 Select Resources Beyond 5-Miles

Considering the scale of the proposed Project and recognizing the proposed wind turbines will, at times, be visible at distances greater than five miles, site-specific consideration is given to additional recreational resources of high scenic importance that are located beyond the typical five-mile radius. Although not all-inclusive, the following resources were identified during the research completed for this VRA:

> Lake Erie State Park (Brockton, NY) – Lake Erie State Park is approximately 8.5 miles from the nearest turbine. In the summer, the Park draws outdoor recreation users for its hiking, bird-viewing opportunities, picnicking, swimming, camping, and for its scenic lakeshore location. In the winter, visitors use the Park's trails network for cross-county skiing.

> Historic Dunkirk Lighthouse (City of Dunkirk) – The Dunkirk Historic Lighthouse and Veteran's Park Museum is within the 60-acre municipal Point Gratiot Park and is one of 25 lighthouses along the New York State Seaway Trail (NYS Route 5). The 61-foot tall Lighthouse is still active and is a point of interest for visitors to the lakeshore and the public beach of Point Gratiot Park. The Lighthouse is approximately 5.5 miles from the nearest wind turbine.

> Lake Erie Waterfront (City of Dunkirk) – The City of Dunkirk lakefront has numerous public facilities including the City Pier, marinas, Main Street Beach, and Wright and Point Gratiot parks. Combined, these offer ample opportunities for boating, swimming, sunbathing, jetskiing, and fishing, and they serve as host sites for numerous festivals and fishing tournaments as well. The waterfront facilities are each roughly 5.5 miles from the nearest proposed wind turbine.

> Seaway Trail – The New York State Seaway Trail runs for 454 miles along Lake Erie, Lake Ontario, the Niagara River and the St. Lawrence Seaway, and has been recognized by the US Department of Transportation (DOT) as one of America's Scenic Byway Trails. The Trail coincides with NYS Route 5 through the City of Dunkirk, and passes several historic markers for the War of 1812 as well as the Dunkirk Harbor and Waterfront Park, Point Gratiot Park and the Dunkirk Historic Lighthouse and Veteran's Park Museum. The section of the Trail closest to the study area is approximately 5.3 miles from the nearest proposed wind turbine.

> New York State Underwater Blueway Trail (Lake Erie) – The New York State Underwater Blueway Trail, an initiative to increase awareness of and access to New York's rich maritime history, is based out of six participating municipalities, including the City of Dunkirk. The underwater trail adds to the already active base of outdoor enthusiasts who visit the area Lake Erie

[15] Potential visual resources were identified during the completion of the *New Grange Wind Farm Visual Resource Assessment,* dated February 18, 2008.

shoreline. The Trail is located just off the coast of Lake Erie, just over 5.5 miles from the nearest proposed wind turbine.

> NYS Boat Ramp (Village of Cassadaga) – The New York State Boat Launch on Cassadaga Lake has 20 parking spots for boaters putting in at NYS Route 60 in the hamlet of Lily Dale. The Boat Launch is approximately 5.3 miles from the nearest proposed wind turbine.

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible (field observed)*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Actual View Likely Based on Field Confirmation of Existing Line-of-sight[16]
Cultural Resources						
42	Fredonia Grange #1	Village of Fredonia	Statewide Significance	●	●	◘
44	Fredonia Commons Historic District	Village of Fredonia	Statewide Significance	●	●	◘
47	Fredonia Post Office	Village of Fredonia	Statewide Significance	●	●	◘
55	Dunkirk Post Office	Village of Fredonia	Statewide Significance	●	●	◘
Recreational and Tourist Resources						
56	Chauatauqua County Fairgrounds	City of Dunkirk	Local Importance	●	●	○
69	Kosciuszko Park	City of Dunkirk	Local Importance	●	●	○
7	Hill Side Acres (WNY Land Conservancy)	Town of Arkwright	Local Importance	●	○	○
24	Boutwell Hill State Forest and Overland Trail	Town of Arkwright	Statewide Significance	●	●	●
28	Canadaway Creek WMA	Town of Arkwright	Statewide Significance	●	●	●
29	Woodside Country Campground	Town of Arkwright	Local Importance	●	○	Not Visited
34	Shumla Falls	Town of Arkwright	Other Places for Analysis	○	○	Not Visited
35	Arkwright Falls	Town of Arkwright	Other Places for Analysis	○	○	Not Visited
54	Arkwright Hills Campground	Town of Arkwright	Local Importance	●	●	●
2	Merritt Estate Winery	Town of Sheridan	Local Importance	●	○	○
71	Woodbury Vineyards	Town of Sheridan	Local Importance	●	●	●
73	Chautauqua County Dunkirk Airport	Town of Sheridan	Local Importance	●	●	●
76	Roberian Winery	Town of Sheridan	Local Importance	●	●	●
33	Cassadaga Beach	Village of Cassadaga	Local Importance	●	○	○
4	Walnut Falls	Village of Forestville	Other Places for Analysis	○	○	Not Visited
41	Russell Joy Park	Village of Fredonia	Local Importance	●	●	●

[16] Field confirmation of potential visibility was conducted during the preparation of the DEIS (January 24 and 25, 2008, and February 7 and 14, 2008). Refer 3.4.1 for additional information.

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible (field observed)*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Actual View Likely Based on Field Confirmation of Existing Line-of-sight[16]
Highway Corridors/Roadside Receptors						
10	Straight Road	Town of Arkwright	Other Places for Analysis	●	●	●
14	Putnam Road	Town of Arkwright	Other Places for Analysis	●	●	●
17	Farrington Hollow Road	Town of Arkwright	Other Places for Analysis	●	●	●
31	Tarbox Road	Town of Arkwright	Other Places for Analysis	●	●	●
37	Center Road	Town of Arkwright	Other Places for Analysis	●	●	●
61	Miller Road	Town of Arkwright	Other Places for Analysis	●	●	●
25	Lewis Road	Town of Charlotte	Other Places for Analysis	●	●	●
26	CR 77	Town of Charlotte	Other Places for Analysis	●	●	●
63	NYS Route 60 - Commercial Area	Town of Dunkirk	Local Importance	●	●	●
6	Creek Road	Town of Hanover	Other Places for Analysis	●	●	●
9	Bennett State Road	Town of Hanover	Other Places for Analysis	●	●	●
11	Bradigan Road at Gage Road	Town of Hanover	Other Places for Analysis	●	●	●
36	Fredonia Stockton Road	Town of Pomfret	Other Places for Analysis	●	●	●
53	CR 60	Town of Pomfret	Other Places for Analysis	●	●	●
59	NYS Route 60 at East Main St	Town of Pomfret	Local Importance	●	●	●
1	US Route 20	Town of Sheridan	Local Importance	●	●	●
68	CR 81	Town of Sheridan	Other Places for Analysis	●	●	●
70	NYS Thruway I-90	Town of Sheridan	Local Importance	●	●	●
72	NYS Route 39 at US Route 20	Town of Sheridan	Local Importance	●	●	●
74	NYS Route 39	Town of Sheridan	Local Importance	●	●	●
12	Round Top Road	Town of Villenova	Other Places for Analysis	●	●	●
13	Prospect Road	Town of Villenova	Other Places for Analysis	●	●	●
16	NYS Route 83	Town of Villenova	Local Importance	●	●	●
21	Plank Road	Town of Villenova	Other Places for Analysis	●	●	●

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible (field observed)*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Actual View Likely Based on Field Confirmation of Existing Line-of-sight[16]
23	CR 72	Town of Villenova	Other Places for Analysis	●	●	●
Residential/Community Resources						
58	Dunkirk Central Schools - School #4	City of Dunkirk	Local Importance	●	●	○
62	City of Dunkirk - Residential	City of Dunkirk	Local Importance	●	●	●
66	Dunkirk Central Schools - School #3	City of Dunkirk	Local Importance	●	●	○
67	City of Dunkirk	City of Dunkirk	Local Importance	●	●	○
15	Hamlet of Black Corners	Town of Arkwright	Local Importance	●	●	●
30	Hamlet of Griswold	Town of Arkwright	Local Importance	●	○	○
39	Hamlet of Cowdens Corner	Town of Arkwright	Local Importance	●	●	●
65	Hamlet of Arkwright	Town of Arkwright	Local Importance	●	●	●
27	Hamlet of Charlotte Center	Town of Charlotte	Local Importance	●	○	○
22	Pine Valley Central Schools	Town of Cherry Creek	Local Importance	●	●	●
64	Jamestown Community College	Town of Dunkirk	Local Importance	●	●	●
38	Erie 2 Chautauqua-Cattaraugus BOCES	Town of Pomfret	Local Importance	●	●	●
40	Hamlet of Laona	Town of Pomfret	Local Importance	●	●	◘
60	Hamlet of Reed Corners	Town of Pomfret	Local Importance	●	●	●
3	Hawkins Corner	Town of Sheridan	Local Importance	●	○	◘
75	Hamlet of Cook Corners	Town of Sheridan	Local Importance	●	●	●
77	Hamlet of Sheridan	Town of Sheridan	Local Importance	●	●	●
18	Hamlet of Balcom Corners	Town of Villenova	Local Importance	●	●	●
19	Hamlet of Balcom	Town of Villenova	Local Importance	●	●	●
20	Hamlet of Hamlet	Town of Villenova	Local Importance	●	●	●
32	Village of Cassadaga	Village of Cassadaga	Local Importance	○	○	○
5	Forestville School Complex	Village of Forestville	Local Importance	●	●	●
8	Village of Forestville	Village of Forestville	Local Importance	●	●	◘

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible (field observed)*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Actual View Likely Based on Field Confirmation of Existing Line-of-sight[16]
43	Village of Fredonia	Village of Fredonia	Local Importance	●	●	◘
45	1891 Fredonia Opera House	Village of Fredonia	Local Importance	●	●	◘
46	D.R. Barker Historic Museum and Library	Village of Fredonia	Local Importance	●	●	◘
48	Rockefeller Arts Center at SUNY Fredonia	Village of Fredonia	Local Importance	●	●	◘
49	Niagara Frontier Center of Empire State College	Village of Fredonia	Local Importance	●	●	◘
50	SUNY Fredonia Off Campus Housing	Village of Fredonia	Local Importance	●	●	●
51	Village of Fredonia - Residential	Village of Fredonia	Local Importance	●	●	●
52	SUNY Fredonia	Village of Fredonia	Local Importance	●	●	◘
57	Fredonia High School	Village of Fredonia	Local Importance	●	●	●

3.3 Factors Affecting Visual Impact

To bring order to the consideration of visual resources, the inventory of visual resources is organized into several recognizable elements, as follows:

3.3.1 Landscape Units

Landscape units are areas with common characteristics of landform, water resources, vegetation, land use, and land use intensity. While a regional landscape may possess diverse features and characteristics, a landscape unit is a relatively homogenous, unified landscape of visual character. Landscape units are established to provide a framework for comparing and prioritizing the differing visual quality and sensitivity of visual resources in the study area. Discrete landscape units were identified through field inventory and air photo interpretation, and divide the study area into zones of unique patterns and visual composition. Within the visual resources study area, four distinctive landscape units were defined. These landscape units, their general landscape character, and use are as follows:

Small City – The primary land uses of this unit are commercial, industrial, institutional and medium density residential activities. This unit consists of the City of Dunkirk. This community is defined as the larger of the commercial and residential centers within the study area. Commercial services are spread throughout the unit. Built structures and streets dominate the visual landscape. Trees line many residential and commercial streets. Most buildings are two to three stories tall, including brick commercial blocks and wood frame structures. Building styles are a mix of older architectural styles (e.g. Federal, Late Victorian, Italianate) interspersed with conventional mid- to late-20th century residences and commercial architecture. The older buildings are in varying states of repair, ranging from restored to poor condition. Views are generally short distance and focused along the streetscape. The built landscape quickly transitions to undeveloped and agricultural uses to the east and west of the City.

Views within the Small City landscape unit may be considered to be of moderate visual quality depending on the character and composition of built and natural features within view.

It should be noted that the majority of the City of Dunkirk is located outside the study area.

Village Center – The study area contains the Villages of Fredonia and Forestville, and a small portion of the Village of Cassadaga. Similarly to the City of Dunkirk, these villages are primarily residential and commercial. Built structures and streets dominate the visual landscape. Each village is centered on a small downtown area based around a Main Street.

Generally, built structures and streets dominate the visual landscape in each of the villages. Trees line many of the roadways. Most buildings are one to three stories tall, including brick and wood frame structures. Buildings styles are an interesting mix of older architectural styles (e.g. predominately Federal and Late Victorian) interspersed with conventional, more modern, mid- to late-20th century residences. Some of the older buildings are very well maintained or restored while others are in various states of disrepair or alteration. Views are generally short distance and focused along streets (which are typically arranged in a grid/block pattern). Structures and trees generally block most distant views, however, filtered or framed views are possible through foreground vegetation and buildings from the perimeter of the villages. Development density drops sharply as one moves away from the central business district as the Village Center landscape unit transitions to the Rural Agricultural Landscape Unit.

Views within the Village Center landscape unit may be considered to be of moderate visual quality depending on the character and composition of built and natural features within view.

Rural Hamlet – Rural hamlets are characterized by low to medium density clusters of older residential dwellings and very limited to no retail or commercial services. Buildings are typically one to two stories tall, and include brick commercial blocks and wood frame structures. Buildings styles are an interesting mix of older architectural styles (e.g. Federal, Late Victorian, Italianate) interspersed with more modern utilitarian styles as well as pre-manufactured homes.

A number of rural crossroad hamlets exist within the study area. These areas vary in size but are generally typified by a small group of houses in an otherwise rural area. Most hamlets occur at road intersections, such as that between a state route and county route. Residences (a mix of old and new and of varying maintenance) and accessory structures (barns, garages, etc.) are a main feature of rural hamlets. Places of worship, community buildings and general stores are also common.

Roadside residences and street trees often reinforce axial views along the highway. Views are typically short distance and directed towards the main thoroughfare and adjacent structures. Structures and trees generally block most views, however, filtered or framed views beyond the hamlet may exist through foreground vegetation. Development density drops almost immediately as one moves away from the hamlet center; transitioning quickly to the character of the surrounding Rural Agricultural Landscape Unit.

The hamlets of Laona, Hamlet, Griswold, Shumla, Black Corners, and Balcom are representative of this landscape unit.

Views found within the Rural Hamlet landscape unit may be considered to be of moderate visual quality depending on the character and composition of built and natural features within view.

Rural Agricultural Landscape Unit – This landscape unit is predominantly a patchwork of open land, including working cropland/pastures and a succession of old-fields transected by property-line hedgerows, occasionally interspersed with woodlots. The terrain itself consists of relatively level topography with gentle low-lying hills and small rounded hillocks primarily under a thousand feet high, but including a few that are up to 2,000 feet. Within this Unit, population densities are very low and structures are sparsely located. Uses are predominantly agricultural and very low-density residential. Minor areas of commercial use are occasionally found along the roadside. Building stock consists primarily of permanent homes and manufactured housing, along with accessory structures (barns, garages, sheds, etc.). Structures are of varying vintage and quality. Poorly maintained or dilapidated structures and properties are not uncommon sights.

Views within the Rural Agricultural Landscape Unit are often short distance, contained by foreground vegetation and surrounding mountains. However, distant vistas are common from higher elevations across down-slope agricultural lands. Narrow and curving roads often provide an interesting series of short views of the rural landscape, but also force drivers to direct their attention to the road rather than the adjacent scenery. Some local residents and visitors may regard the aesthetic character of this landscape unit as an attractive and pastoral setting; others may view it as a working landscape, similar in character with much of rural western New York.

Views within the Rural Agricultural Landscape Unit may be considered of moderate visual quality.

3.3.2 Viewer/User Groups

Viewers engaged in different activities, while in the same landscape unit, are likely to perceive their surroundings differently. The description of viewer groups is provided to assist in understanding the sensitivity and probable reaction of potential observers to visual change resulting from the proposed Project.

Local Residents – These individuals would view the proposed Project from homes, businesses, and local roads. Except when involved in local travel, such viewers are likely to be stationary and could have frequent and/or prolonged views of the Project. They know the local landscape and may be sensitive to changes in particular views that are important to them. Conversely, the sensitivity of an individual observer to a specific view may be diminished over time due to repeated exposure.

Through Travelers – Commuters and through travelers would view the proposed Project from highways. These viewers are typically moving and focusing on the road in front of them. Consequently, their views of the proposed wind energy Project may be peripheral, intermittent, and/or of relatively brief duration. Given a general unfamiliarity or infrequent exposure to the regional or local landscape, travelers are likely to have a lower degree of sensitivity to visual change than would local residents and workers.

Recreational Users – This group generally includes all local residents involved in outdoor recreational activities, as well as visitors who come to the area specifically to enjoy the cultural, recreational, scenic resources, and open spaces of Chautauqua County.

The sensitivity of recreational users to visual quality is variable; but to many, visual quality is an important and integral part of the recreational experience. The presence of wind turbines may diminish the aesthetic experience for those that believe the rural landscape should be preserved for agricultural, rural residential, open space and similar uses. Such viewers will likely have high sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the proposed Project. For those with strong utilitarian beliefs, the presence of the proposed Project will have little aesthetic impact on their recreational experience.

While the scenic quality of the local landscape is an important aspect of the recreational experience for most visitors, viewers will also be cognizant of various foreground details, developments and other visually proximate activities. Visitors and recreational users currently view the existing working landscape, low to moderate-density roadside residential and commercial uses of varying aesthetic quality, as well as utility infrastructure.

A greater number of recreational users will be present in the region when the weather is clear and warm as compared to overcast, rainy or cold days. In addition, more recreational users will be present on weekends and holidays than on weekdays.

Tourists – Chautauqua County draws visitors looking to enjoy the historic, recreational, and scenic resources of the State forest and WMA, Lake Erie, and the wine country.

Most tourists and seasonal residents would have high sensitivity to the visual quality and landscape character, regardless of the frequency or duration of their exposure to the proposed Project. This group may view the proposed facility while traveling local roadways and visiting local points of interest including wineries.

It is important to note that Lake Erie, a tourist attraction to Chautauqua County, is not within the study area. The lakefront provides numerous activities for boating, fishing, sight-seeing and shopping. Views toward the Project area from the lakeshore would be restricted by buildings and vegetation.

3.3.3 Distance Zones

Distance affects the apparent size and degree of contrast between an object and its surroundings. Distance can be discussed in terms of distance zones, e.g., foreground, middleground and background. Distance zones established by the U.S. Forest Service and reiterated by the NYSDEC Visual Policy are used in this VRA. A description of each distance zone is provided below to assist in understanding the effect of distance on potential visual impacts.

Foreground (0-½ mile) – At a foreground distance, viewers typically have a very high recognition of detail. Cognitively, in the foreground zone, human scale is an important factor in judging spatial relationships and the relative size of objects. From this distance, the sense of form, line, color and textural contrast with the surrounding landscape is highest. The visual impact is likely to be considered the greatest at a foreground distance.

Middleground (½ mile to 3 miles) – This is the distance where elements begin to visually merge or join. Colors and textures become somewhat muted by distance, but are still identifiable. Visual detail is reduced, although distinct patterns may still be evident. Viewers from middleground distances characteristically recognize surface features such as tree stands, building clusters and small landforms. Scale is perceived in terms of identifiable features of development patterns. From this distance, the contrast of color and texture are identified more in terms of the regional context than by the immediate surroundings.

Background (3-5 miles to horizon) – At this distance, landscape elements lose detail and become less distinct. Atmospheric perspective[17] changes colors to blue-grays, while surface characteristics are lost. Visual emphasis is on the outline or edge of one landmass or water resource against another with a strong skyline element.

3.3.4 Duration/Frequency/Circumstances of View

The analysis of a viewer's experience must include the distinction between stationary and moving observers. The length of time and the circumstances under which a view is encountered is influential in characterizing the importance of a particular view.

Stationary Views – Stationary views are experienced from fixed viewpoints. Fixed viewpoints include residential neighborhoods, recreational facilities, historic resources and other culturally important locations. Characteristically, stationary views offer sufficient time, either from a single observation or repeated exposure, to interpret and understand the physical surroundings. For this reason, stationary viewers have a higher potential for understanding the elements of a view than do moving viewers.

Stationary views can be further divided to consider the effect of short-term and long-term exposure. Sites of long-term exposure include any location where a stationary observer is likely to be visually impacted on a regular basis, such as from a place of residence. Sites of short-term exposure include locations where a stationary observer is only visiting, such as recreational facilities. Although the duration of visual impact remains at the discretion of the individual observer, short-term impacts are less likely to be repeated for a single observer on a regular basis.

Moving Views – Moving views are those experienced in passing, such as from moving vehicles, where the time available for a viewer to cognitively experience a particular view is limited. Such viewers are

[17] Atmospheric Perspective: Even on the clearest of days, the sky is not entirely transparent because of the presence of atmospheric particulate matter. The light scattering effect of these particles causes a reduction in the intensity of colors and the contrast between light and dark as the distance of objects from the observer increases. Contrast depends upon the position of the sun and the reflectance of the object, among other items. The net effect is that objects appear "washed out" over great distances.

typically proceeding along a defined path through highly complex stimuli. As the tendency of automobile occupants is to focus down the road, the actual time a viewer is able to focus on individual elements of the surrounding landscape may be a fraction of the total available view time. Obviously, a driver is most affected by driving requirements.

Conversely, the greater the contrast of an element within the existing landscape, the greater the potential for viewer attention, even if viewed for only a moment by a moving viewer. Billboards along a rural highway, designed to attract attention and recognition, are an example of this condition. Furthermore, an element is more likely to be perceived in greater detail by local residents to whom it is experienced on a daily basis than it is to passers-by.

3.3.5 Summary of Affected Resources

As listed in Table 5, of the original 77 inventoried visual resources, 11 would likely be screened from the proposed Project by either intervening landform or vegetation/structures and are thus eliminated from further study. Table 6 summarizes the factors affecting visual impact (landscape unit, viewer group, distance zone and duration/frequency/circumstances of view) described above for each visual resource determined to have a potential view of the proposed Project.

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)	Moving/ Stationary
1	US Route 20	Town of Sheridan	Local Importance	29	Rural Agriculture	Travelers, Local residents/workers	4.6/Background	Moving
2	Merritt Estate Winery	Town of Sheridan	Local Importance	0	Rural Agriculture	Recreational, Local residents/workers	3.8/Background	Stationary
3	Hamlet of Hawkins Corner	Town of Sheridan	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	4.6/Background	Stationary
4	Walnut Falls	Village of Forestville	Other Places for Analysis	0	Village Center	Recreational	3.5/Background	Stationary
5	Forestville School Complex	Village of Forestville	Local Importance	21	Village Center	Local residents/workers	3.3/Background	Stationary
6	Creek Road	Town of Hanover	Other Places for Analysis	25	Rural Agriculture	Local residents/workers	2.6/Middleground	Moving
7	Hill Side Acres (WNY Land Conservancy)	Town of Arkwright	Local Importance	0	Rural Agriculture	Recreational	1.5/Middleground	Stationary
8	Village of Forestville	Village of Forestville	Local Importance	29	Village Center	Travelers, Local residents/workers	3.6/Background	Stationary
9	Bennett State Road	Town of Hanover	Other Places for Analysis	30	Rural Agriculture	Local residents/workers	4.9/Background	Moving
10	Straight Road	Town of Arkwright	Other Places for Analysis	39	Rural Agriculture	Local residents/workers	1.6/Middleground	Moving
11	Bradigan Road at Gage Road	Town of Hanover	Other Places for Analysis	34	Rural Agriculture	Local residents/workers	3.2/Background	Moving
12	Round Top Road	Town of Villenova	Other Places for Analysis	36	Rural Agriculture	Local residents/workers	2.6/Middleground	Moving
13	Prospect Road	Town of Villenova	Other Places for Analysis	44	Rural Agriculture	Local residents/workers	4.2/Background	Moving
14	Putnam Road	Town of Arkwright	Other Places for Analysis	21	Rural Agriculture	Local residents/workers	1.4/Middleground	Moving
15	Hamlet of Black Corners	Town of Arkwright	Local Importance	10	Rural Hamlet	Travelers, Local residents/workers	1.0/Middleground	Stationary
16	NYS Route 83	Town of Villenova	Local Importance	41	Rural Agriculture	Travelers, Local residents/workers	1.5/Middleground	Moving
17	Farrington Hollow Road	Town of Arkwright	Other Places for Analysis	29	Rural Agriculture	Local residents/workers	0.5/Middleground	Moving
18	Hamlet of Balcom Corners	Town of Villenova	Local Importance	14	Rural Hamlet	Travelers, Local residents/workers	4.9/Background	Stationary
19	Hamlet of Balcom	Town of Villenova	Local Importance	14	Rural Hamlet	Travelers, Local residents/workers	4.6/Background	Stationary
20	Hamlet of Hamlet	Town of Villenova	Local Importance	7	Rural Hamlet	Travelers, Local residents/workers	2.8/Middleground	Stationary
21	Plank Road	Town of Villenova	Other Places for Analysis	43	Rural Agriculture	Local residents/workers	2.6/Middleground	Moving
22	Pine Valley Central Schools	Town of Cherry Creek	Local Importance	2	Rural Agriculture	Local residents/workers	4.7/Background	Stationary
23	CR 72	Town of Villenova	Other Places for Analysis	41	Rural Agriculture	Local residents/workers	1.5/Middleground	Moving
24	Boutwell Hill State Forest and Overland Trail	Town of Arkwright	Statewide Significance	9	Rural Agriculture	Recreational	0.4/Foreground	Stationary
25	Lewis Road	Town of Charlotte	Other Places for Analysis	36	Rural Agriculture	Local residents/workers	1.0/Middleground	Stationary
26	CR 77	Town of Charlotte	Other Places for Analysis	21	Rural Agriculture	Local residents/workers	0.9/Middleground	Moving
27	Hamlet of Charlotte Center	Town of Charlotte	Local Importance	0	Rural Hamlet	Travelers, Local	3.9/Background	Stationary

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)	Moving/ Stationary
						residents/workers		
28	Canadaway Creek WMA	Town of Arkwright	Statewide Significance	1	Rural Agriculture	Recreational	0.2/Foreground	Stationary
29	Woodside Country Campground	Town of Arkwright	Local Importance	0	Rural Agriculture	Recreational	1.4/Middleground	Stationary
30	Hamlet of Griswold	Town of Arkwright	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	1.2/Middleground	Stationary
31	Tarbox Road	Town of Arkwright	Other Places for Analysis	31	Rural Agriculture	Local residents/workers	2.7/Middleground	Moving
32	Village of Cassadaga	Village of Cassadaga	Local Importance	0	Village Center	Travelers, Local residents/workers	4.9/Background	Stationary
33	Cassadaga Beach	Village of Cassadaga	Local Importance	0	Village Center	Recreational	5.0/Background	Stationary
34	Shumla Falls	Town of Arkwright	Other Places for Analysis	0	Rural Agriculture	Recreational	2.7/Middleground	Stationary
35	Arkwright Falls	Town of Arkwright	Other Places for Analysis	0	Rural Agriculture	Recreational	1.4/Middleground	Stationary
36	Fredonia Stockton Road	Town of Pomfret	Other Places for Analysis	40	Rural Agriculture	Local residents/workers	4.0/Background	Stationary
37	Center Road	Town of Arkwright	Other Places for Analysis	37	Rural Agriculture	Local residents/workers	0.3/Foreground	Moving
38	Erie 2 Chautauqua-Cattaraugus BOCES	Town of Pomfret	Local Importance	20	Rural Agriculture	Local residents/workers	2.8/Middleground	Stationary
39	Hamlet of Cowdens Corner	Town of Arkwright	Local Importance	6	Rural Hamlet	Travelers, Local residents/workers	1.5/Middleground	Stationary
40	Hamlet of Laona	Town of Pomfret	Local Importance	15	Rural Hamlet	Travelers, Local residents/workers	2.4/Middleground	Stationary
41	Russell Joy Park	Village of Fredonia	Local Importance	25	Village Center	Recreational	3.6/Background	Stationary
42	Fredonia Grange #1	Village of Fredonia	Statewide Significance	18	Village Center	Local residents/workers	3.8/Background	Stationary
43	Village of Fredonia	Village of Fredonia	Local Importance	23	Village Center	Travelers, Local residents/workers	3.5/Background	Stationary
44	Fredonia Commons Historic District	Village of Fredonia	Statewide Significance	24	Village Center	Travelers, Local residents/workers	3.7/Background	Stationary
45	1891 Fredonia Opera House	Village of Fredonia	Local Importance	24	Village Center	Travelers, Local residents/workers	3.8/Background	Stationary
46	D.R. Barker Historic Museum and Library	Village of Fredonia	Local Importance	24	Village Center	Local residents/workers	3.7/Background	Stationary
47	Fredonia Post Office	Village of Fredonia	Statewide Significance	24	Village Center	Local residents/workers	3.8/Background	Stationary
48	Rockefeller Arts Center at SUNY Fredonia	Village of Fredonia	Local Importance	25	Village Center	Local residents/workers	4.0/Background	Stationary
49	Niagara Frontier Center of Empire State College	Village of Fredonia	Local Importance	23	Village Center	Local residents/workers	3.5/Background	Stationary
50	SUNY Fredonia Off Campus Housing	Village of Fredonia	Local Importance	26	Village Center	Local residents/workers	4.8/Background	Stationary
51	Village of Fredonia - Residential	Village of Fredonia	Local Importance	21	Village Center	Local residents/workers	3.2/Background	Stationary
52	SUNY Fredonia	Village of Fredonia	Local Importance	26	Village Center	Local residents/workers	4.5/Background	Stationary
53	CR 60	Town of Pomfret	Other Places for Analysis	16	Rural Agriculture	Local residents/workers	2.5/Middleground	Moving
54	Arkwright Hills Campground	Town of Arkwright	Local Importance	5	Rural Agriculture	Recreational	0.4/Foreground	Stationary

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)	Moving/ Stationary
55	Dunkirk Post Office	Village of Fredonia	Statewide Significance	25	Village Center/ Small City	Local residents/workers	4.2/Background	Stationary
56	Chauataugua County Fairgrounds	City of Dunkirk	Local Importance	22	Small City	Recreational	4.5/Background	Stationary
57	Fredonia High School	Village of Fredonia	Local Importance	18	Village Center	Local residents/workers	3.0/ Background	Stationary
58	Dunkirk Central Schools - School #4	City of Dunkirk	Local Importance	6	Small City	Local residents/workers	4.4/Background	Stationary
59	NYS Route 60 at East Main St	Town of Pomfret	Local Importance	18	Rural Agriculture	Travelers, Local residents/workers	2.9/ Middleground	Moving
60	Hamlet of Reed Corners	Town of Pomfret	Local Importance	11	Rural Hamlet	Travelers, Local residents/workers	2.7/ Middleground	Stationary
61	Miller Road	Town of Arkwright	Other Places for Analysis	11	Rural Agriculture	Local residents/workers	0.8/Middleground	Moving
62	City of Dunkirk - Residential	City of Dunkirk	Local Importance	23	Small City	Local residents/workers	4.3/Background	Stationary
63	NYS Route 60 - Commercial Area	Town of Dunkirk	Local Importance	19	Rural Agriculture	Travelers, Local residents/workers	3.4/Background	Moving
64	Jamestown Community College	Town of Dunkirk	Local Importance	21	Rural Agriculture	Local residents/workers	4.0/Background	Stationary
65	Hamlet of Arkwright	Town of Arkwright	Local Importance	8	Rural Hamlet	Travelers, Local residents/workers	0.4/Foreground	Stationary
66	Dunkirk Central Schools - School #3	City of Dunkirk	Local Importance	5	Small City	Local residents/workers	4.7/Background	Stationary
67	City of Dunkirk	City of Dunkirk	Local Importance	24	Small City	Travelers, Local residents/workers	4.9/Background	Stationary
68	CR 81	Town of Sheridan	Other Places for Analysis	18	Rural Agriculture	Local residents/workers	3.1/ Background	Moving
69	Kosciuszko Park	City of Dunkirk	Local Importance	23	Small City	Recreational	4.3/Background	Stationary
70	NYS Thruway I-90	Town of Sheridan	Local Importance	20	Rural Agriculture	Travelers, Local residents/workers	3.0/Background	Moving
71	Woodbury Vineyards	Town of Sheridan	Local Importance	14	Rural Agriculture	Recreational, Local residents/workers	1.9/Middleground	Stationary
72	NYS Route 39 at US Route 20	Town of Sheridan	Local Importance	20	Rural Agriculture	Travelers, Local residents/workers	2.8/Middleground	Moving
73	Chautauqua County Dunkirk Airport	Town of Sheridan	Local Importance	24	Rural Agriculture	Travelers, Local residents/workers	4.4/Background	Stationary
74	NYS Route 39	Town of Sheridan	Local Importance	20	Rural Agriculture	Travelers, Local residents/workers	2.7/Middleground	Moving
75	Hamlet of Cook Corners	Town of Sheridan	Local Importance	22	Rural Hamlet	Travelers, Local residents/workers	3.3/Background	Stationary
76	Roberian Winery	Town of Sheridan	Local Importance	19	Rural Agriculture	Recreational, Local residents/workers	3.4/Background	Stationary
77	Hamlet of Sheridan	Town of Sheridan	Local Importance	21	Rural Hamlet	Travelers, Local residents/workers	4.0/Background	Stationary

3.4 Degree of Project Visibility

3.4.1 Field Observation and Photography

On February 9, 2009 a field crew visited predetermined locations to document existing visibility in the direction of proposed wind turbines. All photographs were taken using a 12.2-mega pixel digital camera with a lens setting of approximately 50mm[18] to simulate normal human eyesight relative to scale. The location selected for each photograph was judged by the field observer to be the most unobstructed line-of-sight to the turbine area from the specified location. To the degree possible, photographs were taken at a time of day when the sun was to the back of the photographer to minimize the effect of glare within the camera's field of view and to maximize visible contrast of the landscape being photographed.

The precise coordinates of each photo location were recorded in the field using a handheld global positioning system (GPS) unit. To determine the direction of the proposed wind turbines from each photo location, the precise coordinates of all proposed turbines were pre-programmed into the GPS as a "waypoint." The GPS waypoint direction indicator (arrow pointing along calculated bearing) was used to determine the appropriate bearing for the camera, so that a desired turbine, or grouping of turbines, would be generally centered in the field of view of each photograph.

Weather conditions on all days in the field generally ranged from sunny to mostly cloudy. Because of the winter conditions while in the field, all photos contain a varying amount of snow cover.

3.4.2 Photo Simulations

Selection of Key Receptors for Photo Simulation – To demonstrate how the actual turbines will appear within the study area, photo simulations were prepared from 13[19] predetermined locations. The location for each of the simulations was based on input received during the fall of 2008 from the Town of Arkwright (Table 7).

Table 7 Identified Locations for Photo Simulation

Map ID	Receptor Name
S1	NYS Route 83 and Center Road
S2	Straight Road and Center Road
S3	Arkwright Town Hall
S4	Arkwright Hills Campground (Entrance from NYS Route 83)
S5	Meadows Road and NYS Route 83
S6	Meadows Road and Center Road
S7	Ruttenburg Road and Farrington Hollow Road
S8	Ruttenburg Road and Rood Road
S9	Ball Road and Center Road
S10	Weaver Road and Center Road
S11	Corner of Cable Road and Miller Road
S12	Straight Road
S13	Ball Road
S14	Farrington Hollow Road (Transmission Line Simulation)
S15	NYS Route 83 (Transmission Line Simulation)

In addition to these 13 locations, two (2) additional locations were selected to show how the proposed 34.5 kV transmission line would appear in the landscape. The

[18] A Canon EOS Rebel XSi digital SLR with an 18-55milimeter (mm) zoom lens was used for all Project photography. This digital camera, similar to most digital SLR cameras, has a sensor that is approximately 1.6 times smaller than a comparable full frame 35mm film camera. Recognizing this differential, the zoom lens used was set to approximately 31mm to achieve a field-of-view comparable to a 50mm lens on a full frame 35mm camera (31mm x 1.6 = 50mm).

[19] Visibility of the Project from the intersection of Bard Road and Burnham Road was not confirmed; therefore a simulation was not completed from this location. The Town of Arkwright also requested this location be considered for the completion of a simulation.

locations (Table 7) were selected to be within close proximity to the transmission line so that visibility of the slender transmission structures would be the greatest.

All completed simulations identified in Table 7 are contained in Appendix A. Those simulations completed for the original New Grange Wind Farm are presented in Appendix B. These simulations are based on the DEIS layout and are contained in this VRA for informational purposes.

Photo Simulation Methodology – A photo simulation of the proposed Project will be prepared from each key location identified in Table 7. Photo simulations are developed by superimposing a rendering of a three-dimensional computer model of the proposed Project into the base photograph taken from each corresponding location (see section 3.4.1). The three-dimensional computer model was developed using *Autodesk Civil 3D 2009® and 3D Studio Max Design 2009®* software (3D Studio Max).

Simulated perspectives (camera views) will then be matched to the corresponding base photograph for each simulated view by replicating the precise coordinates of the field camera position (as recorded by GPS) and the focal length of the camera lens used (e.g. 50mm). Precisely matching these parameters assures scale accuracy between the base photograph and the subsequent simulated view. The cameras elevation (Z) value is derived from Digital Elevation Model (DEM) data plus the cameras height above ground level. The camera's target position was set to match the bearing of the corresponding existing condition photograph as recorded in the field. With the existing conditions photograph displayed as a "viewport background," and the viewport properties set to match the photograph pixel dimensions, minor camera adjustments were made (horizontal and vertical positioning, and camera roll) to align the horizon in the background photograph with the corresponding features of the 3D model.

To verify the camera alignment, visible elements (e.g. structures, towers, roads) within the photograph are identified and digitized from digital orthophotos. Each element is assigned a Z value based on DEM data and then imported to 3D Studio Max. A 3D Terrain model is also created (using DEM data) to replicate the existing site topography. The digitized elements are then aligned with corresponding elements in the photograph by adjusting the camera target. If necessary, slight camera adjustments are made to ensure and accurate alignment.

Once the camera alignment is verified, a to-scale 3D Model of the proposed Project is merged into the model space. The 3D model of the proposed project is intended to accurately convey the current design intent. To the extent practicable, and to the extent necessary to reveal impacts, design details of the proposed turbines[20] were built into the 3D model and incorporated into the photo simulation.

[20] For the development of the simulations, the appearance of the turbines is based on the specifications of Vestas V90 1.8MW turbines with a 80-meter (263 ft.) hub height and 90-meter (295 ft.) diameter blades, this is considered as worst-case. The blade tip height (blade in upright position) used in the simulations was 410 feet. A specific turbine type has not been selected as the Applicant is also considering the Suzlon S88, which is smaller than the Vestas V90. The appearance of the transmission structures is based on generic details provided by the Applicant. The height of all transmission structures contained in the simulations is 60 feet, has an average spacing of 230 feet between poles, and a right-of-way clearing of 150 feet. Final design of the transmission line will be included in the FEIS.

Consequently, the scale, alignment, elevations and location of the visible elements of the proposed facilities are true to the conceptual design.

With the model in place, a daylight system is created based on the exact date and time of the photograph. Regional inputs such as time zone and location are also applied to the daylight system. To accurately depict "reflected light" a ground plane utilizing the previously created mesh (based on DEM data) is placed in the scene. This ground plane also portrays any additional shadows cast by the proposed Project. The camera view is then rendered and saved.

The rendered view was then opened using *Adobe Photoshop CS2* software for post-production editing (e.g. airbrush out portion of turbines that fall below foreground topography and vegetation). In some cases a minor haze may be applied to the proposed project to increase realism and show distance fall-off.

<u>Arms Length Rule</u> – The photo simulations included in Appendix A have been printed using an 11”x17” page format. At this image size, the page should be held at approximately arms length[21] so that the scene will appear at the correct scale. Viewing the image closer would make the scene appear too large and viewing the image from greater distance would make the scene appear too small compared to what an observer would actually see in the field.

For viewing photo simulations at other page sizes (i.e., computer monitor, projected image or other hard copy output) the viewing distance/page width ratio is approximately 1.5/1. For example, if the simulation were viewed on a 42-inch wide poster size enlargement, the correct viewing distance would be approximately 63 inches, or 5 ¼ feet.

<u>Field Viewing</u> – The photo simulations present an accurate depiction of the appearance of proposed turbines suitable for general understanding of the degree and character of Project visibility. However, these images are a two-dimensional representation of a three-dimensional landscape. The human eye is capable of recognizing a greater level of detail than can be illustrated in a two-dimensional image. Agency decision-makers and interested parties may benefit from viewing the photo simulations in the field from any or all of the simulated vantage points. In this manner, observers can directly compare the level of detail visible in the base photograph with actual field observed conditions.

3.5 Character of Project Visibility

3.5.1 Compatibility with Regional Landscape Patterns

The visual character of a landscape is defined by the patterns, forms and scale relationships created by lines, colors, and textures. Some patterns dominate while others are subordinate. The qualitative impact of a Project is the effect the development has on these patterns, and by corollary on, the visual character of the regional landscape.

[21] Viewing distance is calculated based a 39.6-degree field-of-view for the 50mm camera lens used, and the 15.5” wide image presented in Appendix A. “Arm’s length” is assumed to be approximately 22.5 inches from the eye. Arm’s length varies for individual viewers.

Existing Landscape – The visible patterns (form, line, color, and texture) found within the Project region can best be described as representative of the agricultural landscape typical of the region. Given the rural nature of the study area, visible colors are natural, muted shades of green, brown, gray, and other earth tones. When viewed from a distance, the landscape maintains a rather uniform and unbroken blending of colors, which tend to fade with hazing of varying atmospheric conditions.

The following describes the compatibility of the proposed Project with regional landscape patterns within which it is contained and viewed. This evaluation is graphically depicted in the photographic simulations provided in Appendix A.

Form – The form of the regional landscape is essentially a planar landscape. The woodland edge of agricultural fields commonly creates a brief vertical offset of the prevailing planar form. The proposed wind energy Project will be comprised of 44 thin tapered vertical structures distributed throughout the landscape; topped with large rotating blades. The introduction of such clearly man-made and kinetic structures creates a noticeable visual disruption of the agricultural landscape.

Line – The existing landscape maintains a horizontal line formed by extended vistas over an agricultural plain that often forms the visible horizon. The well-defined vertical form of 44 turbines that may be visible across this plain introduces a contrasting and distinct perpendicular element into the landscape. Views will commonly include multiple turbines at varying distances from the viewer. It is anticipated that the turbines will most commonly be viewed in an off-axis manner creating the appearance of a rather random arrangement.

Color – Generally, the neutral off-white color of the proposed turbine tower, nacelle and blades will be viewed against the background sky. Under these conditions the turbines would be highly compatible with the hue, saturation and brightness of the background sky and distant elements of the natural landscape. Color contrast will decrease with increasing distance and/or periods of increased atmospheric haze or precipitation.

Texture – Tubular style monopole towers have been specifically selected, instead of skeletal (or lattice) frame towers, to minimize textural contrast and provide a more simple, visually appealing form.

Scale/Spatial Dominance – The proposed wind turbines will be the tallest visible elements on the horizon and will be disproportionate to other elements (e.g. silos) commonly visible on the regional landscape. From most foreground and middleground vantage points the contrast of the proposed turbines with commonly recognizable features, such as structures and trees, will result in the proposed Project being perceived as a highly dominant visual element. However, when viewed from background vantage points, perceived scale and spatial dominance of the turbines begins to lessen.

3.5.2 Visual Character during the Construction Period

Construction of the proposed wind turbines will require use of large mobile cranes and other large construction vehicles. Turbine components will be delivered in sections via large semi-trucks. The construction period for each turbine is expected to be quite short. As such, construction related visual impacts will be brief and are not expected to result in adverse prolonged visual impact to area residents or visitors.

3.6 Shadow Flicker Analysis

Wind turbines can cause a flickering effect when the rotating turbine blades cast shadows that move across the ground and nearby structures. This can cause a disturbance within structures when the repeating pattern of light and shadow falls across the unshaded windows of buildings, particularly when occupants are trying to read or watch television. The effect, known as shadow flicker, is most conspicuous when windows face a rotating wind turbine and when the sun is low in the sky (e.g., shortly after sunrise or shortly before sunset).

While the study of shadow flicker is a relatively new discipline, evidence from operational turbines suggests that the intensity of shadow flicker is only an issue at short distances. It is generally accepted that shadow flicker will have no affect on properties at a distance further than ten (10) turbine rotor diameters from the turbine.[22] Shadow flicker will only occur when certain conditions coincide:

- Daylight hours (sunrise to sunset) – shadow flicker does not occur at night;
- Sunshine – shadow flicker will not occur on foggy or overcast days when daylight is not sufficiently bright to cast shadows;
- Receptor is within ten (10) rotor diameters of the turbine – beyond this distance a person should not perceive a wind turbine to be chopping through sunlight, but rather as an object with the sun behind it.[23]
- Windows face the turbine – turbine shadows can only enter a structure through unshaded windows; and
- Turbine is rotating – shadow flicker will not occur when the turbine isn't in operation.

Because of constantly changing solar aspect and azimuth, shadows will be cast on specific days of the year and will pass a stationary receptor (i.e. residential structure) relatively quickly. Flicker will not be an everyday event or be of extended duration when it does occur. For those receptors located to the west of a turbine, it is more likely to fall within the shadow zone shortly after sunrise when affected residents are typically asleep with shades drawn. For those receptors located to the east of a turbine, it is more likely to fall within the shadow zone shortly before sunset (see Figure 5 for typical shadow pattern).

When the rotor plane is in-line with the sun and receptor (as seen from the receptor), the cast shadows will be very narrow, of low intensity, and will move quickly past the stationary receptor. When the rotor plane is perpendicular to the sun-receptor "view line," the cast shadow of the blades will move within a larger elliptical area.

[22] http://www.meridianenergy.co.nz
[23] http://www.dti.gov.uk

The distance between a wind turbine and a receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and "focused." This is because a greater proportion of the sun's disc is intermittently blocked. Similarly, flickering is also more intense if created by the area of a blade closer to the rotor and further from the tip. Beyond ten (10) turbine diameters the intensity of the blades shadow is considered negligible and at such a distance there will be virtually no, or limited, distinct chopping of the sunlight.

3.6.1 Shadow Flicker Methodology

The shadow flicker analysis was conducted using *WindPRO 2.4 Basis* software (WindPro), and associated shadow module, a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Variables used for shadow calculations include:

> Sunshine probabilities (percentage of time from sunrise to sunset with sunshine) – The WindPro model calculates shadow frequency based on monthly sunshine probabilities. The following sunshine probabilities were used for this analysis and are based on historic meteorological data for Buffalo, NY, approximately 52 miles northeast of the Project site.[24]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31%	38%	46%	51%	56%	65%	67%	64%	57%	50%	29%	27%

> Operational Time/Rotor Orientation – The WindPro model assumes there will be no shadow flicker during calm winds (when the blades are not turning). Moreover, the orientation of the rotor (e.g., determined by wind direction) affects the size of a shadow cast area. To more accurately calculate the amount of time a shadow will be over a specific location (based on rotor orientation), the WindPro model considers typical wind direction. The following operational time (hours per year [hrs/yr]) of wind direction is based on meteorological data collected by the Applicant from October 2004 to December, 2007:

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
309	455	440	374	427	374	844	1,497	1,276	1,486	949	329

The shadow flicker analysis has been undertaken for the proposed 44-turbine layout using a Vestas V90 turbine with a rotor diameter of 90 meters and a hub height of 80 meters. The Vestas V90 is one of the turbine types being considered for this project and is being used to represent worst-case impact. The turbine has three blades (as illustrated in the simulations contained in Appendix A and B) and rotates at a maximum speed of approximately 15 revolutions per minute. The frequency of flickering is directly related to the number of blades and rotor speed. This analysis, which includes the effect of topography on the potential shadow area, has been completed for a distance of 3,000 feet (approximately 914 meters, which exceeds the ten (10) rotor diameters of 900 meters) from each turbine location. In order to account for changes in topography, the shadow flicker model uses the same digital elevation model (DEM) used in completing the viewshed analysis (description of DEM is described above).

Using these variables, WindPro was used to calculate the theoretical number of hours per year the shadow of a rotor would fall at any given location within 3,000 feet of a turbine. This calculation

[24] http://ggweather.com (data for Buffalo, NY)

includes the cumulative sum of shadow hours for all turbines and is accurate to a 10-meter grid cell resolution. Providing cumulative hours for a receptor does not take into account activities within the dwelling (i.e. rooms of primary use and enjoyment versus less frequently occupied rooms) or account for the direction/location of windows. Figure 6, illustrates the geographic area of cumulative shadow impact using the following increments:

- 0-2 hrs/yr;
- 2-10 hrs/yr;
- 10-20 hrs/yr;
- 20-30 hrs/yr;
- 30-40 hrs/yr; and
- 40+

WindPro does not have the capability to incorporate the possible screening effect of existing vegetation. To account for this more realistic condition, a second shadow map was prepared excluding areas determined through viewshed analysis to be screened from the turbines by existing vegetation. This vegetated condition shadow map, although not considered absolutely definitive, acceptably identifies the geographic area within which one would expect to be substantially screened from turbine shadows by intervening vegetation. Figure 7, illustrates the geographic area of cumulative shadow impact including the screening effect of existing vegetation.

3.6.2 Shadow Flicker Impact on Existing Structures

There are 205 existing structures located within a 3,000 feet of the proposed turbines. These structures were identified through a combination of air-photo interpretation and field verification. Table 8 summarizes the number of hours per year each inventoried structure would theoretically fall within the shadow zone of one or more proposed turbine, the maximum potential shadow hours per day, the number of potential days the receptor may experience shadow flicker[25], whether the structure is owned by a landowner participating in the project, and whether the structure has visibility of the Project. The location of inventoried structures is included in Figure 6 and Figure 7.

[25] The maximum potential shadow hours per day and number of potential days the receptor may experience shadow flicker may be considered worse case.

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year[26]	Project Participant?	Does the Receptor Have Visibility of the Project?[27]	Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year	Project Participant?	Does the Receptor Have Visibility of the Project?
4	0:34	165	13:03	No	No	43	0:22	72	4:17	No	No
6	0:42	96	7:12	No	No	44	0:29	110	8:45	Yes	No
7	0:19	56	2:24	No	No	45	0:24	60	4:31	No	Yes
8	0:53	117	8:53	No	No	50	0:22	66	3:04	No	No
9	0:24	78	3:29	No	Yes	51	0:33	150	20:22	No	Yes
10	0:26	92	4:48	Yes	Yes	52	0:30	115	11:26	No	No
11	0:28	58	3:42	No	Yes	53	0:39	205	26:27	Yes	No
12	0:40	76	6:08	Yes	No	54	1:09	186	31:44	Yes	No
13	0:17	50	2:02	No	No	55	0:47	210	24:52	Yes	No
14	0:00	0	0:00	No	No	56	0:43	198	23:26	Yes	No
15	0:00	0	0:00	Yes	No	57	0:56	221	25:09	Yes	No
16	0:25	64	4:40	No	Yes	58	0:40	178	20:07	Yes	Yes
17	0:21	42	2:24	No	Yes	59	0:49	203	21:56	Yes	Yes
18	0:23	72	3:31	No	No	60	0:31	133	11:16	Yes	No
19	0:22	54	3:31	No	Yes	61	0:28	135	9:30	No	No
20	0:21	62	3:27	No	Yes	62	0:27	177	10:39	No	No
21	0:19	52	2:06	No	Yes	63	0:48	162	13:25	No	Yes
22	0:18	40	1:39	No	No	64	0:28	194	18:05	No	Yes
23	0:21	85	3:59	No	Yes	65	0:32	176	17:04	Yes	No
24	0:25	96	4:48	No	Yes	66	0:26	180	14:30	Yes	No
25	0:29	134	8:44	No	No	67	0:28	138	10:45	No	No
26	0:25	91	6:06	Yes	Yes	68	0:25	183	13:13	No	No
27	0:43	80	5:48	No	Yes	69	0:26	148	9:40	No	No
28	0:42	90	5:51	No	Yes	70	0:24	131	8:38	No	No
29	0:41	68	5:10	No	No	71	0:22	143	9:06	No	Yes
31	0:34	77	6:01	No	No	72	0:21	137	7:58	No	No
32	0:31	106	7:23	No	Yes	73	0:22	147	9:54	No	Yes
33	0:42	120	7:41	No	Yes	74	0:20	122	7:15	No	No
34	0:24	62	3:35	No	No	75	0:20	127	7:59	No	Yes
35	0:17	46	2:20	No	Yes	76	0:21	154	12:15	No	No
36	0:16	57	2:39	No	Yes	77	0:26	161	10:07	No	Yes
37	0:16	32	1:25	No	No	78	0:25	181	11:38	No	No
38	0:00	0	0:00	No	No	79	0:33	201	14:35	Yes	No
39	0:27	42	3:01	No	No	80	0:41	172	16:57	Yes	No
40	0:27	50	3:42	No	No	81	0:29	137	8:53	Yes	No
42	0:35	94	8:23	No	No	82	0:37	213	26:46	No	No

[26] Hours based on topography only.
[27] Visibility based on topography and vegetation viewshed data used for Figure 2.

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year[26]	Project Participant?	Does the Receptor Have Visibility of the Project?[27]	Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year	Project Participant?	Does the Receptor Have Visibility of the Project?
83	1:11	148	18:28	No	Yes	128	0:16	94	3:25	No	No
87	0:22	90	11:33	No	No	129	0:14	78	2:47	No	No
88	0:00	0	0:00	No	No	130	0:14	71	2:26	Yes	No
89	0:32	129	16:52	No	No	131	0:34	34	2:24	Yes	No
90	0:24	54	5:20	No	Yes	132	0:56	88	13:08	Yes	No
91	0:24	99	9:20	No	No	133	0:31	119	10:20	No	No
92	0:26	121	11:54	No	No	134	0:21	75	6:30	No	Yes
93	0:28	117	10:17	No	No	135	0:23	64	6:16	No	No
94	0:28	100	8:49	No	No	136	0:36	238	32:52	Yes	Yes
95	0:37	64	7:18	No	Yes	137	0:39	203	23:49	Yes	No
96	0:35	65	6:36	No	Yes	138	0:39	228	25:55	Yes	No
97	0:41	53	9:04	No	Yes	139	0:49	168	26:28	No	No
98	0:42	54	10:06	No	Yes	140	0:29	153	16:42	No	Yes
99	0:45	57	11:16	No	Yes	141	1:10	113	21:25	Yes	Yes
100	0:38	49	8:21	No	Yes	142	0:46	119	20:31	No	No
101	0:43	153	20:19	No	Yes	143	0:53	142	27:50	No	Yes
102	0:50	107	9:08	No	Yes	144	0:49	143	26:35	Yes	Yes
103	0:48	108	11:32	No	No	145	0:31	70	8:23	Yes	Yes
104	0:57	115	10:41	No	No	146	0:31	73	8:45	Yes	Yes
105	0:28	36	3:23	Yes	Yes	147	0:34	77	9:54	No	Yes
106	0:21	27	2:05	Yes	Yes	148	0:35	91	16:02	Yes	No
107	0:20	26	2:05	No	Yes	154	0:37	117	11:54	No	No
108	0:19	23	1:45	No	Yes	155	0:37	141	13:15	No	No
109	0:18	23	1:32	No	No	156	0:51	94	18:12	Yes	Yes
110	0:16	19	1:09	No	No	157	0:00	0	0:00	Yes	No
111	0:26	52	2:53	No	Yes	161	0:20	90	4:57	Yes	Yes
113	0:48	190	28:43	Yes	Yes	162	0:24	74	5:05	Yes	Yes
114	0:49	189	31:47	No	Yes	163	0:20	47	3:46	No	Yes
115	0:57	125	18:01	No	No	164	0:50	119	31:17	No	Yes
116	0:17	87	4:37	No	Yes	165	0:28	84	11:17	No	No
117	0:17	78	4:12	No	Yes	166	0:27	60	8:37	No	No
118	0:21	94	7:03	Yes	Yes	167	0:00	0	0:00	No	No
119	0:38	144	17:31	No	Yes	168	0:00	0	0:00	No	No
120	0:26	89	7:24	No	No	169	0:25	62	6:11	Yes	Yes
121	0:18	107	5:34	No	Yes	170	0:58	206	30:17	Yes	No
122	0:18	50	4:03	No	No	171	1:23	229	36:03	Yes	No
124	0:31	156	15:59	Yes	No	172	1:06	258	37:59	Yes	No
125	0:36	106	18:31	No	Yes	173	1:02	180	36:08	No	No
126	0:46	86	11:58	Yes	Yes	174	0:52	215	44:30	Yes	No

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year[26]	Project Participant?	Does the Receptor Have Visibility of the Project?[27]	Map ID*	Maximum Potential Shadow Hours per Day	Shadow Days per Year	Maximum Potential Shadow Hours per Year	Project Participant?	Does the Receptor Have Visibility of the Project?
175	0:28	116	12:01	No	No	210	0:24	34	3:16	No	Yes
176	0:00	0	0:00	No	No	211	0:40	92	9:58	No	Yes
177	0:22	67	9:46	No	Yes	212	0:33	72	7:32	Yes	Yes
178	0:45	183	36:26	No	No	213	0:26	71	6:13	Yes	Yes
179	0:45	139	12:03	No	No	214	0:26	78	6:16	No	No
180	0:48	161	18:38	No	No	215	0:29	100	8:01	Yes	Yes
181	0:35	118	8:19	No	No	216	0:19	25	1:56	No	Yes
182	0:32	102	6:44	No	No	217	0:22	36	2:32	No	Yes
183	0:29	84	4:41	No	No	218	0:16	50	1:43	No	No
184	0:25	58	3:19	No	No	219	0:17	78	4:20	No	Yes
185	0:25	42	2:08	No	No	220	0:19	59	3:48	No	No
186	0:00	0	0:00	No	No	221	0:22	51	3:18	No	Yes
187	0:00	0	0:00	No	No	222	0:24	48	3:20	No	No
188	0:00	0	0:00	No	No	223	0:27	50	4:09	No	Yes
189	0:00	0	0:00	No	No	224	0:12	20	0:53	Yes	No
190	0:37	72	6:37	No	Yes	225	0:00	0	0:00	Yes	No
191	0:00	0	0:00	No	No	226	0:42	128	29:00	No	Yes
200	0:23	59	7:25	No	No	227	0:22	67	9:46	No	Yes
201	0:00	0	0:00	Yes	No	228	0:19	58	2:36	No	No
202	0:28	30	1:47	No	No	229	0:30	133	13:18	No	Yes
203	0:14	20	1:09	No	Yes	230	0:34	115	10:31	No	Yes
204	0:16	49	2:39	No	Yes	231	0:33	164	15:17	No	No
205	0:21	88	6:47	No	Yes	232	0:37	110	9:33	No	Yes
206	0:28	48	4:04	No	Yes	233	0:38	186	18:48	No	No
207	0:15	31	1:26	No	Yes	234	0:15	28	0:49	No	No
208	0:14	36	1:21	No	No	236	0:53	207	36:05	Yes	Yes
209	0:13	41	1:37	No	No	237	0:34	148	13:43	No	No
						238	0:38	101	12:20	No	No

* Those receptors (residences) located in Figures 6 and 7 are presented in this table.

Of the 205 studied shadow receptors located within 10 rotor diameters (based on topography only):

> 29 (14.1%) will theoretically be impacted 0-2 hrs/yr;
> 101 (49.3%) will theoretically be impacted 2-10 hrs/yr;
> 46 (22.4%) will theoretically be impacted 10-20 hrs/yr;
> 18 (8.8%) will theoretically be impacted 20-30 hrs/yr;
> 10 (4.9%) will theoretically be impacted 30-40 hrs/yr; and
> 1 (0.5%) will theoretically be impacted 40+ hrs/yr.

There are ten receptors that will theoretically be impacted more than 30 hours per year. These include:

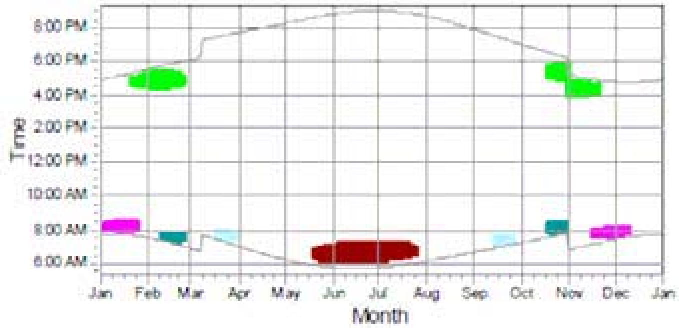
- Receptor 54 (31:44 hours);
- Receptor 114 (31:47 hours);
- Receptor 136 (32:52 hours);
- Receptor 164 (31:17 hours);
- Receptor 170 (30:17 hours);
- Receptor 171 (36:03 hours);
- Receptor 172 (37:59 hours);
- Receptor 173 (36:08 hours);
- Receptor 174 (44:30 hours);
- Receptor 178 (36:26 hours); and
- Receptor 236 (36:05).

Of those receptors that exceed 30 hours, only receptors 114, 136, 164, and 236 have a potential view of the proposed Project. Of these four (4) receptors, two (2) receptors that will theoretically be impacted more than 30 hours per year and are not participating in the Project are receptors 114 and 164. In addition, based on the data presented in Table 8, approximately one-half (50.7%) of the 205 receptors will not have visibility of the Project. It is anticipated that those receptors without a view of the Project will not be impacted by the shadow flicker caused by the turbines.

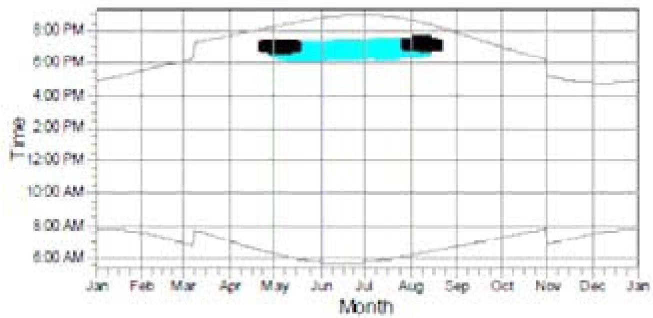
For those receptors, that are not participating in the Project and that have potential visibility[28], Figure 4 shows the general time period during each month when shadow may affect the receptor (each color within the graph symbolizes a different turbine). Shadow will not be evident every day and for the entire amount of time shown.

[28] Based on data used to complete Figure 2.

Figure 4 Months and Time of Day Receptors 114 and 164 May Receive Shadow

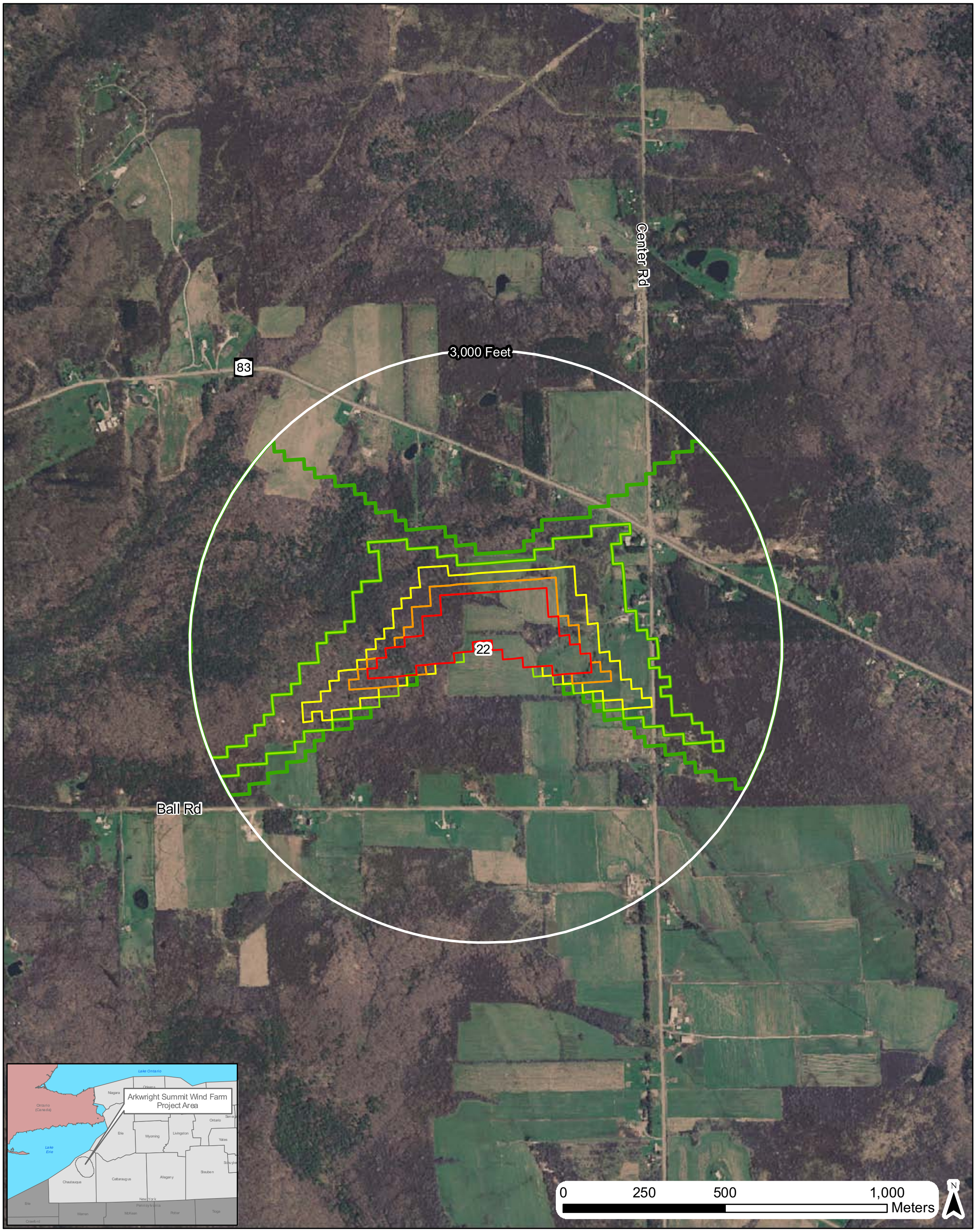


Receptor 114



Receptor 164

There are no regulations or guidelines that establish an acceptable degree of shadow flicker impact on a potential receptor. Based on the limited number of hours any structure may be impacted, shadow flicker is not expected to create an adverse impact on most nearby residential dwellings. For residences where shadow flicker is greatest, this impact might be considered an annoyance by some, and unnoticed by others. For those that find the shadow flicker an annoyance, mitigation of the disturbance within a specific room may be implemented by the use of window shades or awnings.



TYPICAL SHADOW PATTERN FROM WTG # 22

Figure 5
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

22 Proposed Wind Turbine

Shadow Hours Per Year

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- > 40

This map is computer generated using data acquired by Saratoga Associates from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to establish boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required.
File Location: B:\2008\08001\arkwright_typ_flicker_090223.mxd

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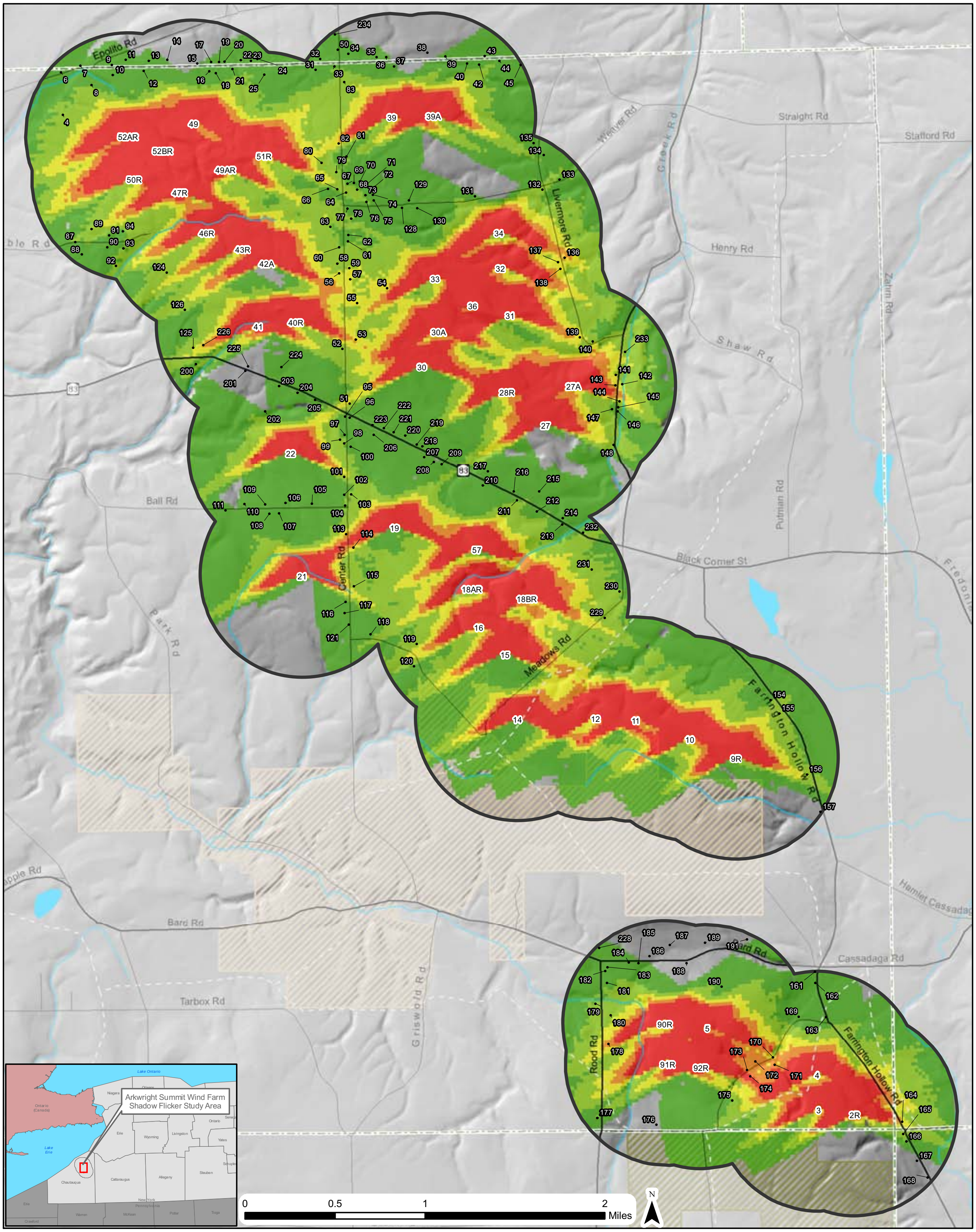
ARKWRIGHT SUMMIT WIND FARM



SHADOW FLICKER ANALYSIS TOPOGRAPHIC

Figure 6
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 25 Shadow Receptor
- 22 Proposed Wind Turbine
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

3,000-Foot Study Area

Shadow Hours Per Year

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- > 40

This map is computer generated using data acquired by Saratoga Associates from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to provide boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required. File Location: B:\2008\08001\arkwright_flicker_topo_090305.mxd

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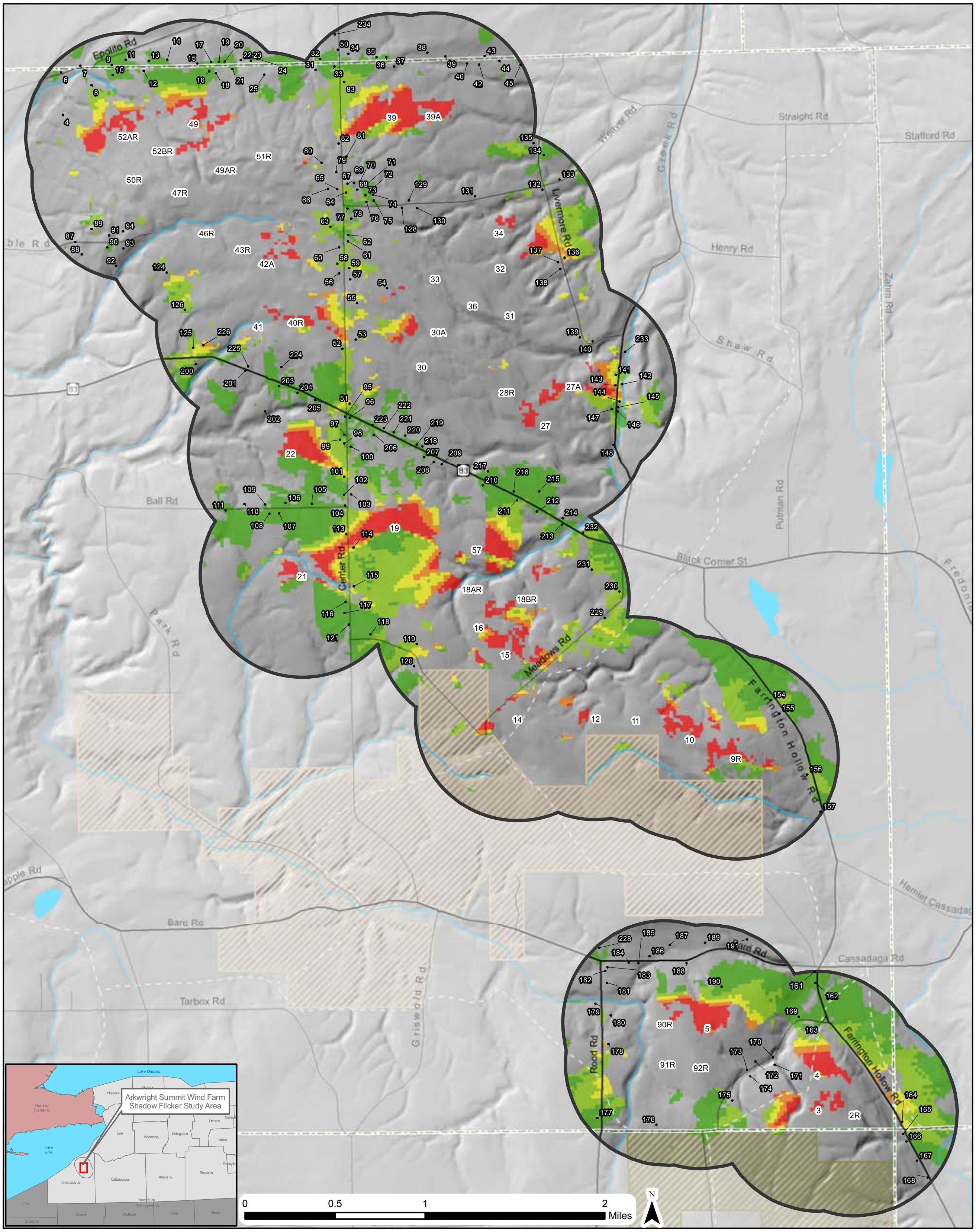
ARKWRIGHT SUMMIT WIND FARM



SHADOW FLICKER ANALYSIS VEGETATED*

*Blade tip hight 125 m (410 ft). Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Figure 7
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 25 Shadow Receptor
- 22 Proposed Wind Turbine
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

3,000-Foot Study Area

Shadow Hours Per Year

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- > 40

PROJECT # 2008 - 2008-001.10M -
This map is computer generated using data acquired by Saratoga Associates from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to establish boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required. File Location: B:\2008\08001\arkwright_flicker_veg_090305.mxd

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ARKWRIGHT SUMMIT WIND FARM

4.0 Mitigation Program

Professional Design

> Wind turbine design is largely driven by aerodynamic efficiency. The applicant is limited in selection of turbine styles to designs presently offered by wind turbine manufacturers. To minimize visual complexity, tubular style towers will be used instead of lattice frame towers to simplify visual form.

> Roads will be designed to generally follow topographic contours to minimize cut and fill and will be located in agricultural lands to the greatest extent possible to minimize vegetative cuts.

> Proposed turbines will not be used for commercial advertising, or include conspicuous lettering or corporate logos identifying the Project owner or equipment manufacturer.

> The Applicant will maximize to the extent possible the subsurface routing of electrical interconnects used to transmit power from between turbine locations.

Screening

> Considering the proposed Project includes 44 wind turbines that will be visible over a wide viewshed area, traditional treatments such as fences, earthen berms and vegetative screening cannot be applied in an effective manner to screen these major structures.

> Perimeter screen plantings will be used to minimize visibility of the proposed substation and operations/maintenance buildings from the public right-of-way.

> Window shades may be utilized by residences in the event shadows cast by the turbines become a nuisance.

Project Siting/Relocation

> The proposed Project is located in the Town of Arkwright for the following reasons:
  - Favorable elevation and exposure of the Project area which is well suited for receiving prevailing winds;
  - Reliable winds that meet the necessary criteria for a commercially viable wind energy project; and
  - The relatively low population of the Project area.

  By their very nature, modern wind energy projects are large and highly visible facilities. The need to position wind turbines in areas of higher elevation cannot be readily avoided. Given the necessary scale of wind energy turbines and the number of turbines required for a sustainable project, there is no opportunity to substantially relocate the Project or any of its components to other sites in the Arkwright area where it would be significantly less visible.

> Proposed turbines will maintain a minimum setback from residential structures. Such separation of uses assures maximum screening benefit of existing woodland vegetation, where such exists.

> Turbine placement will be largely dictated by Project boundaries, environmental constraints, proximity to residential structures, and the positioning of adjacent wind turbines. However,

particularly in response to impacts to specific high value resources, some repositioning of turbines may take place to reduce or eliminate impacts.

Camouflage/Disguise

> The color of the blades, nacelle, and tower will be a neutral off-white. While the FAA mandates this color for aviation safety, this color is well suited to minimize visual contrast with the background sky.

Low Profile/Downsizing

> The proposed Project includes wind energy-generating turbines in sufficient number to produce up to 79.8 MW of electricity. The number of proposed turbines have been reduced from 47 to 44.

> The profile of the wind turbines is dictated by operational efficiency. Because wind turbine power extraction is a function of the cube of wind speed (relatively large increases in power from small increases in wind speed), the height of a tower plays an important role in overall energy production. Reducing the height of the turbines to a meaningful degree would substantially reduce the amount of energy produced rendering the development of the Project impractical or would require constructing a greater number of smaller units to be economically viable.

Alternate Technologies

> Wind energy itself is an alternative to traditional energy sources. Meaningful development of renewable wind energy will reduce reliance on fossil fuel combustion and nuclear fission facilities and result in reduction in air pollutants and greenhouse gasses. A single 750-kilowatt (0.75MW) wind turbine, operated for one year at a site with Class 4 wind speeds (winds averaging 12.5-13.4 mph at 10 meters height), can be expected to displace a total of 1,179 tons (2.36 million pounds) of carbon dioxide, 6.9 tons of sulfur dioxide, and 4.3 tons of nitrogen oxides, based on the U.S. average utility generation fuel mix. More wind power means less smog, acid rain, and greenhouse gas emissions.[29]

Non-specular Materials

> Wind turbine towers will be painted metal structures and blades will be painted fiberglass composite. Where specifications permit, non-specular paint will be used on all outside surfaces to minimize reflected glare.

[29] American Wind Energy Association, Wind Energy Fact Sheet, Wind Energy – the Fuel of the Future is Ready Today (http://www.awea.org)

Lighting

- Due to the height of the proposed turbines, the Federal Aviation Administration requires red flashing aviation obstruction lighting be placed atop the nacelle on approximately 21 of the 44 turbines to assure safe flight navigation in the vicinity of the Project. This federally mandated safety feature cannot be omitted or reduced. If appropriate, alternative approved FAA lighting options will be evaluated to determine if they can minimize the visual impact within the study area.

Maintenance

- How a landscape and structures in the landscape are maintained has aesthetic implications to the long-term visual character of a project. The Applicant places a high priority on facility maintenance, not only for operational purposes, but for aesthetic appearance as well. Recognizing that its public image will be directly linked to the outward appearance of its facilities and desiring to be a welcomed member of the community, the Applicant will implement a strict policy of maintenance, including materials and practices that ensure a clean and well-maintained appearance over the full life of the facility.

Decommissioning

- At the end of the Project life, idled turbines could represent a significant and unnecessary visual impact to the local area. The Applicant will maintain a well-funded decommissioning plan to ensure that these structures can be dismantled and removed from the Project area upon termination of power generation at the site.

5.0 SUMMARY AND DISCUSSION OF POTENTIAL VISUAL IMPACT

Visibility Summary

Viewshed maps clearly indicate that one or more of the proposed turbines will be theoretically visible from approximately 25 percent of the five-mile radius study area (based on vegetative viewshed). Approximately 75 percent of the study area will likely have no visibility of any wind turbines. Visibility is most common in the agricultural uplands from cleared lands with down slope vistas in the direction of turbine groupings. While the viewshed map indicates some visibility from within the City of Dunkirk, Villages of Fredonia and Forestville, as well as hamlets such as Black Corners, the prevalence of mature street trees and site landscaping combined with one to three story residential and commercial structures will provide screening. Filtered or framed views are likely through foreground vegetation and buildings from isolated locations. Direct views are more prevalent on the outskirts of these community centers where localized residential and commercial structures, street trees and site landscaping are less likely to provide a visual barrier.

Open views, and in some cases panoramic views of the Project will be available from many roadways where roadside vegetation is lacking. Panoramic views may occur along roadways including NYS Thruway I-90, US Route 20, NYS Routes 39 and 60, CR 72, and local roads such as Farrington Hollow Road, Fredonia-Stockton Road and Prospect Road. Many of these views may be long distance (background view) and fleeting.

No views, or limited views will occur on the backside of the many hills and within ravines found throughout the study area. Where topography is oriented toward the turbines, dense forest cover commonly prevents distant views.

The area most directly affected by views of the Project will be where there is a significant amount of cleared or agricultural land within immediate proximity of the Project. The rural areas along US Route 20, NYS Route 83, CR 72, Farrington Hollow Road, Prospect Road, Fredonia-Stockton Road, and other roads in these areas will experience a higher degree of visibility. Residents and visitors will regularly encounter proximate views of one or more turbines within the foreground and near-middle-ground distances (e.g., ½ to 1 ½ miles); the distance where the visual contrast of the turbines will be greatest. Within such close proximity, turbines frequently appear and disappear behind intervening foreground landforms and vegetation as viewers move about the Project area.

Impact on Visual Resources

Based on the viewshed analysis, the highpoint of one or more of the proposed turbines will be visible from approximately 66 of 77 (approximately 86%)[30] inventoried visual resources. Although viewshed mapping shows that visibility (of varying degree) of the Project will be seen from each of the following resources of Statewide Significance, many will be screened by topography and vegetation, as well as structures. Based on field observations, it appears that many views from the historic resources will generally be screened by the presence of mature street trees and site landscaping combined with one and two story residential and commercial structures. Also, as a result of

[30] This is contingent on final turbine array.

significant mature vegetation, visibility (where available) will generally occur at the boundaries of the Boutwell Hill State Forest and Canadaway Creek WMA.

Potentially affected resources of Statewide Significance, which are open to the public, include resources such as:

- Dunkirk Post Office;
- Fredonia Commons Historic District;
- Fredonia Post Office;
- Fredonia Grange;
- Boutwell Hill State Forest; and
- Canadaway Creek WMA.

The NYSDEC visual Policy states,

> *"Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Significant aesthetic impacts are those that may cause a diminishment of the public enjoyment and appreciation of an inventoried resource, or one that impairs the character or quality of such a place. Proposed large facilities by themselves should not be a trigger for a declaration of significance. Instead, a project by virtue of its siting in visual proximity to an inventoried resource may lead staff to conclude that there may be a significant impact."*

Based on this definition, it is reasonable to conclude that simple visibility of the proposed wind farm (albeit a large facility) from any of these affected resources of statewide significance does not result in detrimental effect on the perceived beauty of the place or structure; nor will the Project cause the diminishment of public enjoyment and appreciation of an inventoried resource, or impair the character or quality of such a place.

Resources of Local Interest – Because of the number, scale and distribution of the proposed turbines, some portion of the Project will be visible from places of local interest, that do not necessarily meet the broader statewide threshold for visual significance. Most commonly affected are roadside views along various county and local roadways.

Views were found along portions of several county and town roads at varying distance. Most residential neighborhoods and other resources (e.g. playgrounds) located in the City of Dunkirk, villages and hamlets where the prevalence of mature street trees and site landscaping combined with one and two story structures may substantially limit or screen distant views.

Character of View

Chautauqua County is known particularly for its scenic Lake Erie shoreline, wine country, public lands, and community centers. The greatest concentration of tourist attractions in Chautauqua County are located adjacent to Lake Erie and around Chautauqua Lake, neither of which are in the study area. While the study area does not begin until several blocks inland of Lake Erie, many travelers to the lakeshore arrive from major roads within the study area, including NYS Thruway I-90 and US Route 20. Views from the corridors of these roads are fleeting and primarily limited to the direction of travel.

Within the study area typical views, outside developed communities, are characterized by a patchwork of working farms, old fields and forest on a landscape of rolling hills. Built structures consist primarily of low-density permanent homes and manufactured housing, along with accessory structures (barns, garages, sheds, etc.). Development density within the study area is variable, ranging from large, open lots set back from nearby roadways and neighboring properties, to neighborhood clusters of mid-20th century homes or Victorian style homes of varying quality, vintage and size in the Village of Fredonia and City of Dunkirk. Several mobile home communities are present within the study area as well. Overall, the structures are of varying vintage and quality.

The introduction of large, clearly man-made structures creates a visible disruption of the landscape. The prominent hills and forests in the study area should be effective sources of minimizing the visual impact of the wind turbines. This should be true in terms of how visible each turbine will be individually from any given point in the study area and how many turbines can be viewed from any one point in the study area. However, in more level areas, the proposed turbines will be the tallest visible elements within view and will be disproportionate to other elements in the immediate landscape. Given the rolling hills in the study area, distribution of turbines across an extended area will result in a minimization of having an overwhelmingly disproportionate amount of turbines visible from any single point. The moderately paced sweeping rotation of the turbine blades will heighten the conspicuity of the turbines no matter the degree of visibility.

Affected Viewers

The Towns of Arkwright, Hanover, Sheridan, Charlotte, Stockton, Villenova, Pomfret, Cherry Creek and Dunkirk are each quite rural and have small populations. The population of the Town of Pomfret, the most populous town in the study area, has 14,703 residents. Of which, 10,706 are residents of the Village of Fredonia and the majority of these (5,406) are students at SUNY Fredonia.[31] The population of the Town of Arkwright, where all of the 44 proposed wind turbines will be located, is 1,126 and the population density of the Town is only 32 people per square mile. In comparison, the population density of Chautauqua County is 127 people per square mile and, as a whole, New York State has a population density of 402.

Generally, the highways within the study area are moderately traveled. The stretch of I-90 that goes through the study area has the highest average annual daily traffic (AADT) volume of any roads in the study area (29,781 vehicles per day). Aside from I-90, the most heavily traveled stretch of road that

[31] http://www.fredonia.edu

lies entirely within the study area is a section of NYS Route 60, located between the entrance to I-90 and US Route 20; this section of NYS Route 60 receives an average of 24,788 vehicles per day. Further removed from I-90, NYS Route 60 has an AADT volume of 14,938 vehicles in the stretch that runs between NYS Route 83 and US Route 20. In comparison to I-90 and NYS Route 60, an AADT of 1,491 vehicles travel on NYS Route 83 between CR 307 and NYS Route 60. While the proposed Project will be frequently visible to local residents and travelers, the total number of potentially affected permanent year-round viewers within the study area is relatively small when compared to other regions of New York State.

The impact to those residents and tourists recreating in the study area will vary. The sensitivity of individuals to visual quality is variable; but to many, visual quality is an important and integral part of their outdoor experience. The presence of wind turbines may diminish the aesthetic experience for those that believe that the rural landscape should be preserved for agricultural, rural residential, open space and similar uses. Such viewers will likely have high sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the proposed Project. For those with strong utilitarian beliefs, the presence of the proposed Project may have little aesthetic impact on their recreational experience.

For residents and tourists driving through the study area, wind turbines will be clearly visible along numerous portions of local roadways. The visual impact and the length of impact will vary depending on features specific to each road, including speed limit, changes in elevation and curves, as well as the proximity of the road to the Project site.

Other Project Components

During construction of the proposed Project, the use of large mobile cranes, as well as other large construction vehicles (e.g. semi-trucks) and equipment will be noticeable throughout the Project area. It is anticipated that the construction period will be relatively short; therefore the potential visual impacts will be brief and are not expected to result in prolonged adverse visual impact to area residents or visitors.

The proposed substation will be located in the Town of Pomfret; the operations and maintenance building and a small electrical switchgear facility will be located in the Town Arkwright. These structures are relatively minor components of the Project and it is anticipated that they will be visible by local residents or passers-by. In addition, there will be a 3.9-mile transmission line connecting the proposed turbines to the electrical substation. Two simulations of the proposed transmission line may be found in Appendix A.

While red flashing aviation obstruction lighting on communications towers are commonly visible nighttime elements almost everywhere, the concentration of lights within the turbine area would be somewhat unique. While aviation obstruction lighting is generally directed upward, relatively low intensity and will not create atmospheric illumination (sky glow), 21 red lights flashing in unison at close range or in the distance from any given location will be conspicuous and somewhat discordant with the current dark nighttime conditions. Local residents outdoors in the rural nighttime setting will likely be more affected by this condition than would motorists traveling thorough the area after dark.

A viewshed map was completed that clearly indicates that one or more of the 21 proposed lights will be theoretically visible from approximately 22 percent of the study area. The magnitude of this impact will depend on how many lighted turbines are visible at a specific location and existing ambient lighting conditions (e.g. sky glow from the City of Dunkirk) present within the view. These are federally mandated safety features and cannot be omitted of reduced. Daytime lighting of the turbines is not required.

Shadow Flicker

Based on Table 8 and Figures 7 and 8, of the 205 studied shadow receptors located within 10 rotor diameters:

- 29 (14.1%) will theoretically be impacted 0-2 hrs/yr;
- 101 (49.3%) will theoretically be impacted 2-10 hrs/yr;
- 46 (22.4%) will theoretically be impacted 10-20 hrs/yr;
- 18 (8.8%) will theoretically be impacted 20-30 hrs/yr;
- 10 (4.9%) will theoretically be impacted 30-40 hrs/yr; and
- 1 (0.5%) will theoretically be impacted 40+ hrs/yr.

The two (2) receptors that will theoretically be impacted more than 30 hours per year, have views of the Project, and are not participating in the Project are receptors 114 and 164. For those receptors that do have visibility of the proposed Project, potential mitigation (e.g. window shades/awnings) should be evaluated on a case-by-case basis.

There are no regulations or guidelines that establish an acceptable degree of shadow-flicker impact on a potential receptor. Based on the limited number of hours any structure will be impacted, shadow flicker is not expected to create an adverse impact on most nearby residential dwellings. For residences where shadow flicker is greatest, this impact might be considered an annoyance by some, and unnoticed by others.

Comparison of DEIS VRA and SEIS VRA

Since the submission of the DEIS the Applicant revised the Project layout resulting in fewer turbines. Based on the combined changes to the Project layout, including a reduction in the number of wind turbines and relocation of several access roads and power collection line corridors, it was determined that the Supplemental Environmental Impact Statement should be prepared to describe the revised Project and its associated impacts. While the overall turbine changes were relatively minor, there was an affect on Project visibility.

Viewshed Analysis – The currently proposed Project layout includes three (3) fewer turbines than the original layout analyzed in the DEIS. However, despite the reduced Project scale, all visual resources identified in the DEIS as having Project visibility will still likely view one or more turbines. The current layout does not eliminate any previously affected visual resources from view; however two (2) additional resources may have visibility of the Project. While the number of turbines visible from individual receptors may have changed due to layout changes, this is not expected to result in a significant increase in potential visual impact from those resources that had visibility identified during the DEIS.

The viewshed completed for the currently proposed Project shows that approximately 26,050 acres could theoretically have some degree of Project visibility (based on vegetated viewshed). Although slightly higher, this is very similar to the total area (25,711 acres) theoretically affected based on the DEIS layout (based on the vegetated viewshed). Therefore the affected area is not expected to change significantly. Table 9 contains additional information of the potentially affected area within the study area.

Simulations – Additional photo simulations are provided to illustrate the extent of Project visibility from select locations. These photo simulations were added at the request of the Town of Arkwright following the review of the DEIS VRA. Photo simulations from these supplemental locations are provided in Appendix A.

Shadow Flicker Analysis – Based on the current layout there will be two (2) receptors that will be theoretically impacted more than 30 hours per year. These receptors are likely to have project visibility. When compared to the original layout data, this is an increase of one (1) receptor. The current shadow flicker analysis evaluated 205 potential receptors, which is six (6) less than the 211 receptors evaluated in the DEIS. Generally, there was an increase in receptors that would theoretically experience between 2 and 40 hours of shadow per year, and a decrease in the number of receptors experiencing between 0-2 hours per year and those theoretically impacted 40+ hours per year.

Table 9 Viewshed Coverage Comparison (DEIS VRA and SEIS VRA)

	DEIS Topography Only Viewshed		DEIS Vegetation and Topography Viewshed		SEIS Topography Only Viewshed (See Figure 1)		SEIS Vegetation and Topography Viewshed (See Figure 2)	
	Acres*	Percent Cover	Acres*	Percent Cover	Acres*	Percent Cover	Acres*	Percent Cover
No Turbines Visible	19,931	19.1%	78,682	75.4%	19,088	18.5%	77,020	74.7%
1 – 5 Turbines Visible	5,551	5.3%	4,374	4.2%	5,853	5.7%	4,704	4.6%
6 – 10 Turbines Visible	5,557	5.3%	3,667	3.5%	6,273	6.1%	4,219	4.1%
11 – 15 Turbines Visible	7,833	7.5%	3,851	3.7%	9,510	9.2%	4,445	4.3%
16 – 20 Turbines Visible	9,417	9.0%	4,118	3.9%	8,537	8.3%	4,153	4.0%
21 – 30 Turbines Visible	21,807	20.9%	5,920	5.7%	20,767	20.1%	5,429	5.3%
31 – 40 Turbines Visible	18,161	17.4%	2,287	2.2%	19,262	18.7%	2,087	2.0%
41 – 47 Turbines Visible	16,136	15.5%	1,494	1.4%	N/A	N/A	N/A	N/A
41 – 44 Turbines Visible	N/A	N/A	N/A	N/A	13,780	13.4%	1,013	1.0%
Total	104,393	100.0%	104,393	100.0%	103,070	100.0%	103,070	100.0%

*Acreage quantities are rounded to nearest whole number.

Visual Impact Conclusion

The U.S. Department of Energy and New York State Public Service Commission have mandated that renewable energy sources, such as wind turbines, will provide an increasing percentage of the nation's electricity in the coming years. Meaningful development of renewable wind energy will reduce the reliance on fossil fuel combustion and nuclear fission facilities and result in reduction in air pollutants and greenhouse gasses. This Project is proposed to meet, in small part, this ambitious federal and state objective to provide an environmentally friendly and renewable energy source to help meet the growing energy needs for New York State residents and business.

By their very nature, modern wind energy projects are large and highly visible facilities. The need to position these tall moving structures in highly visible locations cannot be readily avoided. The siting of wind turbines within a rural agricultural area provides increased opportunity for potentially discordant views both near and far. While the use of mitigation techniques will help to minimize adverse visual impact, the construction of the Arkwright Summit Wind Farm Project will be an undeniable visual presence on the landscape. However, unlike development projects such as housing complexes and commercial centers, the proposed wind energy facility can and will be decommissioned and removed at the end of its useful working life. All of the towers will be removed and the Project area restored to as near its present condition as possible, thus restoring the landscape to its original condition.

Glossary[32]

Aesthetic impact: Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision-making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce the public's enjoyment and/or appreciation of the appearance of an inventoried resource (e.g. cooling tower plume blocks a view from a State Park overlook).

Aesthetically significant place: A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, millions of people visit Niagara Falls on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Niagara Falls (a designated State Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the state probably has statewide significance. A place visited primarily by people whose place of origin is local generally is generally of local significance. Unvisited places either have no significance or are "no trespass" places.

Aesthetic Quality: There is a difference between the quality of a resource and its significance level. The quality of the resource has to do with its component parts and their arrangement. The arrangement of the component parts is referred to as composition. The quality of the resource and the significance level are generally, though not always, correlated.

Atmospheric perspective: Even on the clearest of days, the sky is not entirely transparent because of the presence of atmospheric particulate matter. The light scattering effect of these particles causes atmospheric or aerial perspective, the second important form of perspective. In this form of perspective there is a reduction in the intensity of colors and the contrast between light and dark as the distance of objects from the observer increases. Contrast depends upon the position of the sun and the reflectance of the object, among other items. The net effect is that objects appear "washed out" over great distances.

Control Points: The two end points of a line-of-sight. One end is always the elevation of an observer's eyes at a place of interest (e.g. a high point in a State Park) and the other end is always an elevation of a project component of interest (e.g. top of a stack of a combustion facility or the finished grade of a landfill).

Line-of-sight profile: A profile is a graphic depiction of the depressions and elevations one would encounter walking along a straight path between two selected locations. A straight line depicting the path of light received by the eye of an imaginary viewer standing on the path and looking towards a predetermined spot along that path constitutes a line-of-sight. The locations along the path where the viewer stands and looks are the control points of the line-of-sight profile.

Scientific Perspective: Scientific, linear, or size perspective is the reduction in the apparent size of objects as the distance from the observer increases. An object appears smaller and smaller as an observer moves further and further from it. At some distance, depending upon the size and degree of contrast between the object and its surroundings, the object may not be a point of interest for most people. At this hypothetical distance it can be argued that the object has little impact on the composition of the landscape of which it is a tiny part. Eventually, at even greater distances, the human eye is incapable of seeing the object at all.

Viewshed: A map that shows the geographic area from which a proposed action may be seen is a viewshed.

[32] NYSDEC Visual Policy (2000) pp. 9-11.

Visual Assessments: Analytical techniques that employ viewsheds, and/or line-of-sight profiles, and descriptions of aesthetic resources, to determine the impact of development upon aesthetic resources; and potential mitigation strategies to avoid, eliminate or reduce impacts on those resources.

Visual impact: Visual impact occurs when the mitigating effects of perspective do not reduce the visibility of an object to insignificant levels. Beauty plays no role in this concept. A visual impact may also be considered in the context of contrast. For instance, all other things being equal, a blue object seen against an orange background has greater visual impact than a blue object seen against the same colored blue background. Again, beauty plays no role in this concept.

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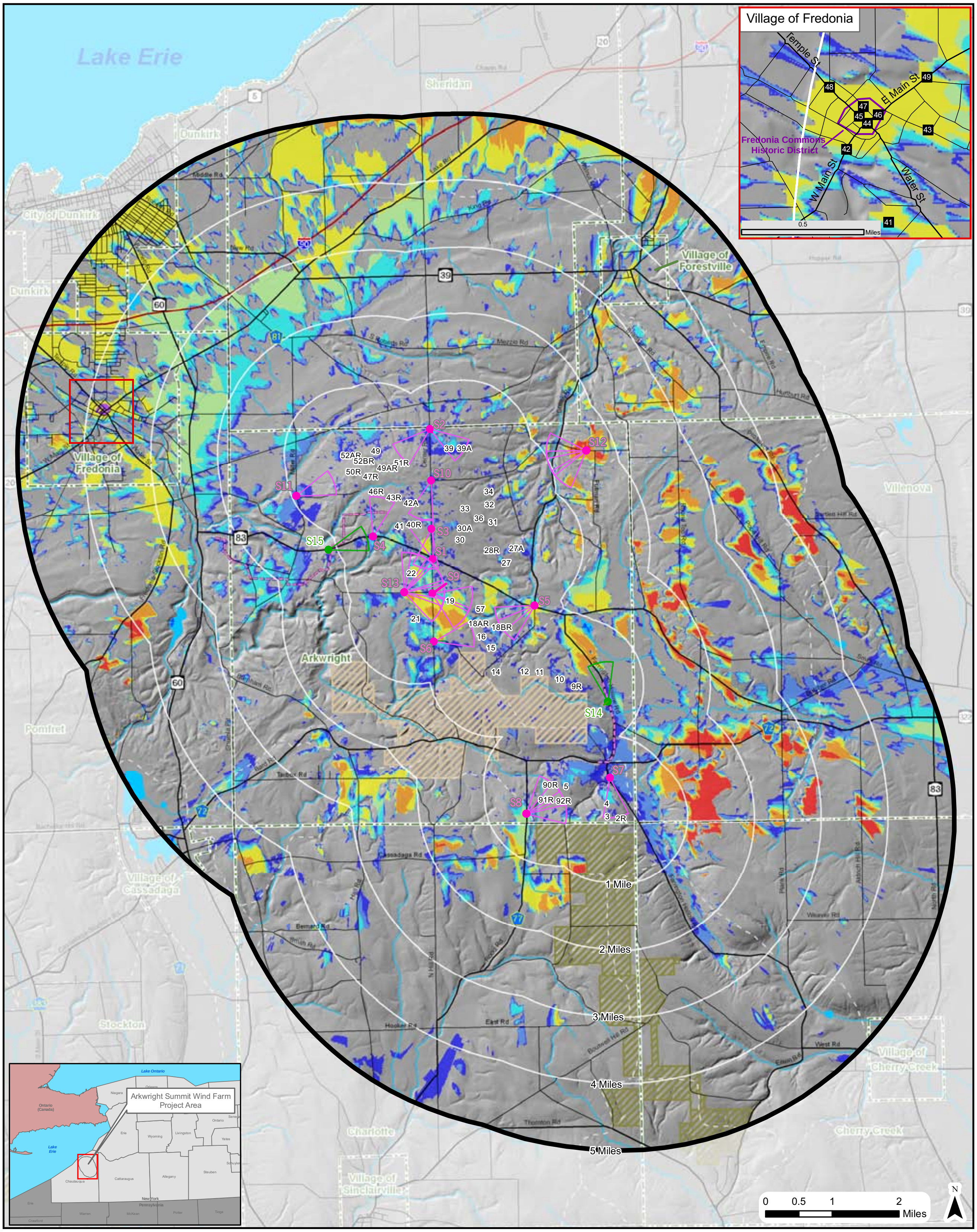
Appendix A
Photographic Simulations



BLADE TIP VIEWSHED - VEGETATED* AND PHOTO SIMULATION LOCATIONS

*Blade tip hight 125 m (410 ft). Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Transmission Line not Considered in Viewshed Anaylsis

Figure A1
Arkwright Summit Wind Farm

March, 2009

Preliminary

KEY

- 12 Proposed Wind Turbine
- Overhead 34.5 kV Transmission Line
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- National Register Site
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area
- Town Selected Simulation Location and Photo Angle
- Transmission Line Simulation Location and Photo Angle

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 30
- 31 - 40
- 41 - 44

SARATOGA ASSOCIATES

Landscape Architects, Architects, Engineers, and Planners, P.C.

New York City > Saratoga Springs > Syracuse

ARKWRIGHT SUMMIT WIND FARM

Existing Condition

SARATOGA ASSOCIATES

FIGURE A2-A

Photo Simulation
VP#S1 - NYS Route 83 and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A2-B

Photo Simulation
VP#S1 - NYS Route 83 and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A3-A

Photo Simulation
VP#S2 - Straight Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A3-B

Photo Simulation
VP#S2 - Straight Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A3-C

Photo Simulation
VP#S2 - Straight Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A3-D

Photo Simulation
VP#S2 - Straight Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A4-A

Photo Simulation
VP#S3 - Arkwright Town Hall
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A4-B

Photo Simulation
VP#S3 - Arkwright Town Hall
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A4-C

Photo Simulation
VP#S3 - Arkwright Town Hall
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

SARATOGA ASSOCIATES

Existing Condition

FIGURE A5-A

Photo Simulation
VP#S4 - Arkwright Hills Campground (Entrance from NYS Route 83)
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A5-B

Photo Simulation
VP#S4 - Arkwright Hills Campground (Entrance from NYS Route 83)
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A6-A

Photo Simulation
VP#S5 - Meadows Road and NYS Route 83
Town of Arkwright
Approximately 0.6 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A6-B

Photo Simulation
VP#S5 - Meadows Road and NYS Route 83
Town of Arkwright
Approximately 0.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A6-C

Photo Simulation
VP#S5 - Meadows Road and NYS Route 83
Town of Arkwright
Approximately 0.6 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A6-D

Photo Simulation
VP#S5 - Meadows Road and NYS Route 83
Town of Arkwright
Approximately 0.6 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Existing Condition

Proposed Condition

Preliminary

FIGURE A6-E

Photo Simulation
VP#S5 - Meadows Road and NYS Route 83
Town of Arkwright
Approximately 0.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A7-A

Photo Simulation
VP#S6 - Meadows Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A7-B

Photo Simulation
VP#S6 - Meadows Road and Center Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A8-A

Photo Simulation
VP#S7 - Ruttenburg Road and Farrington Hollow Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A8-B

Photo Simulation
VP#S7 - Ruttenburg Road and Farrington Hollow Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A9-A

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A9-B

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A9-C

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A9-D

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A9-E

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A9-F

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

Proposed Condition

Preliminary

FIGURE A9-G

Photo Simulation
VP#S8 - Ruttenburg Road and Rood Road
Town of Arkwright
Approximately 0.4 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A10-A

Photo Simulation
VP#S9 - Ball Road and Center Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

FIGURE A10-B

Photo Simulation
VP#S9 - Ball Road and Center Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Preliminary

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A10-C

Photo Simulation
VP#S9 - Ball Road and Center Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A10-D

Photo Simulation
VP#S9 - Ball Road and Center Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A10-E

Photo Simulation
VP#S9 - Ball Road and Center Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A11-A

Photo Simulation
VP#S10 - Weaver Road and Center Road
Town of Arkwright
Approximately 0.5 Miles From Nearest Arkwright Project Turbine

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A11-B

Photo Simulation
VP#S10 - Weaver Road and Center Road
Town of Arkwright
Approximately 0.5 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A12-A

Photo Simulation
VP#S11 - Corner of Cable Road and Miller Road
Town of Arkwright
Approximately 0.9 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A12-B

Photo Simulation
VP#S11 - Corner of Cable Road and Miller Road
Town of Arkwright
Approximately 0.9 Miles From Nearest Arkwright Project Turbine

SARATOGA ASSOCIATES

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A13-A

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A13-B

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A13-C

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A13-D

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A13-E

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A13-F

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A13-G

Photo Simulation
VP#S12 - Straight Road
Town of Arkwright
Approximately 1.6 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A14-A

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A14-B

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A14-C

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A14-D

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A14-E

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Proposed Condition

Preliminary

FIGURE A14-F

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Existing Condition

FIGURE A14-G

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

Preliminary

FIGURE A14-H

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

SARATOGA ASSOCIATES

Existing Condition

FIGURE A14-I

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A14-J

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A14-K

Photo Simulation
VP#S13 - Ball Road
Town of Arkwright
Approximately 0.3 Miles From Nearest Arkwright Project Turbine

Existing Condition

FIGURE A15-A

Photo Simulation
VP#S14 - Farrington Hollow Road
Town of Arkwright
Approximately 80 Feet From Nearest Arkwright Project Component

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Proposed Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

Preliminary

FIGURE A15-B

Photo Simulation
VP#S14 - Farrington Hollow Road
Town of Arkwright
Approximately 80 Feet From Nearest Arkwright Project Component

Existing Condition

ARKWRIGHT SUMMIT WIND FARM

SARATOGA ASSOCIATES

FIGURE A16-A

Photo Simulation
VP#S15 - NYS Route 83
Town of Arkwright
Approximately 80 Feet From Nearest Arkwright Project Component

Proposed Condition

SARATOGA
ASSOCIATES

Preliminary

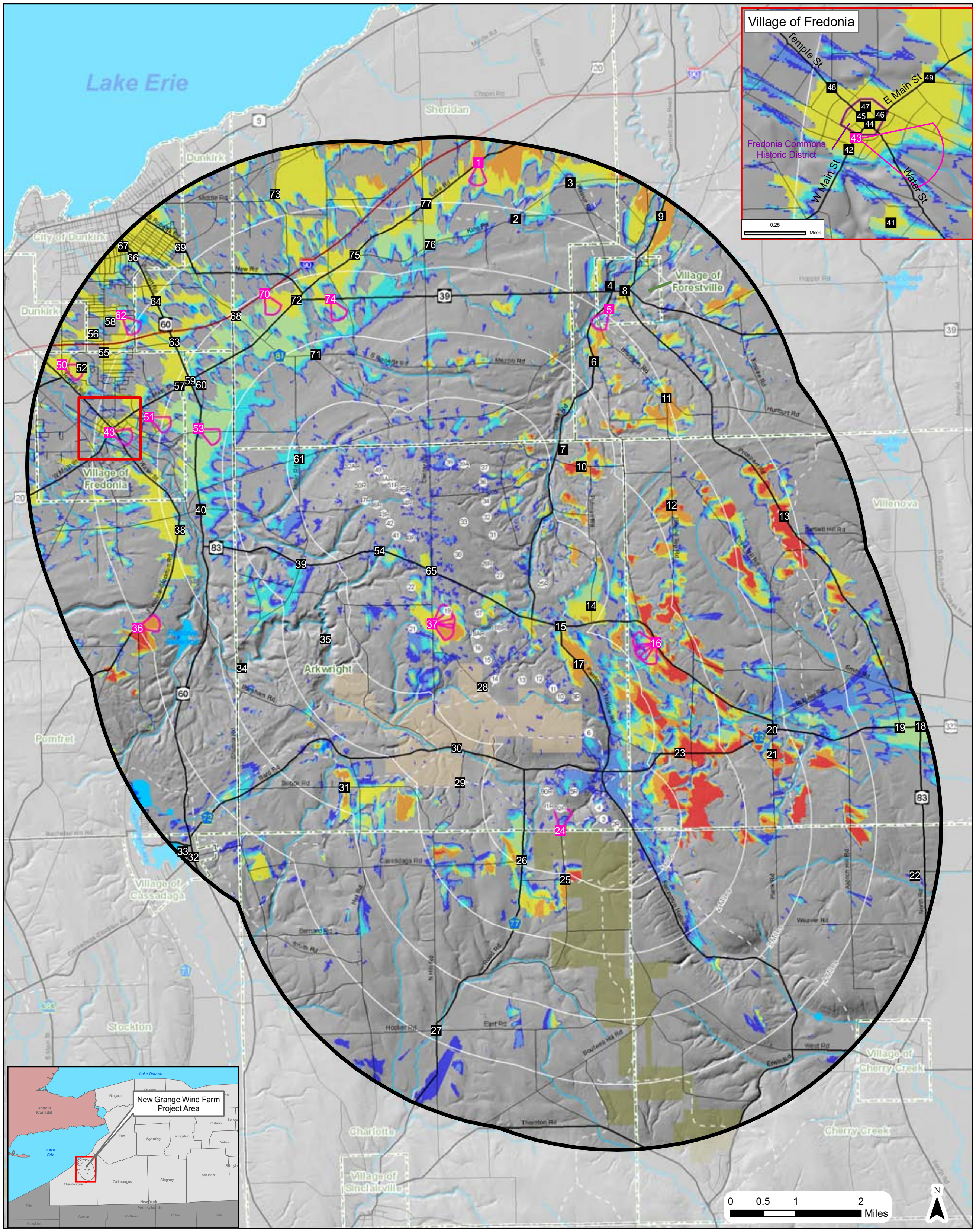
FIGURE A16-B

Photo Simulation
VP#S15 - NYS Route 83
Town of Arkwright
Approximately 80 Feet From Nearest Arkwright Project Component

Appendix B

DEIS Photographic Simulations

(Simulations Based on 47 Turbine Layout)



DEIS BLADE TIP VIEWSHED - VEGETATED AND PHOTO SIMULATION LOCATIONS*

*Blade tip hight 125 m (410 ft). Assumes 12.192 m (40 feet) vegetation height derived from 2001 National Land Cover Dataset forest cover classes.

Figure B1
New Grange Wind Farm

February, 2008

KEY

Number of Turbines Visible
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 30
- 31 - 40
- 41 - 47
- Proposed Turbine Location
- Sensitive Receptor
- Sensitive Receptor / Photo Simulation Location
- Approximate Photo Angle
- 5 Mile Project Area
- Municipal Boundary
- New York State Thruway
- Major Road / State / US Highway
- Local Road
- Snowmobile Trail
- River / Stream / Creek
- Waterbody
- DEC State Forest
- DEC Wildlife Management Area

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File Location: B:\2008\08001\new_grange_viewshd_veg_photo_angles_021508.mxd

SARATOGA ASSOCIATES

Landscape Architects, Architects, Engineers, and Planners, P.C.

NEW YORK CITY > SARATOGA SPRINGS

NEW GRANGE WIND FARM

Existing Condition

FIGURE B2-A

Photo Simulation
VP#1—US Route 20
Town of Sheridan
Approximately 4.6 miles from nearest turbine

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

Photo Simulation

FIGURE B2-B

Photo Simulation
VP#1—US Route 20
Town of Sheridan
Approximately 4.6 miles from nearest turbine

NEW GRANGE WIND FARM
SARATOGA ASSOCIATES

Existing Condition

FIGURE B3-A

Photo Simulation
VP#5—Forestville School Complex
Village of Forestville
Approximately 3.1 miles from nearest turbine

NEW GRANGE WIND FARM
SARATOGA ASSOCIATES

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B3-B

Photo Simulation
VP#5—Forestville School Complex
Village of Forestville
Approximately 3.1 miles from nearest turbine

Photo Simulation

Note: Additional turbines are screened by foreground and midground vegetation.

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B3-C

Photo Simulation
VP#5—Forestville School Complex
Village of Forestville
Approximately 3.1 miles from nearest turbine

Existing Condition

FIGURE B4-A

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Photo Simulation

FIGURE B4-B

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Existing Condition

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B4-C

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B4-D

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Existing Condition

FIGURE B4-E

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B4-F

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

Existing Condition

Photo Simulation

FIGURE B4-G

Photo Simulation
VP#16—NYS Route 83
Town of Villenova
Approximately 1.5 miles from nearest turbine

SARATOGA ASSOCIATES

Existing Condition

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B5-A

Photo Simulation
VP#24—Boutwell Hill State Forest and Overland Trail
Town of Arkwright
Approximately 0.3 miles from nearest turbine

Photo Simulation

NEW GRANGE
WIND FARM
SARATOGA
ASSOCIATES

FIGURE B5-B

Photo Simulation
VP#24—Boutwell Hill State Forest and Overland Trail
Town of Arkwright
Approximately 0.3 miles from nearest turbine

Existing Condition

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B6-A

Photo Simulation
VP#36—Fredonia-Stockton Road
Town of Pomfret
Approximately 4.0 miles from nearest turbine

Photo Simulation

NEW GRANGE
WIND FARM
SARATOGA
ASSOCIATES

FIGURE B6-B

Photo Simulation
VP#36—Fredonia-Stockton Road
Town of Pomfret
Approximately 4.0 miles from nearest turbine

Existing Condition

FIGURE B7-A

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Photo Simulation

FIGURE B7-B

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Existing Condition

FIGURE B7-C

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

NEW GRANGE WIND FARM
SARATOGA ASSOCIATES

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B7-D

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Existing Condition

FIGURE B7-E

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B7-F

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Existing Condition

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B7-G

Photo Simulation
VP#37—Center Road
Town of Arkwright
Approximately 2.8 miles from nearest turbine

Existing Condition

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B8-A

Photo Simulation
VP#43—Village of Fredonia
Village of Fredonia
Approximately 3.8 miles from nearest turbine

Photo Simulation

FIGURE B8-B

Photo Simulation
VP#43—Village of Fredonia
Village of Fredonia
Approximately 3.8 miles from nearest turbine

Existing Condition

FIGURE B9-A

Photo Simulation
VP#50—SUNY Fredonia Off Campus Housing
Village of Fredonia
Approximately 4.7 miles from nearest turbine

Photo Simulation

SARATOGA ASSOCIATES

FIGURE B9-B

Photo Simulation
VP#50—SUNY Fredonia Off Campus Housing
Village of Fredonia
Approximately 4.7 miles from nearest turbine

Existing Condition

FIGURE B10-A

Photo Simulation
VP#51—Village of Fredonia—Residential
Village of Fredonia
Approximately 3.2 miles from nearest turbine

Photo Simulation

FIGURE B10-B

Photo Simulation
VP#51—Village of Fredonia—Residential
Village of Fredonia
Approximately 3.2 miles from nearest turbine

Existing Condition

NEW GRANGE WIND FARM
SARATOGA ASSOCIATES

FIGURE B11-A

Photo Simulation
VP#53—CR 60
Town of Pomfret
Approximately 2.4 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B11-B

Photo Simulation
VP#53—CR 60
Town of Pomfret
Approximately 2.4 miles from nearest turbine

Existing Condition

FIGURE B12-A

Photo Simulation
VP#62—City of Dunkirk—Residential
City of Dunkirk
Approximately 4.3 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM
SARATOGA ASSOCIATES

FIGURE B12-B

Photo Simulation
VP#62—City of Dunkirk—Residential
City of Dunkirk
Approximately 4.3 miles from nearest turbine

Photo Simulation

Note: Additional turbines are screened by foreground and midground vegetation.

FIGURE B12-C

Photo Simulation
VP#62—City of Dunkirk—Residential
City of Dunkirk
Approximately 4.3 miles from nearest turbine

Existing Condition

FIGURE B13-A

Photo Simulation
VP#70—NYS Thruway I-90
Town of Sheridan
Approximately 3.0 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B13-B

Photo Simulation
VP#70—NYS Thruway I-90
Town of Sheridan
Approximately 3.0 miles from nearest turbine

Existing Condition

FIGURE B14-A

Photo Simulation
VP#74—NYS Route 39
Town of Sheridan
Approximately 2.6 miles from nearest turbine

Photo Simulation

NEW GRANGE WIND FARM

SARATOGA ASSOCIATES

FIGURE B14-B

Photo Simulation
VP#74—NYS Route 39
Town of Sheridan
Approximately 2.6 miles from nearest turbine