

BALL HILL WIND PROJECT VISUAL RESOURCE ASSESSMENT – TECHNICAL MEMORANDUM

Prepared for:
Ball Hill Wind Energy, LLC
1101 W. 120th Ave., Suite 400
Broomfield, CO 80021

June 2018



Summary

Ball Hill Wind Energy, LLC (“Ball Hill Wind”) is proposing to develop a wind-powered electrical-generating facility consisting of 29 turbines with a maximum total project capacity of 100.05 megawatts (MW). The proposed Ball Hill Wind Project (referred to as the “Project”) will be located in the Towns of Villenova and Hanover, Chautauqua County, New York.

In 2015, Ball Hill Wind retained Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (“Saratoga Associates”) to complete a Supplemental Visual Resource Assessment (referred to as the “SVRA”) of the Project using its then-proposed layout (referred to as the “2016 Layout”). Since the completion of the SVRA, Ball Hill Wind further revised the proposed Project by changing turbine type, marginally shifting the positions of three (3) turbine locations, and moving the proposed above-ground interconnection transmission line (“gen-tie”) predominantly underground (referred to as “2018 Layout”).¹ The purpose of this technical memorandum is to describe and assess any differences in the Project’s visual impact as a result of these proposed changes.

As discussed in more detail below, Saratoga Associates’ assessment of any change in the potential visual impacts of the proposed Ball Hill Wind Project as a result of the layout revisions (turbine change and predominantly undergrounding the gen-tie) consists of several aspects, including: determining where within a five-mile radius study area turbines might be visible “Zone of Visual Influence” (or “ZVI”); determining where within such study area significant periods of “shadow-flicker” may occur; and determining the degree of Project visibility from certain identified “sensitive viewpoints”. The general conclusion is that the proposed layout changes will not significantly change the visual impact of the Project, except that the height increase of the taller turbines may be perceptible from nearby viewpoints, and visibility of the originally proposed collection substation and 5.7 mile overhead electrical line will be eliminated entirely.

Project Description Comparison

The 2016 Layout included twenty-nine (29) turbines in the Towns of Villenova (23 turbines) and Hanover (6 turbines). The proposed turbines were Vestas V126-3.45 MW, which had a hub height of 285 feet (87 meters), a rotor diameter of 413 feet (126 meters), and a maximum blade tip height of approximately 492 feet (150 meters). A 5.7-mile overhead 115 kV transmission line was proposed to originate at a new 115/34.5kv collection substation and connect the turbines with an existing National Grid 230 kV transmission line in the Town of Hanover. The line included 60 tangent and angled structures, an 8.7-acre switchyard, and an approximately 5-acre collection substation.

The 2018 Layout will consist of twenty-nine (29), yet taller, turbines. The proposed turbine manufacturer and dimension for this layout has not been determined. For the purpose of this Memorandum, the following heights were used as a worse-case scenario:

- > 27 turbines with a hub height of 360 feet (110 meters), a rotor diameter of 497 feet (146 meters), for a maximum blade tip height of 599 feet (183 meters);

¹ While the conceptual design plan is to install the entire length of the gen-tie underground, subsurface or gradient conditions may reveal a need to run on the surface for a minimal number of short spans at an estimated height of 40 feet, which would be potentially visible.

- > One (1) turbine with a hub height of 344 (105 meters), a rotor diameter of 486 feet (148 meters), for a maximum blade tip height of 587 feet (179 meters); and
- > One (1) turbine with a hub height of 344 (105 meters), a rotor diameter of 444 feet (136 meters), for a maximum blade tip height of 566 feet (173 meters).²

This revised turbine configuration represents an increase of up to 75 feet (23 meters) in hub height and 65 feet (20 meters) to the rotor diameter. The turbine model proposed for the 2018 Layout will result in an increase in maximum blade tip height of up to 107 feet (approximately 33 meters) as compared to the 2016 Layout.

The proposed turbine locations are substantially similar in both layouts, with only three (3) turbines being marginally shifted in the 2018 Layout. It is not anticipated that the adjustments (turbine model and layout) will significantly change the appearance of the previously approved Project layout. The 2018 Layout also removes the above-ground 115 kV transmission line, predominantly undergrounds the gen-tie, and eliminates the collection substation. An approximate 80-foot-wide clearing will be required through vegetation, which is less than the previously proposed Project.

Wind Turbine Analysis

Turbine Viewshed Mapping (Zone of Visual Influence) – The Zone of Visual Influence (ZVI) is the area within a five-mile radius of the proposed Project Area in which the Project can be seen. As summarized in Table 1, based on the 2016 Layout, landform and existing natural vegetation would screen visibility of Project turbines, in approximately 67.7 percent of the SVRA five-mile radius study area. Visibility would be further reduced by hedgerows, site landscaping, and various structures (e.g. residential dwellings). Views are most common in agricultural uplands with cleared lands and down-slope vistas in the direction of the turbines. A breakdown of the number of visible turbines is presented in Table 1.

Table 1 2016 Layout – Turbine Viewshed Coverage Summary

	Topography Only Viewshed		Vegetation and Topography Viewshed	
	Acres	Percentage of Study Area	Acres	Percentage of Study Area
No Turbines Visible	16,978	16.8%	68,387	67.7%
1-5 Turbines Visible	8,183	8.1%	7,664	7.6%
6-10 Turbines Visible	8,269	8.2%	6,119	6.1%
11-15 Turbines Visible	8,359	8.3%	4,735	4.6%
16-20 Turbines Visible	13,808	13.7%	5,350	5.3%
21-25 Turbines Visible	14,683	14.5%	5,248	5.2%
26-29 Turbines Visible	30,738	30.4%	3,515	3.5%
Total	101,017	100.0%	101,017	100.0%

² The blade tip heights of 566 and 587 feet were requested by the FAA.

Based on the vegetated viewshed map created for the 2018 Layout, turbines would potentially be screened from approximately 66.1 percent (versus 67.7 percent for the 2016 Layout) of the five-mile study area, due to intervening landform and forest cover. The Layout will result in slight changes to the geographic area where turbines would be visible (i.e. there will be an increase or decrease to the number of turbines visible in each identified turbine grouping). Similarly, as noted above, visibility of the turbines will be further reduced as a result of hedgerows, site landscaping, and structures. As illustrated in Table 2, Figure A2, this Layout results in a 1.6% increase of visibility (total acres) of turbines in the 2018 Layout versus the 2016 Layout.

Table 2 2018 Layout – Turbine Viewshed Coverage Summary

	Topography Only Viewshed (Figure A1 – Topographic Viewshed)		Vegetation and Topography Viewshed (Figure A2 - Vegetated Viewshed)	
	Acres	Percentage of Study Area	Acres	Percentage of Study Area
No Turbines Visible	14,333	14.2%	66,757	66.1%
1-5 Turbines Visible	7,250	7.2%	7,015	7.0%
6-10 Turbines Visible	7,128	7.0%	5,641	5.6%
11-15 Turbines Visible	6,958	6.9%	4,741	4.7%
16-20 Turbines Visible	11,729	11.6%	5,265	5.2%
21-25 Turbines Visible	12,906	12.8%	5,076	5.0%
26-29 Turbines Visible	40,700	40.3%	6,509	6.4%
Total	101,004	100.0%	101,004	100.0%

*Tables 1 and 2 illustrate that one (1) or more structures are theoretically visible from approximately 83.2 and 85.8 percent of the five-mile study radius, respectively, when evaluating the Topographic Viewshed. However, as discussed in the SVRA, this unrealistic treeless condition analysis is used only to identify the maximum potential geographic area within which further investigation is appropriate. The topography only viewshed is not representative of the anticipated geographic extent of visibility and is not intended for public interpretation. Acreage is rounded to the nearest whole number in Tables 1 and 2. Turbine numbers shown on the viewshed figures are out of sequence in order to reference those turbines retained from previous evaluations.

The vegetated viewshed map illustrates that the 2018 Layout would be visible within portions of the Villages of Forestville and South Dayton. Most of the potential visibility within these villages would be screened by structures and localized vegetation. From the downtown sections of both villages, potential Project visibility appears to be minimal, if any. Within the Village of Forestville, potential for visibility is greatest along NYS Route 39 just west of the village center and filtered views are possible along short segments of Ceder and Chestnut Roads. Potential visibility within the Village of South Dayton generally occurs south of NYS Route 322. Views of the Project were noted along sections of 1st Avenue, 2nd Avenue and Main Street. 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. The Project may also be visible within the hamlets scattered throughout the study area.

The Project will be openly visible from many roadways where roadside vegetation is lacking. These roadways would include, but are not limited to, the NYS Thruway, NYS Routes 39, 83, and 322, County Routes 93, Prospect/Ball Hill Road, North and South Hill Road, Pope Hill Road, Round Top Road, Aldrich Hill Road, Hanover Road, and Flucker Hill Road. Many of these views may be long-distant (background view), fleeting as viewers pass in vehicles, or of short duration. Visibility along

roads that intersect the immediate project area is generally greater than visibility from roads farther away. The portion of Prospect/Ball Hill Road that bisects the Project area from southeast to northwest has the greatest visibility of any road immediate to the Project area. Turbines will be visible on both sides of Prospect/Ball Hill Road, as well as Bartlett Hill Road, North Hill Road, Smith Road, Dye Road, Pope Hill Road, and Round Top Road. In these locations, it is anticipated that 360-degree views of the Project may be possible. Open views of the Project will also occur in the agricultural uplands from cleared lands with down-slope vistas in the direction of the proposed Project (e.g. lands south of NYS Route 322).

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

The potential visibility based on the 2016 and 2018 Layouts is similar, not only in the number of acres, but geographic area as well. With the increased height, a higher number (one (1) or more) of turbines may be visible from areas identified for potential visibility. The percentage of acres visible in each study area for each turbine grouping is identified in Tables 1 and 2. As shown in Table 2, the 26-29 turbine grouping has the largest increase of potential visibility (increase of 2,994 acres).

Turbine Visibility Evaluation of Inventoried Resources – In addition to predicting the overall viewshed area for the proposed Project, the SVRA also addressed its visibility from specific potentially sensitive resources. To accomplish this, the SVRA identified fifty-six (56) visual resources of national, state or local significance within the five-mile study area. Viewshed analysis determined that twelve (12) of these resources would likely be fully screened by intervening landform or vegetation, and forty-four (44) visual resources may have a line-of-sight to one (1) or more of the proposed turbines.

In evaluating the visibility based on the 2018 Layout, it was determined that eleven (11) of the inventoried resources would remain fully screened by topography and vegetation. The hamlet of Balltown would have a potential view of one (1) turbine.

Resources of Statewide Significance – The SVRA identified two (2) resources of Statewide Significance within the five-mile study area: the Boutwell Hill State Forest (including the Overland Trail) and the Canadaway Creek Wildlife Management Area. Viewshed analysis and simulations, based on the 2016 Layout, indicate that the Project would not be notably visible from either of these resources. Views of the 2016 layout were confirmed, by field investigation, along property boundaries as these locations had the highest potential for visibility based on the vegetated viewshed map. Overall visibility within the State-owned lands appears to be minimal based on the witnessed vegetative screening potential.

No changes based on the 2018 Layout is expected.

Degree of Turbine Visibility – The SVRA included photo simulations from 14 representative locations. Table 3 lists the key locations that were selected for these simulations.

Overall visibility is anticipated to be similar in both Layouts. Noticeable changes in turbine visibility

are the result of their increased height. Generally, the difference in height will be more noticeable when viewed in close proximity. The further they are from viewer, the less noticeable the height difference is expected to be.

Character of View – Typical views within the study area, outside developed communities, is 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, 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 more populated villages. Mobile home communities are present within the study area as well. Overall, the structures are of varying vintage and quality.

The SVRA addressed the compatibility of the 2016 Layout with regional landscape patterns. The 2018 Layout is substantially similar in visual character and will generally be consistent with the findings of the SVRA.

Affected Viewers – In completing the SVRA, it was reported that the study area is quite rural with a small population. With the exception of a small section of the NYS Thruway (I-90) within the study area, highways are lightly traveled. The short 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 (approximately 24,200 vehicles per day). Aside from I-90, the most heavily traveled stretch of road that lies entirely within the study area is a section of NYS Route 39, located between U.S. Route 20 (outside the five-mile study area) and County Route 141. This section of NYS Route 39 receives approximately 3,200 vehicles per day. While the Project will frequently be 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 areas within New York State.

The impacts to residents and tourists recreating in the study area will vary based on individual sensitivities and expectations. Visual quality is an important and integral part of the outdoor experience for many people. 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 sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the proposed Project.

Table 3 Key Resources Selected for Photo Simulation (2016 Layout)

Map ID	Resource Name	Municipality
2	Prospect Road	Town of Villenova
7	Tri-County Country Club	Town of Hanover
8	NYS Route 39	Town of Hanover
13	NYS Thruway (I-90)	Town of Hanover
33	NYS Route 83	Town of Arkwright
36	Boutwell Hill State Forest and Overland Trail	Town of Arkwright
38	Canadaway Creek WMA	Town of Arkwright
42	Hamlet of Hamlet	Town of Villenova
47	NYS Route 322	Town of Villenova
48	NYS Route 83	Town of Villenova
49	Pine Valley Central Schools	Town of Cherry Creek
53	Village of South Dayton/Hamlet of Skunks Corner	Village of South Dayton
54	Flucker Hill Road	Town of Villenova
55	County Route 93	Town of Hanover

Conversely, some people may enjoy seeing wind turbines in the landscape – for their intrinsic appearance or for what they may represent.

Viewshed and field analysis determined that the Project would be visible from the Overland Trail, Tri-County Country Club, Boutwell Hill State Forest (perimeter of property) and the Canadaway Creek WMA (perimeter of property). Hunters and snowmobile riders on private lands will most likely view the Project across open agricultural fields and may also have a view of the turbines in close proximity.

The 2018 Layout is expected to be similarly visible.

115 kV Transmission Line Analysis

The 2016 Layout included the construction of an approximately 5.7-mile 115 kV above-ground transmission line that included: a new substation, switchyard, and 60 tangent and angle structures (i.e. transmission towers or structures). It was determined this line (one (1) or more structures) could be visible from approximately 23.1 percent of the three-mile radius study area (measured from the proposed transmission line centerline). Visibility would be most common from properties adjacent, or in close proximity to the proposed line, roadways where the transmission line crossed, as well as areas to the north, east and west. Visibility would also be evident from agricultural uplands with cleared lands and down slope vistas in the direction of the proposed transmission line.

The 2018 Layout eliminates the overhead 115 kV transmission line and collection station entirely, in favor of a predominantly underground gen-tie. The 60 tangent and angled structures, all of which are located within the turbine five-mile study area, will no longer exist, significantly reducing the visibility of the Project. As a result, 7,332 acres of the five-mile study area will no longer have a potential for visual impact caused by the transmission line structures (based on the three-mile transmission line study area).

Table 4 Resources Located Within the Five-Mile Turbine and Three-Mile Transmission Line Study Areas

Map ID	Resource Name	Number of Transmission Line Structures Visible
2	Prospect Road	44
3	Hamlet of Nashville	0
6	Hamlet of Parcels Corners	0
7	Tri-County Country Club	0
8	NYS Route 39	56
9	Hurlbert Road	32
10	Hamlet of Smiths Mills	0
11	Town of Hanover Park	0
12	Hanover Road	56
13	NYS Thruway (I-90)	56
14	Hamlet of Dennison Corners	19
15	Hamlet of Keaches Corners	0
16	Bennett State Road	53
17	Bradigan Road	25
18	Forestville School Complex	7
19	Village of Forestville	51
20	American Legion Post 953 Ball Fields	13
21	Village of Forestville Park	0
22	Walnut Falls	0
23	Hawkins Corner	53
24	Creek Road	8
25	Western NY Land Conservancy Hill Side Acres	0
29	Peak on Round Top Road	0
30	Putman Road	0
43	Pope Hill Road	0
54	Flucker Hill Road	0
55	County Route 93	15

When considering the visibility of the Project during the completion of the SVRA, 27 of the resources identified in the turbine analysis were located within the transmission line study area. These resources and the number of transmission structures visible (based on the vegetated viewshed) are identified in Table 4.

Just over half of these locations had possible visibility of the proposed transmission line. By predominantly undergrounding the gen-tie, these locations will no longer have potential for impact.

Although the 60 transmission structures will no longer be part of the Project, it should be noted that viewers may occasionally see a cleared corridor for the predominantly underground gen-tie, but any visibility of man-made structures will be eliminated.

Other Project Components

Night Lighting – While red flashing aviation obstruction lighting on communications towers is a commonly visible nighttime element almost everywhere, the concentration of lights, flashing in unison, within the turbine area would be somewhat different. Although aviation obstruction lighting is generally directed upward, the relatively low intensity does not result in perceptible atmospheric illumination (sky glow).

The SVRA evaluated 22 red lights based on a preliminary lighting plan that followed FAA regulations. A completed viewshed map analysis indicated that one (1) or more of the 22 proposed lights would theoretically be visible from approximately 28.1 percent of the five-mile study area.

As required by the FAA, it has been determined that all 29 turbines will need to be lit. The 2018 Layout, which will have all 29 turbines lit, is expected to have one (1) or more of the lit turbines visible from approximately 30.0 percent of the study area (see Appendix A). This results in a 1.9 percent increase in the study area with theoretical visibility.

Roadways – There should be no difference in potential visual impacts resulting from the proposed layout changes.

Construction Related Impacts

There should be no difference in potential visual impacts resulting from the proposed layout changes.

Cumulative Impact

As a result of the proposed revisions in the 2018 Layout, a slight increase is expected in the total acreage that may have visibility by those wind projects reviewed. With the introduction of the proposed Ball Hill Wind Project (2016 Layout), as well as the Arkwright Summit Wind Farm and Cassadaga Wind Project, one (1) or more structures will be theoretically visible from approximately 40.2 percent of the Projects five-mile radius study area. The total cumulative visibility of the proposed wind projects is approximately 40,645 acres.

Based on the 2018 Layout one (1) or more structures will be theoretically visible from approximately 41.0 percent of the Projects five-mile radius study area (see Appendix B). The total cumulative

visibility of the proposed wind projects is approximately 41,451 acres. This represents an increase of 806 acres when compared to the 2016 Layout.

The introduction of additional turbines within the same viewshed will increase the number of structures visible from many affected vantage points, thus creating a potential higher density of visible structures. However, visibility of the projects is dependent on viewer location/orientation, distance, and other factors. It is possible that with the additional turbines, the impact may be minimal.

It is also possible that all three (3) projects may not be visible in a single field of view. For example, views of the Ball Hill Wind Project are to the east and north, views of the Arkwright Summit and Cassadaga projects are to the west and south. If a viewer is at a location north of the adjacent projects and is viewing eastward, it is possible that the adjacent projects will not be visible.

Shadow-Flicker

Due to the change in turbine height there was an increase number of shadow receptors (i.e. residential dwellings) that may receive 40+ hours of shadow-flicker, when compared to the 2016 Layout. Using the same shadow-flicker data inputs identified in the SVRA, 241 receptors (located within 4,462-feet of the turbines³) were evaluated using the 2018 Layout (see Appendix C). It is anticipated that:

- > 54 (22.4%) receptors will theoretically not be impacted;
- > 9 (3.7%) receptors will theoretically be impacted 0-2 hrs/yr;
- > 57 (23.7%) receptors will theoretically be impacted 2-10 hrs/yr;
- > 46 (19.1%) receptors will theoretically be impacted 10-20 hrs/yr;
- > 30 (12.4%) receptors will theoretically be impacted 20-30 hrs/yr;
- > 17 (7.1%) receptors will theoretically be impacted 30-40 hrs/yr; and
- > 28 (11.6%) receptors will theoretically be impacted 40+ hrs/yr.

The potential shadow-flicker evaluated for both Layouts are similar, but it appears that the 2018 Layout will result in an overall greater number of structures receiving 10-20 and 40+ hours of shadow-flicker per year. In comparing both layouts the differences in hourly categories are as follows:

Table 5 Shadow Receptor Comparison Summary

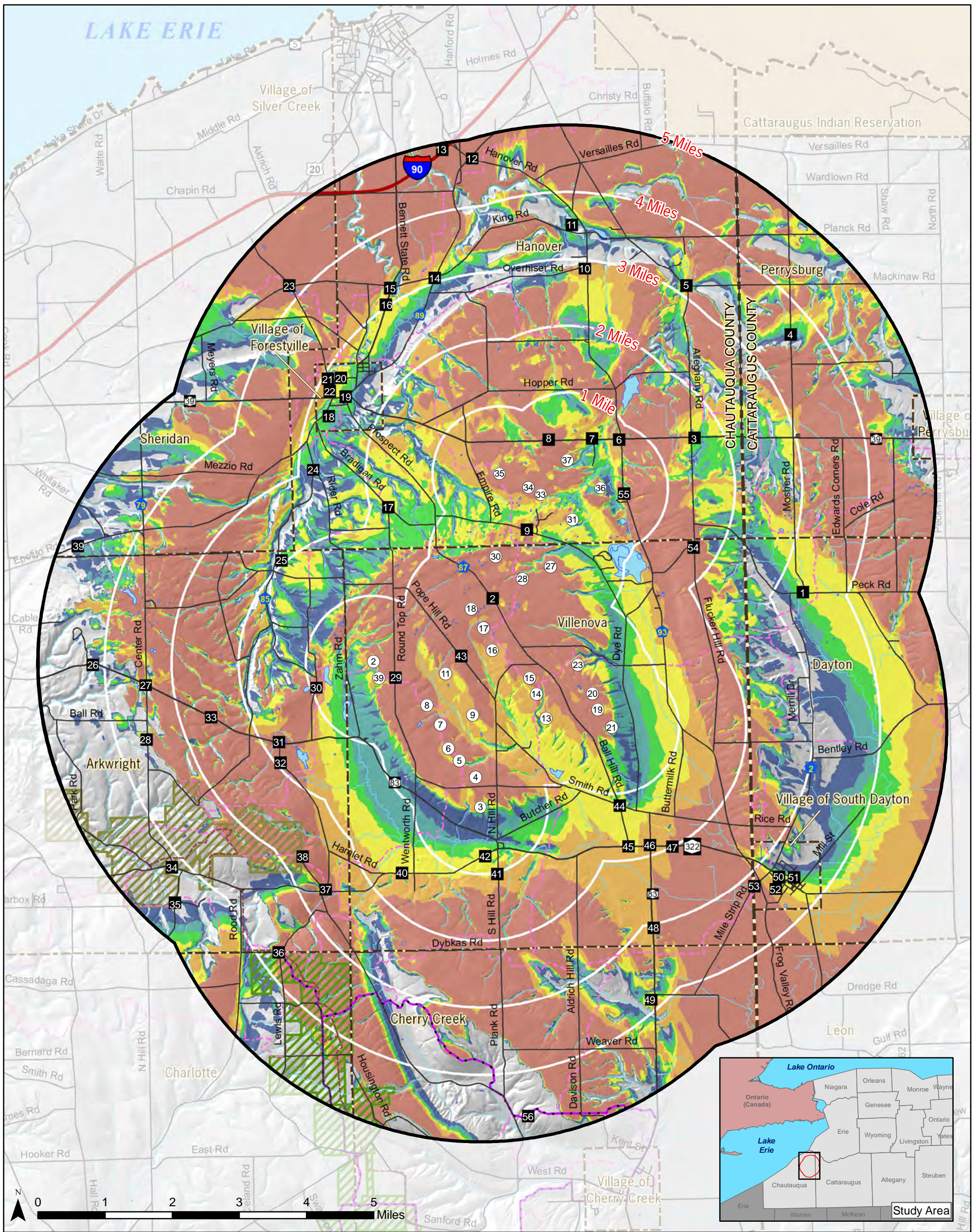
	2018 Layout Percentage of Receptors within Each Grouping	2016 Layout Percentage of Receptors within Each Grouping	Difference Between Layouts (2018 Layout used as baseline)
0-2 hrs/yr	26.1%	31.1%	Decrease of 5.0%
2-10 hrs/yr	23.7%	28.6%	Decrease of 4.9%
10-20 hrs/yr	19.1%	17.8%	Increase of 1.3%
20-30 hrs/yr	12.4%	13.3%	Decrease of 0.9%
30-40 hrs/yr	7.1%	7.1%	No Change
40+ hrs/yr	11.6%	2.1%	Increase of 9.5%
Total	100.0%	100.0%	

³ The same receptors were used in the 2018 Layout analysis in order to determine change from the 2016 Layout. Although the 2018 Layout has a slightly larger study area (based on rotor diameter) additional receptors are not included.

Visual Impact Conclusion

The Project and overall visibility is not expected to significantly change as a result of proposed changes to the 2016 Layout. Moreover, with the removal of the overhead transmission line, the need for 60 transmission structures is no longer required. The removal of these structures significantly reduces overall Project visibility.

Appendix A
Project Viewshed Mapping



TOPOGRAPHIC VIEWSHED

Ball Hill Wind Project

Figure A1
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

KEY

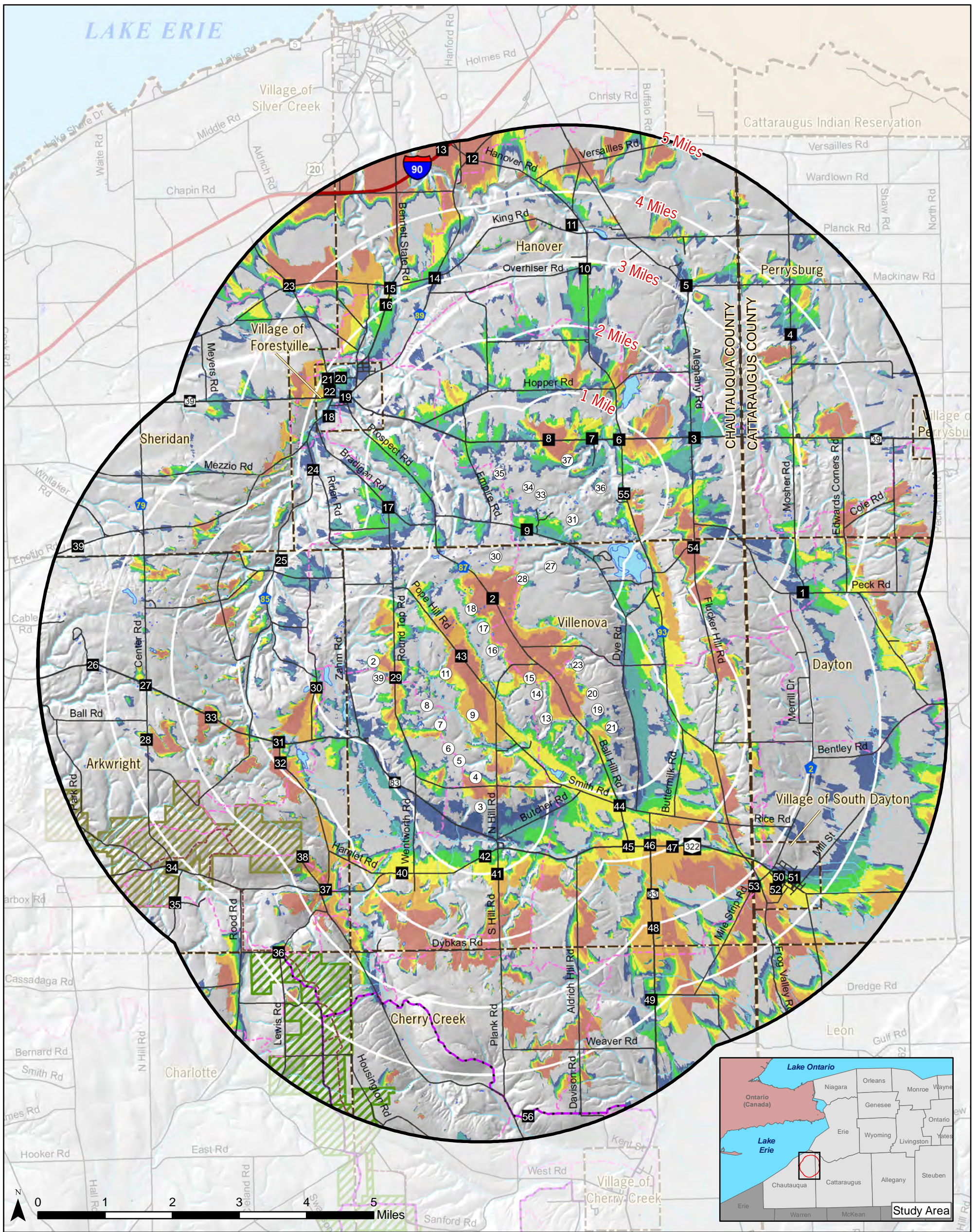
- Proposed Wind Turbine
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

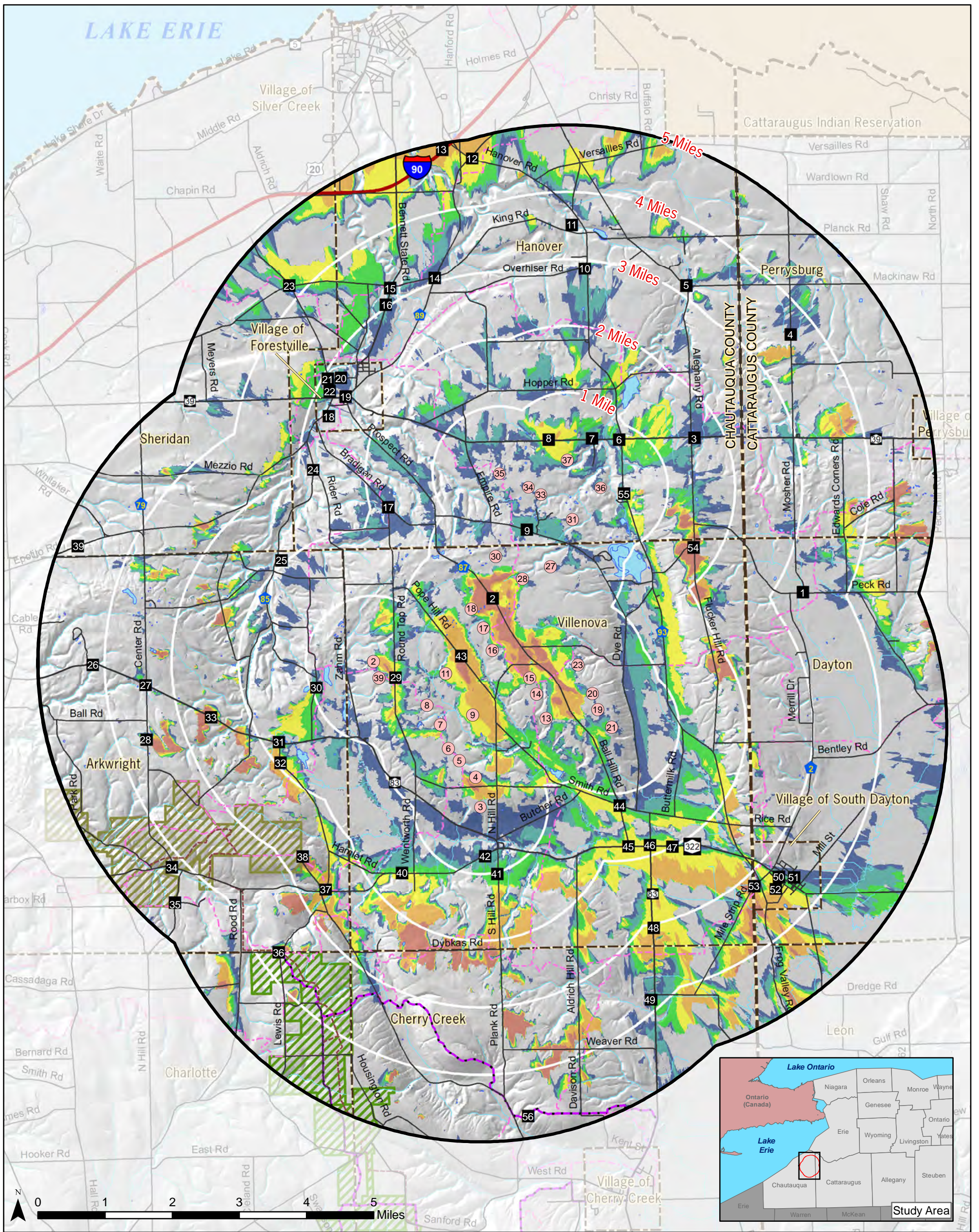
Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

PROJECT # 2017 - 17026.20
Copyright © 2018 Saratoga Associates. All Rights Reserved.
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:\2017\17026\Maps\Viewshed180522\5Mile\5MileTopoVS.mxd

SARATOGA ASSOCIATES
Landscape Architects, Architects, Engineers, and Planners, P.C.
New York City > Saratoga Springs > Syracuse





FAA NAVIGATION LIGHT VEGETATED VIEWSHED*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure A3
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

KEY

- Proposed Wind Turbine with FAA Light
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

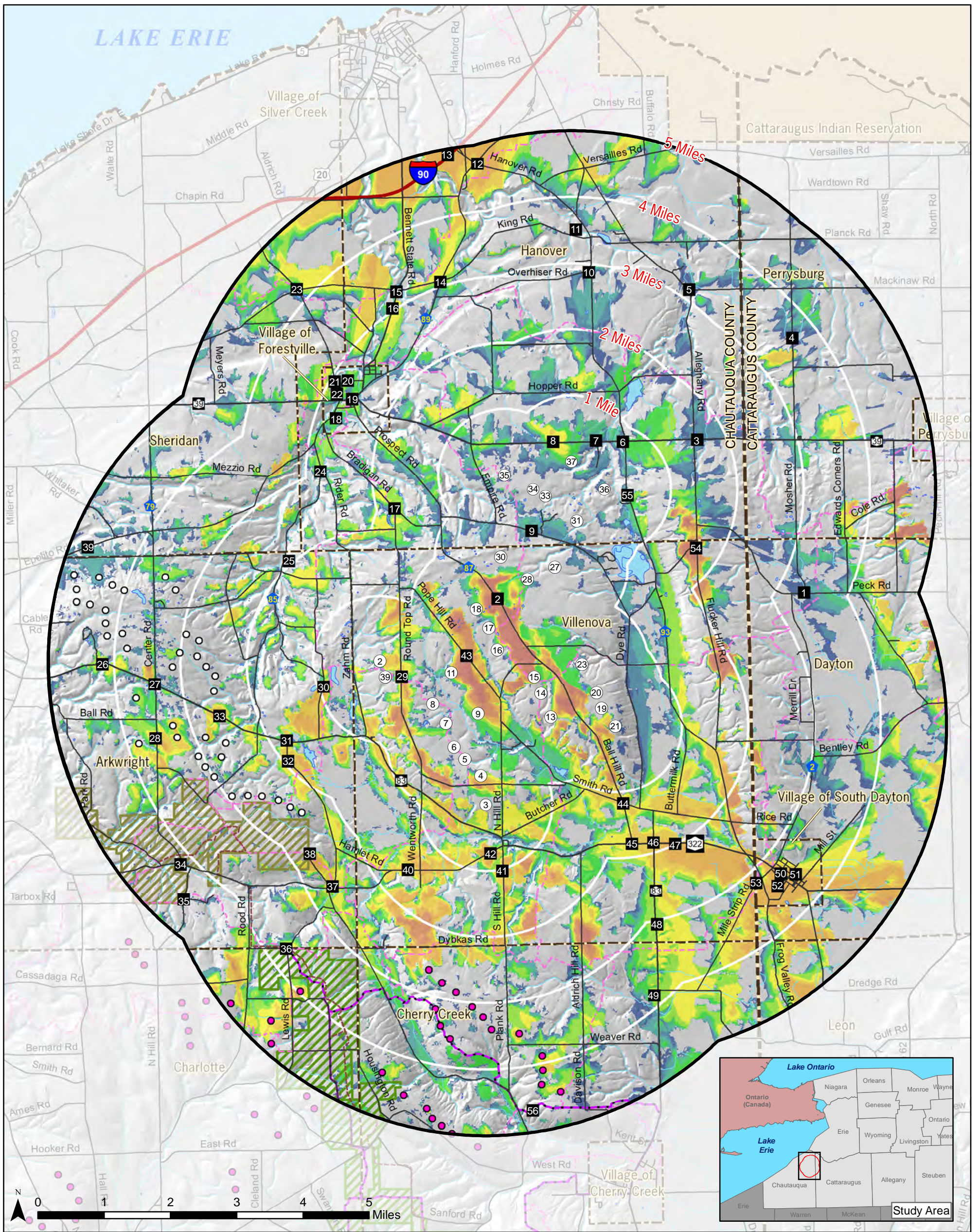
Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

PROJECT # 2017 - 17026.20
Copyright © 2018 Saratoga Associates. All Rights Reserved.
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:\2017\17026\Maps\FAA180522\FAAVegViewshed.mxd

SARATOGA ASSOCIATES
Landscape Architects, Architects, Engineers, and Planners, P.C.
New York City > Saratoga Springs > Syracuse

Appendix B
Cumulative Viewshed Mapping



CUMULATIVE VEGETATED VIEWSHED*

Ball Hill Wind Project, Arkwright Summit Wind Farm, and Cassadaga Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

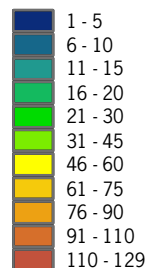
Figure B1
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

KEY

- ① Proposed Wind Turbine
- Cassadaga Wind Turbine
- Arkwright Wind Turbine
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- ▭ County Boundary
- ▭ Municipal Boundary
- ▭ Cattaraugus Indian Reservation
- ▭ Water Body
- ▭ State Forest
- ▭ Wildlife Management Area

Number of Turbines Visible



PROJECT # 2017 - 17026.20
Copyright © 2018 Saratoga Associates. All Rights Reserved.

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.

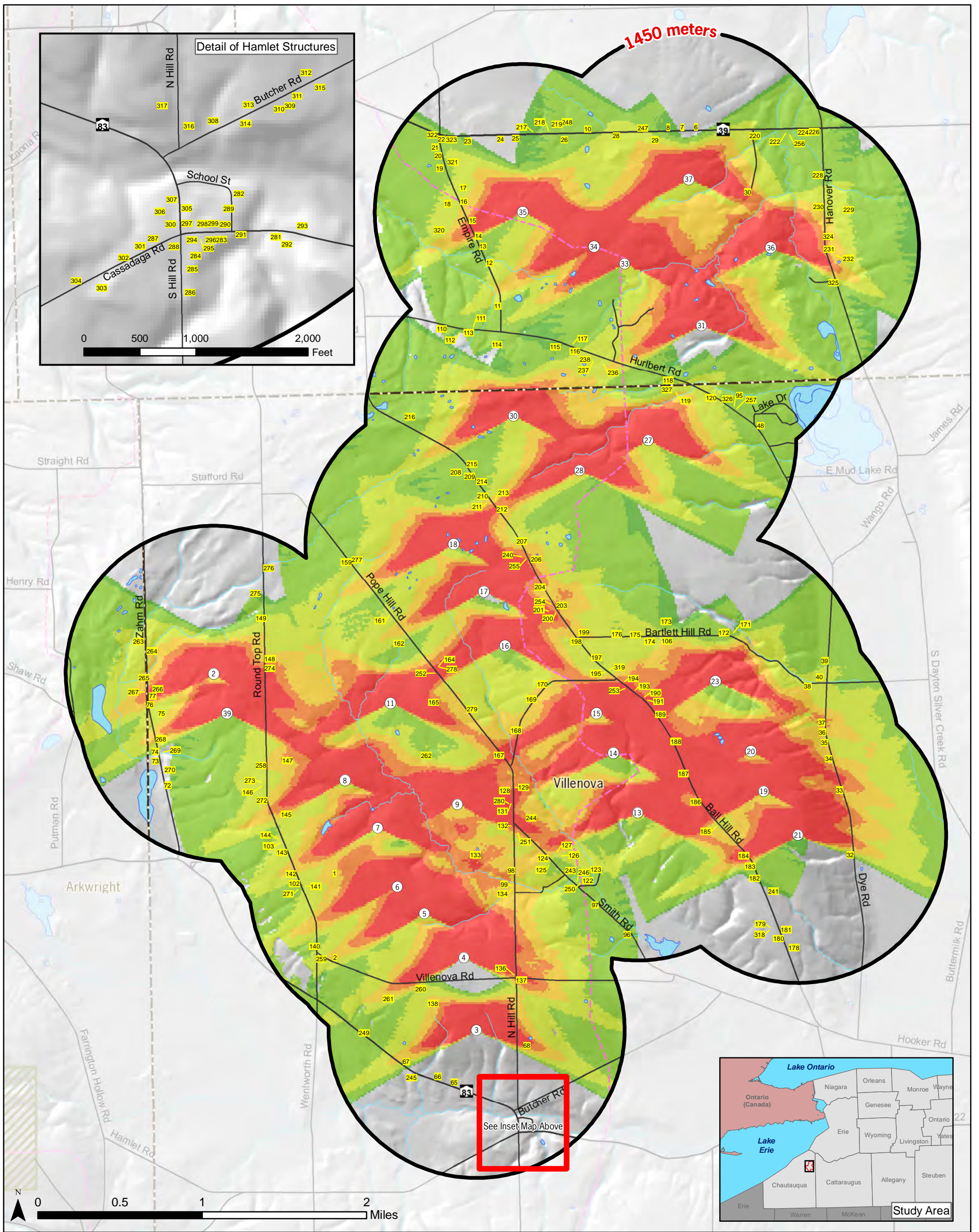
File Location:
B:\2017\17026\Maps\Cumulative180522\CumulativeVegViewshed.mxd

SARATOGA ASSOCIATES

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

New York City > Saratoga Springs > Syracuse

Appendix C
Shadow-Flicker Map



TOPOGRAPHIC SHADOW FLICKER ANALYSIS

Ball Hill Wind Project

Figure C1
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

- KEY**
- ① Proposed Wind Turbine
 - 248 Structure
 - Snowmobile Trail
 - Municipal Boundary
 - Water Body
 - State Forest
 - Wildlife Management Area

- Shadow Hours Per Year**
- Less than 2
 - 2 - 10
 - 10 - 20
 - 20 - 30
 - 30 - 40
 - Greater than 40

PROJECT # 2017 - 17026.20
 Copyright © 2018 Saratoga Associates. All Rights Reserved.
 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:\2017\17026\Maps\Flicker180522\TopoFlicker.mxd

SARATOGA ASSOCIATES
 Landscape Architects, Architects, Engineers, and Planners, P.C.
 New York City > Saratoga Springs > Syracuse