

Route Evaluation Study
Roaring Brook Wind Farm
Town of Martinsburg, NY
CME Project No. 07-093d

Prepared for:



PPM Energy
1125 NW Couch Street
Suite 700
Portland, Oregon 97209

Prepared by:



17 Computer Drive West
Albany, New York 12205-1683
(518) 446-0396

October 22, 2007

1. Introduction, Purpose and Proposed Project:

PPM Energy is proposing to construct a wind-powered, electric generating project in the southwestern portion of Martinsburg Township (Lewis County, New York) starting in the Spring of 2009 and ending in the Fall/Winter of 2009. The project will include approximately 39 wind towers, a system of gravel access roads, an electrical collection system, substation, and a temporary construction staging area located on site. The wind turbines will generate approximately 2.0 megawatts (MW) of power each, equating to a maximum capacity of approximately 78 MW. Access to the proposed tower sites and temporary staging area are located off of Carey Road and French Road. Several miles of existing and proposed on site gravel access roads will be used to access the tower sites. Refer to Figures 1 and 2 for the regional location map and proposed tower locations.

During construction there will be temporary increases in truck traffic on area roadways served by the project. The purpose of this evaluation is to document the existing transportation conditions in the area and identify probable travel routes, constraints, and proposed improvements.

2. Methodology

A field inventory, photo log, and visual assessment was conducted to evaluate possible travel routes. Sample roadway characteristics and conditions were documented. Meetings were held with the Assistant Regional Traffic Engineer and others from the New York State Department of Transportation (NYSDOT) Region 7, the Lewis County Highway Superintendent, and the Town of Martinsburg Highway Superintendent to understand jurisdictional concerns and permit requirements. Research was conducted on wind turbine transportation requirements, and a potential worst-case design vehicle was evaluated to identify possible intersection improvements.

3. Vehicle Types

The number, size and type of trucks depend on the specific project and the equipment being hauled. Turbine components and associated truck trips can generally be classified as follows:

Wind Turbine Equipment

- Blade Sections – Blades are transported on trailers with one to three blades per vehicle. Blades typically control the length of the design vehicle, and the radius of the curves along the travel route to the site. Specialized transport vehicles are designed with articulating (manual or self steering) rear axles to allow maneuverability through curves.
- Tower Sections – Towers typically comprise of four or five sections that are transported separately. Tower sections generally do not control design vehicle dimensions, although special hauling permits will be necessary.
- Nacelle – The turbine and related elements are typically the heaviest component transported.
- Hub and Nose Cone – Typically transported with one or more of the same element on a vehicle. These elements are not critical elements related to design vehicle route evaluation.
- Escort Vehicles

Construction Equipment and Materials

- Construction of Site Roads – Conventional trucks carrying stone, gravel and miscellaneous construction equipment.
- Crane – For assembly of the wind towers, cranes are transported in sections over numerous trips to the site. Assembled cranes may be crawled between tower sites.
- Concrete trucks for tower foundations.
- Construction staff and other incidental truck trips.

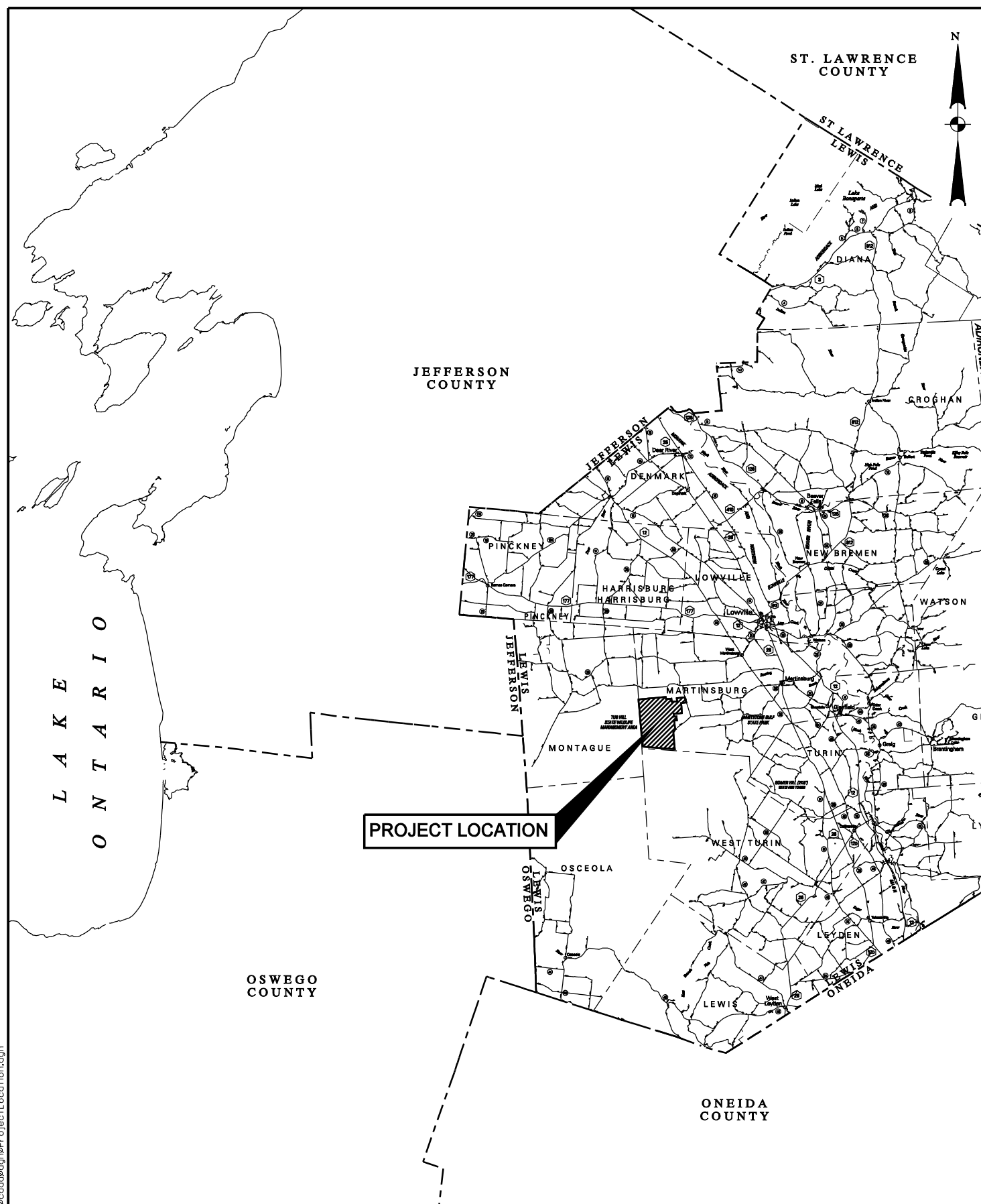
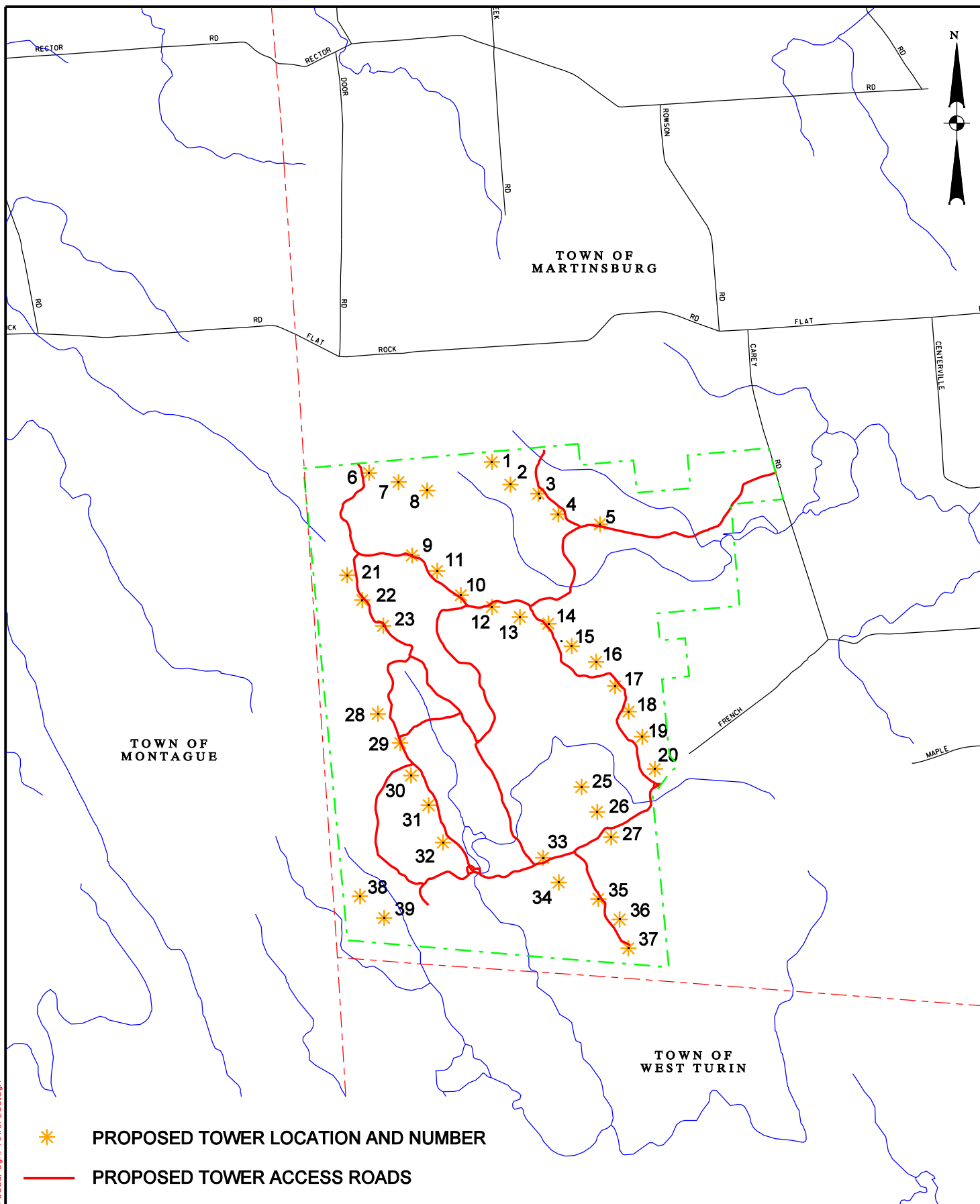


FIGURE: 1



PROPOSED TOWER LOCATIONS

ROARING BROOK WIND FARM
TOWN OF MARTINSBURG, NEW YORK



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FIGURE: 2

4. Trip Generation

The following table represents an order-of-magnitude estimate of the total number of loaded truck trips entering the project site associated with construction of the towers. This trip generation estimate does not include the trips associated with the construction of the access roads.

Table 1 – Preliminary Trip Generation Estimate (loaded trucks entering)

Component/Truck Type	Assumption	Trips
Blades	One blade per truck	117
Towers	5 tower sections per tower (one section per truck)	195
Nacelle	One nacelle per truck	39
Hub, Nose Cone, and other components	7 truck trips per tower	273
Road Construction	Gravel trucks 10 cubic yards per truck, plus other construction equipment.	unk
Crane	Several trips per access point depending on the degree of disassembly.	unk
Concrete	250 to 450 cubic yards per foundation, 8 cubic yards per truck. Assume 50 trips per tower (without on-site batch plant)	1,950
Total Known Heavy Vehicle Trips		2,574

unk = unknown

Note: trips should be doubled to account for exiting.

5. Design Vehicle Research

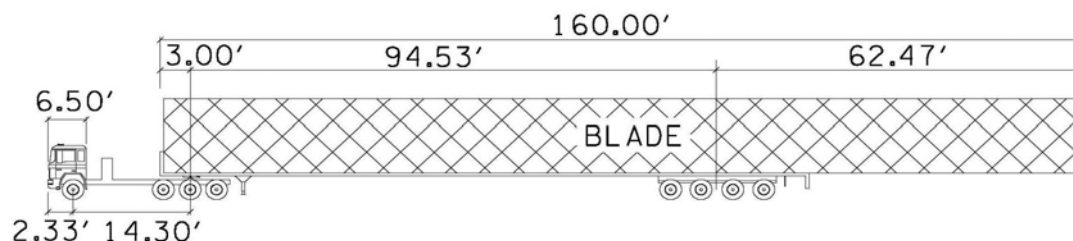
Transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles. Wind turbine components (such as the tower sections, blade sections and nacelle) are transported separately. The actual dimensions and specifications of the design vehicles may vary, depending on the specific type of truck and trailer arrangement used for transport. For planning purposes, worst-case transport requirements are based on the Gamesa G90 2.0 MW Turbine. The following table summarizes the blade length for the Gamesa G90 turbine with a 328-foot (100 m) hub height.

Table 2 – Gamesa Turbine Blade Lengths

Turbine Supplier	Turbine Size (MW)	Blade length	
		Metric	English
Gamesa	2.0	44 m	144 ft
		3-blade transport convoy is 48 m	157 ft

This table shows that the blade length for the Gamesa 2.0 MW is 144 feet for the single blade, and 157 feet for a 3-blade transport convoy. For the purpose of this route analysis, a worst-case design vehicle was developed assuming a 160 foot trailer without a manually controlled articulated rear axle as shown in the following drawing. The minimum turning radius requirements will ultimately be dependent on the wind turbine supplier selected.

Design Vehicle *without* Manually Controlled Articulated Rear Axle



Design Vehicle Dimensions for Route Planning Purposes. Actual Dimensions will vary.

6. Route Evaluation for Wind Turbines

Regionally, it is expected that the wind turbine components will travel by ship to the Port of Oswego located in Oswego, NY. It is anticipated that the regional routing plan will be similar to the one established for the existing Maple Ridge Wind Farm located in the vicinity of the project area. The regional routing plan for the Maple Ridge Wind Farm evaluated the entire route for bridge restrictions from the port of Oswego to NY Route 177. There are four (4) height restricted bridges along Interstate 81 near the City of Watertown. Due to these bridge restrictions and preliminary discussions with the NYSDOT, the probable regional travel route consists of the following roads.

- NY Route 3
- South Landing Road
- NY Route 193
- US Route 11
- NY Route 177

A list of bridge restrictions along these routes is shown in Appendix A.

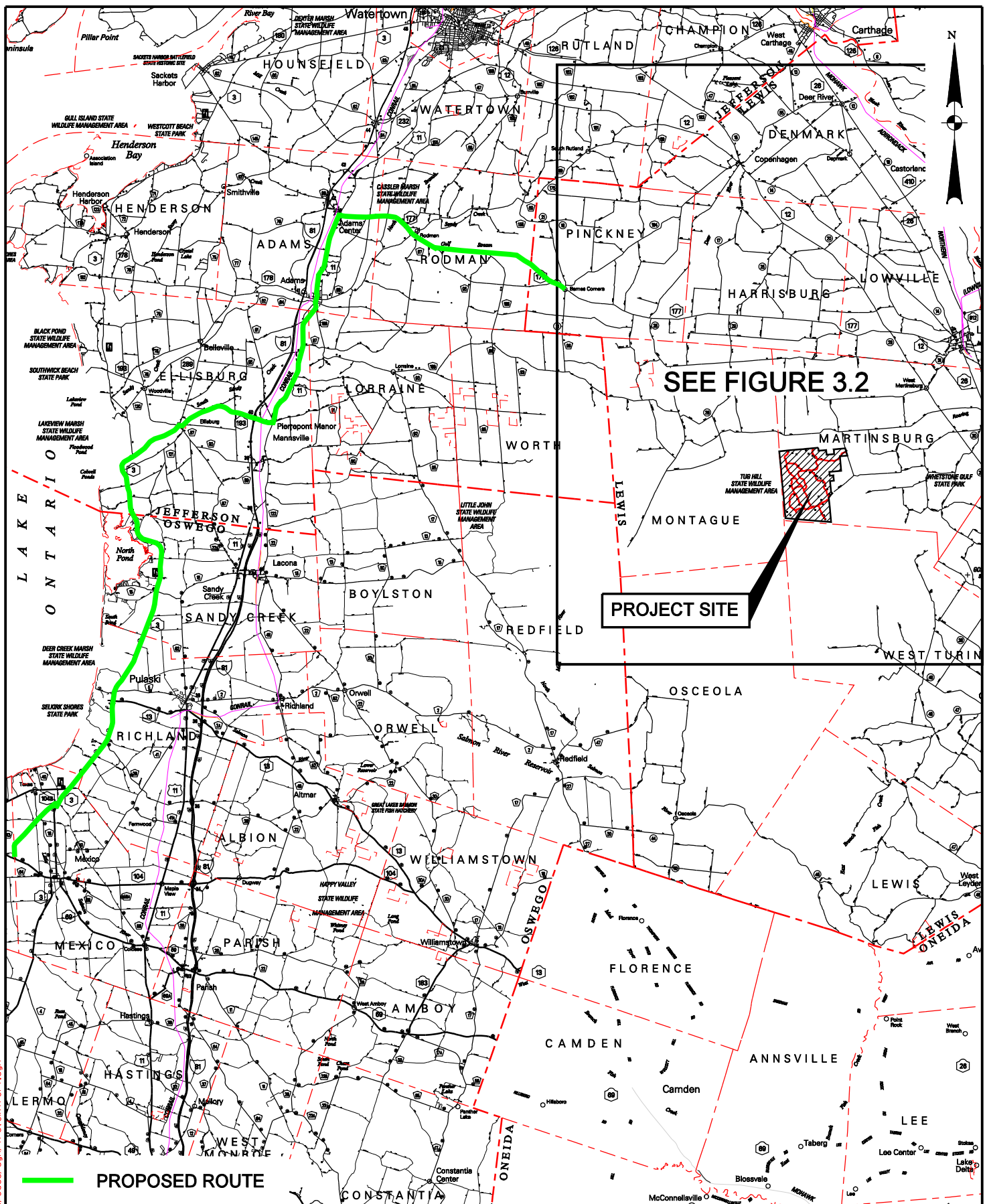
A preliminary local routing plan was identified and evaluated for the transport of the wind turbine components as they enter Lewis County based on research and discussions with the NYSDOT, Lewis County, and the Town of Martinsburg.

An initial evaluation of the potential local routing plan was conducted by traveling area roadways and documenting existing conditions. Probable travel routes, constraints, and potential improvements were then identified. The only significant grade observed on the potential travel route roadways was a 12.2% westbound upgrade on Flat Rock Road located just east of Centerville Road. The following table summarizes the results of the existing conditions inventory.

Table 3 – Road Characteristics

Road	From	To	Lane Width	Pavement Condition	Surface Type	General Speed Limit
State Roads						
US Route 11	NY Route 193	NY Route 177	24	Good	Asphalt	55-mph
NY Route 3	Oswego	S. Landing Road	24	Good	Asphalt	55-mph
NY Route 12	County Rd 194	NY Route 177	24	Good	Asphalt	55-mph
NY Route 26	NY Route 812	County Road 30	22	Good	Asphalt	55-mph
NY Route 177	US Route 11	NY Route 12	22	Good	Asphalt	55-mph
NY Route 812	NY Route 26	East State Street	24	Good	Asphalt	30-mph
County Roads						
County Rd 30	NY Route 26	County Road 29	22	Fair	Asphalt	Not Posted
County Rd 194	NY Route 177	NY Route 12	22	Fair	Asphalt	Not Posted
Local Roads						
Eagle Factory Road	NY Route 177	Gardner Road	18	Fair	Asphalt	Not Posted
Borkowski Rd	Gardner Road	Rector Road	22	Fair	Gravel	Not Posted
Swernicki Road	Rector Road	Flat Rock Road	24	Fair	Gravel	Not Posted
Rector Road	Borkowski Road	Swernicki Road	20	Fair	Asphalt	Not Posted
Flat Rock Road	Carey Road	Swernicki Road	15-23	Fair to Poor	Gravel	Not Posted
Keener Road	County Road 29	Graves Road	20	Poor	Gravel	Not Posted
Graves Road	Keener Road	French Road	15	Poor	Gravel	Not Posted
Whittaker Road	NY Route 26	NY Route 12	20	Fair	Asphalt	Not Posted
Carey Road	Flat Rock Road	End	15	Poor	Gravel	Not Posted
French Road	Graves Road	End	15	Poor	Gravel	Not Posted

Based on this assessment, there are several route options traveling south east from NY Route 177 to the proposed wind tower access roads off of Carey Road. Refer to Figures 3.1 and 3.2 which show the probable travel route, as well as potential alternate routes for each site. These route options are described below beginning with a specified route to reach NY Route 177,



REGIONAL TRAVEL ROUTE FROM
PORT OF OSWEGO

ROARING BROOK WIND FARM
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FIGURE: 3.1

followed by the options to access each site from NY Route 177. Option 1 is considered the most probable route for access to each site.

6A. Access from Oswego to NY Route 177

Option 1: Travel north on NY Route 3 from Oswego until it intersects South Landing Road. Turn right onto South Landing Road and continue east until it intersects NY Route 193. Turn right onto NY Route 193 and travel east toward Pierrepont Manor. Turn left onto US Route 11 and travel north until Adams Center. Turn right onto NY Route 177 and continue eastbound through Jefferson County toward the wind farm located in Lewis County.

6B. Access from NY Route 177 to Site (Wind Turbines 1-39)

Option 1: From the route identified in section 6.A., travel east on NY Route 177 and turn right onto Eagle Factory Road. Travel south through the Gardner Road intersection where Eagle Factory Road becomes Borkowski Road. Travel south to the Borkowski Road/Rector Road intersection. Cross Rector Road onto the "Super Highway" access road that runs through part of the Maple Ridge Wind Farm. Travel south to the Flat Rock Road/Access Road intersection and turn right. Travel west to Carey Road and turn left. Carey Road provides access into the Roaring Brook Wind Farm site.

Alternative Option 2: From the route identified in section 6.A., travel east on NY Route 177 and turn right onto Eagle Factory Road. Travel south through the Gardner Road intersection where Eagle Factory Road becomes Borkowski Road. Travel south to the Borkowski Road/Rector Road intersection and turn left. Travel east on Rector Road and turn right at the Rector Road/Swernicki Road intersection. Travel south on Swernicki Road and turn left onto Flat Rock Road. Travel west to Carey Road and turn left. Carey Road provides access into the Roaring Brook Wind Farm site.

Alternative Option 3: From the route identified in section 6.A., travel east to Barnes Corners on NY Route 177 and turn left onto County Road 194. Travel north and turn right staying on County Road 194 at the County Road 194/County Road 21 intersection. Travel north into the Village of Copenhagen and turn right onto NY Route 12. Travel south on NY Route 12 bearing right toward the NY Route 12/NY Route 177/County Road 29 intersection and turn right onto NY Route 177. Travel west on NY Route 177 and turn left onto Eagle Factory Road. Use Option 1 or Option 2 from Eagle Factory Road to access the Roaring Brook Wind Farm access roads via Carey Road.

7. Route Evaluation for Site Components via Rail

It is anticipated that some of the heavier wind farm components such as the transformer may be regionally shipped to the site via the M.A.&N. Railroad Line in Lowville. A similar procedure was used for the Maple Ridge Wind Farm. The preferred route option to the Roaring Brook Wind Farm from the rail station located on NY Route 812 is as follows:

Option 1: Travel west on NY Route 812 and turn left onto NY Route 26. Travel south to the NY Route 26/NY Route 12 intersection and turn right. Travel west on NY Route 12 and turn left onto NY Route 177. Travel west on NY Route 177 and turn left onto Eagle Factory Road. Use Option 1 or Option 2 (Section 6.B) from Eagle Factory Road to access the Roaring Brook Wind Farm access roads via Carey Road.

8. Route Evaluation for Access Road Construction Materials

It is anticipated that construction materials for the proposed access roads will be transported from the V.S. Verkler & Sons, Inc stone quarry located on Whittaker Road via a similar route used for the Maple Ridge Wind Farm. The preferred route option into the Roaring Brook Wind Farm is as follows:

Option 1: Travel west on Whittaker Road and turn right onto NY Route 26. Travel north to the NY Route 26/Flat Rock Road intersection and turn left. Travel west on Flat Rock Road to the Flat Rock Road/Carey Road intersection and turn left. Carey Road provides access into the Roaring Brook Wind Farm site.

Alternative Option 2: Travel west on Whittaker Road and turn left onto NY Route 26. Travel south to the NY Route 26/County Road 30 (Cemetery Road) intersection and turn right. Travel west on County Road 30 through the County Road 29/County Road 30/Keener Hill Road intersection. County Road 30 becomes Keener Hill Road. Travel west to the Keener Hill Road/Graves Road intersection and turn left. Travel south on Graves Road to French Road and turn right. French Road provides access into the Roaring Brook Wind Farm site. However, French Road is fairly narrow and large trucks would not be able to pass each other without either widening the road or constructing turn-offs. Therefore, it is recommended that construction vehicles exiting the site use the Carey Road entrance after they have dropped off their load which would create a circulating delivery system to and from the stone quarry.

9. Constraints and Conceptual Improvements.

Each of the routes described above and shown on Figures 3.1 and 3.2 have a number of constraining features, particularly intersection turning radii. The path of the worst-case design vehicle was evaluated along each of the probable travel routes and select alternative routes to identify conceptual intersection improvements required. Figure 4.1 shows the locations of the constraining intersections. Individual diagrams were developed to show potential improvement areas for each of the constraints along the probable travel routes for Option 1 and Alternative Option 2 as shown on Figures 5.1 through 5.6. These diagrams show approximate right-of-way and generally include two improvement options for each of the intersections. The approximate right-of-way shown on the maps was obtained from County tax map files.

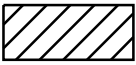
- Path Option A – Widening on the inside of the curve – This option should be selected when a significant physical constraint or unwilling property owner will not allow encroachment on the outside of the curve.
- Path Option B – Widening on the outside of the curve – Similarly, this option may be necessary when a constraint or unwilling property owner will not allow widening on the inside of the curve.

Figures 5.7 through 5.10 were developed for the Alternative Option 3 travel route which has been provided at the request of NYSDOT to avoid the bridge on Route 177 (New Boston Bridge, B.I.N. #139370) that spans Deer River in the Town of Pinckney. The diagrams show that there may be impacts to existing utility poles, signal poles, and buildings for the worst-case design vehicle evaluated for the extremely long blade sections. However, it is noted that some of the heavier, but shorter wind tower components such as the tower sections, nacelle, hub, etc. could negotiate these turns without impacting existing obstacles. It is recommended that a more detailed analysis of these intersections be conducted for the heavier components once the transportation provider has been confirmed to determine if these turbine sections can bypass the New Boston Bridge.

The final limit of improvements are expected to be within the areas shown on Figures 5.1 through 5.10 which may be a combination of widening on the inside and the outside of the curve or moving fixed objects such as utility poles, fences, etc. These limits and potential intersection improvements will be confirmed with the final wind turbine supplier and transportation provider.



LEGEND:



PATH OPTION A - WIDENING ON INSIDE OF CURVE



PATH OPTION B - WIDENING ON OUTSIDE OF CURVE



(IN FEET)
1 INCH = 80 FT.

ROUTE 177 / EAGLE FACTORY RD

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FIGURE: 5.1

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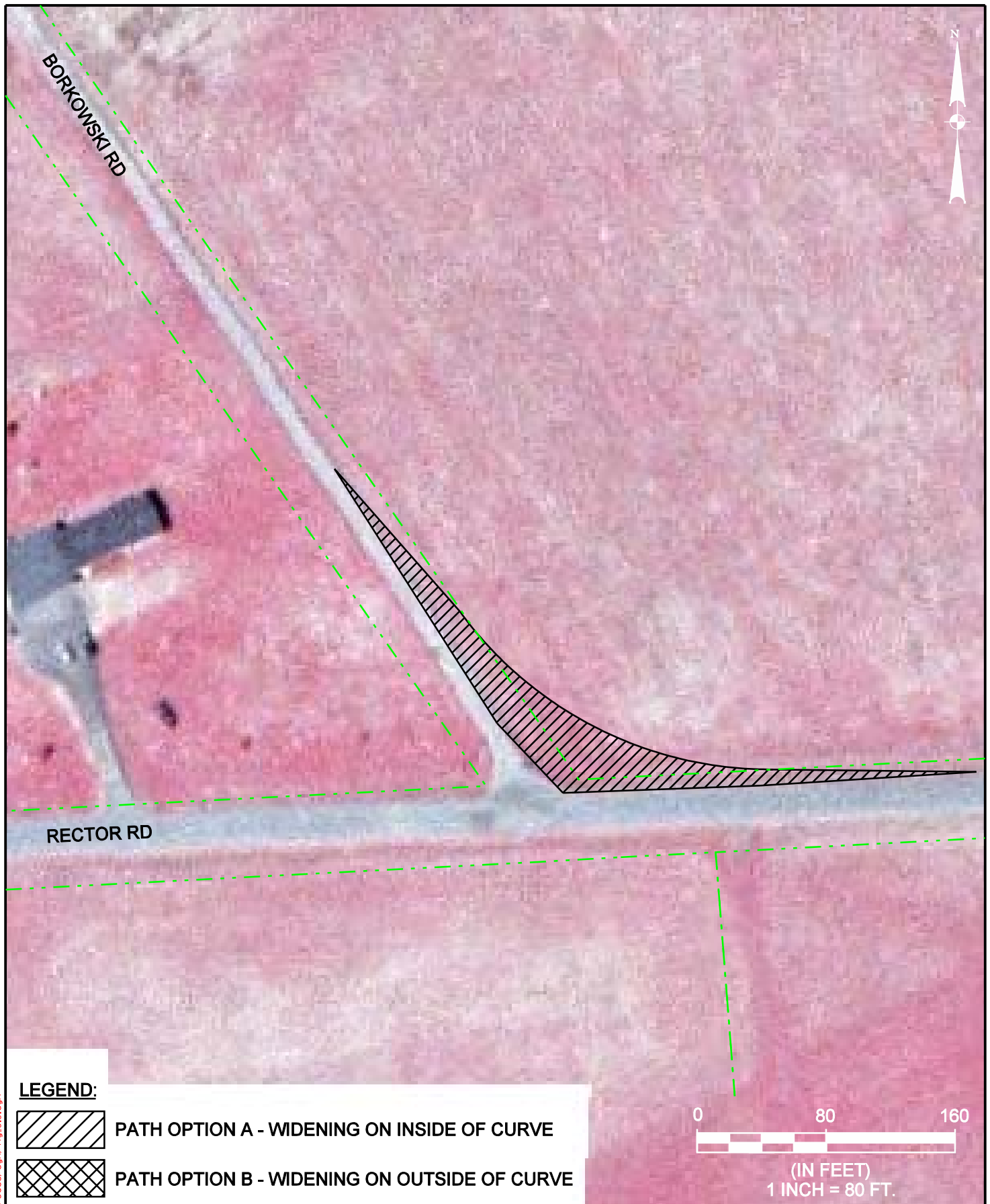
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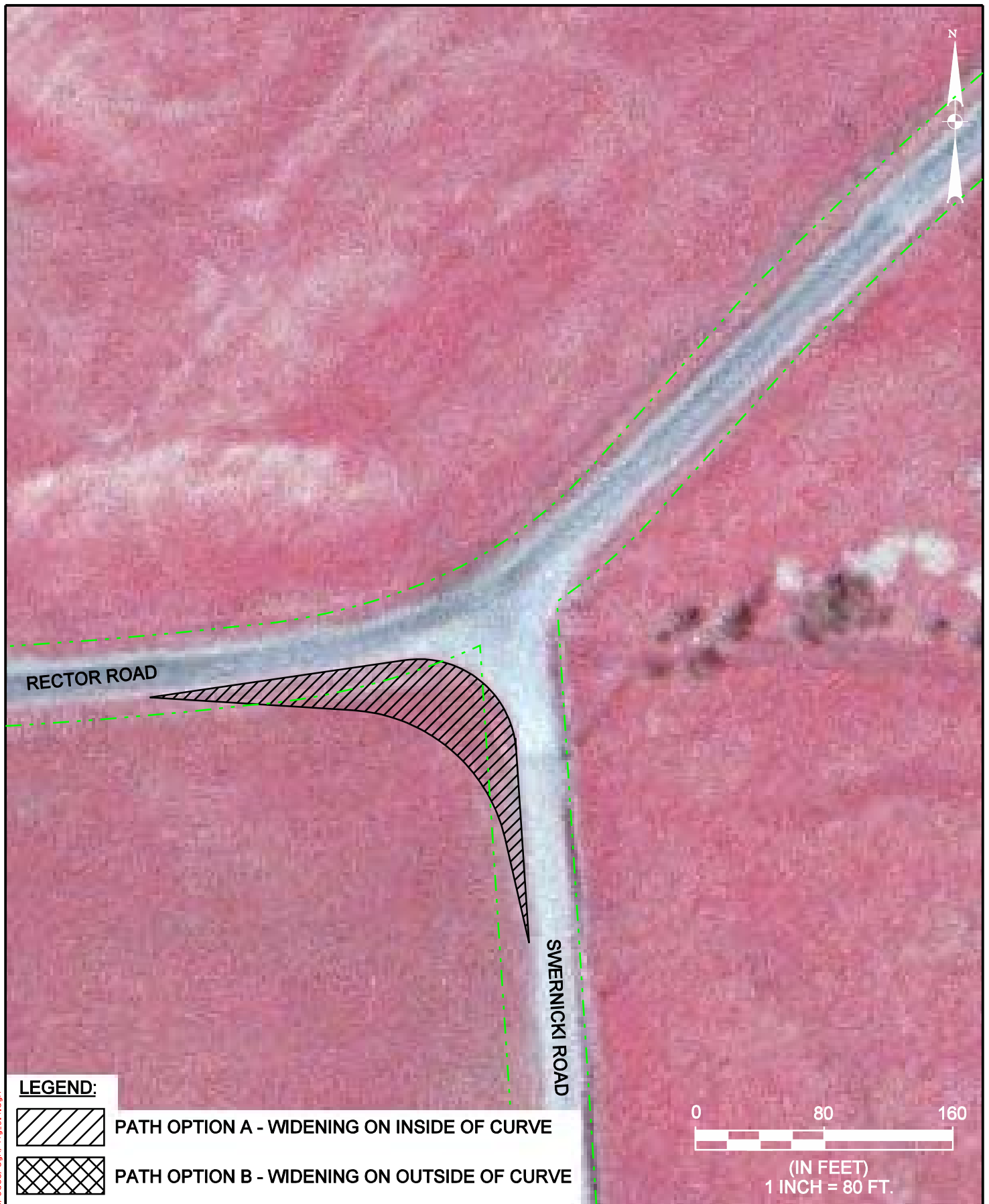
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FIGURE: 5.2



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RECTOR RD / SWERNICKI RD

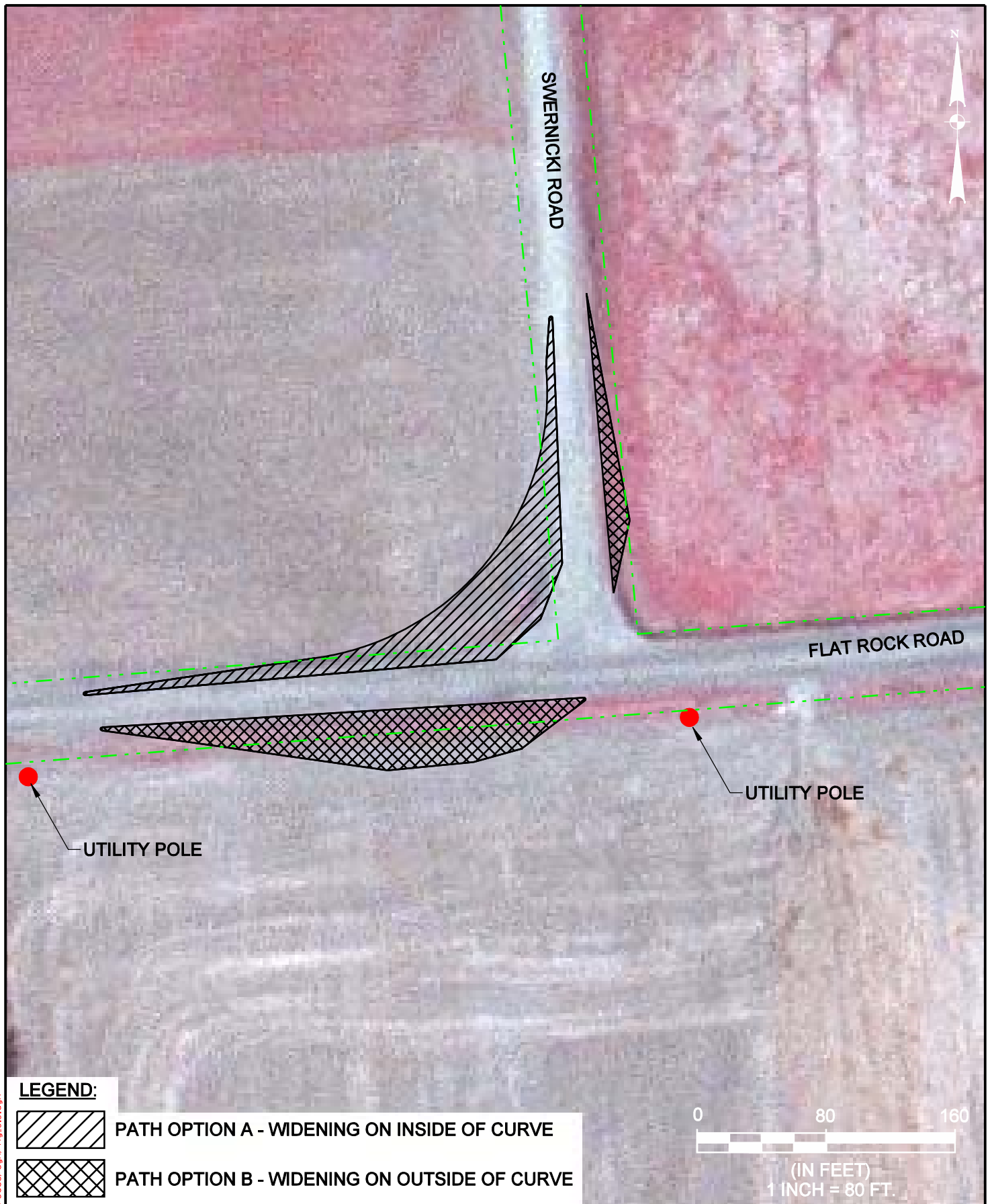
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FIGURE: 5.4



FLAT ROCK RD / SWERNICKI RD

ROARING BROOK WIND FARM
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FIGURE: 5.5



FLAT ROCK RD / CAREY RD

ROARING BROOK WIND FARM
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FIGURE: 5.6



ROUTE 177 / COUNTY ROAD 194 / COUNTY ROAD 96

ROARING BROOK WIND FARM
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FIGURE: 5.7



COUNTY ROAD 194 / COUNTY ROAD 21

ROARING BROOK WIND FARM
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FIGURE: 5.8



ROUTE 12 / COUNTY ROAD 194

ROARING BROOK WIND FARM
TOWN OF MARTINSBURG, NEW YORK



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FIGURE: 5.9



ROUTE 12 / ROUTE 177 / COUNTY ROAD 29

ROARING BROOK WIND FARM
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FIGURE: 5-10

10. Loads and Permits

Special hauling permits are required when loads exceed legal dimensions or weights. The following table summarizes these maximum legal dimensions for State Highways. Transport of the blades, nacelles, tower sections and crane will require a variety of special hauling permits. Actual loads will depend on the specific turbine supplier, crane equipment chosen, and degree of disassembly of the crane.

Table 4 – Dimensional Criteria for Special Hauling Permits

Vehicle Characteristic	State Highway Limit	Problematic Element and Approximate Dimension			
		Blade	Nacelle	Tower Sections	Crane
Width of vehicle, inclusive of load	8 feet ¹	No 7.2'	Yes 13.1'	Yes 14.1'	Yes Unk
Height of vehicle from underside of tire to top of vehicle, inclusive of load	13 feet 6 inches	Yes 15.3'	Yes 15.5'	Yes 16.2'	Yes Unk
Length of combination of vehicles inclusive of load and bumpers	65 feet ¹	Yes > 160'	Yes < 160'	Yes < 160'	Yes < 160'
Weight of component excluding vehicle	80,000 pounds	No 13,790 lbs	Yes 165,500 lbs	Yes 102,00 lbs	Yes >500,000 lbs

Source: adapted from NYSDOT PERM 30 Information Concerning Special Hauling Permits

1) Qualifying or Access Highways allow 8.5 foot width, unlimited length,

The types of permits depend on the characteristics of the vehicle and its cargo, number of trips, distance traveled, and duration. Nacelles can weigh approximately 165,500 lbs, and when combined with the transport vehicle, the total weight can exceed 200,000 pounds. When any vehicle exceeds 200,000 pounds, exceeds 16 feet in width or height, or exceeds 160 feet in length, special super load permits (PERMIT Type 1S) are required from the NYSDOT. PPM Energy will coordinate with the affected agencies and transportation providers to insure the all required permits are obtained. It is noted that NYSDOT will not grant a blanket permit for oversized vehicles for this project and will require PPM Energy to provide a separate permit package for each truck trip to the project site that crosses the New Boston Bridge. The following list summarizes the driveway permits and special hauling permits that may be required for this project.

Roadway Improvement/Driveway Permits

- NYSDOT – A Highway Work Permit (PERM 33) will be required for any physical improvements within the NYSDOT right-of-way. This will apply for improvements on NY Route 177 and Route 12 at any state highway intersection or road improvements.
- Lewis County, Town of Martinsburg, and Town of Lowville – Based on meetings with the respective Highway Superintendents, a roadway work agreement will be drafted that will require PPM Energy to restore any County or Town road back to existing conditions or better after the completion of the project.
- Jefferson County and Town of Ellisburg – Permit/Road Agreement needs currently unknown and need to be verified.

Overload Permits

- NYSDOT – NYSDOT permit package outlines the guidelines, types and fees for various special hauling permits. Based on this outline and previous discussions with NYSDOT special hauling permit representatives, it is not expected that the project will be granted the Type 13 Jobsite permit which can cover most special hauling trips (not including super loads). Type 13 permits are issued at 6 month intervals and can be extended for up to a maximum of one year. Several Type 1 permits for individual convoys may also be required such as the following:

- PERM 85 – Special Hauling Route Survey for Over Dimensional Vehicles
- PERM 12 – Special Hauling Pre-Approval Application Form for Future Permit
- PERM 80 – Special Hauling Pre-Approval Application Form for a Future Crane Permit
- PERM 39-1 – Special Hauling Trip & Building Movement Permit
- PERM 39-2k – Special Hauling Monthly, Annual & Blanket Permit
- PERM 39-3g – Special Hauling Permit Amendment
- PERM 99 – Special Hauling Permit Additional Trailer Attachment Form
- PERM 39-4 – Special Hauling Permit Vehicle Configuration Attachment Sheet
- Lewis County, Town of Martinsburg, and Town of Lowville – Based on meetings with the respective Highway Superintendents, roadway work agreements will detail any overload permits required for transport vehicles and construction trucks (to be verified for Jefferson County and the town of Ellisburg).

11. Remediation Plan

Specialized transport vehicles with numerous axles are designed to distribute the weight and minimize roadway impacts, nevertheless roadway impacts might occur. The condition of the transportation infrastructure should be left as good, or better than it was found at the beginning of the project. The basis for the remediation plan is a preconstruction photo log (see Appendix B), that establishes the pre-existing conditions. PPM Energy is committed to working with the Town, County, and State agencies to confirm necessary transportation improvements before and after completion of the project, and that such improvements will be stipulated in the project approval. This could include:



- Additional route and condition surveys.
- Bonding of improvements.
- Temporary removal of obstacles and replacement in kind.
- Completion of improvements before the project.
- Restoration after the project.

12. Conclusions

The purpose of this assessment is to determine the probable travel routes and potential improvements required for delivery of major wind turbine components during the construction of the Roaring Brook Wind Farm project for the purpose of determining potential environmental impacts and follow-up activities. A number of intersection improvements have been identified. A logistics firm and/or transportation provider experienced with oversized loads will be engaged in the final route assessment and permit process. Confirmation of improvements, construction details, traffic control plans, escort vehicles, scheduling, etc. will be necessary.

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Appendix A

Bridge Restrictions Inventory

Bridge Restrictions

Political Unit	BIN	Carried	Crossed	Posted Load (Tons)	Year Posted	L2 HS Inventory Rating	L2 HS Operating Rating	L2 Rating Date	L1 HS Inventory Rating	L1 HS Operating Rating	L1 Rating Date	Year Built	Curb to Curb Width (ft)	Owner
T/O Harrisburg	1039380	177 177 74021093	Mud Creek	0				6/28/2006	49	88	9/24/1998	1993	0	NYSDOT
T/O Lowville	1009610	12 12 74051225	Mill Creek	0		57	95	8/29/2005	32	84	3/12/1992	1975	40	NYSDOT
T/O Lowville	1009620	12 12 74051249	Mill Creek	0		52	88	1/8/2007				1927	30	NYSDOT
T/O Lowville	1069580	12 12 74051284	Mill Creek	0		37	62	7/8/2005				1927	30.3	NYSDOT
T/O Lowville	1069590	12 12 74051241	Mill Creek	0								1985	40	NYSDOT
T/O Lowville	1078650	12 12 74051272	Mill Creek									2005	39.4	NYSDOT
T/O Martinsburg	3340240	Cemetery Road	Roaring Brook	20	1987	79	133	10/18/2005	43.8	70.8	10/18/2002	1936	24.3	Lewis Co.
T/O Pinckney	1039370	177 177 74021056	Deer River	88	2007	40	59	6/5/2006				1933	30.6	NYSDOT
T/O Pinckney	1039780	COUNTY RD 194	Gulf Stream	0	1994	36	52	7/1/2001	31	56	1/31/1996	1933	27.7	Lewis Co.
T/O Lowville	1009600	12 12 74051216	Mill Creek	0				9/7/2005				1913	42	NYSDOT

Note: Provided by NYSDOT

Appendix B

Existing Conditions Photographs

Road Condition Picture Inventory



Photograph 1 – NY Route 177 at County Road 194



Photograph 2 – County Road 21 at NY Route 177



Photograph 3 – NY Route 177 at County Road 194



Photograph 4 – County Route 194 at NY Route 177



Photograph 5 – County Road 194 at County Road 21



Photograph 6 – Carey Road at Flat Rock Road

Road Condition Picture Inventory (Continued)



Photograph 7 – Flat Road Rd at Carey Road



Photograph 8 – Flat Rock Road



Photograph 9 – Swernicki Road at Flat Rock Road



Photograph 10 – Flat Rock at Swernicki Road



Photograph 11 – Swernicki Road at Rector Road



Photograph 12 – Rector Road at Swernicki Road

Road Condition Picture Inventory (Continued)



Photograph 13 – Flat Rock Road at County Road 29



Photograph 14 – County Road 29 at Flat Rock Road



Photograph 15 – NY Route 12 at NY Route 177



Photograph 16 – County Road 29 leg at NY Route 12



Photograph 17 – NY Route 12 at NY Route 177



Photograph 18 – Eagle Mountain Road at NY Route 177

Road Condition Picture Inventory (Continued)



Photograph 19 – NY Route 177 at Eagle Mountain Rd



Photograph 20 – Eagle Mountain Rd at Gardner Rd



Photograph 21 – Gardner Road at Borkowski Road



Photograph 22 – Borkowski Road at Gardner Road



Photograph 23 – Borkowski Road at Rector Road



Photograph 24 – Rector Road at Borkowski Road

Road Condition Picture Inventory (Continued)



Photograph 25 – NY Route 177 at New Boston Bridge



Photograph 26 – County Road 194



Photograph 27 – NY Route 12 at County Road 194



Photograph 28 – County Road 194 at NY Route 12



Photograph 29 – NY Route 12 at County Road 194