

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE

Roaring Brook Wind Power Project Town of Martinsburg, Lewis County, New York

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Date Accepted by Lead Agency: February 7, 2008
Public Hearing: 6:00 p.m. March 6th, 2008 at Martinsburg Town Hall
Public Comment Period: February 7, 2008 – April 7th, 2008

TABLE OF CONTENTS

COMMONLY USED ACRONYMS AND ABBREVIATIONS	vii
FIRMS INVOLVED IN PREPARATION OF THE DEIS	ix
1.0 EXECUTIVE SUMMARY	10
2.0 INTRODUCTION	17
2.1 Description of proposed action	17
2.2 Project Purpose, Need, and Benefit.....	18
2.3 Project Cost and Funding	21
2.3.1 Project Lease/Easement Terms and Conditions.....	22
2.4 GENERAL PROJECT LOCATION.....	22
2.5 PROJECT LAYOUT AND COMPONENTS.....	23
2.5.1 Project Siting Criteria	23
2.5.2 Wind Turbines.....	25
2.5.3 Electrical System	26
2.5.4 Access Roads.....	27
2.5.5 Wind Measurement Tower.....	28
2.5.6 Staging Area	28
2.5.7 Operations and Maintenance Facility.....	28
2.6 PROJECT CONSTRUCTION	29
2.6.1 Pre-construction Activities.....	30
2.6.2 Staging Area Construction.....	31
2.6.3 Site Preparation for Construction.....	31
2.6.4 Public Road Improvements.....	32
2.6.5 Access Road Improvement and/or Construction.....	32
2.6.6 Foundation Construction.....	33
2.6.7 Electrical Gathering and Interconnect Line Installation	34
2.6.8 Wind Turbine Assembly and Erection.....	35
2.6.9 Point of Interconnection/Collection Substation.....	36
2.6.10 Operations and Maintenance Facility Construction.....	36
2.7 OPERATIONS AND MAINTENANCE	37
2.8 DECOMMISSIONING AND CLOSURE PLANS.....	38
2.9 REQUIRED APPROVALS AND APPLICABLE REGULATORY PROGRAMS	41
2.10 PUBLIC AND AGENCY INVOLVEMENT	42
2.10.1 SEQRA Process	42
2.10.2 Agency and Public Review	43
3.0 ENVIRONMENTAL SETTING, POTENTIAL IMPACTS AND PROPOSED MITIGATION.....	45
3.1 GEOLOGY, SOILS, AND TOPOGRAPHY	46
3.1.1 EXISTING CONDITIONS.....	46
3.1.2 Potential Impacts	50
3.1.3 Proposed Mitigation	51
3.2 WATER RESOURCES	54
3.2.1 Existing Conditions	54
3.2.2 Potential Impacts	61
3.2.3 Proposed Mitigation	70
3.3 BIOLOGICAL RESOURCES	73
3.3.1 Existing Conditions	73
3.3.2 Potential Impacts	88
3.3.3 Proposed Mitigation	100
3.4 AIR QUALITY AND CLIMATE.....	103
3.4.1 Existing Conditions	103

3.4.2	Potential Impacts	104
3.4.3	Proposed Mitigation	105
3.5	AESTHETIC AND VISUAL RESOURCES.....	106
3.5.1	Existing Conditions	106
3.5.2	Viewer/User Groups	108
3.5.3	Potential Impacts	110
3.5.4	Mitigation	115
3.6	HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES.....	119
3.6.1	Existing Conditions	119
3.6.2	Potential Impacts	123
3.6.3	Proposed Mitigation	125
3.7	SOUND.....	125
3.7.1	Existing Conditions	125
3.7.2	Potential Impacts	127
3.7.3	Proposed Mitigation	132
3.8	TRANSPORTATION.....	132
3.8.1	Existing Conditions	133
3.8.2	Potential Impacts	134
3.8.3	Proposed Mitigation	140
3.9	SOCIOECONOMICS	142
3.9.1	Existing Conditions	142
3.9.2	Potential Impacts	146
3.9.3	Mitigation	152
3.10	PUBLIC SAFETY	154
3.10.1	Background Information.....	154
3.10.2	Potential Impacts	158
3.10.3	Proposed Mitigation	163
3.11	COMMUNITY FACILITIES AND SERVICES.....	166
3.11.1	Existing Conditions	167
3.11.2	Potential Impacts	169
3.11.3	Proposed Mitigation	172
3.12	COMMUNICATION FACILITIES	173
3.12.1	Existing Conditions	174
3.12.2	Potential Impacts	175
3.12.3	Proposed Mitigation	177
3.13	LAND USE AND ZONING.....	178
3.13.1	Existing Conditions	178
3.13.2	Potential Impacts	181
3.13.3	Proposed Mitigation	182
4.0	UNAVOIDABLE ADVERSE IMPACTS.....	184
4.1	General Avoidance and Mitigation Measures	185
4.2	Specific Mitigation Measures	187
4.3	Environmental Compliance and Monitoring Program.....	187
5.0	ALTERNATIVEs ANALYSIS.....	189
5.1	ALTERNATIVE PROJECT AREA/Project sites	190
5.2	ALTERNATIVE PROJECT DESIGN/LAYOUT.....	192
5.2.1	Wind Turbine Selection.....	192
5.2.2	Project Arrangement/Layout	194
5.3	ALTERNATIVE PROJECT SIZE.....	198
5.4	ALTERNATIVE TECHNOLOGIES	199
5.5	ALTERNATIVE CONSTRUCTION PHASING	199
5.6	NO ACTION.....	200
6.0	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	201

7.0	GROWTH INDUCING IMPACTS.....	202
8.0	CUMULATIVE IMPACTS	203
9.0	EFFECTS ON USE AND CONSERVATION OF ENERGY RESOURCES.....	207
10.0	LITERATURE CITED	208

LIST OF TABLES

Table 1. Impact Assumptions and Calculations.....	37
Table 2. Permits and Approvals for the Roaring Brook Wind Power Project.....	41
Table 3. Public DEIS Repositories	44
Table 4. Soil Associations Within the Project Site	48
Table 5. Dominant Soil Series Within the Project Site.....	49
Table 6. State Regulated Wetlands Within the Project Area.	56
Table 7. Estimated Temporary Impacts to Wetlands and Surface Waters at the Generating site. ...	63
Table 8. Estimated Permanent Impacts to Wetlands and Surface Waters at the Generating Site ...	66
Table 9. Documented State-listed Species in the Vicinity of the Project Site ¹	87
Table 10. Impacts to Vegetative Communities	89
Table 11. Environmental Impacts of Electricity Sources	100
Table 12. Viewpoints Selected for Simulation and Evaluation.....	114
Table 13. Common Sources of Sound and Associated Typical Sound Levels (dBA).....	127
Table 14. Construction Equipment Sound Levels	128
Table 15. Road Characteristics	133
Table 16. Preliminary Trip Generation Estimate (loaded trucks entering)	135
Table 17. 2006 Real Property Tax Levy Per Taxing Jurisdiction.....	144
Table 18. Assessed Value of Property in the Town by Land Use Classification, 2006.....	145
Table 19. 2005 Municipal Budgets (Town and County).....	145
Table 20. 2005 School District Budgets	145
Table 21. State EMF Standards and Guidelines for Transmission Lines	162
Table 22. Approximate Electric and Magnetic Fields at Center and Edge of Right-of-Way.....	163
Table 23. Wind Energy Facility Requirements and Approvals for the Town of Martinsburg	180
Table 24. Examples of Turbines with < 2.X MW Rating	193

LIST OF FIGURES

- Figure 1. Regional Project Location
- Figure 2. Site Location
- Figure 3. Proposed Project Layout
- Figure 4. Construction Photos
- Figure 5. Surface Waters
- Figure 6. NYSDEC Freshwater Wetlands
- Figure 7. Wetland Delineation
- Figure 8. Representative Site Wetland Photos
- Figure 9. Vegetative Communities
- Figure 10. Preliminary Construction Routing
- Figure 11. Visually Sensitive Resources
- Figure 12. Zoning and District Boundaries
- Figure 13. Agricultural Districts

LIST OF APPENDICES

Appendix A	Component Specifications and Construction Information
Appendix B	Agency Correspondence
Appendix C	Agricultural Protection Measures
Appendix D	Geotechnical Desktop Study
Appendix E	Wetland Delineation Report
Appendix F	Vegetation and Wildlife Lists with Scientific Nomenclature
Appendix G	Phase I Avian Risk Assessment
Appendix H	Breeding Bird Survey
Appendix I	Spring 2007 Visual Study of Nocturnal Bird and Bat Migration
Appendix J	Fall 2007 Visual and Acoustic Study of Bird and Bat Migration
Appendix K	Visual Impact Assessment
Appendix L	Phase 1A Cultural Resource Investigation
Appendix M	Historic Architectural Resources Survey
Appendix N	Noise Modeling Study and Environmental Impact Assessment
Appendix O	Route Evaluation Study
Appendix P	Impacts of Windmill Visibility on Property Values in Madison County, NY
Appendix Q	Communication Studies

COMMONLY USED ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
BBA	Breeding Bird Atlas (New York State)
cy	cubic yard
dBa	decibels, A-rated
DGEIS	Draft Generic Environmental Impact Statement
EAF	Environmental Assessment Form
EDR	Environmental Design & Research, Landscape Architecture, Planning, Environmental Services, Engineering and Surveying, P.C. (EDR)
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
GIS	geographic information system
kV	kilovolt
kW	kilowatt
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NYISO	New York Independent Service Operator
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NYCRR	Official Compilation of Codes, Rules, and Regulations of the State of New York
NYS	New York State
NYSA&M	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
NYSDPS	New York State Department of Public Service
NWCC	National Water and Climate Centers
OPRHP	Office of Parks, Recreation & Historic Preservation (New York State)
OSHA	Occupational Safety and Health Administration
O&M	Operations and Maintenance
PSC	Public Service Commission
PILOT	payment in lieu of tax

SEQRA	State Environmental Quality Review Act
SHPO	State Historic Preservation Office (New York)
SPDES	State Pollutant Discharge Elimination System
USACOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey

FIRMS INVOLVED IN PREPARATION OF THE DEIS

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1.0 EXECUTIVE SUMMARY

This Draft Environmental Impact Statement (DEIS) is for a proposed action known as the Roaring Brook Wind Project. The purpose of this DEIS is to evaluate the potential impacts of the Project, evaluate alternatives and consider mitigation measures.

Project Description

Atlantic Wind, LLC a wholly owned for-profit subsidiary of PPM Energy (“PPM Energy or Project Sponsor”), is proposing to develop a wind-powered generating facility in the Town of Martinsburg, Lewis County. The Project will consist of up to 39 wind turbines and deliver up to 79.9 MW of electrical power to the New York state grid. As presently envisioned, the Project will use the Gamesa Eolica G90 wind turbine (or equivalent), each with a rated capacity of 2.0 megawatts (MW), resulting in a generating capacity of approximately 78 MW for the overall Project. Each turbine will include a three-bladed upwind rotor, with a diameter of 90-meters (295-feet), mounted on an 100-meter (328-feet) tubular steel tower. The Project will also involve the upgrade of an existing 9 mile system of unpaved forest roads, construction of 4 miles of new gravel access roads, installation of approximately 12 miles of buried electrical gathering lines, and one permanent free standing 100 meter tall meteorological tower. To service the facility, an operations and maintenance building (O&M facility) will be constructed which will house operations personnel, equipment and materials, and provide staff parking. To deliver power to the New York State power grid, PPM Energy proposes to construct a 34.5 kV electrical interconnection line and substation/point of interconnection facility located adjacent to the National Grid Taylorville-Boonville 115 kilovolt (kV) transmission line near Lee Road, in the Town of Martinsburg. The interconnection route will be comprised of approximately 4 miles of buried electrical line and 6 miles of overhead line on wooden or steel pole structures.

The Project will be constructed in one continuous phase anticipated to commence in the spring of 2009 and to finish in November 2009, pending receipt of all required permits and approvals. Once built, the wind turbines and associated components will operate in almost completely automated fashion. The Project will, however, employ approximately eight operations and maintenance personnel. Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data.

Regulatory Process

This DEIS has been prepared by Environmental Design & Research, Landscape Architecture, Planning, Environmental Services, Engineering and Surveying, P.C. (EDR) of Syracuse, New York. The Town of Martinsburg Planning Board is the Lead Agency pursuant to New York State Environmental Quality Review Act (SEQRA) (6 NYCRR Part 617). The Town of Martinsburg Planning Board has review and approval authority through the evaluation of an application for a Special Use Permit and has required the preparation of this DEIS in order to evaluate the potential environmental, social and economic impacts of the Project. The purpose of this DEIS is to evaluate the potential impacts of the Project, evaluate alternatives, and consider mitigation measures. The document is intended to facilitate the environmental review process and provide a basis for informed public comment and decision-making.

The proposed location and spacing of the wind turbines and support facilities is preliminary based upon site developability, landowner participation, a wind resource assessment, environmental resource factors, and review of the site's zoning constraints. Factors considered during preliminary and final turbine and other Project component placement include wind resource, turbine spacing requirements, setbacks from residences, setbacks from roads and lot lines, wetlands and waterbodies, agricultural land use, subsurface archaeological resources, wildlife and wildlife habitat, and communication interference.

Various plans and support studies have also been prepared, which provide detailed information on discrete topical areas in furtherance of the SEQRA evaluation. These studies include the following:

- Phase IA Cultural Resources Investigation
- Historic Architectural Survey
- Transportation Route Evaluation
- Breeding Bird Survey
- Phase I Avian Risk Assessment
- Spring 2007 Visual Study of Nocturnal Bird and Bat Migration
- Fall 2007 Visual and Acoustic Study of Bird and Bat Migration
- Communication Interference Studies
- Visual Impact Assessment
- Noise Modeling and Analysis
- Wetland and Stream Surveys

It is anticipated that additional studies will be undertaken to further assess impacts to area resources, particularly along the proposed electrical collection line. Based upon the analysis conducted to date, including any recommendations of completed studies, it is anticipated that the additional study efforts will include a Phase IB Cultural Resources Investigation for the entire project, and field survey's (wetlands, wildlife, vegetative community mapping, visual impact assessment) along the electrical collection line. Scopes of analysis for these additional study efforts will be prepared in consultation with the Lead Agency and appropriate interested or involved regulatory agencies.

Project Purpose, Need, and Benefit

The purpose of the proposed Project is to create an economically viable wind-powered electrical-generating facility that generates up to 79.9 MW, providing a significant source of renewable energy to the New York power grid to:

- Satisfy regional energy needs in an efficient and environmentally sound manner;
- Reduce the price volatility of fossil-fuel electricity generation in the region, as well as reduce the use of fossil fuels in the electrical sector;
- Realize the full potential of the wind resource on the land under lease;
- Promote the long-term economic viability of rural areas in Upstate New York through Increased tax revenues to local municipalities and short-term employment of construction workers, and long-term employment of operating workers; and
- Assist New York State in meeting its proposed Renewable Portfolio Standard for the consumption of renewable energy in the State. The Project will facilitate compliance with Executive Order 111, issued by Governor George Pataki on June 10, 2001, which requires all New York State agencies to purchase 10% of their electricity from renewable energy sources by 2005 and 20% by 2010.

Summary of Potential Impacts and Benefits

In accordance with requirements of the SEQRA process, potential impacts arising from the proposed action were evaluated with respect to an array of environmental and cultural resources. The analysis of potential impacts and benefits is summarized below.

<u>Resource Area</u>	<u>Potential Adverse Impacts and/or Benefits</u>
Physiography, Geology, and Soils	Temporary and permanent soil disturbance, potential for soil erosion and soil compaction
Water Resources	Temporary disturbance to wetlands and streams, potential for siltation/sedimentation, placement of temporary and permanent fill, replacement and/or upgrade of culverts in streams and wetlands
Biological Resources	Temporary and permanent vegetation clearing and disturbance, incidental wildlife injury and mortality, loss or alteration of habitat
Climate and Air Quality	Construction vehicle emissions, dust during construction, no operational air pollutants and greenhouse gases, displacement of fossil fuel use, help to achieve State's greenhouse gas reduction goals
Aesthetic/Visual Resources	Visual change to the landscape
Cultural Resources	Potential for visibility from historic structures, potential for impacts to undocumented archeological resources
Sound	Temporary construction noise, localized operational noise on the generating project site
Transportation	Construction related road wear/damage, public road system improvements/upgrades
Socioeconomic	Host communities payment/PILOT, revenue to participating landowners, expenditures on goods and services, tourism, short-term and long-term employment, promote State's fuel diversity
Public Safety	Potential safety hazards to construction personnel, potential safety concerns relating to fire hazards, turbine malfunction, and EMF
Communication Facilities	Temporary interference to communication signals, impacts on reception to off-air television signals
Community Facilities and Services	Demands on police and emergency services
Land Use and Zoning	Changes in localized land use trends

Construction of the Project will result in total (temporary and permanent) disturbance of up to 211 acres of soil, of which 54 has been previously disturbed/developed for logging and recreation purposes. In addition, approximately 176 acres of successional forest and less than 1 acre of wetland could be temporarily disturbed by Project construction. Along the electrical collection line, approximately 18,000 feet of agricultural land will be crossed, but siting of overhead portions avoids

permanent impacts to agricultural activities to the extent practicable. A total of approximately 21 acres of forest will be converted to built facilities. Permanent wetland impacts are estimated to be approximately less than 0.5 acres. Project construction will also result in some level of temporary disturbance and/or traffic on area roadways.

Project operation is expected to result in some level of avian and bat collision mortality. Based on data from other comparable sites, bird mortality is expected to be in the range of 0 to 7 birds per turbine per year. The turbines will be visible from isolated locations within the surrounding area, primarily fully or partially screened from viewers in many locations. Predicted noise and shadow flicker impacts are negligible or non-existent, due to the extremely remote nature of the generating site. The Project is expected to generate approximately \$624,000 per year (estimated at \$9.4 million over 15 years) in PILOT revenues to local taxing jurisdictions, while requiring very little in terms of municipal services.

Summary of Mitigation Measures

Various measures will be taken to avoid, minimize and/or mitigate potential environmental impacts resulting from Project development. General mitigation measures will include adhering to requirements of various local, state, and federal ordinances and regulations. PPM Energy will also employ an environmental monitor to assure compliance with permit requirements and environmental protection commitments during construction. The proposed Project will result in significant environmental and economic benefits to the area. These benefits also serve to mitigate unavoidable adverse impacts associated with Project construction and operation.

Specific measures designed to mitigate or avoid adverse potential environmental impacts during final Project siting, Project construction or operation include:

- Siting the Project away from population centers and areas of residential development.
- Siting turbines primarily adjacent to previously disturbed/developed areas and within an area of previous logging activity to minimize required clearing of mature forest land to the extent practicable.
- Siting turbines and access roads so as to minimize impacts to wetlands and streams to the extent practicable.
- Continued consultation with New York State Department of Environmental Conservation (NYSDEC) and U.S. Fish and Wildlife Service (USFWS) to develop siting and operational

measures to minimize or avoid impacts to wildlife including threatened and endangered species to the maximum extent practicable.

- Keeping turbines significantly away from any settled areas, with the nearest non-participating permanent residential structure approximately 6,000 distant, considerably in excess of the Town's minimum setback requirements.
- Using existing logging roads for turbine access whenever possible to minimize disturbance to forest land and wetlands.
- Utilizing construction techniques that minimize disturbance to vegetation, streams, and wetlands including restricted use areas (e.g. in appropriate areas use of low pressure vehicles, no vehicle access areas, no herbicide application areas, minimal clearing requirements etc.).
- Consultation with New York State Department of Agriculture and Markets (NYS&M) representatives and implementing agricultural protection measures to avoid, minimize, or mitigate impacts on agricultural land and farm operations from the siting of the electrical collection line.
- Limiting turbine lighting to the minimum allowed by the Federal Aviation Administration (FAA) to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
- Developing and implementing various plans to minimize adverse impacts to air, soil, and water resources, including a dust control plan and sediment and erosion control plan.
- Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant predictable level of funding for the town, county, and school districts over the first 20 years of the Project's operations.

Alternatives

Alternatives to the proposed Project that were considered and evaluated include no action, alternative project siting, alternative Project area, alternative project design/layout, alternate project size, and alternative technologies. Analysis of these alternatives revealed that both the size of the Project and the configuration of the turbines as currently proposed are necessary to produce a commercially feasible project that minimizes adverse impacts to the extent practicable. A smaller project would not fully capture the available wind resource and would not generate enough power to be economically viable given the project development and construction costs, including the expense of connecting to the power grid. A larger facility might theoretically provide more economic return, but it would force location of towers into areas with more marginal wind power resources and greater proximity to residents, mature forestland, and wetland areas. This would result in more numerous

potential adverse environmental impacts than currently anticipated. A larger number of smaller turbines (shorter hub heights/smaller rotor diameters), while perhaps reducing visibility from some areas, would not change the overall visual impact of the Project and would increase impacts associated with the more extensive road and interconnect systems required. Alternative technologies (e.g., different sources of generation) eliminate many of the environmental advantages associated with the proposed Project, and do not meet the objectives of the Project. In summary, the alternatives analysis concluded that the Project as proposed offers the optimum use of resources with the fewest potential adverse impacts.

Effects on Use and Conservation of Energy Resource

Although the Project uses energy resources during construction, the operating Project will have significant, long-term beneficial effects on the use and conservation of energy resources. Energy will be expended during the construction phases of the Project (transportation/mobilization), as well as for the maintenance of the wind turbines and support facilities on-site. However, the operating Project will generate up to 79.9 MW of electricity without any fossil-fuel emissions. This greatly exceeds the energy required to construct and operate the Project, and the output is enough to power approximately 40,000 homes in New York State, (on an average annual basis). The Project will add to and diversify the state's sources of power generation, helping to stabilize power prices currently subject to spikes in fossil fuel prices.

2.0 INTRODUCTION

This Draft Environmental Impact Statement (DEIS) is for a proposed action known as the Roaring Brook Wind Power Project (“the Project”). The Project consists of the construction and operation of up to 39 wind turbine generators and associated facilities, capable of producing and delivering up to 79.9 megawatts (MW) of electrical power to the New York state power grid.

The Town of Martinsburg Planning Board is the Lead Agency pursuant to New York State Environmental Quality Review Act (SEQRA) (6 NYCRR Part 617). The Town of Martinsburg Planning Board has required the preparation of this DEIS in order to evaluate the potential environmental, social and economic impacts of the Project, which is to be located within approximately 4,100 acres of privately owned area (“Project site or Project area”) within the Town of Martinsburg, Lewis County, New York. The purpose of this DEIS is to evaluate the potential impacts of the Project, evaluate alternatives, and consider mitigation measures.

The proposed Project is described below in terms of its components, location, construction, operation and maintenance, and decommissioning. The Project’s purpose, need and benefit; cost and funding; and permits and approvals are also discussed below, along with a description of the regulatory process and opportunities for public and agency involvement in that process.

2.1 DESCRIPTION OF PROPOSED ACTION

Atlantic Wind, LLC a wholly owned for-profit subsidiary of PPM Energy (“PPM Energy or Project Sponsor”), is proposing to develop a wind-powered generating facility in the Town of Martinsburg, Lewis County. The Project will consist of up to 39 wind turbines and deliver up to 79.9 MW of electrical power to the New York state grid. As presently envisioned, the Project will use the Gamesa Eolica G90 wind turbine (or equivalent), each with a rated capacity of 2.0 megawatts (MW), resulting in a generating capacity of approximately 78 MW for the overall Project. Each turbine will include a three-bladed upwind rotor, with a diameter of 90-meters (295-feet), mounted on an 100-meter (328-feet) tubular steel tower. The Project will also involve the upgrade of an existing 9 mile system of unpaved forest roads, construction of 4 miles of new gravel access roads, installation of approximately 12 miles of buried electrical gathering lines, and one permanent free standing 100 meter tall meteorological tower. To service the facility, an operations and maintenance building (O&M facility) will be constructed which will house operations personnel, equipment and materials, and provide staff parking.

To deliver power to the New York State power grid, PPM Energy proposes to construct a 34.5 kV electrical interconnection line and substation/point of interconnection facility located adjacent to the National Grid Taylorville-Boonville 115 kilovolt (kV) transmission line near Lee Road, in the Town of Martinsburg. The interconnection route will be comprised of approximately 4 miles of buried electrical line and 6 miles of overhead line on wooden or steel pole structures.

The layout, location, and number of turbines evaluated in the DEIS presents a Project that is intended to optimize the benefits of the local wind resource while either avoiding or minimizing adverse environmental impacts, and assuring that the Project is commercially viable. All of the potential turbine site locations substantially exceed the Town of Martinsburg Wind Energy Facilities Law setbacks requirements of a minimum of 300 feet from existing public roads and at least 1,000 feet from neighboring permanent residential structures (or excepted by way of waiver). Because of ongoing agency consultation/input, environmental considerations, landowner negotiations, and potential unforeseen construction issues, all of the potential turbine locations are still subject to minor adjustments. However, this DEIS analysis provides a basis for future decision-making that will assure that any such adjustments will, consistent with SEQRA, avoid or minimize adverse impacts to the maximum extent practicable pursuant to thresholds and criteria established by the Lead Agency.

The Project is scheduled to be constructed in 2009. Because of the duration of time until construction, market availability of wind turbines could dictate the use of an alternate turbine from the proposed Gamesa Eolica G90 (2.0 MW) machine. However, any turbine ultimately selected will be of similar technology, size, appearance, operating characteristics and approximate generating capacity. In any case, the Project will deliver a maximum of 79.9 MW of electrical power to the grid.

2.2 PROJECT PURPOSE, NEED, AND BENEFIT

This section describes the purpose of the Project, how it would help meet economic and environmental needs, and how the proposed action is consistent with goals, objectives, orders and directives issued by the executive and congressional branches of the U.S. and State Government.

The purpose of the proposed Project is to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid to:

- Satisfy regional energy needs in an efficient and environmentally sound manner;
- Reduce the price volatility of fossil-fuel electricity generation in the region, as well as reduce the use of fossil fuels in the electrical sector;

- Realize the full potential of the wind resource on the land under lease;
- Promote the long-term economic viability of rural areas in Upstate New York; and
- Assist New York State in meeting its proposed Renewable Portfolio Standard for the consumption of renewable energy in the State (see below).

The Roaring Brook Wind Power Project is expected to have an average annual capacity of approximately 30%, which is comparable to other commercial wind farms in New York State. Total net generation delivered to National Grid's existing 115 kV line is expected to be approximately 204 GWh, or enough electricity to meet the average annual consumption of approximately 40,000 average NYS households.

The Project will facilitate compliance with Executive Order 111, issued by then Governor George Pataki on June 10, 2001 (and continued by Governor Spitzer in January 2007) directing state agencies, state authorities, and other affected entities to be more energy efficient and environmentally aware. Specifically, the Order requires all New York State agencies to purchase 10% of their electricity from renewable energy sources by 2005 and 20% by 2010. The project also responds to objectives identified in the 2002 State Energy Plan (New York State Energy Planning Board, 2002), and the Preliminary Investigation into Establishing a Renewable Portfolio Standard in New York (NYSERDA, 2003). The 2002 State Energy Plan required that the New York State Energy Research and Development Authority (NYSERDA) examine and report on the feasibility of establishing a Renewable Portfolio Standard (RPS). NYSEDA's Strategic Outlook Report 2007-2010 (2007) found that an RPS can be implemented in a manner that is consistent with the wholesale and retail marketplace in New York and that an RPS has the potential to improve energy security and help diversify the state's electricity generation mix. The report also concluded that an RPS would likely spur increased economic development opportunities in the renewable energy industry, including the attraction of renewable technology manufacturers and installers to New York State. In September 2004, The Public Service Commission (PSC) approved the RPS and identified a renewable energy policy, which calls for an increase in renewable energy used in the State to 25% by the year 2013 (PSC, 2004).

Further, Federal policy has recognized the need for increased supply of energy to the U.S., and for new renewable energy resources. The Project fulfills a need for the production and transmission of renewable energy, which would serve the public interest. The Project is consistent with Executive Order 13212 (dated May 18, 2001), which states:

“The increased production and transmission of energy in a safe and environmentally sound manner is essential to the well being of the American people. In general, it is the policy of this Administration that executive departments and agencies shall take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy.”

In addition to partly satisfying goals set by the Executive Branch of New York State and Federal Policy, other benefits of the proposed action include:

- Local socioeconomic benefits:
 - Increased tax revenues to local municipalities,
 - Short-term employment of construction workers, and long-term employment of operating workers (Ouderkirk and Pedden 2004).
- Environmental benefits:
 - Wind-generated electricity displaces the use of fossil fuels in conventional power plants, producing a reduction in the emission of key air pollutants; sulfur dioxide and nitrogen oxides (acid rain precursors); mercury; and carbon dioxide (tied to global climate change). NYSERDA found that if wind energy supplied 10% (3,300 MW) of the state’s peak electricity demand, 65% of the energy it displaced would come from natural gas, 15% from coal, and 10% from electricity imports. This equates to an annual displacement of 6,400 tons of nitrogen oxides and 12,000 tons of sulfur dioxide (GE Energy, 2005).
 - Energy efficiencies and renewable generation together will reduce New York’s greenhouse gas emission, helping to achieve the State’s CO₂ reduction goals (NYSERDA, 2007).
- Statewide economic benefits:
 - New York is the fourth largest energy user, yet only 10% of its requirements come from in state resources. New Yorker’s spent more than \$57 billion for energy in 2005 and 90% of that was imported from outside of New York (NYSERDA, 2007). The State Energy Plan goals promote diversity of the State’s economy through the use of alternative energy sources, including renewable based energy (State Energy Plan, 2002).
 - Reduction in the use of natural gas at New York State power plants will reduce both the demand for and the cost of natural gas, creating benefits for both electric ratepayers and natural gas consumers (ACENY, 2007).

By reducing the reliance on fossil fuels the Project will help contribute to the reduction of the adverse environmental effects of these energy generation sources. Some of the ecosystems in upstate New York are especially at risk from the combustion of fossil fuels. Airborne mercury released by coal combustion has contaminated many lakes in New York State to the extent that the NYSDEC now prohibits the eating of fish caught in those bodies of water (NYSDOH, 2007). The precipitation on the Tug Hill plateau is among the most acidic of any place in the US, one effect of which could be damage to local stands of sugar maple trees (Allan, D. et al., 1995).

Lower emissions of SO₂ and NO_x could also produce healthier rainwater on crops, and less pollution in sensitive ecosystems like the Adirondack area. The RPS started in January 2006 and according to the PSC, should reduce statewide air emissions of nitrogen oxide (NO_x) by 6.8%, sulfur dioxide (SO₂) by 5.9%, and carbon dioxide (CO₂) by 7.7% (PSC, 2004). By offsetting the emission of key air pollutants and greenhouse gases, the Project will clearly benefit local ecosystems, water resources as well as human health. Additional information on the socioeconomic and air quality benefits of the proposed Project are included in Sections 3.9 and 3.4.

In addition, as a result of the RPS, and the displacement of natural gas use described above, the PSC anticipates that wholesale energy prices are likely to be lower than they otherwise would be as the addition of substantial amounts of renewable energy offsets some of the program costs. The cumulative direct cost of RPS-related payments to renewable energy projects, expected to be in the range of \$582 million to \$762 million, is expected to be partly offset by approximately \$362 million in wholesale energy cost reductions as New York reduces its reliance upon fossil fuels (PSC, 2004).

2.3 PROJECT COST AND FUNDING

The approximately \$200 million cost of developing, permitting and constructing the Project will be provided by its sponsor, PPM Energy, which has developed several other wind power projects in the United States, including the recently constructed Maple Ridge Wind Farm on the Tug Hill Plateau in Lewis County, New York. This 321 MW project, which comprises 195 operating wind turbines in the towns of Martinsburg, Harrisburg and Lowville, is jointly owned by PPM Energy and Horizon Wind Energy. The Roaring Brook Wind Power Project will also be funded as a commercial, for-profit enterprise with the approximately \$200 million capital cost to be provided by its Sponsor, which may also elect to finance this expenditure through commercial debt and/or other private investors. PPM Energy intends to own and operate the Project, through a wholly owned subsidiary Atlantic Wind LLC, a standalone special purpose entity (an ownership structure that is typical for the independent

or non-utility industry). The electrical output will likely be sold in the New York Independent System Operator (NYISO) wholesale power market or to other power buyers under bilateral power purchase agreements; and the “green tags” or renewable energy credits will likely be sold separately either to NYSERDA, under the RPS program, or to other buyers of clean power.

2.3.1 Project Lease/Easement Terms and Conditions

PPM Energy will enter into an agreement with the participating landowners (the landowners who consented to Project components occupying their land) in the form of a standard lease agreement (for the host of the wind towers) or easement (for hosts of access roads, electrical collection lines and related facilities), that provide for compensation during the Project’s development, construction and operation. These leases and easements will secure all the land rights necessary to develop, construct and operate the wind turbine generators along with all ancillary facilities. These agreements include the following provisions:

- a term of 25 years with a 26 year extension (at the option of the Sponsor)
- lessee access rights as necessary to develop, build and operate the wind project facilities
- quarterly rental payments for the landowner hosting wind turbine towers, and one-time payments for easements (typically payable per foot of access road or power line)
- standard indemnification provisions that protect the lessor-landowner from any damages related to the construction or operation of the Project facilities
- a clean-up requirement of the lessee that obligates it to remove from the leased premises all refuse and other debris resulting from the development, construction or operation of the wind project facilities, and to maintain the cleanliness of these premises
- a decommissioning requirement that obligates the lessee (i.e. the Project company) to remove all above-ground Project facilities at the end of the Project’s useful life, and to return the leased property to its original condition except for any facilities that are more than 36 inches belowground,
- other commercial terms that are typical for long-term leases or easements in New York.

2.4 GENERAL PROJECT LOCATION

The proposed Project is located on approximately 4,100 acres of leased private land in the Town of Martinsburg, in central Lewis County. The proposed location for wind turbines, access roads, electrical gathering lines, and the meteorological tower, is located on approximately 4,000 acres of leased private land, comprised of multiple parcels with one landowner, in the far southwestern portion of the Town of Martinsburg (“the generating site”). The generating site is located

approximately 4.7 miles south of State Highway 177, approximately 5.7 miles west of the Hamlet of West Martinsburg, and 6 miles southwest of the Village of Lowville. Specifically, the generating site is bordered to the east roughly by Carey Road, to the west by the Montague town line, to the north by private land bordering Flat Rock Road, and to the south by private land bordering French Road and paralleling the town line of West Turin (See Figure 2).

Power generated by the Project will be delivered via a 34.5 kV electrical interconnection line to the substation following land under private easement. Currently, the land easements necessary to develop the electrical interconnection line are under negotiation, and therefore PPM Energy holds proprietary the precise centerline of the proposed route. Figure 2 illustrates the corridor within which the electrical interconnection line will be constructed. This area has a northern boundary approximately one half mile north of Flat Rock Road, a southern boundary of French Road, and an eastern boundary approximately one mile east of NYS Route 26 (“the electrical interconnect site”). The electrical interconnection line will traverse approximately 15 parcels over a maximum 10 mile length, of which approximately four miles will be buried and approximately six miles will be mounted on wood pole structures.

2.5 PROJECT LAYOUT AND COMPONENTS

2.5.1 Project Siting Criteria

The primary goal of wind turbine siting and design is to maximize the capture of wind energy to assure economic viability, while providing a design that minimizes environmental impacts and meets all turbine vendor site suitability requirements. As such, this is an iterative process with the final project array design reflecting a balance of these factors. The proposed location and spacing of the wind turbines and support facilities is initially based upon site developability, landowner participation, a wind resource assessment, environmental resource factors, and review of the site’s zoning constraints. Factors considered during preliminary and final turbine and other project component placement includes the following:

Wind Resource Assessment. Through the use of on-site meteorological data collected at four 60 m monitoring towers and one SODAR station, topographic and surface roughness data, and wind flow modeling and wind plant design software, the wind turbines are sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing southwesterly wind direction in the Project area.

Sufficient Turbine Spacing: A critical design factor is to provide sufficient separation among turbines to minimize wake (energy) loss and added turbulence which translates to turbine component wear. The Project turbines will have a final placement with sufficient space between them to minimize wake losses and maximize the capture of wind energy, and meet all turbine vendor operational specifications.

Local Zoning: The Town of Martinsburg, pursuant to the Town's Wind Energy Facilities Law has established a wind power overlay district, to provide an area within the Town of Martinsburg where wind energy facilities shall be permitted subject to the review and permitting requirements of their local ordinance. All proposed wind turbines will be sited within the district, and the Project will otherwise comply with the terms and conditions of the Town of Martinsburg Wind Energy Facilities Law.

Distance from residences: The turbine locations will maintain a minimum setback of approximately 1,000 feet between the tower and the nearest occupied permanent residence (excepted by way of waiver). The Project well exceeds this minimum, as the nearest permanent residence is approximately 6,000 feet away. This turbine setback complies with the Town of Martinsburg Wind Energy Facilities Law, and minimizes potential visual and sound effects of the turbines on Project neighbors.

Distance from Non-participating Land Parcels: The turbine locations will maintain a minimum setback of 300 feet from the boundary line of all adjacent parcels owned by non-participating neighbors, in accordance with the Town of Martinsburg Wind Energy Facilities Law.

Distance from roads: The turbine locations will also maintain a minimum setback of at least 300 feet from public roads, in accordance with the wind turbine siting requirements of the Town of Martinsburg Wind Energy Facilities Law

Wetlands and Waterbodies: The O&M Facility, temporary construction staging area, substation and turbine foundations will not be located within delineated federal jurisdictional or state regulated freshwater wetlands. However, areas within 100 feet of state regulated freshwater wetlands (regulated adjacent areas), may be unavoidable due to the significant amount of regulated adjacent area on the generating project site. Additionally, placement of interconnecting access roads and electrical lines in wetlands may be unavoidable.

Communication Interference: Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on local communications.

Cultural Resources: All Project components will be sited and Project construction will be conducted in such a way that does not cause any effect to prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialists.

Through an analysis of site developability, wind resource assessment, environmental resource factors, and review of the site's zoning constraints, a proposed project layout was developed by PPM Energy. The components of the layout are described individually in the following sections.

2.5.2 Wind Turbines

The wind turbines currently anticipated to be used for this Project are manufactured by Gamesa Eolica (or equivalent). Additional information regarding these turbines is included in the manufacturer's brochure in Appendix A. This type of wind turbine is selected because it is a state of the art on-shore wind turbine, and because its performance and efficiency are most suited to the wind resource/wind conditions on site to maximize the generation of energy in the Project area. As previously described, because the Project is not scheduled to be built until 2009, market factors such as availability and cost could dictate use of an alternate turbine. However, any turbine ultimately selected will be similar in design and appearance and operating characteristics to the Gamesa machine. Each wind turbine consists of three major components; the tower, the nacelle, and the rotor. The height of the tower, or "hub height" (height from the base of the tower to the center of the rotor hub on top of tower) will be approximately 328 feet. The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The total turbine height (i.e., height at the highest blade tip position) will be approximately 476 feet. Descriptions of each of the turbine components are provided below. See Appendix A for an illustration of the turbine proposed for the Project.

Tower: The tubular towers used for this Project are conical steel structures manufactured in five sections, each of which are trucked separately to the site and bolted together using internal flanges. The towers have a base diameter of approximately 15 feet and a top diameter of approximately 8 feet. Each tower will have an access door, internal lighting, and an internal ladder to access the nacelle. The towers will be painted white to make the structure less visually obtrusive.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed by a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery, and is approximately 28 feet long, 10 feet tall, and 11 feet wide. It is externally equipped with an anemometer and a wind vane that measure wind speed and direction (information used by the turbine controller to turn the machine on and off, and to yaw it into correct position). Attached to the top of some of the nacelles, per specifications of the Federal Aviation Administration (FAA), will be a single, medium intensity aviation warning light. These will be red flashing red lights (L-864) and operated only at night. The nacelle is mounted on a sliding ring that allows it to rotate or “yaw” into the wind to maximize energy capture.

Rotor: A rotor assembly is mounted on the drive shaft, and is operated upwind of the tower. Each rotor consists of three fiberglass composite blades approximately 147 feet in length (total rotor diameter of 295 feet). The rotor attaches to the drive shaft at the front of the nacelle. Electric servo motors within the rotor hub vary the pitch of each blade according to wind conditions, which enable the turbine to operate efficiently at varying wind speeds. The wind turbines begin generating energy at wind speeds as low as 3 meters per second (m/s) (6.7 mph) and automatically shut down at wind speeds above 21 m/s (47 mph). The maximum rotor speed is approximately 19 revolutions per minute (rpm).

2.5.3 Electrical System

The proposed Project is anticipated to have an electrical system that consists of the following parts: 1) a system of buried 34.5 kV shielded and insulated cables that will collect power from each wind turbine (electrical gathering lines), 2) a point of interconnection/collection substation located off of Lee Road that transfers the power to the existing 115 kV National Grid Taylorville-Boonville transmission line and regional power grid, and 3) a 34.5 kV electric interconnection line that connects the wind turbine generators to the substation (partially buried, partially mounted on wood poles). Each of these components is described below, with additional information included in Appendix A.

Electrical Gathering Line System: A transformer located near the base of the tower or the interior of the nacelle, will raise the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the collection system. From the transformer, three power

cables along with the fiber optic communication cables will collect the electricity produced by wind turbine generators to be connected to one of four underground circuits. These power lines will typically be installed adjacent to Project access roads and the system of existing project area roads to be upgraded. The general locations of proposed buried electrical collection lines is indicated in Figure 3.

Electrical Interconnection Line System: Off of the Project site, buried electrical lines will continue eastward for approximately 4 miles, at which point the underground power lines will become overhead, with each of two overhead 34.5 kV circuits hung from a 6-mile long series of single wooden or steel poles. This overhead line will terminate at the 115 kV substation and interconnection point. The overhead line will consist of approximately 100 60-foot tall wood or steel poles with spans averaging 300 feet in length.

Point of Interconnection/Collection Station: The collection substation will be located on a private parcel of land located off of Lee Road adjacent to the existing National Grid 115kV Taylorville-Boonville Line. It is the terminus of the collection system, and will transform the voltage of this system from 34.5 kV to 115 kV. The fence line of the station will be approximately 200 by 250 feet in size and will include 34.5 and 115 kV busses, a transformer, circuit breakers, towers, a control building, and related structures. The substation will be enclosed by chain link fencing and will be accessed by a new gravel access road 16 feet in width (see Appendix A). The point of interconnection station (POI station) will be located immediately adjacent to the collection substation. The fence line will be approximately 250 by 250 feet in size and will encompass electrical switches and related equipment necessary to tie into one of the two existing circuits that comprise the National Grid 115 kV Taylorville-Boonville line. The POI station will be owned and operated by National Grid.

2.5.4 Access Roads

The Project will require the construction of new or improved access roads to provide access to the proposed turbines and collector substation/POI station sites. The proposed location of Project access roads is shown in Figure 3. The total length of access road required to service all proposed wind turbine locations is approximately 13 miles. Of this distance, approximately 9 miles is currently well maintained forest roads and farm lanes which require only improvement for use during construction. The balance of the distance, or 4 miles, will require the construction of new access roads. Temporary access roads will be gravel surfaced and typically are 34 feet wide to

accommodate crane travel (however, for impact calculations purposes, a maximum finished surface of 40 feet is assumed). Crane travel will not be necessary on all Project access roads, but because crane travel is not planned until selection of the crane operator/contractor, a worse case assumption of 40-foot width for all roads is assumed. Following construction, roads will be restored for use as permanent access roads. The permanent roads will be gravel-surfaced and typically are 16 feet in width (however, for impact calculation purposes a maximum finished width of 20 feet is assumed). To construct the overhead sections of the 34.5 kV electrical interconnection line between the point of interconnection/collection station and the generating site, temporary 16 foot wide access roads may have to be constructed for sections of this interconnection line, but any such temporary roads in agricultural fields or wetlands will be restored following construction.

See Appendix A for typical access road specifications.

2.5.5 Wind Measurement Tower

One 100-meter (328-foot) tall wind measurement tower (meteorological tower) will be installed to collect wind data and support performance testing of the Project. The tower will be a self-supporting galvanized tubular or lattice steel structure, and will be equipped with wind velocity and directional measuring instruments at three different elevations. The wind measurement tower is located in the southwest corner of the generating site portion of the Project site adjacent to an existing forest road, as depicted in Figure 3.

2.5.6 Staging Area

Construction of the Project will require the development of a temporary construction staging area. It is currently anticipated that only one staging area will be necessary for the turbine facilities, which will accommodate construction trailers, storage containers, large project components, and parking for construction workers. The staging area is anticipated to be up to five acres in size, and will be located near the entrance to the generating site project parcels, located off of Carey Road (See Figure 3). No fencing or lighting of the staging area is proposed.

2.5.7 Operations and Maintenance Facility

An operations and maintenance facility (O&M) will house the command center of the Project's supervisory control and data acquisition (SCADA) system. The building will be linked by fiber optic cables to each of the turbines through the SCADA system, which allows an operator to control critical functions and the overall performance of each turbine. A storage yard adjacent to the O&M building will house equipment and materials necessary to service the Project. The proposed location

of the O&M facility has not been finalized, but it is anticipated to be up to 6,000 square feet in size and located on a private parcel of land accessible to a public/town road in the vicinity of the generating site to reduce the travel time for a maintenance crew to reach any turbine. In final site selection, PPM will avoid environmentally and culturally sensitive locations. If the facility is within public view, it will include visual screening elements (e.g. vegetation, berms, etc.) to reduce the visibility/improve the aesthetics of the associated storage yard/ parking area.

2.6 PROJECT CONSTRUCTION

Project construction is anticipated to occur in a single phase. Pending the receipt of all appropriate permits, construction is scheduled to start in the spring of 2009 and be completed by December 31 of that year. Although a detailed schedule has not yet been developed, Project construction is anticipated to proceed in the following order: a) civil engineering work (e.g., public road improvements, access roads construction, turbine foundation construction); b) electrical engineering work (e.g., installation of buried interconnect and construction of Project substations); c) wind turbine installation; and d) Project testing and commissioning.

Project construction will be performed in several stages and will include the following main elements and activities:

- Grading of the staging/field construction office area and substation areas
- Construction of access roads, crane pads, and turn-around areas
- Construction of turbine tower foundations
- Installation of the underground electrical collection system
- Construction and installation of the substation
- Assemble and erection of the wind turbines
- Plant commissioning and energization

Prior to the initiation of construction, various environmental protection and control plans will be developed and shared with the town. These will include a construction routing plan, road improvement plan, dust control plan, emergency response plan, public safety plan, and complaint resolution procedures. These plans and procedures are described in greater detail in Section 3 of the DEIS. Actions included in these plans and procedures will be reviewed, coordinated and approved by the town prior to implementation, to assure that the impacts of Project construction on local residents are avoided, minimized, or mitigated to the extent practicable. The following section describes the various activities that will occur as part of Project construction. Representative

photographs of wind power Project construction activities are included in Figure 4. Typical construction details are included in Appendix A.

During all aspects of Project construction, the contractor and/or construction manager will minimize fugitive dust and airborne debris to the maximum extent practical by implementing appropriate control measures. These measures will include (but are not limited to) the application of mulch, water, stone, or an approved chemical agent on any public roads, access roads, exposed soils, or stockpiled soils when dry and windy conditions exist. Other mechanisms to initiate dust control procedures include a determination from the environmental monitor that control measures shall be implemented, and a complaint by a landowner or local resident. A watering vehicle shall be available for use for the duration of Project activities, including restoration. No chemical dust control measures will be implemented in the vicinity of organic farms (if applicable).

2.6.1 Pre-construction Activities

Before construction commences, a site survey will be performed to stake out the exact location of the wind turbines, access roads, electrical lines, and substation areas. Once the surveys are complete, a detailed geotechnical investigation will be performed to identify subsurface conditions and allow development of final design specifications for the access roads, foundations, underground trenching, and electrical grounding systems. The geotechnical investigation involves a drill rig obtaining borings to identify the subsurface soil and rock types and strength properties. Testing is also done to measure the soil's electrical properties to ensure proper grounding system design. A geotechnical investigation is generally performed at some or all turbine locations, at the substation location, along the access roads, and at the O&M facility site.

Using all of the data gathered for the Project (including geotechnical information, environmental conditions, site topography, etc.), PPM Energy will develop a set of site-specific construction specifications for the various components of the Project. The design specifications will comply with construction standards established by various industry practice groups such as:

- American Concrete Institute (ACI)
- Institute for Electrical and Electronic Engineers (IEEE)
- National Electric Code (NEC)
- National Fire Protection Agency (NFPA)
- Construction Standards Institute (CSI)

The Project engineering team will ensure that all aspects of the specifications, as well as the actual on-site construction, comply with all applicable federal, state, and local codes and good industry practice. The Project developer and/or contractor will coordinate directly with the local code enforcement officers in order to assure that all aspects of Project specifications/inspections are properly communicated and understood. All appropriate building permits will be obtained.

To assure compliance with various environmental protection commitments and permit conditions, PPM Energy will hire an environmental monitor to oversee construction (and restoration) activities. Prior to the start of construction at any given site, an environmental monitor and the contractor will conduct a walk-over of areas to be affected, or potentially affected, by proposed construction activities. This pre-construction walk-over will identify sensitive resources to avoid (e.g., wetlands, archeological, or agricultural resources), as well as the limits of clearing, location of wetland and stream crossings, location of drainage features (e.g., culverts, ditches), location of underground utilities and tile lines, and layout of sedimentation and erosion control measures. Upon identification of these features, they will be marked in the field (by staking, flagging, fencing, etc.), specific construction procedures will be determined, and any modifications to construction methods or locations will be proposed before construction activities begin. See Section 4.3 (Environmental Compliance and Monitoring Program) for additional detail.

2.6.2 Staging Area Construction

A construction staging area will be developed by stripping and stockpiling the topsoil and grading and compacting the subsoil. Geotextile fabric and a minimum of 8 inches of gravel will then be installed to create a level working yard. Electric and communication lines will be brought in from existing distribution poles to allow connection with construction trailers. At the end of construction, utilities, gravel, and geotextile fabric will be removed and the sites restored to their preconstruction condition.

2.6.3 Site Preparation for Construction

Actual Project construction will be initiated by clearing woody vegetation (as necessary) from all tower sites, access roads, and electrical interconnect routes. The work area will be cleared with a chainsaw or brush hog. Trees cleared from the work area will be cut into logs and removed, while limbs and brush will be chipped and spread in upland areas onsite so as not to interfere with wetland/streams or other watercourses. For the purposes of this DEIS, it is assumed that a 150-200-foot radius will be cleared around each tower, a 60 foot-wide corridor will be cleared (or forested vegetation trimmed) along access roads that need to accommodate travel of the turbine installation

cranes (although, it may be possible to transport the crane along some sections of access roads without needing to clear a full 60 foot-wide corridor). Buried electrical interconnection will be sited immediately adjacent to or within the footprint of disturbance for proposed access roads, therefore there will be no additional clearing associated with electrical gathering lines on the generating site.

2.6.4 Public Road Improvements

Based upon field visits to the Project area and travel along public roads, it is not anticipated that any significant public road widening activities will be necessary, however the travel route to be used for hauling gravel, concrete and other heavy items has yet to be finalized. Final haul routes will be determined in consultation with the turbine supplier, its transportation provider, the Town of Martinsburg and Lewis County. Certain town roads with widths of less than 16 feet may need to be widened, and turn-outs at the intersection of Project access roads and certain town roads will be temporarily established, to allow an uninterrupted flow of construction activity. Public roadway intersections along the construction and delivery routes may also require spot radii improvements to accommodate the turning radius of over-length delivery vehicles (see Section 3.8 for more detail).

Any stockpiled soil and/or spoil material will only be temporary (i.e., spread and graded to match original contours following construction activities). In addition, appropriate sediment and erosion control measures (see Section 3.1 for additional information and Appendix A for typical details) will be implemented, which will ensure that temporarily stockpiled soil and/or spoil material will not result in significant sedimentation or turbidity to local surface waters.

2.6.5 Access Road Improvement and/or Construction

The Project is utilizing an extensively developed system of existing forest roads in order to reduce construction costs and to minimize impacts to both forested and wetland/stream areas. Where an existing forest road is unavailable or unsuitable, new gravel-surfaced access roads will be constructed. Where access roads are adjacent to, or cross, wetlands, streams or drainage ditches/swales, appropriate sediment and erosion control measures (e.g., silt fence) will be installed. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with 8 to 12 inches of gravel or crushed stone. A geotextile fabric or grid will be installed beneath the road surface, if necessary, to provide additional support. During construction, access road installation and use could result in temporary disturbance of a maximum width of 40 feet (with an area as wide as 60 feet cleared of vegetation), with temporary road corner radii of 200 feet.

Once construction is complete, temporarily disturbed areas will be restored (including removal of excess road material, de-compaction, and rock removal in wetland areas) and returned to their pre-construction contours. The typical access road will be 16 feet in width, with occasional wider pull-offs to accommodate passing vehicles. Maximum permanent road width will be 20 feet. Appropriately sized culverts will be placed in any wetland/stream crossings in accordance with state and federal permit requirements. In other locations culverts may also be used to assure that the roads do not impede cross drainage. Typical access road details are included in Appendix A. Photos of access road construction are included in Figure 4.

2.6.6 Foundation Construction

Once the roads are complete for a particular group of turbine sites, turbine foundation construction will commence on that completed access road section. Foundation construction occurs in several stages including excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Initial activity at each tower site will involve clearing and leveling within a 150 to 200-foot radius around each tower (maximum area of disturbance of up to 2.9 acres). Following topsoil removal, backhoes will be used to excavate a foundation hole. If bedrock is encountered it is anticipated to be ripable, and will be excavated with a backhoe. If the bedrock is not ripable, it will be excavated by pneumatic jacking, hydraulic fracturing, or blasting. If blasting is required, it will be conducted in compliance with a blasting plan, and in accordance with all applicable regulations to avoid impacts to sensitive receptors. Given the extremely remote location of the Project's wind turbines, no impacts to sensitive receptors (such as residences) are anticipated. However, PPM Energy will conduct pre- and post-blasting inspections of all sensitive receptors in the potential impact areas to document any changes that may be due to blasting. If necessary, dewatering of foundation holes will involve pumping the water to a discharge point, which will include measures/devices to slow water velocities and trap any suspended sediment. Dewatering activities will not result in the direct discharge of water into any streams or wetlands.

The foundation is anticipated to be a spread type footing. This foundation type is approximately 10 feet deep, approximately 50 to 60 feet in diameter, and requires approximately 300 cubic yards (cy) of concrete. Once the foundation concrete is sufficiently cured, the excavation area around and over

it is backfilled with the excavated on-site material. The top of the foundation is a nominal 18-foot diameter pedestal that typically extends 6 to 8 inches above grade. The base of each tower will be surrounded by a 6-foot wide gravel skirt, and an area approximately 100 feet by 60 feet will be developed as a permanent gravel crane pad.

2.6.7 Electrical Gathering and Interconnect Line Installation

As mentioned previously, electrical interconnects will generally be sited in the footprint of or parallel with Project access roads. In the case of the electrical interconnection line between the point of interconnection/collection station and the generating site, the electrical line will be sited to follow agricultural field edges and cut directly across agricultural fields in places. The proposed layout of the electrical gathering system (on the generating site) is illustrated in Figure 3. No site specific mapping of the electrical interconnect system is provided, due to proprietary information. However, its general corridor is depicted in Figure 2.

Direct burial methods through use of a cable plow, rock saw, and/or trencher will be used during the installation of underground electrical gathering interconnect lines whenever possible. Direct burial will involve the installation of bundled cable (electrical and fiber optic bundles) directly into a “rip” in the ground created by the plow or saw blade. The rip disturbs an area approximately 24 inches wide with bundled cable installed to a minimum depth of 36 inches (or 48 inches in agricultural land). In active agricultural land located along the electrical interconnection line, up to two parallel cables can be installed by trenching without the need to strip and segregate topsoil (in accordance with NYS Department of Agriculture and Markets [NYS&M] guidance). Sidecast material will be replaced with a small excavator or small bulldozer. All areas will be returned to pre-construction grades, and restoration efforts will be as described above for cable plow installation. Where three or more cables run parallel through active agricultural fields, the topsoil will be stripped and stockpiled prior to cable installation, and replaced, regraded, and stabilized by seeding and mulching following installation.

Where the electrical interconnect line is proposed to be buried across active agricultural fields, the location of any subsurface drainage (tile) lines will be determined (through consultation with the landowner), if possible, to avoid damaging these lines during cable installation. Any tile lines that are inadvertently cut or damaged during installation of the buried cable will be repaired as part of the restoration effort.

For buried electrical interconnection lines (off the generating site), an area of up to 40 feet wide must be cleared of tall-growing woody vegetation and an area of approximately 15 feet wide will be disturbed by the tracks of the installation machinery. However, this disturbance does not involve excavation of the soil and surface disturbance associated with the passage of machinery is typically minimal. Should surface restoration be required, a small excavator or small bulldozer will closely follow the installation, smoothing the area.

Installation of utility lines with an open trench will be used only in areas where the previously described direct burial methods are not practicable. At this time, no open trench installation is proposed unless conditions at the time of construction make direct burial unfeasible. Areas appropriate for open trench installation will be determined at the time of construction and may include areas with unstable slopes, excessive unconsolidated rock, and standing or flowing water. Open trench installation will be performed with a backhoe and will generally result in a disturbed trench 36 inches wide and a minimum of 36 inches deep. The overall temporary footprint of vegetation and soil disturbance may be a maximum of 15 feet due to machinery dimensions and backfill/spoil pile placement during installation.

Approximately six miles of the electrical interconnection line located between the generating site and the point of interconnection/collection line will be installed above ground. In these instances, the cables will be brought above ground and carried by electrical conductors suspended on treated wood or steel poles. An area of up to 40 feet wide must be cleared of tall-growing woody vegetation for installation of the overhead portions of the 34.5 kV electrical interconnection line. Additionally, installation of temporary 15 wide access roads will be necessary to install individual wood or steel poles. All temporary construction access roads needed to construct the overhead portion of the electrical interconnection line will be restored following construction. Following clearing and access road installation, wood or steel poles will be installed by augering a hole, setting the pole, and backfilling with original or native materials.

2.6.8 Wind Turbine Assembly and Erection

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include hubs, nose cones, cabling, control panels and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project site on flatbed transport trucks, and the main components will be off-loaded at the individual turbine sites. Turbine erection is performed in multiple stages including setting of the bus cabinet and ground control panels on the foundation, erection of

the tower, erection of the nacelle, assembly and erection of the rotor, connection and termination of the internal cables, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large track mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by flatbed trucks and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower, and following ground assembly, place the rotor onto the nacelle (see photos in Figure 4). The erection crane(s) will move from one tower to another along the designated Project access roads.

2.6.9 Point of Interconnection/Collection Substation

The point of interconnection/collection substation construction will begin with clearing each site and stockpiling topsoil for later use in site restoration. The site will be graded, and a laydown area for construction trailers, equipment, materials, and parking will be prepared. Concrete foundations for major equipment and structural supports will be poured, followed by the installation of various conduits, cable trenches, and grounding grid conductors. Above-ground construction will involve the installation of structural steel, bus conductors and insulators, switches, circuit breakers, transformers, control buildings, etc. The final steps involve laying down crushed stone across the stations, erecting the chain link fence, connecting the high voltage links, and testing the control systems.

2.6.10 Operations and Maintenance Facility Construction

Construction of the O&M facility is typical of small non-residential building site development. In preparation for construction, the approximately 5 acre area will be cleared and graded, as described in Section 2.6.3. Stripped topsoil will be stockpiled and reserved for re-use during restoration. Following construction of the building and parking areas (anticipated to occupy approximately 3.5 acres), approximately 1.5 acres will be restored including regarding and seeding.

As a summary, project components and their construction will result in disturbance to soil and vegetation and result in land displacement or conversion. Assumptions used for the purposes of the SEQRA evaluation are outlined in Table 1.

Table 1. Impact Assumptions and Calculations

Project Components	Typical Area of Vegetation Clearing	Area of Total Soil Disturbance (temporary and permanent)	Area of Permanent Soil Disturbance
Wind Turbines and Workspaces	Up to 200' radius per turbine	Up to 200' radius per turbine	0.20 acre (pedestal plus crane pad)
New Access Roads	75' wide per linear foot of road	40' wide per linear foot of road	20' wide per linear foot of road
Upgraded Forest Roads	60' wide per linear foot of road	40' wide per linear foot of road	20' wide per linear foot of road
Buried Electrical Gathering Lines and Interconnection	40' wide per linear foot line (except in areas where it parallels an access road)	15' wide per linear foot of line	None
Overhead Electrical Interconnects	40' wide per linear foot of line in forested and shrubland areas	15' wide per linear foot of line	<0.01 acre per pole
Meteorological Towers	1 acre per tower	1 acre per tower	0.10 acre per tower
O&M Building and associated site (4,000 – 6, 000 sf)	5 acres	5 acres	3.5 acres
Staging Areas	5 acres	5 acres	None
Point of Interconnection/ Collection Substation	5 acres	5 acres	2.5 acres

2.7 OPERATIONS AND MAINTENANCE

Operation of the wind turbines and associated components is almost completely automated. However, Project is anticipated to employ a staff of approximately six O&M staff (four wind technicians, a project manager and an administrative support person). For the wind turbines anticipated for the Project, a minimum wind speed of approximately 6.7 mph is required to initiate generation, and high-speed shutdown occurs at around 47 mph. The turbines are equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable

conditions. The system consists of aerodynamic braking by the rotor blades and by a separate hydraulic-disc brake system. Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data back to the SCADA system.

Operations and maintenance staff offices will be located in the O&M building, and staff will be on duty during core operating hours (eight hours a day, five days per week) with weekend shifts and extended hours as required. In the event of turbine or facility outages, the SCADA system will send alarm messages to on-call technicians to notify them of the outage. The Project will always have an on-call local technician who can respond quickly in the event of any emergency. The wind turbines selected for the Project have been chosen in part for their high functional reliability. Each wind turbine manufacturer studies and reports on the frequency of operation problems and malfunctions that arise when the turbines are generating electricity. Data on the turbines' reliability is summarized by the manufacturer in the turbine's availability rating, which estimates the percentage of time that the turbine will function. More detailed specifications on the wind turbines being proposed for the Project are included in Appendix A.

Each wind turbine will receive scheduled preventive maintenance inspections during the first year of operation and twice a year in subsequent years. Given the high availability rating of the turbines, PPM Energy estimates that once operational, individual wind turbines will require maintenance and repair calls an average of three to six times per year in addition to their scheduled inspections. In certain circumstances, heavy maintenance equipment, such as a lifting crane, may need to be brought in to repair turbine problems (such as nacelle component replacement).

PPM has a proven track record in both constructing and operating commercial-scale wind farms. This should provide assurance that Project maintenance and repair work will be completed quickly and with as little impact to the surrounding community and landowners as possible.

2.8 DECOMMISSIONING AND CLOSURE PLANS

At the start of construction, an acceptable form of security, including a combination of corporate guarantees a funded escrow account along with the projected salvage value of the towers and turbines (expected to be available from the dismantling of the Project), will be available to pay for the decommissioning of the Project at the end of its useful life. Specifically, PPM Energy shall provide a bona fide estimate from an independent engineer for the town's review and approval, in order to establish the cost of decommissioning the wind energy facility.

Prior to the granting of local approvals for Project development, PPM Energy shall formulate a decommissioning plan cooperatively with the Town of Martinsburg, or demonstrate that the private land leases provide adequate requirements for this plan.

Unless otherwise agreed between the town and PPM Energy, and unless the Applicant can show that its land leases adequately address this issue, the Decommissioning Plans shall include:

- Provision describing the triggering events for decommissioning of wind power facilities.
- Provisions for the removal of all above-ground structures and debris, but not the removal of anything below a 36-inch depth (e.g., tower foundations or collection line).
- Provisions for the removal of all below-ground structures to 48 inches in active agricultural land.
- Provisions for the restoration of the soil and vegetation.
- A timetable approved by the towns for site restoration.
- An estimate of decommissioning costs certified by an independent, Professional Engineer.
- Financial Assurance, secured by PPM Energy, for the purpose of adequately performing decommissioning, in an amount equal to the Professional Engineer's certified estimate of decommissioning cost, less the expected salvage cost of the wind farm components.
- Identification of procedures for the towns to access financial assurances.
- A provision that the terms of the Decommissioning Plan shall be binding upon PPM Energy or any of their successors, assigns, or heirs.
- A Provision that the towns shall have access to the site, pursuant to reasonable notice, to inspect the results of complete decommissioning.
- Removal of machinery, equipment, tower, and all other materials related to the Project is to be completed within one year of decommissioning.
- All town, county or state roads, impacted by Project activity, if any, will be restored to original condition upon completion of decommissioning.

Megawatt-scale wind turbine generators typically have a life expectancy of 20 to 25 years. The current trend in the wind energy industry has been to replace or "re-power" older wind energy Projects by upgrading older equipment with more efficient turbines. However, if not upgraded or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning to operation), they will be decommissioned, in accordance with the Decommissioning Plan. Decommissioning would consist of the following activities: all turbines, including the blades, nacelles, and towers will be disassembled, and transported off site for reclamation and sale. All of

the transformers will also be transported off-site for reuse or reclamation. Foundations at depths less than 36 inches below grade will be removed (except in active agricultural fields which will be removed up to 48 inches below grade). All underground infrastructure at depths greater than 36 inches below finished grade, or greater than 48 inches in active agricultural fields, (including the subsurface collection conductors, and foundations) will be left in place. Buried electrical lines in active agricultural fields will be abandoned in place. Areas where subsurface components are removed will be graded to match adjacent contours, stabilized with an appropriate seed mix, and allowed to re-vegetate naturally. All road materials will be allowed to remain on site.

As mentioned, a decommissioning plan that details the process, estimated cost, salvage value, and site restoration will be provided to the Town of Martinsburg prior to Project operation. All decommissioning and restoration activities will be in accordance with all applicable federal, state, and local permits and requirements and will include the following:

Turbine removal: Cranes and/or other machinery will be used for the disassembly and removal of the turbines. Electronic components and controls, and internal cables will be removed. The rotor and nacelle will be lowered to the ground for disassembly. The tower sections will be lowered to the ground where they will be further disassembled for transporting. The rotor, nacelle, and tower sections will either be transported whole for reconditioning and reuse or disassembled into salvageable, recyclable, or disposable components.

Turbine foundation removal: Turbine foundations will be removed down to a level 36 inches below grade. The remaining excavation will be filled with clean sub-grade material, compacted to a density similar to surrounding sub-grade material, and finished with topsoil.

Underground collection cables: Except as described otherwise for active agricultural fields, all cables buried less than 36 inches will be removed. All cables buried deeper than 36 inches, will be kept in place if it is determined that their presence does not adversely impact land use and they do not pose a safety hazard.

Access roads and crane pads: At the discretion of the landowner, gravel will be removed from access roads and crane pads and transported to a pre-approved disposal location. Any drainage structures will be removed and backfilled with sub-grade material (if necessary). The ground will be de-compacted (in agricultural and wetland areas only), surfaced with topsoil, contoured, and re-vegetated.

Monitoring: In accordance with the guidelines of the New York State Department of Agriculture and Markets, a monitoring and remediation period of two years immediately following the completion of any decommissioning and restoration activities in agricultural land will commence. Any remaining agriculture impacts can be identified during this period and follow-up restoration efforts will be implemented. Other post-construction monitoring requirements may result from issued state or federal permits.

2.9 REQUIRED APPROVALS AND APPLICABLE REGULATORY PROGRAMS

Implementation of the Project will require certain permits and/or approvals from local, state, and federal agencies. The permits and approvals that are expected to be required are listed in Table 2.

Table 2. Permits and Approvals for the Roaring Brook Wind Power Project

Agency	Agency Status	Description of Permit or Approval Required
<i>Town of Martinsburg</i>		
Town of Martinsburg Planning Board	Lead Agency	Acceptance of DEIS, SEIS, FEIS, and issuance of findings (as Lead Agency under SEQRA). Approval of Special Permit
Town of Martinsburg Town Board	Involved Agency	Wind Overlay District amendments and approval.
Town of Martinsburg Departments (Public Works, Codes, etc.)	Interested Agency	Issuance of building permits. Review and approval of highway work permits.
<i>Lewis County</i>		
Department of Public Works	Interested Agency	Highway work permits.
Lewis County Planning Board	Interested Agency	Recommendation pursuant to General Municipal Law 239-m.
<i>New York State</i>		
Department of Environmental Conservation	Involved Agency	Article 24 Permit for disturbance to state jurisdictional wetlands. Article 15 Permit for disturbance of protected streams. SPDES General Permit. Section 401 Water Quality Certification. Issuance of SEQRA findings.
NYSOPRHP	Interested Agency	Consultation pursuant to NY, Parks, Recreation and Historic Restoration Law (PRHPL) § 14.09 and § 106 of the National Historic Preservation Act.
Department of Transportation	Interested Agency	Special Use Permit for oversize/overweight vehicles. Highway work permit.
<i>Federal</i>		
U.S. Army Corps of Engineers	N/A	Section 404 Individual Permit for placement of fill in federal jurisdictional wetlands/waters of the U.S. NEPA compliance.

Agency	Agency Status	Description of Permit or Approval Required
Federal Aviation Administration	N/A	Lighting Plan and clearances for potential aviation hazard
U.S. Fish and Wildlife Service	N/A	Consultation and conference activities pursuant to Section 7 of the Endangered Species Act, associated with the aforementioned Section 404 Permit.

2.10 PUBLIC AND AGENCY INVOLVEMENT

Since first initiating development work on this Project in 2006, PPM Energy have attended meetings with both the Town board and the Planning board in the Town of Martinsburg. On March 21, 2007, PPM Energy presented the Project to the Town Board and subsequently attended meetings associated with the Wind Overlay District amendment.

In addition, PPM representatives have also met with staff at The Nature Conservancy, the New York Audubon, and the New York State Department of Environmental Conservation in the summer of 2007 to discuss development of the Project. These meetings, which included both onsite and offsite visits, were conducted in August and September 2007 to familiarize staff with site characteristics and to obtain feedback on project development plans.

2.10.1 SEQRA Process

On November 16, 2007 a Full Environmental Assessment Form (EAF) addressing the proposed wind power project was submitted by Roaring Brook Wind to the Town of Martinsburg Town Planning Board pursuant to SEQRA. The submittal of the site plan review application initiated the SEQRA process for the subject action. On December 5, 2007, a solicitation of Lead Agency status was forwarded to involved SEQRA agencies by the Martinsburg Planning Board, along with a copy of the EAF document. No agency objected to the Town Board's assuming the role of Lead Agency. On January 10, 2008, the Town of Martinsburg Planning Board, as Lead Agency, issued a Positive Declaration, requiring the preparation of this DEIS.

This document has been prepared to comply with the requirements of SEQRA (6 NYCRR Part 617). The purpose of the DEIS is to assess the environmental impacts associated with construction of the Project. The SEQRA process for the Project will include the following actions and time frames:

- DEIS accepted by Lead Agency (Martinsburg Planning Board).
- File notice of completion of DEIS and notice of public hearing and comment period.
- Public hearing on DEIS

- A minimum 30-day public comment period.
- Revise DEIS as necessary to address relevant comments received.
- Prepare a Final EIS.
- FEIS accepted by Lead Agency.
- File notice of completion of FEIS.
- Minimum 10-day public consideration period.
- Lead Agency issues Findings Statement, completing the SEQRA process.
- Involved agencies issue Findings Statements.

This DEIS, along with a copy of the public notice, will be distributed for review and comment to the public and to the agencies and parties listed in Table 3. Additionally, a 2005 amendment to SEQRA, (Chapter 641 of the NYS Laws of 2005; “Ch. 641”) requires every Environmental Impact Statement to be posted on a publicly accessible internet website, as of February 26, 2006. A DEIS is to be posted as soon as it is accepted and remain posted until the FEIS is accepted. The FEIS should be posted when completed, and must remain posted until one (1) year after all final approvals have been issued for the Project that is the subject of the FEIS. In accordance with this amendment to SEQRA, the DEIS will be posted to www.ppmenergy.com/roaringbrook.html.

2.10.2 Agency and Public Review

Opportunities for detailed agency and public review will continue to be provided throughout the SEQRA process, as well as in conjunction with the review of applications for the other permits and approvals needed for the Project. With respect to the SEQRA process, the DEIS will be available for public review and agency comment as outlined above. In addition to a public comment period (during which time written comments will be accepted), a duly noticed public hearing concerning the DEIS will be organized and held, in accordance with SEQRA requirements.

This DEIS, along with a copy of a public notice, will be distributed for review and comment to the public and to the parties identified in Table 3.

Table 3. Public DEIS Repositories

Town of Martinsburg	
Terrence Thisse Town Supervisor P.O. Box 8 Martinsburg, New York 13404	Mike Colwell, Chairman Town of Martinsburg Planning Board Town of Martinsburg P.O. Box 8 Martinsburg, New York 13404
Mary Kelley Town Clerk Town of Martinsburg P.O. Box 8 Martinsburg, New York 13404	Mark Gebo Town Attorney Town of Martinsburg 216 Washington Street Suite 300 Watertown, New York 13601
William H. Bush Memorial Library Whittaker Road Martinsburg, New York 13404	
Lewis County	
Thomas Sweet, Superintendent Lewis County Highway Department Lowville, New York 13367	John Bartow, Executive Director Tug Hill Commission Dulles State Office Building 317 Washington Street Watertown, New York 13601-3782
Lewis County Department of Planning Lewis County Court House Lowville, New York 13367	Jack Bush, Chairman Lewis County Legislature Lewis County Court House Lowville, New York 13367
New York State	
NYS Department of Environmental Conservation 635 Broadway Albany, New York 12233-1011	NYS Department of Transportation Region 2 Regional Director Utica State Office Building 207 Genesee Street Utica, NY 13501
NYS Department of Environmental Conservation Region 6 Regional Permit Administrator 317 Washington Street Watertown, NY 13601	NYS Department of Transportation 50 Wolf Road 6 th Floor Albany, New York 12232
NYS Office of Parks, Recreation and Historic Preservation Field Services Unit Peebles Island Waterford, New York 12118	

3.0 ENVIRONMENTAL SETTING, POTENTIAL IMPACTS AND PROPOSED MITIGATION

This section describes the existing environmental conditions within the Project area and the surrounding area. It further describes the environmental impacts expected to result from the Project. Included are analyses of short-term impacts likely to occur as a result of construction activities, as well as impacts expected to result from long-term operation and maintenance of the Project. Finally, this section describes the various measures proposed to avoid, minimize or mitigate significant adverse environmental impacts. Information is presented on geology, soils and topography; water resources; biological resources; aesthetic/visual resources; land use and zoning; socioeconomics; transportation; cultural resources; communication facilities; sound; public safety; community services; groundwater; and property values.

Due to the nature, scope and scale of wind power project design and development, many potential impacts described herein, and the correlating mitigation options, are based upon a preliminary design and conservative evaluation of Project impacts. In many cases potential Impacts are based upon preliminary design criteria, “worse case” assumptions and/or anticipated permit conditions. Based on these generally conservative impact assumptions, appropriate mitigation measures are then presented. For example, temporary construction- related transportation impacts are described based upon a preliminary transportation routing and delivery plan that will be finalized upon selection of a contractor, in accordance with town, county, and state issued highway work permits and road agreements. For the purposes of SEQRA analysis, worst case assumptions are made regarding the type and extent of construction related impacts that may be expected (e.g. increased turning radii, culvert replacement). Actual impacts and correlating avoidance, minimization, and/or mitigation measures, will not be known until the appropriate reviewing agencies have seen detailed plans or engineering design and made a permit decision based upon this more detailed information. As a matter of law, these permit conditions may not be made until SEQRA review is concluded. However, because worst case assumptions have been applied during SEQR, these impacts will constitute thresholds sufficient for the Lead Agency to make informed decisions. This approach is typical to other projects of this scale, and in particular to wind power facilities, and is done in accordance with SEQRA.

The implementation of the various mitigation measures described herein is insured through various mechanisms including the town site plan review; county, state, and federal permit approval conditions; and the environmental compliance monitoring program (described further in Section 4.2).

Therefore, implementation of the mitigation measures described in the DEIS is assured through various regulatory approvals that are required prior to construction.

3.1 GEOLOGY, SOILS, AND TOPOGRAPHY

3.1.1 EXISTING CONDITIONS

3.1.1.1 Topography

The Project area is located within the Central Tug Hill physiographic region of New York State (Reschke, 1990). The generating site is situated on the Tug Hill Plateau, and is characterized by level to undulating topography. Elevations in the generating site range from 1862 to 1990 feet amsl. According to the Lewis County Soil Survey (1960), slopes within the generating site generally range from 0 to 15%. Encompassing portions of the Tug Hill Plateau, the escarpment to the east, and portions of the Black River Valley, the electrical interconnect site includes a wider array of topographical features. Elevations in the electrical interconnect site range from 840 to 2000 feet amsl, while slopes generally range from 0 to 25% (USDA Soil Conservation Service, 1960).

3.1.1.2 Geology

Nearly all of the parent materials of the soils of Lewis County were deposited directly or indirectly through glaciation. Only the recent alluvium of the floodplains and the alluvial fans at the base of the Tug Hill escarpment is post-glacial. The Black River divides the county into two very distinct geological regions. East of the river and into the Adirondacks, bedrock is composed of very old, pre-Cambrian metamorphic and igneous materials, mostly gneiss. West of the river, the bedrock consists of Ordovician sediments in a series of beds of limestone, black shale, gray shale, and sandstone (USDA Soil Conservation Service, 1960).

The generating site is located on top of the Tug Hill Plateau, where bedrock is composed of sedimentary rock of Ordovician origin, primarily gray Oswego sandstone approximately 400 million years old (ATL, 2007). Depth to bedrock at the generating site is variable. No bedrock was observed near proposed turbines, access roads, or electrical gathering lines during fieldwork conducted by EDR in spring, summer and fall of 2007. Surface geological materials within the generating site are primarily glacial till of variable textures and thicknesses.

The electrical interconnect site covers a series of bedrock belts between the Black River and the Tug Hill Plateau. Closest to the Black River is a belt of Pamela limestone, which is about 72 feet thick and made up of solidified lime mud. Further west, this is overlain to a depth of 38 feet by Lowville

limestone, which is overlain by 15 to 20 feet of Leray, a cherty limestone. Above this, at the top of the first rock terrace, is Watertown limestone, which is a blocky, hard, dark-colored limestone 10 to 15 feet thick. The series of formations including the Lowville, Leray, and Watertown are collectively known as the Black River Beds. Moving westward and climbing in elevation, the next formation is the Trenton beds, which overlie the Watertown beds, are more than 400 feet thick near Martinsburg, and are made up of thin layers of limestone alternating with calcareous, shaly layers. Between the Trenton and Utica formations are shaly limestone beds, 100 feet thick, known as the Cobourg formation. The Utica formation is black, mildly calcareous shale of varying depths. Further west, the bedrock is dominated by the Lorraine group that is hundreds of feet thick. The lower part of this group consists of acidic, gray shale and thin-bedded sandstone (the Whetstone Gulf formation), while the upper part of the group is made up of acidic gray shale and thick-bedded calcareous sandstone (the Pulaski formation). The glacial till around the outer edge of the Tug Hill Plateau was derived mainly from these rocks. Like the generating site, the western portion of the electrical interconnect site sits atop the Tug Hill Plateau, which is capped by gray Oswego sandstone, as described above (USDA Soil Conservation Service, 1960).

3.1.1.3 Soils

When conducting the Lewis County Soil Survey, soils scientists made either detailed or reconnaissance-level soil surveys, depending on location. The detailed soil survey covered the central part of the county, and generated typical soil series and mapping unit data. Detailed soil mapping was not done for a large portion of the central Tug Hill Plateau, including the majority of the generating site and the southwestern corner of the electrical interconnect site. The reconnaissance soil survey covered the eastern (Adirondack) and southwestern (Tug Hill) portions of Lewis County. At the time the fieldwork was being conducted in the early 1950s, this area was considered remote and inaccessible, “the least known area of the state.” The reconnaissance-level soil surveys generated soil association maps instead of the more specific mapping units (USDA Soil Conservation Service, 1960).

Mapped soil associations at the generating site include Worth-Empeyville-Westbury, Empeyville-Westbury-Worth, Westbury-Tughill-Empeyville, Empeyville-Worth, and Peat/Muck. Strongly acid stony loams and stony silt loams dominate these soil associations. Mapped soils associations at the electrical interconnect site include Camroden-Pinckney-Marcy, Pinckney-Manlius-Camroden, Poland-Mohawk-Manheim, Herkimer-Houseville, Scantic-Buxton, Nellis-Amenia, Rockland Limestone, Worth-Empeyville-Westbury, Empeyville-Westbury-Worth, Westbury-Tughill-Empeyville, Empeyville-

Worth, and Peat/Muck. Table 4 lists the soil associations found within the Project area and their characteristics.

Table 4. Soil Associations Within the Project Site

Soil Association	Main Characteristics ¹
Worth-Empeyville-Westbury (WE)	<ul style="list-style-type: none"> • Moderately stony soils with acid fragipan • Soils in association: Empeyville (20-40%), Worth (40-60%), Westbury (15-25%), and Tughill (10-15%)
Empeyville-Westbury-Worth (EB)	<ul style="list-style-type: none"> • Very stony soils with acid fragipan • Soils in association: Empeyville (40-60%), Worth (15-20%), Westbury (15-30%), and Tughill (10-20%)
Westbury-Tughill-Empeyville (BU)	<ul style="list-style-type: none"> • Very stony soils with acid fragipan • Soils in association: Empeyville (15-20%), Worth (10-20%), Westbury (30-45%), and Tughill (25-35%)
Empeyville-Worth (EW)	<ul style="list-style-type: none"> • Deep, moderately stony soils with acid fragipan • Soils in association: Empeyville (40-65%), Worth (15-25%), Westbury (10-20%), and Tughill (5-15%)
Camroden-Pinckney-Marcy (RK)	<ul style="list-style-type: none"> • Deep soils with neutral or slightly acid fragipan • Soils in association: Camroden (40-60%), Pinckney (20-35%), Marcy (15-25%), and Alden (10-15%)
Pinckney-Manlius-Camroden (KR)	<ul style="list-style-type: none"> • Shallow soils with neutral or slightly acid fragipan • Soils in association: Pinckney (40-55%), Manlius (25-45%), Camroden (15-25%), and Gage (5-15%)
Poland-Mohawk-Manheim (PM)	<ul style="list-style-type: none"> • Deep soils on high-lime glacial till • Soils in association: Poland (25-50%), Mohawk (25-50%), Manheim (15-25%), Ilion (10-25%), and Fonda (5-10%)
Herkimer-Houseville (HH)	<ul style="list-style-type: none"> • Soils occur at the base of the Tug Hill escarpment • Soils in association: Herkimer (35-55%), Houseville (25-35%), Colonie (10-30%), Glenfield (10-15%), and Westland (0-5%)
Scantic-Buxton (SB)	<ul style="list-style-type: none"> • Soils occur on glacial lake sediments • Soils in association: Scantic (40-60%), Buxton (25-40%), Suffield (10-20%), Biddeford (0-10%)
Nellis-Amenia (NA)	<ul style="list-style-type: none"> • Deep soils on high-lime glacial till • Soils in association: Nellis (40-60%), Amenia (25-30%), Kendaia (10-15%), and Lyons (5-10%)
Rockland Limestone (RL)	<ul style="list-style-type: none"> • Occurs on ledges and exposed rock between the Black River and the Tug Hill Plateau • Soils in association: Rockland limestone (60-80%), remainder very shallow Amenia and Nellis soils
Peat and Muck (P)	<ul style="list-style-type: none"> • Undifferentiated organic peat and muck • Cover of swamp vegetation or forest

¹Information gathered from the Soil Survey of Lewis County, New York (USDA Soil Conservation Service, 1960).

Although the soil series are not completely mapped within these associations, the Lewis County Soil Survey (1960) provides rough estimates of the percentage of different soil series within each association. Table 5 summarizes the characteristics of the dominant soil series found within the Project site.

Table 5. Dominant Soil Series Within the Project Site.

Soil Series	Main Characteristics ¹
Empeyville Series	<ul style="list-style-type: none"> • Moderately well drained to somewhat poorly drained • Formed in glacial till derived from Oswego sandstone, with some shale and igneous rock • Undulating relief • Strongly developed fragipan below 18 inches
Tughill Series	<ul style="list-style-type: none"> • Very poorly drained • Formed in glacial till derived mainly from Oswego and Pulaski sandstones • Flat to depressed relief
Westbury Series	<ul style="list-style-type: none"> • Poorly drained to somewhat poorly drained • Formed in glacial till derived mainly from Oswego and Pulaski sandstones, with some shale • Level to gently sloping relief
Worth Series	<ul style="list-style-type: none"> • Well drained • Formed in glacial till derived mainly from sandstones • Undulating to steep relief • Very firm fragipan below 18 inches
Camroden Series	<ul style="list-style-type: none"> • Moderately well drained to somewhat poorly drained • Formed in glacial till derived mainly from gray shale, with some sandstone • Gently sloping to strongly sloping relief • Strongly developed fragipan below 16 inches
Pinckney Series	<ul style="list-style-type: none"> • Well drained • Formed in glacial till derived mainly from shale • Convex slopes • Well expressed fragipan below 20 inches
Herkimer Series	<ul style="list-style-type: none"> • Well drained • Formed on alluvial fans or on outwash deposits of shale • Nearly level to gently sloping relief
Marcy Series	<ul style="list-style-type: none"> • Poorly drained • Formed in glacial till derived from shale and sandstone • Nearly level to gently sloping relief
Amenia Series	<ul style="list-style-type: none"> • Moderately well drained to somewhat poorly drained • Formed from highly calcareous glacial till, derived mainly from Ordovician limestone and shale • Nearly level to strongly sloping relief

¹Information gathered from the Soil Survey of Lewis County, New York (USDA Soil Conservation Service, 196

There is no agricultural land within the generating site. The electrical interconnect site does include some farmland, particularly towards the east. In active agricultural land located along the electrical interconnection line, siting and construction will be conducted in accordance with *NYSA&M Guidelines for Agricultural Mitigation for Windpower Projects* (Appendix C).

3.1.2 Potential Impacts

3.1.2.1 Construction

Project components have been sited to avoid or minimize impacts to topography, geology, and soils to the extent practical. The Project is not anticipated to result in any significant impacts to geology, but depth to bedrock in the Project site is variable and it is possible that some turbine foundations will be set into bedrock. If bedrock is encountered it is anticipated to be ripable, and will be excavated with backhoe. If the bedrock is not ripable, it will be excavated by pneumatic jacking or hydraulic fracturing. Although not anticipated, if blasting is required, there should be no significant blasting-related impacts on wells, foundations, etc. (see Section 3.2 for more information). Only temporary, minor impacts to topography and geology are expected as a result of construction activities. For example, some cut and fill or addition of fill will be required at some turbine sites and along some access roads; however, the impact to overall topography will be minor.

The primary impact to the physical features of the Project site will be the disturbance of soils during installation of foundations, underground 34.5 kV electric lines, the improvements to existing forest roads, and construction of new access roads. Based on the assumptions outlined in Section 2.5 and summarized in Table 1, these activities will disturb approximately 177 acres of ground. A temporary staging area will disturb approximately 5 acres of soil, while construction of the meteorological tower, O&M building, and substation will disturb approximately 11 acres of soil. The construction of the interconnection route will disturb approximately 18 acres of soil. Soil disturbance from all anticipated construction activities will total approximately 211 acres. Of this total, approximately 54 acres was previously disturbed/developed, and only approximately 27 acres will be converted to newly built facilities (access roads and structures), while the remaining will be restored and stabilized following completion of construction.

Soils at the proposed access road and turbine locations generally do not present significant engineering or development constraints. However, potential soil drainage impacts could be a concern. Soils in the area typically have a fragipan layer, which inhibits vertical infiltration of water, resulting in predominantly lateral subsurface drainage. Therefore, existing flow patterns can be

disrupted/impeded by construction activities. Where subsurface drainage follows construction trench-lines, this disruption can create wet areas. Where access roads divert drainage to existing roadways, the disruption can create increased run-off, excessive ditch erosion, or culvert over-topping. Additionally, earth moving and general soil disturbance will increase the potential for wind/water erosion and sedimentation into surface waters.

3.1.2.2 Operation

Overall, the project will result in permanent conversion of approximately 27 acres of previously undisturbed/undeveloped land into built facilities (0.2-acre of crane pad and foundation at each tower site, maximum 20-foot-wide permanent access roads, a 2.5-acre substation, a 3.5-acre O&M building, and a 0.1-acre met tower). Beyond occasional soil disturbance associated with project maintenance and repair, impacts of the operation of this project on physiology, geography, and soils are expected to be minimal.

3.1.3 Proposed Mitigation

Impacts to topography and geology have been largely avoided by siting Project components so as to minimize disturbances to steep slopes, sensitive soils, and bedrock. Nevertheless, site specific geotechnical investigations will be conducted before construction to verify depth to bedrock and to perform a pre-construction evaluation of surficial and bedrock/geology (see also Section 2.6.1 for a description of preconstruction activities). Although not anticipated, in the event that blasting is employed for the excavation of tower foundations, offset measures will include the development of a blasting plan that limits offsite impacts. This plan will address blast size, timing, and sequencing to focus force within the area of excavation. Any necessary blasting will receive oversight by a qualified. In addition, pre-notification signs and warnings to affected landowners, use of best management practices, and compliance with applicable permit requirements will be instituted as mitigation measures. Furthermore, PPM Energy has an established Complaint Resolution Plan (implemented for the adjacent Maple Ridge Wind project), which is an efficient and proven process by which to resolve any construction or operational related impacts.

Siting turbines in relatively level locations, and using existing roads for turbine access wherever possible have minimized potential impacts associated with soil disturbance. Impacts to soils will be further minimized by the following means:

- In areas where steep slopes are traversed by the electrical interconnection line, the lines will be run overhead as opposed to underground to reduce soil disturbance in erosion-prone areas.
- Low permeability breakers will be installed along buried electrical interconnect trench-lines to inhibit the migration of subsurface water.
- Public road ditches and other locations where runoff is concentrated will be armored with rip-rap to dissipate the energy of flowing water and to hold the soils in place.
- Prior to commencing construction activities, erosion control devices will be installed between the work areas and downslope surface waters or wetlands, to reduce the risk of soil erosion and siltation. Erosion control devices will be monitored continuously throughout construction and restoration for function and effectiveness.
- During construction activities, hay bales, silt fence, or other appropriate erosion control measures will be placed as needed around disturbed areas and stockpiled soils.
- Following construction, all temporarily disturbed areas will be stabilized and restored in accordance with approved plans.

Impacts to soil resources will be minimized by adherence to best management practices that are designed to avoid or control erosion and sedimentation, stabilize disturbed areas, and prevent the potential for spills of fuels or lubricants. In addition, erosion and sedimentation impacts during construction will be minimized by the implementation of an erosion and sedimentation control plan developed as part of the State Pollution Discharge Elimination System (SPDES) General Permit for the project. To minimize the potential for soil erosion during construction activities, hay bales, silt fence, or other appropriate erosion control measures will be installed as needed around disturbed areas and stockpiled soils (see Appendix A for typical details). Erosion and sediment control measures shall be constructed and implemented in accordance with a Stormwater Pollution Prevention Plan (SWPPP) to be prepared and approved prior to construction. At a minimum, this plan will:

- Describe the temporary and permanent structural and vegetative measures that will be used to control erosion and sedimentation for each stage of the project from land clearing to the finished edge.
- Provide drawings showing the location of erosion and sediment control measures.
- Provide dimensional details of proposed erosion and sediment control facilities as well as calculations used in the siting and sizing of facilities, as appropriate.

- Identify temporary erosion and sediment control facilities which will be converted to permanent stormwater management facilities, if applicable.
- Provide an implementation schedule for staging temporary and permanent erosion and sediment control facilities.
- Provide a maintenance schedule for soil erosion and sediment control facilities and describe maintenance activities to be performed.

Mitigation measures to protect and restore agricultural soils at the electrical interconnection site will be undertaken during and after construction, and will include full restoration of temporarily disturbed agricultural land (Appendix C). For example, topsoil will not be stripped during saturated conditions when such actions would damage agricultural soils. Existing access roads will be used for access to farmland to the extent practicable. However, for any required new access roads, topsoil in the work area will be stripped and stockpiled outside the area of disturbance, but on the property from which it was removed. All vehicular movements and construction activity will be restricted to areas where topsoil has been removed. Temporarily disturbed agricultural soils will be restored following construction. This process will generally involve the following sequence of activities:

1. Removal of gravel or other temporary fill.
2. Decompaction of compacted subsoils using a deep ripper.
3. Disking and removal of stones from decompacted subsoil.
4. Spreading of stockpiled topsoil over the decompacted subsoil, and reestablishing pre-construction contours to the extent practicable.
5. Disking and removal of stones following the spreading of topsoil.
6. Seeding and mulching topsoil. Seed selection in agricultural fields will be based on guidance provided by the landowner and the NYSA&M.

Soil impacts occurring during the construction of the electrical interconnection will also be minimized by providing the contractor and all subcontractors copies of the final construction documentation and plans, which will contain all applicable soil protection, erosion control, and soil restoration measures. One or more pre-construction meetings will be held with the contractor and a representative of the NYSA&M, and during construction, the environmental monitors will assure compliance with the construction plans/documentation and soil protection measures described above and included in Appendix C.

3.2 WATER RESOURCES

On-site surface waters, wetlands, and groundwater resources are described below.

3.2.1 Existing Conditions

3.2.1.1 Surface Waters

The generating site and electrical interconnect site are divided amongst the Black River and Oneida Lake drainage basins (USGS Hydrologic Units 04150101 and 04140202, respectively). The generating site contains the headwaters of Roaring Brook, which is joined by Atwater Creek and several unnamed tributaries as it flows east through the electrical interconnect site and ultimately flows into the Black River (located approximately 10 miles to the east of the generating site in the Black River Valley). Whetstone Gulf also occurs within the electrical interconnect site and is a tributary to the Black River. The watershed of the Black River is approximately 1,920 square miles in size, including the northern portion of the generating site and almost the entire interconnect site. The North Branch of Fish Creek and its unnamed tributaries flow through the southern portion of the generating site and eventually into Oneida Lake located approximately 45 miles to the south. Oneida Lake has a watershed of approximately 1,470 square miles.

The generating site contains a number of surface water features ranging from small streams and forested wetlands to larger waterways and marshes (See Figures 5 and 8). Stream morphology for most of the streams on site, both named and unnamed, can be described as low-gradient drainage channels associated with floodplains within undulating upland terrain. Although stream banks are not as apparent in the flatter areas, many of these streams are less than 20 feet wide and predominantly perennial. While some of the streams have well-defined stream banks on drainages flowing from higher terrain, the majority of waterways occur within floodplain corridors of larger wetland systems, and are less well defined. Streambed substrate is typically pebble/cobble and silt/mud with significant aquatic vegetation. Most streams carried flowing water at the time of the field investigations in the fall of 2007. Smaller streams were typically 4-6 inches in depth and larger streams up to a maximum depth of 12 inches. No data were collected in the field along the electrical collection route. However based upon available NYSDEC stream classification mapping, the route contains approximately 12 streams including Atwater Creek and tributaries to Roaring Brook and Atwater Creek. It is anticipated that streams occurring within the electrical interconnect site will be subject to field investigations during the 2008 field season. Based on aerial photo interpretation, it appears that the headwaters of many of these streams occur within forested areas and as they flow

east/northeast they traverse patches of agricultural land, many times occurring within wooded corridors.

Under Article 15 of the Environmental Conservation Law (Protection of Waters), the New York State Department of Environmental Conservation (NYSDEC) has regulatory jurisdiction over any activity that disturbs the bed or banks of protected streams. In addition, small lakes and ponds with a surface area of 10 acres or less, located within the course of a stream, are considered to be part of a stream and are subject to regulation under the stream protection category of Article 15. Protected stream means any stream, or particular portion of a stream, that has been assigned by the NYSDEC any of the following classifications or standards: AA, AA(t), A, A(t), B, B(t) or C(t) (6 NYCRR Part 701). A classification of AA or A indicates that the best use of the stream is as a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The best usages of Class B waters are primary and secondary contact recreation and fishing. The best usage of Class C waters is fishing, and Class D waters represent the lowest classification standard. Streams designated (t) indicate that they support trout, and also include those more specifically designated (ts) which support trout spawning.

Streams within the generating site are classified by the NYSDEC as Class C, Class C(T), and Class C(TS) waters. Streams within the electrical interconnect site are classified as Class AA, Class B(T), Class C, Class C(T), and Class C(TS). Class C waters are not subject to regulation under the stream protection category of the Environmental Conservation Law, Article 15 (Protection of Waters). However, streams and small water bodies located in the course of a stream that are designated as C(T) or higher (i.e., C(TS), B, or A) are collectively referred to as "protected streams," and are subject to the stream protection provisions of the Protection of Waters regulations. These streams, along with all other perennial and intermittent streams in the Project area, are also protected by the Corps of Engineers under Section 404 of the Clean Water Act. There are no streams regulated by Section 10 of the Rivers and Harbors Act of 1899 (navigable waters) within the Project area.

3.2.1.2 Wetlands

Wetlands within the Project area have been examined through review of existing mapping and aerial photography interpretation. Wetlands that occur within the generating site have been further examined through field reconnaissance and a wetland boundary survey during the 2007 field season and it is anticipated that this level of analysis will be performed on the electric interconnect site wetlands during the 2008 field season. Wetlands are discussed below in terms of existing information, field review, and wetland community types.

3.2.1.2.1 Existing Information

The U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) has only mapped wetlands within western third of the generating site. The remainder of the Project area is unmapped, however, aerial photo interpretation and field reconnaissance indicate that numerous federally jurisdictional wetlands occur throughout these areas. The NWI mapping available indicates that broad-leaved forested and needle-leaved evergreen forested wetlands are the dominant wetland types on-site. Less common (at least in the area covered by available mapping) are emergent wetlands with beaver activity, and open water systems. Review of NYSDEC mapping indicates that there are a large number of wetlands located within the Project area that are regulated under Article 24 of the Environmental Conservation Law. The NYSDEC mapped wetlands are evenly distributed throughout the generating site and become more sparse to the east within the interconnect site. The eastern one third or more of the electric interconnect site does not contain any NYSDEC mapped wetlands at all. Table 6 provides a summary of state regulated wetlands in the Project area.

Table 6. State Regulated Wetlands Within the Project Area.

Wetland	Class ¹	Total Size (Acres)	Size Within Project Area (Acres)	Location
P-1	II	237	52.69	Electrical Interconnect Site
P-2	III	633	57.47	Electrical Interconnect Site
P-3	III	444	36.89	Electrical Interconnect Site
P-4	II	253	19.63	Electrical Interconnect Site
P-5	III	1,170	29.49	Electrical Interconnect Site
P-6	III	443	36.57	Electrical Interconnect Site
P-7	IV	203	18.18	Electrical Interconnect Site
P-8	II	3,145	289.81	Generating Site & Electrical Interconnect Site
P-9	II	565	49.29	Generating Site & Electrical Interconnect Site
P-10	II	3,153	287.96	Generating Site & Electrical Interconnect Site
P-11	II	1,083	96.11	Electrical Interconnect Site
P-12	II	198	16.29	Electrical Interconnect Site
P-13	III	141	11.65	Electrical Interconnect Site
P-14	III	146	12.25	Electrical Interconnect Site
P-15	II	277	23.14	Electrical Interconnect Site

Wetland	Class¹	Total Size (Acres)	Size Within Project Area (Acres)	Location
P-16	II	253	20.46	Electrical Interconnect Site
P-17	III	242	21.06	Electrical Interconnect Site
P-18	II	2,240	205.18	Generating Site & Electrical Interconnect Site
P-19	II	3,671	333.53	Generating Site & Electrical Interconnect Site
P-20	III	238	19.65	Generating Site
P-21	II	11,550	36.22	Electrical Interconnect Site
P-22	II	1,987	116.51	Generating Site
P-23	III	309	25.60	Generating Site
P-24	II	1,326	29.95	Generating Site
P-26	III	680	13.49	Generating Site
P-27	III	913	79.95	Generating Site
P-28	II	388	2.64	Generating Site & Electrical Interconnect Site
P-29	II	705	60.30	Electrical Interconnect Site
P-30	II	262	10.74	Electrical Interconnect Site
P-31	II	171	14.90	Electrical Interconnect Site
P-32	II	438	38.70	Electrical Interconnect Site
SP-21	III	237	9.70	Electrical Interconnect Site
SP-22	III	393	9.23	Electrical Interconnect Site
SP-38	IV	333	29.32	Generating Site
SP-39	II	4,815	122.91	Generating Site
SP-41	III	559	51.39	Generating Site
SP-42	IV	237	20.64	Generating Site
SP-43	II	276	22.00	Generating Site
SP-44	II	3,965	6.02	Generating Site

¹ NYS classification system. Four separate classes that rank wetlands according to their ability to provide functions and values (Class I having the highest rank, descending through Class IV).

Hydric soils are poorly drained, and their presence is also indicative of the likely occurrence of wetlands. However, a review of the National Hydric Soil List for New York State indicates that the USDA Natural Resources Conservation Service has not determined hydric soils for Lewis County (NRCS, 2007).

Aerial photography available for the generating site illustrates the significant portions of the site that are comprised of wetlands and open water systems, largely as a result of beaver activity in area surface waters (TVGA, 2007). Of the 4,000 acres of the generating site lands, approximately 1,000 acres are estimated to be freshwater wetlands of variable cover types.

3.2.1.2.2 *Field Delineation*

EDR ecologists delineated on-site wetlands in the fall of 2007. Delineations were only performed within the footprint of the proposed development on the generating site. No wetland inventories were conducted along public roadways that may be used by construction vehicles/equipment, because the transportation routing plan has yet to be finalized. In addition, no wetland delineations were conducted at the electrical interconnect site, because the final route has yet to be determined.

On-site delineations were conducted in accordance with the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987) and the 1985 New York State Freshwater Wetlands Delineation Manual (Brown *et al.* 1995). These methods utilize a three-parameter approach using vegetation, soils, and hydrology to identify the presence of freshwater wetlands. Wetland boundaries were defined in the field with pink surveyor flagging, and these boundaries were subsequently mapped using Trimble Global Positioning System (GPS) Pathfinder® Pro technology with reported sub-meter accuracy. This methodology was applied to all areas in the vicinity of proposed project components, including turbines, turbine workspaces, access roads, and the buried electrical interconnect route within the generating site. In addition, detailed data was collected and USACOE Routine Wetland Determination forms were completed for each delineated wetland. All of this information is presented in the Wetland Delineation Report in Appendix E.

The 2007 delineation effort identified sixty-four (64) wetland areas within the vicinity of Project components, including portions of seven (7) state regulated wetlands described above. Figure 7 provides the locations of all delineated wetlands in the Project area. Once the transportation routing plan and the electrical interconnect route are finalized, all wetlands in the vicinity will be delineated in the same manner as described above, and the wetland delineation report will be updated. Additional wetland delineations are anticipated to occur in the spring and summer of 2008.

3.2.1.2.3 *Wetland Community Types*

Based on the field review, wetlands within the Project area consist are one or more of the following three general types: 1) emergent wetland; 2) scrub-shrub wetland; or 3) forested wetland. Descriptions of each of these communities are presented below, and representative photographs are

included in Figure 8. Scientific names of identified vegetation and wildlife species are provided in Appendix F.

As described in above, wetland delineations were performed only in areas that could potentially be impacted a Project component. There are numerous large, complex wetland systems with the Project site that were not delineated, or had just a tiny periphery of the entire system delineated. As described in Section 3.2.1.2.1, many of these large wetland systems are protected by the NYSDEC. The Project site contains four wetland and stream communities considered significant from a statewide perspective by the New York Natural Heritage Program: shallow emergent marsh, shrub swamp, marsh headwater stream, and rocky headwater stream. None of these communities are inherently rare within the state. However, the on-site occurrences are considered high quality examples of more common community types due to their large size, diversity, remote location, and relatively undisturbed condition within an intact landscape.

It should be noted that the community types listed below apply specifically to delineated wetlands, and do not represent the full range of wetlands community types present on-site. Many of the larger on-site wetlands exist as a mosaic of different wetland communities. Sedge meadow and deep emergent marsh are two examples of wetland communities found on-site that were not encountered in the survey area. Many of the deepwater communities on-site have been created and maintained through the activity of beaver (*Castor canadensis*), which create ponds by damming streams and flooding adjacent areas. Beaver dams were observed on-site in excess of five feet in height.

Emergent wetland – The majority of Project site wetlands are emergent marshes. Emergent wetlands on site were highly variable in size and structure: including sedge meadows, deep water to shallow emergent marshes, and often with a fringe of shrub swamp or forested wetland communities. Significant portions of NYSDEC Freshwater Wetlands P-27, P-22, SP-43, P-19, and P-10 were created by previous and current beaver activity. Active beaver dams were evident in many of the larger complexes. These wetlands are characterized by persistent and/or deep inundation, often containing soils that remain inundated throughout the year. Emergent marshes on-site are dominated by herbaceous species such as common rush, woolgrass, green bulrush, beggar's-ticks, Joe-pye weed, boneset, cattails, fringed sedge, and tussock sedge. The silt/silt loam textured soils are shallow for the most part with a rock layer that varies in depth within 16 inches. The soils are saturated at 2-3 inches and characterized by a low chroma value of 10 YR 2/1 on average. Evidence of watermarks, water-stained leaves, oxidized root channels, and morphological plant adaptations occur throughout these wetlands.

Scrub-shrub wetland –Scrub/shrub wetlands found within the study area are characterized by dense stands of shrub species less than 20 feet tall, including meadowsweet, steeplebush, willows, speckled alder, winterberry, and mountain holly. An understory of herbaceous vegetation is dominated by jewelweed, sedges, beggar’s-ticks, mad-dog skullcap, bugleweed, tearthumb, and asters. The soils are saturated at the surface, have a silt-loam texture, and are characterized by a low chroma value of 10 YR 2/1. Hydrology is characterized by moist to saturated conditions. Evidence of water-stained leaves, oxidized root channels, and morphological plant adaptations occur throughout these wetlands.

Forested wetland – Forested wetland communities are dominated by trees that are 20 feet or taller, but also include an understory of shrubs and herbs. The forested wetlands on site include a mix of trees such as balsam fir, black spruce, yellow birch, and red maple, along with shrub species such as speckled alder and winterberry. The herbaceous layer is comprised of sphagnum mosses, sensitive fern, cinnamon fern, goldthread, sedges, and asters. The soils are typical of the site, with a rather significant organic layer followed by an A horizon with a dark low chroma value of 10YR 2/1 and a silt loam texture. At variable depths, 3-6 inches, a rock layer predominates preventing further soil profile investigation. Indicators of wetland hydrology include saturated soils, watermarks, water-stained leaves, oxidized root channels, and morphological plant adaptations.

The study area for the wetland delineation included many areas where the wetlands were crossed by roads with existing culvert or fords over wetlands and streams. The existing culvert and roadway network is highly variable including highly functioning triple metal culvert pipe crossings to small box culverts.

provide significant functions and values. The primary functions provided by these wetlands appear to include maintaining surface water flows, recharging groundwater supplies, storm water detention, flood protection and abatement, water quality improvement, wildlife habitat, and nutrient production and cycling. Several of the larger forested wetlands provide habitat for forest-nesting songbirds while the open emergent wetlands offer habitat to migrating waterfowl. The functions of many of the delineated wetlands are portions of much larger systems, which may provide significant functions and values. Within the Project site, the highest-value wetlands are the larger, more diverse wetlands regulated by NYSDEC.

3.2.1.3 Groundwater

According to the USGS Ground Water Atlas of the United States, the generating site and the western portion of the interconnect site are located over the Lower Paleozoic sandstone aquifer.

This is a national principal aquifer, indicating that this aquifer is regionally extensive or that it has the potential to be used as a source of potable water. The central portion of the interconnect site is not situated on a principal aquifer, but is part of a surficial aquifer system consisting of glacial deposits of sand and gravel that were laid down during advances and retreats of continental glaciers. The eastern portion of the interconnect site is located in an area mapped as a carbonate-rock aquifer, which is also a national principal aquifer (USGS, 1995).

According to the EPA Safe Drinking Water Information System, nearby municipalities that rely on groundwater for their drinking water supply include Martinsburg, Glenfield, Turin, and Lyons Falls. None of these water systems had any health based violations within the last 10 years (EPA, 2007).

3.2.2 Potential Impacts

3.2.2.1 Construction

3.2.2.1.1 *Surface Waters and Wetlands*

To avoid or minimize overall permanent impact on streams and wetland areas, Project design was guided by the following criteria during the siting of wind turbines and turbine infrastructure:

- Large built components of the Project, including staging areas, wind turbine generators and the substation, either avoided wetland areas or were sited to minimize impacts to wetlands.
- Number and overall impacts due to new access road crossings were minimized by avoiding wetlands whenever possible and utilizing existing roads and narrow wetland crossing locations whenever possible.
- Buried electric interconnect lines avoided crossing forested wetlands whenever possible, crossed wetlands at narrow points, and will utilize installation techniques that minimize temporary wetland impacts. These criteria will also be applied throughout the process of finalizing the buried and overhead interconnection route between the generating site and the substation.

During construction, potential direct or indirect impacts to wetlands and surface waters may occur as a result of the installation of access roads, the upgrade of local public roads, the installation of buried and overhead electrical interconnects, placement poles for aboveground interconnection, and the development and use of temporary workspaces around the turbine sites. Direct impacts, including clearing of vegetation, earthwork (excavating and grading activities), and the direct placement of fill in wetlands and surface waters, are typically associated with the development of access roads and workspaces. The construction of access roads, and possibly the upgrade of local public roads will

result in both permanent (loss of wetland/surface water acreage) and temporary impacts to wetlands. The development and use of temporary workspaces will result in only temporary impacts to either streams or wetlands. The installation of buried electrical interconnects will temporarily disturb streams and wetlands during construction as a result of clearing (brush-hogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical interconnects. Installation of overhead interconnect will likely include temporary soil and vegetation disturbance during construction and permanent impacts may include pole placement and removal of tall woody vegetation adjacent to the interconnect line. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by removal of vegetation and soil disturbance required to install project components. This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are proposed including areas adjacent to proposed access road upgrade/construction, buried and overhead electrical interconnect, turbine sites, staging areas, met towers, or the substation.

A total of 47 areas of wetland impact, including 4 stream crossings, are anticipated to occur at the generating site due to project construction. These impacts will involve both the temporary and permanent placement of fill to accommodate proposed project access road construction, the temporary placement of fill in turbine work spaces, and temporary soil disturbance associated with the installation of buried electrical interconnects. Temporary and permanent conversion of vegetative covertype will also occur as a result of clearing associated with proposed project access roads, buried electrical lines, and turbine workspaces. Improvements to public roads that may be required to accommodate construction traffic are not currently designed, and therefore any associated wetland impacts have not yet been evaluated. Upon finalization of the transportation delivery plan, detailed wetland delineations will be conducted in any areas that may impact wetlands or surface waters. Typical public road improvements could include:

- Placement of additional cover over structures.
- Reinforcing structures with bracing.
- Use of bridge jumpers to clear structures.
- Replacement of structure prior to construction.
- Replacement of structure during or after construction if damaged by construction activities.
- Re-route construction traffic to avoid structures.

For the purposes of temporary wetland impact calculations, it is assumed that impacts resulting from installation of access roads will disturb a width of 40 feet (fill area)/60-75 feet (vegetative

disturbance), which includes installation of buried electrical gathering lines (See Table 1). On the generating site, buried electrical interconnects are installed co-linear with access roads to minimize disturbance (number of crossings) to streams/wetlands. Direct temporary impacts to wetlands and surface waters (fill and disturbance) anticipated during construction are summarized below in Table 7. A locational reference for these wetland and stream areas is provided in Figure 7, and in Figure 7 of the Wetland Delineation Report in Appendix E.

Table 7. Estimated Temporary Impacts to Wetlands and Surface Waters at the Generating site.

EDR Wetland ID	Wetland Covertypes¹	Crossing Type	Temporary Impact (acres)
A (NYSDEC P-8)/(Roaring Brook)	EM/ST	Access road/buried electrical	0.14
B (NYSDEC P-8)/(Roaring Brook)	EM/SS/ST	Access road/buried electrical	0.07
C (NYSDEC P-8)	SS/FO	Access road/buried electrical	0.02
D	EM/ST	Access road/buried electrical	0.01
F	EM	Access road/buried electrical	0.01
G (trib. Of Edick Creek)	EM/ST	Access road/buried electrical	0.01
I	EM	Turbine workspace	0.01
N	EM	Turbine workspace	0.07
O	EM	Turbine workspace	0.08
Q	EM	Access road/buried electrical	0.01
S	FO	Access road/buried electrical	<0.01
T	EM	Turbine workspace	0.18
U	FO	Turbine workspace	0.20
V	FO	Turbine workspace	0.01
W	EM	Access road/buried electrical	<0.01
Y (NYSDEC P-19)	EM/SS	Access road/buried electrical	0.05
AA	EM	Access road/buried electrical	0.03
BB	EM/FO	Turbine workspace	0.01
EE (trib of N. Branch of Fish Creek)	EM/ST	Access road/buried electrical	<0.01
GG (NYSDEC P-10)	FO	Access road/buried electrical	0.06
HH	EM/FO	Turbine workspace	0.11
II (NYSDEC P-10)	FO	Access road/buried electrical	0.03
JJ	FO	Turbine workspace	<0.01
KK (NYSDEC P-10)	FO	Access road/buried electrical	0.06

EDR Wetland ID	Wetland Coverture¹	Crossing Type	Temporary Impact (acres)
LL	EM/SS	Access road/buried electrical	0.01
MM (NYSDEC P-10)/(trib. of Roaring Brook)	EM/ST	Access road/buried electrical	0.03
NN	EM	Access road/buried electrical	0.05
RR	EM	Access road/buried electrical	0.02
SS (NYSDEC P-19)	FO	Access road/buried electrical	0.02
VV (NYSDEC P-27)	EM	Access road/buried electrical	0.04
WW (NYSDEC P-27)	EM/SS	Access road/buried electrical	0.05
XX (NYSDEC P-27)	EM	Access road/buried electrical	0.08
YY	SS	Access road/buried electrical	0.02
ZZ (NYSDEC P-22)	EM/SS/FO	Access road/buried electrical	0.05
DDD	FO	Access road/buried electrical	0.04
EEE	EM	Access road/buried electrical	0.03
FFF (NYSDEC SP-39)	EM/SS	Access road/buried electrical	0.01
HHH (NYSDEC SP-39)	EM/SS/FO	Access road/buried electrical	0.84
III	EM	Access road/buried electrical	0.01
KKK	SS/FO	Access road/buried electrical/ Turbine workspace	0.36
LLL	EM	Turbine workspace	0.03
MMM	EM/SS	Access road/buried electrical	0.06
AAAA (NYSDEC P-27)	FO	Turbine workspace	0.72
BBBB (NYSDEC P-27)	FO	Turbine workspace	0.32
CCCC	EM	Access road/buried electrical	<0.01
Approximated boundary of NYSDEC P-19	FO	Turbine workspace	0.54
Approximated boundary of NYSDEC P-23 and P43	FO	Turbine workspace	0.21
Total Temporary Wetland Impacts			4.76

¹ Wetland covertypes are based upon the Cowardin et. al. classification system: EM = emergent marsh; WM = wet meadow; SS = shrub shrub; FO = forested; and ST = stream.

In summary, the total temporary impact to wetlands/streams at the generating site is anticipated to be approximately 4.8 acres (vegetation disturbance and temporary impacts to soils). As depicted in

Table 7, the majority of impacts are associated with the up to 200-foot workspace around turbines. However, conservative geometry and impact estimates are used for the purposes of preliminary impact analysis and many of these impacts may be avoidable through minor alterations to the workspace layout/geometry. Additionally, PPM Energy will work with the manufacturer to determine if rotors may be assembled in the air instead of on the ground, minimizing the amount of clearing necessary to construct each turbine.

As illustrated in Figure 6, Sheet 2, the generating site Project components are sited closely along existing forest roads that weave through portions of 18 mapped NYSDEC Freshwater Wetlands. In an effort to maximize use of the existing road network and minimize wetland impacts, some project components are sited within the state regulated 100-foot adjacent areas to state mapped wetlands ("wetland buffers"). EDR observed that many freshwater wetland mapped boundaries do not coincide with on-site field conditions. No confirmation of state regulated wetland boundaries delineated in 2007 have yet been performed in consultation with NYSDEC. Although observed to be somewhat inaccurate during field surveys, potential impacts to wetland buffers may only be estimated based upon available freshwater wetland boundaries for the generating site area. Based upon this available mapping, approximately 8 acres of temporary impacts to wetland buffers may occur as a result of the siting of turbines and associated workspaces, access roads, and buried gathering lines. Field consultation with an NYSDEC freshwater wetlands biologist to confirm delineated wetland boundaries is anticipated during Spring/Summer 2008.

Wetland/stream impacts associated with public roadway improvements and the electrical interconnection line are not known at this time, and thus not included in the impact calculations. Based upon a review of NYSDEC Freshwater Wetland mapping (See Figure 6, Sheet 1), it appears the proposed route will cross portions of five NYSDEC wetlands, and result in approximately 3 acres of temporary impact to state regulated wetlands and 1.8 acres of temporary impacts to wetland buffers (vegetation and soil disturbance). Potential impacts that may result from public road improvements or the electrical interconnect will be comprehensively addressed prior to the conclusion of SEQRA and subsequently during NYSDEC and/or USACOE wetland permitting.

Following project construction, temporarily impacted wetland areas will be restored, which is anticipated to include the following:

- 200-foot radius turbine workspaces will be reduced to a permanent footprint of 0.2 acre (60-foot by 100-foot gravel crane pad, 18-foot diameter turbine pedestal, and a 6-foot wide gravel skirt around the tower base).

- 40-foot wide access roads will be reduced to maximum width of 20 feet (except where unstable soil conditions or severe erosion hazard preclude restoration).
- buried electrical gathering line routes will be allowed to regenerate naturally.

To avoid or minimize permanent impact on streams and wetland areas, Project design was guided by siting criteria, as previously described. By following these criteria, permanent impacts to wetlands have been limited. Permanent impacts to surface waters and wetlands (loss of surface water/wetland acreage) will result from the placement of fill material to construct proposed permanent access roads to accommodate long-term maintenance and operation activities. Anticipated direct permanent impacts to wetlands and surface waters anticipated during construction of project access roads (placement of fill) are summarized below in Table 8.

Table 8. Estimated Permanent Impacts to Wetlands and Surface Waters at the Generating Site (Soils Impacts)

EDR Wetland ID	Wetland Covertypes ¹	Crossing Type	Permanent Impact (acres)
A (NYSDEC P-8)/Roaring Brook	EM/ST	Access Road	0.04
B (NYSDEC P-8)/Roaring Brook	SS/EM/ST	Access Road	0.03
C (NYSDEC P-8)	FO/SS	Access Road	<0.01
F	EM	Access Road	<0.01
G (trib. of Edick Creek)	EM/ST	Access Road	<0.01
Q	EM	Access Road	<0.01
Y (NYSDEC P-19)	SS/EM	Access Road	0.02
AA	EM	Access Road	0.01
GG (NYSDEC P-10)	FO	Access Road	<0.01
KK (NYSDEC P-10)	FO	Access Road	0.03
LL	SS/EM	Access Road	<0.01
MM (NYSDEC P-10)/Trib. of Roaring Brook	EM/ST	Access Road	0.02
NN	SS	Access Road	0.01
RR	EM	Access Road	<0.01
VV (NYSDEC P-27)	EM	Access Road	0.02
WW (NYSDEC P-27)	SS/EM	Access Road	0.01
XX (NYSDEC P-27)	EM	Access Road	0.05
ZZ (NYSDEC P-22)/N.Branch of Fish Creek	EM/SS/FO/ST	Access Road	0.04
DDD	FO	Access Road	<0.01
HHH (NYSDEC SP-39)	EM/SS/FO	Access Road	0.03
KKK	SS/FO	Access Road	<0.01
MMM	EM/SS	Access Road	0.03
CCCC	EM	Access Road	<0.01

EDR Wetland ID	Wetland Coverture¹	Crossing Type	Permanent Impact (acres)
Total Permanent Impacts			0.40

¹Wetland covertypes are based upon the Cowardin et. al. classification system: EM = emergent marsh; WM = wet meadow; SS = shrub shrub; FO = forested; and ST = stream.

Other long-term impacts to wetlands will result from construction-related clearing activities (e.g. brush-hogging before installation of buried electrical interconnects) in forested wetlands that will not result in a loss of wetland acreage, but will result in the conversion of forested wetlands to systems dominated by shrub and herbaceous vegetation (scrub-shrub/wet meadow/emergent). Activities that will result in the permanent conversion of forested wetland vegetation include turbine workspaces and total up to 3.32 acres. Activities that will result in clearing of forested wetland areas that will be allowed to regenerate include the restored access road edges and include a total up to 0.29 acres. Therefore total forested wetland conversion impacts are anticipated to be up to 3.6 acres.

In summary, the total permanent impact (wetland loss) to wetlands/streams at the generating site is anticipated to be 0.4 acres (of which 0.12 acres is forested wetland), and are all associated with the upgrade of existing access roads or the construction of new access roads. These calculations include impacts to portions of 5 NYSDEC mapped-regulated Freshwater Wetlands (P-8, P-10, P-19, P-27, and SP-39), and portions of 4 streams (Roaring Brook, tributary of Roaring Brook, tributary of Edick Creek, and the North Branch of Fish Creek). Additionally, total forested wetland conversion impacts are anticipated to be approximately 3.6 acres. As described above in association with temporary impacts, no confirmation of state regulated wetland boundaries delineated in 2007 have yet been performed in consultation with NYSDEC. However, based upon available freshwater wetland boundaries for the generating site area, approximately 5.5 acres of permanent impacts to wetland buffers may occur as a result of the siting of access roads (See Figure 6, Sheet 2). Field consultation with an NYSDEC freshwater wetlands biologist to confirm delineated wetland boundaries is anticipated during Spring/Summer 2008. Wetland/stream impacts associated with public roadway improvements and the electrical interconnection line are not known at this time, and thus not included in the impact calculations. However, potential impacts that may result from public road improvements or the electrical interconnect will be addressed during SEQRA and post-SEQRA permitting.

Permanent wetland impacts within the electrical interconnection route are anticipated to be negligible or non-existent, as poles will be sited so as to avoid placement in wetlands to the maximum extent practicable. Upon finalization of the electrical interconnection route, wetland impacts within the

interconnect site will be evaluated and described in an addendum to the Wetland Delineation Report, prior to the conclusion of SEQRA.

3.2.2.1.2 *Groundwater*

As previously mentioned, the Project will add only small areas of impervious surface, which will be dispersed throughout the Project area, and will have a negligible effect on groundwater recharge. However, construction of the proposed Project could result in certain localized impacts to groundwater, and the use of that water by adjacent landowners. These impacts could include:

- Minor localized disruption of groundwater flows down-gradient of proposed turbine foundations;
- Minor modification to surface runoff or stream-flow, thereby affecting groundwater recharge characteristics;
- Minor degradation of groundwater chemical quality from installation of concrete foundations; and
- Impacts to groundwater recharge areas (wetlands).

Installation of turbine foundations has the greatest potential for impacts to groundwater. If blasting is necessary, it can generate ground vibration, fracture bedrock, and impact groundwater levels. However, based on the anticipated minimum distance to existing resources (at least 800 feet) and the assumption that some private water supply wells will be located in close proximity to these structures (typically within 100 feet), it is highly unlikely that blasting would physically damage the individual wells or affect the groundwater flow to these wells or the well yields.

The construction process would also impact groundwater flow paths in areas where excavation (or blasting) occur below the water table. Water is anticipated to flow around the disturbance and resume its original flow direction down gradient of the disturbance. Groundwater that infiltrates into the excavation may require removal by pumping, which could have an effect on the elevation of the water table. However, this water will be pumped to the surface and allowed to infiltrate back into the water table with negligible loss of volume due to evaporation. Therefore, any effect will be very localized and temporary. Additionally, installation of the concrete foundations could cause a temporary, localized increase in groundwater chemistry (pH) during the curing process. This effect would not extend beyond the immediate area of the foundation and would not adversely affect groundwater quality.

In addition to impacts to groundwater due to turbine foundation installation, minor impacts could result from other Project activities. Construction of access roads will result in minor increase in storm water runoff that otherwise would have infiltrated into the ground at the road locations. Buried transmission lines may facilitate groundwater migration along trench backfill in areas of shallow groundwater. Construction of Project components that traverse wetlands may also have an impact on groundwater as many wetlands serve as groundwater recharge areas.

A final potential impact to groundwater is the introduction of pollutants to groundwater from the discharge of petroleum or other chemicals during construction. Such discharges could occur in the form of minor leaks from fuel and hydraulic systems, as well as more substantial spills that could occur during refueling or due to mechanical failures and other accidents.

3.2.2.2 Operation

3.2.2.2.1 *Surface Water and Wetlands*

Impacts to surface waters and wetlands primarily occur during project construction. The operation of the constructed facility is not anticipated to have significant adverse impacts to wetlands, streams, or other surface waters within the Project site. Vehicular access to the turbines, substation, met towers, and O&M facility will be completely established during project construction, and routine operation and maintenance procedures are not anticipated to result in significant adverse impacts. Minor and isolated incidences of impact may occur, which could have a minimal impact to surface waters or wetlands in or adjacent to the Project site, including buried and overhead electrical interconnect maintenance, access road washouts, culvert replacement/maintenance, or accidental fuel/chemical spills.

The proposed project will not result in wide-scale conversion of land to built/impervious surfaces. Tower bases, crane pads, new access roads, a met tower and the substation in total will add approximately 27 acres of new impervious surface to the 4,100 acre Project site (i.e., conversion of approximately 0.7%). Consequently, no significant changes to the rate or volume of stormwater runoff are anticipated. However, installation of permanent project components could result in localized changes to runoff/drainage patterns.

3.2.2.2.2 *Groundwater*

Most impacts to groundwater will occur during construction only. Over the long term, addition of small areas of impervious surface to the Project area in the form of permanent access roads, crane pads, the O&M building, and the substation will have a minimal effect on groundwater recharge.

Turbine foundations installed below the water table are not anticipated to have any measurable effect on groundwater levels or flow patterns. The migration of groundwater along buried interconnect trenches could have a minor effect on groundwater flow paths, and a continued risk of chemical spills during operation and maintenance activities may also affect groundwater.

3.2.3 Proposed Mitigation

To mitigate for unavoidable permanent wetland and stream impacts associated with the Project, the Project Sponsor will undertake a suitable on-site or off-site compensatory mitigation project, likely through the creation of an in-kind wetland, at a ratio of 1.5 to 1 (mitigation to impact), or through the restoration of on-site degraded wetlands caused by extensive previous logging activity. This suitable compensatory mitigation project will be developed in consultation with the NYSDEC and Corps during the Joint Application for Permit process. This mitigation is anticipated to occur concurrently with impacts. However, the final mitigation area will be determined in consultation with the agencies during permitting and will include any currently undetermined wetland/stream impacts, including those areas associated with the electrical interconnect route and public road improvement efforts.

No mitigation for indirect or temporary impacts to wetlands or streams is proposed, given the fact that these impacts will not result in any loss of wetland acreage. However, temporary impacts to streams and wetlands in will be minimized during construction as discussed below:

The direct impacts of wetland and stream crossings will be minimized by utilizing existing or narrow crossing locations whenever possible. Upgrading under-maintained/undersized crossings will have a long-term beneficial effect on water quality, as it will keep farm equipment and other vehicles out of the streams. Special crossing techniques, equipment restrictions, herbicide use restrictions and erosion and sedimentation control measures will be utilized to reduce impacts to water quality, surface water hydrology, and aquatic organisms. Clearing of vegetation along stream banks and in wetland areas will be kept to the absolute minimum necessary for safe construction.

Where crossings of surface waters and wetlands are required, the Project Sponsor will employ the Best Management Practices associated with particular, applicable streamside and wetland activities, as recommended by the NYSDEC and the Corps and required by the issued wetland/waters permits. Specific mitigation measures for protecting wetlands and surface water resources will include the following:

- No Equipment Access Areas. Except where crossed by permitted access roads wetlands, streams, waterbodies will be designated “No Equipment Access,” thus prohibiting the use of

motorized equipment in the areas. However, there are specific non-jurisdictional crossing techniques that may be employed on a case-by-case basis, with the approval of the environmental inspector, as identified in the preconstruction walkovers.

- **Restricted Activities Area.** A buffer zone of 100 feet, referred to as “Restricted Activities Area”, will be established where Project construction traverses streams, wetland and other bodies of water. Restrictions will include:
 - No deposition of slash within or adjacent to a waterbody;
 - No accumulation of construction debris within the area;
 - Herbicide restrictions within 100 feet of a stream or wetland (or as required per manufacturer’s instructions);
 - No degradation of stream banks;
 - No equipment washing or refueling within the area; and
 - No storage of any petroleum or chemical material.
- **Access Through Wetlands -** When crossing wetlands, skirting around edges, using higher ground, and crossing the narrowest portion of the wetland will be the preferred crossing options. Wherever feasible, low impact crossing methods will be used such as timber mats or similar materials. Geotextile mats, corduroy and/or gravel may also be used to create temporary wetland road widening. Where permanent roadways are installed and impoundment of water is possible, the installation of culverts will be used to maintain the natural water levels on each side of the road.
- **Sediment and Siltation Control –** A stringent soil erosion and sedimentation control plan will be developed and implemented as part of the Stormwater Pollution Prevention Plan (SWPPP) required by the State Pollutant Discharge Elimination System (SPDES) General Permit for the Project to protect surface waters, wetlands, and groundwater and storm water quality. Silt fence, hay bales, and temporary siltation basins will be installed and maintained throughout site development. The location of these features will be detailed on the construction drawings and reviewed by the environmental inspector during the preconstruction walk. A duly qualified individual will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (final grading and seeding). Based upon field conditions, the environmental inspector may require additional sediment and erosion control, beyond what is depicted on the drawings.

The Project Sponsor will adhere to any permit special conditions pertaining to low impact stream crossing techniques, including seasonal restrictions and/or alternative stream crossing methods, such as temporary bridging and installation of crossings “in the dry” on protected streams. Wetlands temporarily disturbed during construction will be restored to their original grade. This will allow wetland areas to redevelop naturally following construction.

To assure compliance with proposed mitigation measures during construction, the Project Sponsor will provide the construction contractor copies of all applicable NYSDEC (Article 24 and 15, Section 401 Water Quality Certification) and Corps permits (Section 404) and site specific plans detailing construction methodologies, sediment and erosion control plans, and required natural resource protection measures. The Project Sponsor will also employ one or more environmental inspectors during construction to ensure compliance with all plans and permit conditions.

Any increase in storm water runoff will be negligible, as Project construction will result in limited addition of impervious surface. Nevertheless, specific means of avoiding or minimizing storm water-related adverse impacts during construction and operation of the Project include adhering to a detailed SWPPP, as described previously. Additionally, a Spill Prevention, Containment, and Countermeasure (SPCC) Plan that outlines procedures to be implemented to prevent the release of hazardous substances into the environment will be developed and implemented. This plan will include a number of required Best Management Practices, such as the requirement that refueling of construction equipment not be allowed within 100 feet of any stream or wetland, and all contractors will be required to keep materials on hand to control and contain a petroleum spill. These materials will include a shovel, tank patch kit, and oil-absorbent materials. Any spills will be reported in accordance with NYSDEC regulations. Contractors will be responsible for ensuring responsible action on the part of construction personnel.

To avoid localized drainage problems, the civil design engineer will identify the need for ditches, water bars, culverts, and temporary sediment retention basins at each road and tower site prior to the initiation of construction and these features will be placed upon the construction drawings as part of the required Project SWPPP. If drainage problems develop during or after construction, the environmental inspector will evaluate the problem (in consultation with the contractor, landowner and/or agency representative) and recommend a solution. Corrective actions will be taken by the contractor within the timeframe recommended by the environmental inspector.

No significant impacts to groundwater are anticipated, and therefore no mitigation is proposed. Potential groundwater related impacts, as described above, could occur if blasting were required.

However, blasting is not currently anticipated. If blasting is required, it will be done in compliance with a blasting plan designed with appropriate charge weights and delays to localize bedrock fracturing to the proposed foundation area, minimizing the already unlikely chance of impacting water levels in residential wells.

3.3 BIOLOGICAL RESOURCES

3.3.1 Existing Conditions

3.3.1.1 Vegetation

Plant species and communities found within the generating site were identified and characterized during field surveys conducted by EDR during the fall of 2007. A total of 146 plant species were documented within the generating site during these field surveys. A list of these species, including scientific names, is included in Appendix F, along with other species likely to occur in the area based on range and habitat conditions. All of the species found during this survey are relatively common in New York State, and include native and introduced species. No listed threatened or endangered plant species were observed on-site during the field review. Furthermore, although the timing of the field survey did not allow for identification of all plant species, typical indicators of possible rare plant occurrence (e.g., rich woodlands, prairie remnants, limestone outcrops, fens, etc.) were not observed on site.

Vegetative communities along the electrical interconnect route were determined through aerial photo interpretation. EDR will conduct additional field surveys at the electrical interconnect site once the route is finalized, and the plant species list will be updated. Additional field surveys are anticipated to occur in the spring and summer of 2008.

3.3.1.1.1 *Ecological Communities*

Historically, the generating site was the site of a sawmill operation and was continuously logged until it was acquired by the current landowner in 2004 (JMA, 2007). Vegetative communities within the generating site include mixed coniferous/deciduous forest, wetlands, streams, beaver ponds, and disturbed/developed areas. Communities were mapped based on interpretation of aerial photography and field verification. Community boundaries were then digitized, and approximate

acreages were calculated through the use of Geographic Information System (GIS) analysis. All identified vegetative communities within the generating site are depicted on Figure 9. Inventoried wetlands in the Project area have been quantified and described separately (see Section 3.2). A description of each community observed on site is presented below, including identification of dominant plant species.

All of the major plant communities found within the Project site are relatively common to New York State. Forestland and wetlands are the dominant community types within the generating site, while open water, and developed/disturbed communities occur to a lesser extent. Based on aerial photo interpretation, similar ecological communities likely occur along the electrical interconnect site, along with land under active agricultural cultivation. Field verification will occur in the spring and summer of 2008. Brief descriptions of these ecological community types are provided below.

Mixed coniferous/deciduous forests are found throughout the Project site. In most places, this community is characterized by relatively young, even-aged, second-growth forest, similar to the successional northern hardwoods community described by Reschke (1990). The entire Project area was heavily logged as recently as 1999, with relatively few large trees remaining. Overstory tree species include yellow birch, red maple, balsam fir, black cherry, American beech, and sugar maple. Shrubby understory vegetation is extremely dense in many places, due to the open forest canopy. Common species include hobblebush, blackberry, striped maple, raspberry, and saplings of overstory trees. Ground vegetation is fairly sparse, except for scattered patches of hay-scented fern. Other common species include wood fern, Canada mayflower, goldthread, shining clubmoss, sarsaparilla, common wood sorrel, bracken fern, whorled aster, and bunchberry.

Wetlands within the Project site include a diverse assemblage of community types. These communities include forested wetlands, scrub/shrub wetlands, wet meadows, and shallow emergent marshes. Forested wetland communities include a mix of hydrophytic trees such as black spruce, American elm, green ash, and red maple, along with shrub species such as winterberry, mountain holly, and dwarf raspberry. Scrub/shrub wetlands within the study area are characterized by dense stands of speckled alder and winterberry, mixed with patches of sedges, rushes, tear thumb, and jewelweed. Wet meadows are dominated by rushes, sedges, jewelweed, joe-pye-weed, boneset, sensitive fern, royal fern, cinnamon fern, beggar-ticks, and tear thumb. Some wet meadow and scrub/shrub areas exist as fringe communities around shallow emergent marshes, which are typically dominated by cattails. Some of the wetlands on the Project site occur as fringe communities along the banks of streams and drainage channels. Wetland communities are described in detail in both Section 3.2 and Appendix E of this DEIS.

Streams and ponds within the Project site include beaver pond complexes, and both perennial and intermittent streams. Streams are typically less than 10 feet wide with well-defined banks and a gravel/cobble substrate. Aquatic vegetation is typically lacking and water depth rarely exceeds 12 inches. Ponds are typically open water components of larger wetland systems. Additional information about these aquatic communities is included in Section 3.2 of this DEIS.

Developed/disturbed areas occur throughout the Project site, and are primarily comprised of unpaved forest/logging roads and soil stockpile sites. Several seasonal cabins are also located within the Project area. Other disturbed areas are associated with road construction, including sites excavated for gravel fill, and large mounds of soil pushed up along the roadsides. These areas are similar to several community types described in Reschke (1990) including unpaved road/path, rural structures, and gravel mine. These communities have typically been excavated, filled, and/or exposed to repeated and on-going disturbance. Vegetation in these areas is either lacking or highly managed (i.e., grass seeded along roadsides for erosion control). Volunteer vegetation in these areas is typically characterized by thinly scattered, often non-native, old-field herbaceous species such as horseweed, ragweed, Queen Anne's lace, oxeye daisy, low cudweed, and various upland grasses.

Agricultural Land only occurs along the eastern end of the electrical interconnection line as row crops, field crops, or pastureland (approximately 25% of electrical interconnection route). Corn is the primary row crop in the electric interconnection area. Hayfields within the electrical interconnection site are often rotated into row crops (typically corn), and less often into pastureland. Consequently, the percentage in each covertype is constantly changing. Pastureland is used for the grazing of livestock (typically cows, but also including horses) and is typically characterized by mixed grasses and broad-leafed herbaceous species, including red clover, plantains, dandelion, and thistles.

3.3.1.1.2 Significant Natural Communities/Rare Plant Species

The United States Fish and Wildlife Service (USFWS) no longer provides project-specific responses to requests for information regarding the potential presence of species protected under the Endangered Species Act. Instead, a website has been designed to assist applicants in determining the possible occurrence of federally listed, proposed, and candidate species by county. The lists include all such species known to occur in a given county, as well as those likely to occur there.

This online consultation procedure was conducted on October 19, 2007. No federally listed, proposed, or candidate species of plants have been documented in Lewis County.

A written request for information regarding listed threatened and endangered plant species and unique or significant natural communities at the generating site was sent to the NYSDEC Natural Heritage Program (NHP) on April 11, 2007. According to the response provided by this agency, no state- or federally-listed threatened or endangered plant species have been documented within the vicinity of the generating site. However, five significant ecological communities have been documented within or adjacent to the Project site. These include shallow emergent marsh, shrub swamp, marsh headwater stream, rocky headwater stream, and beech-maple mesic forest. All of these communities have a state rank of S4 (apparently secure in New York State) or S5 (demonstrably secure in New York State), which indicates that none of these communities are intrinsically rare. However, these communities meet NHP significance criteria as a “high quality example of a more common community type.” Therefore, the NHP considers these communities to be significant from a statewide perspective, and to have high ecological and conservation value.

Shallow emergent marsh is a wet meadow community that occurs on mineral soil or muck soils that are permanently saturated and seasonally flooded. Water depths may range from 6 inches to 3.3 feet (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the substrate is exposed. Shallow emergent marshes occur in lake basins and along streams, and typically have a very diverse assemblage of herbaceous plants that include grasses, sedges, cattails, wetland ferns, and a variety of forbs. There are several thousand occurrences of this community type statewide (NYNHP, 2007a). Additional information about this community, and its distribution in the Project area, is included in Section 3.2 of this DEIS.

Shrub swamps are a wetland community dominated by tall shrubs that occurs on mineral or muck soils. They may be co-dominated by a mixture of species, or have a single dominant shrub species. Characteristic shrub species common in these wetlands include alder, red osier dogwood, willows, meadow-sweet, steeple-bush, wild raisin, and silky dogwood. Shrub swamps are very common throughout New York State (Edinger et al., 2002). Additional information about this community, and its distribution in the Project area, is included in Section 3.2 of this DEIS.

Marsh headwater stream is the aquatic community of a small, marshy perennial brook with a very low gradient, slow flow rate, and cool to warm water that flows through a marsh, fen, or swamp where a stream system originates. These streams usually have clearly distinguished meanders (i.e., high sinuosity) and are in unconfined landscapes. Marsh headwater streams are typically dominated

by runs with interspersed pool sections; they are typically shallow, narrow, have a relatively small low flow discharge and usually represent a network of 1st to 2nd order stream segments. The substrate is typically gravel or sand, but some segments have a softer substrate of silt, muck, peat, marl deposits, woody debris, or leafy debris. These streams may have high turbidity and be somewhat poorly oxygenated, and can vary in alkalinity and color. Species assemblages characteristic of pools and soft bottoms predominate the community (Edinger et al., 2002).

Rocky headwater stream is the aquatic community of a small- to moderate-sized perennial rocky stream, typically with a moderate to steep gradient, and cold water that flows over eroded bedrock, boulders, or cobbles in the area where a stream system originates. These streams are typically shallow and narrow, with a relatively low flow discharge, and usually represent a network of 1st to 2nd order stream segments. These streams typically include alternating riffle and pool sections, and are typically surrounded by upland forests. The predominant source of energy to the stream is terrestrial leaf litter or organic matter; trees shading the stream reduce primary productivity. These streams have high water clarity and are well oxygenated. Species assemblages characteristic of riffles and rocky substrate predominate the community. There are several thousand occurrences of this community type statewide (NYNHP, 2007b).

Beech-maple mesic forest is a hardwood forest with sugar maple and beech co-dominant. This is a broadly defined community type with several regional and edaphic variants. These forests occur on moist, well-drained, usually acid soils. Common associates are yellow birch, white ash, eastern hop hornbeam, and red maple. There are many spring ephemerals that bloom before the canopy trees leaf out, but overall there are relatively few shrubs and herbs. Characteristic small trees or tall shrubs are hobblebush, American hophornbeam, striped maple, witch hazel, and alternate-leaved dogwood. Dominant ground layer species include star flower, common wood-sorrel, Canada mayflower, trilliums, shining clubmoss, and intermediate wood fern. Typically there is also an abundance of tree seedlings, especially of sugar maple; beech and sugar maple saplings are often the most abundant “shrubs” and small trees (Edinger et al., 2002).

A separate written request for information regarding listed threatened and endangered plant species and unique or significant natural communities along the electrical interconnect site was sent to the NHP on December 14, 2007. No response has been received to date.

3.3.1.2 Fish and Wildlife

Fish and wildlife resources within the project area were identified through analysis of existing data sources, such as the North American Breeding Bird Survey (BBS), the New York State Breeding Bird Atlas (BBA), the Audubon Christmas Bird Count (CBC), the New York State Amphibian and Reptile Atlas (Herp Atlas), along with an on-site breeding bird survey conducted by Curry & Kerlinger, LLC during June, 2007, an on-site visual study of bird and bat migration conducted by ABR, Inc. during the spring and fall of 2007, and reconnaissance-level field surveys conducted by ecologists from EDR during the summer and fall of 2007. This information was supplemented through correspondence received from the NHP (see Appendix B) and through review of radar and post-construction monitoring studies conducted for the adjacent Maple Ridge Wind Power Project.

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A total of 78 wildlife species (or sign of these species, such as identifiable tracks, feathers, and/or scat) were observed within the project area during various on-site field surveys conducted during 2007. In addition, based on existing data sources and observed habitat conditions, it is estimated that approximately 260 different species could potentially be found at some time within the project area. These species, including scientific names, are listed in Appendix F. More specific information regarding wildlife within the project area is presented below.

3.3.1.2.1 Birds

Based on the results of on-site field surveys, along with information from existing data sources, it appears that approximately 181 avian species could occur within the project area at some time throughout the year. Details on the site's avian community are presented below.

Breeding Birds: The New York State Breeding Bird Atlas (BBA) is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State. The project area is covered by four BBA survey blocks, each of which covers a 5-square kilometer (km²) area. The

species totals for these blocks range from 79 to 94 species. No state-listed endangered or threatened species were recorded in the four blocks. However, BBA data do indicate the presence of four species of special concern in New York State. These include sharp-shinned hawk, northern goshawk, red-shouldered hawk and American bittern (see discussion in Section 3.3.1.3). The majority of bird species documented in the BBA are common inhabitants of woodland, woodland edge, and shrubland habitats.

The Breeding Bird Survey (BBS) is a long-term, large-scale avian monitoring program that tracks the status and trends of North American bird populations. Two BBS routes are located in the vicinity (i.e., within 10 miles) of the Project site in Lewis County. The closest of these routes (Highmarket) documented the presence of 113 bird species over the last 10 years. The most common species on the Highmarket route were red-winged blackbird, American robin, song sparrow, chestnut-sided warbler, American goldfinch, red-eyed vireo, common yellowthroat, European starling, barn swallow, bobolink, white-throated sparrow, tree swallow, and ovenbird. These species indicate that the route transverses a mix of forest and agricultural habitats. Because the Project is located exclusively in forestland, grassland species such as bobolink are unlikely to occur on site, while woodland birds, such as chestnut-sided warbler and ovenbird, are likely to be more common. Waterbirds were not well represented on the Highmarket BBS route, either in terms of diversity or frequency.

Based on analysis of BBA and BBS data, the Phase I Avian Risk Assessment (ARA) for the Project concluded that the Roaring Brook site has a diverse breeding bird community, composed mainly of woodland bird species (Kerlinger & Guarnaccia, 2007). Noteworthy breeders include wood thrush and Canada warbler, both American Bird Conservancy Green List species (i.e., species identified as having the highest priority for conservation in the United States and Canada). However, both are relatively common in the Tug Hill region. No state-listed endangered or threatened species are likely to breed at the Project site. Among state-listed special concern species, American bittern, sharp-shinned hawk, Cooper's hawk, northern goshawk, and red-shouldered hawk may breed at the site, but they would do so in low abundance.

The breeding bird survey conducted by Curry & Kerlinger, LLC documented the presence of 55 breeding bird species on the Project site (Kerlinger, 2007). Songbirds accounted for 74.5% of species. The survey revealed only a few raptors (one northern harrier and a few turkey vultures) that could be nesting on site. Ten bird species accounted for 55.3% of all species observed, with five (white-throated sparrow, veery, red-eyed vireo, American redstart, and mourning warbler) accounting for 34.5% of all species. These birds are songbirds that nest mostly in brush and forest edge habitat. However, there were several species of forest interior nesting species, also

documented. The presence of some forest edge, brush, and farm/grassland species, including brown-headed cowbird, American goldfinch, American robin, common grackle, common yellowthroat, red-winged blackbird, and song sparrow, among others, demonstrate that the forest has been fragmented. However, the abundance of these species is relatively small in relation to the overall species composition on site. These data demonstrate that fragmentation, though it is occurring, has not eliminated the overall forest character of the habitat on site.

Migrating Raptors: According to the Hawk Migration Association of North America (HMANA), the Tug Hill region is located in the “Central Continental Flyway Region,” despite its location in the Eastern United States. In this “flyway,” the significant hawk migration points where birds congregate in large numbers are located primarily along the edges of the Great Lakes. Rather than crossing these large expanses of water, hawks usually fly around them, in proximity to the shorelines, until they can proceed in the desired direction (north in the spring and south in the fall). As reported in the Phase I ARA (Kerlinger & Guarnaccia, 2007), no New York hawk watches are located in the vicinity of the Project site. The closest is the Derby Hill hawk watch, located approximately 32 miles west-southwest of the proposed Project. Tens of thousands of hawks pass Derby Hill during the spring migration as they concentrate along the shore of Lake Ontario (during the fall migration, relatively few hawks pass Derby Hill). Most of the migration noted at Derby Hill is concentrated within 1 to 5 miles of the lakefront. Inland, migrating hawks are spread more evenly over large areas.

In the absence of water barriers, or ridgelines that create updrafts, hawk migration in the Central Continental Flyway takes place over a broad front. Sufficiently far from Lake Ontario and lacking prominent ridgelines, the area where the Project is proposed can be expected to lack significant concentration of migrating hawks. In addition, studies have shown that the migration altitudes of hawks generally range from 600 up to 1,500 feet (200 to 450 m) or even higher at mid-morning, and up to altitudes up to 3,500 to 4,000 feet (1,100 to 1,200 m) or higher by mid-afternoon, when rising columns of air (thermals) reach their maximum (Kerlinger & Moore, 1989).

Migrating Waterbirds: The Project site includes several marshes, ponds, and streams. However, the site is not unique in this respect. Based on satellite imagery, all forested areas of the Tug Hill Plateau appear to contain these habitat features. Therefore, waterbirds that use these habitats during migration will be spread throughout the landscape, not concentrated in any one area.

Regarding other types of waterbirds, the Project site is not located near any large lakes, marshes, mud flats, or other types of ecological “magnets” where shorebirds, wading birds, gulls, or terns are

know to congregate. Radar studies show that ducks, geese, loons, and other birds typically fly at altitudes of 500 to 1000 feet or more (Kerlinger, 1982; Kerlinger & Moore, 1989; Kerlinger, 1995). It should be noted that migrating geese do make stopovers to feed on corn and other seeds in agricultural fields during fall and spring migration. While agricultural fields are present nearby in the Black River Valley, none occur within 1.5 miles of the Project site.

Migrating Songbirds: According to the Phase I ARA (Kerlinger & Guarnaccia, 2007), nocturnal songbirds are the most numerous of birds migrating over New York State. Species include cuckoos, woodpeckers, flycatchers, vireos, nuthatches, wrens, kinglets, gnatcatchers, thrushes, catbirds, thrashers, tanagers, and sparrows. Based on population estimates provided in Rich et al. (2004), migratory songbird traffic over New York State is probably on the order of hundreds of millions of birds per season. In New York State, nocturnal songbird migration occurs from late April through May (spring migration) and from mid August into November (fall migration). Nocturnal migration also occurs in waves associated with meteorological phenomena. For example, during fall migration, numbers of southbound migrants are greater after the passage of cold fronts with their northwest winds (Kerlinger, 1995). Studies using radar, ceilometers, and direct observation have shown that nocturnal migration is typically initiated 30 minutes to an hour after sunset. Peak nocturnal migration occurs from an hour after sunset until after midnight. Most birds land by sunrise (Kerlinger, 1995).

Studies of bird migration (Berthold, 2001; Alerstam, 1993; Eastwood 1967) strongly indicate that, if the nocturnal migration of individual songbirds over New York State could be plotted on a map, the resulting pattern of parallel movement would cover the entire state relatively evenly. In the fall, this pattern would be oriented in a south-southwesterly direction. In the spring, the direction would be north-northeasterly. Radar studies conducted in the Eastern United States confirm that night migration of songbirds is typically broad-fronted as opposed to concentrated in narrow corridors that follow topographic features (Cooper et al., 1995; Cooper & Mabee, 1999; Cooper et al., 2004a; Cooper et al., 2004b).

Radar studies also indicate that the altitude of night-migrating birds and their direction of travel are very similar, regardless of geographic location or ground-level topography or habitat conditions. In a review of 21 radar studies at existing and proposed wind power sites in the Eastern United States, Young and Erickson (2006) found similar mean passage rates in the spring and fall (258 versus 247 targets/km/hr, respectively). Mean height of flight was 409 m (1,342 feet) above ground level (AGL) in spring and 470 m (1,541 feet) AGL in fall, with 14% of targets below 125 m (410 feet) in spring and 6.5% below that height in fall. Mean flight directions were north-northeast (31 degrees) in spring and south/southeast (193 degrees) in fall. These averages are consistent with results from a fall

2004 radar study conducted for the Maple Ridge Wind Power Project, approximately 2 miles northeast of the Roaring Brook site (Mabee et al., 2005). This study documented a mean flight direction of 184 degrees and mean nocturnal passage rate of 158 targets/km/hr. The mean nocturnal flight altitude was 415 m (1,361 feet), with 8% of all targets occurring below 125m.

These study results suggest that nocturnal songbird migration above the Roaring Brook Project site is comparable to what has been observed at other Northeastern sites. It is likely to be broad front in nature, with most migrants passing at altitudes well above the height of the proposed turbines.

Visual studies of nocturnal bird migration at the Roaring Brook site looked specifically at bird flight characteristics during spring and fall migrations (Mabee et al., 2007; Mabee & Scwab 2007). Mean observation rate documented during the spring study was approximately 4.4 birds per hour (range = 0-19.1 birds per hour), with highest observation rates generally occurring between 2-3 hours after sunset. Approximately 93% of the observed birds were below an altitude of 150 m (492 feet). These birds would be within the rotor-swept area (RSA) of the proposed turbines. During fall migration, the mean observation rate was approximately 2.0 birds per hour (range = 0-67.19 birds per hour), with highest observation rates again occurring between 2-3 hours after sunset. Approximately 80% of the observed birds were below and altitude of 150 m, or within the RSA of the proposed turbines. It should be noted that this study focuses on a significantly more limited study area (90 meters of their 150 meter observation is within the RSA – or higher risk zone), which represents only a small fraction of migrants passing overhead on a nightly basis.

Wintering Birds: The Project site is subject to strong northwest winds, low temperatures, and deep snow during the winter season. Food for most birds, especially woodland birds, is likely to be scarce at this time, and therefore, a low diversity and density of wintering birds would be expected in and around the Project site. The New Boston Christmas Bird Count (CBC) area, which overlaps a portion of the Project site, indicates that a total of 57 wintering species have been documented in the area over the last ten years. The most common wintering bird species were European starling, black-capped chickadee, blue jay, pigeon, house sparrow, wild turkey, American crow, common redpoll, snow bunting, and evening grosbeak. The only state-listed species documented in the New Boston CBC were bald eagle (threatened), northern harrier (threatened), sharp-shinned hawk, Cooper's hawk, northern goshawk, and horned lark (all special concern). Of the listed species, the northern goshawk is considered the most likely to occur on the Project site, but its frequency of occurrence would likely be extremely low (Kerlinger and Guarnaccia, 2007).

3.3.1.2.2 *Mammals*

Due to a lack of existing data regarding mammals within the Project area, the occurrence of mammalian species was documented entirely through reconnaissance-level field surveys and evaluation of available habitat by EDR during the summer/fall of 2007. This effort suggests that up to 41 species of mammal could occur in this area, of which 8 species (or sign of their occurrence) were actually observed. These species included whitetail deer, raccoon, northern red squirrel, chipmunk, black bear, and beaver. Species not observed, but likely to occur on site include striped skunk, mink, weasels, fisher, river otter, red fox, coyote, gray fox, gray squirrel, eastern cottontail, and a variety of small mammals (mice and shrews). All of the observed species, and those likely to occur in the area based on habitat conditions, are common and widely distributed throughout northern New York State.

To characterize and document bat activity within the Project area, ABR conducted field surveys during the spring and fall of 2007 (see Appendices I and J). These surveys involved visual observation of nocturnal bat activity to determine flight characteristics, altitude, and types of bats observed. The spring study determined that an average of 0.3 bats per hour were observed (range: 0-1.9 bats per hour), and that observation rates were consistent through the night (Mabee et al., 2007). Flight orientation was in all directions, and only about 7% of the bats were observed at altitudes below 150 m (492 feet). Of the 44 identified bats observed during this study, 68% were larger tree-roosting bats (presumably including hoary, Eastern red, and silver-haired bats). The fall study documented an average of 0.6 bats per hour (range: 0-4.69 bats per hour), with the highest rate 1 hour after sunset (Mabee & Schwab, 2007). Flight orientation was in all directions, and only about 20% of the bats were observed at altitudes below 150 m (492 feet). Of the 177 identified bats observed during this study, 54% were either big brown bats or migratory tree-roosting bats such as hoary, Eastern red, and silver-haired bats.

The first year post-construction monitoring survey at the nearby Maple Ridge Project has documented the presence of hoary bat, silver-haired bat, eastern red bat, big brown bat, and little brown bat (Jain et al., 2007). Due to the proximity of that site, it is reasonable to assume that these same species occur at the Roaring Brook site.

3.3.1.2.3 Reptiles and Amphibians

Reptile and amphibian presence within the Project area was determined through reconnaissance-level field surveys conducted by EDR and review of the New York State Herp Atlas. The Herp Atlas Project was a ten-year survey (1990 through 1999) designed to document the geographic distribution of the state's herptofauna. Atlas data was collected and organized according to USGS

7.5-minute quadrangles (NYSDEC, 2006a). Based on this data, along with documented species ranges and field observations of species and existing habitat conditions, it is estimated that approximately 38 reptile and amphibian species could occur in the area (see Appendix F). However, only eight of these species (ribbon snake, pickerel frog, eastern garter snake, red-backed salamander, red-spotted newt, American toad, bull frog, and green frog) were actually observed on site. Species not observed, but likely to occur in the Project area based on existing range and habitat conditions, include spotted salamander, painted turtle, eastern American toad, gray treefrog, northern two-lined salamander, mink frog, northern redbelly snake, and northern spring peeper. All of these species are common and widely distributed throughout New York State.

3.3.1.2.4 Fish

Although no site-specific fisheries data were obtained or field surveys conducted, fish species such as largemouth bass, smallmouth bass, sunfish, brook trout, brown trout, creek chub, shiners, and dace most likely occur within the Project site. Several state-classified trout streams occur in the Project area. These streams, which include the headwaters and tributaries of Roaring Brook, the North Branch of Fish Creek, Edick Creek, and Dunton Creek, support a coldwater fish community including trout, creek chub, and slimy sculpin. Ponds/beaver impoundments on site may also support a warmwater fish community (e.g., bass, sunfish, and shiners). Waterbodies on the Project site are all on private property and lack any provisions for public access (i.e., public fishing easement). Consequently, they receive relatively little use as recreational fisheries. However, the North Branch of Fish Creek (a tributary to the East Branch) and Roaring Brook are classified as trout streams by the NYSDEC, and are recognized as high quality fishing streams (with areas of public fishing access) downstream of the site.

3.3.1.2.5 Wildlife Habitat

As previously described, the generating site is dominated by regenerating forest, but includes a variety of ecological community types. The electrical interconnect site includes a mosaic of forest, active agricultural fields, and abandoned old fields. The value of these communities to various wildlife species is summarized below.

Successional Old Field and Wet Meadow Habitats: These grass/forb dominated areas occur primarily along the electrical collection line and within the generating site along road shoulders and at former log landings, as well as in some drained beaver impoundments. Due to their small size and/or wet condition, these areas do not provide preferred nesting and foraging habitat for open

country bird species such as bobolink, horned lark, eastern meadowlark, savannah sparrow, and song sparrow. However, the vegetation in these areas provides forage in the form of seeds and foliage, which is utilized by birds as well as small mammals (mice, shrews, etc.), whitetail deer, and eastern cottontail. Birds of prey, such as northern harrier, and mammalian predators, such as red fox and eastern coyote, also use such areas as hunting areas.

Successional Shrubland and Scrub-Shrub Wetland Habitats: Sapling and shrub-dominated habitats (both wetland and upland) occur in disturbed upland areas where the overstory tree canopy has been removed, and in some wetland areas. These sites provide nesting and escape cover for a variety of wildlife species. Various songbirds, such as gray catbird, American goldfinch, indigo bunting, and yellow warbler, require low brushy vegetation for nesting and escape cover. Whitetail deer and eastern cottontail are also typically found in brushy edge habitat. In addition, some of the shrub species found in these areas (e.g., black berries, raspberries, blueberries) produce berries that are a food source for birds and mammals such as black bear, raccoon, and striped skunk.

Forest Habitat: Results of the on-site breeding bird survey indicate that forest habitat within the Project site still provides habitat for wildlife species that require forest interior conditions, such as wood thrush, veery, eastern wood pewee, red-eyed vireo, black-capped chickadee, rose-breasted grosbeak, black-and-white warbler, and pileated woodpecker. However, as mentioned previously, much of this forest land has been disturbed by logging activity. This activity has resulted in the clearing of overstory trees and the development of forest roads and clearings throughout the site. Consequently, these areas are often characterized by a broken canopy and an abundance of young saplings, as well as periodic human activity/disturbance. Therefore, many of these areas have already experienced forest fragmentation and do not currently provide high quality forest interior conditions preferred by the afore-mentioned bird species. Forested areas on site are interspersed with extensive wetland systems (including forested swamps) and therefore provide habitat for wading birds and waterfowl, including great blue heron and wood duck. Mammals that utilize forested habitat include gray squirrel, red squirrel, eastern chipmunk, beaver, black bear, and whitetail deer.

Emergent Marsh and Open Water Habitats: Although the site includes no large lakes, marshes, mudflats, or other types of wetlands that would attract waterbirds in significant numbers, emergent marsh and open water habitats are common in active beaver impoundments that occur throughout the site. These areas are used as a source of food, water, and/or cover by waterbirds and many of the upland species mentioned previously. These waterbodies also support fish, amphibians, and a diversity of insects and aquatic invertebrates. They are preferred foraging areas for aerial

insectivores, including songbirds and bats. In addition, these areas provide habitat for various wetland/aquatic wildlife species, including great blue heron, mallard, wood duck, painted turtle, bullfrog, mink, muskrat, river otter, and beaver.

The ARA prepared for the Project (Kerlinger and Guarnaccia, 2007, contained in Appendix G) indicates that the Project site is included within a designated Important Bird Area and is adjacent to the Tug Hill Wildlife Management Area (WMA). A program of BirdLife International and Audubon, the Important Bird Area (IBA) Program seeks to identify and protect essential habitats for one or more species of breeding or non-breeding birds. According to Burger and Liner's (2005), the Tug Hill IBA covers 79,600 acres in Lewis County and overlaps the Project site. It is a relatively unfragmented landscape (90% forested) that is ecologically distinct from the Adirondacks. The Tug Hill IBA supports a number of characteristic forest breeders, including state-listed special concern species such as American bittern, sharp-shinned hawk, northern goshawk, and Bicknell's thrush and the Green Listed American black duck, American woodcock, wood thrush, and Canada warbler.

The Tug Hill WMA abuts the generating site to the west. This WMA consists of 5,100 acres of upland hardwood forest, hardwood/coniferous wetlands, and a 65-acre impoundment. About 3,200 acres of the WMA are managed for wildlife habitat diversity through commercial forestry practices. In addition, some State Forest Preserve land is located within 3 miles of the site, mainly to the east and southeast. These tracts are subject to "forever wild" provisions, and therefore, no logging occurs on these sites.

The Nature Conservancy (TNC) has also acquired 15,000 acres immediately south of the Project site. This area is managed by TNC (through sustainable forest management practices and conservation) in partnership with the Tug Hill Commission, EPA, and local partners. Their collective goals are to protect working forestland from subdivision and to protect Tug Hill's aquatic resources including the headwaters of the East Branch of Fish Creek.

Taken together, the Tug Hill IBA, Tug Hill WMA, Forest Preserve lands and TNC property assure that forests on the Tug Hill Plateau will continue to provide important habitat for interior forest wildlife, including a number of bird species of conservation concern.

3.3.1.3 Threatened and Endangered Wildlife Species

Written requests for listed species documentation were sent to the NHP on April 11, 2007. According to the NYSDEC response letter, Indiana bat (state- and federally listed as endangered)

and small-footed bat (state-listed special concern) occur at several sites in Jefferson and St. Lawrence Counties within 40 miles of the Project site and could disperse from these sites into the Project area. The presence of several uncommon (although unlisted) bird species, including bay-breasted Warbler, three-toed woodpecker and clay colored sparrow, within 10 miles of the Project site is also noted in the NYNHP response (see Agency Correspondence in Appendix B).

According to the BBA, no federally listed threatened or endangered wildlife species have been documented in the area. However, four state-listed species or special concern (sharp-shinned hawk, northern goshawk, red-shouldered hawk, and American bittern) have been documented on BBA blocks that include the Project site. BBS data in the vicinity of the Project area indicate the presence of two state-listed threatened species (northern harrier and upland sandpiper) and five species of special concern (American bittern, Cooper’s hawk, Bicknell’s thrush, cerulean warbler, and horned lark).

The presence of state- and/or federally listed species was also determined during on-site surveys conducted during 2007. No listed endangered species were observed, or are considered likely to nest within the Project site, based on results of the on-site breeding bird survey (Kerlinger, 2007). However, one state-listed threatened species (northern harrier) and four Green List species (blue-winged warbler, Canada warbler, Wilson’s snipe and wood thrush) were observed during the field surveys. All state-listed bird species documented on or adjacent to the Project site are listed in Table 9, below. Of these, it appears that all but upland sandpiper and horned lark (both grassland species) could be nesting within the Project site based on the availability of suitable or marginally suitable habitat (Kerlinger, 2007).

Table 9. Documented State-listed Species in the Vicinity of the Project Site¹

Common Name	Scientific Name	NYS Legal Status
Red-Shouldered Hawk ⁺	<i>Buteo lineatus</i>	Special Concern
Northern Harrier*	<i>Circus cyaneus</i>	Threatened
Cooper's Hawk ⁺	<i>Accipiter cooperii</i>	Special Concern
Sharp-shinned Hawk ⁺	<i>Accipiter striatus</i>	Special Concern
American Bittern ⁺	<i>Botaurus lentiginosus</i>	Special Concern
Horned Lark	<i>Eremophila alpestris</i>	Special Concern
Upland Sandpiper	<i>Bartramia longicauda</i>	Threatened
Northern Goshawk ⁺	<i>Ammodramus henslowii</i>	Threatened

¹Source: BBA, BBS, Agency Correspondence, and On-site Surveys

*Observed on site

⁺Suitable nesting habitat on site (Kerlinger, 2007)

No listed endangered, threatened, or special concern mammal species were observed on the Project site during the site visits conducted by EDR, and, based upon existing habitat conditions, are considered unlikely to occur there. However, as indicated in the agency correspondence concerns exist regarding the potential presence of Indiana bat and small-footed bat. The Indiana bat is a state- and federally listed endangered species. Approximately 42,000 Indiana bats reside within New York State and the population appears to be growing (A. Hicks, personal communication). These bats winter (hibernate) in ten known locations (caves and mines) throughout the state. They emerge in the spring and disperse on average up to 30 miles to their summer range. The nearest wintering cave (hibernaculum) used by Indiana bats is located approximately 30 miles to the northwest, in Jefferson County. The preferred habitat of small-footed bats is rocky talus slopes, which do not occur within or adjacent to the Project site. Thus, this species is not anticipated to occur in the area with any frequency. Various factors also suggest that the occurrence of Indiana bat is unlikely within the Project site, as discussed in Section 3.3.2.2.3.

To assess the potential for Indiana bat to be found on site, first year data from the Maple Ridge post-construction monitoring study (Jain, et al., 2007) were reviewed. No Indiana or small-footed bats have been identified among the collision fatalities documented in that study.

According to the data obtained from the NYS Herp Atlas, no state- or federally-listed reptile or amphibian species have been documented in the vicinity of the Project site, and none were observed during the course of field surveys.

3.3.2 Potential Impacts

3.3.2.1 Construction

Based on the current Project layout and studies conducted to date, anticipated construction-related impacts to vegetation, wildlife, and listed threatened and endangered species are outlined in the following section.

3.3.2.1.1 Vegetation

Project construction will result in temporary and permanent impacts to vegetation within the Project area. However, no plant species occurring on the Project site will be extirpated or significantly reduced in abundance as a result of construction activities.

Construction-related impacts to vegetation include cutting/clearing, removal of stumps and root systems, and increased exposure/disturbance of soil. Along with direct loss of (and damage to)

vegetation, these impacts can result in a loss of wildlife food and cover, increased soil erosion and sedimentation, and a disruption of normal nutrient cycling. Impacts to vegetation will result from site preparation, earth-moving, and excavation/backfilling activities associated with construction/installation of access roads, foundations, and buried/overhead electrical interconnect. Based on the current Project layout and the area of impact assumptions presented in Table 1, these activities result in a total disturbance to approximately 176 acres of successional forest. As indicated in Table 10, the majority of the calculated impacts will be temporary, and native vegetation will be allowed to regenerate following restoration of areas disturbed during construction, except in areas where the rotor may need to be dropped for repairs adjacent to turbines. Construction-related impacts to wetlands were previously discussed in Section 3.2.

Table 10. Impacts to Vegetative Communities

Community	Total Disturbance (Acres)	Temporary Disturbance (Acres)	Conversion to Other Successional Community (Acres)	Permanent Loss (Acres)
Forest	176	155	132	21
Freshwater Wetlands ¹	1	<1	--	<1
Agricultural Land	16	10	--	6
TOTAL	193	166	132	27

¹ See Section 3.2 for impacts to freshwater wetlands based upon wetland survey/delineation at the generating site.

In summary, of the 176 acres of cleared forest land, approximately 21 acres will be converted to built facilities (access roads, met tower) 24 acres will be allowed to regenerate naturally (staging area and access road edges) and approximately 132 acres of forest will be converted to a shrubland/successional community for the life of the Project (33 acres along the electrical interconnection route and 99 acres within turbine workspaces).

3.3.2.1.2 Fish and Wildlife

In general, construction-related impacts to wildlife will be minimal as a result of siting Project components in areas where previous or ongoing disturbance has occurred. Construction-related impacts to wildlife are anticipated to be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth moving activities, and displacement of wildlife due to increased noise and human activity. Each of these potential impacts is described below.

Incidental injury and mortality should be limited to sedentary/slow-moving species, such as small mammals, reptiles, and amphibians, which are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to injury or mortality could also include the eggs and young offspring of nesting birds, as well as immature mammalian species that are not yet fully mobile. More mobile species and mature individuals should be able to vacate areas that are being disturbed.

Significant portions of the Project occur on forest land that has been severely disturbed by logging activity. To the extent practicable, Project access roads (including stream and wetland crossings) will utilize existing forest roads. As mentioned previously, these roads have wide cleared shoulders, and little or no additional forest clearing is required along the existing road system. Buried electrical lines will parallel the roads in almost all locations, thus further reducing habitat loss. As discussed for vegetation, approximately 176 acres of forest and successional habitat will be disturbed during construction, and permanent loss and covertype conversion of natural habitat to built facilities will total 153 acres.

The majority of this impact will occur in regenerating forested habitat. Creating breaks in a large area of contiguous forest can alter the secluded forest interior conditions required by songbirds such as wood thrush, rose-breasted grosbeak, and pileated woodpecker. However, forest fragmentation impacts are anticipated to be limited, due to the fact that most of the forested areas where turbines are proposed have already been disturbed/fragmented through past logging and road building activity.

Earth-moving activities, including foundation excavation and back-fill, widening of existing roads and construction of new access roads, may result in sediment and siltation impacts to aquatic habitat. These impacts could occur in the vicinity of existing or proposed wetland and stream crossings by Project access roads, or down slope of areas subject to significant earth-moving activity (e.g., turbine sites). Siltation and sedimentation of water bodies can adversely affect water quality and aquatic habitat. It can also interfere with the respiration of aquatic organisms and the survival of fish and amphibian eggs and larvae.

Some wildlife displacement will occur due to increased noise and human activity as a result of Project construction. The significance of this impact will vary by species, and the seasonal timing of construction activities. However, species most likely to be disturbed/displaced by Project construction include reclusive species or those requiring undisturbed forest interior conditions (e.g., black bear, bobcats).

Most of the construction-related impacts described above will be temporary, and none will be significant enough to affect local populations of any resident wildlife species.

3.3.2.1.3 Threatened and Endangered Species

No rare plant species or unique natural communities are known to occur on the Project site. Therefore, impacts to listed, threatened and endangered plant species are not anticipated. However, five significant natural communities do occur in the area: shallow emergent marsh, shrub swamp, marsh headwater stream, rocky headwater stream, and beech-maple mesic forest. Although none of these communities are intrinsically rare, the NHP considers these communities to be significant from a statewide perspective, and to have high ecological and conservation value. These significant natural communities could be subject to disturbance during construction.

As described direct impacts to shallow emergent marsh, shrub swamp, marsh headwater stream, and rocky headwater stream communities are anticipated to be minimal, and largely restricted to areas of past disturbance (i.e., existing road crossings). Direct impacts could include clearing of vegetation, soil disturbance (excavating and grading activities), and the direct placement of fill in wetlands and surface waters associated with the installation of access roads and buried electrical interconnect. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by construction activities (e.g., removal of vegetation and soil disturbance) along roads interconnect line, and at turbine sites where no direct wetland impacts are anticipated.

The beech-maple mesic forest occurrence reported by the NHP is an enormous area, encompassing approximately 121,000 acres on the central part of the Tug Hill Plateau, bounded by Route 177 to the north, Route 26 to the east, Route 46 to the south, and Route 17 to the west. The area is described as a “forest matrix landscape,” with beech-maple mesic forest co-occurring with successional northern hardwoods, spruce-hardwood northern forests, wetlands, spruce flats, and brushy cleared land in recently logged areas. As described in section 3.4.1.1.1, the Project area was heavily logged approximately 10 years ago. Very few mature trees remain; blackberry and raspberry brambles cover much of the site. In its current condition, the forest on-site is transitioning from a brushy cleared land community to a successional northern hardwood community. There is no forestland on-site matching Edinger’s (2002) description of a beech-maple mesic forest community. Therefore, no impacts to beech-maple mesic forests are anticipated.

As mentioned previously, listed wildlife species observed within the Project site (and possibly nesting there) include one state-listed threatened species (northern harrier) and five state-listed species of special concern (American bittern, red-shouldered hawk, northern goshawk, sharp-shinned hawk, and Cooper's hawk). These species utilize a variety of habitats, including open grassland/wet meadow (northern harrier), forest (red-shouldered hawk, northern goshawk, Cooper's hawk, and sharp-shinned hawk), and emergent marsh (American bittern). Because the proposed Project will not impact any significant area of emergent marsh or wet meadow, northern harrier and American bittern should not be affected by Project construction. However, because most Project components will occur in, or adjacent to, forest habitat, construction-related impacts to the other listed species are possible. Disturbance/displacement, habitat loss, and/or mortality impacts to eggs or young of these species could occur. However, avoidance of areas of undisturbed forest should minimize impacts to these species. Because listed mammals, reptiles, and amphibians are not likely to occur on site, construction-related impacts to such species are not anticipated.

3.3.2.2 Operation

3.3.2.2.1 *Vegetation*

As indicated in Table 9, Project construction is anticipated to result in permanent conversion of 27 acres of previously vegetated land to unvegetated/built facilities (access roads, turbines, crane pads, substation, O&M building, etc.) within the Project area. This area of permanent impact will include approximately 21 acres of forestland. Permanent impacts to wetlands were previously discussed in Section 3.2.2. It should be noted that for vegetation, in addition to permanent conversion to built facilities, impacts can also be expressed in terms of conversion of one vegetative community to another (e.g., forest to successional shrubland or old field). The latter type of conversion will occur within a 200-foot radius of all turbine sites located in forest. A total of approximately 132 acres of forestland will be converted to successional communities. Other than minor disturbance associated with routine maintenance and occasional repair activities, other disturbance to plants and vegetative communities are not anticipated as a result of Project operation.

3.3.2.2.2 *Fish and Wildlife*

As with construction-related impacts, operational impacts to wildlife are generally anticipated to be minor, as a result of siting Project components away from sensitive habitats such as wetlands and tracts of mature undisturbed forest. Operational impacts to wildlife are expected to be limited to minor loss of habitat, increased forest fragmentation, some wildlife displacement due to the presence of the wind turbines and creation of more forest edge, and some avian and bat mortality as a result of collisions with the wind turbines. Each of these potential impacts is described below.

Habitat Loss: A total of 27 acres of wildlife habitat will be permanently lost from the Project site (i.e., previously undeveloped land converted to built facilities). As mentioned in the previous section, the majority of this loss (approximately 21 acres) will occur in forest land. In addition, approximately 132 acres of forest will be maintained as a successional community (old field, shrubland, or saplings) for the life of the Project. A recent review of the literature on the ecological effects of wind-energy development concluded that forest clearing resulting from construction of roads, electrical lines and turbines can represent a significant impact to forest-dependent species due to habitat loss and fragmentation (NRC, 2007). However, as has been mentioned previously, most of the affected forest habitat is already disturbed due to forest management (logging and road building) activities, and therefore in its current condition, is already fragmented and of compromised value to forest interior nesting species. In addition, the total acreage of wildlife habitat that will be lost due to Project development is not significant from a local or regional perspective.

Forest Fragmentation: As mentioned above, the proposed Project will result in permanent loss or covertype conversion of 153 acres of forest habitat. However, the forested habitat being impacted by the Project is generally young/successional, and already highly disturbed by logging activities. In most places the proposed turbines and access roads are utilizing existing clearings (e.g., woods roads and log landings), which will minimize additional fragmentation of the forest. Development of the Project will preclude full restoration of forest interior conditions for the foreseeable future. However, such restoration is considered unlikely even without the Project, as the landowner has indicated that he plans to develop and utilize the site for recreational purposes and/or further timber harvest if the wind power project does not proceed.

Disturbance/Displacement: While wildlife will likely become habituated to the presence of wind turbines within a few years, the rate and degree of habituation is currently unknown because long-term studies have not been conducted. Forest and forest edge birds are not likely to be significantly disturbed because these species are familiar with tall features (i.e., trees) in their habitat (Kerlinger and Guarnaccia, 2007). As reported in the ARA, a post-construction study of 11 turbines located on a ridgeline in Searsburg, Vermont, appears to be the only applicable study on disturbance and displacement impacts on forest-breeding birds (Kerlinger 2000a, 2002b). In that study, point count surveys for breeding birds done before and after the turbines were erected showed that some forest-nesting birds – such as blackpoll warbler, yellow-rumped warbler, white-throated sparrow, and dark-eyed junco – appeared to habituate to the turbines within a year of construction. Other species, such as Swainson's thrush, appeared to be displaced by the turbines. This study could not document whether or not the former species nested close to the turbines, but it certainly demonstrated that

they foraged and sang within forest edge about 100 feet (30 m) from the turbine bases. A visit to the site during the 2003 nesting season revealed that Swainson's thrushes were singing (and likely nesting) within the forest adjacent to turbines, and many other species were present close to the turbines. It is not known if overall numbers of nesting birds were the same as prior to construction, but letting the forest grow up to turbines and roadways may have reduced the fragmentation impacts at that site. It is also possible that habituation to the turbines had occurred.

As also reported in the ARA, the Erie Shores Wind Farm in Ontario, some turbines are situated at the edge of woodlots, but resident woodland and woodland-edge birds appeared to have habituated readily to their presence, including forest-interior species, such as wood thrush (Kerlinger and Guarnaccia, 2007).

Based on these observations, after the construction phase, forest-edge species at the Roaring Brook site are expected to habituate readily to the Project. For some early successional species, Project construction may actually increase available habitat. For forest-interior species, particularly wood thrush, edge effect resulting from access road and turbine construction in forest, may make a portion of the Project site less suitable habitat. If the site were undisturbed forest, such displacement effects could be significant for certain species, but since the site is already heavily disturbed, these effects should be limited.

Other proposed wind power projects in New York State have raised public concerns regarding the potential displacement effect of wind turbines on game species such as deer and wild turkey. While habituation to the presence of the turbines may not be immediate, species such as deer and wild turkey generally adapt quickly to the presence of man-made features in their habitat (as evidenced by the abundance of these species in suburban settings). Significant displacement of game species from a wind power site has not been reported, and observations at the existing Maple Ridge Wind Power Project indicate that deer and turkey regularly feed in the grassy openings around operating turbines.

Collision: According to the Project ARA (Appendix G), avian fatalities at wind plants can result from collisions with turbine rotors, guy wires of on-site met towers, and, perhaps, wind turbine towers. In 2003, an estimated 20,000 - 37,000 birds were killed at about 17,500 wind turbines in the United States (Erickson et al. 2005). Fatalities ranged from zero to about 8 birds per turbine per year, yielding an average of 2.1 birds per turbine per year. Recent studies, in the Western and Midwestern United States have confirmed these fatality levels, while studies from the Eastern United States reveal slightly higher fatality levels. A study conducted in 2003 at the Mountaineer Wind

Energy Center in West Virginia found an average mortality rate of about 4 birds per turbine per year (Kerns and Kerlinger, 2004), and approximately 7 birds per turbine per year were reported killed at a small project in eastern Tennessee (Nicholson, 2002). Preliminary results from the collision mortality study at the near-by Maple Ridge site are most relevant for predicting fatalities to the Roaring Brook site. Although the habitat is somewhat different, the Roaring Brook site will likely experience the same songbird migration characteristics as the Maple Ridge site. In the first year of study at Maple Ridge (June through November 2006) the fatality rates ranged between about 2 and 9 birds per turbine for the study period. The weighted average for that period was about 4 bird fatalities per turbine. Most impacts were to night migrating songbirds (in particular, Kinglets). There were very few raptors, waterfowl, or shorebirds killed, and no species listed as endangered or threatened (Jain, et al., 2007). During the second year of the study, the results appear to be very similar to those reported following the first year, and appear to confirm that annual fatality rates are somewhat greater than other wind power facilities in the Eastern United States (Kerlinger and Guarnaccia, 2007).

In summary, studies conducted at other sites have shown avian fatalities to be relatively infrequent events at wind farms. No federally-listed endangered or threatened species have been recorded, and only occasional raptor, waterfowl, or shorebird fatalities have been documented in collision mortality studies. In the Midwestern and Eastern United States, night migrating songbirds have accounted for a majority of the fatalities at wind turbines. In general, the documented level of fatalities has not been large in comparison with the source populations of these species, nor have the fatalities been suggestive of biologically significant impacts to species (Kerlinger and Guarnaccia, 2007). The observed level of mortality is also minor when compared to other potential sources of avian mortality (Erickson, et al. 2001).

Although collision risk is likely to be low, data on avian migration at the Project site were collected to determine if site-specific migration characteristics might suggest an elevated level of risk relative to other sites. As discussed previously, radar data collected at the adjacent Maple Ridge site are similar to data from other sites in New York and the Northeast in terms of passage rates, flight altitudes, and flight directions, and do not suggest the potential for elevated risk. The nocturnal visual observation studies conducted by ABR in 2007 indicated that a mean of approximately 4.4 birds per hour were observed during the spring migration and that over 90% of these observations were at altitudes of less than 150 m AGL (Mabee et al., 2007). This resulted in a rotor-swept area (RSA) exposure index of approximately 3.6 birds per hour. During the fall migration, a mean of approximately 2.0 birds per hour were observed, with approximately 80% of these observations at altitudes less than 150 m AGL (Mabee & Schwab, 2007). This resulted in a rotor-swept area (RSA)

exposure index of approximately 2.1 birds per hour. These are very small numbers relative to the number of migrants passing over the site, as documented by radar studies (Mabee et al., 2005), and indicates that the number of birds even exposed to the risk of collision is likely to be limited.

Because there currently is no predictive model available to quantify expected avian collision mortality as a result of wind power project operation, risk assessments must be based on pre-construction indices and indicators of risk (e.g., breeding bird survey and radar data) at the proposed Project site), along with empirical data from operating projects (e.g., avian mortality surveys). Because pre-construction surveys revealed no indicators of elevated risk (e.g., abundance of rare species, unusually high numbers, unusually low flight altitude, habitat that would act as an ecological magnet), collision risk to night migrating songbirds is likely to be low at the Roaring Brook site. However, fatalities of night migrants will likely be somewhat greater than observed at other wind sites in the Eastern United States. This conclusion is based on the results of mortality monitoring at the adjacent Maple Ridge site, and the fact that the Roaring Brook turbines are about 25% taller and extend higher into the airspace of these migrants. Fatality studies have not been done at turbines in excess of 125 m (410 feet) so there are no data with which to compare. Even if as many as 9 birds per turbine per year are killed (i.e., the “worst case” number observed during first year monitoring at the Maple Ridge Project), total annual collision mortality would be approximately 350 birds. Although this number may appear large, as radar data indicate, it is a tiny fraction of the population that migrates through the area, and is not considered a biologically significant impact.

Despite the fact that significant impacts to birds and bats are not anticipated, a post-construction avian and bat fatality monitoring program will be implemented for the purpose of gaining more knowledge regarding the relationship between wind projects and wildlife mortality. Although this post-construction study is not proposed to mitigate Project-specific impacts, it is being developed at the request of NYSDEC as a measure to advance understanding of avian and bat collision with operating wind turbines. The purpose of the post-construction monitoring program will be to determine if avian and/or bat collision fatalities are occurring as a result of Project operation, and if so, the rate of mortality and any other correlating data. This data can then be correlated with pre-construction data, and ultimately this information can help to develop models that will more precisely predict the impact of future wind power projects. The protocols and study design will be developed in consultation with the NYSDEC and USFWS, and are anticipated to follow established/accepted procedures for monitoring collision mortality at wind power facilities. These methods include searches under turbines, coupled with analysis of carcass removal rates (scavenging) and searcher efficiency rates.

With the exception of the Altamont Pass Project in California, documented raptor fatalities at wind power projects are very low. Only one raptor (American kestrel) was documented during the first year mortality study at Maple Ridge (Jain et al., 2007), and the open-country species that are most often recorded in mortality studies (red-tailed hawk and American kestrel) are unlikely to frequent the Project site. The woodland raptors that likely reside on the Project site occur at low densities and have rarely been recorded in mortality studies. In addition, studies conducted at operating wind power projects that are near concentrated hawk migration corridors indicate that raptors rarely collide with wind turbines (DeLucas *et. al.*, 2004; Kerns and Kerlinger, 2004). Based on the results of published collision mortality studies (as well as preliminary data from the Maple Ridge Project), Project operation is not expected to result in significant collision mortality to resident or migrating raptors. The Project ARA concludes that risk to listed and unlisted raptors at the Project is not likely to be biologically significant.

The northern harrier (threatened) forages and could possibly nest on site, as indicated by BBA data and on-site observations. The foraging flight of these birds is generally below the rotor-swept height, but their aerial displays ("sky dancing") during the nesting season may put them at rotor height and at increased risk of collision. However, documented fatalities involving northern harriers at wind power facilities are relatively rare. Harriers occur regularly at wind power sites in the Western and Midwestern United States, yet there are only a few records of collisions. Similarly, harriers are observed regularly at the Maple Ridge site, and yet have not been documented in the on-going collision mortality study.

Also based upon recommendations of NYSDEC, PPM Energy will undertake a post-construction habitat displacement study to ascertain whether, and to what extent, the operating turbines are disturbing/displacing nesting forest birds. This study is anticipated to occur over a multi-year time frame, with surveys of breeding birds conducted at selected turbine sites, prior to construction, and in the first, third and fifth years following construction. The primary goal of this study is to determine the extent of operational displacement impacts and whether or not forest and forest edge nesting species become habituated to wind turbines. Although this study will not directly mitigate Project-specific impacts, it will serve to provide post-construction data that can be correlated with pre-construction data, and ultimately used to develop predictive models for use in the siting of future wind power projects.

Findings from the Mountaineer Wind Facility in West Virginia and the Meyersdale Wind Facility in Pennsylvania have heightened concerns regarding collision risk to migratory bat populations. Johnson and Strickland (2004) documented bat mortality rates of 46.2 fatalities per turbine per year

at the NedPower Mount Storm Project in Grant County, Virginia. This differs from the much lower rates (ranging from 0.07 to 2.32 fatalities per turbine per year) documented at more open midwestern and western sites (Erickson *et al.* 2002). Similarly, Jain *et al.* (2007) documented a mortality rates in the range of 15.2 - 24.5 bats per turbine per year at Maple Ridge during the first year of post-construction monitoring. The proximity of this site and the presence of quality bat habitat (mix of forest, wetland and open areas) on site suggests that similar rates of collision mortality could be anticipated on the Roaring Brook site. However, ABR's nocturnal visual observation studies (Mabee *et al.*, 2007; Mabee & Schwab, 2007) documented a mean observation rate of 0.3 bats per hour during spring migration, with only 7% of these bats within 150 m AGL, and a mean observation rate of 0.6 bats per hour during fall migration, with 20% flying below 150 m. The resulting RSA exposure index of 0.05 – 0.23 bats per hour suggest relatively low exposure of bats to risk of turbine collision.

3.3.2.2.3 *Threatened and Endangered Species*

As previously mentioned, no threatened or endangered plant species are known to occur on the Project site. Therefore, operational impacts to rare vegetation are not expected. The NYP also identified five significant natural communities in the area. However, Project operation and maintenance is not anticipated to result in any significant impacts to these natural communities.

Any listed species that transits the Project airspace at or near rotor height or, in the case of raptors, hunts at the Project site, may be at risk of collision. Nevertheless, the ARA indicate that no federal or state-listed species appear likely to engage in these behaviors at a frequency that would lead to significant collision risk. This includes the special-concern sharp-shinned hawk, Cooper's hawk, northern goshawk, and red-shouldered hawk. The Project site lacks habitat for open-country birds that perform aerial courtship displays, such as the threatened northern harrier and upland sandpiper. Green List species found on site, such as wood thrush, are not likely to be at risk of collision because they do not fly above the canopy during most of the nesting season and when they do so, they are only a few feet above the treetops. American bittern (special concern), could be at risk when flying between wetland areas on site, if these birds forage on site regularly. However, waterbirds, have generally not been shown to be at high risk in turbine mortality studies at other sites (Kerlinger and Guarnaccia, 2007).

The NYSDEC expressed concerns regarding potential impacts to Indiana bats during their review of some wind power projects in New York State. This concern has resulted primarily from sizeable bat kills that have occurred at wind power projects in recent years at the Mountaineer site in West

Virginia and the Meyersdale site in Pennsylvania (although no Indiana bats are known to have been killed at these sites). To address these concerns relative to the Roaring Brook Project, an analysis of potential impacts to Indiana bat is provided below.

The nearest wintering cave (hibernaculum) used by Indiana bats is located 30 miles northwest, in Jefferson County. While the proposed Project site is within the potential dispersal distance of Indiana bats, Project-related impacts on this species are not considered likely for a variety of reasons, including:

1. The Project area is not in an area designated by regulatory agencies as critical habitat for Indiana bats.
2. Bats utilizing the Jefferson County hibernaculum are likely to be widely dispersed once they leave the cave. NYSDEC telemetry studies also indicate that most Indiana bats in New York breed within 30 miles of their hibernacula (A. Hicks, personal communication). Thus, relatively few individuals are likely to occur in the vicinity of the proposed Project.
3. There are no physiographic landscape features (e.g., abrupt ridge lines or water courses) that might direct or concentrate bats migrating to and from the Jefferson County hibernaculum toward the Project area.
4. High winds and low temperatures make the Project site less likely to receive use by Indiana bats, when compared to warmer, less exposed valley and lake plain areas located closer to the hibernaculum. Based on the results of previous NYSDEC studies of Indiana bats elsewhere in the state, it is reasonable to expect that Indiana bats (especially reproductive females) will remain within suitable habitat at lower elevation (e.g., lake plain areas along Lake Ontario and the St. Lawrence River). A 2005 radio telemetry study of Indiana bats at the Glen Park hibernaculum (Jefferson County) revealed that none of the bats traveled further than 17 miles from the cave.
5. The majority of documented turbine-related bat mortality has involved three species of migratory tree bat (hoary bat, red bat, and silver-haired bat). The Maple Ridge mortality study confirmed these results, and also documented mortality of little brown bats, big brown bats and unidentified species (*Myotis* and others). An Indiana bat fatality has never been documented at any wind power project site in the United States, even those in proximity to Indiana bat hibernacula and summer maternity roosts, and where sizable numbers of other bat species have been killed.

Based on all of the information presented above, the Project is not expected to result in any impacts to the Indiana bat.

3.3.3 Proposed Mitigation

The development of wind power projects can legitimately be considered a form of mitigation, in that power generated from the wind can satisfy demand that would otherwise utilize power generated by other means. All electric generating facilities have impacts on ecological resources (fish, wildlife, natural communities). However, as indicated in Table 3.3.3-1 below, environmental impacts that result from more traditional power generating facilities (fossil fuel, hydroelectric, nuclear) are much more significant than the impacts caused by wind power projects.

Table 11. Environmental Impacts of Electricity Sources

	Wind	Hydro	Nuclear	Coal	Natural Gas
Global Warming Pollution	None	None	None	Yes	Yes
Air Pollution	None	None	None	Yes	Limited
Mercury	None	None	None	Yes	None
Mining/Extraction	None	None	Yes	Yes	Yes
Fuel Transportation and Storage	None	None	Yes	Yes	Yes
Fuel Waste	None	None	Yes	Yes	None
Habitat Impacts	Limited	Yes	Limited	Yes	Yes

Source: AWEA Factsheet. (www.awea.org/pubs/factsheets.html)

Traditional sources of electric energy generation result in more direct habitat loss due to the greater size of these facilities and extraction of the fuel required to run them; require the use of surface waters for generation and/or thermal regulation (with resulting thermal discharge, fish entrainment, and impingement and habitat disturbance); and generate air pollution from the fuel combination required for power generation and the extraction and transportation of raw materials. Emissions and/or waste disposal requirements of other forms of generation also contribute to impacts, including acid precipitation and global warming, which have secondary effects on ecological (and human/cultural) resources worldwide.

3.3.3.1 Vegetation

Particularly within the generating site, given the previous logging activity of the successional forestland being impacted, and that the Project will result in the permanent loss of 27 acres of native plant communities, the overall impact of the Project on vegetation is anticipated to be very localized and insignificant from a regional perspective.

Some mitigation of impacts to vegetation will be accomplished primarily through careful site planning. Existing forest roads are being used for Project access roads to avoid impacts to forest and wetland areas to the extent practicable. The feasibility of rotor assembly in the air will be explored as a means of reducing required tree clearing at turbine sites. This will reduce the area around the turbine sites needed for assembly/site staging (reduced below 150-200 foot radius). In addition, cleared trees along Project access roads and at the periphery of turbine sites will be allowed to grow back and reestablish forest habitat in these areas. In addition, PPM and the landowner will develop a long-term forest management plan designed to create and maintain forest interior habitat conditions on the majority of the generating site. It is anticipated that this plan will include actions to eliminate and restore sections of existing forest roads (not needed for project access), and a program of sustainable timber harvest similar to the management approach being utilized on the TNC property to the south. In addition, areas of disturbance will be confined to the smallest area possible, and a comprehensive sediment and erosion control plan will be developed and implemented to protect adjacent undisturbed vegetation and other ecological resources.

Mitigation measures to avoid or minimize impacts to vegetation will also include delineating sensitive areas (such as wetlands) where no disturbance or vehicular activity are allowed, educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, complying with guidance provided by environmental inspectors, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. Following construction activities, all temporarily disturbed areas will be seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Other than in active agricultural fields, native species will be allowed to revegetate these areas.

3.3.3.2 Fish and Wildlife

As previously discussed, construction-related impacts to fish and wildlife should be limited to incidental injury and mortality due to human activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth moving activities, and displacement due to increased noise and human activities. Mitigation of impacts related to construction activity will be accomplished through careful site design (e.g., utilizing existing roads, avoiding sensitive habitats, and minimizing disturbance to the extent practicable). In addition, the contractor will assure that all work remains within the designated construction limits and does not encroach upon off-limit sensitive areas.

To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved sediment and erosion control plan and Storm Water Pollution

Prevention Plan (SWPPP) will be implemented. The sediment and erosion control plan and SWPP were previously described in Section 3.2 (Water Resources). Proper implementation of these plans will assure compliance with NYSDEC State Pollutant Discharge Elimination System (SPDES) regulations and New York State Water Quality Standards. In addition, a Spill Prevention, Containment and Counter Measures (SPCC) Plan will be developed and implemented to minimize the potential for unintended releases of petroleum and other hazardous chemicals during Project construction and operation. To protect fish and aquatic organisms, any new or widened protected stream crossings by proposed access roads and interconnect lines will be installed "in the dry". This will be accomplished either by conducting the installation when the streams are dry (in the case of intermittent streams), or by using temporary dikes and pumping water around the work site. If conditions are appropriate, directional drilling may also be considered as a potential means to reduce disturbance of some surface waters during interconnect installation. On all protected trout streams, seasonal work restrictions (i.e., no construction during the spawning season) will be adhered to, in accordance with the requirements of state and federal permits. The Applicant will consult with NYSDEC, and will utilize elliptical culverts, open-bottomed culverts, or other appropriate materials and installation techniques to minimize any long-term adverse impact to fish habitat or fish passage associated with new or improved crossings of any protected streams.

As previously discussed as it relates to vegetation, mitigation for impacts related to permanent habitat loss and forest fragmentation will be accomplished through careful site design (i.e., utilizing the existing road system and other previously disturbed areas, and minimizing the permanent footprint of Project components to the extent practicable) and restoration of all temporarily disturbed areas.

The Project has been designed to minimize bird and bat collision mortality. The turbines will be placed much further apart than in older wind farms where avian mortality has been documented, such as northern California. They will also be mounted on tubular towers (rather than lattice), which prevent perching by birds. In an effort to reduce avian and bat impacts, all electrical lines between the turbines will be buried and the aboveground electrical line will follow Avian Power Line Interaction Committee (APLIC) guidelines for insulation and spacing. Permanent meteorological towers will be freestanding and un-guyed, and lighting of the turbines (and other infrastructure) will be minimized to the extent allowed by the FAA and follow specific design guidelines to reduce collision risk (e.g., using flashing lights with the longest permissible off cycle). In addition, sodium vapor lamps and spotlights will not be utilized at the proposed substations or O&M facility, except in emergency situations. Further, lighting at the entrances of the O&M facility and substation will be controlled by motion sensors.

3.4 AIR QUALITY AND CLIMATE

3.4.1 Existing Conditions

Existing climatic conditions and regional air quality are discussed below.

3.4.1.1 Climatic Conditions

The USDA's NRCS maintains and monitors National Water and Climate Centers (NWCCs) in numerous locations throughout the United States, including one in Lowville. The NWCC substation in Lowville has collected temperature and precipitation data from 1926 until present. Based upon the 30-year averages compiled from 1971-2000, the average daily maximum temperature in Lowville is 53.3°F, and the average daily minimum is 33.2°F. Historically, January is the coldest month with an average daily temperature of 16.4°F, and July is the warmest with an average daily temperature of 67.5°F (NRCS, 2007).

The 30-year average precipitation recorded in Lowville is 41.35 inches. November, with an average precipitation of 4.07 inches, is historically the wettest month of the year, and February, with an average of 2.53 inches, is the driest. The 30-year average snowfall recorded in Lowville is 122.9 inches annually. December and January are historically the snowiest months of the year with annual averages of 29.8 inches and 36.2 inches, respectively. However, measurable snowfall has been recorded at the monitoring station in every month of the year.

3.4.1.2 Air Quality

The NYSDEC Division of Air Resources publishes air quality data for New York State annually. The most recent summary of air quality data available for the state is the *New York State Ambient Air Quality Report for 2006* (NYSDEC, 2006b). Included in this report are the most recent ambient air quality data, as well as long-term monitoring trends in air quality that were collected and compiled from numerous state and private (e.g., industrial, utilities) monitoring stations across the state. All of Lewis County, including the Towns of Martinsburg is designated as within attainment for all of the major pollutants (carbon monoxide, nitrogen dioxide, ozone, lead, particulates, and sulfur dioxide) monitored (i.e., the National Ambient Air Quality Standards [NAAQS] are not exceeded).

Air emissions in the general area are related primarily to manufacturing, vehicular travel, and farm operations, although these sources are not prevalent on the generating site. Vehicles traveling area roads produce exhaust emissions along with dust from unpaved road surfaces. Routine odors are

associated with certain farming practices (e.g., manure-spreading). Although at times an annoyance, none of these have a significant adverse effect on local air quality.

Federally mandated air-emissions standards and regulations (e.g., the Clean Air Act Amendments of 1990) have been enacted in an attempt to reduce air emissions from coal-burning power plants, which are seen as primary acid-rain sources. A number of reports have noted the effects of acid rain deposition in the Northeast, in particular the Adirondack Mountains and surrounding areas (N.Y. Times, 2001). Several programs monitor and track acid rain deposition, including the EPA's Emissions Tracking System (ETS) and its Emissions & Generation Resource Integrated Database (E-GRID), which provides information on air emissions related to electric power generation.

The Tug Hill receives among the greatest levels of acidic deposition ("acid rain") and nitrogen deposition of any location in the United States. High pollutant concentrations in precipitation, along with high annual precipitation rates on the Tug Hill, result in extremely high annual deposition rates of these pollutants. In comparison with other regions of New York, such as the Adirondacks, Catskills, and the Allegheny Plateau, Tug Hill has the highest long-term (1980-2002) average annual deposition rates for ammonium (NH₄⁺), nitrate (NO₃⁻), total inorganic N, sulfate (SO₄²⁻), and hydrogen (i.e., H⁺, affecting pH). For example, Tug Hill is subject to inputs of N and H⁺ that are, respectively, 1.9 and 1.5 times greater than in the central Adirondacks. In addition, because the Tug Hill forests are similar to those of the Adirondacks and northern New England, and much of the region has strongly acidic soils, it is likely that Tug Hill is affected by N saturation and acidification (Mitchell et al, 2005).

3.4.2 Potential Impacts

3.4.2.1 Construction

During the site preparation and construction phases of the Project, minor, temporary adverse impacts to air quality will result from the operation of construction equipment and vehicles. Impacts will occur as a result of both emissions from engine exhaust and from the generation of fugitive dust during earth moving activities and travel on unpaved roads. The increased dust and emissions will not be of a magnitude or duration that would significantly impact local air quality. However, dust in particular could cause annoyance in areas adjacent to unpaved town roads that are used to access the site during construction. These impacts are anticipated to be short-term, localized, and will be avoided or corrected quickly, as discussed below.

3.4.2.2 Operation

The operation of this Project is anticipated to have a positive impact on air quality by annually producing 203,853 Megawatt hours (MWh) of electricity with zero emissions (assuming 39 2.0 MW turbines operating at 30% annually). Power delivered to the grid from this Project will directly displace the generation of energy at existing conventional power plants. Based on emissions rates for the average U.S. average fuel mix (AWEA, 2007a), this 203,853 MWh wind farm is estimated to annually displace:

- 502 tons of NO_x
- 820 tons of SO₂
- 155,788 tons of CO₂

The operation of this Project is not anticipated to have any measurable effect on climate. Some recent studies have suggested that there may be minor impacts to microclimates within 0.5 mile of wind turbines. Modeling conducted by Baidya Roy et al. (2004) suggests that large-scale wind turbine installations (10,000 turbines) may have a warming effect on the local climate. During the environmental review process for a wind farm in Chautauqua, NY a study group analyzed the impacts of wind turbines on vineyard microclimates (DeGaetano, *et al.*, 2004). This study group determined that a wind turbine could influence the ground level air temperature by no more than one degree Celsius (°C) and concluded that there were unlikely to be significant positive or negative impacts to area vineyards as a result of this potential change in microclimate. However, on a larger scale, the Project represents a legitimate effort to mitigate the well-established causes of global climate change by generating 78 MW of electricity without the production of “green house” gasses.

3.4.3 Proposed Mitigation

Except for minor, short-term impacts from construction vehicles, the Project will have no adverse impacts on air quality. The extent of exposed/disturbed areas on the site at any one time will be minimized and restored/stabilized as soon as possible. The environmental monitor will identify dust problems and report them to the construction manager and the contractor. Water will be used to wet down dusty roads (public roads as well as Project access roads) as needed throughout the duration of construction activities. In more severe cases, temporary paving (e.g. oil and stone) could be used to stabilize dusty road surfaces in certain locations. In addition, PPM Energy will implement a Complaint Resolution Procedure to establish an efficient process by which to report and resolve any construction or operational related impacts.

Project operation has the potential to reduce current emissions from existing power plants. The United States obtains approximately 85 percent of its energy from fossil fuels, and 55 percent from coal, the fossil fuel with the highest carbon dioxide content per unit of electricity produced. A detailed analysis by the Department of Energy's Pacific Northwest Laboratory in 1991 estimated the energy potential of the United States wind resource at 10.8 trillion kilowatt-hours (kWh) annually, or more than three times the total U.S. electricity consumption in 1996 (Elliot *et. al.*, 1991; USDOE, 1997). Every 10,000 MW of wind installed can reduce carbon dioxide emissions by approximately 33 million metric tons (MMT) annually if it replaces coal-fired generating capacity, or 21 MMT if it replaces generation from the United States average fuel mix (San Martin, 1989). The American Wind Energy Association (AWEA) estimates that wind energy has the potential to reach 30,000 MW of installed generating capacity in the United States by 2010. If this target is achieved, wind would reduce national carbon dioxide emissions by 100 MMT annually, based on displacement of coal-fired generation (AWEA, undated).

Thus, by contributing to this effort, the Project will have a long-term beneficial impact on climate and air quality. This benefit can be viewed as mitigation for other environmental impacts associated with the Project.

3.5 AESTHETIC AND VISUAL RESOURCES

3.5.1 Existing Conditions

Based on established visual assessment methodology (NYSDEC, not dated) the visual study area for the Project was defined as the area within a 5-mile radius of each of the proposed turbines, and includes 122 square miles in Lewis County. However, because this area includes so few residents and significant aesthetic resources, sensitive site mapping and viewshed analysis were extended to a 10-mile radius (see Figure 4 in Appendix K). Existing visual and aesthetic resources within the visual study area were identified as part of a Visual Impact Assessment (VIA) conducted by EDR (Appendix K). The VIA included a review of existing data and field reconnaissance to identify landscape similarity zones, viewer groups, and sensitive visual resources within the area. These existing visual/aesthetic components of the study area are described below.

3.5.1.1 Landscape Similarity Zones

Land use within the 5-mile radius visual study area is dominated by forest land, but also includes rural residential development, agricultural land, and significant areas of wetland and open water. Within this area, three distinct landscape similarity zones were defined. The general landscape character of these zones is described below:

3.5.1.1.1 Zone 1. Forestland Zone

This LSZ is characterized by the dominance of forest vegetation and generally rolling topography. The forestland zone occurs throughout the visual study area, but is concentrated in the core of the Tug Hill Plateau as well as in woodlots, ravines and on steep slopes in the more agricultural eastern portion of the visual study area. Much of the forest in this zone (including the Project site) has been subject to past and on-going logging activity. Consequently, the forests are a mix of mature stands, selectively harvested stands, and stands in the various stages of regeneration. The latter include areas that are dominated by shrubs and saplings rather than overstory trees. Views within this zone are generally restricted to areas where small clearings, water features, and road cuts provide breaks in the tree canopy. Where long distance views are occasionally available, they are typically of short duration, limited distance, and/or tightly framed by trees and adjacent slopes. Land use in this zone includes low-density residential and recreational use (hunting, snowmobiling, etc.). These forested areas are typically private lands with limited public access. Even public roads are lacking from large portions of this LSZ. However, forested lands that are accessible to the public include State Forest lands, as well as the Tug Hill Wildlife Management Area (WMA), and 15,000 acres of land owned and managed as sustainable forest habitat by The Nature Conservancy (TNC).

3.5.1.1.2 Zone 2. Water/Wetland Zone

The water/wetland LSZ includes ponds and wetlands on the Project site, as well as extensive wetland areas that occur in the typically northwest-southeast oriented stream valleys that are found in the forested western and southern portions of the visual study area. The distinguishing characteristic of views from this zone is the dominance of open water and/or low wetland vegetation in the foreground. Water adds interest to views in this zone, and lack of foreground screening typically allows for more open views (across water and low herbaceous and shrub vegetation) than are available from the adjacent forestland LSZ. Long distance views in this zone are typically limited due to the screening provided by adjacent forested hills and/or trees along the opposite shoreline. Where visible, background features typically include uniform expanses of gently rolling forest land.

3.5.1.1.3 Zone 3. Upland Agricultural Zone

This zone occurs along the northern and eastern edges of the visual study area. It includes land on the Tug Hill Plateau and a series of intermediate plateaus between Tug Hill and the Black River. This zone is characterized by open land, level to steeply sloping topography, and a mix of widely scattered farms and rural residences. The landscape is dominated by active agricultural fields, but also includes numerous hedgerows, woodlots, successional old fields, and wetlands. Uses are

primarily residential and farm-oriented, along with local travel and outdoor recreation (e.g., hunting, snowmobiling, and ATV riding). Scattered areas of industrial/commercial use (e.g., communication towers, rural businesses and the Maple Ridge Wind Farm) also occur within this zone.

Although not specifically defined or mapped beyond 5 miles, the landscape similarity zones described above extend beyond the 5-mile radius visual study area and accurately describe the majority of the landscape within 10 miles of the proposed Project. The area within 10 miles of the Project site also includes a Valley Agricultural LSZ, a Hamlet LSZ, and a Village LSZ. Descriptions of the visual character of these zones were included in the VIA prepared for the Flat Rock Wind Power Project (now Maple Ridge) (EDR, 2003).

3.5.2 Viewer/User Groups

Two categories of viewer/user groups were identified within the 5-mile radius visual study area. These include the following:

3.5.2.1 Local Residents

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

3.5.2.2 Tourists/Recreational Users

Tourists and vacationers come to the area specifically for the purpose of experiencing its scenic or recreational resources. These viewers include visitors to Whetstone Gulf State Park and the Maple Ridge Wind Farm, as well as hunters, snowmobilers, ATV users and weekend home/camp owners. They may view the landscape on their way to their destination or from the destination itself. Some, such as weekend homeowners, may spend extended time at their camp/second home, and thus view the area as would a resident. Tourists' and vacationers' sensitivity to visual quality and landscape character will be variable (depending on their reason for visiting the area), although this group is generally considered to have relatively high sensitivity to aesthetic quality and landscape character. The area is somewhat unique, in that some visitors come specifically to see the existing Maple Ridge project, and thus are coming to the area because they want to see wind turbines.

Recreational users include local and seasonal residents involved in outdoor recreational activities at parks and recreational facilities, and in undeveloped natural settings such as forests, fields and water bodies. Visual quality/scenery may or may not be an important part of the recreational experience for these viewers. However, recreational users will often have continuous views of landscape features over relatively long periods of time. Tourists and recreational users will be concentrated on the Tug Hill Plateau, both within and outside the 5 mile-radius visual study area. Most of these viewers will only view the surrounding landscape from ground-level or water-level vantage points.

3.5.2.3 Visually Sensitive Resources

The 5-mile radius visual study area includes only a few sites that the New York State Department of Environmental Conservation (NYSDEC) Visual Policy (DEP-00-2) considers aesthetic resources of statewide significance. These include five sites that have been previously determined as eligible for listing on the National Register of Historic Places, a portion of Whetstone Gulf State Park, the Tug Hill WMA, and a portion of Roaring Brook, which has been determined as potentially eligible for designation under the 1968 Wild & Scenic Rivers Act. Within the 5-mile radius study area, there are no sites listed on the State or National Register of Historic Places, Urban Cultural Parks, National Wildlife Refuges, National Natural Landmarks, National Park Service lands, state or federally-designated trails, designated scenic overlooks, designated Scenic Byways, state or nationally designated Wild, Scenic or Recreational River, or designated Scenic Areas of Statewide Significance. Review of existing data did not reveal the presence of any State Nature or Historic Preserve Areas, Bond Act Properties purchased under the Exceptional Scenic Beauty or Open Space category, or Critical Environmental Areas (see citations in Appendix K). Beyond scenic resources of statewide significance, the 5-mile radius visual study area also includes areas that are regionally or locally significant/sensitive due to the type or intensity of land use they receive. These include four State Forests, four cemeteries, approximately 71 miles of designated snowmobile trails, and almost 15,000 acres of TNC land.

The area between 5 and 10 miles from the Project site includes additional aesthetic resources of statewide significance. These include five historic sites listed on the National Register of Historic Places (in the Village of Lowville and hamlets of Martinsburg and West Martinsburg), the Black River Trail Scenic Byway, several isolated parcels of State Forest Preserve land, the Little John State WMA, and the Black River, which has been determined potentially eligible under the 1968 Wild & Scenic Rivers Act.

These resources, along with scenic resources of regional or local significance and areas of intensive land use within 10 miles of the proposed Project, are listed in Table 1 in Appendix K. The locations of visually sensitive resources within the visual study area are illustrated in Figure 11.

3.5.3 Potential Impacts

3.5.3.1 Construction

Due to the remote forested location of the Project site, construction activity/site disturbance, such as tree clearing, earth moving, soil stockpiling and road building, will not be visible to the public. Visual impacts during construction will be limited to the addition of working construction vehicles and equipment to the local roads. Dust generated by the movement of these vehicles could also potentially have an adverse impact on aesthetic resources. However, these activities will be relatively short term (i.e., generally restricted to the construction season). Once construction activity ceases and site restoration activities are complete, construction-related visual impacts will no longer occur.

3.5.3.2 Operation

Impacts to visual resources resulting from Project operation were evaluated primarily through the VIA prepared by EDR (see Appendix K). Potential project visibility was evaluated using viewshed mapping, line-of-sight cross section analysis, and field verification (ballooning). Visual impact was evaluated by preparing computer-assisted visual simulations of the Project from representative/sensitive viewpoints from throughout the 5-mile radius study area. The Project's visual impact on the landscape was evaluated by an in-house registered landscape architect with experience in visual impact assessment.

3.5.3.2.1 *Viewshed Analysis*

Topographic viewshed maps for the Project were prepared using USGS digital elevation model (DEM) data (7.5-minute series), the location and height of all proposed turbines, and ESRI ArcView® software with the Spatial Analyst extension. Two 10-mile radius topographic viewsheds were mapped, one to illustrate “worst case” daytime visibility (based on a maximum blade tip height of 476 feet above existing grade) and the other to illustrate potential visibility of turbine lights (based on a nacelle height of 328 feet [100 m] above existing grade).

The resulting topographic viewshed maps define the maximum area from which any turbine within the completed Project could potentially be seen within the study area during both daytime and

nighttime hours (ignoring the screening effects of existing vegetation and structures). Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewsheds represent a "worst case" assessment of potential Project visibility.

Two vegetation viewshed maps were also prepared to better illustrate the potential screening effect of forest vegetation. The vegetation viewsheds utilized a base vegetation layer created with USGS National Land Cover data (forests) with an assumed elevation of 40 feet.

To address concerns regarding the potential cumulative visual impact of multiple wind power projects, cumulative viewshed analyses were prepared for the Roaring Brook Wind Power Project and the existing Maple Ridge Wind Farm in the Towns of Martinsburg, Harrisburg and Lowville. The results of this analysis are presented in the Cumulative Impacts section of the DEIS (Section 8.0).

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in Figure 7 and summarized in Table 3 in Appendix K. The topographic blade tip analysis revealed that the proposed Project would be potentially visible in approximately 87% of the 5-mile study area and 57% of the 10-mile radius study area. Potentially visible areas are concentrated in the central portion of the visual study area, but include slopes and valleys oriented toward the Project (in a generally northwest/southeast direction) throughout the study area. The eastern slope of the Tug Hill Plateau and the Black River Valley are largely indicated as being screened from view of the Project by topography alone. This area includes the main (eastern) section of Whetstone Gulf State Park, the Villages of Lowville and Turin, State Routes 12 (Black River Trail Scenic Byway) and 26, and the hamlets of West Martinsburg, Houseville, West Lowville, East Martinsburg, Glenfield, and Glendale. Potential Project visibility is indicated along significant portions of Route 177, an area along the Black River east of Lowville, the western portion of Whetstone Gulf State Park (including Whetstone Reservoir) and an area along the Number Three Road northwest of Lowville. Essentially all of the Tug Hill WMA, State Forest lands, TNC land, the snowmobile trail system, and one of the four Register-eligible sites/cemeteries occur within the potentially visible portion of the topographic blade tip viewshed.

Areas of potential nighttime visibility cover approximately 80% of the 5-mile radius study area and 46% of the 10-mile radius study area. These areas of potential visibility are indicated in roughly the same locations indicated by the blade tip analysis, although the hamlet of Martinsburg, and the area along the Black River east of Lowville, are shown as being fully screened from views of the turbine lights by topography alone.

Factoring the screening effect of vegetation into the analysis significantly decreases potential Project visibility. Existing forest vegetation, along with topography will limit potential daytime Project visibility to 16% of the 5-mile radius visual study area and 8% of the 10-mile radius study area. Turbine lighting has the potential to be visible from 12% of the 5-mile radius study area and 6% of the 10-mile radius study area. These areas are largely restricted to open agricultural fields and wetlands/waterbodies, most of which are located to the north and east of the Project site. The largest area still indicated as having potential views of the Project is located along Number Three Road/County Highway 14 northwest of Lowville (approximately 7.8 miles from the nearest proposed turbine). As this analysis shows, forest vegetation will screen views from almost all of the visually sensitive sites, including Whetstone Gulf State Park (excluding Whetstone Reservoir), and the vast majority of State Forest/Forest Preserve lands, snowmobile trails, Register-eligible sites and most local public roads. Areas of potential visibility include portions of Lesser Wilderness State Forest, portions of State Route 177, portions of Grant Powell Memorial State Forest, and local roads including Boshart and Flat Rock Roads.

Areas of actual visibility are anticipated to be much more limited than indicated by the viewshed analysis due to the slender profile of the turbines (especially the blades, which make up the top 140 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures (which are not considered in the viewshed analysis).

3.5.3.2.2 Cross Section Analysis

To further illustrate the screening effect of vegetation and structures within the visual study area, two representative line-of-sight cross sections (ranging from 17 to 18 miles long) were cut through the study area. Cross section locations were chosen so as to include visually sensitive areas (e.g., parks, trails, hamlets, and major roads) and cover the various landscape similarity zones occurring within the 5-mile radius study area. The cross sections are based on forest vegetation and topography as mapped on the 7.5-minute USGS quadrangle maps and digital aerial photographs. For the purposes of this analysis, a uniform 40-foot tree height was assumed. A 10-fold vertical exaggeration was used to increase the accuracy of the analysis and facilitate reader interpretation.

Cross section analysis revealed that the Project will be visible from between 1% and 6% of the area along the selected lines of sight. The analysis confirms that most visually sensitive sites within the study area are unlikely to have views of the Project. The cross sections suggest that views of the turbines will not be available from sites in Whetstone Gulf State Park, the Tug Hill Wildlife

Management Area, the Villages of Lowville and Turin, the Lesser Wilderness State Forest, or from various public roads in the area.

3.5.3.2.3 Field Verification

Actual visibility of the proposed Project was evaluated in the field on August 1, 2007. Four 15-foot by 6-foot helium-filled balloons were tethered at the approximate location of proposed Turbines 5, 6, 17, and 33, and raised to a height of approximately 495 feet above the existing grade. This height is somewhat higher than the maximum finished elevation of the turbine blade tip when oriented straight up (i.e., at the 12 o'clock position). The purpose of this exercise was to provide a locational and scale reference to verify visibility of the Roaring Brook Wind Power Project turbines and to obtain photographs for subsequent use in the development of visual simulations.

While the balloons were in the sky, field crews drove public roads and visited public vantage points within the 5-mile radius visual study area to document points from which the balloons could or could not be seen. Photos were taken from 131 representative viewpoints within the study area. Viewpoint locations were determined using hand-held global positioning system (GPS) units and two-foot resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment and noted on field maps and data sheets. Viewpoints generally represented sites where the most open, unobstructed views of the balloons were available.

Field review confirmed that actual Project visibility, (as indicated by visibility of the four helium-filled balloons) is likely to be even more limited than suggested by vegetation viewshed mapping. This is due to the fact that 1) screening provided by trees within the visual study area is more extensive and effective than assumed in this analysis (e.g., vegetation is more extensive than indicated on the USGS maps, and generally taller than 40 feet in height), and 2) open views will often only include blade tips, or occur at a distance where actual visibility will be difficult. Field review confirmed a lack of visibility from areas that were heavily forested, and areas on the eastern slope of the Tug Hill Plateau. The balloons could not be seen from the hamlet of Martinsburg where ground-level views were typically blocked by buildings and street/yard trees, as well as by the eastern wall of the Tug Hill Plateau. They could also not be seen from the Register-eligible St. Patrick's Cemetery, Whetstone Reservoir, the majority of snowmobile trails, or the TNC property south of the Project site, where adjacent trees effectively blocked outward views. However, the balloons could be seen from the Chapel Hill Cemetery on Flat Rock Road, several sections of snowmobile trail, portions of Route 177, and one road along the edge of the Tug Hill State Forest. In most locations where the balloons

could be seen, existing turbines of the Maple Ridge Wind Farm were also visible. In all cases, when these turbines were visible, they were significantly closer, and/or more extensive than the proposed Roaring Brook turbines.

Viewpoint locations are illustrated in Figure 9 in Appendix K, and a summary of potential Project visibility from visually sensitive sites is presented in Table 5 in Appendix K.

3.5.3.2.4 Visual Simulations

Thirteen viewpoints were selected to show representative views of the Project from various distances and directions. The selected viewpoints also include each of the identified viewer/user groups and landscape similarity zones within the visual study area, as well as various sensitive resources. The selected viewpoints also allowed for the development of simulations that would show the full range of visual change that will occur with the Project in place. The 13 selected viewpoints are summarized in Table 12, below.

Table 12. Viewpoints Selected for Simulation and Evaluation

Viewpoint Number	LSZ Represented	Viewer Group	View from nearby Sensitive Receptor?	Distance from Nearest Turbine in View
8	Upland Agriculture	Resident	0.5 mile from Chapel Hill Cemetery	3.1 miles
19	Upland Agriculture	Resident/Tourist	Snowmobile trail, 0.8 mile from Register-eligible historic site	4.3 miles
21	Upland Agriculture	Resident/Tourist	Snowmobile trail, 0.2 mile from Grant Powell Memorial State Forest	3.8 miles
35	Upland Agriculture	Resident	0.6 mile from State Route 26	7.7 miles
38	Upland Agriculture	Resident/Tourist	Snowmobile trail, 0.75 mile from State Route 177	6.3 miles
45	Forestland	Resident/Tourist	Snowmobile trail, Sears Pond State Forest	4.3 miles
59	Upland Agriculture	Resident/Tourist	State Route 177	5.5 miles
62	Upland Agriculture	Resident/Tourist	Snowmobile trail	4.6 miles
64	Forestland	Resident	0.6 mile from Grant Powell Memorial State Forest	4.7 miles
66	Forestland	Resident/Tourist	Snowmobile trail, 0.6 mile from Lesser Wilderness State Forest	1.1 miles
67	Forestland/Wetland	Resident/Tourist	Snowmobile trail	1.2 miles
79	Forestland/Wetland	Resident/Tourist	Lesser Wilderness State Forest, Snowmobile trail	1.7 miles
84	Forestland	Resident/Tourist	~ 1 mile from St. Patrick's Cemetery, Snowmobile trail, 0.4 mile from Lesser Wilderness State Forest	3.6 miles

To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the completed Project from each of the 13 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model in 3D StudioMax®, based on turbine specifications and survey coordinates of the proposed facilities. For the purposes of this analysis, it was assumed that all new turbines would be Gamesa Eolica G90 machines.

Simulations of the proposed Project indicate that the visibility and visual impact of the wind turbines will generally be limited due to the extent of natural screening, the presence of existing wind turbines in the view, and/or distance of the viewer from the Project. Evaluation by an EDR landscape architect suggests that the Project's overall contrast with the visual/aesthetic character of the area will be very low. In most cases the Project was barely perceptible due to forest screening and distance. The simulated views typically included only turbine blades, a few distant turbines, and/or appeared compatible due to the presence of the existing Maple Ridge Wind Farm. Due to its distance and degree of screening from most viewers, the Project is unlikely to receive a negative reaction from the public, regardless of landscape setting or viewer characteristics.

Because locational and design details for the proposed electrical interconnection line and POI/collection station are not yet available, no conclusions could be reached regarding the visibility and visual impact of these facilities. A supplemental VIA will be prepared to address these topics.

3.5.3.2.5 Assessment of Shadow Flicker

Because the nearest adjacent permanent residence is approximately 6,000 feet from the proposed turbines, no study of potential shadow flicker impact was undertaken. At 6,000 feet (1.8 km/1.1 mi) there will be no perceptible shadow from the rotor blades (A. Nielsen, pers. comm.).

3.5.4 Mitigation

Construction-related visual impacts will be avoided, minimized, and mitigated through 1) careful site planning/project layout, 2) development and implementation of various construction plans, and 3) a comprehensive site restoration process following completion of construction.

As mentioned previously, due to its remote, forested location, construction activity on the Project site will generally not be visible to the public. In addition, the proposed Project layout was developed so as to minimize the need for tree clearing and new road construction. The majority of the proposed

access roads and turbines have been sited along existing roads in previously disturbed (logged) areas. The existing forest roads will be upgraded for use as turbine access roads wherever possible, and buried collection lines will follow access roads to minimize required clearing. Where clearing of undisturbed forest is unavoidable, such sites are typically well removed from adjacent roads and residences and therefore will not result in a significant adverse visual impact.

During construction, visual impacts associated with working construction equipment will be minimized through adherence to a construction routing and sequencing plan that minimizes impacts on local roads and residences. A dust control plan will also be developed and implemented to minimize off-site visual impacts associated with construction activities. As described in the impacts discussion, any unavoidable construction-related visual impacts will be short term.

Following completion of construction, site restoration activities will occur. These will include stabilizing/revegetating all disturbed sites through seeding and mulching and allowing forest vegetation to regenerate along road corridors and at turbine work sites. These actions will assure that, as much as possible, the site is returned to its preconstruction condition.

Mitigation options for the operating project are limited, given the nature of the Project and its siting criteria (tall structures on high elevation sites). However, in accordance with NYSDEC Program Policy (NYSDEC, 2000), various mitigation measures were considered. These included the following:

- A. Screening. The Project is already very well screened from most viewers (92% of the 10-mile radius study area) by topography and forest vegetation. In those few instances where views of the Project are available (i.e., local roadways including Flat Rock and Boshart Roads), providing off-site screening would have little value given the presence of the existing Maple Ridge turbines in most of these views. Screening of the storage yard at the proposed O&M facility (e.g., berms, plantings) is being proposed by the Project sponsor. The need for screening around the proposed POI/collection station will be evaluated as part of a supplemental VIA addressing that facility and the overhead interconnection line.
- B. Relocation. Again, because of the well screened nature of the Project site, and its distance from potential viewers/sensitive sites, turbine relocation would not significantly alter its visual impact. The Project is completely screened from almost all of the aesthetic resources of statewide significance within the visual study area. Views that are available from sensitive sites, such as portions of the Tug Hill WMA, TNC land, or State Forest lands, will be distant

and/or significantly screened. Therefore, turbine relocation is not necessary to mitigate visual impacts.

- C. Camouflage. As demonstrated in the simulations, the Roaring Brook turbines will typically be viewed on the horizon, where their white color generally minimizes contrast with the sky under most conditions. This color also precludes the need for daytime aviation warning lights, further reducing daytime visibility and visual impact. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Their appearance as an extension of the existing Maple Ridge Wind Farm from many viewpoints also suggests that camouflage is neither necessary or appropriate for this Project.

- D. Low Profile. A significant reduction in turbine height is not possible without decreasing power generation. To off-set this decrease, additional turbines would be necessary, which would increase potential impacts to ecological and wetland resources on the Project site. Although shorter turbines would be less visible, results of this VIA indicate that the 476 foot tall machines currently proposed have very limited visibility and visual impact.

- E. Downsizing. Because the Project is generally well screened from aesthetic resources of statewide or local significance within the visual study area, downsizing of the Project is not warranted. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area where the proposed turbines could be seen, turbines of the existing Maple Ridge project are already visible and closer to the viewer. A significant reduction in turbine number would also reduce the Project's socioeconomic benefits to the area, and could make the project economically unviable.

- F. Alternate Technologies. Alternate technologies for power generation would have different, and perhaps, more significant, visual impacts than wind power. Alternative utility-scale wind power technologies that would significantly reduce visual impacts do not currently exist.

- G. Nonspecular Materials. Nonspecular conductor will be used on the overhead portions of the electrical interconnection line, and non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare. Galvanized steel used for the meteorological towers and substation equipment will rapidly weather to a dull gray color.

- H. Lighting. Turbine lighting will be kept to the minimum allowed by the FAA (anticipated to be in the range of 12-18). Current FAA guidelines (FAA, 2005) do not require daytime lighting, and allow nighttime lighting of perimeter turbines only, at a maximum spacing of 0.5 mile. Medium or low intensity flashing red lights will be used at night rather than white strobes or steady burning red lights.
- I. Maintenance. The Roaring Brook turbine sites are distant enough from most viewers that the effects of site maintenance will be largely imperceptible. However, all turbines will be maintained to ensure that they are clean, rust-free, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Stanton, 1996). In addition, the Project developer will establish a decommissioning fund to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.
- J. Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. However, results of this VIA do not suggest that such mitigation measures are warranted for the Roaring Brook Wind Power Project.

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

- Compliance with all required set-backs from roads, residences, and property lines.
- All turbines will have uniform design, speed, color, height and rotor diameter.
- Towers will include no exterior ladders or catwalks.
- The Project operations and maintenance building (although not yet designed) will reflect the vernacular architecture of the area (i.e., resemble an agricultural structure).
- New road construction will be minimized by utilizing existing on site and public roads whenever possible.
- The placement of any advertising devices on the turbines will be prohibited.

3.6 HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

John Milner Associates, Inc. (JMA) conducted a Phase IA Cultural Resources Investigation of the Project area (see Appendix L). The purpose of this investigation was to identify previously recorded cultural resources (i.e., archaeological or historic sites) and to evaluate the potential for previously unrecorded cultural resources to occur within the Project site. The cultural resource investigation was conducted in accordance with the National Environmental Policy Act, SEQRA, the National Historic Preservation Act, the State Historic Preservation Act, the State Historic Preservation Office Guidelines for Wind Farm Development Cultural Resources Survey Work (SHPO 2006), and the New York Archaeological Council's Standards for Archaeological Investigations (NYAC 1994). In addition, JMA conducted an Historic Architectural Resources Survey to a) identify architecturally and historically significant properties that might be affected by construction and operation of the Project, and b) evaluate the possible effects of the Project on those properties. The following sections provide a summary of these investigations.

3.6.1 Existing Conditions

3.6.1.1 Prehistoric Sensitivity and Context

The major cultural periods of the prehistoric era that covered New York State are the Paleo-Indian (11,000-8000 BC), Archaic (8000-500 BC), Woodland (500 BC-AD 1500), and Contact (AD 1500-1650) eras. Iroquois mythology and oral history held that Tug Hill was the place where the Iroquois first emerged into the world (Sylvester, 1877). During the Late Woodland and Early Contact Periods, Central New York was the territory of the Iroquois Confederacy. Northern New York (including the Project area) was within the traditional hunting grounds of the Oneida Nation, which extended north to the Saint Lawrence River and south to the Susquehanna River. The numerous Late Woodland Period sites located along the Black River Valley indicate that the surrounding region was extensively occupied during the late prehistoric period (Abel 2002; Abel & Fuerst 1999; Beauchamp 1900; Harrington 1920; Parker 1920).

After about 1550 AD, northern New York was largely unoccupied. The area was used as hunting grounds by the Oneida Iroquois, and served as a buffer zone between the Iroquois Confederacy and the Huron and their allies (Klein et al. 1985; Trigger 1978). At the end of the eighteenth century, a narrow tract of land “a half mile wide on each side of Fish Creek” was set aside as reservation lands for the Oneida “on account of the salmon fisheries” (Child 1872). It is unclear how far north along Fish Creek this reservation was intended to extend; regardless, the Oneida claim to any lands in

Lewis County was settled and extinguished in an agreement executed in 1802 as a component of the Macomb Purchase (Child 1872).

The relative lack of previously recorded Native American archeological sites within the Study Area may not reflect the actual distribution of archeological sites in the region. Previous researchers have observed that relatively little archeological research has been undertaken in Lewis County (Klein et al. 1985; PAF 1989). The Buckingham site (New York State Museum [NYSM] 9098) is the location of a “finely grooved granite axe, 8 inches long” found within a marshy area along the headwaters of Sucker Brook (Einhorn 1968) in an environmental setting very similar to the Roaring Brook Project Area. The Kinsman Farm (NYSM 3614) and Boshart-Marks (NYSM 9117) sites are located at or near the confluence of Roaring Brook and the Black River. The proximity of these sites to a drainage whose headwaters rise within the Project Area suggests the possibility that occupants of these sites may have forayed to the interior of the plateau along the stream, and therefore traversed through or hunted within the Project Area.

However, the rocky landscape within the Project Area is relatively inhospitable. Any possible Native American activity in the vicinity would have been limited to short term hunting or foraging, resulting in small and ephemeral archeological sites. Soils within the Project Area are stony, relatively shallow soils formed in glacial till that overlay sandstone bedrock. There is no possibility for deeply buried archeological sites to be located within the Project Area.

3.6.1.2 Historic Sensitivity and Context

Throughout the Colonial Period, European activities in northern New York were restricted to limited commercial, missionary, and military expeditions (Klein 2001; Trigger 1978). A period of grand-scale land speculation followed the Revolutionary War in western, central, and northern New York. In 1789, the State sold an enormous 3,670,715-acre tract of land to Alexander Macomb and his associates. Macomb’s Purchase included almost all of present-day Franklin, Saint Lawrence, Jefferson, and Lewis Counties (Hough 1883; Klein et al 1985). Portions of the present Town of Martinsburg were sub-divided and sold off to speculators between 1795 and 1803 as parts of the Boylston Tract (Hough 1883). Erroneous surveys, multiple land sales, and competing claims characterized many of these early land transactions. These complications, combined with the undeveloped frontier character of the region, delayed settlement of northern New York until the early-nineteenth century.

Lewis County was formed from Oneida County by an act of the state legislature in 1805; the Town of Martinsburg was formed from Turin in 1803, and received additional lands from Turin in 1819 (Hough 1883). Settlement in the area developed slowly in the early-nineteenth-century. Rural communities formed around gristmills and sawmills, and other institutions such as stores, taverns, schools, and churches were developed to service these communities. By the mid-nineteenth century, the lands in the Black River Valley were largely settled, but the western part of the Town of Martinsburg remained principally wilderness into the 1860s.

Agriculture was the dominant economic pursuit in Lewis County in the nineteenth and twentieth centuries. The alluvial soils of the Black River valley were fertile and allowed for the cultivation of market crops. The thin soils of the Tug Hill Plateau, however, were better suited to pasturage. Initially the dairy industry served local markets, but in the late-nineteenth century, numerous small cheese factories flourished, and cheese was exported by railroad to farther markets. The number of cheese factories declined in the early-twentieth century as transportation and milk handling technologies improved. These improvements allowed for the consolidation of cheese-making operations, as well as the sale of a greater portion of Lewis County's milk production as fluid milk in larger metropolitan markets (Bowen 1970; Hough 1883).

Timber remained an important local resource throughout the nineteenth century and generated numerous industrial concerns in Lewis County, including sawmills and furniture factories (Klein et al. 1985). During the mid-nineteenth century, tanning, paper, lumber, and excelsior mills and manufactories, as well as those for processing hemlock extract, were primarily located along the Black, Moose, Beaver, and Deer rivers in the eastern part of the county (French 1860), taking advantage of the available waterpower as well as the extensive forests found there.

Throughout the nineteenth and twentieth centuries, the Project Area has been actively logged but otherwise remained undeveloped, and does not appear to have ever been cultivated. Historical sources document the operation of a sawmill within the Project Area between 1875 and 1885. Possible historic-period archeological sites that are depicted on historic maps (see Figure 9 in Appendix L) within the Project Area include:

- The “Holden & Owens SM” (sawmill) depicted on the 1875 Beers Atlas of Lewis County, located approximately 680 feet east of proposed wind turbine #38; and
- An unidentified structure, likely a logging or hunting camp, depicted within the southeastern portion of the Project Area on the 1906 Highmarket, NY USGS topographic survey, located approximately 545 feet southwest of proposed wind turbine #25.

An apparently artificial (or constructed), impounded pond along the north branch of Fish Creek was observed in the vicinity of the map-documented sawmill. This water body may represent a millpond constructed as a component of the sawmill. No foundation remains were observed in the immediate vicinity of the possible pond feature during the preliminary field reconnaissance; however, it is possible that structural remains, foundations, other features, and/or artifact deposits associated with the sawmill may be located in the overgrown areas located in the immediate vicinity. Structural remains, features, and/or artifact deposits associated with the ca. 1906 map-documented structure assumed to represent a logging or hunting camp may also be located within the Project Area. However, because the Project Area has never been farmed or otherwise settled, it is relatively unlikely that any other structural remains or features (un-related to the practice of logging) are located within the Project Area.

3.6.1.3 Previously Recorded Cultural Resources

JMA (2007) reviewed the State and National Registers of Historic Places (S/NRHP); the Building-Structure Inventory maintained by OPRHP; the consolidated archeological site files of the OPRHP and the New York State Museum; and standard syntheses of regional prehistory (Beachamp 1900; Einhorn 1968; Parker 1920; Ritchie 1971,1980; Ritchie and Funk 1973) to identify previously recorded archeological sites and historic properties located within the five-mile study area. The study area includes all areas within five-miles of proposed turbines that are within the topographic viewshed for the Project. In addition, JMA contacted appropriate local institutions and individuals for the purpose of identifying additional archeological or historic properties or other issues of concern. Individuals and institutions contacted by JMA included the Lewis County Historical Society and Lisa Becker, the Lewis County Historian.

3.6.1.3.1 *Archeological Resources*

There are no previously recorded archeological sites located within the Project area. However, there are 12 previously recorded archeological sites located within approximately five miles of the Project Area (see Table 2 in Appendix L). These sites include the foundation remains of 10 nineteenth-century farmsteads and one abandoned cemetery (JMA 2004a). NYSM Site 7112 is the only previously identified Native American archeological site located within five miles of the Project Area. The site consists of “traces of occupation” originally documented by Arthur Parker (1920) in *The Archaeological History of New York State*. These traces of occupation imply a broad area from which Native American artifacts have been recovered or reported, and frequently indicate the presence of small campsites and/or lithic scatters. NYSM Site 7112 includes an approximately two-

mile-long area located one-half mile west of and overlooking West Martinsburg, extending both north and south of Rector Road.

The NYSM site files include additional sites located on Tug Hill or along the lower course of the Roaring Brook that are located outside of the five-mile study area. The Buckingham site (NYSM 9098) is the location of a “finely grooved granite axe, 8 inches long” recovered by a hunter from a stone pile located within a marshy area along the Sucker Brook – a tributary of Fish Creek (Einhorn 1968). The Hill Farm site (NYSM 9097) is located within a hayfield on a lower terrace of the eastern Tug Hill escarpment; the site is known from an isolated Susquehanna Broad projectile point (Late Archaic Period) recovered by the owners of the property (Einhorn 1968). The Kinsman Farm site (NYSM 3614) is located approximately 1.5 miles east-northeast of Martinsburg and has been described as a prehistoric “burial place on the Kinsman farm. Skeletons and pipes were found” (Beauchamp 1900; Parker 1920). Archeological testing at the Boshart-Marks site (NYSM 9117) located at the confluence of Roaring Brook and the Black River identified Late Archaic through Late Woodland occupations (Einhorn 1968).

3.6.1.3.2 Historic and Architectural Resources

There are five previously recorded historic and/or architecturally significant properties located within the five-mile study area (see Table 3 of the Historic Architectural Resources Survey in Appendix M). These properties include three nineteenth-century cemeteries and two abandoned mid-to-late-nineteenth-century farmhouses. Four of these properties have been determined eligible for listing in the National and State Historic Registers (JMA 2004b). In addition, historical maps and atlases identify the locations of a ca. 1870s sawmill and a ca. 1906 unidentified structure (likely a logging or hunting camp) within the Project area. Archeological features or artifact deposits associated with these map-documented structures may be located within the Project area (JMA 2007). A Phase 1B archeological survey will be necessary to determine with certainty whether any archeological sites are present within the Project’s archeological Area of Potential Effect.

3.6.2 Potential Impacts

3.6.2.1 Construction

3.6.2.1.1 Archeological Resources

Although no prehistoric sites have been reported within the Project area, JMA reported that the region was used as hunting grounds for Oneida Iroquois. However, the rocky and wet landscape within the Project area is relatively inhospitable. Any possible Native American activity in the vicinity

would have been limited to short term hunting or foraging, resulting in small and ephemeral archeological sites (JMA 2007).

Project earthwork activities have the potential to impact undocumented archeological resources that could occur in the Project area. In accordance with the recommendations of JMA, a Phase IB field investigation will be undertaken to identify potential resources within the study area, so that they may be avoided during final siting of the Project components.

3.6.2.1.2 Historic and Architectural Resources

No structures will be demolished or physically altered in connection with construction of the Project. However, the viewshed maps prepared as part of the preliminary visual assessment indicate that the Project may be visible throughout a portion of the visual study area (see Figure 11). Therefore, Project construction (i.e., crane activity) will also be visible, which has the potential to result in a temporary visual effect on historic properties within the study area. However, according to the Historic Architectural Resources Survey, *“After taking into account moderating effects of distance, seasonality of views, and observer orientation in relation to the affected property, JMA concludes that none of the identified properties will incur an adverse visual impact as a result of Project construction or operation.”*

3.6.2.2 Operation

3.6.2.2.1 Archeological Resources

Once built, there will be no significant earth-disturbing activities associated with operation and maintenance of the Project. Therefore, Project operation will have no adverse effect on archaeological resources.

3.6.2.2.2 Historical and Architectural Resources

Permanent, physical impacts to historic structures will not occur because the Project will not result in any structures being demolished or physically altered. However, as previously mentioned, viewshed mapping indicates that the Project may be visible throughout significant portions of the study area. Visual effects on any historic or architecturally significant property is dependent on a number of factors including distance, topography, vegetation, and the types and density of existing modern features (such as buildings/residences, overhead electrical lines, cellular towers, and silos). According to the Historic Architectural Resources Survey, *“After taking into account moderating effects of distance, seasonality of views, and observer orientation in relation to the affected property,*

JMA concludes that none of the identified properties will incur an adverse visual impact as a result of Project construction or operation.” A detailed analysis of potential impacts to historic properties is provided in Section 4.0 of the Historic Architectural Resources Survey (Appendix M).

3.6.3 Proposed Mitigation

3.6.3.1 Archeological Resources

No impacts to known archaeological resources are anticipated, and therefore no mitigation is proposed. However, to further examine the potential for impacts to archaeological resources, PPM has committed to conduct a Phase IB archaeological survey in sensitive areas prior to Project construction. JMA (2007) has developed a survey strategy for the Phase IB following the SHPO Guidelines (2006). This survey methodology is presented as Section 4.2 of the Phase IA Cultural Resource Investigation (see Appendix L). The results of the Phase IB survey will be provided in the FEIS. If additional archaeological resources are discovered during this survey, Project components will be relocated or rerouted (if necessary) to avoid these resources. Thus, the Project will not result in temporary or permanent impacts to archaeological resources. Further measures to protect identified archeological resources during construction will be employed, including demarcating/protecting resource areas with orange construction fencing and signage. Beyond this, additional mitigation is not necessary, and is therefore none is proposed.

3.6.3.2 Historic and Architectural Resources

Section 4.0 of the Historic Architectural Resources Survey analyzes potential impacts (visual and noise) to historic properties. Section 4.3 (Conclusions) of this study states, *“In the opinion of JMA, construction and operation of the Project will have no effect on significant historic architectural resources. No additional studies are recommended, and no mitigation measures will be necessary.”* Therefore, mitigation is not proposed.

3.7 SOUND

A Noise Modeling Study and Environmental Impact Assessment was prepared by Hessler Associates, Inc. (Hessler), a member of the National Council of Acoustical Consultants with over 30 years of experience evaluating industrial, commercial, and residential noise issues. Hessler’s report is included as Appendix N. Information regarding existing conditions, potential impacts, and proposed mitigation is presented below.

3.7.1 Existing Conditions

Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise (i.e., unwanted sound). Some properties of sound which can be measured include:

1. **Frequency:** Frequency is the rate at which the source produces sound waves, (i.e. complete cycles of high and low pressure regions). In other words, frequency is the number of times per second that a vibrating body completes one cycle of motion. The unit for frequency is the hertz (Hz = 1 cycle per second). Low pitched or bass sounds have low frequencies. High-pitched or treble sounds have high frequencies. The sensitivity of the human ear to sound depends on the frequency or pitch of the sound. The human ear, in general, and different individuals, in particular, hear some frequencies better than others.
2. **Sound Pressure:** Sound pressure level (SPL) is the amount of air pressure fluctuation that a sound source creates. We "hear" or perceive sound pressure as loudness. Sound pressure is usually expressed in units called pascals (Pa). The common sounds we hear have sound pressure over a very wide range (0.00002 Pa - 20 Pa). It is difficult to work with such a broad range of sound pressures. To overcome this difficulty a unit of decibel (dB) is used which compresses the scale of numbers into a manageable range. SPL can be statistically summarized as the residual, or L90, sound level. The L90 is the sound level exceeded during 90% of a measurement interval. It excludes sporadic, short-duration sound events, thereby characterizing the more quiet lulls between such events. It is this consistently present "background" level that forms a conservative basis for evaluating the audibility of a new sound source.
3. **Sound Power:** The sound power is the sound energy transferred per second from the sound source to the air. A sound source has a given, constant sound power that does not change if the source is placed in a different environment. Sound power is expressed in units called watts (W). An average whisper generates a sound power of 0.0000001 watts, a truck horn 0.1 W, and a turbo jet engine 100,000 W. Like sound pressure, sound power (in W) is usually expressed as sound power levels in dB. Sound measurement readings can be adjusted to correspond to human hearing with an "A-weighting filter" which de-emphasizes low frequencies or pitches that are outside the normal range of human hearing. Decibels measured using this filter are A-weighted and are called dB(A).
4. **Time Distribution:** Sound can be continuous, variable, intermittent or impulsive depending on how it changes over time. Continuous sound remains constant and stable over a given time period.

For most wind power projects, the sound produced during construction and operation is a concern to local residents. However, this Project is somewhat unusual for New York State in the sense that the generating site is located in a remote area on a single tract of wooded, largely undeveloped private land. The nearest permanent residence to any of the proposed turbines is over 2 miles away. According to Hessler, because the site is so isolated and there are essentially no permanent residential receptors close enough to be significantly impacted by operational noise, a field study of background masking sound levels was considered unnecessary. In essence, it was immediately clear from Hessler's inspection of the site area that Project sound levels would be very low at the nearest potentially sensitive receptors and that the amount of sound masking by existing environmental noise was unlikely to be relevant to the analysis. However, based on many field surveys in New York State and elsewhere, a residual, or L90, background level of between about 35 and 43 dBA is very commonly measured in rural areas during wintertime, leaf-off conditions when the wind is blowing in at around 6 to 8 m/s – the speed when turbine noise usually first begins to be significant.

3.7.2 Potential Impacts

Virtually everything that has moving parts will make some sound, including wind turbines. Table 13 lists examples of common sound levels using typical dB(A) levels.

Table 13. Common Sources of Sound and Associated Typical Sound Levels (dBA)

Source/Activity	Indicative sound level (dBA)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Car at 40mph at 100m	55
Busy general office	60
Truck at 30mph at 100m	65
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Source: The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994. Cited in "Noise from Wind Turbines," British Wind Energy Association, <http://www.britishwindenergy.co.uk/ref/noise.html>.

The potential sound-related impacts resulting from the construction and operation of wind turbines are described below.

3.7.2.1 Construction

Construction of wind power projects requires the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, the installation of buried electrical interconnects, and the erection of turbine components. Assessing and quantifying construction-related impacts is typically difficult for most wind power projects because construction activities will be constantly moving from place to place around the site, leading to highly variable impacts at any given location. A significant portion of the construction (within the generating site) will occur in a remote area and significant construction-related sound impacts are not anticipated. The sounds from turbine-related construction are likely to be faintly perceived as the far off sound of diesel-powered earthmoving equipment characterized by such things as irregular engine revolutions, back up alarms, gravel dumping and the clanking of metal tracks. The 34.5 kV electrical interconnection line is also located in a relatively remote area, but has more exposure to some rural residences and public roads, and is therefore is more likely to be perceived by local residences during the construction interval.

The types of equipment likely to be used on the Project and their typical sound levels are presented in Table 14.

Table 14. Construction Equipment Sound Levels

Equipment Description	Typ. Sound Level at 50 ft., dBA	Est. Maximum Total Level at 50 ft. per Phase, dBA*	Max. Sound Level at a Distance of 1,000 ft., dBA	Distance Until Sound Level Decreases to 40 dBA, ft.
Road Construction and Electrical Line Trenching				
Dozer, 250-700 hp	88	92	62	4,200
Front End Loader, 300-750 hp	88			
Grader, 13-16 ft. blade	85			
Excavator	86			
Foundation Work, Concrete Pouring				
Piling Auger	88	88	58	4,200
Concrete Pump, 150 cu yd/hr	84			
Material and Subassembly Delivery				
Off Hwy Hauler, 115 ton	90	90	60	4,800
Flatbed Truck	87			

Equipment Description	Typ. Sound Level at 50 ft., dBA	Est. Maximum Total Level at 50 ft. per Phase, dBA*	Max. Sound Level at a Distance of 1,000 ft., dBA	Distance Until Sound Level Decreases to 40 dBA, ft.
Erection				
Mobile Crane, 75 ton	85	85	55	3,400

*Not all vehicles are likely to be in simultaneous operation. Maximum level represents the highest level realistically possible at any given time. (Source: Hessler Associates)

What the values in this table indicate is that sound levels from construction equipment will decrease to 40 dBA at a maximum distance of 4,800 feet (0.9 mile). Because the nearest permanent residence is over 2 miles away from the areas where turbines will be sited, construction-related sound impacts from the generating site will be insignificant, and likely undetectable. Within the vicinity of the buried and overhead construction of the electric interconnect line and the substation, construction equipment sound levels will be perceived.

Sound from the very small amount of daily vehicular traffic to and from the construction site should be negligible in magnitude relative to normal traffic levels and/or the sounds of tractors, trucks, and other agricultural machinery, and temporary in duration at any given location.

3.7.2.2 Operation

According to Rogers et. al. (2006), the sources of sounds emitted from operating wind turbines can be divided into two categories: 1) mechanical sounds, from the interaction of turbine components, and 2) aerodynamic sounds, produced by the flow of air over the blades. Mechanical sounds originates from the relative motion of mechanical components and the dynamic response among them. Since the emitted sound is associated with the rotation of mechanical and electrical equipment, it tends to be tonal (of a common frequency), although it may have a broadband component. Aerodynamic broadband sound is typically the largest component of wind turbine acoustic emissions. It originates from the flow of air around the blades, and aerodynamic sound generally increases with rotor speed.

In order to quantitatively look at potential impacts in absolute terms, a modeling study of worst-case project sound levels was carried out to determine what specific sound levels could be expected at the nearest receptors. Using the turbine sound power level spectrum obtained from Gamesa for the G90 turbine model, an estimated worst-case noise level contour plot for the site was calculated using the Cadna/A®, ver. 3.5 noise modeling program developed by DataKustik GmbH (Munich).

This software enables the project and its surroundings, including terrain features, to be realistically modeled in three-dimensions.

The program calculates distant sound levels in strict accordance with ISO 9613-2 *Acoustics – Attenuation of Sound during Propagation Outdoors*, which considers the geometrical spreading of sound waves from a source and all other natural attenuation mechanisms that might come into play such as barriers, sound wave interaction with the ground surface, air absorption, etc. In this instance, only geometric spreading (distance loss), air absorption under ISO “standard day” conditions (10 deg. C, 70% RH) and ground absorption were considered in the model.

Various conservative assumptions have been applied to help ensure that actual project noise levels do not exceed the predicted levels – including during times when atmospheric conditions may favor noise propagation relative to average conditions. As a consequence, the studies, which are based on these conservative assumptions, are likely to overestimate project sound levels. Sound levels that are somewhat lower than those predicted in the modeling plots are actually expected to occur much of the time. The model represents a theoretical worst-case condition at any given receptor point that would require a convergence of the following conditions to occur:

- **Wind Direction** – from all the turbines towards the receptor point
- **Wind Speed** – 8 m/s wind speed worst-case. Impact thresholds would contract all other wind speeds
- **Low Ground Porosity** – normally wooded areas are more absorptive than assumed in the model
- **Observer Outside** – the plotted sound levels occur outside; sound levels inside of any dwelling will be 10 to 20 dBA lower

At the present time, the Model G90 wind turbine produced by Gamesa Eólica is planned for the Project. The sound emissions of the G90 have recently been measured in accordance with IEC 61400-11 and recently published by the manufacturer.

Beyond a wind speed of 7 m/s at 10 m (or 10.2 m/s at hub height) the noise emissions of the G90 remain constant because the rotor has reached its maximum rotational speed. The point where the sound level first reaches its maximum is where the potential for adverse noise impacts is greatest, since the background sound level is lowest relative to the turbine and sound level at that point. At

higher wind speeds the background level continues to increase while the turbine sound level remains constant.

The model results are illustrated in the Hessler Report provided in Appendix N of this DEIS, which show the conservatively predicted sound levels due only to the Project (exclusive of any background noise). The sound emissions from the Project are shown out to a limit of 35 dBA because this sound level represents the point where project noise is likely to become insignificant relative to the typical background sound level found in rural areas during moderately windy conditions. The plot provided in Appendix N is a typical regression of the near-minimum, L90 background sound level vs. wind speed measured recently at a rural wind project site in New York. At this comparable site, the mean background sound level during an 8 m/s wind was found to be 41 dBA – meaning that project noise at this other similar site would largely fade into the background around that sound level (41 dBA) and would be difficult to perceive, if not inaudible, by the time it diminished to 35 dBA. Consequently, the cut-off of 35 dBA used in the contour plot for Roaring Brook can reasonably be considered the outermost limit where any potentially adverse noise impact might occur.

According to the model results, the nearest permanent residence is well beyond the nominal 35 dBA impact threshold. A theoretical project-only sound level of about 29 dBA is predicted at this house, which is so quiet that project noise is highly unlikely to be noticeable even in the complete absence of any background noise. Consequently, no adverse impact from Project noise is expected at this residence.

In addition to this single closest house there are also several seasonal/hunting cabins in the general vicinity of the Project site on Carey and Flat Rock Roads. These structures are essentially on the 35 dBA threshold and Project noise is not expected to be significant under most normal conditions. There may be times, however, when the atmospheric conditions are more conducive to sound propagation than during “normal conditions” and the turbines may be perceptible.

One additional seasonal cabin exists roughly 800 feet from Turbine 20 on French Road and a sound level of about 50 dBA is predicted at this structure. At this location, as opposed to the others discussed above, turbine noise will be clearly audible above the natural background levels during moderately windy conditions. The Applicant has discussed this situation with the owners of this only intermittently occupied cabin and the owners are unconcerned about any potential noise and have agreed to a setback easement.

3.7.3 Proposed Mitigation

Potential noise impacts at the remote Roaring Brook Wind Farm Project have been evaluated by conservatively modeling Project noise levels at the nearest permanent residence and also at the handful of seasonal cabins in the general vicinity of the site. The expected sound level of 29 dBA at the nearest permanent residence over 2 miles away is so low that it is unlikely that the project will be perceptible under any circumstances. Consequently, no adverse impact is expected and mitigation is not proposed.

Besides this one home there are several intermittently occupied seasonal cabins in the general vicinity of the Project site. Modeling indicates that all but one of these cabins can, under most normal circumstances, expect to see Project sound levels of about 35 dBA, which is comparable to (or less than) the natural background sound level that would typically occur in a rural area during moderately windy conditions. This means that Project noise is unlikely to be clearly discernable above the background sound level most of the time but may be intermittently perceptible during certain atmospheric conditions that favor sound propagation over long distances. Nevertheless, the absolute magnitude of Project noise even under these worst-case conditions is expected to be quite low and therefore unlikely to constitute a significant adverse impact, especially given the fact that these cabins are only occasionally inhabited. Consequently, mitigation is not proposed.

At one seasonal cabin on French Road it is anticipated that the turbine noise will be very prominent and audible at this location. To mitigation for any project-related sound impact at this cabin, the Applicant has discussed this situation with the owners of this cabin, and the owners are unconcerned about any potential noise and have agreed to a setback easement. Beyond this, additional mitigation measures are not necessary.

3.8 TRANSPORTATION

Wind power generating projects have the potential to create transportation impacts as a result of short-term construction activities (temporary impacts) and as a result of long-term operation and maintenance of the Project (permanent impacts). To evaluate the potential temporary and permanent impacts resulting from the proposed Project, Creighton Manning Engineers (CME) conducted a Route Evaluation Study. The purpose of this evaluation is to document the existing transportation conditions and identify probably travel routes, constraints, and proposed improvements. The CME Route Evaluation Study is included as Appendix O.

3.8.1 Existing Conditions

Lewis County is served by two railroads and an extensive network of state, county, and local highways: 248 miles of county roads, 895 miles of town roads, 155 miles of state highways (LCIDA, undated). Roads range from two-lane highways with paved shoulders to single-lane, seasonally maintained, gravel roads. The New York State highway system in and adjacent to the project area includes NYS Route 177 and NYS Route 12. Route 177 is classified as a Rural Major Collector, which connects to Interstate 81 approximately 25 miles west of the project area. Average annual daily traffic on Route 177 through the project area is approximately 1,700 vehicles (NYSDOT, 2006). Route 12 is classified as a Rural Principal Arterial and connects the project area to both Watertown and Utica. According to the NYSDOT 2006 Traffic Volume Report, average annual daily traffic on Route 12 is approximately 3,100 vehicles. The other major access route to the project area is NYS Routes 26, a two-lane highway with average daily traffic volume of approximately 4,500 vehicles.

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 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 discussion 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. The following table summarizes the results of the existing conditions inventory.

Table 15. Road Characteristics

Road	From	To	Lane Width	Pavement Condition	Surface Type	Speed Limit
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Road	From	To	Lane Width	Pavement Condition	Surface Type	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 Rd	NY Route 177	Gardner Road	18	Fair	Asphalt	Not Posted
Borkowski Rd	Gardner Road	Rector Road	22	Fair	Gravel	Not Posted
Swernicki Rd	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

3.8.2 Potential Impacts

3.8.2.1 Construction

Some temporary impacts to public road will result from the movement of vehicles involved in Project construction. The exact construction vehicles have not yet been determined; however, it is known that transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles. 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.

Table 16 represents an estimate of the total number of loaded truck trips entering the site during the construction of the turbines. The estimates do not account for trips associated with the construction of Project access roads.

Table 16. 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.

Based upon an assessment of the existing conditions, CME identified several route options traveling southeast from NY Route 177 to Carey Road. Figures 10 illustrate the primary and alternate travel routes. These route options are described below.

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.

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

Option 1: From NY Route 177, travel east on NY Route 177 and turn right onto Eagle Factory Road. Travel south through the Gardner Road intersection where Eagle Factor 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 Project site.

Alternative Option 2: From NY Route 177, 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 NY Route 177, 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 Factor Road. Use Option 1 or Option 2 from Eagle Factory Road to access the Roaring Brook Wind Farm access roads via Carey Road.

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 from Eagle Factory Road to access the Roaring Brook Wind Farm access roads via Carey Road.

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.

Each of the routes identified above have a number of constraining features, particularly intersection radii. For planning purposes, worst-case transport requirements are based on the Gamesa G90 2.0 MW Turbine with a 328-foot (100 m) hub height. For the purposes of this route analysis, a worst-

caste design vehicle was developed assuming a 160-foot trailer without a manually controlled articulated rear axle. 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 in Appendix O shows the locations of the constraining intersections. Individual diagrams were developed by CME to show potential improvement areas for each of the constraints along the probable travel routes for Option 1 and Alternative Option 2. These diagrams, which are provided in Appendix O, show the approximate ROW and generally include two improvement options for each of the intersections. The approximate ROW 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.

CME Figures 5.7 through 5.10 (Appendix O) were developed for the Alternative Option 3 travel route which has been provided at the request of NYDOT 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 the improvements are expected to be within the areas shown on CME Figures 5.1 through 5.10 of Appendix O, 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.

The following construction activities will likely be required at the locations of public road improvements:

- Clearing and grubbing of existing vegetation
- Grading of the terrain to accommodate the improvement
- Extension of existing drainage pipes and/or culverts
- Re-establishment of ditch line (if necessary)
- Construction of a suitable roadway surface to carry the construction traffic (based on the existing geotechnical conditions)

Improvements to public roads will be included among the initial stages of Project construction, and are anticipated to start Spring 2009. The required improvements that will ultimately be necessary cannot be finalized until landowner negotiations are complete, and input from the turbine manufacturer and/or the contractor is provided. However, the information provided in the DEIS (and Appendix O) is based upon an analysis conducted by a qualified transportation consultant/expert, and this information represents conceptually identified worst-case scenarios. It should be noted that landowner negotiations are currently underway, as PPM initiated this process upon receipt of the transportation assessment conducted by CME. During the negotiation process, all landowners are made aware of the potential impacts to their land, and ultimately all participating landowners will understand (and agree) to these impacts.

The required improvements will be coordinated with state, county, and local highway departments (at no expense to these departments) prior to the arrival of oversize/overweight vehicles on-site. In addition, these improvements may create additional Project related impacts (i.e. wetlands, drainage, grading, etc.) that will be addressed in detail during the final Project design, and reviewed/approved during all Project permitting subsequent to this DEIS (i.e., SPDES General Permit, USACOE/NYSDEC wetland permits, highway work permits).

3.8.2.2 Operation

Once the Project is commissioned and construction activities are officially concluded, public road use will likely be concentrated around the O&M building. The Project will employ up to approximately eight individuals, all of whom may drive separately to the O&M building. Some of these personnel will need to visit each turbine location and return to the O&M building. Each turbine typically requires routine maintenance visits once every 3 months, but certain turbines or other Project improvements may require periods of more frequent service visits should a problem arise. Such service visits typically involve 1 to 2 pick-up trucks. However, because all turbines and associated access road are located on (and accessed from) private land, public road use due to routine maintenance activities will be very limited.

Project personnel or National Grid employees may also need to service the Project substation. Routine servicing would likely be carried out on a similar quarterly basis (unless a non-routine maintenance matter occurs) and would involve a similar number of maintenance vehicles. In addition to maintenance activity, the operation of a wind power project typically increases tourist traffic, which can negatively impact certain roadways within the Project site. However, due to the Project's proximity to the Maple Ridge Wind Farm, an increase in tourism beyond existing levels is unlikely.

The Project owner is responsible for the maintenance of all private access roads leading to the turbine sites, and does not anticipate plowing access roads during winter months. Therefore, it may become necessary for personnel to service turbines with snowmobiles or some other small track driven vehicles.

3.8.3 Proposed Mitigation

Special hauling permits are required when loads exceed legal dimensions or weights. Thus transport of the blades, nacelles, tower sections and crane will require a variety of special hauling permits. 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 NYSDOT. PPM 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 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.

Road Improvement/Driveway Permits

- NYSDOT – A Highway Work Permit (PERM 33) will be required for any physical improvements within the NYSDOT ROW. 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 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 Town of Ellisburg).

Final transportation routing will be designed to avoid/minimize safety issues associated with the use of the approved haul routes, which will confine the heavy truck travel to a few select roads. The Applicant will repair damage done to roads affected by construction within the approved haul route, at no expense to the towns, county, or state. Delivery/haul routes may change during the design and construction preparation process; however, the municipalities will be notified of the changes throughout the continued development of the Project. Additionally, design plans will be completed for all public road improvements, and will be made available for the affected local towns (and to the owner/operator of the respective road) to review prior to construction activities.

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 O of the DEIS), that establishes the pre-existing conditions. PPM 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

3.9 SOCIOECONOMICS

To understand the effects this Project will have on socioeconomic conditions within the Town of Martinsburg and the surrounding communities, it is important to understand the current state of the economy in the area. Thus, this section presents specific information regarding the labor force, including population and housing; the economy, in particular employment rates and opportunities; and municipal budgets and taxes, including the local school budgets and taxes. The potential impacts of the Roaring Brook Wind Project on these existing socioeconomic conditions, during both construction and operation, are then evaluated.

3.9.1 Existing Conditions

Existing population and housing, employment and income, and municipal budgets and taxes in the Town of Martinsburg are described below.

3.9.1.1 Population and Housing Characteristics

According to U.S. Census Bureau data from 1990-2000, the Town of Martinsburg experienced a population decline of 8.0%. Between 1980 and 2000, the Town experienced a decline of 16.4% (Lewis County CEDS, 2006). Generally, population trends have been away from villages into adjacent towns, increasing rural populations in the county from 69.4% in 1990 to 71% in 2000 (Lewis

County CEDS, 2006). Lewis County as a whole experienced very little change in population between 1990 and 2000.

From 1980-2000 the county population increased by 7.6%; however, it grew at only 0.6% from 1990 to 2000 (Lewis County CEDS; U.S. Census Bureau). This change in population between 1980 and 1990 was a result of the activation of the U.S. Army's 10th Mountain Division at Fort Drum. This brought more than 10,600 soldiers plus their family members, which changed the population of Lewis and Jefferson Counties (Jefferson County website; Lewis County CEDS, 2006). According to the 2000 Census, Lewis County was the fourth least populated County in New York State.

A portion of available housing in Martinsburg is only utilized for seasonal, recreational or occasional uses. In 2000, the number of total available housing units in the Town of Martinsburg was 627, of which 75.4% (or 473) were occupied. 24.6% (or 154) were vacant, but 14.2% (or 89) are for seasonal, recreational or occasional use (U.S. Census Bureau). As the county population growth has remained fairly stable over the past few years, it can be rationally assumed that the availability of housing remains strong.

Not only is housing available but local home ownership is fairly strong. Home ownership is 80.3% in the Town of Martinsburg. Home ownership in Lewis County is comparable, at approximately 77.2% (U.S. Census Bureau). The percentage of ownership reflects the affordability of housing in the area.

The median housing values in 2000 in the Town of Martinsburg are comparable to the median value for Lewis County, but are low when compared to the median value for New York State. In 2000, the median housing value in the Town of Martinsburg was \$55,700, whereas the County median value was \$63,600. This compares to a statewide median value of \$148,700 in 2000 (U.S. Census).

3.9.1.2 Economy and Employment

According to the 2000 U.S. Census, the largest industry in Lewis County was the 'educational, health, and social services' industry, with approximately 22.9% of workers employed in this sector. The second largest industry was 'manufacturing', employing 18.5% of local workers. The next largest industry sectors in Lewis County both comprise 10.3% of the workforce: 'retail trade', and 'agriculture, forestry, fishing, hunting, and mining'. The county's largest manufacturing employers are Kraft (325 employees), Fibermark DSI (216 employees), Climax Manufacturing (195 employees), and Quibica AMF (99 employees) (Lewis County CEDS). The wood products industry is an important component of the overall economy, and is represented by logging firms, sawmills, paper

mills, a wood-burning cogeneration plant and finished/secondary wood products processors (Lewis County CEDS). The vast majority of Martinsburg's employment is attributed to the agriculture industry, community services, or one of the commercial manufacturing facilities in the region. Lewis County's average unemployment rate from 2000 to 2005 was 6.2%. The unemployment rate fluctuates dramatically during the year – from 5.5% in the summer to 9% in the winter – due to the weather, and the subsequent effect on jobs in construction and agriculture (Lewis County CEDS).

With respect to the agricultural industry, dairy is the primary agricultural product in Lewis County. According to the 2002 Census of Agriculture, 44% of all farms in the county have milk cows (USDA National Agricultural Statistics Service, 2002). The same 2002 Census reported a total of 721 farms in Lewis County, which comprised 196,774 acres. This represents a 44% decrease in farms since 1959, when the county had 1,291 working farms (290,847 acres), accounting for a significant percentage of the total employment in the county (USDA NASS). The decline in employment in the agricultural industry is a widespread and continuing trend, but local officials report that agribusiness is more stable in Lewis County than in other areas of the region, state, and perhaps the nation (Lewis County CEDS). In 2006, there were 196 parcels in agricultural use in the Town of Martinsburg, with an assessed value of \$22,296,100 (NYS Office of Real Property Services, 2007).

3.9.1.3 Municipal Budgets and Taxes

Municipalities (towns, villages, and counties) and school districts are responsible for providing specific services and facilities to those who live and work within their boundaries. Municipalities and school districts incur costs associated with providing these facilities and services, and to cover these costs, collect revenues by levying taxes. Tax revenues in the Project area accrue from both sales taxes and real property taxes. The taxing jurisdictions in the Project site include Lewis County, the Town of Martinsburg, and the Lowville and South Lewis School Districts. Table 17 summarizes the total 2006 property tax levy for these taxing jurisdictions.

Table 17. 2006 Real Property Tax Levy Per Taxing Jurisdiction

Taxing Jurisdiction	2006 Real Property Tax Levy
Town of Martinsburg	\$363,716
Lewis County	\$10,365,673
Lowville Central School District	\$4,150,386
South Lewis Central School District	\$5,684,475

(Source: NYS Office of Real Property Services, 2007)

The distribution of broad land use categories within the town is similar to that seen throughout Lewis County. In 2006, the highest percentage of land use in both the town and the county was classified

as residential. The second highest percentage of land use was vacant land with agricultural land ranking third (Office of Real Property Services, 2007). Type of land use contributes to the assessed value of property, and thus influences the total real property tax levy for the towns and county. The total assessed value of the land use classifications for the town is summarized in Table 18 below.

Table 18. Assessed Value of Property in the Town by Land Use Classification, 2006

Type of Land Use	Town of Martinsburg	
	Total Assessed Value	Percent of Total Parcels
Residential	\$24,111,000	37.7%
Commercial	\$2,480,250	2.5%
Industrial	\$117,000	0.2%
Recreation & Entertainment	\$46,400	0.3%
Community Service	\$5,749,700	2.1%
Agricultural	\$22,296,100	16.5%
Vacant Land	\$1,602,600	18.8%
Public Service	\$189,381,364	7.4%
Public Parks, Wild, Forested & Conservation	\$5,963,200	14.5%
Total	\$251,747,614	100%

(Source: NYS Office of Real Property Services, 2007)

Another source of revenue is the local sales tax revenue. The current sales tax rate for the County is 7.75% (3.75% local tax plus 4% state tax) (New York State Department of Taxation and Finance). In 2005, the total sales tax revenue for the county was \$8,224,474 (NYS Office of the State Comptroller). The amount of sales tax revenue collected by the Town of Martinsburg in 2004 or 2005 was not available from the New York State Office of the State Comptroller.

The county, town, and school district budgets are influenced by several factors, one of which is the annual real property tax levy. An increase in revenues raised through real property taxes has a positive effect on local municipal budgets. However, local business owners, farmers, or residents are directly impacted when their real property tax or sales tax obligations increase. Table 19 summarizes municipal budgets for 2005 at the town and county levels. Table 20 summarizes the 2005 budgets for the Lowville and South Lewis Central School Districts.

Table 19. 2005 Municipal Budgets (Town and County)

Taxing Jurisdiction	Total Revenue	Total Expenditures
Town of Martinsburg	\$1,010,015	\$824,167
Lewis County	\$79,325,406	\$80,046,406

(Source: New York State Office of the State Comptroller, 2007)

Table 20. 2005 School District Budgets

District	Revenue (total)	Expenditure (total)	Indebtedness
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Lowville CSD	\$17,449,226	\$17,216,919	\$18,725,00
South Lewis CSD	\$18,966,592	\$19,736,569	\$17,099,125

(Source: New York State Office of the State Comptroller)

The town, county, and local school districts face the yearly challenge of meeting their service obligations or expenditures through the collection of sales and real property taxes. Property tax is the largest single source of revenue that offsets the cost of providing local services. As with most taxing jurisdictions in upstate New York, the loss of (or lack of) commercial and industrial tax base, in combination with rising service and material costs, make it increasingly difficult to meet their budgets without significantly raising real property taxes.

3.9.2 Potential Impacts

The Project will have both direct and indirect positive economic effects on the town, county, and school districts, as well as the individual landowners participating in the Project. These effects will commence during construction and continue throughout the operating life of the Project. In the short term, benefits will include additional employment and expenditures associated with Project construction. In the long term, the Project will generate significant additional revenue through a payment in lieu of taxes (PILOT) agreement, purchases of goods and services, and lease payments to participating landowners. The Project will also provide full-time employment for a limited number of individuals and likely result in some increased visitation to the Project area by tourists interested in wind power. All of these results could have a beneficial effect on local businesses. The overall socioeconomic impact of Project construction and operation is discussed in detail below.

3.9.2.1 Construction

3.9.2.1.1 Population and Housing

As mentioned previously, the town where the Project site is located has experienced a considerable population decline between 1980 and 2000. This population trend will likely continue regardless of whether the proposed Project is built. The Project will not generate construction employment at a level that would significantly increase population in either the town or the county. Even though employment during the construction period will be significant (on the order of 100 to 125 full-time jobs), this employment is relatively short term, and is not expected to result in workers permanently relocating to the area. For the duration of construction (approximately nine months) there could be a temporary increase in local population and demand for temporary housing by out-of-town workers. However, this demand will be relatively modest, and can easily be accommodated by the available

housing in towns and surrounding communities. Beyond this relatively minor (and positive) short-term impact, Project construction will have no significant impact on population and housing.

3.9.2.1.2 Economy and Employment

It is anticipated that construction of the proposed Project will employ a total work force of approximately 100-125 employees, and that the majority of this employment will be drawn from the local labor market. Local employment will primarily benefit those in the construction trades, including equipment operators, truck drivers, laborers, and electricians. Project construction will also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is anticipated that the majority of these specialized workers will originate from outside the area and will remain only for the duration of construction.

In addition to the jobs created during construction and the wages paid to the work force, this Project will have a direct economic effect (or impact) from the first round of buying/selling, which includes the purchase of goods from local sources (such as fuel), the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects will result in additional, subsequent rounds of buying and selling in other sectors. Thus, the Project will have an indirect effect (or impact) through the increase in sales of other industry sectors in the county (NWCC, 2004).

3.9.2.1.3 Municipal Budgets and Taxes

During construction, the Project will not impact municipal budgets and taxes. Temporary construction workers will not create significant demand for municipal or school district services or facilities. These workers will also not generate significant revenue through payment of property taxes. However, sales tax revenue will increase through the purchase of local goods and services. The Project will result in impacts to the local road system (see discussion of transportation impacts in Section 3.8.2). This has the potential to affect local highway department expenditures/budgets. However, as will be discussed in the mitigation section, cost of any construction-related road repairs/improvements will be borne by the Project developer.

3.9.2.2 Operation

3.9.2.2.1 Population and Housing

Approximately 6-8 full-time jobs will be created once the Project is fully operational. These will include 4-6 wind technicians, 1 plant manager, and 1 plant administrator. These employees are expected to reside locally, which could translate into the purchase of a few homes and addition of a

few families to the town and/or the surrounding communities. Although this represents a positive economic impact, long-term employment associated with the Project is not large enough to have a significant impact on local population or housing characteristics.

Factors beyond property values have an effect on population and housing. For example, the upgrade of some local roads could conceivably promote access to areas that were previously undeveloped. With some minor exceptions, much of the road system within the Project area consists of unpaved forest roads. However, the improvement of existing road systems to accommodate Project component delivery (e.g. turning radii, culvert replacement, etc.) is not anticipated to substantially promote additional residential or commercial growth (area is currently zoned a forest district) within the Project area than currently exists. Project access roads that will be constructed will be located within private land, and therefore will not significantly induce growth in the area. Other factors having an effect on population and housing could result from an aversion to living near wind energy facilities. It may be reasonable to assume that some area residents could relocate due to an objection to the presence of a wind turbine, dependent upon individual personal acceptance. No published studies could be found that document a reduction in occupied houses in a given area after the construction of a wind turbine project.

Local residents often express concern over the potential for local property values to depreciate as a result of a proposed wind power project. This issue has come up during the siting and review of other wind power projects in New York and throughout the United States. In order to address this concern, the Renewable Energy Policy Project (REPP) conducted a quantitative study in 2003. REPP assembled a database of real estate transactions adjacent to every wind power project in the United States (10 MW or greater) that became operational between 1998 and 2001 (a total of 10 projects, including the Madison and Fenner projects in Madison County, New York). For this study, data was gathered within 5 miles of the wind projects, as this was determined to be the potential area of visual impact (viewshed). For each of the 10 projects, similar data was also gathered for a comparable community that was located outside of the project viewshed (comparable communities were based on interviews with local assessors as well as analysis of U.S. Census demographic data). The goal of the data collection was to obtain real estate transaction records for a time period covering roughly 6 years (3 years pre-construction and 3 years post-construction). The data was then analyzed in three different ways: Case 1 examined the price changes in the viewshed and the comparable community for the entire period of the study; Case 2 examined how property values changed in the viewshed before and after the project became operational; and Case 3 examined how property values changed in the viewshed and the comparable community after the project became operational.

The results of these analyses showed no negative affect on property value from existing wind farms. Of the 10 projects examined in the Case 1 analysis, property value actually increased faster within the wind power project viewshed in eight of the 10 projects. The Case 2 analysis revealed that the property values also increased faster after the wind farms became operational in nine of the 10 projects examined. In the Case 3 analysis, property values increased faster in the wind power project viewshed than in the comparable community in nine of the 10 projects. More specifically (and perhaps more relevant to the proposed Roaring Brook Wind Power Project) is the fact that these positive results apply to the Madison Wind Power Project and the Fenner Wind Power Project in New York State. The results from the Madison and Fenner analysis revealed a generally positive affect on property value. In five of the six case studies (Case 1, 2, and 3 analyses for both projects), the monthly average sales price grew faster or declined slower in the viewshed communities than in the comparable communities outside the project viewshed. The REPP study therefore concluded that there is no evidence that the presence of the Madison and Fenner wind farms had a significant negative effect on residential property values in Madison County, New York (REPP, 2003).

However, it should be noted that the REPP study has been criticized because it assumes that all properties within the study area have a view of the respective wind farm, does not account for property distance to the wind farm, uses not ideal statistical analysis, and includes inappropriate transactions (e.g., estate sales, sales between family members, sales due to divorce, etc.). To present a clearer understanding of the actual effects of existing wind farms on property values, a master of science thesis was prepared by Ben Hoen (2006). A copy of the thesis is presented in Appendix P. The purpose of this study was to analyze if the transaction value of homes within 5 miles of the existing Fenner Wind Farm was significantly affected by views of the wind farm. "View" is defined using a continuous variable from 0 (no view) to 60 (a full view of all 20 turbines). The study additionally investigates how this effect varies with distance (spatially), time (temporally) and house value. Lastly, the effect and degree of the PILOT payment to Fenner Township is investigated. The study utilized the hedonic pricing model, which, given enough data, is sensitive enough to allow sales to be grouped temporarily (e.g., by year), spatially (e.g., by distance), and economically (by the value of the home).

The data concerning transaction values and assessor information was collected from the Madison County Real Property Tax Office. From January 1, 1996 through June 1, 2005, 452 sales took place that were coded "arms-length" transactions by county assessors, and were within 5 miles of Fenner Wind Farm. Of these 167 were removed as land-only sales (i.e., sale of parcel that did not contain a house), and five were removed as non arms-length sales, resulting in a total of 280 sales. Of

these, 140 occurred after construction of the Fenner Wind Farm began (2001). A field analysis was conducted on October 30 and 31, 2005 to ensure complete accuracy of the "view" variables used in the model. Visits were made to those homes sold after January 1, 2001 (138 homes visited) to assess the degree to which the home could see the wind farm. By standing at or near the house a rating of 1 to 60 was established for each home. This rating was based on the degree to which viewers could see each of the 20 windmills in the Fenner Wind Farm. A total of 3 points per turbine were possible (one point if only the blade above the nacelle was visible, two points if the nacelle was also visible, and three points if the tower below the rotor swept area was also visible), for a cumulative maximum of 60 points.

The analysis of 280 home sales within 5 miles of the Fenner Wind Farm did not reveal a statistically significant relationship between either proximity to or visibility of the wind farm and the sale price of homes. Additionally, the analysis failed to uncover a relationship even when concentrating on homes within one mile of the wind farm that sold immediately following the announcement and construction of the project. This study therefore concluded that in Fenner, a view of the wind farm does not produce either a universal or localized effect, adverse or not. To the degree that other communities resemble the Fenner rural farming community, similar conclusions are anticipated (Hoen, 2006).

Also worth noting is a June 28, 2005 press release from the Madison County Public Information and Services Department. This press release discussed a recent study published in *Progressive Farmer* (a national publication), which ranked Madison County as the fourth best place to live in the northeast in their list of Best Places to Live in Rural America. The rankings for each county were based upon healthcare, education, climate, pollution, crime, and tax burden (Madison County, 2005).

Given the results of the REPP and Hoen studies, and the similarity of the Madison County sites to the Martinsburg Project area, it is reasonable to conclude that the proposed Project will not have an adverse impact on local property value.

3.9.2.2.2 Economy and Employment

Total wages for this Project's 6-8 full-time employees are estimated to be approximately \$210,000 to \$270,000 per year. It is anticipated that these jobs will have a spin-off effect on the local economy, through local expenditures on goods and services associated with Project operation and maintenance. Additionally, expected lease and easement payments will be provided to the local landowners participating in the Project. These lease payments are a direct financial benefit to the

participating landowners. Russell Cary, Supervisor of the Town of Fenner, New York believes that lease payments from the wind power project in his town are preserving a rural life style (R. Cary, pers. comm.). Local lease payments will also enhance the ability of the participating landowners to purchase additional goods and services. To the extent that these purchases are made locally, they will have a broader positive effect on the local economy.

With respect to tourism in the region, it is worth noting that other wind power projects in New York have resulted in a significant increase in visitation from tourists interested in the projects. This has certainly resulted in increased local expenditures for goods and services, but these have not been quantified, and are probably fairly modest. It should also be acknowledged that this effect is likely to diminish as wind power projects become more common in the state and their novelty decreases.

Despite potential concerns, there is no evidence to indicate that the presence of wind turbines will have a negative impact on tourism. A 2002 study conducted in the Argyll Region of Scotland, involving interviews with over 300 tourists, found that 91% said the presence of wind farms in the area would not influence their decision about whether to return to the area (MORI Scotland, 2002). Almost half (48%) of the tourists interviewed were visiting the area because of the 'beautiful scenery and views'. Of those who had actually seen wind farms, 55% indicated that their effect was "generally or completely positive", 32% were ambivalent, and 8% felt that the wind farms had a negative effect. Similar positive effects have been reported from various wind farm locations in Australia. According to the Australian Wind Energy Association (AusWEA), initial concerns that wind turbines would negatively impact tourism in that country have proven unfounded (AusWEA, 2003). Similarly, a recent survey of visitors to Vermont's Northeast Kingdom found that 95% would not be deterred from further visits by the existence of a proposed wind farm (Institute for Integrated Rural Tourism, 2003). This is also evident in the resort community of Palm Springs, California, where there are over 3,500 wind turbines. Tours of this wind farm regularly draw 10,000 to 12,000 curious tourists every year according to Christy Regaldo of PS Windmill Tours (Clean Power Now, 2006).

3.9.2.2.3 Municipal Budgets and Taxes

Wind energy systems installed prior to 2006 received a tax-exempt status in New York State. According to New York State Real Property Tax Law, Article 4, Section 487, real property, which includes a wind energy system, shall be exempt from taxation for 15 years. Local municipalities and school districts had the option to disallow this tax-exempt status for properties that were within their jurisdiction (See RPTL §487[8]), and generally they have done so only in exchange for a Payment in

Lieu of Taxes (PILOT) agreement with the sponsors of wind projects that provides for an increase in local tax revenues.

Although the presence of the turbines will increase the value of the properties on which they are located, due to the policy adopted in Lewis County only the owners of the wind generating equipment will be taxed, not the underlying landowners, as part of a proposed local PILOT program (see below). In addition, the existence of the wind farm leases may also have the effect of increasing both the market value and the assessment of the underlying properties due to the stream of lease payments, and any resulting increase in local property taxes is the responsibility of the landowner. And, at the end of the PILOT agreement, all the wind farm facilities will revert to full taxation at the local level for the remainder of their useful economic lives. Finally, studies of wind power impact on property values have indicated that these projects typically do not have an adverse effect on assessed property value (REPP, 2003 and Hoen, 2006). Therefore, for all these reasons the Project should not negatively affect the total amount of real property taxes levied by the local taxing jurisdictions or the budgets of these jurisdictions, and in fact will substantially increase local PILOT and tax revenues for the life of the Project as discussed further below.

According to the Town of Fenner Supervisor Russell Cary, the wind farm in his town has required the town to purchase additional road maintenance equipment to service roads that have been improved or are more heavily traveled as a result of the project (R. Cary, pers. comm.). However, the improved roads are a benefit to the community, and represent the only significant municipal service required by the project. The Martinsburg Wind Power Project will place similar, limited demand on municipal and school district services.

The Project will have a beneficial impact on municipal budgets and taxes in that the taxing jurisdictions will receive additional revenue from the Project in the form of PILOT payments, which are necessarily distributed to the relevant taxing jurisdictions according to their share in the combined tax rate. Through the PILOT agreement, the Project will more than offset any limited impact on municipal budgets by generating additional revenue. The details of the PILOT agreement are described in Section 3.9.3.2.3 below.

3.9.3 Mitigation

3.9.3.1 Construction

As described in the Impacts discussion, construction of the proposed Project will not have a significant impact on local population and housing, and will have a short-term beneficial impact on

the local economy and employment. Consequently, no mitigation is necessary to address these impacts. The only potential adverse impact to municipal budgets is the impact of Project construction on local roads, and the need to repair or upgrade these roads to accommodate construction vehicles and activity. To mitigate this impact, construction-related damage or improvements to state, county, or town roads will be the responsibility of the Project developer, and will be undertaken at no expense to the town or county (see additional detail in the discussion of transportation mitigation in Section 3.8.2.1).

3.9.3.2 Operation

3.9.3.2.1 *Population and Housing*

As discussed in Section 3.9.2.1, the operating Project is not anticipated to adversely affect population or housing availability in the towns or the surrounding area. Nor is it expected to have a depressing effect on local property values. Consequently, mitigation measures to address population and housing impacts are not necessary.

Property owners within the viewshed of proposed wind power projects are often concerned about the possibility that these projects could at some point be abandoned, and that the derelict facilities will have a depressing effect on local property values. To address this concern, the Project developer will establish a decommissioning fund. This fund will assure that the proposed wind power facility will be dismantled and removed in the event that it is not completed, proves economically unviable, or reaches the end of its operational life span. Prior to the start of construction the Project developer will submit evidence of the mechanisms that are in place to ensure the removal of each wind turbine in the event it is not in active service for one year or more.

3.9.3.2.2 *Economy and Employment*

As described previously, the operating Project's potential impact on the local economy and employment will be positive, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). However, the number of permanent jobs created is not large enough to create a financial burden on the towns, county, or school districts by requiring provision of additional services and/or facilities. Thus, mitigation measures to address either loss of jobs or increased demand for municipal services are not necessary.

3.9.3.2.3 *Municipal Budgets and Taxes*

Operation of the proposed Project will not create a significant demand for additional municipal or school district services and facilities, and therefore it will have no adverse impact on municipal or school budgets. PPM Energy plans to enter into a PILOT agreement with local tax jurisdictions. They propose that the PILOT agreement have a term of 15 years. Although the specific terms of the PILOT agreement have not been negotiated, PPM Energy anticipates, based upon annual PILOT payments for other wind energy projects in New York, that the annual PILOT payment will be approximately \$8,000 per MW of installed generation capacity. At that rate, and assuming that 78 MW of generation is installed, the PILOT payments would average approximately \$624,000 per year. Further, over an assumed 15-year duration of the PILOT agreement, the local jurisdictions would receive total payments of approximately \$9.4 million. PPM Energy anticipates that the annual PILOT payments would be distributed between the Town of Martinsburg, Lewis County, and the local school district. However, the percentage sharing of the payments has not yet been negotiated. After the PILOT expires, the facility will be taxed at its assessed value.

The PILOT payments will increase the revenues of the local taxing jurisdictions, and will represent a significant portion of their total tax levy. Further, the PILOT payments will more than offset any minor increases in community service costs that may be associated with long-term operation and maintenance of the Project (e.g., small number of additional school children, slightly increased road maintenance costs).

3.10 PUBLIC SAFETY

This section addresses potential public safety concerns related to the proposed Project. Background information on public health and safety issues associated with wind energy projects is presented first, followed by a discussion of potential impacts associated with the Project, and proposed mitigation measures.

3.10.1 Background Information

Public safety concerns associated with the construction of a wind power project are categorized primarily by fairly standard construction-related concerns. These include the potential for injuries to workers and the general public from 1) the movement of construction vehicles, equipment and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These types of incidents are well understood, and do not require extensive background information. In addition, because the generating portion of the Project is contained within a remote parcels private land, these safety concerns do not present risk to the general public.

Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section. In many ways, wind energy facilities are safer than other forms of energy production since significant use and storage of a combustible fuel are not required. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, risks to public health and safety can be associated with these facilities. Examples of such safety concerns include ice shedding, tower collapse/blade throw, stray voltage, fire, lightning strikes, electrocution, and electro-magnetic fields. Each of these concerns is discussed individually below.

3.10.1.1 Ice Shedding

Ice shedding and ice throw refer to the phenomena that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. Although a potential safety concern, there has been no reported injury caused by ice being "thrown" from an operating wind turbine (Global Energy Concepts, 2005). However, ice shedding does occur, and could represent a potential safety concern.

Under favorable conditions, ice may build up on the rotor blades and/or sensors, slowing its rotational speed and potentially creating an imbalance in the weights of the individual blades. Such effects of ice accumulation can be sensed by the turbine's computer controls and would typically result in the turbine being shut down until the ice melts. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan et. al., 1998). Ice can potentially be "thrown" when ice begins to melt and stationary turbine blades begin to rotate again (although turbines usually do not restart until the ice has largely melted and fallen straight down near the base).

The distance traveled by a piece of ice depends on a number of factors, including: the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), and the prevailing wind speed. Data gathered at existing wind farms have documented ice fragments on the ground at a distance of 50 to 328 feet from the base of the tower. These fragments were in the range of 0.2 to 2.2 pounds in mass (Morgan et. al., 1998). The risk of ice landing at a specific location is found to drop dramatically as the distance from the turbine increases. European studies have identified a safety threshold of 200 to 250 meters (660 to 820 feet) from any turbine, beyond which there is no significant risk from falling ice fragments (Morgan & Bossanyi, 1996).

3.10.1.2 Tower Collapse/Blade Throw

Another potential public safety concern is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. These are extremely rare occurrences, but such incidents can occur and are potentially dangerous for project personnel and very remotely for the general public. PPM Energy is aware through industry sources, in the history of the US industry, there has been only one incident resulting in a project employee fatality from a tower collapse, and none from the public. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. Past occurrences of these incidents have generally been the result of design defects during manufacturing, poor maintenance, wind gusts that exceed the maximum design load of the engineered turbine structure, or lightning strikes (AWEA, 2007b). Most instances of blade throw and turbine collapse were reported during the early years of the wind industry. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have largely eliminated such occurrences.

3.10.1.3 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960's. It is an effect that is primarily a concern of farmers whose livestock can receive electrical shocks. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Wisconsin Rural Energy Management Council, 2000). The term stray voltage can be further defined as a "continuous voltage sources of less than 10 volts between two objects that are likely to be contacted simultaneously by livestock". Most stray voltage problems have been traced to either National Electric Code wiring violations or poorly grounded electric services serving the farms in question (J. Barrett, pers. comm.).

Wind power projects and other electrical facilities can only create stray voltage if they are not properly designed or during unusual circumstances. Stray voltage from overhead electric lines usually only occurs if poorly grounded metal objects (fences, underground pipelines, etc.) are in close proximity to the overhead line and run parallel to it for long distances (J. Barrett, pers. comm.). Stray voltage is a phenomenon that has been studied and debated since at least the 1960's. It is an effect that is primarily a concern of farmers whose livestock can receive electrical shocks. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Wisconsin Rural Energy Management Council, 2000). The term stray voltage can be further defined as a "continuous voltage sources of less than 10 volts between two objects that are likely to be contacted simultaneously by livestock". Most stray voltage

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3.10.1.4 Fire

Wind turbines, due to their height, physical dimensions, and complexity, have the potential to present response difficulties to local emergency service providers and fire departments. Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic) does create the potential for fire or a medical emergency within the tower or the nacelle. This, in combination with the elevated location of the nacelle and the enclosed space of the tower interior makes response to a fire or other emergency difficult, and beyond the capabilities of most local fire departments and emergency service providers.

Other project components create the potential for a fire or medical emergency due to the storage and use of diesel fuels, lubricating oils, and hydraulic fluids. Storage and use of these substances may occur at the substation, in electrical transmission structures, staging area(s), and the O&M building/facility. The presence of high voltage electrical equipment presents potential safety risks to local responders. However, due to the accessibility of these areas, response to an emergency should not prove difficult to local fire and emergency personnel.

3.10.1.5 Lighting Strikes

Due to their height and metal/carbon components, wind turbines are susceptible to lightning strikes. Statistics on lightning strikes to wind turbines are not readily available, but it is reported that lightning causes four to eight faults per 100 turbine-years in northern Europe, and up to 14 faults per 100 turbine-years in southern Germany (Korsgaard and Mortensen, 2006). Most lightning strikes hit the rotor, and their effect is highly variable, ranging from minor surface damage to complete blade failure. All modern wind turbines include lightning protection systems, which generally prevent catastrophic blade failure.

3.10.1.6 Electrocution

Due to the generation and transmission of electricity, a wind power project poses the risk of electrocution. Because power generation and transmission does not occur until after the wind project has been constructed, this concern is primarily associated with an operating wind power project. The electricity generated by each turbine will initially be transmitted through buried 34.5 kV electric lines, and ultimately delivered to the Project substation through overhead 34.5 kV lines. The buried lines will be placed at least 3 feet below grade; therefore, any earthwork conducted at or below these depths (and in the immediate proximity of the buried lines) will introduce the risk of electrocution by accidental contact. The overhead 34.5 kV line will be centered within a 75-foot wide ROW, and Roaring Brook Wind will secure a utility easement for this ROW.

3.10.1.7 Electro-magnetic Fields

Electro-Magnetic Fields (EMF) are a combination of electric and magnetic fields produced in nature and generated by the operation of various pieces of electric equipment and facilities. Humans are exposed to a wide variety of natural and man-made EMF both in the outdoor environment and in homes, schools, and businesses. The EMF produced by electric power lines are well within the range of EMF exposures from such other sources. Numerous public health review groups, including the National Institute of Environmental Health Sciences, the National Institutes of Health, and the U.S. Department of Energy, have examined the public's exposure to EMFs produced by power lines. The consistent overall conclusion of these groups is that available data do not support a cause and effect relationship between exposure to environmental levels of EMF and elevated risk of disease.

3.10.2 Potential Impacts

3.10.2.1 Construction

As mentioned in the background information section, public safety concerns associated with project construction include 1) the movement of large construction vehicles, equipment and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These issues are most relevant to construction personnel who will be working in close proximity to construction equipment and materials, and will be exposed to construction related hazards on a daily basis. However, risk of construction related injury will be minimized through regular safety training and use of appropriate safety equipment.

The participating landowner could also be exposed to construction-related hazards due to the passage of large construction equipment on the private roads and access to the work site (on foot, by motor vehicle, ATV, or snowmobile). The latter could result in collision with stockpiled materials

(e.g., soil, rebar, turbine/tower components), as well as falls into open excavations. However, because construction activities will occur on one parcel of private land, and will be well removed from public roads and residences, exposure of the general public to construction-related risks/hazard will be essentially non-existent.

3.10.2.2 Operation

3.10.2.2.1 *Ice Shedding*

As stated previously, while turbine icing certainly will occur at times, any ice that accumulates on the rotor blades will likely cause an imbalance, or otherwise alert sensors, and result in turbine shut-down. As the ice begins to thaw, it will typically drop straight to the ground. Any ice that remains attached to the blades as they begin to rotate could be thrown some distance from the tower. However, such a throw will usually result in the ice breaking into small pieces, and falling within 300 feet of the tower base. European studies have identified a safety threshold of 200 to 250 meters (660 to 820 feet), beyond which there is no significant risk from falling ice fragments (i.e., the risk is equivalent to being hit by lightning) (Morgan and Bossayani, 1996). However, because the nearest public road is approximately 670 feet from the closest turbine, and the nearest non-participating permanent residence is approximately 1.1 mile from the closest turbine, impacts from ice shed/ice throw are not anticipated. Based upon the results of studies/field observations at other wind power projects, the project's siting criteria, and the lack of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public due to ice shedding.

3.10.2.2.2 *Tower Collapse/Blade Throw*

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (AWEA 2007a). The engineering standards of the wind turbines proposed for this project are of the highest level and meet all International, Federal, State, and local codes. In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw. The wind turbines proposed on the Roaring Brook project automatically shut down at wind speeds over 56 mph. They also cease operation if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring system. In addition, the nearest public road is approximately 670 feet from the closest turbine, and the nearest non-participating permanent residence is approximately 1.1 mile from the

closest turbine. For all of these reasons, the risk of catastrophic tower collapse or blade failure is minimal.

3.10.2.2.3 Stray Voltage

While the concerns surrounding stray voltage are legitimate, it is important to note they are largely preventable with proper electrical installation and grounding practices. The Project's power collection system will be properly grounded, and will not be connected to the local electrical distribution lines that provide electrical service to on-site structures or off-site farm buildings and homes. It will be physically and electrically isolated from all of the buildings in and adjacent to the project area. Additionally, the wind farm's electrical collection lines will be located a minimum of three feet below ground, and will use shielded cables with multiple ground points. This design eliminates the potential for stray voltage (J. Barrett, pers. comm.).

3.10.2.2.4 Fire

All turbines and electrical equipment will be inspected by the utilities (for grid and system safety) prior to being brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring in the turbines or electrical stations. However, fire at these facilities could result from a lightning strike, short circuit or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition system and reported to the project control center. Under these conditions, the turbines would automatically shut down and project maintenance personnel would respond as appropriate.

In the event that a wind turbine catches fire, it is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the section of the project with the turbine fire is also disconnected. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (Global Energy Concepts, 2005). However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially non-existent. In addition, transformers at the substation are equipped with a fire suppression system. This system should quickly extinguish any fires that occur at the project substation and shutdown power to the facility.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the project owner/operator.

Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the project site (e.g., tower rescue, working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk.

3.10.2.2.5 Lighting Strikes

Lightning protection systems were first added to rotor blades in the mid 1990s, and are now a standard component of modern turbines (Korsgaard and Mortensen, 2006). Lightning is effectively and safely intercepted at several receptor points including the outermost blade tip and the blade root surface and transmitted to the wind turbine's lightning conductive system. These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. The turbines' blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically, or at a minimum, be inspected to assure that damage has not occurred.

3.10.2.2.6 Electrocutation

As previously mentioned, the buried electric lines will be placed at least three feet deep on private property. In addition, the overhead electric lines will be located within an established easement/ROW, and will be constructed to all applicable National Grid standards. Therefore, the general public will not be exposed to risk from electrocution.

3.10.2.2.7 Electro-magnetic Fields

Electro-Magnetic Fields (EMF) are a combination of electric and magnetic fields generated by the operation of various Project components, including the turbine generator, electrical collection lines and transformers. The strength of EMF is inversely proportional to the distance a sensor is from the Project component, so that the electric and magnetic field strengths decline as the distance from the component increases. The height of the turbine generator (over 250 feet) above the ground, the location of electrical collection cables underground, the establishment of an easement/ROW for the overhead route, and the location of substation transformers and other electrical equipment inside a fenced yard provide separation of these components from the general public to limit EMF exposure.

New York is one of few states that have established standards for electric and magnetic fields produced by electric power lines. The Table below lists guidelines that have been adopted by various states in the U.S.

Table 21. State EMF Standards and Guidelines for Transmission Lines

State/Line Voltage		Electric Field		Magnetic Field	
		On ROW	Edge ROW	On ROW	Edge ROW
Florida ^c	69-230 kV 500 kV	8.0 kV/m 10.0 kV/m	} 2.0 kV/m ^f		150 mG 200 mG, 250 mG ^e
Massachusetts					85 mG
Minnesota		8.0 kV/m			
Montana		7.0 kV/m ^a	1.0 kV/m ^b		
New Jersey			3.0 kV/m		
New York ^c		11.8 kV/m 11.0 kV/m 7.0 kV/m	1.6 kV		200 mG
Oregon		9.0 kV/m			

Key: ROW = right of way; mG = milliGauss; kV/m = kilovolts per meter

Notes: ^a Maximum for highway crossings

^b May be waived by the landowner

^c Magnetic fields for winter-normal, maximum line load capacity

^d Maximum for private road crossings

^e 500 kV double-circuit lines built on existing ROW's

^f Includes the property boundary of a substation

Sources: "Questions and Answers About EMF." National Institute of Environmental Health Sciences and U.S. Department of Energy, 2002.

Florida, see <ftp://ftp.dep.state.fl.us/pub/siting/Rules/62-814-EMF.doc>

Electric Fields

Electric fields around power lines are produced by electrical charges, measured as voltage, on the energized conductor. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance a sensor is from the conductors. The strength of the electric field is measured in units of kilovolts per meter (kV/m). The voltage, and therefore the electric field, around a power line remains practically steady and is not affected by the common daily and seasonal fluctuations in production of electricity by the Project.

Magnetic Fields

Magnetic fields around power lines are produced by the electrical load or the amount of current flow, measured in terms of amperage, through the conductors. The magnetic field strength is directly proportional to the amperage; that is, increased amperage produces a stronger magnetic field. The magnetic field is inversely proportional to the sensor's distance from the conductors. Magnetic fields are expressed in units of milligauss (mG). However, unlike voltage, the amperage and therefore the magnetic field around a power line, fluctuate hourly and daily as the amount of current flow varies. The strength of the magnetic field depends on the current in the conductor, the geometry of the

construction, the degree of cancellation from other conductors, and the distance from the conductors or cables.

34.5-KV Underground Line

For an underground 34.5-kV circuit, the electric field is totally contained within the insulation of the cable. Because the electric field is contained within the buried cables, no electric field is measurable at the surface of the ground.

For the underground configuration, the magnetic fields are assessed on the basis of 3 parallel conductors, bundled together, and placed 3 ft below grade. The conservative peak line loading value assumed for assessment of each underground circuit is approximately 50% higher than expected peak loading levels. The net magnetic field of buried cables is measurable 1 meter above the surface of the ground over the cables.

34.5-KV Overhead Line

For the overhead configuration, the conservative peak line loading value assumed for assessment of each of the two circuits is approximately 50% higher than expected peak loading levels. The net electric and magnetic fields are measurable 1 meter above the surface of the ground at the center and edge of the power line right-of-way.

The conservative approximation of maximum electric and magnetic fields that would be produced by the proposed lines with the wind farm at full output are as follows:

Table 22. Approximate Electric and Magnetic Fields at Center and Edge of Right-of-Way

Voltage and Configuration	Magnetic Field		Electric Field	
	(mGauss)		(KV/M)	
	Center of ROW	Edge of ROW 35 feet from center	Center of ROW	Edge of ROW 35 feet from center
34.5-kV Overhead	59.8	13.8	0.221	0.049
34.5-kV Underground	42.2	1.5	None	None

3.10.3 Proposed Mitigation

3.10.3.1 Construction

Contractors will comply with all Occupational Safety and Health Administration (OSHA) regulations, in addition to state worker safety regulations, regarding electricity, structural climbing, and other hazards, during construction of the wind farm. To minimize safety risks to construction personnel, all workers will be required to adhere to a safety compliance program. The safety compliance program will address appropriate site health and safety related issues including:

- personal protective equipment such as hardhats, safety glasses, orange vest, and steel-toed boots)
- job safety meetings and attendance requirements
- fall prevention
- construction equipment operation
- maintenance and protection of traffic
- hand and power tool use
- open hole and excavation area safety
- parking
- general first aid
- petroleum and hazardous material storage, use, containment and spill prevention
- posting of health and safety requirements
- visitors to the job site
- local emergency resources and contact information
- incident reporting requirements

Construction vehicles will avoid areas where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, all over-sized vehicles will be accompanied by an escort vehicle and/or flagman (if necessary) to assure safe passage of vehicles on public roads. The general public will not be allowed on the construction site. Temporary construction fencing or other visible barriers will be placed around excavations that remain open during off hours. The contractor will coordinate with local fire and emergency personnel to assure that they are aware of where various construction activities are occurring, and avoid potential conflicts between construction activity and the provision of emergency services (e.g., road blockages, etc.).

3.10.3.2 Operation

3.10.3.2.1 *Ice Shedding*

As stated previously, distance to the nearest public roads/non-participating residences will essentially eliminate any public safety risk associated with ice shedding. Therefore, mitigation is not proposed.

3.10.3.2.2 Tower Collapse/Blade Throw

In those rare instances where towers or blades have failed, the failure typically results in components crumpling or falling straight down to the ground. It would be very unusual for the tower to break off at the base and fall over. The setbacks included in the Town of Martinsburg ordinance should assure that a tower failure would not endanger adjacent properties, roadways, or utilities. In addition, members of the public do not have access to the private land on which the turbines are located, and as previously stated, distance to the nearest public road/non-participating residence essentially eliminates risk to the public due to tower collapse/blade throw. Therefore, mitigation is not proposed.

3.10.3.2.3 Stray Voltage

Stray voltage will be prevented through proper design and grounding of the project's electrical system. Although not anticipated, any reported stray voltage problems will be addressed through the project's Complaint Resolution Procedure. Beyond this, additional mitigation is not proposed.

3.10.3.2.4 Fire

An employee safety manual will be incorporated into the overall operating and maintenance policies and procedures for the project. Included in that manual will be specific requirements for a fire prevention program. In addition, a Fire Protection and Emergency Response Plan will be prepared for the Roaring Brook Project, and will include the following components:

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All project vehicles will be equipped with fire fighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.

- The MSDS for all hazardous materials on the project will be on file in the construction trailers (during construction) and the O&M building (during operation).
- The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan.

Development and implementation of this plan will assure that project construction and operation will not have a significant adverse impact on public safety, or the personnel and equipment of local emergency service providers.

3.10.3.2.5 Lightning Strikes

Beyond the turbines' lightning protection system, and the fire/emergency response plan described previously, no additional measures to mitigate the effects of lightning strikes are proposed.

3.10.3.2.6 Electrocutation

Roaring Brook Wind has committed to placing all buried electric lines a minimum of three feet below ground. All above ground lines will be built in strict accordance with all relevant National Grid standards/regulations. Beyond these activities, no additional measures to mitigate the potential for electrocution are proposed.

3.10.3.2.7 Electro-magnetic Fields

Because no significant impacts from EMF are expected, no mitigation is necessary. As previously indicated, all proposed electrical collection lines are expected to operate well below the state established standard for electric and magnetic fields. Roaring Brook Wind will voluntarily adhere to the magnetic field strength interim standards established in the New York State PSC's Interim Policy Statement on Magnetic Fields, issued September 11, 1990. The Interim Policy establishes a magnetic field strength interim standard of 200 mG, measured at one meter above grade, at the edge of the right-of-way, at the point of lowest conductor sag.

3.11 COMMUNITY FACILITIES AND SERVICES

Community facilities and services provided to the Project area include public utilities, police and fire protection services, emergency medical services (EMS), health care facilities, education facilities, waste disposal, and recreational facilities. The level of services provided to the Project area was

determined through review of publicly available data on the internet, or through telephone communications with County personnel, including the County Sheriff's Department, the County Emergency Services Coordinator, and the County Fire Coordinator.

3.11.1 Existing Conditions

Public Utilities and Infrastructure

Public utilities and infrastructure in the Project area include various overhead and underground facilities. Aboveground components include electric distribution and telephone lines along many of the public roads in the Project area. Underground utilities include sewer and water mains, telephone and cable television lines, and natural gas transmission lines. For the most part, these buried utilities are confined to the Village of Lowville and the hamlet of Martinsburg.

Police Protection

According to the New York State Division of Criminal Justice Services (2007), Lewis County had one of the lowest crime rates of New York State counties in 2006. The New York State Police, the Lewis County Sheriff's Office, and the Lowville Village Police Department have jurisdiction in and around the Project area. All three agencies maintain stations in or adjacent to the Village of Lowville, approximately 5 miles northeast of the Project area. The NYS State Police satellite station is on NYS Route 26, approximately 1.5 miles north of the Village of Lowville. There are 7 officers assigned to the Lowville station. The State Police provide 24-hour patrolling, with two officers per vehicle for the overnight shift. The Lewis County Sheriff's Department station is on Outer Stowe Street in the Town of Lowville. The Sheriff's Department has 16 road officers that also patrol 24 hours per day. All sheriff patrols are single-officer vehicles. The Village of Lowville Police Station is on Dayan Street and has four officers, with an officer on patrol 24 hours per day. The three agencies have coordinated emergency response so that the closest patrol car responds to a call. There are typically two state cars, two or three county cars, and one village car on patrol from 7 a.m. to 3 p.m., one or two state cars, two county cars, and one village car on patrol from 3 p.m. to 11 p.m., and one patrol from each agency on duty from 11 p.m. to 7 a.m. (Tabolt, pers. comm.).

Fire Protection and Emergency Response

Located on Whittaker Road in the hamlet of Martinsburg, the Martinsburg Volunteer Fire Department has jurisdiction over the entire Project area. The firehouse is located approximately 6.8 miles from the nearest proposed turbine site. The 32 volunteers respond to approximately 40 calls annually. As of December 2007, current equipment includes one pumper (1,250 gpm), two tankers (2,200 and 2,700 gallons), a rescue van, an equipment van, and portable generators and pumps. However,

according to Lewis County Fire Coordinator Jim Martin, a new 1,250 gpm pumper and two new tankers have been ordered (Martin, pers. comm.).

Lewis County Search and Rescue provides ambulance service to the middle third of Lewis County, including the Towns of Lowville, Harrisburg, Martinsburg, Denmark, Greig, Montague, and Watson. The ambulance station is located on West State Street in the Village of Lowville. The 65 volunteers respond to approximately 1,050 calls annually. In addition to three advanced life support ambulances and a rescue truck, they maintain global positioning system (GPS) equipment, a snowmobile sled, and two ATVs to assist in search and rescue missions associated with area ATV, snowmobile, and outdoor recreation activities (Tuttle, pers. comm.).

Health Care Facilities

Lewis County's primary health care facility, the Lewis County General Hospital and Residential Health Care Facility, is located on North State Street in Lowville, approximately 7.6 miles from the nearest proposed turbine site. Lewis County General is the only health care provider in the county and has been designated Sole Provider status by the Federal Government. The hospital provides 54 acute-care and 160 long-term beds for use by county residents and seasonal visitors. There are 82 physicians on staff, practicing emergency medicine, family medicine, internal medicine, general practice, general surgery, cardiac rehabilitation, obstetrics/gynecology, ophthalmology, orthopedic surgery, podiatry, pediatric medicine, and other services. The hospital also has adult day care, physical therapy, and occupational medicine. Lewis County General Hospital is the largest employer in the county, with over 425 employees (Lewis County General Hospital, 2007).

Educational Facilities

The project area is located entirely within the Lowville Central School District. The Lowville Academy serves approximately 1,440 students in elementary, middle, and high schools located on State Street in the Village of Lowville, approximately 6.5 miles east of the project area (Lowville Academy, 2007). Public education is also available at the Lewis County Jail School on Outer Stowe Street in Lowville (School Tree, 2007). The Lowville School District offers bus service to all elementary through high school students living within the project area.

In addition, there is one private religious school in the area. Hope Mennonite School serves 13 students in grades 1-10 (School Tree, 2007).

Parks and Recreation

The project area and vicinity includes several park and recreational facilities, including Whetstone Gulf State Park and Whittaker Falls Park. Whetstone Gulf State Park is built in and around a 3-mile-long gorge cut into the eastern edge of the Tug Hill Plateau. The gorge and associated trail offer spectacular scenic vistas. Other park facilities include overnight campsites, a picnic area along Whetstone Creek, a man-made swimming area, and hiking, snowmobiling, and cross-country ski trails. The park also includes Whetstone Reservoir, which is a popular canoeing and fishing destination. Whittaker Falls Park is maintained by the William H. Bush Trust. The park is open to the public and provides opportunities for hiking, picnicking, and overnight camping. No visitation figures are available for Whittaker Falls Park.

Areas of public recreational land in the vicinity of the project area that are administered by NYSDEC include portions of three state forest units, the Tug Hill Wildlife Management Area (WMA), the Lowville Demonstration Area, and the Beach's Bridge Boat Launch. State forestland includes the 8,077-acre Grant Powell State Forest located northwest of the Project area, the 13,789-acre Lesser Wilderness State Forest located east and southeast of the Project area, the 1,292-acre East Branch Fish Creek State Forest located south of the Project area, and the 2,048-acre Cobb Creek State Forest located north of the Project area. Recreational activities that occur on state forestland include hunting, trapping, fishing, hiking, bird watching, cross-country skiing, and snowmobiling. The Tug Hill WMA is a 5,114-acre area located southwest of the project area. Recreational activities that take place on the WMA include hiking, snowmobiling, camping, cross-country skiing, snowshoeing, hunting, fishing, bird watching, and trapping. The Lowville Demonstration Area includes 97 acres along the Black River, east of Lowville. The area includes a forestry nature trail and also provides opportunities for hiking, fishing (including a handicapped-accessible fishing deck), cross-country skiing, and bird watching. The Beach's Bridge Boat Launch is located on the Number Four Road east of Lowville. It provides a hard surface boat launch ramp on the Black River and parking for 10 cars and trailers.

Other park and recreational facilities within 10 miles of the project area include the Lewis County Fairgrounds, Veterans Memorial Park, and Bostwick Field in the Village of Lowville, and a community playground in the hamlet of Martinsburg.

3.11.2 Potential Impacts

The project is not expected to result in significant adverse effects on community facilities or services within the project area, including utilities, provision of emergency services, libraries, park and

recreational areas, and health care and public education facilities. In fact, the additional tax revenue generated by the project will help support these facilities and services without significantly drawing upon them.

3.11.2.1 Construction

During construction, the Project will result in no significant increase in the demand for utilities such as telephone, natural gas, electric, water, or sanitary sewer. However, the Project will have a beneficial impact by generating a total of up to 79.9 MW of clean renewable energy that can be used by the people of Lewis County and New York State.

Short term and minor impacts to existing electric distribution facilities may occur during the construction phase of the Project. National Grid owns the majority of the local overhead distribution poles and lines. Prior to the development of Project construction drawings, PPM will share the Project layout with National Grid representatives in order to determine potential areas of conflict between existing utility lines and construction activities. PPM will then contract a detailed survey (pole locations, line height, etc.) of all lines identified to have potential conflict. If conflicts cannot be avoided through minor shifts in access road alignment or the delivery route, National Grid will either have to temporarily raise a line(s), drop a line(s), or relocate a line(s). None of these activities will require new utility easements/right of ways.

The police, fire, and emergency response departments have adequate personnel and equipment to respond to basic emergency needs during construction of the Project. However, during construction, access to some area roadways may be temporarily blocked during the movement of large construction and delivery vehicles. In addition, damage to the roadways caused by oversized/heavy equipment has the potential to reduce the response time of emergency personnel. This is not anticipated to be a significant problem due to the small number of residents within the Project area, the general availability of alternate access routes, and correspondence and coordination that will occur between construction managers and local police and fire departments. The construction site could also experience vandalism/trespass problems that would require involvement of local police. However, based on experience with other wind power projects in New York State, this is not anticipated to be a significant impact.

Project construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Project work areas, and disposed of in dumpsters located at the

construction staging area(s). A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility.

During construction, the Project will not adversely impact the local school districts, beyond the possible delay of school bus pick-ups and drop-offs at homes within the Project area due to construction traffic/activity. PPM will coordinate construction travel routes with local school districts. Temporary construction workers will not create significant demand for school district services or facilities. These workers will also not generate a significant demand on local recreational facilities or other community services/facilities.

3.11.2.2 Operation

Once in operation, the Project will not result in any significant impacts to local utilities. Facility operation and maintenance will require energy use, but this impact will be minor because the amount of required electricity and fuel is small, and local fuel suppliers and utilities have sufficient capacity available to serve the Project's needs. As a result, no improvements to the existing energy supply system will be necessary. In addition, the Roaring Brook Wind Power Project will generate up to 79.9 MW of electric power, and will advance New York State's goal of having 25% of the state's power provided by renewable sources by 2013.

No significant problems that would require response by local police, fire, and emergency service personnel are anticipated to result from Project operation. The wind turbines are located at least 300 feet from property lines and public roads, and no permanent residential structures occur within 1,000 feet of a wind turbine. This is well outside of any area that could be affected in the unlikely event of a tower fall or catastrophic blade failure. Although operation of the proposed Project could result in accidents that result in personal injury and/or property damage, their occurrence is relatively unlikely, and well within the response capabilities of local emergency service providers. Local providers have experience in responding to fire and accidents in rural locations, including off-road areas used by hikers, ATVers, and snowmobilers. This topic is discussed in detail in Section 3.10.

As described in Section 3.10, local fire departments do not have the specialized equipment necessary to respond to a fire in one of the turbines. Generally, any emergency/fire situations at a wind turbine site or substation will be the responsibility of the Project owner/operator. Operations and maintenance personnel will be trained and equipped to deal with emergency situations that may occur at the Project site (e.g., tower rescue, working in confined spaces, high voltage, etc.), and will coordinate such efforts with the local departments.

During Project operation, very little solid waste will be generated. Any waste that is generated will be placed in containers or dumpsters at the O&M facility and hauled away on a regular basis (e.g., weekly) by a private contractor. The waste will be disposed of at a licensed solid waste disposal facility.

The Project is not anticipated to result in a significant increase in the demand for educational services/facilities. While the operating Project will require approximately 8 full-time employees, existing educational facilities/staff within the school districts are adequate to accommodate the addition of up to eight families to the area.

3.11.3 Proposed Mitigation

The impacts to community services resulting from the proposed Project are not of the type or magnitude to require mitigation. In fact, development of the proposed Project will have a negligible impact on population, and place little demand on community services. At the same time, the Project will provide significant income and tax revenue to the Town, county, and school districts. This income will more than offset any incurred costs, and will assist with the financing of community services that benefit all residents of the towns and county.

Due to the previous construction experience at the Maple Ridge Wind Farm, also located in the Town of Martinsburg, PPM Energy and the Town police, fire and emergency services personnel have an ongoing relationship and history related to the construction and operation of a wind generation facility. To alleviate any potential concerns regarding Project construction, PPM will meet with the local emergency service personnel (fire, police, and EMS) prior to initiation of construction activities to review the planned construction process. During this meeting, unique construction equipment/material, construction traffic routing, and construction scheduling/phasing will be discussed. Prior to construction, PPM will implement a coordinated emergency response plan, which will be developed in consultation with local emergency service personnel. The distance and response time of some of the emergency response personnel will be taken into account when initially developing the coordinated emergency response plan, along with identifying where various construction activities will be concentrated, the provision of maps and other related materials requested by emergency responders, and the development of alternate response routes in the event that the primary route is blocked by construction activities.

On-going communication between PPM and Town police, fire, and emergency services officials will help assure adequate levels of protection related to the Project. PPM representatives will meet with fire and police and other emergency responders to develop plans to address potential public safety issues. The Fire Protection and Emergency Response Plan to be prepared for the Project will include the following components:

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All Project vehicles will be equipped with fire fighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.
- The MSDS for all hazardous materials on the Project will be on file in the construction trailers (during construction) and the O&M building (during operation).
- The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan.

PPM shall coordinate with the local fire departments and emergency service agencies with regard to training, practice drills and documentation of appropriate actions in case of emergency circumstances at the Project. Such documentation shall include the locations of all emergency shutdown controls, location of any potentially hazardous materials, and site maps showing access routes. The Operator will provide emergency plan updates to the Town of Martinsburg within 4 weeks after any changes in operation or facility occur.

Because the solid waste impacts of the Project will be minimal, and because the Project will utilize existing permitted disposal facilities (in accordance with applicable laws and the local town ordinances), the Project will not create any conflict with the county's solid waste management plan.

3.12 COMMUNICATION FACILITIES

To evaluate the potential for the Project to impact existing telecommunication signals, Comsearch was contracted to conduct an Off-Air Television Reception Analysis, Licensed Microwave Search, Land Mobile Radio (LMR) Search, and a Cellular/PCS Telephone Search in the vicinity of the proposed Roaring Brook Wind Power Project site (see reports in Appendix Q).

3.12.1 Existing Conditions

3.12.1.1 Microwave Analysis

Microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-sight conditions between each antenna. Comsearch (2007) identified no microwave paths that intersect the Project area (see Figure 1 in Appendix Q).

3.12.1.2 Off-Air Television Analysis

The television reception analysis identified all off-air television stations within a 100-mile radius of the proposed Project (as measured from the approximate center of the Project site). Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna. The results of the study indicate that there are one hundred fifty six (156) off-air television stations within 100 miles of the Project site (see Appendix Q). One hundred twenty-seven (127) of these are U.S. stations and thirty one (31) of them are Canadian.

The most likely stations that will produce off air coverage to the Project site are those within a distance of approximately 40 miles or less. Comsearch concludes that given the service and coverage of the stations identified, the number of US stations available to the local communities is extremely limited. As a result, most residents in the area likely view television programming through the use of cable or a satellite dish.

3.12.1.3 AM and FM Broadcast Analysis

The Comsearch analysis did not include a search for AM and FM stations licensed within the proposed Project site.

3.12.1.4 Mobile Phones (cellular and PCS)

Cellular and personal communication system (PCS) services are available within the Roaring Brook Wind Power Project site. There are two (2) cellular telephone operators and eight (8) PCS telephone operators.

3.12.1.5 Land Mobile Radio (LMR) Coverage

Comsearch determined that there were four hundred fifty six (456) LMR systems registered within fifteen (15) miles of the center of the Project site. The majority of registered LMR operators are governmental bodies, i.e. State of New York, Lewis County, and local municipalities. The LMR coverage is the result of the placement of tower-mounted repeaters. All of the LMR repeaters are located outside of the Project site.

3.12.2 Potential Impacts

3.12.2.1 Construction

Temporary communication interference as a result of Project construction is theoretically possible. Cranes used during construction activities (and the individual turbine components being raised by the cranes) can cause temporary obstruction of microwave links as well as some degradation to television and radio signals (L. Polisky, pers. comm.). However, because there are no microwave paths that cross the Project area, there is no potential for microwave interference by construction activities. Any impact on television or radio reception caused by construction equipment would be temporary, as assembly and erection is typically completed within 2 days per turbine.

3.12.2.2 Operation

3.12.2.2.1 Microwave Communication Systems

To ensure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each antenna, but also within a mathematical distance around the center axis known as the Fresnel Zone. Since no microwave paths cross the Project site, Project operation is not anticipated to result in any interference to microwave communications.

3.12.2.2.2 Off-Air Television System

Comsearch examined the coverage of the identified off-air television stations within a 100-mile radius of the Project site and the potential for degraded television reception as a result of Project operation. The Comsearch report indicated that off-air stations located within 40 miles of the Project site are most likely to provide serviceable coverage for local residents. Of the one hundred fifty six (156) stations initially identified, twenty two (22) stations are located within the 40-mile range, none of which are Canadian stations. Of the twenty two (22) stations located within the 40-mile range, only eleven (11) were operational at the time of the Comsearch analysis (December 2007). Of the eleven (11) operational stations, three are full power analog stations, two are full power digital

stations, and three are low power stations with limited coverage. According to the Comsearch study, only the full power/full service analog and digital stations are capable of providing coverage to the area in the vicinity of the Project. Based on the low number of TV channels available and the difficulty of most communities to receive the signals it is not expected that the off-air television stations are the primary mode of delivering television service to the local communities. Television service is more likely delivered through TV Cable service and/or direct satellite broadcast. Satellite reception is unaffected by the presence of the wind turbines as long as the earth station antennas have a clear view of the satellite and are not obstructed by the wind turbines. As a result, the Project is not likely to impose significant impacts to television reception in the area. However, because some level of off-air coverage is provided to the area, impacts to existing television reception for some communities and/or individual receptors as a result of the Project are possible (i.e., those that rely exclusively on off-air coverage). Specifically, the loss of one or more of these stations to residents who rely only on off-air reception for television programming would likely represent a significant impact. These impacts would most likely include noise generation at low VHF channels within 0.5 mile of turbines, reduced picture quality (ghosting, shimmering), and signal interruption (NWCC, 2005).

3.12.2.2.3 AM and FM Broadcast

AM radio interference is not a problem as long as the separation of each turbine from the AM antenna is greater than 1-km for an Omni-Directional antenna and 3-km for an AM directional antenna. FM is normally not a problem because the antennas are usually installed much higher than the tops of the turbines and FM audio signals are not affected as noticeably as video signals. The remote location of this project is well removed from any existing antenna.

3.12.2.2.4 Mobile Phones (cellular and PCS)

Telephone mobile communications in the cellular and PCS frequency bands should be minimally affected by the presence of the wind turbines. This applies to operations both within and outside of the Project site. Signal blockage caused by wind turbines is not very destructive to the propagation of the signals in these frequency bands. In addition, these systems are designed so that if the signal from (or to) a mobile unit cannot reach one cell, it will be able to reach one or more other cells in the network. Therefore, local obstacles are not normally a problem for these systems, whether they are installed in urban areas near large structures and buildings, or in a rural area near a wind energy facility.

3.12.2.2.5 Land Mobile Radio (LMR) Coverage

Considering the frequencies at which these systems operate, and the fact that the channels are used for audio, coverage should not be a problem when the turbines are installed.

3.12.3 Proposed Mitigation

3.12.3.1 Construction

If disruptions to existing communication systems occur as a result of Project construction, they will be temporary, and will only occur during the erection of specific turbines. Because turbine installation/crane activity will occur at different locations and at different times during the construction period, any degradation/disruption to existing communications will not represent a constant interference to a given television/radio reception area or microwave signal (L. Polisky, pers. comm.). In addition, turbine erection will be performed as efficiently as possible. Under favorable conditions, one turbine can be erected in one day. Therefore, mitigation for construction interference is not warranted.

3.12.3.2 Operation

3.12.3.2.1 *Microwave Communication System*

The Project, as currently proposed, will not impact existing microwave communications. If future turbine layout revisions are necessary, the new layout will be designed so as not to interfere with existing microwave paths. Beyond this, additional mitigation is not necessary and is therefore not proposed.

3.12.3.2.2 *Off-Air Television Systems*

If Project operation results in any impacts to existing off-air television coverage, the developer/operator will address and resolve each individual problem as commercially practicable. Mitigation actions could include adjusting existing receiving antennas or possibly upgrading either the antenna or the cable connecting the antenna to the television. In addition, the FCC's mandate to transition all off-air television broadcasts from analog signals to digital signals by February 2009 will eliminate any turbine-related contrast variation (shimmering), thus reducing the potential for television signal interference from wind turbines (L. Polisky, pers. comm.).

3.12.3.2.3 AM and FM Broadcasts

The proposed Project will not result in any interference to existing AM and FM Broadcasting Network Systems. Therefore, no mitigation is necessary, and none is proposed.

3.12.3.2.4 Mobile Phones (cellular and PCS)

If a cellular or PCS company were to claim that their coverage had been compromised by the presence of the proposed Project, coverage could be restored by installing an additional cell or an additional sector antenna on an existing cell for the affected area. Utility, meteorology, and/or the turbine towers within the Project site could serve as the structure platforms for the additional cellular or PCS base station or sector antennas.

3.12.3.2.5 Land Mobile Radio (LMR) Coverage

If there is a reported change in LMR coverage in the area, it can be easily corrected by repositioning or adding repeaters that operate with the LMR mobile systems. This could be accomplished by adding or positioning the repeaters at locations within the Project site. Repeater antennas could also be installed on utility, meteorological, or turbine towers within the Project site, if needed.

3.13 LAND USE AND ZONING

Land use and zoning in the project area was determined through review of local town codes, tax parcel maps, aerial photographs, and field review. Land use and zoning are discussed in terms of regional land use patterns, project area land use and zoning, and future land use.

3.13.1 Existing Conditions

3.13.1.1 Regional Land Use

The proposed wind farm is located in the Town of Martinsburg, in central Lewis County. Lewis County is centrally located in the northern section of New York State, north of Utica-Rome, and east of Lake Ontario and the City of Watertown. The County includes the Tug Hill Plateau to the west, the Adirondack foothills to the east and the Black River Valley running north and south through the center (Lewis County CEDS). Lewis County is bordered by Jefferson County to the west, St. Lawrence County to the northeast, Herkimer County to the east, Oneida County to the south, and Oswego County to the southwest.

The Town of Martinsburg is located in the geographic center of Lewis County. The town is rural and characterized by an abundance of dairy farms and active agricultural land, interspersed with small nodes of more concentrated development. Within the region, higher-density residential and commercial development is concentrated in the Villages of Lowville and Copenhagen, in small hamlets such as Glenfield, Martinsburg, and West Martinsburg, and along major roads such as NYS Routes 12, 26, and 177.

Lowville is the residential, commercial, and governmental hub of the area. It includes numerous older/historic homes along streets typically lined with mature trees. The village includes Lewis County government facilities, a main commercial district along State Street, and businesses and industries around the village perimeter (shopping centers, automobile sales/repair, convenience stores, Kraft Foods, AMF, etc.). The existing Maple Ridge Wind Farm is located in Lewis County, northeast of the Project site in the Towns of Martinsburg, Harrisburg, and Lowville.

There are approximately 721 working farms in Lewis County, occupying 196,774 acres, or 24% of Lewis County. Of that total, 97,402 acres were classified as harvested cropland and 32,437 acres as pastureland (USDA National Agricultural Statistics Service, 2002). 10.5% of residents within the Town of Martinsburg (59 residents) indicated farming, fishing or forestry as their primary occupation (U.S. Census Bureau, 2007).

Current land use patterns within the Town of Martinsburg are similar to those of the larger region. The Town is predominantly rural, with the majority of land being active agricultural fields, vacant land, or undeveloped forestland. According to the New York State Office of Real Property Services (NYSORPS), 37.7% of all parcels of land within the town are designated as residential properties (NYSORPS website). Residential development, consisting of individual single-family homes and farmhouses, is concentrated along state, county, and local highways.

3.13.1.2 Project Area Land Use and Zoning

The project area is characterized by a variety of mostly undeveloped land, including managed forests and wetlands. Land within the generating portion Project area belongs to a single landowner, and contains no permanent residential buildings. However, there are three seasonal hunting camps dispersed through the Project area, and a network of private roads (seasonal use only).

The Town of Martinsburg Development Law designates six zoning districts: Hamlet (H), Agricultural (A), Rural Residential (RR), Forest Resources (F), Wind Power Overlay (WPO), and Water Supply Protection Overlay (WSP). All land in the Town of Martinsburg is assigned to one of the first four districts (H, A, RR, or F), and then overlay districts (WFO and WSP) are assigned over the underlying land use zones. WPO-designated areas allow wind power generating facilities upon application to the Town Board and the Town Planning Board. The entire generating portion of the Project area is zoned F and WPO (See Figure 12). Operation and maintenance of essential facilities (e.g., substations, electric power lines) within the Town of Martinsburg require a special use permit issued by the Town Planning Board in districts identified as RR, A, and F; no special use permit for essential facilities is required in H districts (Town of Martinsburg, 2005).

Table 22 summarizes the requirements and approvals associated with zoning approval of wind power generating facilities in the Town of Martinsburg.

Table 23. Wind Energy Facility Requirements and Approvals for the Town of Martinsburg

Requirements	Approvals
<ul style="list-style-type: none"> • Wind power generating facilities are allowed as a conditional use in a Wind Power Overlay (WPO) district, pursuant to approval of a WPO by the Town Board. • Overlay guidelines for wind power generating facilities include: <ul style="list-style-type: none"> - Setback from road centerline: 300 feet - Setback from side and rear lot: 300 feet, which can be waived by the Planning Board if neighboring parcels are also participating in the wind project or in the case of a non-participating neighbor, the applicant has secured a development easement from the neighbor - Setback from any existing residential structure: 1,000 feet - Screening of accessory structures from adjacent residences - Appropriate landscaping to keep site neat and orderly 	<ul style="list-style-type: none"> • Zoning amendments adopted by Town Board • Approval of WPO from Town Board • Approval of special use permit from Planning Board

3.13.1.3 Future Land Use

Other than the proposed project, future land use patterns in the area are anticipated to remain largely unchanged for the foreseeable future. The Lewis County Industrial Development Agency (LCIDA) continues to promote agriculture, forestry, manufacturing, and recreation as growth opportunities (LCIDA web site). Current land use patterns in the Town of Martinsburg is expected to remain largely unchanged, with an emphasis on agricultural, forest resource, and recreational uses. However, land use within the project area which includes the electrical collection line is anticipated to undergo some degree of change as farms are sold and agricultural land goes out of production. An influx of Amish and Mennonite farmers from out-of-state is serving to keep many farms in production.

However, some active and abandoned agricultural lands are being purchased, subdivided, and converted to homes and seasonal camps for recreational use (e.g., hunting and snowmobiling).

3.13.2 Potential Impacts

The Project will be compatible with the forestland use that dominates the Project site. However, there will be minor impacts to land uses within the Project site and the larger community. Anticipated land use and zoning impacts are described below.

3.13.2.1 Construction

Construction of the generating site will result in the temporary disturbance of approximately 203 acres of land zoned as forested. No impacts to land zoned as Hamlet, Agricultural, or Rural Residential are proposed as part of the generating site. Along the electrical collection line, approximately 12,800 linear feet of land zoned as Agricultural (A), approximately 26,800 linear feet of land zoned as Rural Residential (RR), and 12,800 linear feet of land zoned as Forest Resources (F) will be crossed by the proposed buried and overhead portions of the electrical interconnection line which connects the proposed collection substation to the generating site.

Construction activities could have temporary impacts on forest management/timber harvest activities. Movement of equipment and materials could temporarily block or damage forest access roads. Timber harvest activities may also need to be curtailed/rescheduled in certain areas to avoid interfering with Project construction. It is anticipated that any marketable timber that results from forest clearing activities will be salvaged and stockpiled for use/removal by the landowner. Construction impacts to forestland have also been minimized by siting turbines in previously disturbed areas and using the existing network of forest roads, log landings, and skid trails to accommodate proposed access road and interconnect routes. Improvements to existing roads to accommodate construction activity will ultimately enhance access to these properties for future forest management activities.

3.13.2.2 Operation

The Project as proposed is consistent with existing zoning/wind energy facilities regulations and land use patterns within the Town of Martinsburg. The Project will occur entirely on private land in areas dominated by managed/disturbed forestland. Project components will be sited in accordance with local setback requirements and no public lands or recreational facilities will be impacted. Therefore, impacts to residential, commercial, and recreational land use will be minimized. The operating Project will be largely compatible with forestland use, which dominates the Project site.

Only very minor changes in land use within the Project site are anticipated as a result of Project implementation. The 39 turbine sites, substation, and other ancillary facilities represent the cumulative conversion of approximately 27 acres of land from its current use (plus 37 acres of land previously disturbed/developed). During Project operation, additional impacts on land use should be infrequent and minimal. Other than occasional maintenance and repair activities that could have impacts similar to those described in Section 3.7.2.1, the Project should not interfere with on-going land use. The presence of wind turbines may also limit or prevent the conversion of forestland to seasonal or permanent residential use.

3.13.3 Proposed Mitigation

Beyond reducing impacts to agricultural land along the electrical interconnection route and forest land on the generating site, other mitigation measures will be undertaken to reduce the impact of the wind energy facilities on land use and zoning (including full compliance with the Town of Martinsburg Development Law). These include:

- Locating all electrical gathering lines underground to the maximum extent practicable, or siting above ground lines in hedgerows or out of areas being actively cultivated.
- Lighting towers only to the extent necessary to comply with FAA requirements. Lighting for the substation and other ground level facilities will be kept to a minimum and generally operated by switch or motion detector.
- Utilizing tubular towers and finishing structures with a single, non-reflective matte finish color.
- Avoiding use of guy wires on permanent wind measurement towers.
- Installing turbines in locations where proximity to existing fixed broadcast, retransmission, or reception antenna for radio, television, or wireless phone or other personal communications systems will not produce electromagnetic interference with signal transmission or reception.
- Designing all Project components in a way that minimizes the impacts of land clearing and the loss of open space. Land protected by conservation easements is being avoided.
- Locating Project components so as to minimize impacts on state and federal jurisdictional wetlands.
- Managing storm water run-off and erosion control in a manner consistent with all applicable state and federal laws and regulations.
- Removing all solid waste, hazardous materials, and construction debris from the site and managing its disposal in a manner consistent with all appropriate rules and regulations.
- Generally limiting construction to the hours of 7 a.m. to 7 p.m., in accordance with local laws.

These actions will assure that adverse impacts on land use and zoning are minimized or mitigated to the extent practicable.

4.0 UNAVOIDABLE ADVERSE IMPACTS

The proposed Project will result in significant long-term economic benefit to participating landowners, as well as to the Town of Martinsburg, the local school districts, and Lewis County (see Section 3.9). When fully operational, the Project will provide up to 79.9 MW of electric power generation with no emissions of pollutants or greenhouse gases to the atmosphere. The development of the site is consistent with surrounding land uses and will help maintain the area in rural open space use.

Despite the positive effects anticipated as a result of the Project, its construction and operation will necessarily result in certain unavoidable adverse impacts to the environment. The majority of the adverse environmental impacts associated with the Project will be temporary, and will result from construction activities. Site preparation (e.g., clearing, grading), improvement of local roads, and the improvement of existing forest roads, installation of new roads, turbines, interconnects, a staging area, the O&M building, a meteorological tower, and the point of interconnection/collection station will have short-term and localized adverse impacts on the soil, water, agricultural and ecological resources of the site. This construction will also have short-term impacts on the local transportation system, air quality, and noise levels. These impacts will largely result from the movement and operation of construction equipment and vehicles, which will occur during the seven-month development of the Project. The level of impact to each of these resources has been described in other sections of the DEIS and will generally be localized and/or of short duration.

Long-term unavoidable impacts associated with operation and maintenance of the Project include turbine visibility from isolated locations within the town (and immediately adjacent towns). The presence of the turbines will result in some change in perceived land use from some areas, but in many areas will simply appear as a part of or extension of the existing Maple Ridge Wind Farm. The Project also may function to keep land within the Project site in rural forest land condition, thus protecting open space and existing land use patterns. Project development will also result in a loss of successional forest land, wildlife habitat changes, and some level of avian and/or bat mortality associated with bird/bat collisions with the turbines. As described in Section 3.0, these impacts range in significance from minor to significant.

Although adverse environmental impacts will occur, they will be minimized through the use of various general and site-specific avoidance and mitigation measures. With the incorporation of these mitigation measures, the Project is expected to result in positive, long-term overall impacts that will offset the adverse effects that cannot otherwise be avoided.

The following subsections summarize general mitigation and avoidance measures that have been incorporated into the Project design, and specific mitigation and avoidance measures proposed to minimize adverse impacts to specific resources.

4.1 GENERAL AVOIDANCE AND MITIGATION MEASURES

General mitigation measures include compliance with the conditions of various local, state, and federal ordinances and regulations that govern Project development, as well as the inherent characteristics of the Project. The primary government review/approval processes that apply to the Project include:

- State Environmental Quality Review Act (SEQRA).
- New York State Department of Transportation (NYSDOT) and Lewis County Highway Department regulations.
- Federal Clean Water Act regulations (Section 404 nationwide permit, 401 water quality certification) including corresponding required agency consultations with the US Fish and Wildlife Service for potential impacts to threatened or endangered species.
- Town of Martinsburg building and/or zoning regulations.
- Town of Martinsburg Wind Energy Facilities Law.
- NYSDEC water resources regulations (Article 24, Article 15, Section 401 water quality certification).
- NYSDEC SPDES regulations (stormwater management).
- Occupational Safety and Health Administration (OSHA) regulations (standard conditions for safe work practices during construction).
- NYS Agricultural Districts law.

SEQRA regulations require environmental review of proposed development projects so that potential adverse impacts and public concerns can be identified prior to Project implementation and avoided or mitigated, to the extent practicable. This DEIS was prepared in accordance with these regulations, and provides a primary means by which the potential costs and benefits of the Project are described and weighed in a public forum. Compliance with SEQRA regulations will assure that public and agency comments are solicited and appropriately addressed, Project alternatives are evaluated, and potential adverse impacts are identified and mitigated to the extent practicable. Response to comments and preparation of a Final Environmental Impact Statement (FEIS) will provide the information necessary for the lead agency and other involved agencies to draw

conclusions (Findings Statement) regarding the Project's overall environmental impacts and impose conditions on its approval, if necessary.

Compliance with the other various federal, state, and local regulations governing the construction and design of the proposed Project also will serve to minimize adverse impacts. Construction activities and building designs will be in compliance with state and local building codes and federal OSHA guidelines to protect the safety of workers and the public. State and Federal permitting required by the NYSDEC and the USACOE will serve to protect water resources, while state and county highway permitting will assure that safety, congestion, and damage to highways in the area is avoided or minimized. Compliance with town ordinances that require building and highway permits will further serve to minimize impacts of the Project. The local Wind Energy Facilities Law contains protective requirements for the siting and regulation of wind power projects that are consistent with (or exceed) the requirements found in other local wind power ordinances in New York State.

Along with regulatory compliance, the final Project layout will be in accordance with various siting criteria, guidelines, and design standards that serve to avoid or minimize adverse environmental impacts. These include:

- Siting the Project away from population centers and areas of residential development.
- Siting turbines in compliance with all local set-back requirements to minimize noise, shadow flicker, and public safety concerns.
- Following NYS&M Agricultural Protection Guidelines for potential impacts associated with the electrical interconnection line.
- In areas where steep slopes are traversed by the electrical interconnection line, the lines will be run overhead as opposed to underground to reduce soil disturbance in erosion-prone areas.
- Utilizing existing disturbed areas (existing forest road crossings) for stream and wetland crossings, to the maximum extent practicable.
- Using existing forest roads for turbine access whenever possible, to minimize impacts to soil, ecological, wetlands/streams, and forestland.
- Minimizing overhead electrical lines and designing any overhead electrical line in accordance with Avian Power Line Interaction Committee (APLIC) guidelines to minimize impacts on birds.
- Project design, engineering, and construction will be in compliance with various codes and industry standards to assure safety and reliability.

- Limiting turbine lighting to the minimum allowed by the FAA to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
- Construction procedures will follow Best Management Practices for sediment and erosion control.
- Turbines will include grounding and automatic shutdown/braking capabilities to minimize public safety concerns.

4.2 SPECIFIC MITIGATION MEASURES

Project development and operation will also include specific measures to mitigate potential impacts to specific resources. These were described in detail in Section 3.0, but generally include the following:

- Implementing a complaint resolution procedure to address landowner concerns throughout Project construction and operation.
- Developing and implementing various plans to minimize adverse impacts to air, soil, and water resources, including a dust control plan, and sediment and erosion control plan (see Section 3.1.3 for additional information and Appendix A for typical details).
- Video documentation of existing road conditions, development of a road improvement plan, and undertaking public road improvement/repair at no cost to the town or county.
- Post-construction avian and bat monitoring studies to monitor Project impacts on birds and bats and sharing data with other interested agencies and research entities.
- Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant predictable level of funding for the towns, county, and school districts.
- Implementation of an emergency response plan with local first responders.

4.3 ENVIRONMENTAL COMPLIANCE AND MONITORING PROGRAM

In addition to the mitigation measures described above, PPM Energy will implement an environmental compliance program and employ one on-site environmental monitor to oversee compliance with environmental commitments and permit requirements. The environmental compliance program will be similar to that utilized on PPM Energy's Maple Ridge Wind project in Lewis County (TtEC, 2005), and will include the following components:

1. Planning – Prior to the start of construction, the environmental monitor will review all environmental permits and, based upon the conditions/requirements of the permits, prepare an environmental management document that will be utilized for the duration of the Project. This

document will outline environmental requirements for construction and restoration included in Project permits and approvals.

2. Training – The environmental monitor will hold environmental training sessions that will be mandatory for all contractors and subcontractors. The purpose of the training sessions will be to explain the environmental compliance program in detail prior to the start of construction.
3. Preconstruction Coordination – Prior to construction, the contractor(s) and the environmental monitor will conduct a walkover of areas to be affected by construction activities. This walkover will identify landowner restrictions, sensitive resources, limits of clearing, proposed stream or wetland crossings, and layout of sediment and erosion control features. The limits of work areas, especially in sensitive resource areas, will be defined by flagging, staking, or fencing prior to construction, as needed.
4. Construction and Restoration Inspection – The monitoring program will include the inspection of construction work sites by the environmental monitor. The monitor will be present during construction at environmentally sensitive locations, will keep a log of daily construction activities, and will issue periodic/regular reporting and compliance audits. Additionally, the monitor will work with the contractors to create a punch list of areas for restoration in accordance with issued permits. Following construction, PPM Energy or an environmental monitor will maintain a monitoring presence following completion of site restoration to evaluate areas disturbed during construction and assure that ecological and land use functions and values are restored and maintained over the long term.

5.0 ALTERNATIVES ANALYSIS

SEQRA (6 NYCRR Part 617) requires that an EIS evaluate all reasonable project alternatives. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable". As described in §617.9 (b)(5)(v), an EIS must contain a description and evaluation of the range of reasonable alternatives to the action that are feasible, considering the objectives and capabilities of the project sponsor. As stated in Section 2.2, the objective of the proposed action is to take advantage of the available wind resource and New York bulk power transmission system availability in order to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid. PPM Energy has a 79.9 MW interconnection request with the NYISO, therefore the preferred alternative is to construct a facility that can produce up to 79.9 MW of renewable energy. The Roaring Brook Wind Power Project is currently proposed as a 78 MW facility and is planned to have a total net annual generation of approximately 204 GWh, delivered to National Grid's existing 115 kV line, or enough electricity to meet the average annual consumption of approximately 40,000 average NYS households.

Additionally, §617.9 (b)(5)(v) indicates the description and evaluation of each alternative should be at a level of detail sufficient to permit a comparative assessment of the alternatives discussed. It is well-established law under SEQRA that "the degree of detail with which each alternative must be discussed will vary with the circumstances and nature of each proposal." (*King v Saratoga County Bd. of Sup'rs*, 223 AD2d 894 [3d Dept 1996], *aff'd* 89 NY2d 341 [1996]; Impact Review, § 5.14 [3].) The range of alternatives must include the no action alternative. The no action alternative discussion should evaluate the adverse or beneficial site changes that are likely to occur in the reasonably foreseeable future, in the absence of the proposed action. The range of alternatives may also include, as appropriate, alternative:

- (a) sites;
- (b) technology;
- (c) scale or magnitude;
- (d) design;
- (e) timing;
- (f) use; and
- (g) types of action. For private project sponsors, any alternative for which no discretionary approvals are needed may be described. Site alternatives may be limited to parcels owned by, or under option to, a private project sponsor;

The following alternatives to the proposed action are described and evaluated: alternative project area/ project sites, alternative project design/layout, alternate project size, alternative technologies and no action. These alternatives offer a potential range and scope of development for comparative analysis and consideration.

5.1 ALTERNATIVE PROJECT AREA/PROJECT SITES

Under 6 NYCRR § 617.9(b)(5)(v)(g), site alternatives addressed in an EIS may be limited to parcels owned by, or under option to, a private project sponsor. PPM Energy does not own, or have under option, any contiguous parcels in Lewis County other than the ones that constitute the Project site. Therefore, there is no requirement to evaluate any alternative project areas. Nonetheless, this section provides background information on the selection of the Project site to facilitate understanding of the criteria that PPM Energy employed.

The preliminary selection of wind turbine locations on a regional or statewide basis is constrained by several factors that are essential for the Project to operate in a technically and economically viable manner. These factors include the following:

- adequate wind resource
- adequate access to the bulk power transmission system, from the standpoints of proximity and ability of the system to accommodate the interconnection and accept and transmit the power from the Project
- contiguous areas of available land
- compatible land use
- willing land lease participants and host communities
- limited population/residential development

In selecting a specific project area, several design factors greatly favor rural areas for commercial wind development, particularly turbine spacing and setback requirements. Generally, approximately 60 acres of land is required per MW-scale wind turbine for the turbine to perform properly under New York state wind conditions (required air space). Although the actual footprint of the wind turbine is much smaller, this amount of airspace is required to minimize effects turbines have on one another when sited down wind. In sum, a dense array of wind turbines may result in reduced wind capture and impose unacceptable stresses on operating wind turbine components. These larger land requirements also favor other design considerations including acceptable setback distances from residential areas.

Several areas of the northern tier of New York have the desired combination of these attributes that make them more suitable for commercial wind development such as rural settings, proximity to high-voltage power lines, and higher elevations and proximity to lake-effect weather. During the development of the Maple Ridge Wind project, PPM Energy began a search of other potentially suitable sites in New York, including areas in the vicinity of Maple Ridge, Southern Lewis, Oneida, Herkimer, St. Lawrence, Franklin, Clinton, and Jefferson Counties. Initial criteria evaluated include the above referenced essential factors to operate a viable wind power facility.

During this site search, PPM Energy identified feasible sites in St. Lawrence, Franklin, Herkimer and Jefferson counties and initiated development activities, including the installation of meteorological monitoring stations, on specific sites within these counties.

In particular, several other sites in southern Lewis County and northern Oneida County that might also interconnect to the same 115kV high-voltage electrical line were considered for development. Meteorological towers were installed on several of these sites to measure the wind potential. Although the wind data from southern Lewis County sites looked favorable, closer examination of these sites indicated an unacceptably high number of permanent residential structures in the vicinity of the proposed tower locations. Northern Oneida County sites were more distance from settled areas, but the wind data was less favorable to development. Consequently, development of these areas specifically, was abandoned in favor of the Roaring Brook generating site location.

Specific to willing landowners, PPM energy was approached by a Lewis County resident who, owned approximately 4,000 acres of contiguous land, had independently erected a wind measurement tower and subsequently requested PPM Energy to determine if there was an adequate wind resource on his land, and if other essential factors were present to allow for development of a wind power project.

In addition to the landowner's support for a wind project on his property, PPM Energy selected the proposed Roaring Brook site for the following reasons:

- It provides a desirable wind resource; based upon an ongoing meteorological monitoring program initiated in October 2005.
- It is proximate to the National Grid 115 kV Taylorville-Boonville transmission line; a suitable transmission facility, which has available capacity to transmit power from the Project to the New York State grid;

- The site is very remote, and the area within the vicinity of the proposed Project generating site is of low population and residential density. Therefore turbines on the this site will generally be remote from population centers and occupied structures and will readily exceed setback requirements as set forth in the Town's Zoning Ordinance.
- The project site consists of significantly logged/managed forestland with an existing extensive system of adequate logging roads within the generating site that will significantly minimize necessary infrastructure development.

5.2 ALTERNATIVE PROJECT DESIGN/LAYOUT

5.2.1 Wind Turbine Selection

Several factors drive the selection of wind turbines for the Project, including market competition, market (supply) availability, industry trends, and importantly, site and wind resource suitability. As discussed in Section 2.5.2, the type of wind turbine generator proposed for the Project is a 2.0 MW, three-bladed, upwind turbine design with 100 meter hub height and 90 meter rotor diameter. Most modern commercial scale wind turbines are three-bladed designs with the rotor position maintained upwind (on the windy side of the tower) using electrical motors in their yaw mechanism (mechanism used to turn the wind turbine rotor against the wind). The vast majority of commercial scale turbines sold in world markets have this design.

Wind power projects in New York (both proposed and operational) include turbines that range in size from 660 kW to 2.5 MW. Driven by both economics and technical change, the national and international trend in the industry is towards larger turbines, in the form of taller towers, larger rotor diameters, and nameplate capacities in the 2.X MW class. Typical proposed turbines have 78 to 100 meter tall hub heights and 77 to 100 meter diameter rotors. Higher hub heights generally equate to higher wind speeds while larger rotor diameters capture more of the available wind energy. The site specific wind resource characteristics are the drivers in selecting the optimal hub height, rotor diameter, as well as the turbine design to maximize wind energy capture and electricity generation. Wind turbines are designed for various wind speed profiles from very energetic Class I regimes (average wind speeds greater than 8.5 m/s) to lower Class III regimes (< 7.5 m/s). These lower Class III wind conditions are typical to New York and typical of the Roaring Brook site, and the use of Class III turbines here is consistent with the stated objectives of PPM Energy and current industry practices.

Alternatively, if the Project specified the use of smaller (lower hub height/smaller rotor diameter/smaller rated capacity) the number of turbines required to meet the Project's stated

purpose, need and benefits would have to increase. Table 23 provides examples of wind turbine types and capacities below the 2.X MW rating currently proposed, and then indicates the number of turbines needed to meet the interconnection capacity request of 79.9 MW.

Table 24. Examples of Turbines with < 2.X MW Rating

Turbine Type/Manufacturer	Rated Capacity	Rotor Diameter (meters)	Height Range (meters)	# of Turbines needed to reach 79.9 MW
GE77 sle	1500 kW (1.5 MW)	77	67-80	53
Siemens SWT 1.3	1300 kW (1.3 MW)	62	Varies	61
Suzelon 950	950 kW	64	65	84
Vestas V52	850 kW	52	65-86	94

The current generating site boundary cannot accommodate a project of greater than 50 turbines, due to site constraints including turbine spacing requirements and significant freshwater wetlands (and associated 100 foot regulated adjacent areas). The use of a greater number of smaller turbines (lower hub height and/or smaller rotor diameter) may have the effect of minimizing visibility (See section 3.6 for a discuss of visual impacts of the proposed turbines), but due to the remoteness of the generating site and the quantities of existing forested vegetation in the Project vicinity, this change is not warranted as mitigation. Temporary and permanent impacts to streams, wetlands, soils, and vegetation associated with constructing more than 39 turbines and associated infrastructure (gathering lines, staging areas and roads) would significantly outweigh any slight potential benefits associated with smaller turbines.

For example, using the impact assumptions presented in Table 1, the analysis of constructing approximately 53 1.5-MW wind turbines (to achieve up to 79.9 MW) and associated facilities can be performed. Development of 53 turbines is an approximately 35% increase in site development footprint. It is reasonable to assume there would be a proportional increase in length of new access roads, electrical gathering lines, and staging area size. It can also be assumed that the existing substation size, meteorological towers, and electrical interconnection line can remain similar in size to a 39 turbine project and not need to proportionally increase. Using these assumptions, it is estimated that the overall impacts to vegetation, streams, wetlands and soils will also increase by approximately 35%. For example, the overall permanent loss or conversion of successional land as a result of constructing 53 turbines would be approximately 238 acres, versus 176 acres for the proposed Project.

Another possible alternative is the selection of an even larger Class III wind turbine generator, with both a longer turbine radius and a higher generator capacity rating, would make it possible to generate an equivalent amount of clean power with a smaller number of total towers and thus an even smaller footprint (fewer turbines). For example, a Suzelon 2.3MW machine with a 93 meter rotor could be selected which would require 34 turbines to generate up to 79.9 MW. However, for a project anticipated to be energized in 2009, PPM Energy does not currently have access to any wind turbines larger than the proposed Gamesa Eolica G90. If some larger machines did become available, PPM Energy may consider their deployment at Roaring Brook, possibly requiring a revised project configuration. If substantially alternate locations were selected that impacted areas not currently contemplated, PPM Energy would prepare a Supplemental DEIS to examine the impacts of a different project layout.

Another potential alternative is to expand the total size of the Project, given that the electrical interconnection could accommodate a power infusion larger than 80 MW, and there is additional land available in the region suitable for installation of MW-scale wind turbine generators. As discussed above, PPM has identified other areas in southern Lewis County that have a commercial-grade wind resource, and some of those areas are close enough to Roaring Brook's interconnection point to be feasibly interconnected in tandem with the power from Roaring Brook.

This expansion of the Roaring Brook project, though it would most likely have a positive impact on the Project's total economics, would require installation of wind turbine towers much closer to the eastern edge of the Tug Hill escarpment, and much closer to the NYS Park at Whetstone Gulf. The visual impact of wind turbines at these alternative sites would be much greater in areas near the State Park, especially along NYS Rt 26. Even though the northern end of this same viewshed has already been impacted somewhat by the construction of the southernmost wind turbines in the Maple Ridge wind project, PPM has decided not to expand the Roaring Brook Project into these areas, and to concentrate instead on the development of the much more remote and less visible location west of Carey Rd.

5.2.2 Project Arrangement/Layout

5.2.2.1 Wind Turbines

As presented in Section 2.5.1, the proposed location and spacing of the wind turbines are directly related to the turbine selected for the proposed site and are also based upon site developability, landowner participation, a wind resource assessment, environmental resource factors, and review of the site's zoning constraints. Factors considered during turbine placement includes the following:

Wind Resource Assessment: Through the use of on-site meteorological data collected at four 60 meter monitoring towers and one SODAR station, topographic and surface roughness data, and wind flow modeling and wind plant design software, the wind turbines are sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing southwesterly wind direction in the Project area.

Sufficient Turbine Spacing: A critical design factor is to provide sufficient separation among turbines to minimize wake (energy) loss and added turbulence which translates to turbine component wear. The Project turbines will have a final placement with sufficient space between them to minimize wake losses and maximize the capture of wind energy, and meet all turbine vendor operational specifications.

Local Zoning: The Town of Martinsburg, pursuant to the Town's Wind Energy Facilities Law, has established a wind power overlay district to provide an area within the town where wind energy facilities shall be permitted subject to the review and permitting requirements of their local ordinance. All proposed wind turbines will be sited within the district, and the Project will otherwise comply with the terms and conditions of the Town of Martinsburg Wind Energy Facilities Law.

Distance from residences: The turbine locations will maintain a minimum setback of approximately 1,000 feet between the tower and the nearest occupied permanent residence (excepted by way of waiver). The Project layout greatly exceeds this minimum as the nearest permanent residence is approximately 6,000 feet away. This turbine setback complies with the Town of Martinsburg Wind Energy Facilities Law, and minimizes potential visual and sound effects of the turbines on Project neighbors.

Distance from Non-participating Land Parcels: The turbine locations will maintain a minimum setback of 300 feet from the boundary line of all adjacent parcels owned by non-participating neighbors, in accordance with the Town of Martinsburg Wind Energy Facilities Law.

Distance from roads: The turbine locations will also maintain a minimum setback of at least 300 feet from public roads, in accordance with the wind turbine siting requirements of the Town of Martinsburg Wind Energy Facilities Law

Wetlands and Waterbodies: Turbine foundations will not be located within delineated federal jurisdictional or state regulated freshwater wetlands. However, locating project components in areas within 100 feet of state regulated freshwater wetlands (regulated adjacent areas or wetland buffers), may be unavoidable due to the significant amount of regulated adjacent area on the generating project site.

Communication Interference: Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on existing communications.

Cultural Resources: Turbine foundations and related infrastructure will be sited and constructed in such a way that does not cause any affect to prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialists.

Through an analysis of site developability, wind resource assessment, environmental resource factors, and review of the site's zoning constraints, a proposed project layout was developed by PPM Energy. The layout of 39 turbine sites as proposed is satisfactory to the participating landowner and results in a carefully achieved balance of energy production and environmental protection. Significant relocation of any of the turbines to a site other than one of the identified 39 sites would have a ripple effect, in that the location of other turbines would have to be reexamined and possibly changed to maintain an efficient/workable Project design. Therefore, reduction of environmental impacts in one location could result in increased impact in another location and/or reduced power generation. In the case of visual impact, removal or relocation of one or two individual turbines from a 39-turbine array is unlikely to result in a significant change in Project visibility and visual impact from most locations.

5.2.2.2 Electrical Gathering and Interconnection Lines

As a matter of general economical design preference, the Project sponsor would prefer to build all electrical lines in the shortest, most direct alignment between turbines. However, on the generating site, the Project's electrical gathering system will be buried along existing and proposed access roads to significantly consolidate and minimize crossing impacts to on site vegetative communities and wetland/stream systems. Other potential alternatives including overhead gathering lines, or gathering lines that were not adjacent to access roads were not considered, as they provided significant impacts over the Project proposal.

PPM Energy evaluated three potential routes for the electrical interconnection line that will connect the point of interconnection/collection substation to the generating site area. The study area for the overall corridor is presented in Figure 2. All three potential routes were of essentially the same distance (between 7 and 10 miles in length), crossed agricultural and forested private land parcels, and were sited away from public rights of way limiting visibility of the line. However, the preferred alternative was selected due to willingness of the local landowners to enter into easement agreements. Each of the two other routes had landowners that were not willing participants, and without their participation resulted in a non-contiguous easement between the generating site and the point of interconnection/collection substation.

PPM Energy is currently proposing that of the 10 miles of electrical interconnection line, 4 miles of it will be buried, and 6 miles will be mounted on wood or steel poles. PPM Energy explored alternatives to this arrangement including pole mounting all 10 miles, or burying all 10 miles. Although the cost of burying all 10 miles is economically cost prohibitive, PPM Energy proposes to bury 40% of the line to address local landowner concerns along the interconnection line.

5.2.2.3 Point of Interconnection/Collection Substation

The location of the substation has been selected for its proximity to other project components along with its adjacency to the interconnecting National Grid 115kV electric transmission line, which minimizes the total length (and impact) of the electrical collection and interconnection systems. In addition, the site was selected from a broader area adjacent to the existing electric transmission line based upon existing grade, limited visibility from public roads, avoidance of wetlands, and landowner requests/concerns. The proposed location consists of open agricultural land, thus eliminating the need for tree removal/clearing.

5.2.2.4 Access Roads

Permanent access road widths will be the minimum necessary to operate and maintain the project. The Project site provides an existing well maintained forest road system totally approximately 9 miles in length. This existing road network significantly reduces the impacts of alternatively building all new project access roads. Approximately 4 miles of new access roads are necessary to connect existing forest roads to turbine sites. These access roads will be reduced from a construction width of 40 feet to an operation/maintenance width of 16 feet (unless determined otherwise through landowner requests and/or negotiations). Shorter, more direct routes are a more desirable alternative from a project development/cost perspective. However, by following siting guidelines

such as utilizing existing forest roads and avoiding significant wetland crossings, this alternative is essentially rejected.

Consequently, PPM Energy believes that alternative project designs are likely to result in equal or greater adverse environmental impacts, while yielding lower electrical output. They are therefore considered less desirable than the proposed design.

5.3 ALTERNATIVE PROJECT SIZE

PPM Energy has a 79.9 MW interconnection request with the NYISO, therefore the preferred alternative is to construct a facility that has the ability to produce 79.9 MW. A project of significantly more, or fewer, turbines would pose challenges to the technical or economic feasibility of the Project, and would not meet the stated objective's of the Project.

If the proposed number of turbines were significantly reduced, the maximum benefit of the available wind resource would not be realized. If the turbine number was even moderately reduced, the Project would cease to be economically viable due to the high fixed cost of interconnection with the power grid. As with environmental impacts, economic benefits would also be reduced proportionately with a smaller project. PILOT payments to local taxing jurisdictions (which are typically developed on a per MW or per turbine basis), as well as construction expenditures, would be greatly reduced.

If the proposed number of turbines were significantly increased, the Project sponsor would need to obtain more leased land area and request an amended interconnection request with the NYISO. The current Taylorville-Boonville 115 kV line does have the capacity to accept a 79.9 MW project and may accept a project of up to 100 MW without significant project upgrades.

As mentioned previously, various siting constraints dictate the size and layout of a wind power project. These constraints make a significantly larger number of turbines within the Project site highly unlikely. A larger project would result in location of wind turbine towers in areas that do not have ideal wind resources, and which may not have willing landowner participants. This alternative would also require installation of more turbines in areas with more sensitive resources and/or higher population density. Although a larger facility might theoretically have more economic value, the greater environmental impacts would not justify the marginally increased power generation potential of the Project.

5.4 ALTERNATIVE TECHNOLOGIES

The turbines proposed for the Project will utilize the latest in wind power generation technology to enhance Project efficiency and safety and minimize impacts such as noise and bird collisions. The proponent PPM Energy, is proposing to develop 79.9 MW of renewable energy. Alternative power generation technologies, such as fossil-fuel and biomass combustion, would not meet the goals of the Project, are not the area of expertise of the Project sponsor, and would pose more significant adverse environmental impacts, particularly on air quality but also on land use, aesthetics, and water resources. Most fossil fuel-fired generating facilities would require significant amounts of water to operate, the use of which may pose impacts to surface water or groundwater resources as well as fish and other aquatic organisms. Nuclear power plants have not been constructed in the U.S. for over 25 years, due primarily to public opposition, high cost, and concerns over the safe storage and disposal of nuclear waste. These plants also present potential public safety and security/terrorism concerns. Conventional power plants also would not advance the RPS goal of generating 25% of the state's power by 2013.

In regard to other renewable sources of generation, hydroelectric plants have significant impacts on terrestrial and aquatic ecological resources, land use, and aesthetics. They can also only be developed in places with appropriate water volumes and topographic conditions (which do not exist within the Project site). Other renewable energy technologies, such as solar power and hydrogen, are still either cost-prohibitive or in development. Aside from cost constraints, utility-scale solar power is not feasible in an area such as upstate New York, where available sunshine is limited. Currently, wind is the only renewable energy source that can help meet energy needs in a technologically and economically efficient manner. It can also do this without the emission of greenhouse gases and other environmental impacts that alternative power generation technologies would create.

5.5 ALTERNATIVE CONSTRUCTION PHASING

PPM Energy proposes to construct the Project in a single phase during a single construction season. Single phase construction will result in a more efficient construction process, with a shorter duration of construction-related impacts, than a multiple phase construction approach, and will allow resources, such as soils, wildlife, and vegetation, that are temporarily impacted by construction, to begin to recover and/or habituate sooner. In contrast, a multiple phase construction process would result in a longer period of construction disturbance, and would be less economically efficient for both the sponsor and the local beneficiaries of the direct and indirect economic benefits of the Project.

5.6 NO ACTION

The no action alternative assumes that the Project site would continue to exist as vacant/underdeveloped land, managed timber lands, and recreational use. This no action alternative would not affect on-site ambient noise conditions, construction traffic or public road conditions, wildlife or wildlife habitat, wetlands and streams, or television/communication systems, and would maintain community character, economic and energy-generating conditions as they currently exist.

Under this alternative, no wind turbines or infrastructure (e.g., roads, buried or above ground electrical interconnects, and substations) would be developed on the site. Consequently, none of the environmental impacts associated with Project construction and operation would occur. In addition, no economic benefits would accrue to the area. These unrealized economic benefits would include income from construction jobs, lease payments to the landowners, and annual PILOT payments to the affected town, school district, and county. Annual revenues to the town of Martinsburg, Lewis County, and the school district remain to be negotiated in the final terms of a PILOT agreement, but are anticipated to be in the range of \$624,000 per year for the first 15-20 years of Project operation, declining thereafter based on depreciation. Under the no action alternative, multiplier effects from these economic benefits would also not be realized. In addition, to the extent that the Project helps to preserve the existing rural forested setting, the no action alternative could have an adverse impact on land use and habitat. In the absence of the Project, the current generating site landowner has indicated an interest in subdividing the land, and building cabins and recreational facilities or other development possibilities. These possibilities could result in a change to the existing character and available wildlife habitat. Furthermore, the benefits of adding up to 79.9 MW of clean, renewable electric energy to the power grid would be lost, and reliance on fossil-fuel-fired generators, which contribute to emissions of sulfur dioxide (a precursor of acid rain), nitrogen oxide (a smog precursor), and carbon dioxide (a greenhouse gas) would continue unabated. Given the short-term nature of anticipated construction impacts and the generally minor long-term impacts of Project operation, as compared to the significant economic benefits that the Project would generate, the no action alternative is not considered a preferred alternative.

6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed Project will require the irreversible and irretrievable commitment of certain human, material, environmental, and financial resources, as described below. For the most part, the commitments of these resources will be offset by the benefits that will result from implementation of the Project.

Financial resources have already been and will continue to be expended by PPM Energy, the State of New York (i.e., various state agencies), Lewis County, and the Town of Martinsburg for the planning and review of the Project. The expenditure of funds and human resources will continue to be required throughout the permitting and construction phases of the Project (e.g., for environmental reviews and permitting, site plan approval, building and construction inspections).

The Project also represents a commitment of land for the life of the Project. Specifically, the approximately 27 acres of previously undisturbed land to be developed for wind turbines, access roads, and substations will not be available for alternative purposes for the life of the Project. However, because the turbines/towers could be removed, and the land reclaimed for alternative uses at some future date, the commitment of this land to the Project may be neither irreversible nor irretrievable.

Various types of construction materials and building supplies will be committed to the Project. The use of these materials, such as gravel, concrete, steel, etc., will represent a long-term commitment of these resources, which will not be available for other projects.

Energy resources also will be irretrievably committed to the Project, during both the construction and operation of the Project. Fuel, lubricants, and electricity will be required during site preparation and turbine construction activities for the operation of various types of construction equipment and vehicles, and for the transportation of workers and materials to the Project site. However, the energy resources utilized to construct and operate the Project will be minor compared to the energy generated by the Project and made available to the people of New York State.

7.0 GROWTH INDUCING IMPACTS

Certain proposed actions covered under the SEQRA process have the potential to trigger further development by either attracting a significant local population, inviting commercial or industrial growth, or by inducing the development of similar projects adjacent to the built facility. The proposed Project does not require a permanent work force greater than approximately eight employees, and therefore will not lead to significant growth in local population or housing. Although it will provide some support the local economy through the purchase of goods and services, the type and level of expenditures are not of the sort that would generate significant growth of businesses that serve the proposed facility. Therefore, secondary/indirect impacts resulting in local growth are not anticipated to occur as a result of the proposed action.

The Roaring Brook Wind Project is proposed, in part, because of the presence of existing resources and facilities that allow the Project to be economically viable. Specifically, the availability of adequate wind and the presence of an existing transmission line allows for generation and transmission of the Project's electric output to the state power grid. The occurrence of these resources/facilities might suggest that other wind power projects could be proposed on adjacent lands or within other areas of Martinsburg or Lewis County. However, this would be the case with or without the proposed Project. Its presence alone will not encourage the development of additional wind power projects in the area. In fact, because existing transmission facilities have limited additional capacity, the Project may make future projects more difficult to develop if such development could only be accommodated by upgrading the existing transmission line. If this were the case, such upgrades would likely make future projects less economically viable. In addition, landowner willingness and environmental sensitivity play a significant role in the location of wind power projects. As currently proposed, the Project, coupled with the Maple Ridge Wind Farm, maximizes the land resource within the wind power overlay district of willing landowners within the Town of Martinsburg. Any additional wind power development in these areas is likely to be limited due to set-back constraints, more significant environmental impacts, and lack of landowner participation.

8.0 CUMULATIVE IMPACTS

SEQRA requires a discussion of cumulative impacts where such impacts are “applicable and significant” (6 NYCRR § 617.9[b][5][iii][a]). Cumulative impacts are two or more individual environmental effects which, when taken together, are significant or which compound or increase other environmental effects. The individual effects may be effects resulting from a single project or, in certain circumstances, from separate projects.

Where individual effects of the Project may interact with other effects of the Project, such potential cumulative impacts have been addressed in Section 3.

This section addresses the potential cumulative impacts that may arise from interactions between the impacts of the Project and the impacts of other projects. In general, cumulative impact analysis of external projects is required where the external projects have been specifically identified and either are part of a single plan or program, or under common ownership or control. The subsections below, provide a broader analysis than is strictly required by SEQRA. These subsections identify other projects, which are not part of a common plan but which are proposed for construction in the Region and assess the extent to which the impacts of such projects may be cumulative with the impacts of the Roaring Brook Wind Power Project.

Existing and Approved Projects

The nearest existing project is the Maple Ridge Wind Farm, a 195 turbine, 321 MW wind energy facility located in the towns of Lowville, Martinsburg, and Harrisburg in Lewis County. This facility is located approximately 2 miles from the generating portion of the Project site, and therefore does have a direct impact on the surrounding area within and near the Towns Martinsburg.

Cumulative impacts associated with the operation of the Maple Ridge Wind Farm and the Roaring Brook Wind Power Project are anticipated to be limited to visual, avian/bats, and socioeconomic resources.

A possible cumulative impact resulting from the construction of a new wind power project adjacent to an existing facility would be the effects on visual/aesthetic resources and community character. As discussed in Section 3.5, to address concerns regarding the potential cumulative visual impact of multiple wind power projects, cumulative viewshed analyses were prepared. To accomplish this, the 10-mile radius Roaring Brook Wind Power Project topographic and vegetation viewshed analyses (based on maximum blade tip height) were overlaid on the same viewshed analyses prepared for the

existing Maple Ridge Wind Farm in the Towns of Martinsburg, Harrisburg and Lowville. The viewsheds for the two projects were then plotted on a base map, and areas of viewshed overlap identified. The cumulative viewshed analysis of the proposed Roaring Brook Wind Power Project and the existing Maple Ridge Wind Farm is presented in Appendix K, Figure 7, Sheets 5 and 6. Based on the screening effect of topography alone, it appears that areas with potential simultaneous views of these two projects are primarily available west of the Maple Ridge facility. Many of sensitive receptors (including the hamlet of Martinsburg, St. Patrick's Cemetery, portions of the State Forests, and Tug Hill WMA) could potentially have simultaneous views of both projects. Factoring vegetation into this cumulative viewshed analysis essentially eliminates wooded sites from the area of potential cumulative project visibility. Areas indicated as having potential views of both projects on the cumulative vegetation viewshed map are limited to open field areas located primarily to the north and east of the Project site. Such views could be available along portions of Rector Road, Boshart Road, Flat Rock Road (in Martinsburg), County Route 14 (in Lowville), and State Route 177 (in Harrisburg). Areas of potential cumulative visibility in total amount to approximately 5% of overlapping 10-mile radius study areas (Appendix K, Figure 7, Sheet 6).

Additionally, as stated in Section 3.5.2.4, evaluation by an EDR landscape architect suggests that the Project's overall contrast with the visual/aesthetic character of the area will be very low. In most cases the Project was barely perceptible due to forest screening and distance and/or appeared compatible due to the presence of the existing Maple Ridge Wind Farm in the views.

Cumulative avian impacts may occur as a result of proximity of the two projects. As discussed in Section 3.3.2.2.2, Erickson et al. estimated 20,000 - 37,000 birds were killed at about 17,500 wind turbines in the United States in 2003 (Erickson et al. 2005). These fatalities ranged from zero to about 8 birds per turbine per year, yielding an average of 2.1 birds per turbine per year. In the first year of study at Maple Ridge (June through November 2006) the fatality rates ranged between about 2 and 9 birds per turbine for the study period. The weighted average for that period was about 4 bird fatalities per turbine. Using the range of annual averages, cumulative avian mortality for both the Maple Ridge Wind Farm and Roaring Brook projects is estimated to be between approximately 491 and 936 birds per year. These cumulative avian impacts are not anticipated to be biologically significant for any of the affected species.

As described in Section 3.3.2.2.2, Jain et al. (2007) documented a mortality rates in the range of 15.2 - 24.5 bats per turbine per year at Maple Ridge during the first year of post-construction monitoring. None of the bat carcasses retrieved during the study were threatened or endangered species. The proximity of this site and the presence of quality bat habitat (mix of forest, wetland and

open areas) on site suggests that similar rates of collision mortality could be anticipated on the Roaring Brook site. However, ABR's nocturnal visual observation studies (Mabee et al., 2007; Mabee & Schwab, 2007) documented a mean observation rate of 0.3 bats per hour during spring migration, with only 7% of these bats within 150 m AGL, and a mean observation rate of bats per hour during fall migration, with 20% flying below 150 m. The resulting RSA exposure index of 0.05 – 0.23 bats per hour suggest relatively low exposure of bats to risk of turbine collision. Using the conservative assumptions of potential mortality rates from the first year at Maple Ridge, cumulative mortality rates for bats resulting from the operation of both projects could be between 3,552 and 5,733 bats per year. Of these estimated fatalities, approximately 2,964 – 4,777 are as a result of Maple Ridge while 593 - 955 are projected as a result of the operation of Roaring Brook Project.

Cumulative economic impacts will be realized by the town of Martinsburg, the affected school districts, and Lewis County. Currently, the Towns of Martinsburg, Harrisburg, and Lowville, the local school districts, and Lewis County receive \$8 million annually from the PILOT agreement associated with Maple Ridge Wind. Although the exact percentage distribution to the Town, County and school districts from the Roaring Brook Wind Project cannot currently be known, based upon the PILOT payment assumptions outlined in Section 3.9.3.2.3, there will be a cumulative increase in these revenue bases by approximately \$624,000 annually.

Proposed or Future Projects

Across New York State, several additional wind-powered generating facilities are under construction, or in the project planning and development phases. The review and approval status of these projects is highly variable, ranging from preliminary site investigations to those with completed system reliability impact studies (requirement of NYISO), detailed project plans, and landowner agreements.

The NYISO oversees the New York Transmission System (the "grid") and has in place a process for permitting new electric generating facilities to "hook up" to the grid. Consequently consideration of a project's status in the NYISO review process is a helpful measure for determining whether a proposed project may or may not be built.

The NYISO reviews projects in three main phases: submittal of an interconnection request, preparation of a feasibility study, and completion of a system reliability impact study. This review process separates projects, initially by feasibility to connect to the New York power grid via a selected transmission facility. Proposed projects in any phase of project review by the NYISO are listed on a comprehensive queue listing maintained by NYISO on their website

<http://www.nyiso.com>. It is reasonable to assume, that wind power projects with in-progress system reliability impact studies and with upcoming proposed operation dates may be considered 'proposed' or 'future' projects for the purposes of this cumulative impact analysis.

In Lewis County, there are currently no projects listed as being under review with the NYISO (NYISO, queue updated 1/2/2008).

9.0 EFFECTS ON USE AND CONSERVATION OF ENERGY RESOURCES

The proposed Project will have significant, long-term beneficial effects on the use and conservation of energy resources. The operating Project will generate up to 79.9 MW of electricity without any fossil-fuel emissions. Assuming that the average house in Upstate New York uses approximately 650 kilowatt hours of electric power per month, and assuming the Project actually generates approximately 30% of its nameplate generating capacity, this is enough power to support approximately 40,000 homes in New York State (on an average annual basis). The Project will add to and diversify the state's sources of power generation, accommodate growing power demand through the use of a renewable resource (wind), and displace the use of fossil fuels in conventional power plants.

It will also facilitate compliance with Executive Order 111, issued by then Governor George Pataki on June 10, 2001 (and continued by Governor Spitzer in January 2007) directing state agencies, state authorities, and other affected entities to be more energy efficient and environmentally aware. This Order specifically calls for an increase in renewable energy used in the state to increase to 25% (from the then level of 19%) by the year 2013. The principal benefits of the Project are in accordance with the 2002 State Energy Plan (New York State Energy Planning Board, 2002), namely:

- “Stimulating sustainable economic growth”
- “Increasing energy diversity...including renewable-based energy”
- “Promoting and achieving a cleaner and healthier environment”

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