PHASE I AVIAN RISK ASSESSMENT

Clayton Wind Farm

Jefferson County, New York

Report Prepared for:

PPM-Atlantic Renewable Energy

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Executive Summary

This report details the results of a Phase I Avian Risk Assessment for the proposed Clayton Wind Farm (hereafter the "Project") in the towns of Clayton, Orleans, and Brownville in Jefferson County, New York. This assessment includes: 1) a site visit conducted on November 8 and 9, 2004, 2) a review of the literature and available databases, and 3) written consultations with the U.S. Fish and Wildlife Service (USFWS; pending) and New York State Department of Environmental Conservation (NYSDEC; pending). The site visit evaluated habitat in order to determine the type and number of birds likely to nest, forage, rest, or otherwise use the site. The literature and database review examined the avifauna most likely to be present at or surrounding the site and what is known about the impacts to birds at wind power facilities. The written consultations with wildlife agencies sought to clarify bird species of concern in the Project vicinity. Together, this information indicates the type and number of birds that are known or suspected to use the Project site. When incorporated into the risk assessment, this information helps determine the degree of risk to birds from the proposed wind power development.

Of moderate size, the Clayton Wind Farm is proposed by PPM-Atlantic Renewable Energy. The Project plan calls for about 70 wind turbines distributed over an area 8 miles (12.8 km) long and 4.5 miles (7.2 km) wide. Each of the wind turbines would have a nameplate generating capacity of 1.5 to 1.8 MW (megawatts), yielding a total nameplate generating capacity of between 100 and 125 MW. The towers of the wind turbines would be about 80 meters (262 feet) tall and have rotors of about 38.5 m (126 feet) long. With the rotor tip in the twelve o'clock position, the wind turbines would reach a maximum height of about 120 m (394 feet) above ground level (AGL). At the six o'clock position, the rotor tip would be 41.5 meters (136 feet) AGL.

The predominant land-use at the Project site is agricultural, including corn, hay, cover crops, freshly plowed areas, and pasture. There are also extensive areas of fallow, grassy fields, as well as extensive areas of shrubby thickets. About 10% of the site is composed of woodlots and forest fragments. With regard to wetlands, they make up a very small percentage of the habitat on site, consisting mainly of small ponds and willow thickets. Wind turbines would mainly be constructed in existing open areas, but some limited areas with trees could be affected by road and turbine construction. There is a significant number rural residences along a network of roads within the Project area.

Habitats in and around the Project site support typical bird communities, composed mainly of common species associated with grassland, brushy areas, woodland

edge, and woodland. Habitat appears suitable for nesting for a number of state-listed species, particularly those of grassland communities, including the threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow, and special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow. Wooded areas on site also appear suitable for nesting for the following raptors that nest in forest and forest edge: Sharp-shinned Hawk (special concern), Cooper's Hawk (special concern), Red-tailed Hawk, and American Kestrel. The nesting suitability of on-site habitat is less likely for the threatened Bald Eagle, special-concern Osprey (which has nested in the adjacent Perch River Wildlife Management Area), and special-concern Goshawk. In addition, two species of special concern associated with wooded habitats may also breed within the Clayton Wind Farm area. These are the Whip-poor-will and Golden-winged Warbler.

Regarding waterbirds, the Project site itself contains little suitable nesting habitat. But, high quality waterbird habitat is located adjacent to the Project site in the Perch River Wildlife Management Area. A number of listed species occur there, including the endangered Black Tern, threatened Pied-billed Grebe and Least Bittern, special-concern American Bittern and Osprey, and about twelve species of waterfowl.

There are no known major hawk migration pathways or lookouts at or near the site. Songbirds and other species are likely to migrate over the Project site, although not in numbers, patterns, or altitudes that are significantly different from most other areas in central New York. The site itself is unlikely to be a significant wintering site for birds, but significant wintering of waterfowl has been recorded along the nearby St. Lawrence River, and significant wintering of raptors has been recorded at nearby Point Peninsula, along the shore of Lake Onatrio. Wintering raptors – mostly Red-tailed Hawk, Rough-legged Hawk, Northern Harrier, Short-eared Owl, and American Kestrel – will likely be present at the Project site in winter in small to moderate numbers. It is conceivable that the Project site will attract significant numbers of migrating waterfowl, mainly geese, to feed in its agricultural lands during migratory stopover at the Perch River Wildlife Management Area.

The avian risk assessment makes the following recommendations:

- Electrical lines within the project site should be underground between the turbines, and any new above ground lines from the site and substations to transmission lines should follow Avian Power Line Interaction Committee (APLIC) guidelines for insulation and spacing.

- Permanent meteorology towers should be free-standing (i.e., without guy wires) to prevent the potential for avian collisions.

- Size of roads and turbine pads should be minimal to disturb as little habitat as possible. After construction, any natural habitat should be permitted or encouraged to regenerate as close to the turbines and roads as possible to minimize habitat fragmentation and disturbance/displacement impacts.

- Lighting of turbines and other infrastructure (turbines, substations, buildings) should be minimal to reduce the potential for attraction of night migrating songbirds and similar species. Federal Aviation Administration (FAA) lighting for night use should be flashing lights (red or white) with the longest permissible off cycle. No steady burning FAA lights should be used. Sodium vapor lamps and spotlights should not be used at any facility at night except when emergency maintenance is needed.

- A post-construction study of collision fatalities would be helpful to guide future wind power development in New York State. Such a study would provide information on the number and type of fatalities that occur, and determine the biological significance and potential cumulative impact of turbine development in New York and in the eastern United States.

- Because the habitat on site appears to be suitable for New York State listed species and species of concern, a nesting bird survey should be undertaken to determine the distribution and densities of these species, particularly grassland birds. The threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow, and the special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow are likely present in grassland habitats that would be occupied by wind turbines and related infrastructure. The special-concern Sharp-shinned Hawk, Cooper's Hawk, Whip-poor-will, Golden-winged Warbler, and possibly other listed species may occur in wooded habitats where turbines and related infrastructure may be located. Such a survey would include mapping areas where these birds nest in relation to planned turbine and road locations. The results of this survey may be used to prevent or mitigate disturbance impacts and displacement of these species. Should a nesting survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- Raptor and waterfowl use of the Project site, particularly during migration (but also in late fall and winter in the case of raptors, given the high concentration of wintering raptors reported at nearby Point Peninsula), should be determined through a flight-use study. Should such a survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- Radar studies should be conducted at the site in order to determine flight patterns of night migrants (direction, altitude, and numbers of birds) passing over the wind farm site. Should such a survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- The future of the grassland and brushland bird communities at the Clayton site depends on the long-term management of their habitats, which farmers are presently accomplishing through their agricultural practices. While wind energy development may displace grassland birds from the areas around where the turbines are located, it would limit other types of development that could more severely impact grassland habitat and its birds. Wind energy development can

also provide incentives and funding that maintain grassland habitats. These options should be explored.

With respect to grassland nesting songbirds and perhaps some raptors, some species will likely be displaced to varying degrees from current nesting areas. The degree of this displacement cannot be predicted, nor is it known if these birds will eventually habituate to the turbines, because detailed studies have not yet been conducted in similar habitat in New York State. The level of impact to these birds could be significant at the local level, but it is highly unlikely to be significant at the regional or global level. As a result, the Project will not threaten or jeopardize the overall populations and stability of these species.

Collision risk to birds at the Clayton Wind Farm is likely to be minimal. From what was learned from the site visit and literature search, as well as a documented lack of significant avian fatalities at modern wind power facilities, there is no indication that the Clayton Wind Farm will result in biologically significant collision impacts to birds.

Based on other wind power projects in New York State, it is likely that USFWS and NYSDEC will request pre and post-construction studies in order to minimize and mitigate potential impacts from the proposed project and to help guide future wind power development in New York State.

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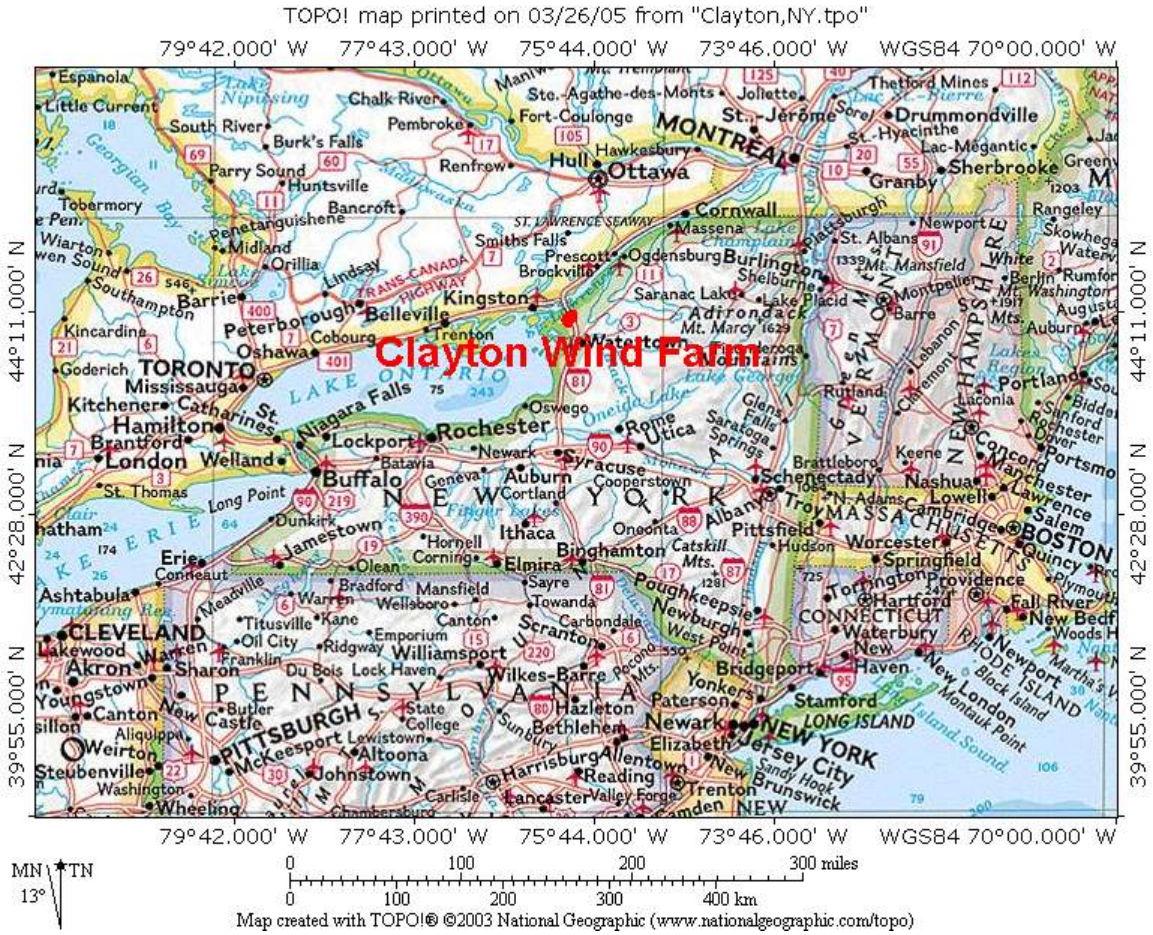

Figure 1. Location of the Proposed Clayton Wind Farm in New York State

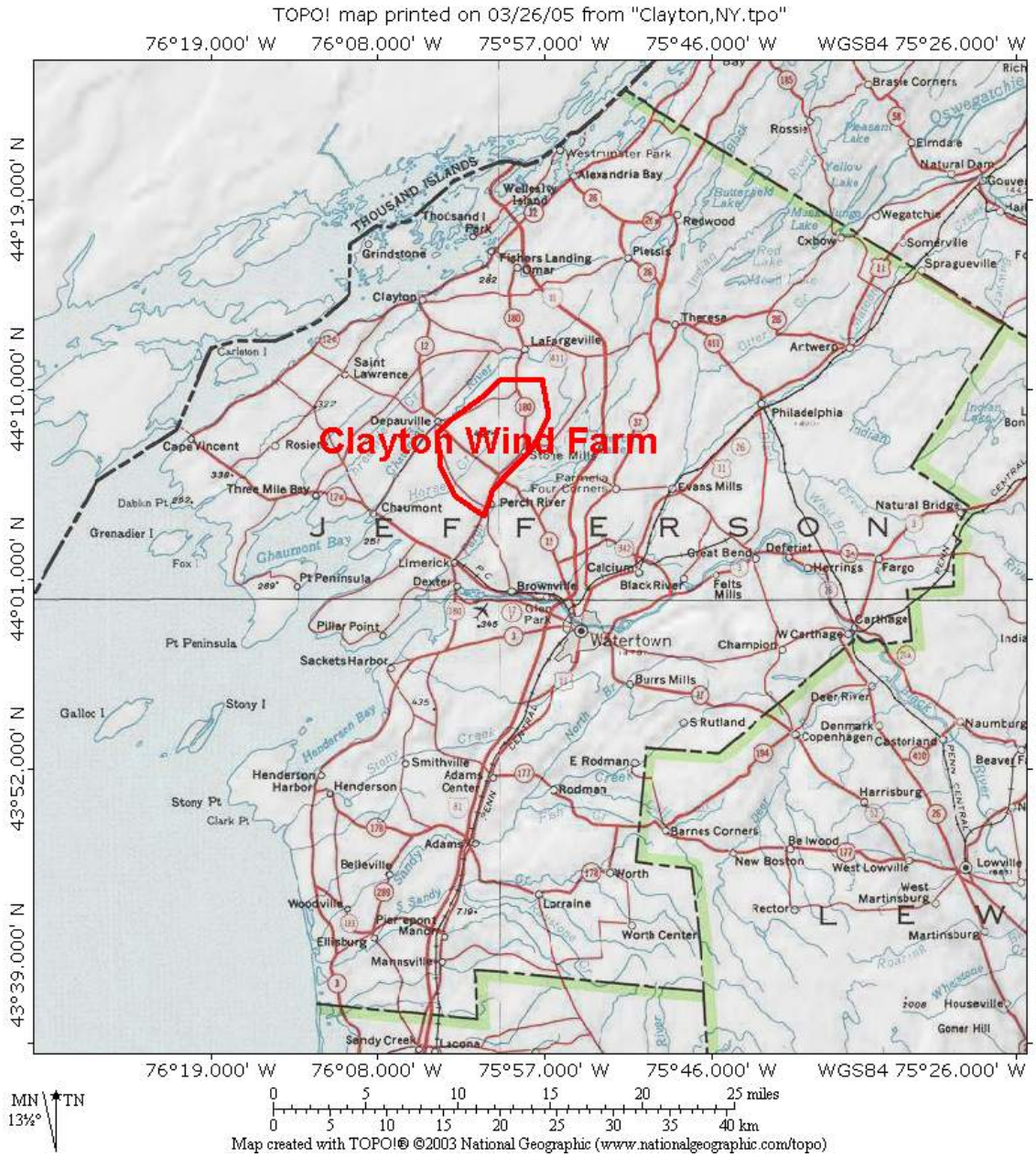

Figure 2. Location of the Proposed Clayton Wind Farm in Jefferson County, New York

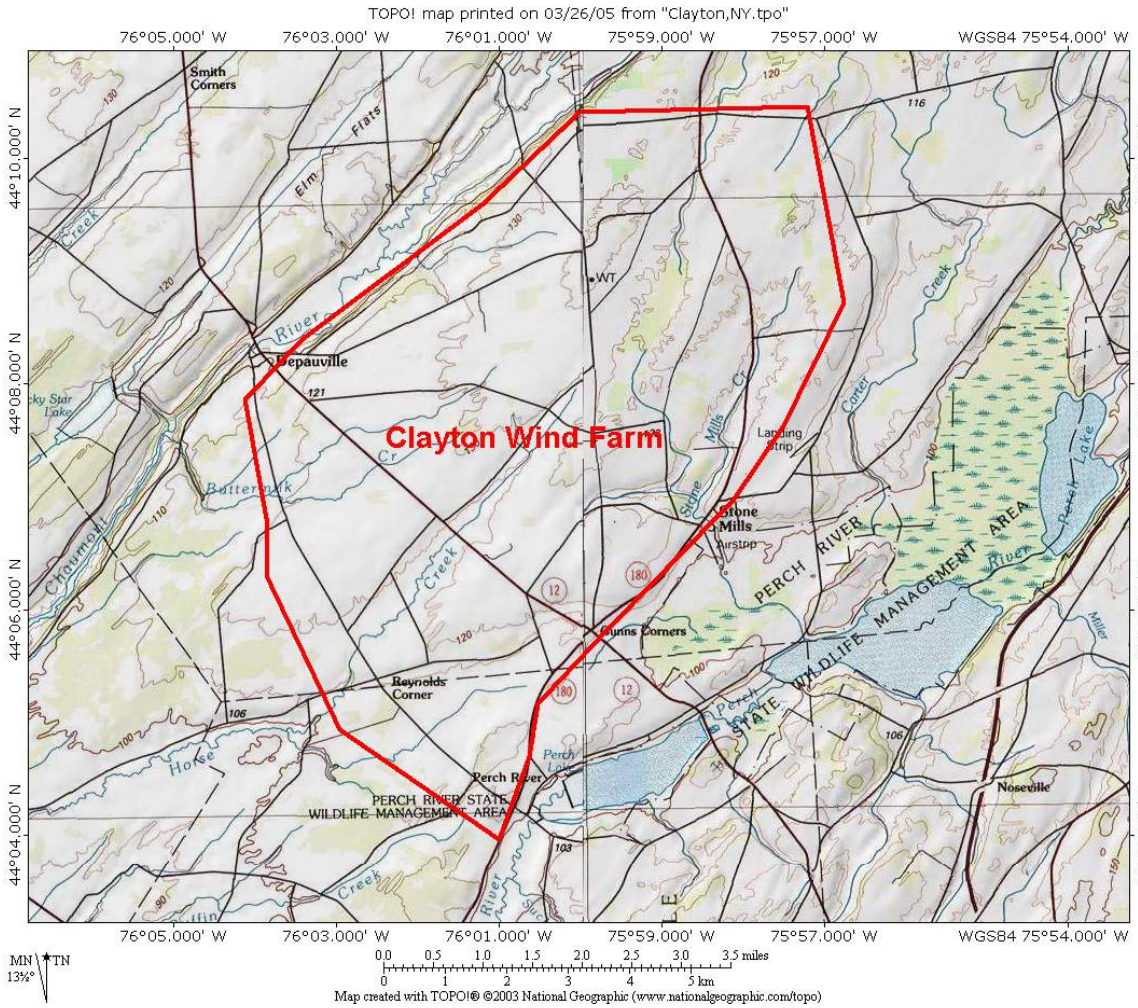

Figure 3. Topography, Forest Cover, and Location of Adjacent State Wildlife Management Area at the Proposed Clayton Wind Farm (boundary approximate)

1.0 Introduction

Wind power is considered to be one of the most environmentally benign sources of electrical power, but impacts to birds have been documented at projects in the United States and Europe. These impacts have included collisions with turbine rotors and meteorology towers and the disturbance and displacement of nesting and feeding birds resulting from construction activities and new infrastructure. Potential bird impacts have become an issue that numerous stakeholders – including wildlife agencies, local government officials, and the public – question in the siting of new wind power projects.

A moderately sized wind power plant (about 70 turbines) has been proposed for a site in the towns of Clayton, Orleans, and Brownville in Jefferson County, New York (see Figures 1, 2, and 3). The project has been named the Clayton Wind Farm (hereafter referred to as the "Project"). This report details a Phase I avian risk assessment conducted for this Project.

The purpose of a Phase I risk assessment is to determine the potential for risk to birds at a proposed project site. Thus, the Phase I risk assessment is designed to guide developers, regulators, environmentalists, and other stakeholders through the risk assessment process at a particular site, including how evaluation of potential impacts may require further study. This assessment includes: 1) a site visit, 2) a literature and database search, and 3) written consultations with wildlife agencies regarding endangered and threatened species. In addition, this report addresses compliance issues and recommendations now being made by the U.S. Fish and Wildlife Service (USFWS) in its document, *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003; please see Appendix E).

A site visit is undertaken by an avian technician with experience in bird identification and in evaluating avian habitat with respect to what species are likely to be present. The site and surrounding area is toured by automobile and walked. The purpose of the site visit is to evaluate habitat and topographic features so that a list of species that might be present can be assembled and the potential for risk to those birds assessed. The site visit is not meant to be an exhaustive inventory of species presence and use.

Avian literature and databases examined include USFWS records (pending), New York Natural Heritage Program (NYNHP; pending), New York State Breeding Bird Atlas (BBA, both the 1980-1984 and 2000-2004 projects), North American Breeding Bird Surveys (BBS), Important Bird Areas (IBA), Audubon Christmas Bird Counts, hawk migration literature and newsletters (e.g., Hawk Migration Association of North America), and other information on birds that might nest, migrate, forage, winter, or concentrate at the site. An additional part of the literature search focuses on what is known about wind turbine impacts to birds.

Consultations are done with wildlife agency biologists, including USFWS and New York State Department of Environmental Conservation (NYSDEC), via a letter requesting information on listed species at or near the Project site. The letters are an

effort to determine more about the avifauna at a site and potential risk to birds that are likely to be present. Such consultations are a means of determining the scope of work that may be needed to further assess risk after the Phase I assessment has been completed.

The information developed from the site visit, literature searches, databases, and consultations with wildlife agencies is then integrated into a report, such as this one. The report summarizes habitat and birds likely to be present at a site, potential risk of wind turbine construction at the site, a comparison the project site with other sites where risk has been determined, where detailed studies have not yet been conducted), and recommendations for further studies and mitigation, if indicated.

2.0 Project and Site Description

2.1 Project Description

Located 4.5 miles (7.2 km) northeast from Chaumont Bay on Lake Ontario, 7.5 miles (12.0 km) southeast of the St. Lawrence River, and 8.5 miles (13.6 km) northwest of the city of Watertown (see Figures 1 and 2), the proposed Clayton Wind Farm would consist of about 70 wind turbine generators, each with a nameplate capacity of about 1.5 to 1.8 megawatts. Together, they would produce a total of between 100 and 125 MW (megawatts) of generating capacity. The elevation of the wind farm would range from about 400 to 450 feet (120-140 m) above sea level. The Project site measures about 8 miles (12.8 km) long and 4.5 miles (7.2 km) wide and has an area of approximately 36 square miles (23,000 acres). The center of the Project is located about 3 miles (4.8 km) east of the town of Depauville (see Figure 3).

Tower heights would likely be about 80 meters (262 feet) with rotor lengths of up to 38.5 m (126 feet). Maximum height of the rotor tip when the rotor is in the twelve o'clock position would be up to about 120 m (394 feet) above ground level (AGL). In the six o'clock position, the rotor tip would be 41.5 m (136 feet) AGL. Turbines would mounted on steel tubular towers and all or a subset of them would be lit according to Federal Aviation Administration (FAA) guidelines. As with most new wind farms, FAA lighting would probably be red strobes (L-864) on the nacelle at about 82 m (269 foot) above the ground. Most electrical collection lines within the Project area would be underground. An electric substation for the purpose of connecting the Project to the electric power grid would be constructed somewhere on the Project site. The connection between the substation and existing transmission lines could be above ground.

2.2 Site Description

Information regarding the site's topography, physiography, and habitat was first gathered from a 1:24,000 USGS topographic map. This information was subsequently checked during a site visit conducted in early-mid November, 2004. In addition, several studies (Andrle and Carroll 1988, Levine 1998, and Wells 1998) were examined to determine the type of habitat known to be present in the general vicinity of the proposed

Project. This research allowed a determination of the bird communities and species that are likely to be present.

The Clayton Wind Farm and adjoining portions of Jefferson County are situated in the Eastern Ontario Plains ecozone. According to Anderle and Carroll (1988), the Eastern Ontario Plains are a nearly level region that ranges in elevation from 250 to 500 feet (76-152 m). The region enjoys a climate moderated by Lake Ontario and productive soils derived from lake sediments over limestone bedrock. Agriculture and dairying are the region's principal economic mainstays. As a result, forest cover is greatly reduced. The dominant forest type is elm-red maple and northern hardwoods.

There are no large bodies of water (lakes or rivers) on the Project site itself, but the Chaumont River runs just to the northwest of the site and the Perch Rivers flows just to the south. Both rivers empty into nearby Lake Ontario. The Perch River has been dammed in three sections just southeast of the Project site. These dams have created lakes and marshes that are managed within the Perch River Wildlife Management Area (WMA).

Based on topographic maps, the Project site appears to be mostly open agricultural land, with dispersed woodlots and fragmented forest covering about 10% of the landscape (see photographs in Appendix A). A small swamp appears in the north-central portion of the proposed wind farm.

The Project site is bounded and crossed by a number of paved and dirt roads. Along these roads are a significant number of houses and farms. There are also existing transmission and distribution lines within the Project boundary. In general, the lands where the turbines would be located have been highly disturbed by farming practices.

3.0 Results of Site Visit

The proposed Clayton Wind Farm site was visited on November 8 and 9, 2004. All areas accessible by road were toured by automobile and some areas were walked. The weather on those days was mostly fair and did not impede the observation of habitats and birds. It was windy during the observations, and a few snow squalls obscured the field biologist's vision for five to ten minutes at a time. There was some snow on the ground during the site visit. The areas where turbines would be located are relatively open and gently rolling terrain, permitting a visual evaluation of most of the Project site. During the visit, an effort was made to observe the bird life and habitat on and adjacent to the site, thereby allowing a determination of what birds or ornithological phenomena might be present on site or nearby.

The site visit confirmed that the predominant land-use at the Project site is agricultural, including corn, hay, cover crops, freshly plowed areas, and pasture (see photographs in Appendix A). Extensive areas of fallow, grassy fields were also noted, as well as extensive areas of shrubby thickets. The following tree species were noted in the wooded areas: sugar maple, quaking aspen, gray birch, red maple, white ash, black

cherry, apple, and American elm, with some White Pine mixed into most woodlots. Also noted were dense planted stands of red spruce. Red cedar was also present. Wetlands made up a very small percentage of the habitat on site, consisting mainly of small ponds and willow thickets.

A total of 45 bird species were observed during the site visit (see Appendix B). These were mostly common, year-round resident, wintering, and late migratory species. Six NYSDEC-listed species were noted, however. These included two threatened species – the Northern Harrier and Golden Eagle – and four species of special concern – Sharp-shinned hawk, Cooper's Hawk, Northern Goshawk, and Horned Lark.

4.0 Avian Overview of the Clayton Wind Farm Site

Based on the site visit, literature review, and agency consultations, the avifauna in and around the vicinity of the Clayton Wind Farm can be characterized as follows:

4.1 Nesting Birds

Table 4.1-1 summarizes the NYSDEC and USFWS lists of endangered and threatened species, as well as of species of special concern. Given their special status, these species have been given particular attention in assessing avian risk at the Project site. Based on the site visit and other data sources, Table 4.1-1 also grades the suitability of habitat for nesting on the Project site as suitable, marginally suitable, or not suitable.

Based on the visual evaluation of habitat on the Project site afforded by the site visit, available habitat appeared to be suitable for nesting for four species listed by NYSDEC as threatened. These were Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow. The combination of many large fallow fields, pastures, and hay fields could support the breeding of these four species. On-site habitat could also be suitable for two state-listed endangered species – the Short-eared Owl and Loggerhead Shrike. In the 1980-1985 BBA project, western Jefferson County was one of the few areas that retained these species as breeders. But, while BBA surveys from 2000 to 2004 show the Short-eared Owl hanging on as a breeder in Jefferson County, the shrike appears to have completely disappeared.

The habitats in and around the Project site were also judged to be potentially suitable for nesting for a number of species of special concern. The site's wooded areas and forest edges could conceivably support nesting Sharp-shinned Hawks, Cooper's Hawks, Northern Goshawks, Red-shouldered Hawks, and Whip-poor-wills. The grassland habitats appeared to be suitable nesting habitat for Horned Larks, Vesper Sparrows, and Grasshopper Sparrows. In addition, early successional habitats with grassy patches, thick brush, and small trees could conceivably host nesting Golden-winged Warblers

Table 4.1-1. Listed Species

Species	NYS Status[1]	Federal Status[1]	Nearby BBA Record?[2]	Nearby BBS Record?[3]	Habitat Suitability at Site[4]
Endangered/Threatened					
Pied-billed Grebe	T		Yes	Yes	NS
Least Bittern	T		Yes		NS
Bald Eagle	T	T	Yes		MS?
Northern Harrier	T		Yes	Yes	S
Golden Eagle	T				NS
Peregrine Falcon	E				NS
Spruce Grouse	E				NS
King Rail	T				NS
Black Rail	E				NS
Upland Sandpiper	T		Yes	Yes	S
Piping Plover	E	T			NS
Common Tern	T			Yes	NS
Roseate Tern	E	E			NS
Black Tern	E		Yes		NS
Least Tern	T				NS
Short-eared Owl	E				S?
Loggerhead Shrike	E				S?
Sedge Wren	T		Yes	Yes	S
Henslow's Sparrow	T		Yes		S
Of Special Concern					
Common Loon	SC			Yes	NS
American Bittern	SC		Yes	Yes	NS
Osprey	SC		Yes	Yes	MS?
Sharp-shinned Hawk	SC		Yes	Yes	S?
Cooper's Hawk	SC		Yes		S?
Northern Goshawk	SC		Yes		MS?
Red-shouldered Hawk	SC				S?
Black Skimmer	SC				NS
Common Nighthawk	SC				NS
Whip-poor-will	SC		Yes		S
Red-headed Woodpecker	SC				NS
Horned Lark	SC		Yes	Yes	S
Bicknell's Thrush	SC				NS
Golden-winged Warbler	SC		Yes	Yes	S
Cerulean Warbler	SC			Yes	MS?
Yellow-breasted Chat	SC				NS
Vesper Sparrow	SC		Yes	Yes	S
Grasshopper Sparrow	SC		Yes	Yes	S
Seaside Sparrow	SC				NS

[1] E = Endangered, T = Threatened, and SC = Special Concern.

[2] BBA = Breeding Bird Atlas. Please see Table 4.1-2 for details.

[3] BBS = Breeding Bird Survey. Please see Table 4.1-3 for details.

[4] S = Suitable, MS = Marginally Suitable, NS = Not Suitable, and ? = uncertainty in evaluation.

Letters to USFWS and the NYS Natural Heritage Program (a division of NYSDEC) have been sent, but responses had not been received as of April 18, 2005. Based on past agency consultations related to wind power projects in New York State, the extensive information and data sources checked for this report are likely to cover many wildlife agency concerns, although not all of them.

Two other data sources were examined to determine the potential presence of listed species, species of special concern, and other nesting birds in and around the Clayton Wind Farm site. The most important of these sources was the New York State Breeding Bird Atlas (BBA; specifically the 2000-2004 Atlas project), because its coverage includes the Project site. Of secondary importance were the nearby Breeding Bird Surveys (BBS) of the U.S. Geological Survey (USGS), which do not overlap the Project site but do survey similar habitats in the Project region. Detection of any listed species, species of special concern, or suitable habitat for these species in either of these information sources signaled that these species might be found on or near the proposed wind power site.

4.1.1 Breeding Bird Atlas (BBA) Analysis

The Breeding Bird Atlas (BBA) is a comprehensive, statewide survey that reveals the current distribution of breeding birds in New York State. New York's first BBA was conducted in 1980-1985 and reported in the 1998 publication, *The Atlas of Breeding Birds in New York State* edited by Robert F. Anderle and Janet R. Carroll. In 2000-2004, this effort was repeated in order to determine what changes have occurred in breeding bird distribution. The results of the recent survey are available on the Internet (see http://www.dec.state.ny.us/apps/bba/results/).

The BBA project divided the entire state into ten regions (the Project site is in Region 6) and 5,335 blocks, each of which measured 5 x 5 km (3 x 3 miles). Each block was designated as A, B, C, or D, with A blocks in general given the most importance, in the event volunteers did not have enough time to survey all of the blocks. Blocks were assigned to volunteer birdwatchers who, with detailed topographic maps, visited the various habitats within their assigned blocks in order to record evidence of breeding for the birds they saw. Evidence of breeding was graded as *Possible* (i.e., a species is simply observed in possible nesting habitat), *Probable* (i.e., a species exhibits certain behaviors that indicate breeding, such as territoriality, courtship and display, or nest building), or *Confirmed* (i.e., a species is observed nesting or engaged in behaviors associated with nesting, such as distraction display, carrying a fecal sac, carrying food for young, etc.).

The nine blocks that covered the Clayton Wind Farm site were surveyed during the 2000-2004 Atlas Project (see Table 4.1-2). It is important to note, however, that these blocks cover areas both inside and outside the proposed wind farm development. The species totals for the blocks ranged from 100 to 47 species, with 132 species recorded cumulatively (see Appendix C for a complete list). Of this number, 83 species (63%) were confirmed as breeders, 30 (23%) were recorded as probable breeders, and 19 (14%) were listed as possible breeders.

4.1-2. Breeding Bird Atlas (BBA) Records

Block Number	Wind Farm Section	Total Species	Listed Species[1]	Breeding Status	Notes
4189C	North	58	Northern Harrier (T)	Confirmed	Adult(s) with food for young
			Upland Sandpiper (T)	Probable	Bird (or pair) apparently holding territory
			Horned Lark (SC)	Probable	Bird (or pair) apparently holding territory
			Vesper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Grasshopper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
4189D	North	47	Upland Sandpiper (T)	Possible	Recorded in possible nesting habitat
			Horned Lark (SC)	Possible	Recorded in possible nesting habitat
			Henslow's Sparrow (T)	Probable	Courtship, display, or agitated behavior noted
4088B	Center	93	American Bittern (SC)	Possible	Recorded in possible nesting habitat
			Bald Eagle (T)	Possible	Recorded in possible nesting habitat
			Northern Harrier (T)	Confirmed	Adult(s) with food for young
			Sharp-shinned Hawk (SC)	Possible	Recorded in possible nesting habitat
			Cooper's Hawk (SC)	Probable	Pair observed in suitable nesting habitat
			Upland Sandpiper (T)	Probable	Pair observed in suitable nesting habitat
			Whip-poor-will (SC)	Probable	Singing male at same place on more than one date
			Horned Lark (SC)	Probable	Singing male at same place on more than one date
			Golden-winged Warbler (SC)	Possible	Recorded in possible nesting habitat
4188A	Center	82	Northern Harrier (T)	Probable	Bird (or pair) apparently holding territory
			Upland Sandpiper (T)	Probable	Pair observed in suitable nesting habitat
			Horned Lark (SC)	Possible	Recorded in possible nesting habitat
			Grasshopper Sparrow (SC)	Probable	Singing male at same place on more than one date
			Henslow's Sparrow (T)	Probable	Bird (or pair) apparently holding territory
4188B	Center	59	Northern Harrier (T)	Probable	Pair observed in suitable nesting habitat
			Upland Sandpiper (T)	Possible	Recorded in possible nesting habitat
			Horned Lark (SC)	Probable	Bird (or pair) apparently holding territory
			Vesper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Grasshopper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Henslow's Sparrow (T)	Probable	Bird (or pair) apparently holding territory

4088D	South	100	Northern Harrier (T)	Confirmed	Recently fledged young observed
			Sharp-shinned Hawk (SC)	Confirmed	Recently fledged young observed
			Northern Goshawk (SC)	Confirmed	Recently fledged young observed
			Upland Sandpiper (T)	Probable	Pair observed in suitable nesting habitat
			Whip-poor-will (SC)	Confirmed	Recently fledged young observed
			Horned Lark (SC)	Possible	Recorded in possible nesting habitat
			Golden-winged Warbler (SC)	Probable	Singing male at same place on more than one date
			Grasshopper Sparrow (SC)	Probable	Singing male at same place on more than one date
			Henslow's Sparrow (T)	Possible	Recorded in possible nesting habitat
4188C	South	75	Pied-billed Grebe (T)	Confirmed	Adult(s) with food for young
			American Bittern (SC)	Possible	Recorded in possible nesting habitat
			Northern Harrier (T)	Possible	Recorded in possible nesting habitat
			Sharp-shinned Hawk (SC)	Possible	Recorded in possible nesting habitat
			Upland Sandpiper (T)	Probable	Pair observed in suitable nesting habitat
			Horned Lark (SC)	Probable	Bird (or pair) apparently holding territory
			Vesper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Grasshopper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Henslow's Sparrow (T)	Probable	Bird (or pair) apparently holding territory
4188D	South	91	Pied-billed Grebe (T)	Confirmed	Nest with young recorded
			American Bittern (SC)	Probable	Courtship, display, or agitated behavior noted
			Least Bittern (T)	Possible	Recorded in possible nesting habitat
			Osprey (SC)	Confirmed	Nest with eggs recorded
			Northern Harrier (T)	Confirmed	Adult(s) with food for young
			Sharp-shinned Hawk (SC)	Probable	Pair observed in suitable nesting habitat
			Upland Sandpiper (T)	Probable	Bird (or pair) apparently holding territory
			Black Tern (E)	Confirmed	Nest with young recorded
			Horned Lark (SC)	Probable	Bird (or pair) apparently holding territory
			Sedge Wren (T)	Probable	Bird (or pair) apparently holding territory
			Vesper Sparrow (SC)	Probable	Pair observed in suitable nesting habitat
			Grasshopper Sparrow (SC)	Probable	Bird (or pair) apparently holding territory
			Henslow's Sparrow (T)	Probable	Bird (or pair) apparently holding territory

4187A	South	90	Northern Harrier (T)	Probable	Pair observed in suitable nesting habitat
			Sharp-shinned Hawk (SC)	Possible	Recorded in possible nesting habitat
			Cooper's Hawk (SC)	Probable	Pair observed in suitable nesting habitat
			Upland Sandpiper (T)	Probable	Pair observed in suitable nesting habitat
			Whip-poor-will (SC)	Confirmed	Nest with eggs recorded
			Horned Lark (SC)	Probable	Singing male at same place on more than one date
			Grasshopper Sparrow (SC)	Probable	Singing male at same place on more than one date
			Henslow's Sparrow (T)	Possible	Recorded in possible nesting habitat

[1] E = Endangered, T = Threatened, and SC = Special Concern.

Most of the species recorded in the 2000-2004 BBA were common nesting species for this region of New York State. However, a large number of state listed species were present on the BBA surveys. Eight threatened or endangered species and ten species of special concern were recorded near the Project site (see Tables 4.1-1 and 4.1-2 and the discussion below).

Waterbirds were very well represented in the BBA survey, mainly because of the high quality aquatic habitat contained in the Perch River Wildlife Management Area (WMA). The Project site and this wildlife management area coincide in Block 4188D. In Table 4.1-2, the listed species recorded in that block included Pied-billed Grebe (threatened), American Bittern (special concern), Least Bittern (threatened), Osprey (special concern), and Black Tern (endangered). The grebe, Osprey, and Black Tern were even confirmed as breeders. Nevertheless, as noted above, waterbird habitat is not well represented on the Project site itself, as can be seen in the records of listed species in blocks 4188A and 4188B, which cover the heart of the proposed wind farm area (see Table 4.1-2).

Six raptors were confirmed as breeders in the BBA blocks that covered portions of the Project site. They were Osprey (special concern), Northern Harrier (threatened), Sharp-shinned Hawk (special concern), Northern Goshawk (special concern), Red-tailed Hawk, and American Kestrel. The Osprey was only recorded in the block that covered a section of the Perch River WMA and is unlikely to nest on the Project site itself. In addition, a Bald Eagle (U. S. threatened) was observed in one block during the survey, making the list of possible breeders, and a pair of Cooper's Hawks (special concern) was observed in suitable nesting habitat most likely south of the Project site. The unlisted Turkey Vulture was recorded as a probable breeder.

A wide variety of songbirds were recorded, including many of the species one would expect in forest, forest-interior, forest-edge, woodland, old field, grassland, and wetland habitats. Many were confirmed as breeders, including Whip-poor-will (special concern). An impressive community of grassland nesting birds was recorded, including probable nesting by Upland Sandpiper (threatened), Horned Lark (special concern), Sedge Wren (threatened), Vesper Sparrow (special concern), Grasshopper Sparrow (special concern), and Henslow's Sparrow (threatened), and confirmed nesting by Savannah Sparrow, Bobolink, and Eastern Meadowlark.

Regarding listed species (see Table 4.1-2), many were widely recorded. For example, Northern Harrier (threatened) was recorded in 8 of the 9 blocks that covered portions of the Project site, including confirmed breeding in four of the blocks. Upland Sandpiper (threatened) and Horned Lark (special concern) were recorded in all nine blocks, mostly as probable breeders. Henslow's Sparrow (threatened) was recorded in 7 of 9 blocks, again mostly as a probable breeder. The large fallow fields and adjacent pastures and hay fields provide almost ideal nesting conditions for many of these species.

Other listed species were less often recorded. Sharp-shinned Hawk (special concern) was recorded in five blocks, including as a confirmed breeder in one. Sharp-shinned Hawks are forest nesting birds and are found frequently in spruce forests like those present within the Project area. Whip-poor-will (special concern) was recorded in three blocks, including one confirmed breeding. Golden-winged Warbler (special concern) was recorded in two blocks, in one as a probable breeder. These declining birds prefer edge and second growth habitats with some brush. Sedge Wren (threatened), a grassland or wet meadow nesting species, was recorded as in one block as a probable breeder. Vesper Sparrow (special concern) and Grasshopper Sparrow (special concern) are two other grassland nesting birds that were documented as probable breeders in more than one block.

The endangered Short-eared Owl and Loggerhead Shrike, both grassland-type habitat nesters, were not recorded in any block that covered a portion of the Project site. In the 1980-1985 BBA Project, both species were recorded sparingly in nearby sections of Jefferson County. At that time, the highest breeding status assigned to the Short-eared Owl in Jefferson County was probable. The shrike was confirmed as a breeding species.

In examining the 2000-2004 BBA results for these two declining species, it was noted that Short-eared Owl was recorded in twenty BBA blocks throughout New York State (down from 36 in 1980-1985), including five in Jefferson County, where it was confirmed breeding at Point Peninsula, 8 miles (12.8 km) southwest of the Project site, and in or in the vicinity of the Fort Drum Military Reservation, about 16 miles (26 km) to the east. Loggerhead Shrike, however, was not recorded at all in Jefferson County. There were four records in 1980-1985 out of a total of 24 statewide records. In 2000-2004, the shrike was recorded in only six Atlas blocks statewide (in all cases as a possible breeder, the lowest status). The closest Atlas block to the Project site was in southwest St. Lawrence County, about 35 miles (56 km) east, in the foothills of the Adirondacks. In light of this information, both species could conceivably turn up as breeders at the Project site, with the owl more likely than the shrike.

In summary, the BBA data indicate that the Project site and surrounding area have a significantly diverse breeding bird community, with a high representation of state-listed species. A large number of these species are grassland nesting species and nest (or forage) in fallow fields, meadows, pastures, and hay and alfalfa fields. Eighteen of the 38 NYSDEC-listed species were recorded in the 2000-2004 BBA, nearly half of the state list. While waterbirds are not well represented on the Project site itself, they are well represented on adjacent lands, particularly the Perch River WMA to the southeast. These include the endangered Black Tern, threatened Pied-billed Grebe and Least Bittern, and special-concern American Bittern and Osprey.

The breeding birds of the Project site are mainly those of open and wooded upland habitats, including a noteworthy grassland bird community, which includes the threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow and special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow. Among the birds that breed in association with wooded habitats, the following special-concern

species may well nest on the Project site: Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Whip-poor-will, and Golden-winged Warbler.

4.1.2 Breeding Bird Survey (BBS) Analysis

Now overseen by the Patuxent Wildlife Research Center of the U.S. Geological Survey (USGS), the North American Breeding Bird Survey (BBS) is a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each year during the height of the breeding season (normally June), mainly volunteer participants skilled in avian identification collect bird population data along roadside survey routes. Each survey route is 24.5 miles (39.4 km) long with stops at 0.5 mile (0.8 km) intervals. At each stop, a three-minute point count is conducted. During the count, every bird seen within a 0.25 mile (0.4 km) radius or heard is recorded. Surveys start one-half hour before local sunrise and take about five hours to complete. Surveys are sometimes repeated several times each spring during the nesting season.

Four BBS routes, all within 35 miles of the Project site and covering similar habitat within the Eastern Ontario Plains, were analyzed in order to evaluate the likelihood of the occurrence of listed species as breeders at the Clayton Wind Farm site (see Table 4.1-3). The closest BBS route to the Project site was Watertown, about 4 miles (6.4 km) distant. Data analysis was limited to the last ten years, beginning in 1994, but none of the routes was surveyed every year during that period.

Overall, waterbirds are not as well represented in the BBS routes as in the BBA quadrants, mainly because no BBS route appeared to sample aquatic habitat as productive as the Perch River State WMA, which shared two BBA quadrants with the Project site. With their loud carrying calls, Pied-billed Grebe (threatened) and American Bittern (special concern) were recorded respectively on two and three of the four BBS routes sampled. Waterfowl records were limited to Canada Goose, Wood Duck, American Black Duck, and Mallard. Ring-billed Gull was well recorded on all four BBS routes, as would be expected from the proximity of Lake Ontario and the St. Lawrence River. One Common Tern was recorded in one year on the Ogdensburg route along the St. Lawrence River.

Regarding raptors, eight species were recorded in the BBS data, as opposed to nine in the BBA. Turkey Vulture, Osprey (special concern), Northern Harrier (threatened), Sharp-shinned Hawk (special concern), Red-tailed Hawk, and American Kestrel were recorded in both surveys. But, the BBS did not record Bald Eagle (threatened), Cooper's Hawk (special concern), and Northern Goshawk (special concern). It did, on the other hand, add Red-shouldered Hawk (special concern) and Broad-winged Hawk. All raptors, however, were recorded in low numbers in the BBS. For example, in some years, common raptor such as the Red-tailed Hawk and American Kestrel went unrecorded, and the maximum number recorded on any route in any year was three and two respectively.

4.1-3. Breeding Bird Survey (BBS) Records[1]

Route Number	Route Name	County	Distance/ Bearing from Site	Years Analyzed	Species Max/Min	Listed Species[2]	# Years	# Birds
61071	Watertown	Jefferson	4 mi S	5	72 / 61	Pied-billed Grebe (T)	1	1
						American Bittern (SC)	4	1-4
						Northern Harrier (T)	2	1-3
						Upland Sandpiper (T)	1	1
						Horned Lark (SC)	2	4-9
						Golden-winged Warbler (SC)	1	1
						Vesper Sparrow (SC)	3	1-2
						Grasshopper Sparrow (SC)	3	1-3
61113	Philadelphia	Jefferson/St. Lawrence	12 mi E	8	89 / 54	Common Loon (SC)	2	1
						Pied-billed Grebe (T)	1	2
						American Bittern (SC)	1	1
						Northern Harrier (T)	2	1
						Sharp-shinned Hawk (SC)	1	1
						Upland Sandpiper (T)	2	1
						Horned Lark (SC)	1	1
						Sedge Wren (T)	1	1
						Golden-winged Warbler (SC)	6	2-11
						Cerulean Warbler (SC)	3	1
61096	Ogdensburg	St. Lawrence	19 mi NNE	6	65 / 42	American Bittern (SC)	2	1
						Northern Harrier (T)	1	1
						Common Tern (T)	1	1
						Horned Lark (SC)	1	2
61072	Pulaski	Oswego	35 mi S	4	72 / 63	Osprey (SC)	1	1
						Northern Harrier (T)	2	1
						Red-shouldered Hawk (SC)	1	1
						Golden-winged Warbler (SC)	4	1-5

[1] From the North American Breeding Bird Survey, 1994-2004

[2] NYSDEC status, E = Endangered, T = Threatened, and SC = Special Concern

Most of the species recorded by the BBS in the Project region were common birds of forest, forest edge, woodland, old field, grassland, and wetland habitats. Nevertheless, Golden-winged Warbler (special concern) was recorded on two of the routes, sometimes in impressive numbers (11 in 1996 and 7 in 2004 on the Philadelphia route). Single Cerulean Warblers (special concern) were recorded in three of eight years along the Philadelphia route.

With regard to grassland birds, the BBS recorded most of the specialty species, including Northern Harrier (threatened), Upland Sandpiper (threatened), Horned Lark (special concern), Sedge Wren (threatened), Vesper Sparrow (special concern), and Grasshopper Sparrow (special concern). Only Henslow's Sparrow (threatened) was missed.

In summary, based on the site visit, BBA analysis, and BBS data, there is a high likelihood that nesting habitat is present at the Project site for a number of state-listed species, particularly those of grassland communities. Among the listed grassland species, the Clayton Wind Farm site probably contains suitable breeding habitat for the threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow, as well as for the special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow.

The Project site also likely contains suitable nesting habitat for the following raptors that nest in forest and forest edge: Sharp-shinned Hawk (special concern), Cooper's Hawk (special concern), Red-tailed Hawk, and American Kestrel. The nesting suitability of on-site habitat is less likely for the threatened Bald Eagle (one record in the BBA), special-concern Osprey (more likely to nest adjacent to quality aquatic habitat, not in woodlots removed from such habitat), special-concern Goshawk (the woodlots and forest fragments on site may be too small to support this species), and special-concern Red-shouldered Hawk (recorded once on a distant BBS route).

Two special-concern species associated with wooded habitats may also breed within the Clayton Wind Farm area. These are the Whip-poor-will and Golden-winged Warbler. The Project site's habitat is probably not suitable for Cerulean Warbler, which, in this part of New York State, prefers wooded swamps, deciduous forest in stream bottoms, and lake and river shores with numerous tall trees (Bull 1974).

Regarding waterbirds, the Project site itself contains little suitable nesting habitat, limited mainly to small ponds and willow thickets. But, high quality waterbird habitat is located adjacent to the Project site in the Perch River WMA. A number of listed species occur there, including the endangered Black Tern, threatened Pied-billed Grebe and Least Bittern, special-concern American Bittern and Osprey, and about twelve species of waterfowl.

4.2 Migratory Birds

Given its proximity to Lake Ontario and the St. Lawrence River – not far from Cape Vincent, where the one flows into the other – in a region where wildlife

management areas are well represented (including the adjacent Perch River WMA), the Project site appears to be located in an area where significant bird migration seems to occur. The above features can be considered ecological magnets that attract migrating birds (Berthold 2001, Alerstam 1990).

The sections that follow examine the migration of songbirds, hawks, and waterbirds (waterfowl, shorebirds, and others).

4.2.1 Nocturnal Songbird Migration

The literature has few references to songbird migration in north-central New York State, including Jefferson County. Thus, little information was found about the Project site or areas nearby. Nonetheless, several sources that would apply to this New York region and other locations were found regarding the night migration of songbirds.

It appears that the night migration of songbirds through northern and central New York occurs over a broad front with no large concentrations of these birds, with the likely exception of the immediate area along the shoreline of Lake Ontario where songbirds probably make stopovers in fairly large numbers. There is also no evidence that songbirds follow topographic structures such as ridges and valleys during night flight and that most night migration occurs over broad fronts (Berthold 2001, Alerstam 1993, Eastwood 1967). Berthold (2001) went so far as to say, "individuals originating from geographically dispersed breeding areas cross all geomorphological features (lowlands, mountains, rivers, and so on) along their routes without deviating much from the orientation of their initial tracks." Berthold uses the term "broad fronts" to describe these migrations. Radar studies conducted in western and upstate New York suggest that migration is generally broad front (Cooper et al. 1995, Cooper and Mabee 1999, Cooper et al. 2004a, 2004b). Perhaps the best evidence from eastern North America to support the contention that birds do not follow topographic features is a study by Cooper et al. (2004) from a ridge in West Virginia, which showed that night migrants simply crossed the ridge at an oblique angle rather than following it. This finding is consistent with the phenomenon of broad front migration.

Even migrants confronted by the Great Lakes in upstate New York (eastern Lake Erie and Lake Ontario) do not turn when they reach the lake shores during night migration (Diehl and Larkin 2003) and continue to cross the lakes as if they were not present. These birds do, however, put down for stopovers in habitats close to the lakeshores, especially in the hours before dawn. Nonetheless, the evidence is overwhelming that most night migrating songbirds are spread across a broad front over most types of topography encountered by these birds.

A short-term marine radar study conducted in spring near Cape Vincent at the eastern end of Lake Ontario showed slightly elevated numbers of night migrants close to the shoreline (Cooper et al. 1995). This may demonstrate slightly elevated numbers of birds, as compared to inland migration away from the lakes. Nevertheless, an in depth study is needed from both spring and fall migration seasons to better determine whether

the numbers of migrants near the east end of Lake Ontario is greater than farther from the lake. The Clayton Wind Farm site is inland east-southeast of the radar site at Cape Vincent.

There are two accounts from northeastern states that suggest birds do, at times, change migration direction when confronted by topographic features. In New Hampshire at Franconia Notch, at the northern edge of the White Mountains, birds may turn when they encounter the massive topographic features of these mountains (Williams et al. 2001). This is similar to the European findings of birds flying through passes in the Alps and diverting around the Alps (Bruderer and Liechti 199). However, the Williams et al. (2001) report provides little information on high flying migrants or migrants flying in other than a restricted location near Franconia Notch, so there is limited information from this site. A study done at two New York sites (one along the Hudson River and the other in the Helderberg Mountains, near Albany) suggested that birds might have been following the Hudson River (or the lights along the River) during fall migration (Bingman et al. 1982) when winds were strong from the west.

There is no evidence to suggest that the Project site would experience anything but broad-front nocturnal migration. But, given the site's proximity to the Lake Ontario lakefront, there is the possibility that migratory stopover of songbirds could concentrate the migration of some birds just to the west of the site, both in the spring and fall. Nevertheless, the site is likely too distant from the lakeshore and does not contain enough wooded habitat to be an attractive stopover site for large numbers of nocturnal migrants.

4.2.2 Hawk Migration

Hawk migration throughout New York State has been well documented (including by this report's senior author, who did his doctoral research on this phenomenon in east-central New York between 1975 and 1981). Since the boom of recreational birdwatching in the 1960s, thousands of birdwatchers have searched the state to locate the migration corridors for raptors. Annually, thousands of these birdwatchers visit dozens of sites throughout the state to watch and count migrating hawks. These sites are distributed from eastern Long Island to the shores of Lake Erie. It is safe to say that most of the localities where large numbers of hawks occur during migration are known.

Overall, there are fewer than about a dozen hawk watches in the state where migrating hawks can be reliably seem in impressive numbers of up to ten of thousands of birds. The best hawk watching sites are located either in the far southeastern corner of the state in the lower Hudson Valley and on Long Island, or along the southern shore of Lake Ontario (Derby Hill, Braddock Bay) and Lake Erie (Ripley).

Located about 40 miles (64 km) south-southwest of the proposed Clayton Wind Farm, the Derby Hill hawk watch is the closest major migration site to the Project site. It is considered a significant hawk watch (Zalles and Bildstein 2000), with tens of thousands of hawks passing by on the spring migration as they concentrate along the shore of Lake Ontario. During fall migration, relatively few hawks pass Derby Hill.

Except for Derby Hill, there are no other noteworthy hawk watching sites near the proposed Clayton Wind Farm site.

Most of the migration noted at Derby Hill is concentrated within 1 to 5 miles (1.6 to 8 km) of the lakefront. Once migrating hawks clear the southeast corner of Lake Ontario beyond Derby Hill, they turn northward and disperse above the landscape. Inland, migrating hawks are spread more evenly over large areas. Away from the large bodies of water and steep ridges that concentrate hawk migration, most hawk migration in central New York occurs at relatively high altitudes (generally above 100 m [328 feet]) and is spread over a broad front, as confirmed by radar studies (Kerlinger et al. 1985).

The highly concentrated hawk migration that occurs during spring migration at Derby Hill is not likely to be indicative of the numbers of hawks migrating over the Clayton Project site. By the time the hawks that have passed Derby Hill reach the latitude of the Project site, they will likely be dispersed over the landscape at high altitude, not concentrated along the lakeshore. In the fall, some hawks may concentrate at the northeast corner of Lake Ontario in Canada, but once these birds have cleared the lake and begin to head south, they will again disperse over the landscape. Along the immediate lakefront, a concentrated migration of falcons and accipiters can be expected. Away from the lakefront, in the area of the proposed wind farm, falcons and accipiters will pass by, but not in concentrated numbers. A number of falcons and accipiters, however, will be attracted to the Perch River WMA.

4.2.3 Waterbird Migration

While the Project site itself generally lacks waterbird habitat, it is located adjacent to the 8,000 acre Perch River Wildlife Management Area (WMA), which does attract waterfowl. According to the website of the Important Bird Areas Project in New York State (see http://ny.audubon.org/iba/perchriverwma.html), the following state-listed species have been recorded at Perch River both in spring and fall migration: the endangered Black Tern, the threatened Pied-billed Grebe and Least Bittern, and the special-concern Osprey and American Bittern.

Ducks and geese are also well represented in migration at Perch River. During the November site visit, both Snow Geese and Canada Geese were observed within the proposed wind farm area. This indicates that migratory flocks of geese that stopover at Perch River sometimes feed in the agricultural fields of the Project site.

The Project site is also located about 15 miles (24 km) east of Cape Vincent, where Lake Ontario and the St. Lawrence River meet. Chaumont Bay on Lake Ontario is only 4.5 miles (7.2 km) southwest of the Project site. The St. Lawrence is about 7.5 miles (12.0 km) northwest. This indicates that the region in which the Project site is situated is an important migratory corridor and stopover area for waterbirds.

Most migrating waterbirds fly at night (and to a lesser extent during daytime) at altitudes of 500 to 1,000 feet (152 to 304 m) or more (Bellrose 1976). This phenomenon

has been confirmed with radar at many locations for ducks, geese, loons, and other birds (Kerlinger 1982, reviewed by Kerlinger and Moore 1989). But, with the proximity of Perch River WMA, Lake Ontario, the St. Lawrence River, and other wildlife management areas, it is likely that significant numbers of waterbirds will be stopping over on migration in the Project region. This will include migrating Snow and Canada Geese that feed in corn and other agricultural fields during fall and spring migration. This type of agricultural habitat occurs on the Project site.

Small wetlands do occur within the Project boundary, some of which will attract small numbers of migrating waterbirds including rails, bitterns, waterfowl, and, perhaps, some grebes. Because these wetlands are small, and because larger, more productive wetlands are located outside of the site, the relative importance of the wetlands within the Project site is likely to be minimal.

4.3 Wintering Birds

Beginning in mid-November and extending into mid-March, winter in far upstate New York is generally harsh and relatively inhospitable for many birds. The flat terrain beyond Lake Ontario where the Clayton Project would be located is subject to strong winds, low temperatures, and a great amount of snow. Food for birds is likely to be scarce. A much lower diversity and density of birds is to be expected in and around the Project site during winter than at other times of the year.

The Audubon's Christmas Bird Count (CBC) provides an excellent overview of the birds that inhabit an area or region during early winter. Counts take place on a single day during a three-week period around Christmas, when dozens of birdwatchers comb a 15-mile (24 km) diameter circle in order to tally up all the bird species and individuals they see. In preparation for count day, participants also scout for birds during the "count week" period. While most of these birdwatchers are unpaid amateurs, they are usually proficient or highly skilled observers.

Table 4.4-1. Audubon Christmas Bird Counts (CBC's) Examined

Count Name (Code)	County	Distance/ Bearing from Site	Years Analyzed	Number Participants	Number Species Min/Max
Watertown (NYWA)	Jefferson	3 mi SSE	9	6-16	44-64
New Boston (NYNB)	Lewis	17 mi SSE	10	8-17	30-43
Oswego-Fulton (NYOS)	Oswego	45 mi SSW	10	10-15	25-51
Massena-Cornwall (NYMC)	St. Lawrence	68 mi NE	9	9-18	57-69

Available at http://audubon2.org/birds/cbc/hr/count_table.html, CBC data are used by scientists, wildlife agencies, and environmental groups to monitor bird populations. The results over the last ten years for four of the CBC's closest to the Project site (see Table 4.4-1) were examined in order to understand the winter bird populations likely to occur at the Project site. Each CBC surveys an area of about 177 square miles (453 square km). Thus, the four CBC's considered in this report covered a

total area of 708 square miles (1,812 square km). Observer participation per count during the analysis period varied from a minimum of 6 observers to a maximum of 18.

Table 4.4-2. CBC Records for Listed Species

Species (Listing[1])	CBC	Number Recorded per Year	Number Years Recorded
Common Loon (SC)	Watertown	2	2
	Oswego-Fulton	1-5	9
	Massena-Cornwall	1-19	6
Pied-billed Grebe (T)	Oswego-Fulton	1-4	7
	Massena-Cornwall	1-2	2
Bald Eagle (T)[2]	Watertown	1	2
	New Boston	1	2
	Oswego-Fulton	1	3
	Massena-Cornwall	1-7	8
Northern Harrier (T)	Watertown	1-13	7
	New Boston	1	1
	Oswego-Fulton	1	2
	Massena-Cornwall	3	1
Sharp-shinned Hawk (SC)	Watertown	1-5	7
	New Boston	1-2	6
	Oswego-Fulton	1-3	7
	Massena-Cornwall	1-4	7
Cooper's Hawk (SC)	Watertown	1-4	7
	New Boston	1-4	5
	Oswego-Fulton	1-4	7
	Massena-Cornwall	1-3	6
Northern Goshawk (SC)	Watertown	1	2
	New Boston	1-3	8
	Oswego-Fulton	1	1
	Massena-Cornwall	1-2	6
Golden Eagle (T)	Massena-Cornwall	1	1
Peregrine Falcon (E)	Massena-Cornwall	1	1
Short-eared Owl (E)	Watertown	2	2
Red-headed Woodpecker (SC)	Watertown	1	1
Horned Lark (SC)	Watertown	1-179	7
	New Boston	3-52	5
	Oswego-Fulton	1	1
	Massena-Cornwall	2-15	4

[1] NYSDEC status, E = Endangered, T = Threatened, and SC = Special Concern

[2] Also listed as Threatened by USFWS

The number of species recorded in these counts ranged from a maximum of between 43 and 69 species to a minimum of between 25 and 57 species. Except for the more inland New Boston count, which recorded a maximum of 43 species, these CBCs

were located along Lake Ontario or the St. Lawrence River, which provided open water for waterfowl and other waterbirds and permitted tallies of up to 69 species.

A majority of the birds reported on in the CBC data sets examined were common species of aquatic habitats, agricultural land, grassland, brushland, forest edge, and forest. While the Project site itself lacks open water, it is located adjacent to the Perch River WMA, which offers high quality habitat to waterbirds when not frozen over. When Perch River is open, waterbirds can be expected to fly over the project site, and geese can be expected to feed in the Project site's agricultural fields during the day. When the refuge is frozen over, waterbirds will essentially disappear until spring migration.

Open-country raptor species recorded on the CBC's – Red-tailed Hawk, Rough-legged Hawk, Northern Harrier (threatened), and, to a lesser extent, American Kestrel – are likely to be present on the Project site on a regular basis during winter. Their presence will vary from year to year depending upon snow cover and prey availability. In years with normal or heavy snow, few raptors will be present. But, if voles and mice are at the peak of their abundance fluctuations, more of these hawks are likely to be present foraging in the farm fields.

Many of the grassland, brush, and forest species recorded in the CBC's are likely to be recorded on the Project site during winter, with some found most often around residences, farmyards, and other locations where there is more shelter and food. Only a small subset of the species will be found in large fields (corn, hay, and fallow fields) or in forested and edge situations that are prevalent at the Project site. These will include various sparrows, woodpeckers, open-country passerines, owls, grouse, and a few other species. Their abundances are likely to be relatively low.

No federally listed endangered species were present on any of the counts from the four CBC's examined over the ten-year period. Bald Eagle, now federally listed as threatened (and proposed for delisting in 2000), was generally seen in small numbers on all four CBCs analyzed (Table 4.4-2), but six and seven individuals were seen in two years probably along the St. Lawrence River at the Massena-Cornwall CBC. The Bald Eagle most often inhabits areas near open water, where they eat fish, crippled and sick ducks, or carrion. When the Perch River WMA is not frozen over, Bald Eagles may occur in the vicinity of the Project site in winter.

There were two State-listed endangered species and three State-listed threatened species present on the CBC's (Table 4.4-2). Of these, Pied-billed Grebe (threatened) will not be found on the Project site itself, but it may occur in the Perch River WMA before it freezes over. Peregrine Falcon (endangered) are unlikely to be found on the Project site, as they do not generally forage in upland farm fields during winter, because there is little food for them. Nevertheless, they may be drawn to the Perch River WMA when it still has open water. Golden Eagle (threatened) may forage at times on or near the Project site. This bird, observed during the fall site visit, may have been passing through the area during the migration season, but the presence of occasional Golden Eagles on northern

New York State CBCs shows that they do, at times, winter in upstate New York, usually in very small numbers.

Short-eared Owl (endangered) and Northern Harrier (threatened) do forage in open farm fields during winter and will likely be present at the Project site, because of its low elevation and the moderating influence of Lake Ontario on the region's climate. Both Short-eared Owls and Northern Harriers sometimes roost communally and are very easy to find as they forage low over fields in daylight or at dawn and dusk. It is important to note that individuals of all these listed species may be migrants from farther north and from populations that are not listed.

Six species of special concern in New York State were present on the CBC's. They were Common Loon, Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Red-headed Woodpecker, and Horned Lark. Because the Project site itself lacks open water, Common Loon will not be attracted to it in winter. While it could occur at Perch River WMA, it is more likely to be found on Lake Ontario. Sharp-shinned and Cooper's Hawk might use the Project site in winter, but in very small numbers. These hawks usually frequent areas where there are bird feeders that attract their avian prey. They are regularly found in residential areas. Northern Goshawk could also be found on the Project site during midwinter. These birds generally eat rabbits, large rodents, and larger birds. Goshawks cover very large areas during winter in search of prey.

It is highly unlikely that a Red-headed Woodpecker would occur on the Project site in winter. It is a rare bird in upstate New York during that season, as the single record in the four counts analyzed over a ten-year period demonstrates.

Of all these species, Horned Lark is the one that will be found most often on the Project site during winter, because it forages in farm fields. Nevertheless, in years with significant snow cover, Horned Larks are unlikely to be present. As the significant fluctuation in numbers on the counts analyzed demonstrates, larks can be numerous and hundreds of individuals can be present in some years.

As with the listed species discussed above, individuals of these species of concern were probably migrants from more northerly populations that are not listed. In other words, it is unlikely that these individuals were from New York State breeding populations that are in decline.

In summary, based on the CBC analysis and what we know of the foraging habits of birds, no species listed as federally endangered will be found on the Project site in winter. The federally threatened Bald Eagle may fly through the Project site, or occasionally roost in its trees, when the Perch River WMA still has significant open water in winter. This may also be true of the State-listed endangered Peregrine Falcon.

On the other hand, the state-listed endangered Short-eared Owl and the state-listed threatened Northern Harrier are likely to be present at the Project site on a regular basis in winter. The state-listed species of concern that are likely to be on site at times during

winter include Horned Lark, Sharp-shinned Hawk, Cooper's Hawk, and Northern Goshawk, and they may even occur regularly in small numbers. When the adjacent Perch River WMA still has open water in winter, waterbirds will likely fly through the site, and geese will feed in the site's agricultural fields. Farmland, brush, and forest edge habitats on and near the Project site are likely to attract small numbers of common species during the winter. Raptor numbers will fluctuate between years and among species because of prey fluctuations. The remaining species will be present in modest numbers.

5.0 Important Bird Areas, Reserves, and Sensitive Habitats in Project Vicinity

As part of the avian risk analysis, databases were checked to see if any Important Bird Areas (IBAs) or federal, state, or private protected areas overlap with the Project site or are found in close vicinity. The presence or proximity of such areas could indicate the presence of sensitive bird habitats and increased avian risk.

5.1 Important Bird Areas (IBA's)

A program of BirdLife International and Audubon, the Important Bird Area Program seeks to identify and protect essential habitats to one or more species of breeding or non-breeding birds. The sites vary in size, but usually they are discrete and distinguishable in character, habitat, or ornithological importance from surrounding areas. In general, an IBA should exist as an actual or potential protected area, with or without buffer zones, or should have the potential to be managed in some way for birds and general nature conservation. An IBA, whenever possible, should be large enough to supply all or most of the requirements of the target birds during the season for which it is important.

About 125 IBA's have been designated in New York State, including eight in Jefferson County. Table 5.1-1 lists the nine, closest New York IBA's to the Project site and summarizes information available at the IBA website about their noteworthy features and conservation issues (see http://www.audubon.org/chapter/ny/ny/iba/).

As can be seen from the list in Table 5.1-1, the Project site coincides with one IBA (the Perch River Grasslands are centered in the east-central section of the proposed wind farm), lies adjacent to another (Perch River Wildlife Management Area), and is in the vicinity of a number of others by virtue of its location near Lake Ontario and the St. Lawrence River. Two of the IBA's (Perch River Grasslands and Fort Drum Grasslands) designate grassland breeding bird communities of statewide importance. Two others (Point Peninsula and Derby Hill Bird Observatory) designate important sites for raptors. The Point Peninsula IBA is singled out for its winter raptor population, but high numbers given in the website description (see http://ny.audubon.org/iba/pointpeninsula.html) for the 1987-1988 winter may be from a year with an extraordinary abundance of rodent prey. The other five IBA's (see list) designate important habitat for breeding and migrating waterbirds. The Upper St. Lawrence/Thousand Islands IBA is additionally designated for wintering waterfowl.

Table 5.1-1. Important Bird Areas (IBA's)

IBA Name	County	Distance/ Bearing From Site	Size (acres)	Noteworthy Features	Conservation Issues
Perch River Grasslands	Jefferson	On site E	6,000	One of the most significant concentrations of breeding grassland birds in the state	Loss of grassland habitat as farmer's sell land for development or allow fields to revert to forest
Perch River Wildlife Management Area	Jefferson	Adjacent SE	8,000	Exceptional wetland bird community	Continued monitoring of state-listed species is needed
Eastern Lake Ontario Barrier Beaches/Wetland Complex	Oswego-Jefferson	5 mi SSW	24,000	Wetland complex that supports many migratory and breeding species	Shoreline development; recreational use, particularly of sand beaches
Upper St. Lawrence/Thousand Islands	Jefferson-St. Lawrence	7.5 mi NW	100,000	Important waterfowl migration and wintering area; important Common Tern nesting area	Level of toxins in ecosystem; disturbance of breeding colonies by recreational boating and fishing
Point Peninsula	Jefferson	8 mi SW	6,400	Winter concentration area for various raptors, including Short-eared Owl and Northern Harrier	Loss of grassland habitat as farmer's sell land for development or allow fields to revert to forest
Indian River Lakes-Black Lake	St. Lawrence-Jefferson	10 mi NE	80,000	Mixture of wetlands, shrublands, and agricultural areas that support many state-listed breeders	Management of early and mid-successional habitats
Fort Drum Grasslands	Jefferson	16 mi E	107,000	One of the most significant grassland and shrubland breeding bird communities in the state	Loss of grassland bird community to forest succession if U.S. Army abandons area
Little Galloo Island	Jefferson	21 mi SW	43	Exceptional breeding concentration of colonial waterbirds	No official management agreement in place with landowners
Derby Hill Bird Observatory	Oswego	40 mi SSW	57	Spring hawk concentration	Loss of overlook property to lakefront erosion

On the Canadian side of the St. Lawrence River, the closest IBA is Wolfe Island in Kingston, Ontario. It is noteworthy for its waterfowl congregations in spring and winter concentrations of hawks and owls.

Regarding conservation issues, all the IBA's with grassland habitat are facing the loss of that habitat to forest succession. In the case of the Perch River Grasslands and Point Peninsula, habitat management is in the hands of farmers, who are increasingly pressured financially to sell their land for development or to take land out of production, allowing it to revert to forest, because of decreasing profit margins. In the case of the Fort Drum Grasslands, grassland habitat is managed by the U.S. Army for training activities. Should the Army abandon this military reservation, and no other entity steps forward to manage the grasslands, this habitat will disappear. The waterbird IBA's are faced with issues ranging from the need for population monitoring of listed species (Perch River WMA) to shoreline development (Eastern Lake Ontario Barrier Beaches/Wetland Complex), to environmental toxins (Upper St. Lawrence/Thousand Islands). All of these factors should be considered in determining potential risks to birds using these areas in the long-term.

In summary, based on the location and nature of the closest IBA's, the proposed Clayton Wind Farm is located in a region with important grassland bird communities, waterbird breeding communities, and waterbird migration sites. The wind farm itself is situated in an area recognized for its grassland bird habitat. While the wind farm site lacks significant waterbird habitat, quality waterbird habitat is located nearby. Nevertheless, the loss of grassland bird habitat to forest succession is a significant issue in and around the Clayton Wind Farm site. Management is required to arrest forest succession and allow grassland areas to endure. The development of a wind farm in habitats in this area should be factored into any long-term conservation plan for the area.

5.2 Federal, State, and Private Protected Areas

The Project site is located in the vicinity of a number of wildlife management areas (WMA's). These are owned by New York State and managed by NYSDEC. Their purpose is to establish permanent public access to lands for the protection and promotion of fish and wildlife resources. Since most WMA's were acquired through hunting license fees and the federal tax on guns and ammunition, the WMA program emphasizes game species. Fishing, hunting, and trapping are the most widely practiced activities on many WMA's, but non-game-related uses also take place, such as hiking, cross-country skiing, birdwatching, and nature study. For more information, please see http://www.dec.state.ny.us/website/dfwmr/wma/wmaprog.htm.

The following major WMA's are located in Jefferson County near the Project site:

- Perch River, 7,862 acres of upland and wetland habitats, located adjacent SE
- Dexter Marsh, 1.339 acres of wetland habitats, located 5 miles (8 km) SW
- French Creek, 2,265 acres of upland and wetland habitats, located 5.5 miles (8.8 km) NW

- Ashland Flats, 2,037 acres of upland and wetland habitats, located 6 miles (9.6 km) W
- Indian River, 968 acres of upland and wetland habitats, located 11 miles (17.6 km) NE

Given the scenic values of Lake Ontario and the St. Lawrence River, there are at least five state parks along the waterfront within 10 miles (16 km) of the Project site. These include Long Point, Burnham, Cedar Point, Grass Point, and Wellesly Island. Adirondack Park is located about 35 miles (56 km) east of the Project site.

Canada maintains St. Lawrence Islands National Park along the nearby section of the St. Lawrence River. At its closest point, this national park is located 9 miles (14.4 km) northwest of the Project site.

All other protected areas are too distant from the Project site to be applicable to this avian risk assessment. Such areas include U.S. National Parks, National Forests, National Wildlife Refuges, and Audubon Sanctuaries.

In summary, the Project site is located in a region with a high representation of wildlife management areas (WMA's). Given that all of these WMA's contain wetland habitat, significant number of waterfowl and other waterbirds can be expected to occur, particularly in migration. In addition, raptor use of the area is likely to be significant.

6.0 Risk to Birds at the Proposed Clayton Wind Farm

6.1 Review of Risk to Birds at Wind Power Plants in the United States and Europe

Presently, the best means of assessing risk to birds at prospective wind power development sites is to compare the proposed site's avifauna, geographic and topographic settings, and habitat with empirically demonstrated levels of risk at existing sites. By comparing the types of species present or likely to be present, numbers of individuals, seasonal presence, and behavior of birds that nest, forage, migrate through, or winter on a proposed wind power site with existing facilities where risk has been determined, probabilistic assessments of risk can be made. A review of the literature on empirical studies of avian risk follows. This literature review is then used for assessing risk at the Clayton Wind Farm Project.

Two general types of impacts have been documented at wind power projects: 1) habitat alteration and disturbance with resulting bird avoidance and displacement, and 2) fatalities resulting from collisions with turbines, meteorology towers, and other infrastructure. These two types of impacts are detailed below.

6.1.1 Disturbance and Displacement

Habitat alteration and disturbance resulting from the construction and operation of turbines and other wind farm infrastructure sometimes can result in making a site unsuitable or less suitable for nesting, foraging, resting, or other bird use. Impacts to birds from human activity and the presence of large structures on birds are becoming better documented. The footprint of turbine pads, roads, and other infrastructure at a project site is generally a small percentage of the site after construction. Therefore, overall land use is relatively unchanged by wind power development. But, the true amount of wildlife habitat altered by a wind power project can extend beyond the functional project footprint. This is because of the presence of tall structures and increased human activity. The presence of new infrastructure (primarily tall turbines with moving rotors) has been examined to determine whether birds avoid or are displaced from an area as a result of these new features on the landscape.

Studies documenting disturbance, avoidance, and displacement have focused mainly on birds living in grassland and other open country habitats, including farm fields. At a large wind power plant in southwestern Minnesota, reduced nesting activity was detected in grassland birds in fields close to wind turbines as opposed to farther from the turbines (Leddy et al. 1999). Leddy et al. also found that the activities of many grassland-nesting birds were inhibited within about 80 m (260 feet) to nearly 200 m (650 feet) of turbines. The turbines involved were smaller than those now used at the newest and proposed wind power facilities by at least 100 feet (31 m). An impact gradient study demonstrated that disturbance was greatest within the first 100 m (325 feet) of a turbine and decreased at greater distances. This means that, after the construction of turbines, some birds either do not nest or forage close to the turbines or do so at lower frequency.

At the Foote Creek Rim Wind Plant in Wyoming, nesting Mountain Plovers (a grassland-nesting species) declined after erection of turbines. Plover productivity also declined (Johnson et al. 2000), although successful nesting of Mountain Plovers was noted within 200 m (650 feet) of operating turbines. Thus, the area impacted extended beyond the actual footprint of the project.

The Altamont Pass Wind Resource Area of California (APWRA) hosts very large numbers of raptors and grassland nesting songbirds, which regularly perch on the lattice towers and guy wires of the site's older turbines. In a study in the APWRA, Red-tailed Hawks trained for falconry in Idaho were exposed to turbines in order to study their flight behavior. Upon first seeing the turbines at 100+ feet (30 m), the birds would not fly. Within weeks, however, they appeared to habituate to the turbines in a manner comparable to resident Red-tailed Hawks (R. Curry, personal communication). Unlike most other sites, turbines have been present in the APWRA for about 20 years, giving birds ample time to habituate.

In Europe, studies have shown that some waterfowl, shorebirds, and grassland songbird species avoid the area near turbines. For example, shorebirds (mostly migrants) were displaced by 250-500 m (800-1,650 feet) from turbines (Winkelman 1990). In Denmark, some migrant shorebirds were displaced by up to 800 m (2,600 feet) by the presence of turbines (Pederson and Poulsen 1991). Other studies have shown that some shorebirds and other birds can habituate to turbines to some degree (Ihde and Vauk-Henzelt 1999, Winkelman 1990). No studies have been conducted that examine behavioral changes or habituation of birds to wind turbines over periods as long as 5 to 10 years after construction. Therefore, it is not yet known if these species are permanently displaced.

Other studies conducted in Denmark, have demonstrated species-specific differences in avian avoidance patterns near wind turbines (Larsen and Madsen 2000, Percival 1999, Kruckenberg and Jaene 1999). In general, Pink-footed Geese (Larsen and Madsen 2000) would not forage within 50 m (160 feet) of wind turbine rows and did not forage within 150 m (500 feet) of a cluster of wind turbines. Fewer of these geese foraged within 100 m (325 feet) of wind turbines than foraged farther from the turbines. Barnacle Geese, however, foraged within about 25 m (80 feet) of turbines, showing they are less sensitive than Pink-footed Geese (Percival 1999). Nonetheless, White-fronted Geese did not forage within about 400 to 600 m (1,300 to 1,950 feet) of wind turbines (Kruckenberg and Jaene 1999). A study recently completed at the Top of Iowa wind power project demonstrated that there was virtually no displacement or disturbance of Canada Geese at the new, 90 turbine site (Koford et al. 2005). Anecdotal information from the Fenner Wind Power facility in New York State (Paul Kerlinger), located approximately 75 miles (120 km) south of the Project site, suggests that Canada Geese forage in close proximity to large wind turbines. Resident geese readily habituate to human structures and activities. Thus, different species react differently to wind turbines, and it is not known if species will habituate or, if so, how long the process might take.

A post-construction avian study at the Searsburg, Vermont, wind power project (11 turbines) may be the only study of disturbance/avoidance-type impacts to birds in a mountaintop forest (Kerlinger 2000a, 2002). 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. On the other hand, Swainson's Thrush, and perhaps some other species, seemed to move away from 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.

Observations of autumn hawk migration in Vermont showed that the numbers of hawks that flew close to a hill with newly constructed turbines was smaller than in the year prior to turbine construction and operation (Kerlinger 2000b). These migrants may have been avoiding the novel structures.

The overall results of research on bird disturbance and displacement suggest that grassland and other open country birds avoid turbines more than forest species. Forest species may not be averse to having objects over their heads while foraging and nesting. It has also become evident that there are species-specific differences, with some species not displacing as far as other species and habituating to turbines more readily. Nonetheless, which species are capable of habituating is not known, and impact gradient-type studies are needed to quantify the avoidance and displacement of various species.

6.1.2 Collision Fatalities

Avian fatalities at wind plants result from collisions with turbine rotors and guy wires of on-site meteorology towers. Electrocutions have occurred at older wind plants, because electrical lines were above ground and constructed prior to the development of Avian Power Line Interaction Committee (APLIC) guidelines. Collision impacts have been studied at more than 20 wind power projects in more than a dozen states in the United States (Erickson et al. 2001; see Appendix D), as well as at locations in Canada and Europe.

An estimated 28,000 to 33,000 birds were killed at about 15,000 wind turbines in the United States in 2001 (Erickson et al. 2001), yielding an average of 2.1 birds per turbine per year. Fatalities ranged from zero birds per turbine per year to upwards about seven birds per turbine per year at some eastern U.S. sites, with slightly higher rates at eastern as opposed to western wind power facilities. The fatalities were spread among several dozen bird species and showed taxonomic differences in collision susceptibility.

The numbers of fatalities at wind turbines annually are orders of magnitude lower than collision fatalities reported for transmission lines, windows, highways (motor vehicles), and communication towers (Erickson et al. 2001), as well as for non-collision fatalities related to cat predation, hay mowing, oil pits, fishery long lines, acid rain, etc (see www.currykerlinger.com, Hames et al. 2002). Some of these human-related

mortality sources are estimated to kill tens of millions to hundreds of millions of birds per year. To put this matter in perspective, turbine collision fatalities are also orders of magnitude smaller than hunting harvests determined by professional wildlife managers (data from USFWS, Martin and Johnson 2002) and lower than depredation permits allowed by the U. S. Department of Agriculture (USDA) and the USFWS. These harvests amount to more than 100 million birds per year and are not deemed biologically significant.

In Europe, avian fatalities have generally been small at wind power plants, although there are a few localities where greater numbers of fatalities have been found. At a wind power site with 18 turbines in the coastal Netherlands, dozens of songbirds and a variety of shorebirds were reported to have collided with wind turbines during the migration season (Winkelman 1995). At another wind plant in the Netherlands, where turbines were erected in a saltwater lake, about 65 waterfowl fatalities were noted in one winter (Winkelman 1995). These sites are adjacent to the North Sea, where migration and wintering birds are densely concentrated. That several species were killed reduced the potential for population impacts in any one species. There are also higher fatality rates reported from Belgium, with respect to terns and gulls, at turbines located on harbors and adjacent to open water (Everaert 2002), and from Navarre in northern Spain (reports on the Internet), where large numbers of raptors have apparently been killed.

Fatalities of migrants have been relatively rare at most other sites in Europe. Perhaps the best example comes from Tarifa, Spain, where more than 100,000 raptors and other soaring birds, and millions of other birds converge on the Straits of Gibraltar (Montes Marti and Barrios Jaque 1995, Janss 2000, Barrios and Rodriguez 2004, and DeLucas et al. 2004). Local Griffon Vultures and kestrels are killed on occasion, apparently because they habituate to the turbines and frequently forage amongst them. Despite large numbers of birds, fatalities of migrants at this site are rare.

The only wind power site in the United States where risk to birds has been suggested to be significant is the Altamont Pass Wind Resource Area (APWRA), where raptor fatalities have been reported for over 15 years. Golden Eagles, Red-tailed Hawks, American Kestrels, and other species collide with turbines in varying numbers. These findings suggest that raptors are the most collision-susceptible group of birds (Anderson et al. 2000). However, such fatalities have not impacted regional populations. A long-term study of the Altamont Golden Eagle population by Hunt (2002) concluded that, despite the high fatality rate, the population remains stable. Large numbers of gulls, ravens, vultures, grassland songbirds, and other species fly amongst the APWRA turbines and rarely collide with the turbines. The raptor fatalities in the APWRA are an anomaly, because they have not been demonstrated elsewhere. Other studies conducted at U.S. wind power facilities outside of the APWRA have not revealed large numbers of raptor fatalities.

Several factors are believed to contribute to raptor risk in the APWRA, and some can be generalized to other species. These factors act alone or together to produce the

collision mortality documented in the APWRA (Howell and DiDonato 1991, Orloff and Flannery 1992, 1996). They are:

- Large numbers of turbines (presently about 5,400, down from about 7,000 several years ago) concentrated in a small area and providing many obstacles to flight
- Closely spaced turbines (less that 10 m [30 feet] rotor-to-rotor distance) that may not permit birds to fly safely between them
- Extraordinary numbers of foraging raptors throughout the year, the result of a superabundant population of California ground squirrels
- Steep topography with turbines placed in valleys and along valley and canyon edges, where collision risk is greater
- Turbine rotors that sweep down to less than 10 m (30 feet) of the ground, inhabiting airspace where raptors forage extensively
- Turbines mounted on lattice-type towers that encourage perching and provide shade and cover from sun and rain
- Small turbine rotors that revolve at high rates (40-72 rpm) making the rotor tips difficult to see

West of the Rocky Mountains, avian mortality resulting from collisions with wind turbines has been studied at sites in California, Oregon and Washington State (Appendix D). With the exception of the APWRA, reported fatality numbers have been small. At San Gorgonio Pass and in the Tehachapi Mountains, relatively few birds were killed in two years of searches, including very low representation of raptors (Anderson 2000). One Golden Eagle has been found in the San Gorgonio Wind Resource Area in more than two years of study. At a new wind power site in Oregon, at which there are 38 turbines in farmland, a one-year study documented no raptor fatalities, eight songbird fatalities, and four upland gamebird fatalities (three of which were introduced species). The actual number of fatalities was greater (N = 24 fatalities; 0.63 fatalities per turbine per year) when searcher efficiency and carcass removal (scavenging) estimates are factored in.

At one of the world's largest wind power facilities, the State Line project in Washington and Oregon, the fatality rate per turbine per year was recently found to be slightly less than two birds per turbine per year (Erickson et al. 2002, 2003). That project has 399 turbines. Among the fatalities were a variety of species, with Horned Larks (locally nesting birds) accounting for 46% of all birds found. Six raptors from three species were killed and about 24% of fatalities were night migrating songbirds. The rates of avian fatalities at smaller wind power sites in Oregon (Klondike) and Washington (Nine Canyon) averaged slightly lower and higher, respectively. Birds killed were divided among night migrants, resident species, very few waterfowl, and small numbers of raptors. The rate of night migrants killed in the far west has been roughly one bird per turbine per year or less, including when factoring in carcass removal and searcher efficiency.

Most of the projects in the far western United States, discussed above, were situated in tilled agricultural fields or pasture/prairie-like habitats. It should be noted that many of the turbines involved in California studies were less than 200 feet in height and

did not have FAA lights. All turbines in Oregon and Washington were taller than 275 feet and a subset (perhaps 1 in 3 to 1 in 4) of them had FAA lights (the presence or absence of lights is significant, because, as discussed below, lighting has been implicated in large-scale fatality events at communication towers). There has been no suggestion of population impacts at any of these facilities, nor have fatalities involved endangered or threatened species.

Avian fatality studies also have been conducted at wind plants in the grasslands of Colorado, Wyoming, and a small site in Kansas. After five years of systematic searches at 29 new turbines (expanded to 45 in the third year) in a short-mixed grass prairie/pasture land in northern Colorado, small numbers of fatalities were documented (Kerlinger, Curry and Ryder, unpublished). The fatalities included mostly Horned Larks, with fewer McCown's Longspur, White-throated Swifts, one teal, Lark Bunting, one American Kestrel, and some other songbirds. The prevalence of Horned Larks on the fatality lists is likely a result of their aerial courtship flight during which they display and sing at the elevation of the rotors.

At the Foote Creek Rim project, also in a short-mixed grass prairie habitat, 90 fatalities were recorded, 75 of which were at wind turbines and 15 of which were at meteorology towers with guy wires (Young et al. 2003). Thus about 20% of the fatalities resulted from collisions with guy wires at the meteorology towers and likely would have been avoided by using free-standing towers. Few raptors were found dead at the Foote Creek Rim project (three American Kestrels and one Northern Harrier) and 48% of the fatalities were night migrating birds. Of the migrants, no species accounted for more than 5 to 7 individuals (including Chipping and Vesper Sparrows). Finally, no fatalities were noted by Young (2000) at the two turbines in the Jeffrey Energy Center in Pottawatomie County, Kansas. For all of these studies, the numbers given above are the numbers of carcasses found. The actual number of fatalities is greater because not all carcasses are found by searchers and because scavengers remove some carcasses before searchers can find them. Per turbine per year estimates based on carcass removal and searcher efficiency were made only for the Foote Creek Rim project, for which the rate was about 2.8 birds per turbine per year.

Studies done in the Midwest and eastern United States in tilled agriculture, grassland, and forested settings may be most relevant to the Clayton Project, because: 1) they involve the most similar habitat, and 2) the species that either nest, forage on, or migrate through these sites are similar to those at the Clayton site. These studies have revealed relatively few avian fatalities.

At the Buffalo Ridge wind power facility (approximately 400 turbines) near Lake Benton, Minnesota, relatively small numbers of fatalities have been reported (Johnson et al. 2002) during four years of searching at subsets of the turbines. The fatality rates per turbine ranged between about one bird per turbine per year to nearly 4.5 birds per turbine per year. The species composition included a variety of birds, including one raptor (Red-tailed Hawk), very few waterbirds, and a number of migrating songbirds (about 70% of the 53 documented fatalities). Only about five ducks and coots were found during the

study, despite their regular presence around the wind power site and the fact that the wind plant is on a major migration area for waterfowl (Bellrose 1976).

During two years of carcass searches in the Kewaunee County peninsula of Wisconsin about two-dozen songbird (mostly migrants) fatalities were found under 31 turbines situated in farm fields. Perhaps six of the fatalities documented were night migrants. One Mallard and one Herring Gull were the only two waterbirds found dead at this site (Howe et al. 2002). The authors estimated that each turbine killed between one and two birds per year, when searcher efficiency and carcass removal rates were factored into the estimates. A study of two modern wind turbines at Shirley, Wisconsin, revealed one night migrating songbird fatality during a year-long study (Howe and Atwater 1999). A study at a small wind plant in Iowa reported no fatalities (Demastes and Trainor 2000).

In tilled agricultural fields in Iowa, avian fatality rates have been very low (Koford et al. 2005). Roughly 1.5 birds per turbine per year were reported killed at the 89 turbine Top of Iowa project, despite intense use by geese and ducks that feed in the fields surrounding the turbines. No shorebird fatalities were registered. In two years, that study revealed a single raptor fatality and few night migrant fatalities.

In the northeastern United States, where wind farms have only recently been developed, there are fewer in depth studies of collision fatalities at turbines than in the west. But, there is information from six wind power facilities in the eastern United States that are in some ways relevant to the Clayton Project, involving many of the same species and migration behaviors, especially among night migrants. In southeastern Vermont, searches done in June through October 1997 (nesting through fall migration) revealed no fatalities at 11 new, unlit turbines (192 feet [58 m] tall) situated on a forested hilltop (Kerlinger 2000a and 2002). In upstate New York on the Tug Hill Plateau in Lewis County, several months of daily searches during spring and autumn migration beneath two unlit wind turbines (168 feet [51 m] tall) located in open fields revealed no carcasses (Cooper et al. 1995).

At a facility with eight modern turbines (four with red-flashing FAA lights approximately 280 feet [85 m] tall) located in farmland in Somerset County, Pennsylvania, 17 rounds of fatality searches conducted from June 2000 through May 2001 revealed no avian fatalities (Kerlinger 2001). A study conducted in 2003 by biologists at 44 turbines (12 of which were lit with FAA-certified red strobes) at the Mountaineer Wind Energy Center in West Virginia found that the numbers of fatalities (about 4 or more birds per turbine per year, including between two and three night migrants per turbine per year, one duck, and one raptor) did not suggest significant biological impacts (Kerns and Kerlinger 2004).

A more relevant study is from the nearby Madison Wind Power Project, about 85 miles (136 km) south-southeast of the Clayton site. The Madison site has seven modern turbines that reach a maximum height of about 120 m (390 feet) and all lit with FAA red strobes. Four collision fatalities have been recorded below the turbines, plus one at a guyed meteorological tower (Kerlinger 2002). During the spring and fall migrations,

each turbine was searched five and six times, respectively. If carcass removal and searcher efficiency rates at the Madison site were similar to those at other projects, the numbers of fatalities would likely be on the order of about 2 to 4+ birds per turbine per year. Of these fatalities, most would be night migrating songbirds and similar species. At another nearby wind power project –Fenner, about 75 miles (120 km) south of the Clayton site, a project with 20 turbines – the plant manager reported no large scale fatality events or raptors or other large bird kills when interviewed in mid 2004 (Paul Kerlinger, pers. comm.). But, it has been reported to author Paul Kerlinger that biologists from the NYSDEC were on site during 2004 and found small numbers of dead bats. Certainly, rigorous post-construction fatality studies are warranted. The results of such studies would make assessing risk at other wind power sites in New York State more reliable.

The greatest fatality rate found for birds at turbines in the United States was about seven birds per turbine per year found under three turbines on a forested mountaintop in eastern Tennessee. The two-year study of the 290 foot (88 m) turbines equipped with white strobes revealed several dozen fatalities, mostly night migrating songbirds (Nicholson 2002). It is ironic that this project was lit with white strobes, the lighting recommended by the USFWS as being the least attractive (risky) to night migrants. Nonetheless, it is possible that the larger rates of fatalities at the Tennessee site are the result of the more southerly latitude of this project, as opposed to others in the eastern United States. There are more migrants at more southerly latitudes, thereby increasing potential risk to night migrants.

Two studies of single turbines situated near or along the shorelines of Lake Ontario near Toronto, Canada, are also of some relevance to the Clayton project. At these sites, these modern wind turbines were found to kill very few birds. One study (James and Coady 2003) was done at a turbine 94 m (308 feet) in height that was within a few hundred meters of the Lake Ontario shoreline. The other turbine (117 m; 384 feet) was located at a marsh a few miles inland from Lake Ontario.

As summarized above, studies at these and other sites have shown 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 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.

6.2 Avian Risk Assessment for the Clayton Wind Farm

6.2.1 Disturbance and Displacement Risk at the Clayton Wind Farm

Because much of the habitat within the Project site is grassland, there is the potential for disturbance and displacement of some grassland nesting birds, including state-listed threatened and special-concern species for which the habitat appears suitable. In the wooded areas within the site, the disturbance and displacement potential is likely to be minimal, as explained below. In addition, some birds may be displaced temporarily from both types of habitats during the Project's construction phase, as heavy equipment passes through the area and as new roads are constructed. This impact is likely to be temporary and decrease markedly after construction.

Impacts to grassland-nesting songbirds are likely to include displacement of individuals nesting within 100 to 200 or more meters (325 to 650 or more feet) of turbines in some cases, or reduced densities of species within 100 to 200 m of the turbines. The species that may be affected include Savannah Sparrow, Bobolink, and Eastern Meadowlark, plus the threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow, and the special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow. The degree to which these species are affected depends of the nesting locations and densities relative to the wind turbine placements. If they are displaced, it is not known how far this displacement would extend from the turbines, because detailed studies have not yet been conducted in New York State.

The long-term significance of this disturbance and displacement cannot entirely be understood without examining the long-term integrity and maintenance of the grassland-like habitats that now compose so much of the Project site. If fields that now support nesting grassland bird species succeed into woodland in ten years, as is the case for much abandoned farmland throughout New York State, grassland birds will be displaced from those areas despite the construction of wind turbines. If the grassland-like habitats are maintained over the long-term, grassland birds can be expected to continue nesting on site. It is also not known if populations of grassland-nesting birds that are impacted by hay mowing on site are viable populations in the long-term, but BBA data from 1980-1985 and 2000-2004 indicate that the diverse grassland bird community in the Project area has persisted. Nevertheless, any attempt to determine the significance of impacts to these birds from wind turbines would have to consider the cumulative impacts of agricultural practices, farm conversion, and other deleterious impacts to these declining species.

It is also not known if grassland birds that would potentially be displaced can or do habituate to the presence of turbines. Some birds do habituate, as stated in the previous section, but long-term studies at wind power facilities have yet to be conducted, so the degree to which grassland birds habituate is not known.

With respect to forest nesting birds, habitat alteration from turbine construction will affect the forest edges and relatively small forest patches within the wind farm area.

This activity will displace some birds that currently nest in these habitats. It is unlikely that the turbines would, in the long term, displace many birds nesting in the forest edges and patches. Living among trees, forest dwelling birds appear to have a greater ability to habituate to tall structures. Kerlinger (2002) found modest disturbance to forest dwelling songbirds at a wind power site in Vermont, but no long term studies on habituation have been conducted. There have also been no quantitative studies on displacement distance for these types of birds.

With respect to raptors that nest in trees at the Project area, minor disturbance impacts may occur if turbines are placed near nesting sites of Red-tailed Hawks and American Kestrels, the most likely raptors to nest in the site's wooded areas. The same would also be true for any Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks (all species of special concern recorded in the BBA) that might nest in the site's woodland areas. Disturbance resulting from actual construction activity is likely to be temporary and will occur only over a few months. It is likely that nesting Red-tailed Hawks and American Kestrels will habituate to the presence of turbines, especially after most construction equipment and workers have left the site. It is noteworthy that these species, plus the Northern Harrier, have been recorded to forage near (sometimes even beneath) turbines and are likely with time to habituate to the presence of turbines within their foraging areas. These and other foraging raptors have demonstrated habituation to the presence of wind turbines, as is evident from studies conducted in the APWRA (Orloff and Flannery 1992).

Because of the proximity of the Perch River WMA, migrating waterfowl and some summering Canada Geese can be expected to forage in the farm fields within the proposed wind farm area, sometimes in substantial numbers. Displacement impact on waterfowl – particularly Canada and Snow Geese, the species likeliest to forage in the farm fields – is not likely to be significant, given the large amount of agricultural habitat in the general area and based on some other studies (Koford et al. 2005). Canada Geese often habituate quickly to human structures. .

6.2.2 Collision Risk at the Clayton Wind Farm

6.2.2.1 Listed Species

Available data demonstrate that federally listed species are likely to be absent at the Project site, strongly indicating that there will be no adverse impacts to those species. In the case of the Bald Eagle, which is federally listed as threatened, birds may fly over the site at any time of the year (the BBA has recently confirmed Bald Eagle nesting in Jefferson County). While Bald Eagles are unlikely to use the Project site for nesting or foraging, the bird's expanding population in New York State may eventually bring it to nest in the adjacent Perch River WMA. Bald Eagles, however, are not known to be susceptible to colliding with structures such as wind turbines (see species lists in Erickson et al. 2001) or communication towers (see species list in Shire et al. 2000).

With respect to state-listed grassland species, the weight of evidence from the BBA and IBA's suggests that a number of species nest on the project site. But it is difficult to assess collision risk because the location and density of birds with regard to wind turbine placements is not known. Listed species that have aerial courtship displays could be at risk of collision during those activities, if they regularly fly in circles at 100-200 feet (30-60 m) above the ground. Such species would include Short-eared Owl (endangered), Northern Harrier (threatened), Upland Sandpiper (threatened), and Horned Lark (special concern).

6.2.2.2 Raptors

Risk to listed and unlisted raptors at the Project area is not likely to be biologically significant. The numbers of fatalities will probably be small and limited primarily to Red-tailed Hawk, American Kestrel, and perhaps other species in rare instances. The species most likely to be impacted are those that forage in open country, as opposed to migrating raptors that pass through the site or general area.

The Northern Harrier (threatened) forages and probably nests on site, as was evident from the site visit, BBA data, and IBA analysis. These birds are at some risk of collision with turbines, although documented fatalities involving Northern Harriers at wind power facilities are rare. Harriers occur regularly at wind power sites in the western and Midwestern United States, yet there are only a few records of collisions. The low foraging flight of these birds is generally below the rotor-swept height, but their aerial displays during the nesting season can put them at rotor height and at increased risk of collision.

Sharp-shinned Hawk, Cooper's Hawk, and Northern Goshawk (all special concern) were recorded in the BBA in Project area. During the breeding season, they can be expected to forage within forested areas, not open country. As a consequence, they will not be at particular risk of collision.

As demonstrated in Table 6.2.2.2-1, the known or suspected risk factors for raptors are not apparent at the Clayton Wind Farm site. That the Clayton Project will have relatively few turbines in comparison with the 5,400 that are present in the APWRA, suggests small numbers of fatalities. At the APWRA, raptor numbers are very high throughout the year, and dozens (if not hundreds) of raptors forage there, as opposed to much smaller numbers at the Clayton site.

Table 6.2.2.2-1. Comparison of Risk Factors

Known or Suspected Risk Factors Altamont Pass Wind Resource Area (APWRA)	**Comparison of Risk Factors Proposed Clayton Wind Power Project**
Large concentration of turbines (about 5,400 in 2002)	Up to about 70 turbines
Lattice towers that encourage raptors to perch	Tubular towers, no perching
Fast rotating turbine blades (40-72 rpm)	Slow rotating blades (12-18 rpm)
Closely spaced turbines (less than 30 m [100 feet] apart)	Widely spaced turbines (greater than 250 m [800 feet])
Turbines in steep valleys and canyons	Turbines on gently to moderately rolling hills
Large prey base that attracts raptors	Minimal prey base
Turbine rotors sweep to less than 10 m (30 feet) from ground	Turbine rotors sweep down to about 35 m (115 feet)
High raptor and susceptible species use of area	Low to moderate raptor use of area

Risk to migrating raptors should not be significant at the Clayton site, as there are no noteworthy hawk migration sites in the project's vicinity. The closest site is the Derby Hill Hawk Watch, located 40 miles (64 km) to the south-southwest. Where concentrated hawk migration does occur around wind energy sites, evidence so far shows that risk to migrating raptors is not great and not likely to be biologically significant. At the Mountaineer Wind Energy Facility on Backbone Mountain (a long, linear ridge) in West Virginia, a study by Kerns and Kerlinger (2004) found that only one raptor, a Red-tailed Hawk, was killed during a year of study. Reports from Tarifa, Spain, where raptor migration is highly concentrated, strongly suggest strongly that migrating raptors rarely collide with turbines (DeLucas et al. 2004). At the Meyersdale Wind Power Project site in southwestern Pennsylvania, a few thousand hawks migrate along the ridge each autumn. But, it is not known if these birds collide with turbines at rates that are biologically significant, because no studies have been conducted there during the migration season.

6.2.2.3 Nocturnal Migrants

Night migrating songbirds and other small night migrants comprise the majority of the birds killed at wind power projects, especially at eastern and Midwestern wind farms. Nonetheless, the collision-mortality studies conducted to date (summarized in Appendix D) have not reported large or significant numbers of mortalities of night migrants. Most reports involve single birds killed by a turbine on a given night, unlike the large-scale events documented over the past 60 years at communication towers greater than 500-600 feet (152-183 m) in height (Avery et al. 1980).

That nocturnal migrants collide at a lower rate with wind turbines, compared with tall communication towers, is related to the much greater height of communication towers, as well as to the presence of guy wires (Kerlinger 2000c) and steady-burning FAA red lights (L-810 obstruction lights) on communication towers. A majority of night migrants fly at altitudes between 300 and 2,500 feet (91-915 m) above ground level (Kerlinger 1995, Kerlinger and Moore 1989), with small numbers flying above 5,000 feet (1,524 m). Except for landing and taking off, fewer migrants fly below about 500-600 feet (152-183 m) than above that height range. Mean hourly altitudes usually average about 1,200 to 1,500 feet (366-457 m) (Able 1970, Cooper et al. 2004a, 20004b).

Because the rotors of most modern turbines extend to about 300-390 feet (90-120 m), relatively small numbers of migrants passing over a site such as the proposed Clayton site are likely to fly within the height range of turbine rotors. The turbines proposed for use at Clayton would be about 50 feet (16 m) and 100 feet (31 m) taller than those situated on Appalachian ridges in West Virginia (Kerns and Kerlinger 2004) and Tennessee (Nicholson 2002), respectively. But, the turbine placements in West Virginia and Tennessee have not been demonstrated to present significant risk to night migrants. In addition, the Clayton turbines would be hundreds of miles farther north than those in Appalachia. In addition, they would be to the north of turbines at the Madison and Fenner wind power facilities, also situated in New York State, which have not been reported to impact large numbers of migrants. Wind power sites that are farther north experience a lower passage rate than those farther south because the source area is smaller at more northern sites.

The communication towers that are responsible for a vast majority of avian fatalities, including virtually all of those where large numbers have been killed in a single night, are almost entirely taller than 500-600 feet (152-183 m; from literature and recent unpublished studies). Such towers are much taller than the turbines proposed for the Clayton Project. The most recent literature surveys conducted by the USFWS and the U.S. Department of Energy (Trapp 1998, Kerlinger 2000b, Kerlinger 2000c) reveal virtually no large scale mortality events at communication towers less than 500-600 feet in height. It should be noted that the few communication towers less than 500 feet in height that have been associated with reports of large-scale fatality events have been equipped with steady burning sodium vapor lights or other bright lights (Kerlinger 2004a,b). Very attractive to birds, sodium vapor lights are very different from the lights stipulated by the FAA for wind turbines.

The fact that there are no guy wires on modern wind turbines is of critical importance, because it is the guy wires of tall communication towers that account for almost all of the collisions. The literature does not reveal fatalities at unguyed communication towers that are as tall as 475 feet with very few exceptions (J. Gehring, Central Michigan University, unpublished study of communication towers in Michigan). Recently, studies at 400-475 foot tall unguyed communication towers revealed between about zero and two birds killed per tower per year, although those results are preliminary. No other published studies have revealed collision fatalities at unguyed towers, including unguyed meteorology towers at wind power sites (W. Erickson personal communication, Kerns and Kerlinger 2004).

The last risk factor that has been implicated in collisions of night migrating birds with tall structures is lighting (Kerlinger 2000c). The lights of communication towers and some other structures have been demonstrated to attract migrants that then collide with the structure. The lighting on wind turbines is very different from the lighting on communication towers (FAA Advisory Circular). Wind turbines almost never have the steady-burning red lights (L-810 obstruction lights) that are present on communication towers. There is one exception – a few turbines at Buffalo Ridge in Minnesota have this lighting. Note that on the 1,000 foot tall communication towers where large fatality events have occurred, all have been equipped with up to 12 steady burning red L-810 obstruction lights as well as flashing L-864 red lights.

Research by Kerns and Kerlinger (2004) has not demonstrated any large-scale fatality events at wind turbines, nor has it shown any difference in numbers of fatalities at lit versus unlit turbines. Similar results from wind plants in Washington, Oregon, and Minnesota have supported this finding. Kerns and Kerlinger (2004) did find a fatality event involving about 30 night migrating songbirds in May 2003. That event occurred on a very foggy night and it occurred at an electrical substation involving mostly one turbine and the substation fencing. Birds were apparently attracted to four sodium vapor lamps on the substation and collided with the three closest turbines (mostly the closest turbine) and the substation infrastructure. Interestingly, almost no birds were found at the 41 other turbines at that project, despite 11 of them being lit with red flashing, L-864 lights. A smaller fatality event, involving 14 migrants at two adjacent turbines in Minnesota is also of interest. Seven birds were found at each of these turbines and one was equipped with steady burning red lights. This suggests that steady burning red lights can attract birds.

The fact that no large scale mortality events involving night migrating birds have been documented at wind turbines anywhere, combined with the fact that there is no difference between the numbers of birds killed at lit versus unlit wind turbines at sites across the United States, strongly suggests that FAA obstruction lighting for wind turbines (red flashing, L-864 lights) does not have the same attractive effect as the steady burning red lights of communication towers (Kerlinger 2004a, b). Furthermore, the FAA does not stipulate that all wind turbines be lit.

For the reasons presented above, collision risk to night migrating songbirds is likely to be minimal and fatalities are not likely to be biologically significant at the proposed Clayton Wind Farm.

6.2.2.4 Waterbirds

Shorebirds can be expected to migrate over the site, but this would be mostly at night and at high altitudes (Kerlinger and Moore 1989). Moreover, research has demonstrated that very few shorebirds collide with wind turbines or other tall structures. Shorebirds are extremely rare on the lists of birds killed at wind plants (Erickson et al. 2001), and they are almost nonexistent at communication towers (Shire et al. 2000). They are also not known to be attracted to lights (FAA or other types). Therefore, shorebirds are not likely to be at significant risk of colliding with these wind turbines at the Clayton site, even when stopping over at the Perch River WMA.

Risk of collision to waterfowl and other waterbirds during migration is also likely to be minimal, because these birds migrate at such high altitudes (Kerlinger and Moore 1989, Bellrose 1976) and because this group of birds has not demonstrated a propensity to collide with wind turbines (or communication towers). The Canada Geese and Snow Geese that forage on the Clayton Project site, during migration and at other times, may experience a slightly higher level of risk. However, Canada Geese have never demonstrated susceptibility to colliding with turbines (Koford et al. 2005, Erickson et al. 2001) or communication towers (Shire et al. 2000); therefore, they are unlikely to be at significant risk and may be at no risk.

Risk to nesting waterbirds (waterfowl, long-legged waders, shorebirds, rails, etc.) at the Project site is likely to be minimal, even with the high quality aquatic habitat adjacent to the site at the Perch River WMA, because these species are unlikely to forage within the wind farm area. Because there are small wetland areas within the Project boundary, some waterbirds such as bitterns and rails may be present, at which time they could be at risk of colliding with turbines. Waterbirds were poorly represented, however, in the BBA blocks that covered the Project site but not the Perch River WMA or other wetland areas.

7.0 Findings

The following conclusions are based on an examination of the habitat and topography present at the Clayton Wind Farm site and from the literature search:

1. The Project is located on nearly level to gently rolling land within 7.5 miles (12 km) of Lake Ontario and the St. Lawrence River. Land ownership is private, and land use (primarily agriculture with some residential housing and perhaps limited forestry) should continue relatively unchanged following construction of the wind farm. There is the future possibility, however, that grassland areas released from agriculture may, if not managed, succeed into woodland and be lost as habitat for nesting grassland birds, including many state-listed species. Grassland management is an issue highlighted in the description of the Perch River Grasslands, an Important Bird Area (IBA) that overlaps the Project site (see http://ny.audubon.org/iba/perchrivergrasslands.html).

2. All sections of the Clayton site have grassland habitat consisting of hay fields, cover crops, pasture, fallow fields, brushy areas, and old fields. Forest-type habitat throughout the site is highly fragmented and accounts for about 10% of habitat coverage. Wind turbines and related infrastructure would mainly be located in the agricultural lands and grasslands, with some portions of the wind farm adjacent to or within forest patches.

3. Based on an examination of the habitat present, BBA data, IBA descriptions, and other literature sources, the wind farm's predominant agricultural and grassland habitats appear to be high quality nesting habitat for grassland birds. Nesting grassland birds could include all or some of the following species: state-listed threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow; special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow; and protected Savannah Sparrow, Bobolink, and Eastern Meadowlark. There is the remote possibility that the endangered Short-eared Owl might also breed in these grasslands, although there are no recent records. Birds that inhabit forest edges and forest interiors would be farther from turbine placements than grassland birds. These likely include the following state-listed species of special concern: Sharp-shinned Hawk, Cooper's Hawk, Whip-poor-will, and Golden-winged Warbler. Northern Goshawk, Red-shouldered Hawk, and Cerulean Warbler are less likely to breed on the site.

4. As detailed in the preceding bullet, several New York State-listed species and species of concern likely nest on the site. There is no suitable habitat on site, however, for federally listed endangered or threatened species. On occasion, Bald Eagles (federally threatened) may fly over the site. As its population continues to expand in New York State, the Bald Eagle may eventually nest at the adjacent Perch River Wildlife Management Area (WMA).

5. The Project site is located near a number of ecological features that could attract large numbers of migrants to stopover, particularly waterfowl. These include the adjacent Perch River WMA and nearly Lake Ontario and St. Lawrence River. Night migrating songbirds are likely to be spread rather evenly throughout the region, except closer to Lake Ontario where aggregations of migrants making stopovers probably occur.

6. The habitat on site does not suggest large concentrations of wintering birds or the presence of state or federally listed species during that season, but significant numbers of wintering Short-eared Owls (endangered) and Northern Harriers (threatened) have been recorded at the Point Peninsula IBA, about 8 miles (12.8 km) southwest of the Project site. The upper St. Lawrence River is also known as a wintering area for waterfowl. It is located 7.5 miles (12 km) northwest of the project site. The Perch River WMA likely hosts migratory waterfowl in significant numbers. Waterfowl may remain in the WMA into early winter, until the aquatic habitats freeze over. Other IBA's and wildlife management areas are also located within 5 to 10 miles (8 to 16 km) of the Project site.

7. The Project will likely displace grassland nesting species, including some New York State-listed species, which, based on available evidence, probably nest within the Project site. Such impacts are not likely to be regionally or globally significant, but could affect locally nesting populations. Because there are no indicative studies from other wind energy sites, it is not known if these species would habituate to the presence of turbines. Recommendations are made below to prevent and mitigate potential impacts.

8. The project may also displace forest and forest-edge nesting species, including New York State-listed species of special concern, which, based on available evidence, likely nest within the Project site. Such impacts are not likely to be regionally or globally significant, but could affect locally nesting populations. Given that forest cover is 10% of the available habitat, and that forest birds are more tolerant of tall structures, displacement impact will likely be less than with grassland birds.

9. Collision impacts at the Clayton Project are likely to be similar to those found to date at the Madison Wind Power Project in central New York State, and other existing wind power projects in the Midwestern and eastern United States. As various studies at existing wind energy sites indicate, fatalities at the Clayton site are not likely to be biologically significant.

8.0 Recommendations

The following recommendations for the proposed Clayton Wind Farm Project are based on a site examination of the habitat and on literature and database searches regarding the Project site's avifauna and what is known about the potential risks to birds from wind power development in the United States and Europe.

- Electrical lines within the project site should be underground between the turbines and any new above ground lines from the site and substations to transmission lines should follow APLIC (Avian Power Line Interaction Committee) guidelines for insulation and spacing.

- Permanent meteorology towers should be free-standing (i.e., without guy wires) to prevent the potential for avian collisions.

- Size of roads and turbine pads should be minimal in order to limit habitat disturbance as much as possible. After construction, any natural habitat should be permitted or encouraged to regenerate as close to the turbines and roads as possible. This measure will minimize habitat fragmentation and disturbance impacts.

- Lighting of turbines and other infrastructure (e.g., substations and buildings) should be minimal in order to reduce the potential for attracting night migrating songbirds and similar species. FAA lighting for night use should be flashing lights (red or white) with the longest permissible off cycle. No steady burning FAA lights should be used. Sodium vapor lamps and spotlights should not be used at any facility at night, except when emergency maintenance is needed.

- A post-construction study of collision fatalities would be helpful to expand the existing data base and allow for more informed decisions regarding future wind power development in New York State. Such a study would provide information on the number and type of fatalities that occur. It would also determine the biological significance and potential cumulative impact of turbine development in New York and the eastern United States.

- Because the habitat on site appears to be suitable for New York State listed species and species of concern, a nesting bird survey should be undertaken to determine the distribution and densities of these species, particularly grassland birds. The threatened Northern Harrier, Upland Sandpiper, Sedge Wren, and Henslow's Sparrow, and the special-concern Horned Lark, Vesper Sparrow, and Grasshopper Sparrow are likely present in grassland habitats that would be occupied by wind turbines and related infrastructure. The special-concern Sharp-shinned Hawk, Cooper's Hawk, Whip-poor-will, Golden-winged Warbler, and possibly other listed species may occur in wooded habitats where turbines and related infrastructure may be located. Such a survey would include mapping areas where these birds nest in relation to planned turbine and road locations. The

results of this survey may be used to prevent or mitigate disturbance impacts and displacement of these species. Should a nesting survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- Raptor and waterfowl use of the Project site, particularly during migration (but also in late fall and winter in the case of raptors, given the high concentration of wintering raptors reported at the Point Peninsula IBA), should be determined through a flight-use study. Should such a survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- Radar studies should be conducted at the site in order to determine flight patterns of night migrants (direction, altitude, and numbers of birds) passing over the wind farm site. Should such a survey be conducted, its design should involve consultation with NYSDEC biologists prior to implementation.

- The future of grassland and brushland bird communities at the Clayton site depends on the long-term management of their habitats, which farmers are presently accomplishing through some agricultural practices. While wind energy development may displace grassland birds from the areas around where the turbines are located, it would limit other types of development that could more severely impact grassland habitat and its birds. Wind energy development can also provide incentives that maintain grassland habitats. These options should be explored, along with cooperative agreements between the NYSDEC and landowners.

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Appendix A-1. Photographs of representative habitat at the proposed Clayton Wind Farm Site, Jefferson County, New York.

Appendix A-2. Photographs of representative habitat at the proposed Clayton Wind Farm Site, Jefferson County, New York.

Appendix B. Birds Observed at the Site of the proposed Clayton Wind Farm on November 8 and 9, 2004.

(NYSDEC-listed species are highlighted; T = Threatened; SC = Special Concern)

Snow Goose
Canada Goose
Northern Harrier (T)
Sharp-shinned Hawk (SC)
Cooper's Hawk (SC)
Northern Goshawk (SC)
Red-tailed Hawk
Rough-legged Hawk
Golden Eagle (T)
American Kestrel
Ring-necked Pheasant
Ruffed Grouse
Wild Turkey
Ring-billed Gull
Herring Gull
Rock Dove
Morning Dove
Downy Woodpecker
Hairy Woodpecker
Blue Jay
Common Raven
American Crow
Horned Lark (SC)
Black-capped Chickadee
White-breasted Nuthatch
Golden-crowned Kinglet
Eastern Bluebird
American Robin
European Starling
American Pipit
Cedar Waxwing
American Tree Sparrow
Fox Sparrow
Song Sparrow
White-throated Sparrow
Dark-eyed Junco
Snow Bunting
Northern Cardinal
Red-winged Blackbird
Brown-headed Cowbird
Purple Finch
House Finch
American Goldfinch
Evening Grosbeak
House Sparrow

Appendix C. Birds Recorded in the Vicinity of the Project Site during the 2000-2004 Breeding Bird Atlas (BBA) Project.

NB: This list was compiled from the nine BBA quadrants that include sections of the proposed Clayton Wind Farm. The breeding status listed (possible, probable, or confirmed) is the highest status recorded in one or more of the nine quadrants. The Project site does not include aquatic or wetland habitats that support many of the waterbirds listed below. But, quality habitat for waterbirds is located adjacent to the proposed wind farm site at the Perch River Wildlife Management Area (see Figure 3).

(NYSDEC-listed species are highlighted; E = Endangered, T = Threatened, SC = Special Concern)

Pied-billed Grebe (T) – Confirmed
Double-crested Cormorant – Confirmed
American Bittern (SC) – Probable
Least Bittern (T) – Possible
Great Blue Heron – Possible
Green Heron – Probable
Black-crowned Night-heron – Confirmed
Turkey Vulture – Probable
Canada Goose – Confirmed
Mute Swan – Possible
Trumpeter Swan – Confirmed
Wood Duck – Confirmed
Gadwall – Possible
American Wigeon – Possible
American Black Duck – Possible
Mallard – Confirmed
Blue-winged Teal – Probable
Northern Shoveler – Probable
Common Merganser – Possible
Hooded Merganser – Possible
Osprey (SC) – Confirmed
Bald Eagle (T) – Possible
Northern Harrier (T) – Confirmed
Sharp-shinned Hawk (SC) – Confirmed
Cooper's Hawk (SC) – Probable
Northern Goshawk (SC) – Confirmed
Red-tailed Hawk – Confirmed
American Kestrel – Confirmed
Ring-necked Pheasant – Confirmed
Ruffed Grouse – Confirmed
Wild Turkey – Confirmed
Virginia Rail – Probable
Common Moorhen – Confirmed
American Coot – Confirmed
Killdeer – Confirmed
Spotted Sandpiper – Confirmed
Upland Sandpiper (T) – Probable
Wilson's Snipe – Probable
American Woodcock – Confirmed
Ring-billed Gull – Possible
White-winged Tern – Confirmed
Black Tern (E) – Confirmed
Rock Pigeon – Confirmed
Mourning Dove – Confirmed
Black-billed Cuckoo – Probable
Yellow-billed Cuckoo – Possible
Eastern Screech-Owl – Confirmed
Great Horned Owl –Probable
Whip-poor-will (SC) – Confirmed
Chimney Swift – Confirmed
Ruby-throated Hummingbird – Confirmed
Belted Kingfisher – Confirmed
Red-bellied Woodpecker – Possible
Downy Woodpecker – Confirmed
Hairy Woodpecker – Confirmed
Northern Flicker – Confirmed
Pileated Woodpecker – Confirmed
Eastern Wood-Pewee – Probable
Yellow-bellied Flycatcher – Possible
Alder Flycatcher – Probable
Willow Flycatcher – Probable
Least Flycatcher – Probable
Eastern Phoebe – Confirmed
Great Crested Flycatcher – Confirmed
Eastern Kingbird – Confirmed
Yellow-throated Vireo – Probable
Warbling Vireo – Confirmed
Red-eyed Vireo – Confirmed
Blue Jay – Confirmed
American Crow – Confirmed
Horned Lark (SC) – Probable
Tree Swallow – Confirmed
N. Rough-winged Swallow – Confirmed
Bank Swallow – Confirmed

Cliff Swallow – Confirmed
Barn Swallow – Confirmed
Black-capped Chickadee – Confirmed
Red-breasted Nuthatch – Confirmed
White-breasted Nuthatch – Confirmed
Brown Creeper – Possible
House Wren – Confirmed
Sedge Wren (T) – Probable
Marsh Wren – Confirmed
Eastern Bluebird – Confirmed
Veery – Probable
Hermit Thrush – Probable
Wood Thrush – Probable
American Robin – Confirmed
Gray Catbird – Confirmed
Northern Mockingbird – Confirmed
Brown Thrasher – Confirmed
European Starling – Confirmed
Cedar Waxwing – Confirmed
Blue-winged Warbler – Probable
Golden-Winged Warbler (SC) – Probable
Nashville Warbler – Confirmed
Yellow-Warbler – Confirmed
Chestnut-sided Warbler – Probable
Yellow-rumped Warbler – Confirmed
Black-throated Green Warbler – Probable
Pine Warbler – Possible
Prairie Warbler – Confirmed
Black-and-white Warbler – Confirmed
American Redstart – Confirmed
Ovenbird – Confirmed
Common Yellowthroat – Confirmed
Scarlet Tanager – Probable
Eastern Towhee – Confirmed
Chipping Sparrow – Confirmed
Clay-colored Sparrow – Probable
Field Sparrow – Confirmed
Vesper Sparrow (SC) – Probable
Savannah Sparrow – Confirmed
Grasshopper Sparrow (SC) – Probable
Henslow's Sparrow (T) – Probable
Song Sparrow – Confirmed
Swamp Sparrow – Confirmed
White-throated Sparrow – Confirmed
Dark-eyed Junco – Possible
Northern Cardinal – Probable
Rose-breasted Grosbeak – Confirmed
Indigo Bunting – Probable
Bobolink – Confirmed
Red-winged Blackbird – Confirmed
Eastern Meadowlark – Confirmed
Common Grackle – Confirmed
Brown-headed Cowbird – Confirmed
Baltimore Oriole – Probable
Purple Finch – Confirmed
House Finch – Confirmed
American Goldfinch – Confirmed
House Sparrow – Confirmed

Total Species:	132	
Confirmed Breeders:	65	(58%)
Probable Breeders:	24	(21%)
Possible Breeders:	24	(21%)

Appendix D. Review of Avian Mortality Studies

The numbers provided are, in most cases, recorded fatalities. When observer efficiency and carcass removal by scavengers are factored in, the actual numbers of fatalities are greater.

- **New York** - Tug Hill Plateau, 2 modern turbines in farmland, 2 migration seasons, 0 fatalities, Cooper et al. 1995

- **New York** – Madison, 7 modern turbines on farmland, 1 year, 4 fatalities (2 songbird migrants, 1 owl, 1 woodpecker), Kerlinger 2002

- **Vermont** – Searsburg near Green Mountain National Forest, 11 modern turbines on forested mountain top studied during nesting and fall migration season, 0 fatalities, Kerlinger 2002

- **Pennsylvania** – Garrett (Somerset County), 8 modern turbines, farm fields, 12 months, 0 fatalities, Kerlinger 2001

- **West Virginia** – Mountaineer WEC, 44 modern turbines on forested ridge, 1 year study (22 searches of all turbines), 69 fatalities found, 200+ fatalities (4+ fatalities per turbine per year; mostly night migrating songbirds, 1 Red-tailed Hawk), Kerns and Kerlinger 2004

- **Tennessee** – Buffalo Mountain, 3 turbines on forested/strip-mined mountain, 2 years, ~7 fatalities per turbine per year (night migrating song and other birds), Nicholson 2001, 2002

- **Massachusetts** - Hull, 1 modern turbine, open grassy fields adjacent to school and ferry terminal on island in Boston Harbor, informal searches for at least 1 year on dozens of occasions have revealed no fatalities, Malcolm Brown, personal communication, 2002

- **Minnesota** – Buffalo Ridge near Lake Benton, 200+ modern turbines in farm and grassland, 4 years (1996-1999), 53 fatalities found, 2-4 fatalities per turbine per year (mostly songbirds and 1 hawk); displacement found among grassland nesting songbirds; Johnson et al. 2002

- **Kansas** – St. Mary's, 2 modern turbines in grassland prairie, 2 migration seasons; 33 surveys, 0 fatalities, Young 1999

- **Wisconsin** – Kewaunee County Peninsula, 31 modern turbines in farmland, 2 years (4 migration seasons), 25 fatalities, ~1.3 fatalities per turbine per year, (3 waterfowl, 14 songbirds, some night migrants), Howe et al. 2002

- **Wisconsin** – Shirley, 2 modern turbines in farmland, 54 surveys, 1 fatality (night migrating songbird), report to Wisconsin Department of Natural Resources Bureau of Integrated Science Services, Richter Museum of Natural History Special Report, and Howe and Atwater 1999

- **Iowa** – Algona, 3 modern turbines in farmland, three seasons, 0 fatalities, Demastes & Trainer 2000

- **Iowa** – Top of Iowa, 89 modern turbines in tilled agriculture, 2 years, 7 carcasses found at 26 turbine searched, ~1.5 birds per turbine per year, 1 Red-tailed Hawk, few night migrants, no waterfowl or shorebirds killed; Koford et al. 2005

- **Colorado** – Ponnequin, 29 (44 in 2001) modern turbines in rangeland, 5 years - 1999-2003, ~ two dozen birds per year, 1 duck, 1 American Kestrel fatality, Curry & Kerlinger unpublished data

- **Wyoming** – Foote Creek Rim, 69 modern turbines in rangeland, 2 years, 75 turbine fatalities (songbirds, including 48% night migrants, plus 4 raptors), 1.8 fatalities per turbine per year, Young et al. 2003 (15 additional fatalities were at guyed meteorology towers)

- **Oregon** – Klondike, 16 modern turbines in rangeland and shrub-steppe, 1 year, 8 fatalities found (songbirds, including 50% night migrants, plus two Canada Geese), 1.3 fatalities per turbine per year, Johnson et al. 2003

- **Oregon** – Vansycle, 38 modern turbines in farm and rangeland, 1 year, 11 birds (7 songbirds, including about 4 night migrants, and 4 gamebirds), Erickson et al. 2000

- **Oregon-Washington** – Stateline Project, 1.5 years, 106 fatalities including 7 raptors (28+ bird species total) at 124 or 399 modern turbines in farmland, 1.7 fatalities per turbine per year, 1.0 fatalities per turbine per year, Erickson et al. 2003

- **Washington** – Nine Canyons – 37 modern turbines, 1 year, prairie and farmland, 36 bird fatalities found (mostly songbirds, 1 kestrel, 1 Short-eared Owl), 3.6 fatalities per turbine per year, Erickson 2003

- **California** - Altamont Pass Wind Resource Area (APWRA), 5,400 older turbines mostly on lattice towers in grazing and tilled land, many years, large numbers of raptor fatalities (>400 reported) and some other birds, Howell and DiDonato,1991, Howell 1997, Orloff and Flannery 1992, 1996, Kerlinger and Curry 1997, Thelander and Rugge 2000

- **California** – Montezuma Hills, 237 older turbines, 11 modern turbines in tilled farmland, 2+ years, 30+ fatalities found (including 10 raptors, 2 songbirds, 1 duck), Howell 1997

- **California** - San Gorgonio Pass Wind Resource Area, thousands of older turbines, 120 studied in desert, 2 years, 30 fatalities (9 waterfowl, 2 raptors, 4 songbirds, etc.), Anderson et al. 2000

- **California** - Tehachapi Pass Wind Resource Area, thousands of turbines, 100s of mostly older turbines studied, in Mojave Desert mountains (grazing grassland and scrub), 2+ years, 84 fatalities (raptors, songbirds), Orloff 1992, Anderson et al. 2000

Canada

- **Ontario** – Pickering Wind Turbine, 1 modern turbine (384 feet, 117 m) near a marsh, 2 migration seasons, 2 nocturnal migrant fatalities (James, unpublished report)

- **Ontario** – Exhibition Place, 1 modern turbine (308 feet; 94 m) in Toronto on the lakefront, 2 migration seasons, 1 starling and 1 American Robin fatality; mortality projected at 3 birds per year (James and Coady 2003)

Appendix E

Conformance with U. S. Fish and Wildlife Service Guidelines

This addendum addresses the recent issuance by the U.S. Fish and Wildlife Service's (USFWS) of the document, *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003). The Federal Register published these guidelines in early July 2003, and USFWS briefed the National Wind Coordinating Committee on them on July 29, 2003. USFWS has emphasized that the guidelines are interim and voluntary. The Federal Register has opened a comment period that will last two years. The guidance document has not yet been reviewed by professional wildlife biologists outside the USFWS, nor has USFWS amended the document based on the significant public comment it has received over the past year. In April 2004, USFWS Director Williams sent a letter to the Service's state offices directing them regarding the implementation of the guidance document and its recommendations.

It should be noted that the risk assessment conducted for the Clayton Project relied on procedures similar to those presented in the USFWS guidelines, as well as other procedures that exceed what is usually requested by USFWS. For many years, the standard Phase I Avian Risk Assessment process has incorporated most of the guidelines and recommendations made by USFWS, particularly those that have been shown to be scientifically valid. Therefore, the risk assessment presented above fulfills the intent of the guidance document and follows its recommendations in order to avoid or minimize impacts to wildlife, specifically birds and their habitats.

Specific Conformance to Guidelines

Teaming With Agencies. Letters have been sent to the New York State Natural Heritage Program (NHP) and the USFWS Cortland, New York office requesting information on listed species and species of special concern, as well as other bird information. Approaching these agencies meets the recommendation by USFWS that developers should attempt to team or involve such agencies in the site evaluation process. There does not appear to be a federal nexus for the Clayton Project, although the New York State Department of Environmental Conservation (NYSDEC) will likely be involved through New York State Environmental Quality Review (SEQR) process. If work within wetlands is required for roads or turbine locations, a federal nexus will occur through the U.S. Army Corps of Engineers (USACOE), which often defers to USFWS with respect to wildlife issues.

Reference Sites. The Clayton Wind Farm site was compared to other wind power facilities in the United States, including about ten existing wind power projects in the Midwest and east, as well as projects in the western United States and Europe. Selecting a worst-case scenario site for comparison with the Project site was not possible because choosing such sites would necessitate tenuous assumptions about high risk at wind power projects that have not been demonstrated. Selection of a worst-case scenario site at this time would not be based on biologically documented impacts. None of the other wind

power projects in the United States, with the possible exception of the APWRA of California, have resulted in biologically significant impacts to birds. In terms of collision risk to birds, comparisons made suggest that risk at the Clayton site is no greater than at other wind power facilities in the United States.

While it is not possible to compare the Clayton Project with a site that could be construed as worst-case scenario, comparisons to the APWRA and sites where risk has been documented to be negligible were made. Clearly, the Clayton Project site does not have the collision risk factors present in the APWRA (see Table 6.2.2.2-1). Further comparisons were made to the impacts of communication towers of various sizes, lighting specifications, and construction types (guyed versus unguyed). This type of comparison is particularly important because there is a large body of research on communication towers, including towers in the eastern and Midwestern United States.

The potential for biologically significant fatalities at wind power facilities was assessed by comparing numbers of known fatalities and likely fatalities at the Clayton site with the hundreds of millions of bird fatalities permitted by the USFWS via depredation, hunting, and falconry permits. This comparison strongly suggests that impacts of wind turbines – estimated at tens of thousands of bird fatalities per year nationally – are not biologically significant. These comparisons are relevant because they provide actual numbers of takings permitted by the USFWS and the NYSDEC. In comparison, fatalities from wind power projects cannot be deemed biologically significant.

With respect to habitat disturbance and displacement of nesting birds, comparisons were made with various sites where such disturbance has been determined to occur. Because these types of impacts are likely to occur among some grassland nesting species at the Clayton Project site, further research has been recommended to prevent or mitigate such impacts.

Alternate Sites. In the case of the Clayton Project, there are problems with requiring an alternative site analysis. No alternative sites were available for this study, because the habitat for several miles surrounding the Project is very similar and likely to support the same bird community. It should also be noted that if no federal permits appear to be necessary for this project. Therefore, a NEPA review is not triggered, and an alternative sites analysis is not required. The Phase I Avian Risk Assessment did, however, compare potential impacts at the Clayton Project to other wind power projects.

Checklists. Instead of using the PII and checklists supplied in the USFWS guidelines, the Phase I assessment included detailed descriptions of the habitat and topography of the site and surrounding areas. For example, the risk assessment included determination of actual or potential migration pathways and the presence of ecological magnets and/or other attractive habitats located within or adjacent to the Project boundary. This included descriptions of the grasslands, farm fields, forests, forest edges, brushland, abandoned farmland, wildlife and natural areas, degree of habitat (grassland and forest) fragmentation, and degree of landscape alteration by farming and other land use practices

within and around the site that could influence avian impacts potentially resulting from the proposed development.

Regarding other specific guidance and recommendations, in the area of site development, the Phase I Avian Risk Assessment covers the following concerns:

- Letters of inquiry were sent to USFWS and NHP requesting records of listed species. In addition, habitat was examined to determine whether listed avian species are likely to nest or use the site.
- Except perhaps for waterfowl, which use Lake Ontario, the St. Lawrence River, and the numerous wildlife management areas to varying degrees, the Clayton site is not on a known migration pathway for birds, including hawks, songbirds, and shorebirds. In addition, it has not been demonstrated that wind turbines produce biologically significant impacts on migrating birds. The Phase I assessment explains this.
- Raptor use of the area appears to be moderate, so setbacks from soaring and updraft locations do not appear to be applicable. Raptor fatalities at wind power projects outside of the 5,400 turbine APWRA have totaled very few birds. Even in the APWRA, mortality does not appear to be biologically significant. It should be noted that none of the turbines at the Clayton site would be at the edge of steep terrain that could be used for soaring.
- The USFWS recommendation to configure turbines in ways that would avoid potential mortality has not been demonstrated empirically to reduce or prevent impact, because fatality numbers are small to begin with.
- Habitat fragmentation issues have been addressed in this risk assessment.
- There are no prairie grouse or similar species present at the Clayton site. Other grassland nesting species that may be disturbed or displaced have been addressed in the Phase I assessment.
- Road areas and habitat restoration are addressed in this risk assessment.
- Carrion availability is not applicable at the Project site.

Regarding wind turbine design and operation, many of the USFWS recommendations are either covered in this risk assessment or routinely done at modern wind plants. Some USFWS recommendations, however, are incorrect or not applicable.

- Tubular (unguyed) towers will be used to prevent perching.
- Permanent meteorology towers have been recommended to be free-standing, without guy wires, in the risk assessment.
- The USFWS recommendation that only white strobes should be used at night to avoid attracting night migrants is only partially correct. That red lights should be avoided is also only partially correct. There is strong evidence (Kerlinger 2004a, 2004b) that, in the absence of steady burning red L-810 lights, red strobe-like Federal Aviation Administration (FAA) lights do not attract birds to wind turbines. Red strobe-like lights (L-864) are likely to be recommended by the FAA for the Clayton Project. This has been addressed in detail in the text of this risk assessment.

- Adjustment of tower/rotor height is problematic and cannot be addressed in this report. However, the turbines that are proposed are much less than 500 feet in height and, therefore, unlikely to cause large-scale fatality events, such as those at tall communication towers. Such turbines have not been documented to cause biologically significant impacts to migrants.
- Underground electric lines and APLIC guidelines have been recommended in the risk assessment.
- Seasonal concentrations of birds are addressed in the risk assessment. The appropriateness of shutting down turbines or other mitigation is dependent on the level of demonstrated impacts, which cannot be determined during the preconstruction phase.
- The USFWS guidance document stipulates that radar or other remote sensing methodologies should be used if large concentrations of migrants are suspected. A detailed discussion of the geographic and topographic patterns of migration is presented in this Phase I assessment. Although this discussion provides strong evidence that concentrated migration does not occur at the Project site, the proximity to Lake Ontario suggests that larger numbers of night migrants may be present only a short distance from the Project site. Therefore, we recommend a radar study of night migration at the Project site for a period of one spring and one fall migration.
- Post-construction fatality monitoring would provide a means of determining the Project's impact to birds and has been recommended in this risk assessment.

Overall, the USFWS's interim and voluntary guidance document promises to provide a means of evaluating wind power sites for wildlife impacts. Some of the guidance and recommendations are integral to adequately assessing risk, although some have not been substantiated or are only partially correct. The guidance and recommendations set forth by USFWS are in need of a thorough review by the scientific community, industry, and environmental organizations prior to being required for wind power projects. Most importantly, there is need to validate the recommendations and protocols for ranking sites as to potential risk. Until such validation has been done, it is difficult to determine how valuable the guidance and recommendations document is.

It should be noted that the American Wind Energy Association (AWEA) has reviewed the USFWS guidelines and recommendations. In December 2003, it submitted a detailed review to Interior Secretary Norton. AWEA requested several changes, most of which addressed the lack of scientific validation of recommendations and protocols. USFWS has publicly stated that it will not address any comments or revise the guidelines and recommendations until mid-2005.