COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE)

TITLE: *Environmental Assessment: DOE's Proposed Financial Assistance to Pennsylvania for Frey Farm Landfill Wind Energy Project, Manor Township, Lancaster County, Pennsylvania*

CONTACT: For additional copies or more information on this environmental assessment (EA), please contact:

Jane Summerson
EA Document Manager
U.S. Department of Energy
702-292-4290

Abstract: PPL Renewable Energy, LLC and the Lancaster County Solid Waste Management Authority propose to construct and operate a 2 turbine wind energy project at the Frey Farm Landfill (FFLF) in Manor Township in Pennsylvania's Lancaster County to provide up to 3.2 megawatts of electricity principally to the adjacent Turkey Hill Dairy. Pennsylvania proposes to provide the project a $1.5 million grant, which would come from a formula grant Pennsylvania received from DOE pursuant to the Department's State Energy Program. This EA analyzes the potential environmental impacts of the proposed construction and operation of the FFLF wind energy project and the alternative of not implementing this project.

Public Participation: DOE invited comments on the Draft EA for this project for a period of 12 days beginning with publication of a notice in the Lancaster *Intelligencer Journal* on Wednesday, January 27, 2010. A copy of the Draft EA was made available at the Columbia Public Library, 24 S. 6th Street, Columbia, PA 17512. The public was encouraged to submit written comments regarding the proposed project to DOE by the close of the comment period on February 8, 2010. As of February 10, 2010, DOE had received no comments on the Draft EA.

DOE/EA-1737

ENVIRONMENTAL ASSESSMENT

DOE'S PROPOSED FINANCIAL ASSISTANCE TO PENNSYLVANIA FOR FREY FARM LANDFILL WIND ENERGY PROJECT

MANOR TOWNSHIP
LANCASTER COUNTY, PENNSYLVANIA

U.S. Department of Energy
National Energy Technology Laboratory

February 2010

DOE/EA-1737

ENVIRONMENTAL ASSESSMENT

DOE'S PROPOSED FINANCIAL ASSISTANCE TO PENNSYLVANIA FOR FREY FARM LANDFILL WIND ENERGY PROJECT

MANOR TOWNSHIP
LANCASTER COUNTY, PENNSYLVANIA

U.S. Department of Energy
National Energy Technology Laboratory

February 2010

TABLE OF CONTENTS

Section			Page
1.	INTRODUCTION AND BACKGROUND		1-1
1.1.	National Environmental Policy Act and Related Procedures		1-1
1.2.	Purpose and Need		1-2
1.2.1.	DOE's Purpose and Need		1-2
1.2.2.	Pennsylvania's Purpose and Need		1-2
1.3.	Public and Agency Involvement		1-2
1.4.	Considerations Not Carried Forward for Further Analysis		1-3
2.	PROPOSED ACTIONS AND ALTERNATIVES		2-1
2.1.	DOE's Proposed Action		2-1
2.2.	Pennsylvania's Proposed Project		2-1
2.3.	Alternatives		2-3
2.3.1.	DOE Alternatives		2-3
2.3.2.	No-Action Alternative		2-4
2.3.3.	Alternatives Considered by the Project Proponents		2-4
2.3.4.	Alternatives Considered by Pennsylvania in the PEDA Grant Process		2-6
2.4.	Required Agency Permits and Approval Types		2-6
2.5.	Project Proponents' Commitments		2-7
3.	AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS		3-1
3.1.	No-Action Alternative		3-1
3.2.	Pennsylvania's Proposed Project		3-1
3.2.1.	Land Use		3-1
3.2.2.	Biological Resources		3-2
3.2.3.	Noise		3-9
3.2.4.	Visual Quality		3-10
3.2.5.	Transportation		3-10
3.2.6.	Groundwater and Surface Water Resources		3-11
3.2.7.	Soils		3-12
3.2.8.	Air Quality and Climate Change		3-12
3.2.9.	Socioeconomics and Environmental Justice		3-13
3.2.10.	Energy Impacts		3-14
3.2.11.	Cultural Resources		3-14
3.2.12.	Human Health and Safety		3-15
4.	CUMULATIVE IMPACTS		4-1
4.1.	Reasonably Foreseeable Projects		4-1
4.2.	Summary of Cumulative Impacts		4-1
5.	REFERENCES		5-1
6.	AGENCIES AND PERSONS CONSULTED		6-1

LIST OF TABLES

Table		Page
2-1	Federal, State and Local Permits and Approvals	2-6

APPENDICES

Appendix A: Figures
Appendix B: Agency Coordination
Appendix C: Agency and Other Approvals
Appendix D: Analysis and Supporting Documentation

ACRONYMS AND ABBREVIATIONS

APE	Area of Potential Effect
APP	Avian Protection Plan
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CRGIS	Cultural Resources Geographic Information System
DEP	Department of Environmental Protection
DOE	Department of Energy
EA	environmental assessment
FAA	Federal Aviation Administration
FFLF	Frey Farm Landfill
IBA	Important Bird Area
LCSWMA	Lancaster County Solid Waste Management Authority
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination
PDCNR	Pennsylvania Department of Conservation and Natural Resources
PEDA	Pennsylvania Energy Development Authority
PGC	Pennsylvania Game Commission
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PNDI	Pennsylvania Natural Diversity Inventory
PPL	PPL Renewable Energy, LLC
SEP	State Energy Program
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
WEVCA	Wind Energy Voluntary Cooperative Agreement

1. INTRODUCTION AND BACKGROUND

PPL Renewable Energy, LLC (PPL), and the Lancaster County Solid Waste Management Authority (LCSWMA) (project proponents) propose to construct a 2 turbine wind energy project at the Frey Farm Landfill (FFLF) in Manor Township in Pennsylvania's Lancaster County to provide electricity to the adjacent Turkey Hill Dairy and, potentially, the regional electricity grid. The current estimated project cost is $8.5 million. The Commonwealth of Pennsylvania selected this project for a $1.5 million grant from the Pennsylvania Department of Environmental Protection via the Pennsylvania Energy Development Authority (PEDA) based on its unique structure (small-scale wind project providing electricity directly to an adjacent commercial end user) that would (1) provide emissions-free energy, (2) create jobs during project construction, and (3) control electricity costs, thereby helping preserve jobs at Turkey Hill Dairy.

A PEDA grant to this project would come from money that Pennsylvania received from the U.S. Department of Energy (DOE) pursuant to DOE's State Energy Program (SEP). The purpose of the SEP is to promote the conservation of energy and reduce dependence on imported oil by helping states develop comprehensive energy programs and by providing them with technical and financial assistance. States can use their SEP funds for a wide variety of activities related to energy efficiency and renewable energy. *See generally* 42 United States Code (U.S.C.) § 6321 *et seq*. and 10 Code of Federal Regulations (CFR) Part 420. In the *American Recovery and Reinvestment Act of 2009* (Public Law 111-5, 123 Statute 115; Recovery Act), Congress appropriated $3.1 billion to DOE for the SEP, and Pennsylvania received $99 million pursuant to a statutory formula for distributing these funds.

Pennsylvania recently informed DOE that it proposes to use $1.5 million of its SEP funds for a grant to the FFLF Wind Project. The potential use of federal SEP funds to assist in the financing of this project constitutes a federal action subject to review under the National Environmental Policy Act (NEPA). Therefore, DOE has prepared this *Environmental Assessment: DOE's Proposed Financial Assistance to Pennsylvania for Frey Farm Landfill Wind Energy Project, Manor Township, Lancaster County, Pennsylvania* (DOE/EA-1737) with Pennsylvania's assistance. This environmental assessment (EA) evaluates the potential environmental consequences of DOE's Proposed Action (allowing Pennsylvania to use $1.5 million of its SEP funds for a grant to this project) and of a No-Action Alternative (not allowing use of SEP funds for this project and assuming, therefore, that the project would not proceed). The EA informs DOE and the public of the potential environmental consequences of these alternatives and mitigating measures that will help reduce these potential consequences.

1.1. National Environmental Policy Act and Related Procedures

NEPA, the Council on Environmental Quality NEPA regulations (40 CFR Parts 1500 to 1508), and DOE's NEPA implementing regulations (10 CFR Part 1021) require that DOE consider the potential environmental impacts of a proposed action before making a decision. This requirement applies to decisions about whether to provide different types of financial assistance to states and private entities.

In compliance with these regulations, this EA examines the potential environmental impacts of DOE's Proposed Action and the No-Action Alternative. During the course of preparing this EA, DOE conferred with the project proponents, the United States Fish and Wildlife Service (USFWS), and the Pennsylvania Game Commission (PGC) in order to obtain information on the project and on impacts to avian species, respectively. This EA provides DOE with the information needed to make an informed decision about whether allowing Pennsylvania to use some of its SEP funds for the proposed FFLF Wind Project may result in significant environmental impacts. Based on the EA, DOE either will issue a finding of no significant impact, which could include mitigation measures, or determine that additional study is needed in the form of a more detailed environmental impact statement.

Nothing in this EA affects the project proponents' obligations to comply with the laws of the United States, including the Endangered Species Act, Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Nothing in this EA limits the USFWS's regulatory and permitting authorities under these or any other statutes.

1.2. Purpose and Need

1.2.1. DOE's Purpose and Need

DOE's purpose and need is to ensure that SEP funds are used for activities that meet Congress's statutory aims to improve energy efficiency, reduce dependence on imported oil, decrease energy consumption, or promote renewable energy. However, it is not DOE's role to dictate to Pennsylvania how to allocate its funds among these objectives or to prescribe the projects it should pursue.

1.2.2. Pennsylvania's Purpose and Need

PEDA's purpose and need is to take action to help fulfill its mission to finance clean, advanced energy projects in Pennsylvania, including wind energy projects. Applications are evaluated using criteria including but not limited to technical and financial feasibility of the project, number and quality of jobs created or preserved, and other economic benefits for the Commonwealth of Pennsylvania. Projects must show financial commitment from at least one source other than PEDA and demonstrate a net environmental benefit to Pennsylvania.

1.3. Public and Agency Involvement

The public had at least 18 opportunities over more than 2 years to learn about the project and to provide comments to the LCSWMA and, on 2 occasions, to the Manor Township Zoning Board. LCSWMA conducts its business in open public meetings, providing a forum for ongoing reporting and comment on the project ranging from wind and bird studies, to progress on agreements with purchasers, to approving a wildlife assessment agreement with the PGC. The minutes from these meetings are available on the LCSWMA website at http://www.lcswma.org/boardMeetings.asp. These minutes do not identify any public opposition, controversy over resources that would be affected by this project, or suggestions to consider

alternatives or mitigation actions not identified in this EA. In addition, no objections were received when the project was presented at the December 9, 2009, meeting of the Manor Township Zoning Hearing Board meeting, which was advertised to and open to the public.

From 2007 through 2009, LCSWMA gave 38 public presentations on the FFLF Wind Project to a wide variety of audiences, including industry affiliates, community groups, and private business. LCSWMA reports that it did not receive any objections to the proposed project at these public presentations. The most recent community meeting was in October 2009.

During this period, the following agencies and organizations were contacted:

- U.S. Fish and Wildlife Service (USFWS)
- Federal Aviation Administration (FAA)
- U.S. Department of Commerce, National Telecommunications and Information Administration
- Pennsylvania Bureau for Historic Preservation
- Pennsylvania Game Commission
- Pennsylvania Department of Conservation and Natural Resources (PDCNR)
- Pennsylvania Fish and Boat Commission
- Manor Township
- Lancaster County Conservation District
- Sprint Nextel

DOE invited comments on the Draft EA for this project for a period of 12 days beginning with publication of a notice in the Lancaster *Intelligencer Journal* on Wednesday, January 27, 2010. A copy of the Draft EA was made available at the Columbia Public Library, 24 S. 6th Street, Columbia, PA 17512, and the Draft EA was available for download from the DOE NEPA Website (http://www.gc.energy.gov/NEPA). The public was encouraged to submit written comments regarding the proposed project to DOE by the close of the comment period on February 8, 2010. As of February 10, 2010, DOE had received no comments on the Draft EA.

In addition, Pennsylvania published a notice requesting comments in the *Pennsylvania Bulletin* [40 Pa.B. 562] and the Harrisburg *Patriot-News* on January 23, 2010, and placed the Draft EA on the Pennsylvania Department of Environmental Protection website (http://www.depweb.state.pa.us). The Department of Environment did not receive comments on the Draft EA.

1.4. Considerations Not Carried Forward for Further Analysis

Consistent with NEPA implementing regulations and guidance, DOE focuses the analysis in an EA on topics with the greatest potential for significant environmental impacts. For the reasons discussed below, the proposed wind turbine project is not expected to have any measurable effects on certain resources, and these resources are not analyzed further in Chapter 3.

Floodplains and Wetlands
DOE reviewed the USFWS National Wetlands Inventory maps (USFWS, 2009) and Federal Emergency Management Agency (FEMA) floodplain maps (FEMA, 2005) and identified no floodplains, wetlands, or surface water sources such as streams or drainage channels on the proposed project site or that could be affected by the construction and operation of the wind turbines.

Waste Management
Solid wastes anticipated to be generated during construction include equipment packaging materials and construction-related material debris. Solid wastes generated during operation of the turbines would be minimal. Solid wastes anticipated to be generated during decommissioning include dismantled equipment and construction-related material debris. Hazardous, regulated non-hazardous, and universal wastes are not anticipated to be generated during construction, operation, or decommissioning. All wastes generated over the life of the proposed project would be managed in accordance with applicable federal, state, and local regulations. Used oil (for example, spent gear box oil, hydraulic fluid, and gear grease) is not considered a waste because it can be reused and/or recycled. Used oil would be generated during project operation, and would be handled, collected, transferred, and reused or recycled in accordance with applicable federal, state, and local regulations.

Wild and Scenic Rivers
DOE reviewed the PDCNR Pennsylvania Scenic Rivers Program website (http://www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.aspx) and the National Park Service national rivers inventory website (http://www.nps.gov/ncrc/programs/rtca/nri/states/pa.html). The proposed project site is not located within a waterway, corridor, or drainage area of a stream or river designated as a Pennsylvania Scenic River or a waterway included in the National Wild and Scenic River System. The 2 closest scenic rivers are in Lancaster County (Octoraro Creek and Tucquan Creek, approximately 19 and 8.8 miles from the proposed project site, respectively). The proposed project would not impact federal or state wild and scenic rivers.

Intentional Destructive Acts
DOE considers intentional destructive acts (acts of sabotage or terrorism) in its EAs and environmental impact statements (DOE, 2006). Construction and operation of this wind energy project would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. The project would not offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts on human life, heath, or safety. In the unlikely event an attack were to occur, its consequences would be similar to those of an accident.

2. PROPOSED ACTIONS AND ALTERNATIVES

2.1. DOE's Proposed Action

DOE's Proposed Action is to allow Pennsylvania to use its SEP funds for a grant to assist in financing the FFLF Wind Project in order to facilitate Pennsylvania's achievement of the objectives of the SEP.

2.2. Pennsylvania's Proposed Project

PEDA selected the FFLF Wind Project for a $1.5 million grant based on its unique structure (small-scale wind project providing electricity directly to an adjacent commercial end user) and its ability to (1) provide emissions-free energy, (2) create jobs during project construction, and (3) reduce Turkey Hill Dairy's electricity costs, thereby helping to preserve jobs at the dairy. A criterion of the PEDA grant program is that the project must be completed by December 31, 2010, and fully operational by February 1, 2011.

The proposed project offers benefits to several parties. LCSWMA would receive a nominal lease payment from PPL for hosting the wind energy project on its property. PPL would fulfill its obligation to provide electricity from alternative energy sources under the Pennsylvania Alternative Energy Portfolio Standards Act. Turkey Hill Dairy would reduce its carbon footprint by purchasing clean power from the project and control energy costs now that rate caps have expired in Pennsylvania. The project also offers the opportunity to teach the public about wind energy through an environmental education center planned for development in the nearby town of Columbia and through public tours of the wind energy facility.

The project would involve construction, operation, and eventual removal of 2 GE wind turbines that would generate approximately 3.2 megawatts of electricity. The height of the turbines' hubs would be approximately 80 meters (262 feet) and the rotor diameter would be approximately 82.5 meters (271 feet), making the total height approximately 121 meters (398 feet). The project would include a new underground electrical distribution line to connect the turbines to existing equipment at the adjacent Turkey Hill Dairy.

Turkey Hill Dairy expects to purchase all the electricity generated by the turbines, which would provide about 25 percent of the dairy's total electrical demand. The distribution line would be connected to the electrical grid so that power also could be sold to Pennsylvania Power and Light for regional distribution.

Proposed Site
The proposed FFLF Wind Energy project would be located atop Turkey Hill Point overlooking the Susquehanna River, southwest of the city of Lancaster, south of Washington Borough, and southwest of the town of Creswell in Lancaster County's Manor Township (Figure 1, Appendix A). The site is on the perimeter of the active landfill, which is situated between River Road and the Susquehanna River at Lake Clarke (Figure 2, Appendix A). The proposed locations for Wind Turbines A and B are shown on Figure 3 in Appendix A; these locations are closest to

tower locations T-1 and T-5 marked on Figure 4 in Appendix A. Entrance to the FFLF is from River Road. The approximate center point of the FFLF is at Latitude/Longitude 39° 57' 22.42"/76° 27' 15.10".

Construction

Construction would include installation of the 2 turbines, underground distribution line, necessary access roads and road improvements, crane pads, foundation systems, and fencing around the proposed site. It would be performed in accordance with an approved erosion and sedimentation control plan, National Pollutant Discharge Elimination System (NPDES) permit, and in compliance with all other applicable requirements. Wind turbine installation, including site preparation, erection, and final commissioning, generator installation, underground distribution line installation, and overall systems tie-in and start-up is planned to be completed within about 4 months of project start.

Construction also would entail clearing approximately 2 acres of trees. The trees planned for removal are young white pines (*Pinus strobus*) (approximately 1 acre) along the landfill's former perimeter fence and some relatively young deciduous trees (approximately 1 acre) along the northwestern property line.

There would be a transformer at the base of each wind turbine to boost the voltage to 12,000 volts (12 kilovolts). An underground distribution line would be routed east in a straight path through a new duct bank from the wind turbines for approximately 2,440 feet, where it would be connected to an existing underground duct bank (Option A, Figure 3, Appendix A). The wire would then be pulled through the existing duct bank to connect with Turkey Hill Dairy's existing switchbox. A duct bank protects electrical or other cables from damage by soil, moisture, puncture, and other sources of potential damage. There is no need for a conventional transmission line, a substation, or extensive wiring.

The new section of concrete-reinforced duct bank would be installed in an excavated trench approximately 4.5 feet deep and 2.5 feet wide. The proposed route would cross previously disturbed areas consisting of maintained land within the landfill property and would parallel an access road adjacent to agricultural land. Efforts would be made to minimize disturbance to the agricultural lands. Alternative options would require disturbance of a larger area and additional costs associated with extending the length of the duct bank.

During construction, the contractor would provide necessary facilities consistent with similarly sized construction projects, including construction trailer, temporary chemical toilets, and solid-waste collection containers. All solid and liquid wastes would be removed from the site in accordance with applicable regulations and permit conditions.

Due to the unique characteristics of the site (see Section 2.3.3), there were no other reasonable areas for placing the project on LCSWMA property. The project proponents evaluated 5 potential turbine locations within the project area to determine the best locations for minimizing harm to birds. The size of the project is the minimum needed to maintain economic viability for the project proponents.

Operation
PPL and LCSWMA would operate and maintain the wind energy project according to standard industry procedures and applicable requirements. Routine maintenance of the turbines would be necessary to maximize performance and identify potential problems or maintenance issues. Each turbine would be remotely monitored daily to ensure operations are proceeding efficiently. Any problems would be reported to operations and maintenance personnel, who would perform both routine maintenance and most major repairs. Most servicing would be performed up-tower, without using a crane to remove the turbine from the tower. In addition, all roads, pads, and trenched areas would be regularly inspected and maintained to minimize erosion.

Decommissioning
The turbine and other infrastructure are expected to have a useful life of at least 20 years. Pursuant to the Zoning Hearing Board of Manor Township variance approval, the project proponents must provide a plan for the removal of wind turbine A when it becomes functionally obsolete or is no longer in use. The project proponents also would decommission turbine B consistent with the variance requirements.

The trend in the wind energy industry has been to "repower" older wind energy projects by upgrading equipment with more efficient turbines, thereby extending the project's useful life beyond 20 years. When the project is terminated, the turbine and other infrastructure would be decommissioned, and all facilities would be removed to a depth of approximately 3 feet below grade. Underground facilities could be removed, or safely secured and left in place. Salvageable items (including fluids) would be sold, reused, or recycled as appropriate; unsalvageable material would be disposed of at authorized sites. The soil surface would be restored as close as possible to its original condition. Reclamation procedures would be based on site-specific requirements commonly employed at the time the area is to be reclaimed and could include regrading, adding topsoil, and replanting of all disturbed areas.

2.3. Alternatives

2.3.1. DOE Alternatives

Pennsylvania's SEP funds are from a formula grant – the amount is determined pursuant to a formula established in DOE grant procedures at 10 CFR 420.11. Allocation of funds among the states is based on population and other factors. Recipients of these formula grants have broad discretion in how they use their funds. Accordingly, DOE's alternatives to its Proposed Action relating to Pennsylvania's use of its SEP funds are limited to (1) any alternatives that Pennsylvania is still considering regarding this project and (2) prohibiting Pennsylvania from providing a grant to this project. The second alternative is equivalent to the No-Action Alternative described in Section 2.3.2. Pennsylvania has informed DOE that it is not considering any "project-specific" alternatives for the FFLF Wind Project; therefore, DOE's alternatives are limited to the No-Action Alternative. Additionally, there are no unresolved conflicts concerning alternative uses of available resources associated with the project site that would suggest the need for other alternatives.

2.3.2. No-Action Alternative

Under the No-Action Alternative, DOE would not allow Pennsylvania to use its SEP funds for this project. DOE assumes for purposes of this EA that the project would not proceed without SEP funding. This assumption could be incorrect, but it allows for a comparison between the potential impacts of the project as proposed and the impacts of not proceeding with the project. Without the proposed project, FFLF operations would continue as otherwise planned but without the proposed wind turbines, and the Turkey Hill Dairy would continue purchasing electricity as it does now. Pennsylvania's ability to use its SEP funds for energy efficiency and renewable energy activities would be impaired, as would its ability to create jobs and invest in the nation's infrastructure in furtherance of the goals of the Recovery Act.

2.3.3. Alternatives Considered by the Project Proponents

During the more than 2 years of the project's development, PPL and LCSWMA considered several alternative locations for the wind turbines (Figure 4, Appendix A). The project proponents eliminated all but the 2 proposed locations due to various siting considerations (topography, site elevation, prevailing wind direction), avian considerations, location (proximity to electrical interconnection, proximity to the meteorological tower location, accessibility), physical siting constraints (landfill footprint, property boundaries, adjacent trail), and turbine spacing.

The wind energy project was originally conceived of as having 4 turbines with approximately 6 megawatts of capacity (tower locations T-1, T-2, T-3, and T-4). Based on the results of a spring bird migration survey, project biologists estimated that potential impacts to wildlife could be reduced by moving the turbines inland from Turkey Hill Point and by reducing their number to 2. At that time, a fifth possible tower location (T-5) was identified on a neighboring parcel to the north of FFLF, away from the riverine forested corridor and back from the steep riverine slope. LCSWMA purchased the parcel in September 2009 and added T-5 to the fall raptor/eagle migration survey.

The project proponents selected the locations of proposed wind turbine A (near T-1) and wind turbine B (near T-5) based on the siting considerations and constraints described below.

Siting Considerations
The project proponents performed various studies to determine potential impacts to avian species (see Section 3.2.2). These studies found, for example, that observations of eagles within the potential rotor-swept zone varied by location, with 68 at T-2, 65 at T-4, 53 at T-1, 43 at T-3, and 31 at T-5. Tower location T-2 in spring and fall had the greatest number of observations recorded for all species of special concern. Overall, tower location T-4 had the most occurrences of all birds within its rotor-swept zone. When considering all raptors/eagles, T-1 and T-5 had the fewest occurrences of species within a possible rotor-sweep zone. Turkey vultures and black vultures were recorded within the zones of all 5 potential tower locations.

Proposed wind turbine A would be a short distance from the location analyzed for tower location T-1, and proposed wind turbine B would be 232 feet southwest of tower location T-5.

The project proponents changed the locations to minimize potential impacts to avian species; maintain necessary siting requirements with respect to increasing the setbacks from the river and riverine forested habitat; and satisfy property line, access road, and utility setbacks. The results of the 2009 fall migration survey for tower locations T-1 and T-5 correlate to proposed wind turbines A and B, respectively. Based on the wind characteristics of the site, physical siting constraints, and the results of the raptor/eagle migration surveys, the project proponents determined that wind turbine locations A and B are the most favorable with respect to minimizing potential impacts to wildlife while maintaining the economic viability of the project.

The proposed turbine locations are on Turkey Hill Point, which extends out into the Susquehanna River at Lake Clarke and forms a steep bluff adjacent to the river. This unique landform is responsible for producing higher wind speeds at the proposed project site than in surrounding areas because the wind must accelerate up and over the steep bluff. Only the northern and western edges of the FFLF are suitable for a wind energy project due to the need to have uninterrupted exposure to the west-northwesterly prevailing wind direction. In addition to favorable exposure to the prevailing wind, the northern and western edges of the FFLF are the highest elevations at the site, which results in higher sustained wind speeds. Based on these features, a 22-month wind resource assessment was performed at the site using information collected from a meteorological tower on the northwestern edge of the landfill. According to the project proponents, the wind resource assessment provided the basis for energy production estimates that demonstrated the viability of the project.

The project proponents also considered in their siting proposal that the turbines should be near the electrical interconnection point at Turkey Hill Dairy and in accessible locations that would minimize new road construction. The proposed locations are within 1 mile of the interconnection point to deliver energy to Turkey Hill Dairy, which would minimize environmental disturbances and reduce construction costs. The turbine locations also are adjacent to the active landfill, which is a compatible land use for the wind energy project because accessibility would be available for construction and maintenance and overall environmental impacts associated with new access road construction would be reduced.

Wind turbine orientation and spacing also were important criteria in the siting process. The proposed wind turbines at FFLF would be situated roughly perpendicular to the prevailing wind direction to maximize energy generation. Additionally, the proposed turbine locations are separated by the minimal spacing needed to prevent wake interference between the turbines.

Physical siting constraints at the landfill also were considered and include the active landfill footprint; property boundaries; existing utilities; and the Turkey Hill Trail. Siting wind turbines on an active landfill is not allowed because foundation stability requirements would not be satisfied. Therefore, possible turbine locations were limited to the western and northern periphery of the FFLF. Existing utilities (such as the PPL high voltage electrical transmission line and the Sprint-Nextel cellular tower) limited the movement of the proposed turbine locations farther east. Moving the turbines farther west was limited by the steep bluff and by proximity to the Turkey Hill Trail.

One other underground distribution line alignment (Option B, Figure 3, Appendix A) was evaluated. This option would have entailed "piggybacking" the distribution line on the existing utility poles that extend from near the proposed wind turbines to the existing landfill gas-to-energy facility and then continuing the line in an underground duct bank to Turkey Hill Dairy. This option would have required a significant lengthening of the distribution line, adding substantial cost to the project. The Manor Township Zoning Ordinance requires all transmission or distribution lines from renewable energy projects to be underground; therefore, an aboveground option would have required a variance. The aboveground option also would pose a greater risk of electrocution to birds and other wildlife species. Due to these considerations, the project proponents concluded that Option B was not a viable option for the distribution line.

2.3.4. Alternatives Considered by Pennsylvania in the PEDA Grant Process

In 2009, the Pennsylvania Department of Environmental Protection received 389 PEDA applications seeking more than $400 million. Eleven projects were competitively selected to receive $10 million in Recovery Act funding. Thirteen additional projects were competitively selected to receive $10.7 million in state funding.

2.4. Required Agency Permits and Approval Types

Prior to construction, all required federal, state, and local permits and approvals would be obtained. Table 2-1 lists the required permits and approvals.

Table 2-1. Federal, State, and Local Permits and Approvals

Agency	Permit Approval/Type
Federal	
Federal Aviation Administration	Aeronautical Determination (Received 12/22/2009)
National Telecommunications and Information Administration	Radio Frequency Transmission Approval (Received 01/05/2010)
State	
Pennsylvania Department of Environmental Protection	National Pollutant Discharge Elimination System
Pennsylvania Historic and Museum Commission	Compliance with the Pennsylvania History Code Compliance with the National Historic Preservation Act
Pennsylvania Game Commission	Compliance with the Wind Energy Voluntary Cooperation Agreement
Local	
Manor Township Zoning Board	Variance Approval (Received 01/06/2010)
Lancaster County Conservation District	Erosion and Sediment Control Plan Approval

In addition, the project proponents are coordinating with the USFWS to comply with the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act in an effort to avoid and minimize impacts to avian species as a result of the project.

2.5. Project Proponents' Commitments

PPL and LCSWMA have committed to the following measures and procedures to minimize or avoid potential environmental impacts of the proposed project.

Concentration Areas and Landscape Features Known to Attract Birds
Birds are known to use the wooded habitat along the Susquehanna River. To minimize potential impacts to avian species, the proposed turbine locations were moved as far back from the Susquehanna River corridor as practicable. LCSWMA purchased an additional 16 acres of land adjacent to the FFLF to facilitate the relocation of the proposed turbines to the north of the landfill and to accommodate a desired setback from the Susquehanna River.

Reduce Number of Turbines
The project proponents reduced their project from 4 wind turbines to 2. The reduction eliminated the turbines with the most potential to affect avian species (i.e., those located farther west toward the river).

Turbine Configuration
The proposed wind turbines would be configured to avoid potential avian mortality, where feasible. The turbines would be spaced as close together as possible following recommended USFWS interim guidance (USFWS, 2003). The proposed turbine locations were moved away from the river corridor to the extent possible. The turbine configuration balances potential impacts to wildlife with wind patterns, siting requirements, and topographic conditions.

Bird, Bat, and Raptor Avoidance and Minimization Measures
All American kestrel and Eastern Bluebird nest boxes in the vicinity of the proposed wind turbine locations have been removed. This will reduce the attractiveness of the project area to these species.

The project proponents have entered into a voluntary cooperative agreement with PGC (Wind Energy Voluntary Cooperation Agreement) to work collaboratively to ensure that the proposed wind energy project is developed in an environmentally conscientious manner and with best regard to the conservation of wildlife resources. The agreement includes post-construction monitoring surveys for 2 years to assess mortality of avian species and bats. PGC and USFWS would be notified if any threatened or endangered species were found during post-construction mortality surveys. PGC and USFWS would consult (as part of the adaptive management approach) regarding the need for any additional project proponents-committed measures based on the findings of the post-construction surveys.

Construction of the wind turbines and associated facilities would commence before the beginning of the 2010/2011 bald eagle nesting season (which can begin in late November and continue through August) to avoid construction disturbance to any new nests that might occur in the vicinity of the proposed project. (Based on surveys conducted in December 2009 and January 2010, the nearest nest is more than 1 mile away across the Susquehanna River [ARM, 2010a]). If construction did not commence before the 2010/2011 nesting season, a new aerial nesting survey would be performed and provided to the USFWS and PGC for review.

An Avian Protection Plan (APP) would be prepared and submitted to the USFWS for approval before commencement of construction activities. The USFWS Avian Protection Plan Guidelines (2005) would be used to develop the APP. These guidelines were primarily developed to address avian electrocution and collision impacts associated with transmission lines. However, these guidelines have been used, with USFWS approval, for wind power projects (Iberdrola Renewables, 2008). An APP supports practices and processes intended to minimize impacts to birds, with a goal of implementing a series of best practices to avoid or reduce risks to birds. Because every project is different, the USFWS guidance is used as a "tool box" from which a utility can select and tailor components applicable to specific needs. The following components would be implemented as part of the APP for the project:

- Make a reasonable effort to construct and alter wind turbines to reduce the instance of avian mortality (this component has been completed via turbine siting and configuration).
- Obtain and comply with all legally required permits.
- Monitor incidents of avian mortality (this component is already part of the project).
- Report to USFWS any takes of bald eagles that occur as a result of the wind turbines during the operational life of the project.
- Train personnel on avian issues such as reporting avian mortalities and disposal of carcasses.
- Develop an avian reporting system.
- Identify avian experts that can be called upon to resolve avian issues, which could include state or federal resource agencies, universities, or conservation groups.
- Identify adaptive management protocols.
- Adopt decommissioning conservation measures.

Habitat Restoration
The design plans would include measures to minimize potential impacts to wildlife following construction and during the operation phase of the project. Grass beneath the wind turbines would be regularly cut to reduce the value of the habitat for wildlife and decrease habitat attractiveness for wildlife. Existing nest boxes in the vicinity of the proposed wind turbines have been removed.

Turbine Design
Guy wires would not be used to support the wind turbines. Guy wires can be a challenge for birds and bats to locate, which makes them difficult to maneuver around and can lead to injury or death. Also, lattice towers, which have become roosting sites for birds at other wind projects, would not be used to support the wind turbines.

Aviation Lighting
Aviation lighting would comply with FAA requirements to minimize impacts to birds and bats. White strobe lights would be used in the minimum number, intensity and number of flashes per minute allowed by the FAA. Solid red or pulsating red warning lights would be avoided. The project has received final approval from the FAA (see Appendix C).

Health, Safety, and Noise
The construction contractor and facility operator would prepare a Health and Safety Plan in accordance with Occupational Safety and Health Administration requirements before

commencing work. Facilities would be secured by fencing and include signs warning of high voltage. All construction activities would occur during normal working hours to avoid noise and other disturbances to surrounding residences. Construction of the proposed wind energy project would comply with all applicable federal, state, and local requirements.

Erosion Control

The Lancaster County Conservation District is responsible for administering the erosion control program in Lancaster County (Pennsylvania Department of Environmental Protection Chapter 102 erosion control regulations). The project proponents would prepare and implement an Erosion and Sediment Pollution Control Plan, which would also address and NPDES requirements (for projects grading more than 1 acre) and would submit the plan to the Lancaster County Conservation District for an Erosion and Sediment Pollution Control Plan adequacy determination.

Invasive Species Control

Voluntary cleaning of equipment and vehicles during construction and operation, using clean fill and mulch, and avoiding planting of invasive species would be employed at the project site. The conservation measures would be included as notes on the construction drawings to help conserve sensitive plant habitats.

Recycling

Used oil would be generated during project operation, and would be handled, collected, transferred, and reused or recycled in accordance with applicable federal, state, and local regulations.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1. No-Action Alternative

If the FFLF Wind Project is not implemented, the 25 percent of Turkey Hill Dairy's electrical power that could be provided by the project would continue to be purchased from Pennsylvania Power and Light. That utility generated about 60 percent of its total electricity with fossil fuels in 2008 (PPL, 2009). The remaining 40 percent of generation came from sources that do not directly emit carbon dioxide (renewables and nuclear). Thus, carbon dioxide emissions from electricity generation to serve the dairy would be higher under the No-Action alternative and Turkey Hill Dairy would not meet its objective to reduce its carbon footprint.

Baseline conditions would continue pursuant to current FFLF plans. Specifically, soil storage would continue in the project area. Under the No-Action alternative, there would be no impacts to the area's visual resources and no noise impacts as a result of the project. Potential impacts to bird species, including the bald eagle, from operation of the wind turbines would not occur. The small number of jobs created by construction and operation of the wind turbines would not be realized and the local area would forego the economic benefit associated with these new jobs. The road improvements required for the project would not be made and resulting impacts would not occur.

3.2. Pennsylvania's Proposed Project

3.2.1. Land Use

The land use pattern beyond the boundaries of the FFLF and surrounding the proposed wind energy project site is primarily rural residential/agricultural with patches of wooded areas consisting of stream corridors, fence rows, and wood lots. The landfill itself is in the excavation zoning district as indicated on the Zoning Map of Manor Township, and the adjacent Turkey Hill Dairy facility has an industrial zoning designation. The proposed project area is in the rural zoning district. There is an active railroad corridor under the ownership of Pennsylvania Lines, LLC (also known as Norfolk Southern Railroad), immediately adjacent to the river to the west of the project site. The railroad property is in the conservation zoning district. Wind energy conversion systems are allowed in both the rural and conservation zoning districts as uses accessory to "public uses and public utilities structures," as defined in the Township's zoning ordinance. The most contiguous patch of forestland occurs on the steep slopes of the Susquehanna River corridor and is situated between the active railroad corridor and the active landfill. The forested corridor along the river is, overall, approximately 400 feet wide, with a slope of approximately 75 percent.

The proposed project area is situated along the northern and northwestern perimeters of the active landfill and the edge of the forested corridor along the Susquehanna River. The proposed project area is on 16 acres of former agricultural land purchased by FFLF in September 2009. Most of the 16 acres would remain an open area, with a portion occupied by the 2 turbines and related equipment and several acres used for a soil stockpile area for the landfill. Existing vegetation in the proposed project area consists primarily of active hay fields, maintained grass areas, and herbaceous vegetation on soil stockpiles.

Manor Township's Zoning Ordinance does not impose height restrictions on wind energy conversion systems provided that the height of the systems is not greater than the shortest distance measured along a horizontal plane from the unit to any property boundary. A zoning variance was approved by the Zoning Hearing Board of Manor Township on January 6, 2010, granting the LCSWMA relief from the property line setback requirement for wind turbine A (see Appendix C).

The project area is in the vicinity of the Turkey Hill Trail, which is maintained by the Lancaster County Conservancy. The trail is in a wooded area down-slope of the proposed turbine locations. The forested habitat surrounding the trail might serve as a buffer, especially during the growing season, to minimize effects on visual quality. The closer of the 2 turbines would be approximately 450 feet from the trail. The trail is beyond the length of a turbine at its fully extended height. The trail receives the most use during summer and fall. As explained in Section 3.2.3 of this EA, noise emitted from the operation of the wind turbines is not expected to affect hikers using the trail.

The proposed wind energy project is in the immediate vicinity of the Susquehanna River at Lake Clarke. Lake Clarke is an 11.5-square-mile lake bordered by York County to the west and Lancaster County to the east, and is used for recreational activities such as boating, sailing, canoeing, swimming, waterfowl hunting, fishing, and bird watching. Lake Clarke is in a designated Pennsylvania Fish and Boat Commission water trail section that extends 52 miles from Harrisburg, Pennsylvania, to the Maryland border. The proposed wind project would be visible from the lake, but is not expected to affect recreational activities at the lake. The section of river nearest the project area, including Lake Clark, is an Audubon Pennsylvania-designated Important Bird Area (IBA), Conejohela Flats IBA #56 (see Section 3.2.2 for more discussion on this IBA).

3.2.2. Biological Resources

Birds and bats can be injured or killed if they fly into operating wind turbines. In addition, birds, bats, and vegetation could be disturbed by construction and decommissioning activities associated with the proposed project. The USFWS, PGC, and PDCNR are responsible for protecting various plant and animal species and associated habitat in the proposed project area. A primary emphasis of these agencies is to ensure that appropriate actions are taken to reduce or mitigate potential harm to protected species and habitat.

To identify potentially affected species and habitat, the project proponents first used the Pennsylvania Natural Diversity Inventory (PNDI), which is found on the PDCNR Pennsylvania

Natural Heritage Program website (http://www.naturalheritage.state.pa.us/). This was followed by direct contact with the USFWS, PDCNR, and PGC. PNDI search results did not indicate any reason to coordinate with the Pennsylvania Fish and Boat Commission, and no coordination with the Commission was undertaken. Appendix B includes the results of the initial online inquiry and follow-up communication.

3.2.2.1. Bald Eagles and Other Migratory Birds

The PNDI review reported three species under PGC jurisdiction within the proposed project area – the great egret (*Casmerodius albus*), a Pennsylvania endangered species; the prothonotary warbler (*Protonotaria citrea*), a species of special concern; and an unidentified sensitive species listed as Pennsylvania threatened. Following review of the PNDI report and other project information, PGC reduced to 2 the number of species requiring further coordination – the great egret (*Ardea alba*[2]) and bald eagle (*Haliaeetus leucocephalus*), a Pennsylvania threatened species (see Appendix B, PGC letter dated November 30, 2009). The bald eagle is no longer a federally listed species pursuant to the Endangered Species Act, but it is protected by the Migratory Bird Treaty Act[3] and the Bald and Golden Eagle Protection Act. Thus, project proponents also coordinated with USFWS regarding project planning and establishing mitigation measures.

The lower Susquehanna River is a known avian migratory pathway. Conejohela Flats IBA #56 provides breeding and foraging habitat for birds and is an important resting and feeding area during migration. The bird species of concern in the IBA vicinity include the bald eagle, great egret, and osprey (*Pandion haliaetus*), Pennsylvania threatened; peregrine falcon (*Falco peregrines*), Pennsylvania endangered; and northern harrier (*Circus cyaneus*), Pennsylvania at-risk. These species are protected by state wildlife protection regulations and the Migratory Bird Treaty Act.

Wind Turbines and Bird Mortality

Avian mortality rates from collisions with wind turbines vary by location, species, and turbine technology (GAO, 2005). Erickson et al. (2001) estimated the national average collision-related mortality for all birds at wind farms to be approximately 2.19 birds per turbine per year. Excluding California, the average mortality rate drops to 1.83 birds per turbine per year. The large number of older turbines operating in California is one reason for a disproportionately high number of bird deaths associated with wind projects in that state (GAO, 2005). The Government Accountability Office reviewed 30 studies of avian mortality and found that overall bird fatalities range from 0 to 7.28 birds per turbine per year (GAO, 2005).

For the proposed FFLF Wind Project, the primary concern is potential impacts to bald eagles and other raptors (birds of prey). Erickson et al. (2001) estimated the national average collision-related mortality for raptors at wind farms to be approximately 0.033 raptors per turbine per year, or 0.006 raptor fatalities per turbine per year when excluding California. The Bureau of Land Management (BLM) reviewed 18 wind farms in 11 states – including a western Pennsylvania

[2] The great egret has 2 scientific names: *Casmerodius albus* and *Ardea alba*.
[3] The Migratory Bird Treaty Act prohibits any "take," including to pursue, shoot, shoot at, poison, wound, kill, capture, collect, molest, or disturb.

wind farm, Somerset Wind Energy Center – and found that the number of raptor collisions ranged from 0 fatalities per turbine per year for eight of the wind farms to 0.48 fatalities per turbine per year. The Somerset wind farm recorded no raptor or bird fatalities during monitoring. In the Appalachia region of the United States, raptor fatalities ranged from 0 to 0.07 raptor fatalities per turbine per year (GAO, 2005).

BLM compared bird abundance and post construction mortality studies at several existing wind farms across the United States and found that there was little correlation between species that are present in an area and those that are killed in collisions with wind turbines (BLM, 2005). More recently, de Lucas (2008) also found that that there was no clear relationship between collision fatality of raptors at wind farms and raptor abundance.

Researchers have observed raptor behavior that suggests some species are able to avoid wind turbines. BLM (2005) concluded that not all species are prone to collisions at wind farms, probably through a combination of their typical flight patterns, their abilities to perceive the turbines, and their abilities to avoid the turbines. Young et al. (2003) recorded several instances in which birds were observed avoiding turbines. Raptors were observed altering their flight paths to avoid turbines, and in one case, a golden eagle turned around and flew back the way it had come when it approached a turbine. Several different species of raptors and large birds were observed positioning themselves around turbines while maintaining the same flight course. Golden eagles were observed climbing above the level of the spinning blades to pass over turbines.

BLM (2005) notes that no bald eagles have been reported to be killed at any wind power farm in the western states. Erickson et al. (2001) also compared bird mortality rates at various wind developments and found a similar pattern of no bald eagles being killed. Generally, raptors are able to avoid wind turbines (Young et al., 2003) and the number of raptors killed at any facility is small (NWCC, 2002). Depending on the species involved and its population size, the number of fatalities might or might not result in population-level effects to the affected raptors. No studies have shown population-level effects in raptor populations associated with wind energy projects (BLM, 2005).

FFLF Avian Studies

Due to the presence of bird species of concern and the proximity of a migratory pathway, the project proponents performed 4 avian studies in 2009 and 2010. Each of the studies was provided to USFWS and PGC:

- 2009 Raptor and Eagle Migration Survey - March 2009 (ARM, 2009)
- Bald Eagle and Osprey Nest Survey - December 21, 2009 (ARM, 2010a)
- 2009 Fall Migration Survey - August 15 to December 15, 2009 (ARM, 2010b)
- Bald Eagle Winter Roost Survey - January 2010 (ARM, 2010c)

The migration surveys followed PGC's *Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites* (PGC, 2007). The aerial nest survey was reviewed with PGC and USFWS at an agency coordination meeting December 14, 2009. The plan of study for the winter roost survey was provided to PGC and USFWS before the study was performed.

The aerial nest survey and winter roost survey identified no bald eagle nests within 1 mile of the project area and no bald eagle winter roost areas in the project area. The nearest bald eagle nest is more than 1 mile west of the proposed project area, across the Susquehanna River.

A total of 174 hours of observation were recorded during the spring survey and 647.2 hours were recorded during the fall survey. Tower location T-5 was not part of the project during the spring survey, but was accounted for in the fall survey. The objectives of the surveys were to:

- Determine the species, number, and frequency of migratory raptors and eagles within the proposed wind turbine area.
- Identify the potential for impacts to raptors and eagles.
- Assess the potential risk to raptors and eagles at each turbine location.
- Assist in siting and design to avoid and minimize potential impacts to raptors and eagles.
- Serve as a technical document for state and federal agencies during the review process.

Parameters recorded during observations included flight direction, height of flight, flight altitude, relationship to the proposed wind turbines, type of flight (direct, indirect, soaring hunting, or perching), weather data, and observation duration. Observers also recorded sector-to-rotor zone (circular zone outline by the tips of the turning rotor blade) identified as Sector A, the west or north side of the proposed turbine area; Sector B, along the summit within a 200-meter swath, where turbines would likely be situated; and Sector C, the east (or south) slope of the zone, but not within 100 meters of the mountain top or spine (see Figure 5, Appendix A).

A total of 12 and 14 species of raptors/eagles were observed during spring and fall surveys, respectively. Turkey vultures and black vultures represent the largest number of recorded species during both surveys. Bald eagles were the fifth most recorded raptor during the spring survey (2 percent of the total species observed) and third most recorded during the fall survey (8.3 percent of the total species observed). A daily passage rate of 1.1 eagles per hour was observed during the spring survey, while 6.9 eagles per hour were observed during the fall survey. Overall, tower locations T-1 and T-5 had the fewest observed raptor species within a turbine zone. Tower locationT-5 had the fewest occurrences of raptors/eagles observed and the fewest occurrences of raptor species of concern (eagles, osprey, peregrine falcon, and northern harrier) within a possible rotor-swept zone of the turbine. Tower locations T-2 and T-4 had the most occurrences of raptors/eagles within a possible rotor-swept zone based on both migration surveys. Tower location T-2 in spring and fall had the greatest number of observations recorded for the raptor species of special concern identified above.

PGC (2008) noted that the bald eagle observations in fall might be related to raptor risk level. According to the fall migration survey, the FFLF is a high risk site for raptors because 559 bald eagles and 2 unidentified eagles were observed in the vicinity of the proposed wind turbine locations. The “observations” record the number of times an eagle or raptor enters the sectors being observed. It does not reflect the total number of eagles or raptors observed because one individual could be counted several times.

Potential Impacts during Construction

Construction noise and activities are known to disturb the nesting and foraging behaviors of bald eagles and other bird species. To avoid nesting disturbance of bald eagles, all turbine and related facility construction would begin outside the nesting season (late November through August; *National Bald Eagle Management Guidelines* [USFWS, 2007]). Winter 2009-2010 aerial nesting survey results indicated that the nearest bald eagle nest is more than 1 mile away from proposed construction activities (ARM, 2010). Nest building for the 2010 breeding season was well underway at the time of the winter nesting survey; therefore, it is highly unlikely that any new nests would occur in the vicinity of the wind turbine project during this season. Construction is planned to begin in late summer 2010. In the event construction is not completed by December 2010, bald eagles looking to build nests for the 2011 breeding season would likely avoid the construction area due to the ongoing disturbance.

Nesting bald eagles generally forage within 2 to 3 miles of their nest (BLM, 2005). Construction activities could disturb a portion of this foraging range for the bald eagle nest more than 1 mile to the west. However these effects would be temporary and isolated to the area of disturbance directly surrounding the proposed project area. Decommissioning activities would be similar to construction and would likely require that conservation measures similar to the proposed construction measures be implemented. Because decommissioning is at least 20 years away, and conditions in the area could change, decommissioning conservation measures would be included in the APP developed and provided to the USFWS for approval, and measures would allow for adaptive management if necessary. At a minimum, the decommissioning conservation measures in the APP would include decommissioning timing constraints so that this activity occurs outside the bald eagle and raptor nesting season, or, if that timing is not feasible, performing an aerial nesting survey before decommissioning and establishing appropriate buffers (determined in coordination with USFWS and PGC) if a nest was encountered during the aerial nest survey.

Potential Impacts during Turbine Operation

Based on 2 wind turbines, less than one raptor fatality per year at FFLF is expected assuming an average mortality rate of 0.07 raptors per year per turbine (the high end of the range identified in studies summarized above) and 2.8 raptor fatalities would be expected over 20 years of operation). Because this risk estimate considers all raptors, potential bald eagle fatalities are expected to be even less.

Operation of the wind turbines could disturb bald eagle or other raptor foraging in the vicinity of the landfill. However, FFLF accepts mostly inorganic materials such as ash residue and construction debris, so there is minimal odor and minimal scavenging by birds (ARM, 2010b). No raptors were documented in the landfill during ARM raptor migration surveys (ARM, 2010b). Operation noise from the wind turbines would not be expected to affect bald eagle nesting or foraging because the noise levels would be low. At a distance of approximately 350 meters (~1,150 feet), sound from wind turbines is in the range of 35 to 45 A-weighted decibels, similar to the background noise found in a typical home (AWEA, 2009). To put this into perspective, decibel levels of 60, 50, 40, and 30 are equivalent to conversational speech at 1 meter, an average home, a quiet library, and a quiet bedroom at night, respectively.

Agency Coordination and Planned Mitigation

The project proponents would implement avoidance and minimization measures to reduce possible impacts to bald eagles, to the extent practicable, within the constraints of land availability, project economics, and technology. If construction of the wind turbine project did not commence before the start of the bald eagle nesting season in 2010 (late November), an additional nesting survey would be completed and provided to USFWS and PGC for review and approval. In an effort to further minimize potential impacts to bald eagles and other raptors, the area encompassing a radius of 660 feet around wind turbines A and B (full rotor extent) would be investigated just before construction of the wind turbines to verify that bald eagle or other raptor nests and roost trees are absent and to ensure conservation of species. If such nest or roost trees were found, the project proponents would notify USFWS and PGC to determine what avoidance measures to implement. In addition, the project proponents would prepare an Avian Protection Plan and submit it to USFWS for approval; the plan would include the elements listed in Section 2.5.

The project proponents initiated formal coordination efforts with USFWS and PGC via letter on October 6, 2009, and October 28, 2009, respectively. These coordination efforts have continued and all FFLF avian studies have been provided to both USFWS and PGC. Appendix B includes copies of written correspondence related to this coordination effort.

PGC requested that additional surveys in accordance with the protocols described in the Wind Energy Voluntary Cooperative Agreement (WEVCA) be conducted. PPL and PGC executed the WEVCA in December 2009. The WEVCA provides measures to avoid and minimize impacts to the bald eagles, great egrets, and other wildlife species. Appendix B includes a copy of the signed WEVCA. As part of the WEVCA, 2 years of post-construction monitoring would be implemented to monitor impacts to birds and bats and to assess impacts to other species of concern.

The project proponents have participated in several calls with USFWS to develop and agree on additional avoidance and minimization measures. DOE has separately participated in calls with USFWS, and participated in conference calls with several parties, including USFWS, to discuss this issue. DOE communications with USFWS include a call between the 2 agencies on February 1, 2010, and a conference call with USFWS, PGC, and the project proponents on February 4, 2010. As a result of these efforts, the project proponents have added the following conservation measures: develop an Avian Protection Plan (described in Section 2.5), construct the turbines outside the bald eagle nesting season (which would avoid noise and other construction-related disturbance of nesting bald eagles, raptors, and other migratory bird species), and perform ongoing post-construction mortality surveys. These conservation measures would augment the measures previously committed to by the project proponents (entering into the WEVCA, adaptive management in cooperation with the USFWS, and 2 years of post-construction avian mortality studies).

The potential for an unavoidable, non-purposeful take of the bald eagle exists at the project site, due to the installation of the proposed wind turbines. However, based on the findings of the avian surveys and a review of pertinent literature as discussed above, the project would not be likely to adversely affect the bald eagle's feeding, roosting, or nesting habits. Additionally, based on

recent communications with USFWS and planned implementation of additional conservation measures, DOE has determined that the proposed wind project, which would include construction and operation of the wind turbines in compliance with all USFWS permitting and other requirements, would have no significant impact on the bald eagle.

3.2.2.2. Indiana Bat

The PNDI review did not identify state or federal endangered or threatened bat species in the project area. However, during subsequent communications, the USFWS stated that, while the federally listed endangered Indiana bat (*Myotis sodalist*) is not known to occur within the proposed project boundaries, there could be potential habitat in the area. Both USFWS and PGC recommended that the project proponents search the proposed project area for potential bat hibernacula (places providing a constant temperature and protection during winter hibernation) (see Appendix B, USFWS letter, November 13, 2009, and PGC letter, November 30, 2009).

The project proponents searched the PNDI, Natural Heritage Inventory of Lancaster County, Pennsylvania (update 2008), and Natural Heritage Inventory of York County, Pennsylvania (2004 amended) (http://www.naturalheritage.state.pa.us/CNAI_Download.aspx) to determine if caves potentially providing habitat for bat hibernacula were known within a 5-mile radius of the project area. They identified no caves supporting bats of concern within 5 miles of the proposed project area. In addition, ARM biologists performing other field investigations on the FFLF site report that they observed no caves.

The Indiana bat uses trees for roosting and nesting. The proposed project site contains wooded areas that could provide roosting or nesting habitat. Approximately 2 acres of trees would be removed before March 31, 2010, in the vicinity of wind turbines A and B to minimize potential impacts to nesting bats. The trees planned for removal are relatively young white pines (approximately 1 acre) along the landfill's former perimeter fence and some relatively young deciduous trees (approximately 1 acre) along the northwestern property line. Representative tree species along the perimeter of the project area include northern hackberry (*Celtis occidentalis*), black cherry (*Prunus serotina*), black locust (*Robinia pseudoacacia*), pawpaw (*Asimina triloba*), and red maple (*Acer rubrum*). Oak species (*Quercus* sp.) and hickory species (*Carya* sp.) are present farther down slope, closer to the river. Many of the trees are overgrown with mile-a-minute (*Polygonum perfoliatum*) and river bank grape (*Vitis riparia*), making them less suitable for nesting. Indiana bats are not known to use white pine trees for roosting or nursing.

Based on these investigations and mitigation commitments and DOE's review of documents in the record, DOE has determined that the proposed project would have no effect on the Indiana bat. Therefore, DOE does not need to enter into informal or formal consultation with the USFWS under Section 7 of the Endangered Species Act.

3.2.2.3. Plant Species

Vegetation in the proposed project area consists of maintained grass, vegetated stockpiles, and former agricultural lands. The lands that would be primarily affected by the wind energy project have been disturbed by landfill activities and agricultural use. In the PNDI review, 2 plant

species of concern were identified under the jurisdiction of PDCNR – scarlet ammannia (*Ammannia coccinea)*, Pennsylvania endangered, and the tooth-cup (*Rotala ramosiori)*, a state species of special concern. The PNDI review indicated that no further consultation with PDCNR is necessary as long as conservation measures are implemented. Conservation measures include voluntary cleaning of equipment/vehicles, use of clean fill and mulch, and avoiding planting invasive species. The project proponents would include these conservation measures as notes on the construction drawings to ensure they are implemented.

3.2.3. Noise

The proposed project area is on the western and northern boundaries of an active landfill. The existing noise environment is characterized by heavy landfill equipment operating 6 days a week and by other nearby activities such as a railroad; a gas-to-energy facility with 2 engines operating 24 hours a day, 7 days a week; and Turkey Hill Dairy's manufacturing and processing facilities. The nearest noise-sensitive receptors (occupied dwellings) to the proposed wind energy project are on River Road approximately 2,250 feet east of tower location T-5. This residential area is east of the Turkey Hill Dairy.

Noise would be emitted from the project site by construction equipment during the approximately 4-month construction period. However, due to the distance to the closest noise-sensitive receptor and the noise-generating activities at the adjacent active landfill, wind energy project construction noise would not be expected to increase the overall ambient noise emissions from the site.

Modern wind turbines are generally quiet in operation and the sound is very low compared to that of road traffic, trains, aircraft, and construction activities. Modern wind turbines have been designed to drastically reduce the noise of mechanical components, so the most audible noise is the sound of the wind interacting with the rotor blades. At a distance of approximately 350 meters (~1,150 feet), sound from wind turbines is in the range of 35 to 45 A-weighted decibels, similar to the background noise found in a typical home (AWEA, 2009).

The noise from the proposed wind project would not be expected to affect noise-sensitive receptors, given the distance to the nearest receptor (approximately 2,250 feet) and the other noise-generating activities between the project site and the receptor. The sound emitted from the project would be attenuated by the distance to the receptor. In addition, all of the additional noise sources would act to "drown out" the minimal sound generated from the wind energy facility.

While hikers on the Turkey Hill Trail could experience temporary noise impacts from the project site during the estimated 4-month construction period, the trail and project site are adjacent to an active landfill where construction equipment operates and generates construction-type noise 6 days a week, year round. Additionally, there are a number of other permanent noise sources in the area, such as the railroad. The noise emitted from the operation of the wind turbines would not be expected to affect hikers using the trail.

3.2.4. Visual Quality

The existing view of the project area is primarily rural/residential and agricultural, with adjacent government facilities and a dairy operation. There are some vertical features, including a Sprint cellular tower in the immediate vicinity of the project area. Other area features do not have a strong vertical component and are not immediately visible from many viewpoints. The nearest viewers are employees at the FFLF and adjacent dairy. Three occupied dwellings were identified within approximately 2,250 feet of the project location. There are scattered residences farther east and southeast of the project location. Due to their location atop Turkey Hill, and depending on the vantage point, the turbines would be visible from a distance of 10 miles from certain directions on a clear day. This includes viewpoints along the Susquehanna River and at Lake Clarke. The ability to see discrete features at a distance of 5 to 10 miles is limited by weather conditions, visual acuity, structures and clusters of trees, and other factors.

While it is not possible to quantify the visual impact of a wind energy project due to the subjective nature of aesthetics, visual impacts are sometimes a concern with such projects. Concerns about the visual impacts of wind energy projects generally revolve around aesthetic impacts and shadow flicker impacts associated with the rotating turbines. To address potential concerns about the aesthetic impacts of the proposed project, LCSWMA held a public meeting on October 14, 2009, for Manor Township residents and presented rendered images of what the project would look like from various vantage points within the surrounding communities, including views from the western bank of the Susquehanna River in York County. Appendix D includes copies of these renderings and a map of the viewing points. Following the public meeting, there was no correspondence from any members of the township objecting to the project on the basis of visual impacts. Furthermore, there was no public opposition to the project at the Manor Township Zoning Hearing Board meeting in December 2009, at which time a zoning variance from setback requirements was requested to construct the project.

In addition to preparing the renderings of the project, the project developers commissioned a study to determine if any nearby occupied dwellings would be adversely affected by shadow flicker from the project. Appendix D includes the shadow flicker analysis, which concluded that while 5 occupied dwellings within a 1-mile radius of the turbines could experience shadow flicker effects for approximately 2 hours per year, the proposed siting of the turbines conforms to industry standards and no substantial adverse shadow flicker impacts would result from developing the wind energy project at the proposed location.

Overall, there are no anticipated visual impacts that would significantly affect nearby residents and users of the project area and surrounding areas as a result of the development of this project.

3.2.5. Transportation

During the project construction phase, a temporary increase in vehicular traffic on the local roads surrounding the project site would be anticipated. This modest traffic increase would occur for a period of approximately 4 months. No long-term or permanent impacts to the local transportation systems would occur as a result of this project.

Large pieces of equipment such as turbine towers, rotor blades, and nacelles that would be designated oversized loads would temporarily slow traffic on Route 30 and some local roads, such as River Road, as they were moved into the project area. Additionally, minor road improvements or adjustments might be needed to deliver the extended-length components to the project site. Any necessary road closures would be temporary and would only apply to the roads immediately surrounding the project site. Any damage to the local road network as a result of delivering project equipment would be fully mitigated and repaired by the project developer.

3.2.6. Groundwater and Surface Water Resources

In compliance with the Clean Water Act and Pennsylvania's Clean Stream Law, there were no streams identified in the project area based on observations made by biologists and geologists visiting the project area. An erosion swale was identified to the northwest of tower location T-3, and another erosion swale was identified northeast of location T-5. Both erosion swales carry surface water runoff during heavy precipitation events. There are no private well-water supplies on or near the project site.

The Susquehanna River is approximately 500 feet from the wind turbine locations. The Susquehanna River is classified as Warm Water Fishes and Migratory Fishes at this location, according to the Pennsylvania Code Title 25, Chapter 93, Water Quality Standards. The closest stream to the wind turbines with a high-quality designation is Wisslers Run, which is approximately 3,000 feet to the north of the proposed project area. Wisslers Run is designated as High Quality-Cold Water Fishes and Migratory Fishes, according to the Pennsylvania Code Title 25, Chapter 93, Water Quality Standards. Wind turbine B would be closest to the Wisslers Run watershed. However, due to distance, overland flow from the proposed project area would not reach Wisslers Run. A Lancaster County Conservation District approved Erosion and Sediment Pollution Control Plan would be implemented before, during, and following construction.

The proposed distribution line (Option A, Figure 3, Appendix A) would consist of a concrete reinforced duct bank installed in an excavated trench with approximate dimensions of 4.5 feet deep and 2.5 feet wide. Approximately 1,710 feet of this buried duct bank would be within the Susquehanna River watershed, which includes Mann's Run subwatershed. The Susquehanna River and Mann's Run at this location do not have a high-quality or exceptional-value protected water-use designation, according to Title 25 of the Pennsylvania Code, Chapter 93, Water Quality Standards. The remaining approximately 730 feet is within the Wisslers Run watershed, a High-Quality Cold Water Fishes and Migratory Fishes watershed, according to Title 25 of the Pennsylvania Code, Chapter 93, Water Quality Standards. However, the installation of the duct bank would occur within an area of the Wisslers Run watershed that drains directly to an existing, NPDES-permitted and maintained detention basin on Turkey Hill Dairy property (Figure 3, Appendix A). No runoff or discharges from the proposed excavation area would directly enter Wisslers Run. An NPDES permit would be acquired prior to any earthwork related to the installation of the duct bank. All trench excavation and any other related ground-disturbing work would be in conformance with an approved Erosion and Sedimentation Pollution Control Plan specific to this project.

3.2.7. Soils

The following soils are located in the vicinity of the 5 possible tower locations based on review of the Soil Survey of Lancaster County, Pennsylvania (USDA, 1985):

- Glenelg silt loam, 3 to 8 percent slopes
- Glenelg silt loam, 8 to 15 percent slopes
- Manor silt loam, 8 to 15 percent slopes
- Manor Stony Silt Loam, 8 to 25 percent slopes
- Manor Stony Silt Loam, 25 to 60 percent slopes

Glenelg silt loam is listed as prime farmland soils and Glenelg silt loam and Manor silt loam are listed as soils of statewide importance for Lancaster County, Pennsylvania. The locations of T-2, T-3 and T-4 are within the Glenelg silt loam soil type, but the soils have been disturbed from landfill operations. Wind turbine A (immediate vicinity of T-1) and wind turbine B (immediate vicinity of T-5) would be in a parcel that was previously farmed but no longer in agricultural use because a portion of the parcel is being used for landfill soil stockpiling activities. The proposed location of wind turbine A is in the vicinity of Glenelg silt loam. Therefore, soils in the vicinity of the proposed wind turbines have already been disturbed.

Site preparation and project construction would result in soil disturbance. As part of project construction, approximately 2 acres of wooded area would be lost and the total area of disturbance would be less than 10 acres. Ground-disturbing activity requires compliance with the Pennsylvania Department of Environmental Protection Chapter 102 erosion control regulations, including the preparation and implementation of an Erosion and Sediment Pollution Control Plan. The Lancaster County Conservation District, through a delegation agreement with the Pennsylvania Department of Environmental Protection, is responsible for administering the Erosion Control Program in Lancaster County. In addition to the required Erosion and Sediment Pollution Control Plan, earthmoving projects that disturb more than 1 acre might require an NPDES Permit. Pursuant to the Chapter 102/NPDES delegation, the Erosion and Sediment Pollution Control Department staff reviews plans, issues NPDES Permits, and performs site inspections. After an Erosion and Sediment Pollution Control Plan is reviewed and determined to be adequate, a determination of adequacy letter is issued. If an NPDES permit is needed, the Lancaster County Conservation District would issue the NPDES permit concurrently with or shortly after the Erosion and Sediment Pollution Control Plan adequacy determination.

An approved Erosion and Sediment Pollution Control Plan, in compliance with NPDES, would be implemented before, during, and following construction activities. On-site quality assurance inspectors would ensure that the erosion and sediment pollution control measures are implemented and properly installed and maintained.

3.2.8. Air Quality and Climate Change

The affected air environment can be characterized in terms of concentrations of the criteria pollutants carbon monoxide, sulfur dioxide, particulate matter, nitrogen dioxide, ozone and lead. The U.S. Environmental Protection Agency has established National Ambient Air Quality

Standards for these pollutants. There are 2 standards for particulate matter, one for particulates with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}) and one for particulates with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$). According to the Environmental Protection Agency Mid-Atlantic Air Protection website (http://www.epa.gov/reg3artd/airquality/airquality.htm), Lancaster County, Pennsylvania, is in non-attainment for $PM_{2.5}$ and ozone (listed as "marginal" for both 1-hour and 8-hour ozone). Lancaster County is in attainment for carbon monoxide, sulfur dioxide, PM_{10}, nitrogen dioxide, and lead.

The proposed wind energy project at the FFLF would be an emissions-free energy generation project that would not degrade air quality. Aside from temporary dust generated during construction and decommissioning, which would be minimized to the extent practicable (for example, by keeping gravel on roads and watering dry roads), this project would not result in any adverse impacts to air quality. The project would not require any air permits.

It is assumed that if the wind energy project was not built, the electricity used by Turkey Hill Dairy would continue to be supplied primarily by fossil-fuel sources. Pennsylvania Power and Light generated about 60 percent of its total electricity in the United States with fossil fuels in 2008 (Pennsylvania Power and Light Company, 2009). The proposed FFLF Wind Project would generate approximately 7,500,000 kilowatt-hours per year, which would offset greenhouse gases (approximately 4,300 tons per year of carbon dioxide equivalents) and other emissions from the use of fossil fuels to generate electricity (ICF, 2010).

3.2.9. Socioeconomics and Environmental Justice

The proposed wind energy project would be in Lancaster County's Manor Township. The county's population in 2006 was approximately 494,000 and the population of Manor Township in 2000 was approximately 16,500 (U.S. Census Bureau, 2000). The economy of Lancaster County is a diverse combination of manufacturing, agricultural, transportation, and service industries. Major local employers in Manor Township include the Turkey Hill Dairy. Construction of the proposed project would create temporary jobs, and operation and maintenance of the proposed wind turbines would be expected to create new permanent jobs. The temporary construction jobs would last approximately 4 months and would not cause population increases in the area. The additional permanent jobs would be expected to be filled by residents of the local area and would not cause a population increase. The area's public and community services, such as schools, health care, social services, and fire protection, would not be affected by the proposed project. No residences, businesses, or industries would be negatively affected or relocated as a result of the proposed wind energy project. The additional permanent jobs would provide a benefit to the local economy.

Executive Order 12898 (February 11, 1994) directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The racial makeup of Manor Township in 2000 was 95.6 percent White, 1.4 percent African American, 0.1 percent American Indian, 1.3 percent Asian, 0.8 percent from other races, and 0.9 percent from 2 or more races. People identifying themselves as Hispanic or Latino of any race made up 2.3 percent of

the population. The median income for a household in Manor Township in 2000 was $47,806, compared to $41,994 for the United States. About 2.4 percent of families and 3.8 percent of individuals in Manor Township were below the poverty line (U.S. Census Bureau, 2000).

The proposed wind project would be adjacent to an active landfill and at least 2,250 feet from the closest residential area, which is on River Road. No potential high and adverse impacts to human health or environmental effects have been identified in this EA. There would be no disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

3.2.10. Energy Impacts

The proposed wind energy project would have a nameplate capacity of 3.2 megawatts and generate approximately 7,500,000 kilowatt-hours per year, or enough electricity to supply up to 700 homes each year. The wind energy generated from the proposed project would meet approximately 25 percent of Turkey Hill Dairy's annual electricity needs. If the project did not move forward, it is assumed that the electricity used by Turkey Hill Dairy would continue to be supplied primarily by fossil-fuel sources, which are finite. The proposed renewable energy project would produce significant amounts of clean electricity for the 20-year design life of the project. No adverse energy impacts would result from the project.

3.2.11. Cultural Resources

Neither the Pennsylvania Inventory of Historic Places nor the National Register of Historic Places lists any state or federal historic resource within the proposed project area. No known National Register-eligible sites were identified in the Area of Potential Effect (APE) of the proposed wind turbines or the proposed electrical distribution line. Also, there are no known sites within the proposed project area on the National Registry of Natural Landmarks according to the National Park Service webpage (http://www.nature.nps.gov/nnl/), which shows the localities of national natural landmarks.

A portion of the National Register-eligible Enola Branch Rail Line, Atglen & Susquehanna Branch, is located along the Susquehanna River in the vicinity of the APE. However, direct and indirect effects to the resource would not be anticipated. The project proponents initiated consultation with the Pennsylvania Historical and Museum Commission on January 21, 2010, to obtain concurrence on these conclusions (see Appendix B).

The Pennsylvania Historical and Museum Commission Cultural Resources Geographic Information System (CRGIS) indicates the presence of potential prehistoric archaeological sites within the proposed project area. Two potential prehistoric archaeology sites were mapped in the project area as part of a separate soil stockpile project for the FFLF. One of the sites is in the vicinity of tower location T-2 in an area disturbed by the landfill, and CRGIS indicates the site was not recommended as eligible for listing on the National Register of Historic Places. The other site (36LA939) was identified in the vicinity of the 2 proposed wind turbine locations. A Phase I archaeological survey was performed by a qualified archaeologist in October 2009 in the area of the proposed wind turbines. The Phase I findings appear consistent with the mapped

location of the known site, thus confirming the presence of the site. However, the artifact recovery was low and no temporally diagnostic artifacts were recovered. The Pennsylvania Historical and Museum Commission concurred with the survey findings that further investigation of the site would not yield data significant to the prehistory of the region (see Appendix B). The site was not considered eligible for listing in the National Register of Historic Places and further archaeological investigation was not recommended by the Pennsylvania Historical and Museum Commission. If any prehistoric archaeological site were encountered during construction, the contractor would stop work in that area, while the project proponents consult with the Pennsylvania Historical and Museum Commission on the need for appropriate evaluative studies, determinations of National Register eligibility, and potential mitigation measures, as required by the National Historic Preservation Act.

3.2.12. Human Health and Safety

Workers can be injured or killed during construction, operation, and decommissioning of wind turbines through industrial accidents such as falls, fires, and dropping or collapsing equipment. Such accidents are uncommon in the wind industry and are avoidable through implementation of proper safety practices and equipment maintenance. All contractors, subcontractors and their personnel would be required to comply with all federal and state worker safety requirements. The construction contractor and facility operator would prepare a Health and Safety Plan pursuant to Occupational Safety and Health Administration requirements before commencing work, and by following this plan, greatly reduce the potential for worker injuries and fatalities.

If members of the pubic were to attempt to climb towers or open electrical panels, they could be injured or killed. Public access to the proposed project area would be restricted by a 6-foot-high security fence. Safety signage would be posted around all towers, transformers and other high-voltage facilities, and along roads in conformance with applicable federal and state regulations.

Two major accident scenarios associated with turbines are the collapse of a turbine and breakage of one or more turbine blades. The potential for the proposed turbines to fall over or collapse causing damage, injury, or death would be remote. Foundations are designed to prevent turbines from falling over, but 5 of the 13,000 GE turbines operating globally have collapsed since 2002 (Bogdan, 2009). For example, in March and October 2009, 1.5-megawatt GE turbines collapsed in Altona and Fenner, New York, respectively. Similarly, blades have broken off wind turbines, but such events are rare. In either case, the impacts would depend on the direction of the falling turbine or dislodged blade and who or what was in the path. In most directions, the impact would be on LCSWMA property with little potential for damage. Turbine A would be approximately 450 feet from the Turkey Hill Trail, which is maintained by the Lancaster County Conservancy. If that turbine fell in the direction of the river, there is a potential to topple trees on the steep slope and to impact the trail. Another potential source of accidents is ice shedding and ice throw. GE has established recommendations to mitigate this risk (http://www.gepower.com/prod_serv/products/tech_docs/en/wind_turbines.htm).

The proposed project area is not in the vicinity of a local or regional airport or a military air base. All structures more than 61 meters (200 feet) tall must have aircraft warning lights in accordance with requirements specified by the FAA. Both turbines would have such lighting. The FAA has

issued a Determination of No Hazard to Air Navigation for the proposed wind project (see Appendix C).

Lubricants are used in wind turbines, including gearbox oil, hydraulic fluid, and gear grease that require periodic replacement. These lubricants would be managed in accordance with federal and state regulations. Any accidents involving potential spills of gear box oil, hydraulic fluid, and gear grease would be contained and cleaned up to minimize environmental impacts and slip, trip, and fall hazards. In addition, PPL and LCSWMA would require that fueling and lubrication of equipment and motor vehicles be performed in a manner to protect against spills and evaporation and that unused lubricants and oils be disposed of in approved manners and locations.

4. CUMULATIVE IMPACTS

Cumulative impacts are potential environmental impacts that result "from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

4.1. Reasonably Foreseeable Projects

DOE reviewed information on past, present, and reasonably foreseeable future projects and actions that could result in impacts over the same period and in the same general location as the proposed wind energy project. Based on this review, DOE identified the following three projects as appropriate for inclusion in the cumulative impacts analysis:

- FFLF opened in 1989 and currently is expected to operate through 2020. FFLF consists of 96 acres and includes 5 disposal cells. A Resource Recovery Facility, Household Hazardous Waste Facility, and Waste Management Transfer Complex also are located at the landfill. The Resource Recovery Facility is a waste-to-energy facility that processes up to 1,200 tons of solid waste per day. Under planned operations, a portion of the cleared area closest to the proposed wind turbines would be used for soil storage.

- LCSWMA is exploring a plan to vertically expand landfill capacity in the area of the proposed project. Current plans include employing a mechanically stabilized earthen berm around the perimeter of the existing FFLF to add an additional 10 million cubic yards of capacity (approximately doubling the current capacity) without a substantial change in footprint. The earthen berm could be up to 60 feet high in places. Construction is not expected until 2017 or 2018 under current planning scenarios (LCSWMA, undated).

- The Turkey Hill Dairy is to the northwest of the FFLF. It produces milk, ice cream, ice teas, and fruit drinks.

4.2. Summary of Cumulative Impacts

Biological Resources
PGC recently reported that approximately 175 active bald eagle nesting pairs produced approximately 242 fledglings in 2009 in 48 counties of Pennsylvania. This represents an increase from approximately 156 nests and approximately 171 fledglings in 2008 and approximately 132 nests and 151 fledglings in 2007. Pennsylvania's bald eagle population is increasing at a rate of 15 percent per year (PGC, 2009). An approximate 90-percent success rate for active nests has been reported, which represents 1.6 young per successful nest from 2007 to 2009. Pennsylvania bald eagles have produced at least 1,400 eaglets over the past 20 years (Gross, 2009). The population trends recorded by Audubon between 1967 and 2006 show an average annual

increase of bald eagle sightings of 14.4 percent for Pennsylvania, which represents the second highest of any state (Audubon, 2007).

Based on these growth trends, it is likely that the bald eagle will continue to expand its existing population throughout the Lower Susquehanna River basin due to abundant habitat availability and food supply. Like any tall structure (such as communications towers and high-voltage transmission towers) constructed within the known habitat of the bald eagle, the proposed wind turbines present the potential for an unavoidable, non-purposeful take of bald eagles. However, project proponents would implement avoidance and minimization measures to reduce possible impacts to bald eagles to the extent practicable within the constraints of land availability, project economics, and technology.

Noise

Noise from the proposed project would be localized (see Section 3.2.3) and add to the noise levels in the immediate project vicinity. Other noises from the project vicinity are intermittent, such as the noise from passing vehicles on area roads, noise that would be generated during the planned vertical landfill expansion, and noise resulting from FFLF operations. While the turbines would add to background noise levels, these levels, even when added to noise sources from the activities listed in Section 4.1 and other local activities, would not be likely to cumulatively impact area residents or change the semi-rural nature of the area.

Visual

The wind turbines would be the dominant vertical component in the landscape due to their total height of 121.25 meters (398 feet). The vertical expansion of the landfill would also have visual impacts, but they would be localized and potentially screened by vegetation. Cumulative impacts to visual resources could affect users of the Turkey Hill Trail. Trail users would experience a change in visual quality due to the impacts of the wind turbines and landfill expansion.

Greenhouse Gas

While the scientific understanding of climate change continues to evolve, the Intergovernmental Panel on Climate Change Fourth Assessment Report stated that warming of Earth's climate is unequivocal, and that warming is very likely attributable to increases in atmospheric greenhouse gases caused by human activities (anthropogenic) (IPCC, 2007). The Fourth Assessment Report indicates that changes in many physical and biological systems, such as increases in global temperatures, more frequent heat waves, rising sea levels, coastal flooding, loss of wildlife habitat, spread of infectious disease, and other potential environmental impacts are linked to changes in the climate system, and that some changes could be irreversible (IPCC, 2007).

The release of anthropogenic greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. It is assumed that this wind energy project would displace fossil-fuel electricity currently used at Turkey Hill Dairy, resulting in a net decrease in emissions of approximately 4,300 tons of carbon dioxide equivalents for each year of operation. The proposed project would neither reduce the concentration of greenhouse gases in the atmosphere nor reduce the annual rate of greenhouse-gas emissions. Rather, it would minimally decrease the rate at which greenhouse-gas emissions are increasing every year and contribute to ongoing global efforts to reduce greenhouse gases and slow climate change.

5. REFERENCES

ARM (ARM Group, Inc.). 2009. 2009 Spring Raptor and Eagle Migration Survey - Proposed Wind Energy Project at Frey Farm Landfill. Prepared for Lancaster County Solid Waste Management Authority and PPL Development Company, LLC.

ARM (ARM Group, Inc.). 2010a. Bald Eagle Osprey and Nest Survey - Proposed Wind Energy Project at Frey Farm Landfill. Prepared for Lancaster County Solid Waste Management Authority and PPL Development Company, LLC.

ARM (ARM Group, Inc.). 2010b. 2009 Fall Raptor and Eagle Migration Survey - Proposed Wind Energy Project at Frey Farm Landfill. Prepared for Lancaster County Solid Waste Management Authority and PPL Development Company, LLC.

ARM (ARM Group, Inc.). 2010c. Bald Eagle Winter Roost Survey - Proposed Wind Energy Project at Frey Farm Landfill. Prepared for Lancaster County Solid Waste Management Authority and PPL Development Company, LLC.

Audubon. 2007. Audubon Christmas Bird Count Data 1967-2006. Published June 26. Available at http://audubon.org/news/pressroom/Bald_eagle/eagle_chart.pdf.

AWEA (American Wind Energy Association). 2009. Wind Energy Fact Sheet -- Utility Scale Wind Energy and Sound
Available: http://www.awea.org/pubs/factsheets/Utility_Scale_Wind_Energy_Sound.pdf

BLM (Bureau of Land Management). 2005. *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States*. Prepared by Argonne National Laboratory for BLM, Washington, D.C.
Available at http://windeis.anl.gov/documents/fpeis/index.cfm Accessed January 29, 2010.

Bogdan, J. 2009. *Responsibility for Toppled Turbine Cloudy. The Observer-Dispatcher*. December 28. Available at http://www.uticaod.com/news/x1437795639/Responsibility-for-toppled-turbine-cloudy Accessed February 07, 2010

de Lucas, Manuela, et al. 2008. Collision fatality of raptors in wind farms does not depend on raptor abundance. Journal of Applied Ecology 45:6, 1695-1703. Online publication date: 9-Oct-2008. Abstract available at
http://www.ingentaconnect.com/content/bsc/jappl/2008/00000045/00000006/art00018
Accessed January 29, 2010.

DOE (U.S. Department of Energy). 2006. Memorandum. Office of NEPA Policy and Compliance. *Need to Consider Intentional Destruction Acts in NEPA Documents*. December 1, 2006.

Edison Electric Institute's Avian Power Line Interaction Committee (APLIC) and U.S Fish and Wildlife Service (USFWS). 2005. Avian Protection Plan Guidelines, April 2005.

Erickson, W.P., Johnson, G.D., Strickland, M.D., Young, D. P. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States, Report to the National Wind Coordinating Committee (Cheyenne, Wyoming: NWCC). Available at http://www.west-inc.com/reports/avian_collisions.pdf Accessed January 29, 2010.

FEMA (Federal Emergency Management Agency). 2005. https://hazards.fema.gov/wps/portal/mapviewer Accessed January 20, 2010. Effective date: April 19, 2005.

GAO (U.S. Government Accountability Office). 2005. Wind Power Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife. Available at www.gao.gov/new.items/d05906.pdf

Gross, Douglas. 2009. Pennsylvania Game Commission Wildlife Biologist, Endangered Bird Specialist and PA Bird Coordinator.

Iberdrola Renewables. 2008. Avian and Bat Protection Plan. Available at http://www.iberdrolarenewables.us/pdf/Signed_ABPP_10-28-08.pdf Accessed February 3, 2010.

ICF (ICF International). 2010. Carbon Dioxide Emissions Calculation.

IPCC (International Panel on Climate Change). 2007. Fourth Assessment Report, Climate Change 2007: Synthesis Report

LCSWMA (Lancaster County Solid Waste Management Authority). Undated. *Future Landfill Expansion Issue.*

NWCC (National Wind Coordinating Committee). 2002. Permitting of Wind Energy Facilities: A Handbook, Siting Subcommittee, c/o RESOLVE, Washington, D.C., March. Available at http://www.nationalwind.org/assets/publications/permitting2002.pdf Accessed February 1, 2010.

PGC (Pennsylvania Game Commission). 2007. *Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites* http://www.dcnr.state.pa.us/info/wind/documents/final_draft-bird_pre_and_post_feb_23_2007.pdf
..
Pennsylvania Power and Light Company. 2009. *PPL Sustainability Report 2009 – Climate Change.* Available: http://www.pplweb.com/corporate+responsibility+report/2008/environmental+-+climate+change.htm

Census Bureau. 2000. Available: http://www.census.gov/main/www/cen2000.html Accessed January 20, 2010.

USDA (U.S. Department of Agriculture). 1985. Soil Survey of Lancaster County Pennsylvania. Available: http://soildatamart.nrcs.usda.gov/manuscripts/PA071/0/Lancaster.pdf
USDS-Soil Conservation Service.

USFWS (U.S. Fish and Wildlife Service). 2003. *Interim Guidelines on Avoiding and Minimizing Impacts from Wind Turbines*, May 13, 2003.

USFWS. 2007. National Bald Eagle Management Guidelines, May 2007.

USFWS. 2009. National Wetlands Inventory. http://www.fws.gov/wetlands/Data/Mapper.html. Accessed January 20, 2010. Published September 25, 2009.

Young, D.P., et al. 2003. Comparison of Avian Responses to UV-Light-Reflective Paint on Wind Turbines, NREL/SR-500-32840, National Renewable Energy Laboratory, Golden, Colo., Jan. Available at http://www.west-inc.com/reports/fcr_nrel.pdf Access January 29, 2010.

6. AGENCIES AND PERSONS CONSULTED

U.S. Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, PA 16801-4850

National Telecommunications and Information Administration
Herbert C. Hoover Building (HCHB)
U.S. Department of Commerce / NTIA
1401 Constitution Avenue, N.W.
Washington, D.C. 20230

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 20d Floor
400 North Street
Harrisburg, PA 17120-0093

Division of Environmental Planning and Habitat Protection
Bureau of Wildlife Habitat Management
Pennsylvania Game Commission
2001 Elmerton Avenue
Harrisburg, PA 17110

Pennsylvania Department of Conservation and Natural Resources
Department of Conservation and Natural Resources
Rachel Carson State Office Building
PO Box 8767
400 Market Street
Harrisburg, PA 17105-8767

Pennsylvania Fish and Boat Commission
236 Lake Road
Somerset, PA 15501
Manor Township

Lancaster County Conservation District
1383 Arcadia Road, Room 200
Lancaster, PA 17601

Sprint Nextel
6391 Sprint Parkway
Overland Park, KS 66251-2650

Appendices Table of Contents

Appendix A: Cover Page

Appendix A-1: Site Vicinity Map and Site Location Map

Appendix A-2: Electrical Transmission Line Options

Appendix A-3: Probable Wind Turbine Generator Locations

Appendix A-4: 2009 Fall Raptor and Eagle Migration Survey Map

Appendix B: Cover Page

Appendix B-1: PNDI Review Receipt

Appendix B-2: Letter to PGC October 28 2009

Appendix B-3: Letter from PGC November 30 2009

Appendix B-4: Letter to USFWS October 6 2009

Appendix B-5: Letter from USFWS November 13 2009

Appendix B-6: Letters to PGC and USFWS December 23 2009

Appendix B-7: Wind Energy Voluntary Cooperation Agreement

Appendix B-8: Species Figures and Tables

Appendix B-9: PHMC Coordination

Appendix C: Agency and Other Approvals

Appendix D: Cover Page

Appendix D-1: Shadow Flicker Analysis

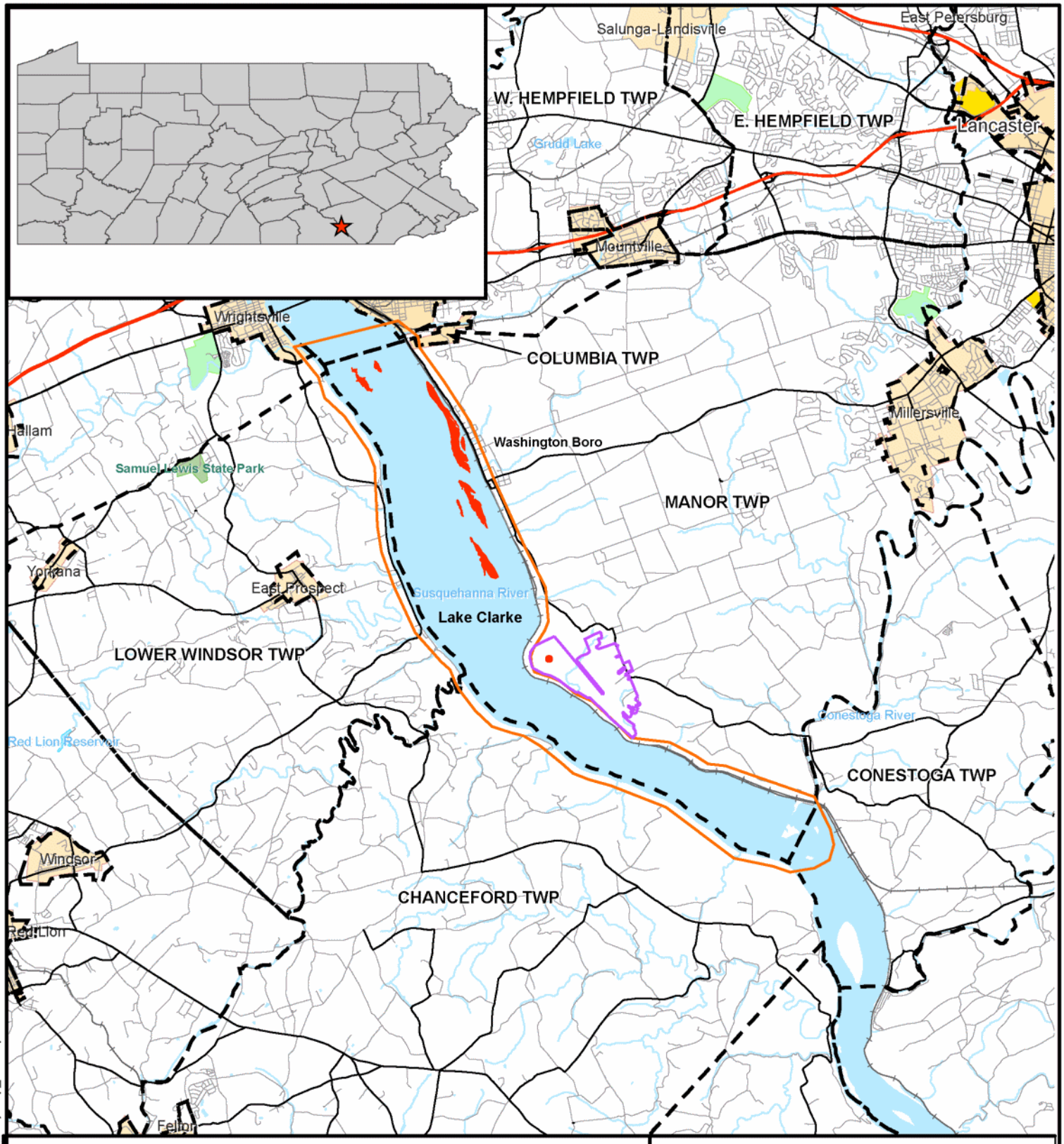
Appendix D-2: FFLF Wind Energy Photo Renderings

Appendix D-3: Shadow Study Figures

Filename: Appendices TOC.doc
Directory: O:\All EH-4xfolders\EH-42\ARRA\FFLF EA
Template: C:\Documents and Settings\freeman\Application Data\Microsoft\Templates\Normal.dot
Title: Appendix A Figures
Subject:
Author: Elizabeth Diller
Keywords:
Comments:
Creation Date: 2/11/2010 8:18:00 PM
Change Number: 2
Last Saved On: 2/11/2010 8:18:00 PM
Last Saved By: Elizabeth Diller
Total Editing Time: 1 Minute
Last Printed On: 2/18/2010 1:28:00 PM
As of Last Complete Printing
Number of Pages: 1
Number of Words: 132 (approx.)
Number of Characters: 759 (approx.)

APPENDIX A

FIGURES



LEGEND

- LCSWMA PROPERTY LINE
- CONEJOHELA FLATS IMPORTANT BIRD AREA
- CONEJOHELA FLATS
- MUNICIPAL BOUNDARY

0 5,000 10,000 20,000 30,000

Feet

N

Site Vicinity Map

FFLF Wind Energy Project
Environmental Assessment

January 2010 | Scale: 1" = 10000' | 06377

ARM Group Inc.

Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 1

S:\06377 LCSWMA Wind Energy_Pdfs\SiteVicinityMap_buffer.pdf

Base map from Safe Harbor USGS 7½ minute quadrangle dated 1995.

LEGEND

- LCSWMA Property Boundary (Frey Farm/Creswell Landfill)
- Creswell Landfill Waste Limit (closed, inactive)
- Frey Farm Landfill (FFLF) Permitted Waste Limit
- Proposed Wind Turbine Location
- Probable Wind Turbine Location
- Conejohela Flats Important Bird Area

0 1,500 3,000 4,500

SCALE IN FEET

N

Site Location Map

FFLF Wind Energy Project
Environmental Assessment

January 2010	Scale: 1" = 1,500'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\06377_Figure 2 Environmental Assessment_rev012110.dwg

Letter to PGC October 28 2009

ARM Group Inc.
Earth Resource Engineers and Consultants

October 28, 2009

Certified Mail Article Number: 7008 1140 0004 8931 4952

Ms. Tracey Librandi Mumma
Wind Project Coordinator
Pennsylvania Game Commission
2001 Elmerton Avenue
Harrisburg, PA 17101-9797

Re: Threatened and Endangered Species
Project Review Request
PNDI Search ID 20090916210107
LCSWMA/PPL Wind Energy Project,
Manor Township, Lancaster County
Pennsylvania
ARM Project 06377-6-3

Dear Ms. Librandi,

ARM Group Inc. (ARM), on behalf of the Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Development Company LLC, is requesting from the Pennsylvania Game Commission (PGC) a threatened and endangered species review for the above-referenced proposed Wind Energy Project. LCSWMA and PPL met with you on July 23, 2009 regarding the proposed Wind Energy Project. During the meeting, wildlife issues discussed included the raptor and eagle migratory bird surveys and an eagle/osprey nesting survey.

As you are aware, ARM is conducting engineering and environmental studies for the project. As part of the studies, a formal threatened and endangered species review response is requested in order to complete the erosion and sediment pollution control plan and application.

An on-line review of the Pennsylvania Department of Conservation and Natural Resource's Natural Heritage Program's Environmental Review Tool determined that potential impacts to three species of concern under the jurisdiction of the PGC warranted further review to resolve potential conflicts. The species are identified as the Great Egret (*Casmerodius albus*), a state endangered species; the Prothonotary Warbler (*Protonotaria citrea*), a species of special concern as well as another sensitive species, identified as State threatened. A signed copy of the Environmental Review Receipt and Review Form as well as other supporting project information is attached.

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Review of the Project Description and Site Location

PPL and LCSWMA are proposing to install wind turbine generators (WTG) at the Frey Farm Landfill (FFLF), Manor Township, Lancaster County, Pennsylvania (Figure 1, Project Vicinity Map). The project is situated south of Columbia Boro and along the Susquehanna River at Lake Clarke. To mitigate against potential migratory bird impacts, the proposed project size has been reduced from four WTGs to two WTGs. The WTG sites have been located back from the Susquehanna River, to avoid existing wooded habitat while preventing interference with landfill activities. Currently, two WTGs are proposed and are expected to generate approximately 3.2 megawatts of electricity. The hub height of the wind turbines will be approximately 80m (meters) and the rotor diameter is expected to be approximately 82.5m. The wind turbines would also include a section of new transmission line to connect the wind turbines to either an end user location, which is located on an adjacent property, or to the grid. The proposed project is situated adjacent to an active municipal solid waste landfill; accordingly, land disturbances are minimal and access is readily available.

The approximate locations of five potential WTG locations and the associated investigation area are illustrated on the enclosed Figure 2, Site Location Map (Safe Harbor, United States Geological Survey (USGS) 7 ½ minute quadrangle dated 1995). Although five potential turbine sites are being evaluated and shown on the mapping, only two turbine sites will be selected.

Access for the proposed WTGs during construction will be made using existing landfill roads, where possible. Additionally, efforts will be made to avoid disturbances to large mature trees. Areas surrounding the turbines upon project completion will be planted with native grasses and regularly maintained to minimize potential raptor hunting in and around the wind turbines. WTG 5 (Tower 5), if constructed, will be adjacent to a vegetated soil stockpile.

Existing WGT Investigation Area and Site Conditions at Frey Farm Landfill

The WTGs are proposed within the landfill property and adjacent to landfill activities. Existing habitat at the proposed WTG locations is primarily comprised of active hayland, maintained grass areas and herbaceous vegetated soil stockpiles. No wetland habitats or watercourses are present in the WGT investigation area.

As discussed during the July 23, 2009 meeting, Bald Eagles are known to the project investigation area and vicinity. An active Bald Eagle nest site (spring 2009) was located across the river from the landfill on the forested river slope in York County. Conejohela Flats Important Bird Area (IBA) #56 is situated approximately 1 mile north of the landfill and potential WTG locations.

Raptor / Eagle Migration Monitoring

The fall (2009) raptor and eagle migration survey is currently being conducted. The raptor and eagle migration surveys are being conducted in accordance with the PGC's *Wind Energy Cooperative Agreement, Exhibit A, Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*. The draft spring raptor and eagle migration monitoring report was submitted to the

PGC prior to the July 23, 2009 meeting and the fall migration survey report will be submitted upon completion following the survey. The bald eagle/osprey nest survey will be conducted in the 2009-2010 winter season, as requested by the PGC, to identify the locations of nests within the wooded hillsides (Lancaster and York borders) of the Susquehanna River in proximity of the proposed WTG locations. The nest survey will be conducted by helicopter boarded by two biologists. Data will be recorded and documented in a nest survey report and submitted to the PGC.

Thank you for your assistance with this project review. If you have any questions regarding this investigation, or if you require any additional information, please contact me by email at mcohen@armgroup.net or (717) 508-0528. Your time and attention to this request is greatly appreciated.

Sincerely,

ARM Group Inc.

Michelle S. Cohen

Michelle S. Cohen
Senior Scientist/Program Manager

Enclosures: PNDI Project Environmental Review Receipt and Form
Figure 1 – Project Vicinity Map
Figure 2 – Site Location Map

cc: Brooks Norris, LCSWMA
Steve Gabrielle, PPL

Signed Project Environmental Review Receipt and Form

1. PROJECT INFORMATION

Project Name: **LCSWMA/PPL WIND ENERGY PROJECT**
Date of review: **9/16/2009 9:33:47 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Wind power facility (wind farm, turbines) - new, expansion, modification**
Project Area: **7.3** acres
County: **Lancaster** Township/Municipality: **Manor**
Quadrangle Name: **SAFE HARBOR**
ZIP Code: **17516**
Decimal Degrees: **39.95956 N, --76.45519 W**
Degrees Minutes Seconds: **39° 57' 34.4" N, -76° 27' 18.7" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Conservation Measure**	**No Further Review Required, See Agency Comments**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

RESPONSE TO QUESTION(S) ASKED

Q1: "Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. ""Project"" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur ."
Your answer is: **"3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from a wetland specialist, and detailed project maps should document this.) "**

Q2: Accurately describe what is known about wetland presence in the project area or on the land parcel. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur .
Your answer is: **3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)**

Q3: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Casmerodius albus
Common Name: Great Egret
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Protonotaria citrea
Common Name: Prothonotary Warbler
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Threatened

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Ammannia coccinea
Common Name: Scarlet Ammannia
Current Status: Endangered
Proposed Status: Threatened

Scientific Name: Rotala ramosior
Common Name: Tooth-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

RESPONSE: Conservation Measure: Please avoid the introduction of invasive species in order to protect the integrity of nearby plant species of special concern. Voluntary cleaning of equipment/vehicles, using clean fill and mulch, and avoiding planting invasive species (http://www.dcnr.state.pa.us/forestry/invasivetutorial/index.htm) will help to conserve sensitive plant habitats.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Michelle Cohen
Company/Business Name: ARM Group Inc
Address: 1129 West Governor Road
City, State, Zip: Hershey, PA 17033
Phone:(717) 533-8600 Fax:(717) 533-8605
Email: mcohen@armgroup.net

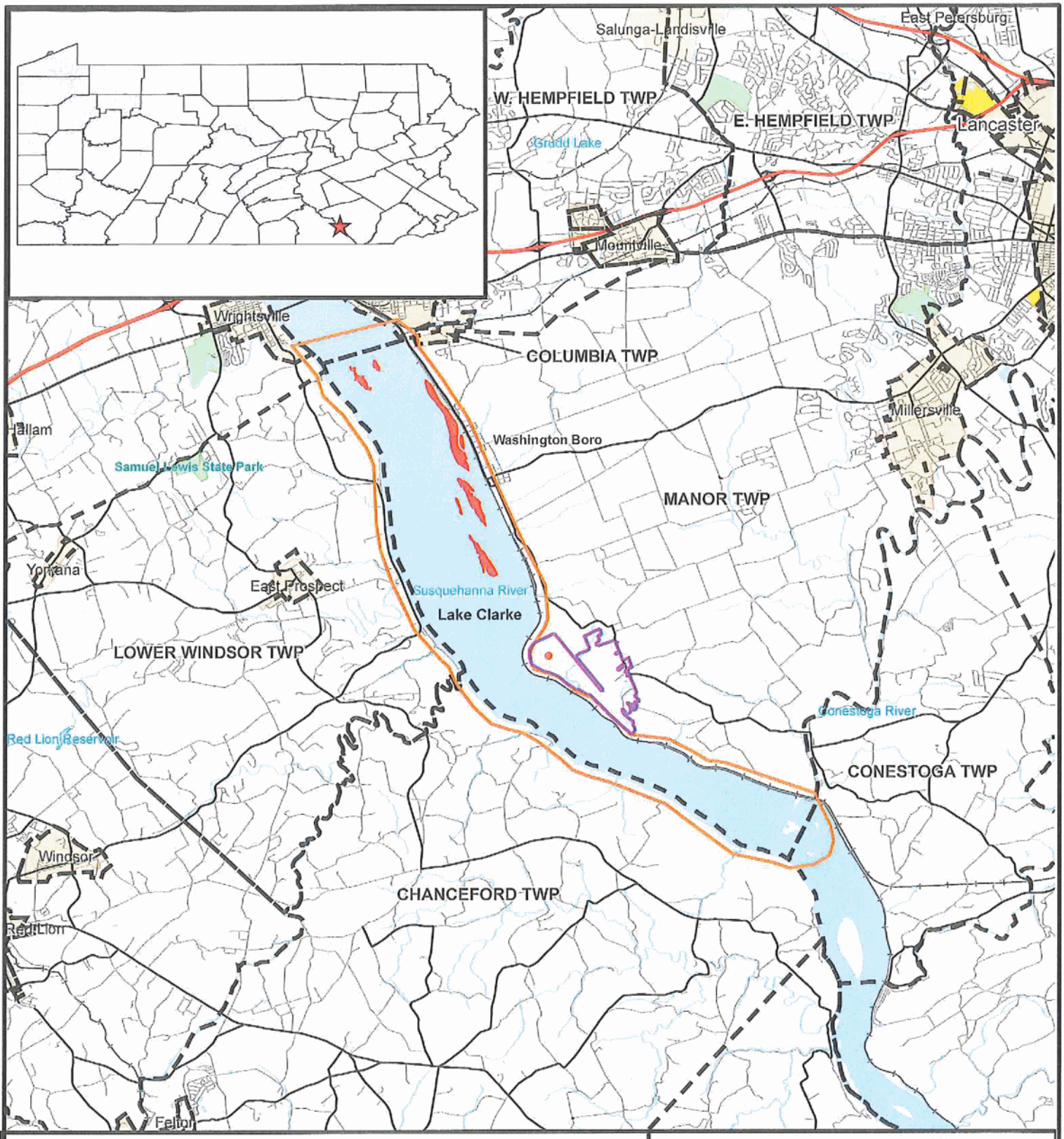
8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Michelle A Cohen 10/5/09

applicant/project proponent signature date

Figure 1 – Site Vicinity Map



LEGEND

- LCSWMA PROPERTY LINE
- CONEJOHELA FLATS IMPORTANT BIRD AREA
- CONEJOHELA FLATS
- MUNICIPAL BOUNDARY

0 5,000 10,000 20,000 30,000

Feet

N

Site Vicinity Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

May 2009	Scale: 1" = 10000'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 1

S:\06377 LCSWMA Wind Energy_Pdfs\SiteVicinityMap_buffer.pdf

Figure 2 – Site Location Map
(USGS Map showing tower locations)

Base map from Safe Harbor USGS 7½ minute quadrangle dated 1995.

LEGEND

- LCSWMA Property Boundary (Frey Farm/Creswell Landfill)
- Creswell Landfill Waste Limit (closed, inactive)
- Frey Farm Landfill (FFLF) Permitted Waste Limit
- Proposed Wind Turbine Location
- Conejohela Flats Important Bird Area

N

0 1,500 3,000 4,500

SCALE IN FEET

Site Location Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

August 2009	Scale: 1" = 1,500'	06377-5

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\06377_Figure 2 Site Location_USFWS.dwg

Letter from PGC November 30 2009

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110
"TO MANAGE ALL WILD BIRDS, MAMMALS AND THEIR HABITATS FOR CURRENT AND FUTURE GENERATIONS."

November 30, 2009 PNDI Number: 20090916210107

Michelle Cohen
ARM Group Inc.
119 West Governor Road
Hershey, PA 17033

PNDI Number: 20090916210107
Re: LCSWMA/PPL Wind Energy Project
Manor Township, Lancaster County, PA

Dear Ms. Cohen,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20090916210107 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office dated October 28, 2009, as well as PNDI data, and has determined that potential impacts to threatened, endangered or species of special concern may be associated with your project. Therefore, further coordination with this office is necessary to avoid potential impacts to the species listed below.

Scientific Name	Common Name	PA Status
Haliaeetus leucocephalus	Bald Eagle	THREATENED
Ardea alba	Great Egret	ENDANGERED

Next Steps

The proposed project is located adjacent to the Conejohela Flats Important Bird Area. This IBA has been designated as such because it has a significant concentration of waterfowl, it is the largest, most dependable migrant shorebird site in Pennsylvania, the site provides habitat for threatened, endangered, and species of special concern, and provides important feeding and resting area for a significant number of birds during migration.

The following surveys should be performed to assess the potential impacts to the above listed species and migrating birds from the proposed LCSWMA/PPL Wind Energy Project. Once the following surveys have been completed, please provide the results to the PGC so that a more accurate determination can be made:

- Spring and fall raptor and waterfowl migration surveys following protocols found in the PGC Wind Energy Voluntary Cooperative Agreement. The PGC requests a minimum of one full season of both spring and fall raptor migration surveys.
- Breeding bird surveys on entire project area following protocol found in the PGC Wind Energy Voluntary Cooperative Agreement. Breeding bird survey should include both point counts and area searches.
- Bald eagle nesting survey following the enclosed PGC protocol to document presence of nesting eagles within or surrounding project area. The PGC supports the USFWS request for a summertime survey of bald eagle movement and usage, including foraging activities, roosting activities, and identification of important roosting trees.

In addition to being protected under State law, the bald eagle is also protected under Federal law. The Bald and Golden Eagle Protection Act protects eagles from various forms of take, including disturbance. Please refer to the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines (http://www.fws.gov/migratorybirds/baldeagle.htm) for specific measures that should be taken to ensure bald eagles are not disturbed. If you have questions about when and how to obtain a federal permit because you believe your proposed project will disturb bald eagles, and you are not able to implement measures to avoid disturbance, please contact the Fish and Wildlife Service's Pennsylvania Field Office at 814-234-4090.

The operation of wind power projects in PA has resulted in mortality to birds and bats. The potential exists for mortality to federal and state-listed species of special concern and other species under the PGC's jurisdiction may occur due to tower operation. Of particular concern are the impacts during spring and fall migrations of birds and bats. In addition to the above surveys, the PGC strongly recommends investing the entire project area for caves and mine opening. If openings are found that have potential as bat hibernacula, they will need to be surveyed to determine the presence or absence of bat species using the attached *PGC Protocol for Assessing Abandoned Mines/Caves for Bat Surveys.* Also, the PGC recommends conducting pre-construction bat acoustic surveys following the monitoring protocols found in the PGC Wind Energy Voluntary Cooperative Agreement in order to assess the potential risk to migrating bats at this site. Likewise, the PGC strongly recommends mortality surveys for a minimum of two years post-construction following the standard mortality monitoring protocols found in the PGC Wind Energy Voluntary Cooperative Agreement to determine what the actual mortality of bats and birds is from this project's operation. The PGC Wind Energy Voluntary Cooperative Agreement and protocols are enclosed and can also be found on the PGC website, www.pgc.state.pa.us, click on "wind energy" in the "quick clicks" box on the right-hand side of the PGC homepage.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Tracey Librandi Mumma

Tracey Librandi Mumma
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3614
Fax: 717-787-6957
E-mail:tlibrandi@state.pa.us

A PNHP Partner

Pennsylvania Natural Heritage Program

Enclosure

PGC Wind Energy Voluntary Cooperative Agreement
PGC Bald Eagle Nesting Survey Protocol
PGC Protocol for Assessing Abandoned Mines/Caves for Bat Surveys

cc: Killough
Morgan
DuBrock
Brauning
Gross
Cindy Tibbott, U.S. Fish & Wildlife Service

PENNSYLVANIA GAME COMMISSION
WIND ENERGY VOLUNTARY COOPERATION AGREEMENT
February 23, 2007

The Pennsylvania Game Commission (Commission) seeks to coordinate wind energy projects with wind energy developers (Cooperator) in order to work collaboratively to ensure that wind-energy development project sites are developed in both an environmentally conscientious manner and with best regard to the conservation of the Commonwealth's wildlife resources.

Whereas, the Commission under its jurisdiction from Title 34 (Game and Wildlife Code) has authority to avoid, propagate, manage and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the laws of this Commonwealth relating thereto.

Whereas, both the Commission and Cooperator support renewable energy initiatives and are dedicated to arriving at uniform guidance, in the absence of comprehensive state regulations, on how best to avoid, minimize, and/or potentially mitigate adverse impacts to wildlife resources.

Whereas, the Commission and Cooperator, in an effort to best avoid, minimize, and/or mitigate potential adverse impacts with specific intent to birds and mammals, have entered into this Cooperative Agreement in an effort to standardize wildlife monitoring protocols and wildlife impact review methods associated with wind-energy development projects in a mutually beneficial and flexible manner and with high regard to both parties goals, objectives, and purviews.

Therefore, the Commission and Cooperator enter into this Cooperative Agreement and agree as follows:

1. The Cooperator will notify the Commission of any potential wind energy development sites (or an expansion of an existing site with the addition of 5 or more turbines), at least fourteen months prior to construction. The notification prior to the initiation of construction at the site will allow the Commission to provide as much known information on bird and mammal resources which may be present and/or potentially impacted by the development of the proposed wind-energy project. The notification should include a brief narrative of the project's planned development and proposed construction times and include as much detailed information as available such as: an original copy of the U.S.G.S.

topographic map(s) depicting the proposed project area boundary limits with the quadrangle name and associated county identified on it, the proposed project site's general infrastructure delineations (both known and planned) to include access roads, electric transmission lines, wind turbine locations, planned surface impact areas, development and future maintenance of the project, and any known wetland areas or predetermined wildlife habitat regimes which are deemed to be of critical importance or high value.

For those projects, which the Cooperator has already initiated prior to the effective date of this agreement, or that are planned for construction prior to the fourteen-month time frame noted herein, the Cooperator shall submit the required information within ninety days (90) from the date of this agreement.

For all other projects, which are currently under construction prior to the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* (post-construction bird & bat mortality) as contained herein. Further, within 90 days of the agreement date, the Cooperator can provide to the Commission a listing of all projects, which are planned for construction to begin within 12 months from the date of this agreement. The listing will include all available site-specific project information as more clearly specified within this paragraph for each project identified on the list. For each project identified on the list which construction commences within 12 months from the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* as contained herein. All other paragraphs, provisions, terms and conditions, which are not inconsistent to the above, shall remain in full force and effect.

2. It is understood between the Cooperator and Commission that both parties may support the use of other potential funding mechanisms or processes which directly or indirectly reduce the overall costs associated with the Cooperator's monitoring requirements as identified herein providing further the intent of those monitoring requirements remain the same.

3. The Commission and Cooperator will share all relevant information concerning wildlife resources under the jurisdiction of the Commission in and around the project area and the potential adverse impact to those resources. Shared information will include all known publicly available data from past/current/future monitoring efforts and pre and post-construction study results relative to the subject project area. The Commission further agrees to consider all existing relevant wildlife resource information provided by the Cooperator and the Commission will reduce to the fullest extent possible any further requests made to the Cooperator to provide additional relevant data and/or monitoring results which can be ascertained from known existing data regarding potential known wildlife impacts.

4. The Commission will provide the Cooperator with the results of all its internal reviews and provide written comment and or meet with the Cooperator within 45 days of receiving the information specified in Paragraph 1, as well as the results of the Pennsylvania Natural Diversity Inventory, and all pre and post-monitoring methods and recommendations on how best to avoid and reduce direct and indirect impacts to birds and mammals. Additional coordination will occur from the Commission for actions needed in regards to species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) to include all state threatened and endangered bird and mammal species known to occur or determined to exist within or adjacent to the project area.

5. The Commission in consultation with the Cooperator will determine the risk level for monitoring and survey efforts. If needed, the risk level may be adjusted based on new relevant information. The Commission may request the Cooperator conduct an additional year's post-construction monitoring if a T&E species is killed or other mortality is deemed to be at an unacceptable level for any species. The Cooperator may request a reduction in the mortality monitoring effort for the second year based on the first year's mortality results. Such a request by either party for additional or reduced monitoring shall be made in writing by the party requesting a change and an informal meeting will be arranged between the parties to discuss and mutually agree upon any changes in monitoring efforts.

6. All suggested pre-construction and some post-construction techniques are designed to reduce the exposure of state-listed species in order to avoid, minimize or mitigate potential adverse risk to species of special concern.

i. Birds

Migrating Raptors and Eagle Surveys

Goal: Assess risk to migrating raptors from development of wind power at a particular site in order to avoid, minimize, and mitigate adverse impacts.

Objective 1) Observe raptors to determine the number, height of flight, time of day, flight path, avoidance behavior, and species passing through the project area and zone of greatest risk.

Objective 2) Use the survey data to make recommendations to decrease potential adverse impacts to the wildlife resource.

1. Migrating Raptors Survey – If recommended by the Commission, raptor surveys will be conducted according to the attached protocol Exhibit A. The maximum level of effort per project will be one person per five days per week during the pre-construction phase and post construction phase, in both the spring and fall seasons during March and from August 15 through December 15. The minimum level of effort will be that no raptor survey is requested or conducted.

2. Eagles – If the project area is within proximity to a known migratory fly route for eagles, then additional monitoring shall occur in the spring in conjunction with the monitoring criteria noted in Paragraph 6-(i.) The maximum level of effort per project will be one person per five days per week for the entire month of March during the first years monitoring effort. The minimum level of effort

will be that no eagle survey is requested or conducted

3. Breeding Bird Surveys–

Goal: Assess risk to bird species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) in order to avoid and minimize direct and indirect impacts to these species and evaluate the potential for habitat enhancement/mitigation measures.

Objective 1) Proactively evaluate critical wildlife resources that may cause risk to the future stability of project operation.

Objective 2) Use the data to help develop and implement the most appropriate post-construction habitat reclamation and management for the site.

Objective 3) Determine if state listed species are present. If present then further coordination with the Commission is required in order to avoid, minimize, or mitigate potential impacts to the species or their habitat.

If the project area is within an Important Bird Area (IBA) as previously designated by the Audubon process, or within an area supporting birds identified as those priority species of "greatest conservation concern" within the Pennsylvania Comprehensive Wildlife Conservation Strategy, the Cooperator will conduct a survey to confirm or deny the presence of the species. The survey will consist of three days of effort (one day in May, two in June, separated by at least one week). Projects with existing data on species of special concern will be coordinated with the Commission as to the appropriate survey methods required to be used by the Cooperator.

4. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

ii. Bats

Hibernacula

Goal: Determine if any hibernacula exist within the project area in order to avoid and minimize impacts to active hibernacula and the associated bat species due to project development and its operation.

Objective 1) Conduct an on site field review to locate and determine use of potential bat hibernacula in the project area.

Objective 2) Survey bat hibernacula for species presence and abundance in order to assess potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid, minimize, and mitigate adverse impacts to bats and or enhance their habitat from project construction and operations.

1. Pre-construction survey- If recommended by the Commission, the Cooperator is responsible for surveying the project area for any caves, abandoned mine portals, or other openings that may harbor bats as per the Commission's protocol. All openings with potential as suitable bat hibernacula will be surveyed by a qualified bat biologist according to Exhibit B.

Goal: Determine those bat hibernacula existing within 5 miles of the project area that may induce additional avoidance and minimization measures due to anticipated adverse bat impacts from project operations.

Objective 1) The Commission will conduct surveys to locate and determine use of potential bat hibernacula within 5 miles of the project area boundary.

Objective 2) The Commission will survey bat hibernacula (outside of the project area) for species presence and abundance in order to establish potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid and minimize adverse impacts to bats and their habitat from project construction and operations.

2. Prior to the Cooperator conducting the field survey(s) as noted in Paragraph 6 (ii), the Commission will conduct a literature search for other mine portals/caves/openings which are suitable and/or known bat hibernacula and are on or within 5 miles of the proposed wind-energy project boundary delineation. The information will be provided to the Cooperator along with the relevant known bat hibernacula as per the Commission's review and the Commission's recommendations on the need for the Cooperator to conduct additional surveys based on the probable presence of Pennsylvania listed threatened, endangered, and/or candidate bat species. If the Commission recommends additional surveys, the Cooperator will conduct those surveys with a qualified bat biologist according to the attached protocol Exhibit B.

3. Cooperator will conduct pre and post-monitoring surveys as outlined in the Commission's attached Exhibit B & C. The maximum level of effort per project is one-year pre-construction survey and two years post-construction. The minimum level of effort is no bat survey is required.

4. Acoustic Monitoring

Goal: Determine the presence, activity, and temporal use of the project area by bats in order to avoid and minimize potential adverse impacts.

Objective 1) Surveys will be conducted to evaluate the levels of bat activity within the project area and determine their temporal patterns.

Objective 2) Evaluate the potential to avoid and minimize adverse impacts to bats based on their probable use of the project area during the project's construction and future operations.

Cooperator will conduct pre- and post-construction acoustic surveys based on priority level. This survey will assess the level of bat activity for both hibernating and tree bats. The priority level will be used for acoustic monitoring due to a lack of knowledge on the temporal and spatial activity of tree bats, as outlined in the Commission's attached Exhibit B. The maximum level of effort per project is one-year pre-construction and one-year post-construction from April 1 through November 15. The minimum level of effort is from July 15 to October 15 before and after construction.

5. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

6 iii. Post-Construction Bat & Bird Mortality Monitoring

Goal 1) Determine the mortality of bats and birds from project operation and whether those mortality rates would cause an unacceptable level of impact and if needed induce additional minimization or mitigation measures.

Objective 1) Conduct mortality surveys in the most cost-effective and proficient manner.

Objective 2) Provide a mechanism to evaluate the proficiency of the project's mortality survey methodology.

Goal 2) Assess the predictive value of pre-construction monitoring, minimization and avoidance measures by comparing those results with post-construction mortality.

Objective 1) Identify those protocols or monitoring methods that need revision, adaptation, replacement, or abandonment because of their level of success.

Objective 2) To make appropriate adjustments to monitoring protocol and future effort as indicated by the acquired information.

1. The Cooperator will perform the bird and bat mortality monitoring as outlined in the Commission's attached mortality protocol Exhibit C for a minimum of two years post-construction. Mortality studies shall be conducted from April 1 through November 15 by a qualified biologist(s) having expertise in the identification of bats and/or birds and at the interval as noted in the attached Exhibit C.

2. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

7. Cooperator agrees to utilize to the greatest extent possible, all reasonable and feasible generally accepted wind industry and Commission best management practices relevant to the conservation of wildlife resources during construction and subsequent operation of the wind-energy facility. The Commission shall provide copies of all known and updated best management practices to the Cooperator on an annual basis.

8. Commission agrees to issue a special use permit defining the terms and conditions for use throughout the project area by the Cooperator's designated biologist(s) for all bats, birds, and state listed threatened or endangered species which are collected while conducting the Commission's approved monitoring plan and

mortality protocol. The general format for the special use permit is attached as Exhibit D and may be automatically renewed upon the anniversary date of the permit, providing further that the permit terms and conditions have been strictly adhered to and this Cooperation Agreement remains in effect.

9. The Commission agrees not to pursue liability against the Cooperator due to any incidental takings of the Commonwealth's bird and mammal resources for which it has purview under Title 34 (Game & Wildlife Code) as a result of the Cooperator's wind-energy development and operations within the Commonwealth of Pennsylvania providing further such incidental takings were not malicious in their intent and the Cooperator remains in compliance with the terms and conditions of this agreement and has with a good faith effort avoided and minimized potential adverse impacts by way of implementing best management practices and Commission guidance as noted herein.

   The Commission and Cooperator agree to work cooperatively in the future to avoid, and minimize further impacts to the Commonwealth's bird and mammal resources as new relevant project information becomes available. In the event that an incidental take occurs upon a Pennsylvania listed threatened or endangered species of bird or mammal during the operation of any of the Cooperator's wind-energy facilities, the Cooperator agrees to take all reasonable measures as deemed appropriate by the Commission and the Cooperator to further avoid, minimize and/or mitigate such wildlife losses in the future.

10. Commission recommendations or decisions under the Cooperative Agreement do not supercede any comments, decisions, or recommendations of the United States Fish & Wildlife Service.

11. The Cooperator agrees to provide coordinated access, upon prior notice during normal business hours, to all its wind-energy facilities as deemed necessary by Commission staff in order to ensure both parties compliance to this agreement. All Commission access shall be coordinated as far in advance as possible and subject to all the normal safety measures implemented by the Cooperator with regard to access to the facility.

12. Either party upon their own discretion and reason can terminate this agreement in its entirety after having first provided the other party written notification of such termination forty-five (45) days in advance of such termination date. Said written notification to be sent certified mail to the respective parties place of address as noted herein. Termination can be conditioned to exclude those projects identified, which remain in compliance with the agreement.

13. It is understood between the parties that information resulting from the Cooperator's compliance with this agreement shall be treated with the highest affordable level of confidentiality available unless otherwise agreed to in writing by both parties OR if it is necessary to support the Commission's waiver of liability set forth in Paragraph 9 hereof. It is the intent of both parties to release to the general public relevant project monitoring & mortality information deemed to be in the best interest of both the Commission and Cooperator. Release of information will be by mutual consent only.

14. Assignment: The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any affiliate (as defined below) without the approval or consent of the Commission provided that (i) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment and (ii) the Cooperator notifies the Commission of any proposed assignment in accordance with this Agreement. The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any non-affiliate (as defined below) provided that (a) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment, (b) the proposed assignee has agreed in writing to be bound by all of the terms and conditions of this Agreement, (c) the Commission has met with the proposed assignee and the Cooperator, after being notified of the proposed assignment, to discuss the terms and conditions of the project(s) covered by the assignment and (d) the Commission consents to the proposed assignment in writing, which consent shall not be unreasonably withheld, conditioned or delayed. For purposes of this section, an "affiliate" of the Cooperator refers to any person, corporation or entity that (i) has a direct or indirect ownership interest in the Cooperator or vice

versa or (ii) is subject to common operating control and is operated as part of the same system or enterprise as the Cooperator. Any person, corporation or entity that is not an "affiliate" as defined above shall be a non-affiliate for purposes of this section. At the request of the Cooperator, the Commission and the assignee shall execute, after said assignment is approved if required, a new Agreement with terms identical to the terms of the Agreement at the time of the assignment.

15. Notices. All notices demands or requests required or permitted under this Agreement shall be in writing and shall be personally delivered or sent by certified United States mail (postage prepaid, return receipt requested), overnight express mail, courier service, facsimile transmission or electronic mail with confirming receipt (in the case of facsimile transmission and electronic mail with the original transmitted by any of the other aforementioned delivery methods) addressed as follows:

If to Commission to: Pennsylvania Game Commission
ATTN: William A. Capouillez, Director
Bureau of Wildlife Habitat Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

and

If to Cooperator to:

or to such other person at such other address as a Party shall designate by like Notice to the other Party. Unless otherwise provided herein, all Notices hereunder shall be effective at the close of business on the Day actually received, if received during business hours on a Business Day, and otherwise shall be effective at the close of business on the first Business Day after the Day on which received.

16. No Third-Party Beneficiaries. This Agreement is not intended to, and does not, confer upon any Person other than the Parties hereto and their respective successors and permitted assigns, any rights or remedies hereunder.

17. Entire Agreement. This Agreement, including all Schedules hereto, constitutes the entire agreement between the Parties hereto with respect to the matters contained herein and therein, and all prior agreements with respect to the matters covered herein are superseded, and each Party confirms that it is not relying upon any representations or warranties of the other Party, except as specifically set forth herein or incorporated by reference hereto.

18. Amendment. This Agreement may not be amended or modified except by a written instrument signed by each of the Parties hereto.

IN WITNESS WHEREOF, Commission and Cooperator have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION

ATTEST:

_____

Executive Director Date

COOPERATOR

ATTEST:

_____

President or Vice-President Date

_____

Company Name

EXHIBIT A (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Pre and Post-Construction Monitoring of Birds

Following is a classification of raptor concentration locations across Pennsylvania based on the number and type of species found. Pre-construction bird monitoring efforts at wind energy developments will be scaled based on this classification. A complete listing of Pennsylvania sites in which raptors concentrate is provided at the end of this document (Table 1).

Competent and experienced field ornithologists that are mutually agreed upon by the Cooperator and the PGC shall conduct migratory raptor or breeding bird surveys.

I. Classification of Monitoring Effort for Raptors

A three-tiered approach is recommended for raptor migration monitoring at prospective wind development sites:

A. High Priority Sites – Major raptor concentration points, including areas documented in migration.

Raptor Migration Survey Effort: At least one year full-time fall and spring monitoring with a corresponding effort post-construction.

B. Moderate Priority Sites -- Lesser disconnected ridges in the Valley and Ridge Province and near escarpments in the Allegheny Plateau Province.

Raptor Migration Survey Effort – At least one year full-time fall monitoring pre-construction and a corresponding effort post-construction, and where eagle migration is noted, spring monitoring.

C. Low Priority Sites -- Sites of flat terrain where there are no updrafts and low-priority sites as listed separately.

Raptor Migration Survey Effort – None.

Several sites designated as Low Priority. They lack a standard set of raptor migration data, but there may be significant migration at the site at some time of year. It is not required, but prudent to do a field check for raptors during periods when migration is most likely to occur to avoid risk to raptors migrating there.

II. Protocols for Diurnal Raptor Monitoring

Golden eagles tend to use the north-south trajectory of the ridges in south-central and southwestern parts of the state. Unlike other raptors, their spring route northward is similar to their fall migration route southward.

Diurnal raptor surveys should follow standards and forms used by the Hawk Migration Association of North America (www.hmana.org). The HMANA daily log form and instructions are attached as one sheet.

1. Site Location: The diurnal raptor monitoring site should be chosen with maximum count of migration as the goal. A good view of the escarpment, looking into the direction where most raptors are expected to fly (the windward side of the mountain) is necessary for a thorough count. A secondary site may be needed to see raptors during different prevailing winds. The site location and the reason for the change should always be indicated on the field form. Geographical information for the site should also be collected (coordinates in Latitude / Longitude, directions to site) for general reporting.

2. Field Season: The fall field season includes the period August 15 through December 15 and spring field season is March 1 through March 31.

3. Time and Frequency: Count hours are 9:00 to 5:00 EDT from August 15 through October 30, and 8:00 to 4:00 EST from November 1 through December 15. Emphasis shall be placed on periods when migration is greatest in numbers or when high priority species are most likely to occur. Therefore, sampling can be reduced to three days a week from 15 August through 15 September, but should cover days when a large flight can be expected.

4. Equipment: The counter should use binoculars and or a scope. Hand-held weather instrument are preferred for gathering weather data. A laser rangefinder would be useful for measuring distance of raptors to the escarpment or proposed turbine sites.

5. Data Collection: All raptors considered migratory will be tallied by date and hour using the HMANA Daily Reporting forms. Data for both eagle species will be recorded on a separate form (see below). General instructions for entering data are provided in back of the HMANA form, including the codes for various weather data (e.g. sky, wind). Weather data will be recorded by the hour; wind data can be collected later from the meteorological tower. HMANA sites often use the Beaufort wind scale (see HMANA form), but directly measuring wind with a wind gauge also is acceptable.

   Flight Pattern Notes: Keep separate tally of raptors observed flying in the zone of the anticipated rotor sweep area where raptors may be at greatest risk. Separate tallies can be made on the HMANA form by designating the position of the birds or by using multiple HMANA forms for one day with a form designated for each of the three sectors delineated below. Participants are invited to devise their own form to accommodate this collection of behavior data. *This should be accomplished without compromising the total raptor count conducted with the HMANA protocol.* Raptors that are not using the ridge for migration should also be noted on the field form.

The relative position of raptors should be categorized with respect to the anticipated wind turbine rotor zones for the specific development in question. All raptors should be recorded passing the area, divided into the three sectors:

Code	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

If birds changed sectors, this should be indicated by sequential letters (e.g., AB, BC, ABC). Each individual bird should be classified by flight pattern.

Behavior: The type of flight should be recorded according to the following categories:

Code	Type of Flight
D	Direct flight with few changes in direction, all less than 30 degrees
I	Indirect flight during which more than one circle was recorded, but more than 50% of flight is without such turns
S	Soaring flight during which more than 50% of time is circling/
H	Flight that appeared to be for hunting
P	Birds that perched

6. Flight Altitude: Use the following table to describe the *general flight* of raptors at the site for each hour of observation. Additional notes on the flights of golden and bald eagles or other species of interest should also be recorded either as part of the Golden and Bald Eagle Data Form (Page 5) or field notes to be added to the data file of the site observation.

Code	Flight Altitude
0	Below eye level
1	Eye level to 30 meters
2	Birds easily seen with unaided vision (eyeglasses not counted as aids)
3	At limit of unaided vision
4	Beyond limit of unaided vision but visible with binoculars to 10X

5	At limit of binoculars
6	Beyond limit of binoculars 10X or less but can detect with binoculars or scope of greater power (note magnification)
7	No predominate height

All birds observed at the site are to be counted. Residents, or other individuals suspected to be previously counted, should be recorded.

7. Golden and Bald Eagle Data Collection: Eagle observations should be recorded on the Golden and Bald Eagle Data Sheet. (The eagle form also can be used to document details of flight line and behavior of other high priority species.) The eagle form includes a simple set of codes that allow for location and behavior options. These codes are provided at the bottom of the form. The weather can be recorded on the form in the style (codes) used on the HMANA form. Observers should fill in notes about behavior liberally in the right hand column or on extra sheets and use extra sheets as necessary.

Golden and Bald Eagle Data Sheet

Use as addendum to HMANA form

LOCATION:	**Date:**		**Sky:**
OBSERVER:	**Start:**	**Stop:**	**Wind:**

For Data Codes, see bottom of form.

#	Sps.[a] BE,GE	Time [b] (military)	Age [c] (J/Sub/Ad)	View [d] (D/V)	Height of Flight [e] (L/M/H)	Direct. of Flight [f] (NE, N...)	Flight Type [g] (P, G, S)	Flight Path [h] (RT, PRS, PRN, ..)	Behavioral Notes Interactions with other birds
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

[a] Species: Bald Eagle = BE, Golden Eagle = GE, see HMANA form for other species. [b] Time: use military time (0800, etc.), [c] Age: indicate either Juvenile (J), Sub-adult (S), or Adult (A). More detail on BE plumage types are appreciated but not necessary (e.g. Basic I,II, III, etc.). [d] View: D -= Dorsal, V = ventral, DV = Both. [e] Height of flight: L = 100 feet (30 m), M = 100 – 400 ft. (approx. tower ht.), H = above 400 ft. (tower ht.). [f] Direction of flight: N, NE, E, SE, S, SW, W, NW. [g] Flight type: P = Powered (flapping), G = Gliding, S = Soaring. [h] RT – Moving along Ridge Top, PRN = Parallel to Ridgetop Northside, PRS Parallel to Ridgetop Southside, VS = Valley to South, VN = Valley to North, XR = Crossed ridge, LR – left ridge.

Use additional sheets if necessary.

III. Pre-Construction Sampling for Breeding Birds

1. Survey Methods: Breeding bird surveys should be conducted once in May and two visits in June. Points should be established systematically at 250-meter intervals (or at 500 meters in grassland settings) using a grid or track that covers the projected development site. Based on overall project size and project configuration, the PGC will be flexible with regard to breeding bird survey sampling intervals.

A circle is delineated around each point of 50-meters and allowance is made for detecting birds outside that ring (unlimited circle). Observers should be experienced or be trained at judging distances, using a range-finder and local landscape features as cues. Sample period should be divided into three periods, starting with the first three minutes, the subsequent two minutes, and the final five minutes. These time bands allow comparisons between these data sets with other point-counts (including the BBS route data) of 3- and 5-minute lengths (Ralph et al. 1995).

Sampling should occur in the morning when detection of birds is greatest. Counts should not be conducted in periods of heavy rains or high winds. Each location should be approached quietly in order to avoid disturbance of the birds and to observe birds near the sample point, but outside of the detection circle. Each bird should be recorded in the first period it is observed. A small bull's eye is provided on the point count data sheet for registering the general location of the bird. The up position is North with the lines dividing the circle into four quadrants. Additional notes on location of birds can be made on separate sheets. Birds detected while flying over should be counted separately.

The location of each point should be registered on a separate form using GPS (Attachment Form Wind 7008). The use of standard four-letter species alpha codes, breeding bird atlas codes, and other standard abbreviations are helpful to the standardized collection of data (Ralph et al. 1993, Hamel et al. 1996, PA Breeding Bird Atlas website). A stopwatch or other chronometry is very helpful to ensure conformity to the time band data periods. A compass or GPS unit with compass capacity is needed to identify the position of the birds.

The field observer should provide evidence of rare or unexpected species by taking photographs, making field recordings, or field sketches. Digital recordings are preferable because of their ease of storage and transfer.

In each successive time-band, the observer should attempt to relocate each singing bird and record its detection in that period. Each observation should be categorized as either inside or outside the designated center circle (50 meter radius). If a bird moves from one side to the other of the count circle, it should be designated as the original position to inside, the original observation point should be noted. There are columns for non-singing observations provided for birds within and outside the circle. Care is needed to avoid duplicate counting of individuals at the same point or at multiple points.

The data collected with the removal method point-counts should be analyzed with methods outlined by Farnsworth et al. (2002). The program SURVIV also is used for finding estimates of densities and associated variables (White 1983). This program is available from the U.S.G.S. Patuxent Wildlife Research Center website (http://www.mbr-pwrc.usgs.gov/software.html#a).

Alternate point count methodologies that address observer detection effects, such as spot-mapping (I.B.C.C. 1970, Ralph et al. 1993) or distance sampling (Buckland et al. 2001, Rosenstock et al. 2002), may be used as an alternative to the point count data collection described herein.

2. Area Searches are effective for developing a species site list and detecting birds not as effectively detected by point counts (Ralph et al. 1993). This approach may replace or supplement the point count method.

The observer visits the variety of habitats at a site and records all birds encountered. As for any field survey, the weather conditions and field times also are recorded. The field time can be used as a measure of effort made by the observer and the bird data can be interpreted as birds per party hour or a similar efforts measure. There is a form for use in Area Search Surveys that will organize observations (Attachment Form Wind 7008). Any breeding behavior should be recorded using standardized Breeding Bird Atlas codes (see 2nd Pennsylvania Breeding Bird Atlas website and point count form). The locations of Species of Special Concern and Watch List species should be recorded (NAD27 format). Additional information about bird sightings and behavior can be recorded separately.

At least three area-searches should be conducted at the construction site and these searches include periods when Birds of Conservation Concern are most detectable (http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=164510). Since many raptors are more easily detected fairly early in the nesting season, a full sample protocol should include a field trip conducted from mid-March to April 30. A second trip in May would also be appropriate for earlier nesting species and has the potential for early-arriving forest migrants. A third trip should be taken in the peak of the nesting season for most songbirds in the period from June 1 through July 10 (but, June would be more effective than a July date). Some early-nesting species also can be detected in post-nesting period when dependent young are easily detected.

Data collected on these forms, maps, and associated documents shall be sent to the Pennsylvania Game Commission as outlined in the Special Use Permit.

FORM Wind-70008-BBPC-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Breeding Bird Point Count			
Site:	Observer:		Date:
Point #	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Indiv. & Posit.	**Species Code**[a]	**1 0 – 3 min.**		**2 3 – 5 min.**		**3 5 – 10 min.**		**Non-song Cues**		**Fly Over #**	**Breeding Code, Behavior, and Other Notes**
		<50m	**>50m**	**<50m**	**>50m**	**<50m**	**>50m**	**<50m**	**>50m**		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

[a] *Use standard 4-letter alpha codes for species names available at PBBA website, USGS, and various references.*

Notes:

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Codes for Breeding Bird Point Counts and Area Searches

Sky Condition Codes	
Code	Sky condition indicator
0	Clear or a few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy (broken) or overcast
4	Fog or smoke
5	Drizzle
7	Snow
8	Showers

Wind Speed Codes (Beaufort Scale)	
Code	Wind Speed Indicators
0	Smoke rises vertically (< 1 mph, <2 kph)
1	Wind direction shown by wind drift (1-3 mph, 2-5 kph)
2	Wind felt on face; leaves rustle (4-7 mph, 6-12 kph)
3	Leaves, small twigs in constant motion (9-12 mph, 20-29 kph)
4	Dust rises; small branches move (13-18 mph, 20 – 29 kph)
5	Small trees in leaf begin to sway (19-24 mph, 30-38 kph)

Pennsylvania Breeding Bird Atlas Breeding Codes (BC)

For further explanations of BCs, Safe Dates, and other Breeding Bird Information, see the website of the 2nd Pennsylvania Breeding Bird Atlas

Observed	
O	Observed within safe dates, but not in suitable habitat
Possible	
X	Bird seen or heard in suitable nesting habitat within safe dates
Probable	
T	Territorial behavior observed
P	Pair observed
C	Courtship behavior observed
U	Used nest of species found
A	Agitated behavior or anxiety calls given by adults
Confirmed	
CN	Bird seen carrying nesting material
NB	Nest building observed at nest site
DD	Distraction display
FL	Recently fledged young observed
CF	Adult carrying food or fecal sac
ON	Occupied nest found, contents unknown
NE	Nest found containing eggs
NY	Nest found containing young

FORM Wind-70008-PCL-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Point Count Locations at this Project.
Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
And datum used (NAD27 Preferred)

Project Name:_____ Page: _____ of _____

Total Number of Points:_____

Lat/Lon GPS Location Information (DMS) for All Points

DATUM used:

Point No.	Latitude			Longitude			Habitat:
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-BBPC-2
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Bird Survey Area Search Form			
Site:	Observer:		Date:
Area:	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Species Code	Breeding Code / Behavior Notes [a]	Habitat	GPS Location Data (NAD 27)					
			Latitude			Longitude		
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘

[a] Use Breeding Codes recommended for point counts. Also note if an audio-lure (tape-playback) was used to attract the bird observed.

Additional Notes on Survey:

Table 1: Tiered Approach to Classifying Risk to Migrant Raptors by Wind Power Development

**Risk assessment based on concerns for general raptor migration, for Bald Eagle (BAEA) or Golden Eagle (GOEA) migration or concentrations.*

High Potential Risk Sites					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Allegheny Front	Bedford, Blair, Clearfield, Centre	General, BAEA, GOEA	Yes	#84 Allegheny Front	Yes
Bald Eagle / Brush Mountains	Centre, Blair, Huntington	General, GOEA	Yes	#32 Bald Eagle Ridge	Yes
Conneaut Marsh / Geneva Marsh	Crawford	BAEA	Yes	#7 Conneaut / Geneva Marsh	No
Kittatinny Ridge / Blue Mountain	Monroe, Northampton, Carbon, Lehigh, Berks, Schuylkill, Perry, Franklin, Cumberland	General, BAEA, GOEA	Yes	# 51 Kittatinny Ridge / Hawk Mt. Sanctuary	Yes
Lake Erie Shore	Erie	General, BAEA	Yes	# 1 Presque Isle, # 2 Roderick Reserve	Yes (NY)
Lower Susquehanna River	York, Lancaster, Dauphin, Perry	BAEA	Yes	#56 Conjohela Flats, #57 Conowingo Reservoir, Muddy Run, #46 Sheets Island Archepeligo	No
Pymatuning Res. / Hartstown Complex	Crawford, Mercer	BAEA	Yes	#3 Pymatuning, Hartstown Complex	No
Second Mountain / Mauch Chunk Ridge	Lebanon, Schuylkill, Carbon	General, BAEA, GOEA	No?	#43 St. Anthony's Wilderness, #44 Second Mountain Corridor	Yes
Tuscarora / Cove Mountains	Franklin, Fulton, Perry, Huntington, Juniata	General	Yes	#36 Tuscarora Ridge / The Pulpit	Yes

High Potential Risk Sites (continued)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Tussey Mountain	Bedford, Blair, Huntington, Centre	General, GOEA	Yes	#81 Greater Tussey Mountain, #35 Rothrock State Forest	Yes
Upper Delaware River	Wayne, Pike, Monroe	BAEA	Yes	#60 Upper Delaware Scenic River	No
Moderate Potential Risk Sites					
Allegheny Ridge	Lycoming	General, GOEA	Yes	None Listed	No
Backlog Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Bald Mountain	Luzerne	General	No	None Listed	No
Berry Mountain	Dauphin, Perry	General	Yes	None Listed	No
Big / Sugar Valley Mountains	Clinton	General	No	None Listed	No
Brush Mountain	Centre	General	No	None Listed	No
Catawissa Mountain	Columbia, Luzerne	General	No	None Listed	No
Dunning / Evitts / Loop / Lock / Canoe Mountains	Bedford, Blair	General, GOEA	Yes	# 76 Canoe Creek Watershed	No
Jack's Mountain	Huntington, Mifflin, Snyder	General, GOEA	Yes	None Listed	Yes
Line / Little Mountains.	Northumberland	General, GOEA	No	None Listed	No
Mahantango / Buffalo Mountains	Dauphin, Schuylkill, Perry	General	Yes	None Listed	No
Meadow Mountain	Somerset	General	Yes	None Listed	None
Moosic Mountain	Lackawanna, Wayne	General	No	None Listed	No
Nescopeck Mt.	Columbia, Luzerne	General, BAEA	No	None Listed	No
Nittany Mountain	Centre	General, GOEA	Yes	None Listed	No

Moderate Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
North White Deer Ridge	Lycoming	General, GOEA	Yes	None Listed	Yes (historic)
Penobscot / Lee / Wilkes-barre / Wyoming Mts.	Luzerne, Columbia	General, BAEA	No	None Listed	Yes
Peter's Mountain	Dauphin, Perry	General	No	# 43 St. Anthony's Wilderness	Yes (historical)
Shade Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Shamokin Mountain / Montour Ridge	Union, Snyder, Montour, Northumberland	General	Yes	None Listed	No
Sharp / Pisgah Mountains	Lebanon, Schuylkill, Carbon	General	No	None Listed	No
Sideling Hill	Fulton, Huntington	General, GOEA	Yes	None Listed	No
South Mountain	Adams, Franklin	General	Yes	#40 Michaux State Forest	No
Spring Mountain	Carbon	General	No	None Listed	No
Stone Mountain	Huntington	General, GOEA	Yes	#35 Rothrock State Forest / Stone Mountain	Yes
Town Ray Hills	Fulton, Bedford	General, GOEA	Yes	None Listed	No
Wills Mountain	Bedford, Blair	General, GOEA	Yes	None Listed	No
Low Potential Risk Sites					
Big Mountain	Northumberland, Columbia	General	No	None Listed	No
Broad Mountain	Franklin	General	No	None Listed	No
Buck Mountain	Columbia, Luzerne	General	No	None Listed	No
Buffalo Mountain	Centre, Union	General	No	#37 The Hook Natural Area	No

Low Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Chestnut Ridge	Fayette, Westmoreland	General	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
First / Thick Mountains	Centre	General	No	None Listed	No
Front Mountain	Mifflin	General	Yes	None Listed	No
Laurel Hill	Fayette, Westmoreland, Somerset, Cambria	General, GOEA	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
Little Allegheny Mt.	Somerset, Bedford	General	No	None Listed	No
Locust / Nesquehoning Mts.	Schuylkill, Carbon	General	Yes	None Listed	No
Long Mountain	Mifflin, Centre	General	No	None Listed	No
Mahanoy Mountain	Northumberland	General	No	None Listed	No
Martin Mountain	Bedford	General	No	None Listed	No
Negro Mountain	Somerset	General	No	None Listed	No
North Mountain	Columbia, Sullivan, Luzerne, Wyoming	General	Yes	# 42 Loyalsock State Forest, # 48 Dutch Mt. Wetlands, # 49 Ricketts Glen State Park	No
Paddy Mountain	Centre, Union	General	No	None Listed	No
Polish Mountain	Bedford	General	No	None Listed	No
Savage Mountain	Bedford	General	No	None Listed	No
Warrior Mountain	Bedford	General	No	None Listed	No

Bird Protocol References:

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling. Oxford University Press, Oxford, United Kingdom.

Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simmons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. Auk 119: 414-425.

Hamel, P. B., W. P. Smith, D. J. Twedt, J. R. Woehr, E. Morris, R. B. Hamilton, and R. J. Cooper. 1996. A land manager's guide to point counts of birds in the Southeast. Gen. Tech. Rep. SO-120. New Orleans, LA: U.S. Dept. Of Agriculture, Forest Service, Southern Research Station. 39 pp.

Hawk Migration Association of North America (HMANA). 2006. (Data collection protocol). Forms available on-line at: http://www.hmana.org/forms.php (viewed 25 July 2006).

I.B.C.C. (International Bird Census Committee). 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24: 722-726.

Mulvihill, R. and M. Lanzone. 2006. 2nd Pennsylvania Breeding Bird Atlas Website. Carnegie Museum of Natural History. http://www.carnegiemnh.org/atlas/home.htm

Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission. [L. Williams, editor.] 2005. Pennsylvania Comprehensive Wildlife Strategy, Version 1.0. Harrisburg, PA.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. U. S. Dept. of Agriculture, Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-144.

_____, J. R. Sauer, and S. Droege (Tech. Eds.). 1995. Monitoring Bird Populations by Point Counts. Gen. Tech. Rep. PSW-GTR-149. Albany, CA: Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture.

Rosenstock, S. S., D. R. Anderson, K. M. Giesen, T. Leikering, and M. F. Carter. 2002. Landbird counting techniques: Current practices and an alternative. Auk 119: 46-53. White, G. C. 1983. Numerical estimation of survival rates from band-recovery and biotelemetry data. Journal of Wildlife Management 47: 716 – 728.

White, G.C.. 1992. PC SURVIV Users Manual. Dept. of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO. Found at U.S.G.S. Patuxent Wildlife Research Center website: http://www.mbr-pwrc.usgs.gov/software/index.html#a.

Exhibit B (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Pre and Post-Construction Monitoring of Bat Populations at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

I. Classification of Monitoring Effort for Bats for Pre and Post-Construction Monitoring

Pre- and post-construction bat monitoring efforts will be scaled to the type of bat activity on or within 5 miles of the proposed wind power project area, as identified in the following three site types. A **Hibernacula of Concern** is identified as a known hibernaculum that houses a large number of bats (1000+ counted in an internal survey or 100+ captured via trapping), one that supports a diverse number of bat species (4 or more species), or which houses the state threatened small-footed bat (*Myotis leibii*) or the state and federally listed endangered Indiana bat (*Myotis sodalis*) in Pennsylvania.

Sites are classified in the following three categories:

A. High Priority Sites:

1) Hibernacula of Concern exist on or within 1 mile of the project area or several hibernacula occur within 1 mile of the project area.
2) A hibernaculum with >5000 bats is on or within 5 miles of the project area.
3) Any known occurrence supporting breeding or hibernating state-listed threatened or endangered species is present on or within 5 miles of the project area.

Pre-construction work required:

1) Consultation with PGC required for state-listed bat occurrences.
2) Site-specific surveys include: spring migration and/or fall telemetry of a maximum of 10 or more individuals as determined by the PGC to determine areas of high use and travel corridors.
3) One season (April 1-November 15) of acoustic monitoring to determine activity levels of bats within the project area.
4) One season of mist netting following USFWS guidelines to determine the presence of Indiana bats and potential use of the area as maternity colonies. Work is conducted by approved bat consultants that are prepared to adhere with the transmitter requirements.

Post-construction work required:

1) Two years of mortality monitoring with possible extension based on severity of impacts.
2) Post-construction acoustic monitoring for one season (April 1 – November 15) and concurrent with mortality monitoring.

B. Moderate Priority Sites:

1) Hibernacula of Concern exist between 1 and 5-mile radius of project area.
2) Any hibernacula on or within 5 miles of the project area contains between 1,000 and 5,000 bats.
3) One hibernaculum containing between 100 and 1000 bats on or within 1 mile of the project area.

Pre-construction work required:

1) Pre-construction acoustic monitoring for a spring (April 1- April 30) and fall season (July 15 – November 15), and concurrent with mortality monitoring.

Post-construction work required:

1) Two years of mortality monitoring.
2) Post-construction acoustic monitoring for a spring (April 1- April 15) season and a fall season (July 15 – November 15), and concurrent with mortality monitoring.

C. Low Priority Sites: Criteria

1) No known presence of state-listed bats on or within 5 miles of the project area.
2) No known Hibernacula of Concern on or within 5 miles of the project area.
3) No hibernaculum with more than 100 bats exists in the project area.

Pre-construction requirements: Acoustic monitoring from July 15-October 15.
Post-construction: Standard post-construction mortality monitoring.

II. Protocols for Locating and Surveying Potential Hibernacula

Hibernacula (natural caves, mines, tunnels, and other underground workings) within the project area should be located using mineral literature (The Pennsylvania Cave Database, maps and records from the Office of Surface Mining, and the PA Bureau of Abandoned Mines) and properly investigated by a USFWS approved bat consultant.

Due to the increased bat activity around such sites and/or the presence of threatened and endangered species, Hibernacula of Concern on or within five miles of a proposed wind development site triggers bat monitoring efforts. The Pennsylvania Game Commission (PGC) will notify the developer if such a hibernaculum is known on or within five miles of the proposed project and the developer should enter into consultation with the PGC to determine if additional protection or investigation will be useful to siting turbines. The PGC may conduct a survey in or around the project area for potential hibernacula that are not currently known and survey them for the developer. In the event that the PGC survey results confirm a previously unknown hibernaculum the PGC will notify the Cooperator and further coordination will be required. If a mine is located and contains multiple entrances, then all the bats captured at each entrance will be added together to determine if the site qualifies as a Hibernaculum of Concern.

The following progression of action should generally be followed in order to meet the agreement, as fits the site classification hierarchy above:

1) A consultant/cooperator will perform a literature search for potential hibernacula within project area.
2) Following the literature review, a consultant will conduct ground searches to examine each identified potential hibernaculum, record the location with a GPS, and search for unknown openings (mine collapse, abandoned tunnels, new caves, etc) within the project area.
3) Consult with PGC to determine if any sites have ever been surveyed for bats.
4) PGC may conduct literature and ground searches for a potential hibernaculum located up to 5 miles from the project area.
5) PGC may survey hibernacula up to 5 miles from the project area.
6) Newly discovered sites, and sites that have not been investigated within 10 years, will be surveyed via the methods and protocols set forth in the USFWS mine sampling protocol.
7) Bat consultants from the USFWS approved list must be hired to examine any potential hibernacula within the project area.
8) If a state-listed species is located within the project area, the bat consultant will consult with the Cooperator and PGC to discuss telemetry protocols, effort levels and site specific details.
9) If the federally endangered Indiana bat is known to exist at any time within 5 miles, telemetry may be requested, and areas of use are to be determined. Buffer areas around the Indiana bat location should not be included in the project area.
10) Data must be entered on provided sheets (Appendix A) and submitted to the PGC before construction. Maps should indicate all turbines, hibernacula surveys, and results of telemetry if applicable.
11) All captures of state-listed bats must be photo documented as described in Appendix A.
12) Genetic samples (wing punches) and hair sample collection need to be taken on all individual state listed species Each individual will also be banded with a unique band of appropriate size (Indiana bat bands must be obtained by the consultant from the PGC). Consultants should contact the PGC prior to performing work.

III. Protocols for Mist Netting Surveys

The length of the project area (or summation of all roads, whichever is longer) will be tallied. There will be 1 mist netting station per kilometer of the project area. For projects that are not linear in design, a polygon surrounding the entire project area will be tallied and there will be 2 stations per square kilometer.

1) Mist netting shall follow USFWS guidelines in terms of both level of effort and sampling protocol except for the below additions:
2) All bat consultants to perform this work must be on the USFWS approved Indiana bat list and obtain a special use permit from the PGC.
3) Proposals should be submitted and approved by PGC before work commences and include a map of the project area, locations of the turbines, and estimated locations targeted for net deployment.
4) All captures of Indiana bats should be photo-documented with profile shots of the head and shots of the foot and keeled calcar for Indiana bats as shown in Appendix A. Photos of small-footed bats should clearly show the entire facial mask and foot as well.

5) Genetic samples (wing punches) and hair samples should be collected and marked for all Indiana, small-footed, red, hoary, and silver-haired bats. Consultants should be prepared to attach a unique band to each of these species and should consult with the PGC prior to the commencement of work, with all data recorded on data sheets provided (Appendix A).
6) The bat consultant should have transmitters prepared for all captures of small-footed and Indiana bats in order to locate roost trees. Transmitters should be capable of operating for 21 days on the state frequency of 172 MHz. The PGC must be notified no later than 72 hours post capture and attachment of the transmitter.

IV. Protocols for Standardized Acoustic Monitoring of Bats

The recommendations following for acoustical monitoring are geared towards assessing temporal and spatial activity of bats, with an emphasis on the migratory tree bats.

1) All met towers installed on site should be equipped with acoustic monitoring devices as close to rotor zone as possible. It is suggested to have contractor attach equipment before tower is raised.
2) If possible, Met towers should be maintained for at least one year following construction in order to complete acoustic monitoring.
3) All projects should use the same type of detector throughout the study.
4) Detectors should record from 30 minutes prior to sunset to 30 minutes following sunrise every day.
5) Acoustical monitoring will record the number of bat passes per hour and will be entered on data sheet provided.
6) All recorded calls should be permanently archived for possible research needs and submitted with final report.
7) Provide data regarding wind speed, humidity, and ambient temperature every 10 minutes from the project area and concurrent with acoustic and mortality monitoring surveys.
8) All met tower locations must be recorded with GPS unit (decimal degrees, NAD 27 preferred) and should be reported on project maps.
9) All information gathered must be entered on Pennsylvania Game Commission survey forms (Appendix A).
10) Copies of all acoustic data sheets will be submitted in conclusive end-of-year reports to the PGC Harrisburg, PA at the end of every calendar year.

APPENDIX A
COMMONWEALTH OF PENNSYLVANIA

Pennsylvania Game Commission, Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Procedure and format for permittee reports to the PA Game Commission when conducting wind turbine pre-construction bat netting and bat detector surveys.

The report is divided into five sections which include: (1) Cover page, (2) Site Survey Record, (3) Bat Measurement and Capture Data Forms, (4) Maps and (5) Photo Documentation.

Section 1 - Cover

A separate cover page should be provided for each project with the accompanying data of Sections 2 through 5 contained within. An example is provided.

Section 2 - Bat Netting/Acoustic Survey Record

(FORM Wind-70008-PRE)

This is a **mandatory** two-page summary of site(s) surveyed, captures and bat detector tallies of bat passes. It should be completed for all sites surveyed, including those with no captures. If an additional technique other than mist netting and bat detector work is conducted, it should be described in remarks. Complete 1 for each site survey night (If site is trapped twice, 2 site survey records are required, etc.).

This form may not be modified for reporting because it is used for data entry. If necessary, supplemental pages may be added to report unique data.

Section 3 - Bat Measurement and Capture Data Form

(FORM P-70008-M)

This form is **mandatory** for:

1. *Myotis sodalis* captures
2. *Myotis leibii* captures
3. Bats you are banding and all band recaptures
4. All radio-tagged bats (describe transmitter in remarks)
5. Bat species not usually found in Pennsylvania*.

* Pennsylvania species: *Myotis lucifugus, Myotis septentrionalis, Myotis leibii, Myotis sodalis, Eptesicus fuscus, Pipistrellus subflavus, Lasiurus borealis, Lasiurus cinereus, and Lasionycteris noctivagans*

This form may not be modified for reporting because it is used for data entry.

The surveyor also has the option to use this form for measuring and reporting all bats. All measurements should follow North American collector standards (Nagorsen, D. W. and R. L. Peterson. 1980. Measurements and Weights. Pp. 22-26 in Mammal Collectors' Manual. Royal Ontario Museum, Publications in Life Sciences). Banded bat information will be maintained in a database and future recaptures of your bands will be reported to you.

Section 4 - Maps

An example is provided. All survey sites will be reported on a map (preferably a 7.5' USGS Topographic Map) so that locations can be accurately located and coordinates verified.

Section 5 - Photo Documentation

An example is provided. It is required that photographs be taken of identification characteristics of all *M.sodalis*, *M.leibii*, and species not usually found in PA. The photos should be labeled with the site, date and capture number.

Return reports to address on the heading of this page within 90 days of project completion.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

WIND FARM PERMITTEE
BAT CAPTURE / ACOUSTIC MONITORING PRE-CONSTRUCTION SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address: _____

_____

_____

Phone: (_____)_____-_____ **Fax:** (_____)_____-_____

E-Mail:_____

Project Supervisor Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____

_____

_____

FORM Wind-70008-PRE
02/05
Section 2

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

BAT -NETTING/ACOUSTIC SITE SURVEY RECORD

1. Survey Date:_____ **2. Company Name:**_____

3. Reporter:_____ **4. Assistants:**_____

5. Site Name and/or Number:_____

6. Site is (circle one): hibernation site summer habitat

7a. If hibernation site circle one: limestone mine, coal mine, limestone cave, sandstone cave, RR tunnel,

other structure, describe -_____.

7b. If summer habitat, describe area being sampled (e.g. forested stream or forest clearing with stream):

_____

8. County:_____ **9. 7.5' Quad.:**_____

10. Was site GPS'd (required) YES - NO

11. Geographic Coordinates (D-M-S): Latitude: _____°-_____'-_____"N, Longitude: _____°-_____'-_____"W

Datum *(circle one)*: **NAD27** (Preferred), NAD83, WGS84, Other:_____

12. Ownership and Access: *(Who owns site or controls access? Give name and address.)*_____

_____

13. Time *(military)* **& Temperature:** Start Time_____h Stop Time_____h Total Minutes:_____

Start Temp._____°C End Temp._____°C

14. General Weather *(circle one)*: Clear; Partly Cloudy; Mostly Cloudy; Cloudy; Drizzle; Intermittent Rain; Steady Rain; Thunderstorms; Snow; Other:_____.

15. General Wind Conditions *(circle one)*: Calm, Breezy (Leaves Rustling), Windy (trees swaying).

16. Capture Setup at Site *(Minimum of 2 sets required at each site)*:

Set #	Type	Count	Dimensions	Description	TOTAL AREA (m)
1	**Nets**	*4*	*12m x 2.6m*	*Stacked over trail*	*124.8 sq. m*

Total Capture Area:_____sq. m

(Site Survey Record – Continued) **Site Name/No.:** _____ **Date:**_____

17. Describe habitat 150 m around site: *(topography and vegetation including dominant tree species.)*

18. Was reproductive status checked? YES / NO *(if "NO" only enter numbers in* **Total** *columns)*

***CAPTURE RESULTS**

Species	Number of Adult Females				No. Juv. Fem.	Total No. Fem.	Number of Adult Males		No. Juv. Male	Total No. Males	Species Totals
	NR	PG	L	PL			SCR	NR			
Eptesicus fuscus	2		1			3	2	1	1	4	7
Myotis lucifugus											
Myotis septentrionalis											
Myotis leibii											
Myotis sodalis											
Eptesicus fuscus											
Pipistrellus subflavus											
Lasiurus borealis											
Lasiurus cinereus											
Lasionycteris noctivagans											
Other – specify:											
Other – specify:											

Reproductive Status: **NR**= nonreproductive, **PG**= pregnant, **L**= lactating, **PL**= post lactating, **SCR**= scrotal/epididymis swollen. **Grand Total**

***Complete Measurement and Capture Data Form for all:**
(1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA.

Comments:

DATE:_____

19. ACOUSTIC MONITORING: ***(Tallies of bat passes / hour. Use military time and record sunset/sunrise times in comments.)***

Hour # ___	Hour # ___	Hour # ___	Hour # ___	Hour # ___
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C
For bat detector passes where calls can be identified by Genus and/or species, record identification data below by call tallies				
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____
Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____

Comments:

DRAFT

FORM P-70008-M
12/01
Section 3

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Page#_____ of _____

Bat Measurement and Capture Data Form

(Complete for all (1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA)

Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

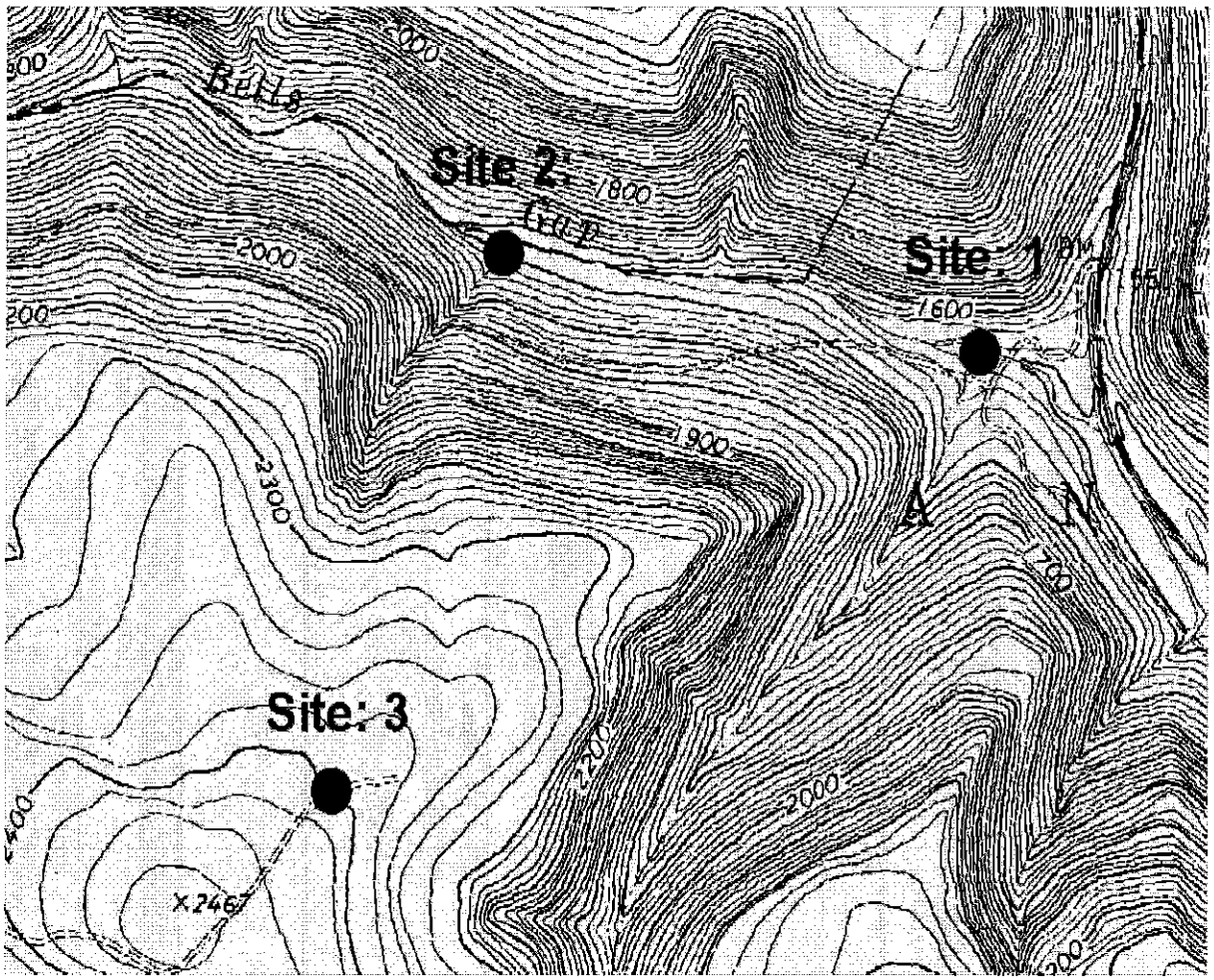
Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

*Capture Number = number in sequence by site

DRAFT

Section 4 - Maps *(example)*

Blair Co., Blandburg Quadrangle, Bells Gap Area.
Location of Sites 1, 2, and 3 for Project PA-24

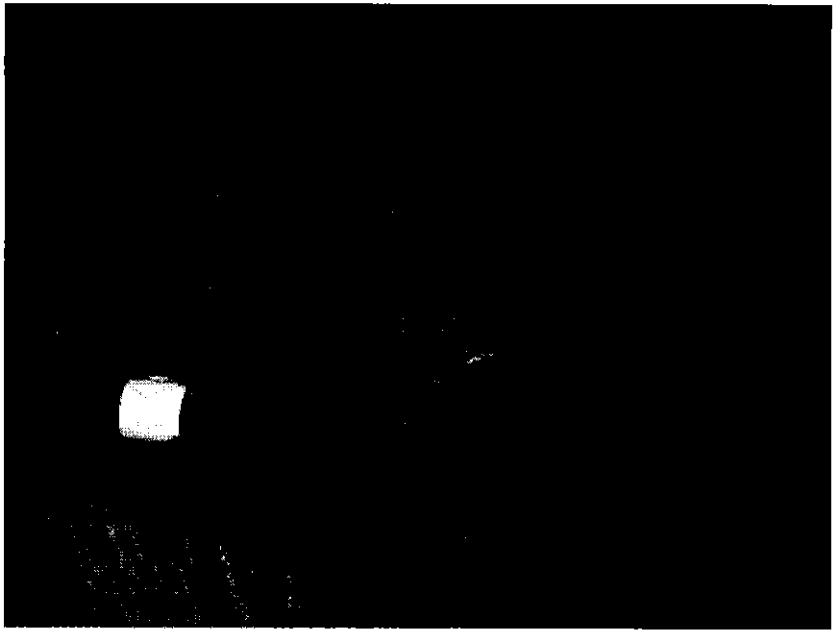


DRAFT

Section 5 - Photos *(example)*

Male *Myotis sodalis* captured at **Site 1**
Capture date: **7/18/01**
Capture Number: **06**

Portrait



Keeled Calcar

Exhibit C (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bat & Bird Mortality at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Post-Construction Mortality Monitoring

I. Duration and Frequency of Monitoring:

All mortality monitoring should take place daily for the period between April 1 and November 15 for 2 complete years following construction, unless other mortality information is available and the PGC can adequately justify a reduced monitoring effort. For higher risk golden eagle migration routes, as designated in page 11 of Exhibit A, additional monitoring may be requested. Mortality monitoring should commence at sunrise and an appropriate number of surveyors must be hired to complete surveys of all turbines within 8 hours. Turbines that are being chosen for monitoring should be determined with the initial proposal so the location of acoustic monitoring devices can be coordinated to occur at the same locations.

II. Number of Turbines to Monitor:

The number of turbines monitored will follow the guidelines below as per "Standard Mortality Transect Survey", and will include at least one validation procedure to correct bias. Validation procedures can include, but are limited to the use of nets, the use of dogs, thermal imaging, or night optical device. Monitored turbines shall be identified in consultation between the parties and based upon pre-determined bat and bird risk assessment. A minimum of 10 turbines will be sampled, or a maximum of 20% of the turbines in the project area (whichever is greater). If the project contains less than 10 turbines, all turbines in the project area will be sampled unless otherwise agreed to by the Commission.

III. Mortality Monitoring Procedure

Carcass removal and searcher efficiency trials will be performed, and the duration, frequency and number of turbines to monitor are the same.

At each turbine to be monitored, a rectangular plot that is 120 meters by 120 meters will be centered on the turbine. Although evidence suggests that > 80% of the bat fatalities fall within ½ the maximum distance of turbine height to ground (Erickson 2003a,b) search areas vary and often do not allow surveys to consistently extend to this distance. Therefore, the searchable area underneath turbines will be delineated and mapped, and estimates of mortality will be produced. Maps are to be constructed illustrating all turbine locations, a designated numbering system for turbines, 120 meter plot, boundaries of survey areas, and searchable areas (broken down into visibility classes and transect numbering if performing standard transect surveys).

1) Times spent surveying each turbine should be recorded daily and remain consistent.
2) All information gathered (i.e. specimen location, species, transect/net grid number, etc.) should be entered on data sheets provided. Any mortality that occurs to state listed endangered or threatened species should be reported to the PGC within 72 hours.
3) Any large mortality events (> 50 total animals) or mortality of any eagle, or threatened or endangered species that occur outside of the survey periods are to be reported to the PGC within 72 hours.
4) Separate data sheets will be used for each date of survey completed. All carcasses are to be picked up and bagged upon discovery. They are to be identified, handled, and labeled properly, in accordance with the special use permit, with the date, turbine number, transect number, and unique specimen number.
5) All specimens located should have an azimuth **from** tower and distance to turbine, and recorded on data sheet. It is appropriate to use a numbered flag for each specimen and record distance and azimuth upon completion of transect searches, so long as flags are removed after each day/turbine.
6) All carcasses are to be properly identified, labeled, frozen daily, and submitted with data sheets every 2 months to the local regional office of the PGC.
7) A summary report of this monitoring, including all data sheets and maps are to be submitted with the annual reports (due December 31) until monitoring is complete. A complete set of post-

construction bat mortality data sheets, all acoustic data sheets with passes/hour, species identification charts, etc. should be included.

Standard Mortality Transect Surveys:

The basis for the methods to be followed for this procedure are set forth by Erickson 2003a, 2003b, Bats and Wind Energy Cooperative 2005 final report, and Kerns and Kerlinger 2004. Areas defined for surveys should be mapped and depict not only prominent structures and area, but in addition to previous studies, label search areas into 1 of 4 visibility classes. All visibility classes represented should be included in the map and proportion of each noted in report. Each visibility class will be equally tested with a minimum of 200 trials using carcasses returned by the PGC.

Visibility Classes: Each turbine will have the vegetation in the searchable area defined into one of the following 4 classes and mapped for submission.

Class 1 (easy): Bare ground 90% or greater; all ground cover sparse and 6 inches or less in height (i.e. gravel pad or dirt road).

Class 2 (moderate): Bare ground 25% or greater; all ground cover 6 inches or less in height and mostly sparse.

Class 3 (difficult): Bare ground 25% or less; 25% or less of ground cover over 12 inches in height.

Class 4 (very difficult): Little or no bare ground; more than 25% of ground cover over 12 inches in height.

1) Following the establishment of searchable areas, the breakdown of this area into visibility classes, and mapping of each turbine, transects should be established at no greater than 6 meters apart and marked every 10 meters.

2) Each transect will be walked with ½ of the distance between transects equal to the distance on each side to be examined by the searcher.
3) As transects are searched, carcasses should be bagged and labeled properly (date, turbine number, transect number, carcass number) and a numbered flag placed in their place. At completion of each turbine, the distance and bearing from each turbine should be recorded and then all flags removed.
4) Searches will be abandoned if severe weather is present, and continue if it clears. The time spent searching at all turbines will be recorded and should be consistent.

V. Validation Guidelines

Performing carcass removal by scavenger and searcher efficiency are the standard methods performed together to correct for biases in data collection. Below are accepted techniques to perform this correction. However, please note the PGC will consider alternative methods of validation, to include but not limiting to the use of dogs, thermal imaging, night optical devises etc.

Carcass Removal Trials

Because there are numerous variables that may make every turbine unique, we suggest placing an equal number of carcasses per turbine to be monitored for removal by scavengers. Additionally, all 4-visibility classes should have an equal sample size. A random bearing and distance from the turbine should be selected to determine placement of the carcass. For these trials, carcasses must be placed within the surveyed area underneath turbines after sunset and under darkness, and monitored for removal every 12 hours. Ideally, the total number of bird and bat carcasses used should be representative of the actual size and species of killed animals, with no less than 50 specimens monitored per year. These trials should be performed periodically throughout each monitoring session. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction and have its location recorded. Records shall include the turbine number, a brief

description of immediate vegetation that may impede visibility, classification using one of the 4 visibility classes described above, and length of time before removal.

VI. Searcher Efficiency Trials

To produce the best estimates of mortality, a high number of searcher efficiency trials will be performed. A minimum of 200 individual trials will be performed to test searchers. The carcasses will be toe clipped to identify and number them. Carcasses missed by searchers will be picked up after their survey is complete and will be used again. Because a number of samples will be collected from all dead bats, each carcass recovered will be submitted to the PGC and the appropriate number needed for testing will be returned. The habitat surrounding turbines may vary considerably and searcher efficiency appears highly correlated to visibility and habitat types. Therefore, the search area defined for each turbine surveyed will be divided into the 4 visibility classes (illustrated on map). An equal number of carcasses will be placed in each visibility class, and will be placed at a random azimuth and distance. Each turbine monitored by searchers should be examined, with an equal number of carcasses placed at each turbine.

Testing should occur sporadically throughout monitoring periods and searchers should not be made aware they are being tested. An effort should be made to test searchers equally during both inclement and good weather, with weather conditions recorded. Carcasses placed should be representative of the percentage and number of species found during the mortality monitoring, and should replicate the manner in which the majority of bats are found in that visibility class (i.e. crawled under vegetation). An effort to maximize the number of carcasses placed is best, with no less than 200 per year.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

IV. WIND FARM PERMITTEE
V. POST-CONSTRUCTION BAT MORTALITY SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address:_____
_____
_____
_____

Phone: (_____)_____-_____ Fax: (_____)_____-_____

E-Mail:_____

Project Supervisor Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____
_____

FORM Wind-70008-Mort-1
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

GPS Locations of All Wind Turbines at this Project.

(Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
Also provide datum used (NAD27 Preferred)

Project Name:_____ Page: _____ of _____

Total No. of Turbines:_____

Lat/Lon GPS Location Information (DMS) for All Turbines.

DATUM used:

Turbine No.	Latitude			Longitude			Comments
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-Mort-2 **COMMONWEALTH OF PENNSYLVANIA**

02/05 **Pennsylvania Game Commission**

Description of Wind Turbine Searched for Carcasses

Project Name:_____ **Turbine Number:**_____

1. Diameter of Blade Span: _____m **Number of Blades:**_____

2. Blade Height Above Ground- Max.:_____m;
Min.:_____m

3. Surface Area of Search Plot:_____m^2

4. Attach map of each turbine with 120 meter plot, search boundaries, location and numbering of transects/area covered by nets, and vegetation classification if applicable on separate sheet.

5. Attach a spreadsheet with weather data collected at 10-minute intervals. Data should include wind speed, temperature, precipitation, cloud ceiling height, and height and altitude of monitoring device.

6. General Habitat Description and Topography within 100 m of Turbine:

7. General Habitat Description and Topography >100m from Turbine:

FORM Wind-70008-Mort-3a
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Daily Search Summary
Page: _____ of _____
Project Name:_____ *(complete each day of search)*

	Turbine		Time			Number of Carcasses Found				
Date	Number	Observer	Start	End	Weather[a]	Bat	Bird	Other	Total	Comments

[a]Weather: F= fog, D= drizzle, R= steady rain (Use additional Pages as needed)

FORM Wind-70008-Mort-3b **COMMONWEALTH OF PENNSYLVANIA** **Observer**
Name:_____
02/05 Pennsylvania Game Commission

Date:_____

Project Name:_____ Carcass Data Sheet

(Use to record all carcasses found)

% Cloud Cover: _____ **%;** **Temperature:** _____ **°C;** **Precipitation:** _____ **(fog, drizzle, steady rain)**

	Carcass Tag Information[a]				Check One[b]		From Turbine					
Time (h)	**Turbine No.**	**Date**	**Transect No.**	**Specimen No.**	**Bat**	**Bird**	**Azimuth**	**Dist.(m)**	**Species**	**Age[c]**	**Sex[d]**	**Condition[e]**

[a]Carcass Number= Turbine # - Date - Transect No. - Sequential Specimen No.; [b]If other than bat/bird leave blank and complete remainder of information; [c]Age= A (adult), J (juvenile) Unk (unknown);
[d]Sex= M(male), F(female), Unk (unknown); [e]Condition: E= excellent, F= fair, P= poor.

PENNSYLVANIA GAME COMMISSION **(9/22/09)**
BALD EAGLE NESTING SURVEY PROTOCOL

The bald eagle (*Haliaeetus leucocephalus*) is a state listed threatened species known to nest in wooded areas in the vicinity of large bodies of water or wetlands. The nest is typically placed in a fork high in a tree, usually 40 to 100 feet above ground. White pine, sycamore, red oak and red maple seem to be preferred nesting trees in Pennsylvania. The nest trees typically are in large mature stands of timber with an open and discontinuous canopy that allows for an easy flight path to and from the nest. Occasionally isolated trees, snags, or artificial structures are used. Most eagle nests in Pennsylvania have been placed in view of a large body of water and within 1 mile from their primary food although new sites are sometimes 2 or more miles from large bodies of water. Mature forests associated with bodies of water greater than 20 acres or major rivers are considered potential habitat for nesting bald eagles.

This protocol provides a framework for conducting surveys to determine presence or absence of the species in and adjacent to a project area. The following surveys should be conducted after the Pennsylvania Game Commission (PGC) has indicated the presence of potential eagle nesting activity in or adjacent to the project area. Coordination on state listed endangered, threatened, and special concern species of birds and mammals is done through the Division of Environmental Planning and Habitat Protection located at the PGC office in Harrisburg, PA.

SURVEY METHODS

Bald eagles are easily surveyed because of their large (5-10ft diameter) and conspicuous nests that are located in tall trees usually within sight of bodies of water. Surveys should be conducted between February 1 and May 1 in any area over, adjacent, or within 2 miles of large bodies of water or major rivers. The surveys should be conducted at least 3 times with a minimum of 3 weeks between survey dates. The bald eagle is prone to indirect disturbance factors that can cause them to abandon a nest site. In order to assess potential impacts it is required that the nest site surveys be conducted within the project area and extend 1/4 mile beyond the outer project area boundary.

Surveyors should not approach any closer to active nests than is needed to identify the species, determine the nest location, and determine the nesting status. Approaching too close to the nest or multiple visits can disrupt nesting activity and may cause nest abandonment. If a nest is located the PGC should be contacted immediately for further instructions.

A brief report should be developed and sent to the Pennsylvania Game Commission, Division of Environmental Planning and Habitat Protection, that includes the project description, days and times the surveys were conducted, nest location (s), species heard or seen (bald eagle plus any other species of special concern), weather conditions, a map of the survey areas and nest location (s), photographs of the surveyed wetlands, etc.

For additional information contact: Pennsylvania Game Commission
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17013
(717) 783-5957

* In addition to being protected under State law, the bald eagle is also protected under Federal law. The U.S. Fish and Wildlife Service may require additional surveys (aerial or others) above and beyond those recommended by the PGC.

Commonwealth of Pennsylvania
Pennsylvania Game Commission, Bureau of Wildlife Management
Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Protocol for Assessing Abandoned Mines/Caves for Bat Surveys

In general, openings can be dismissed from bat surveys when:

1. There is only one horizontal opening less than 6 inches in diameter and no or very little airflow is detected.
2. Vertical shafts <1 foot in diameter.
3. Passage continues less than 50 feet and terminates with no fissures that bats can access.
4. Mines that are prone to flooding, collapsed shut and completely sealed, or otherwise inaccessible to bats.
5. Openings, which have occurred recently (within 1 year) due to subsidence.

Additional notes: Bats can access mines via old open buildings such as a fan house. Foliage and other vegetation in front of mine openings do not stop use by bats. They can navigate through foliage. Collapsed entrances with multiple crevices between boulders etc. are accessible to bats and should be sampled. Collapses completely sealed with fine soil are of course inaccessible to bats.

Sampling Dates, Times and Temperature Criteria

1. Spring sampling will be conducted between: April 10 thru May 10
2. Fall sampling will be conducted between: September 15 thru October 31
3. Sampling will start ½ hour before sunset and continue for at least 5 hours.
4. Weather must provide for:
   a. Temperatures ≥50°F (10°C) for first 2 hours of sampling and not fall below 35°F (1.6°C) by midnight.
   b. At least 3 hours free of heavy rain and thunderstorms.
5. Sampling will be conducted on two evenings. If no captures occur and no bat activity is noted with a bat detector on the first evening during acceptable weather conditions, sampling can be suspended for the site.
6. The shining of lights, and noise will be kept to a minimum with no smoking around the sample site. The use of radios, campfires, running vehicles, punk sticks, citronella candles and other disturbances will not be permitted within 300 feet of site during surveys.
7. Before conducting surveys, local residents and/or law enforcement agencies should be informed of the scheduled nighttime activities.

Equipment

No equipment, litter or other debris will be left unattended at site that could result in the capture or entanglement of any animals. Any equipment stored at site between sampling sessions will be clearly labeled with contact information.

Harp Trap: Place in front of opening and block surrounding space with plastic sheeting or bird netting. Traps should be tended at least once per hour. When the catch rate is high (>25 bats per hour) or during inclement weather, traps should be tended more frequently.

Mist Nets: 50 denier, 38mm mesh. Place in front or around opening. Nets need to be monitored closely and checked at least once every 20 minutes. At sites with a heavy bat swarm, the net may need to be monitored continuously.

Bat Detector: A bat detector should be on site to monitor bat activity when trapping or netting. Bat passes should be monitored and tallied for at least one hour after 10pm. Bat tallies should be reported along with the time sampled. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.

Other: In situations where it is too dangerous to approach an entrance, bat detectors and/or night vision/infrared recording devices may be used to monitor and record bat activity to determine bat use of the site. Bat activity in or around the entrance can be monitored by counting bat passes with a bat detector, or night vision/infrared video tapes can be made providing actual counts of bats entering the opening. As with trapping, monitoring should be conducted for 5 hours. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.

Reporting

In addition to reports for the client, the Pennsylvania Game Commission requires copies of the report as part of the vendor's permitting requirement. To simplify data entry, mandatory sampling summary forms are also required by the PA Game Commission for bat surveys within the Commonwealth. If the vendor did not receive a copy of the data form with the permit, they can be obtained by contacting the:

Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
717/787-5740

INTERIOR WINTER HIBERNACULA SURVEYS

Sites that are determined to be safe for entry to conduct winter counts (primarily caves & stable hard rock mines) will be coordinated with the PA Game Commission, Wildlife Diversity Section and scheduled for interior surveys between January 1 and March 10. Contact information for the Wildlife Diversity Section is:

PA Game Commission
Bureau of Wildlife Management, Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
(717) 787-5529

Base map from PAMAP Program 2005 Color Orthophotos of Pennsylvania, photos 23002330PAS and 24002330PAS.

- LOSHMA PROPERTY BOUNDARY
- EXISTING CONTOURS
- FENCE
- FREY FARM LANDFILL (FFLF) PERMITTED BOUNDARY
- TURKEY HILL TRAIL
- PROPOSED WIND TURBINE TOWER LOCATION
- X OBSERVATION POINT LOCATION

Sector	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area.
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated.
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

ARM Group Inc.
North Resource Engineers and Consultants
1129 West Governor Road - Hershey, PA 17033-0797
Ph: (717) 533-8600 Fax: (717) 533-8605

No.	Revision	Date	By

project ARM
client MSC
work RMM
scale NTS
date 02/02/2010
project no. 06377-5-5
project code

2009 FALL RAPTOR AND EAGLE MIGRATION SURVEY MAP

project title LCSFWA/PPL PROPOSED FFLF WIND ENERGY PROJECT

MANOR TOWNSHIP
LANCASTER COUNTY, PA

Fig. 5

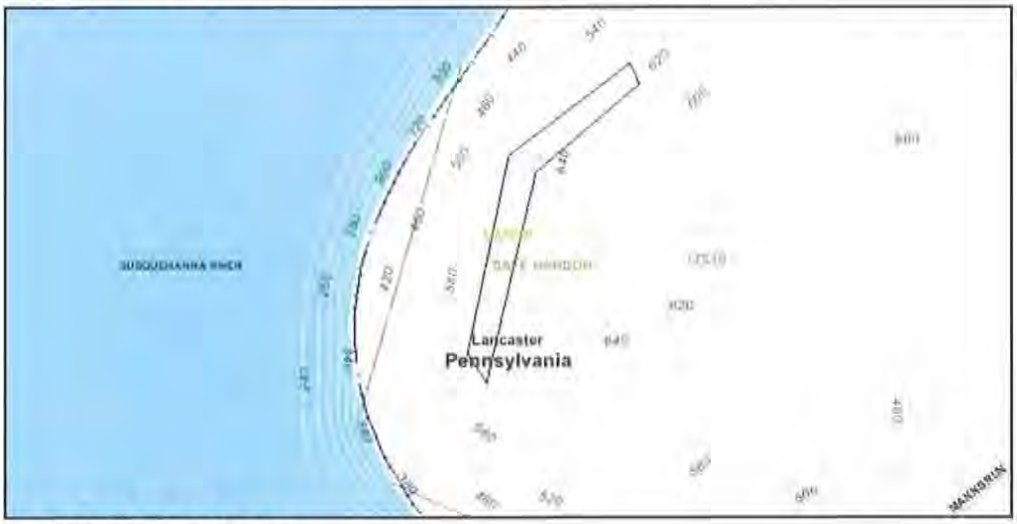
APPENDIX B

AGENCY COORDINATION

PNDI REVIEW RECEIPT

1. PROJECT INFORMATION

Project Name: **LCSWMA/PPL WIND ENERGY PROJECT**
Date of review: **9/16/2009 9:33:47 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Wind power facility (wind farm, turbines) - new, expansion, modification**
Project Area: **7.3** acres
County: **Lancaster** Township/Municipality: **Manor**
Quadrangle Name: **SAFE HARBOR**
ZIP Code: **17516**
Decimal Degrees: **39.95956 N, --76.45519 W**
Degrees Minutes Seconds: **39° 57' 34.4" N, -76° 27' 18.7" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Conservation Measure**	**No Further Review Required, See Agency Comments**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

RESPONSE TO QUESTION(S) ASKED

Q1: "Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. ""Project"" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur ."
Your answer is: **"3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from a wetland specialist, and detailed project maps should document this.) "**

Q2: Accurately describe what is known about wetland presence in the project area or on the land parcel. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur .
Your answer is: **3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)**

Q3: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Casmerodius albus
Common Name: Great Egret
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Protonotaria citrea
Common Name: Prothonotary Warbler
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Threatened

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Ammannia coccinea
Common Name: Scarlet Ammannia
Current Status: Endangered
Proposed Status: Threatened

Scientific Name: Rotala ramosior
Common Name: Tooth-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

RESPONSE: Conservation Measure: Please avoid the introduction of invasive species in order to protect the integrity of nearby plant species of special concern. Voluntary cleaning of equipment/vehicles, using clean fill and mulch, and avoiding planting invasive species (http://www.dcnr.state.pa.us/forestry/invasivetutorial/index.htm) will help to conserve sensitive plant habitats.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Michelle Cohen
Company/Business Name: ARM Group Inc
Address: 1129 West Governor Road
City, State, Zip: Hershey, PA 17033
Phone:(717) 533-8600 Fax:(717) 533-8605
Email: mcohen@armgroup.net

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Michelle S. Cohen 10/5/09

applicant/project proponent signature date

Letter to PGC October 28 2009

ARM Group Inc.
Earth Resource Engineers and Consultants

October 28, 2009

Certified Mail Article Number: 7008 1140 0004 8931 4952

Ms. Tracey Librandi Mumma
Wind Project Coordinator
Pennsylvania Game Commission
2001 Elmerton Avenue
Harrisburg, PA 17101-9797

Re: Threatened and Endangered Species
Project Review Request
PNDI Search ID 20090916210107
LCSWMA/PPL Wind Energy Project,
Manor Township, Lancaster County
Pennsylvania
ARM Project 06377-6-3

Dear Ms. Librandi,

ARM Group Inc. (ARM), on behalf of the Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Development Company LLC, is requesting from the Pennsylvania Game Commission (PGC) a threatened and endangered species review for the above-referenced proposed Wind Energy Project. LCSWMA and PPL met with you on July 23, 2009 regarding the proposed Wind Energy Project. During the meeting, wildlife issues discussed included the raptor and eagle migratory bird surveys and an eagle/osprey nesting survey.

As you are aware, ARM is conducting engineering and environmental studies for the project. As part of the studies, a formal threatened and endangered species review response is requested in order to complete the erosion and sediment pollution control plan and application.

An on-line review of the Pennsylvania Department of Conservation and Natural Resource's Natural Heritage Program's Environmental Review Tool determined that potential impacts to three species of concern under the jurisdiction of the PGC warranted further review to resolve potential conflicts. The species are identified as the Great Egret (*Casmerodius albus*), a state endangered species; the Prothonotary Warbler (*Protonotaria citrea*), a species of special concern as well as another sensitive species, identified as State threatened. A signed copy of the Environmental Review Receipt and Review Form as well as other supporting project information is attached.

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Review of the Project Description and Site Location

PPL and LCSWMA are proposing to install wind turbine generators (WTG) at the Frey Farm Landfill (FFLF), Manor Township, Lancaster County, Pennsylvania (Figure 1, Project Vicinity Map). The project is situated south of Columbia Boro and along the Susquehanna River at Lake Clarke. To mitigate against potential migratory bird impacts, the proposed project size has been reduced from four WTGs to two WTGs. The WTG sites have been located back from the Susquehanna River, to avoid existing wooded habitat while preventing interference with landfill activities. Currently, two WTGs are proposed and are expected to generate approximately 3.2 megawatts of electricity. The hub height of the wind turbines will be approximately 80m (meters) and the rotor diameter is expected to be approximately 82.5m. The wind turbines would also include a section of new transmission line to connect the wind turbines to either an end user location, which is located on an adjacent property, or to the grid. The proposed project is situated adjacent to an active municipal solid waste landfill; accordingly, land disturbances are minimal and access is readily available.

The approximate locations of five potential WTG locations and the associated investigation area are illustrated on the enclosed Figure 2, Site Location Map (Safe Harbor, United States Geological Survey (USGS) 7 ½ minute quadrangle dated 1995). Although five potential turbine sites are being evaluated and shown on the mapping, only two turbine sites will be selected.

Access for the proposed WTGs during construction will be made using existing landfill roads, where possible. Additionally, efforts will be made to avoid disturbances to large mature trees. Areas surrounding the turbines upon project completion will be planted with native grasses and regularly maintained to minimize potential raptor hunting in and around the wind turbines. WTG 5 (Tower 5), if constructed, will be adjacent to a vegetated soil stockpile.

Existing WGT Investigation Area and Site Conditions at Frey Farm Landfill

The WTGs are proposed within the landfill property and adjacent to landfill activities. Existing habitat at the proposed WTG locations is primarily comprised of active hayland, maintained grass areas and herbaceous vegetated soil stockpiles. No wetland habitats or watercourses are present in the WGT investigation area.

As discussed during the July 23, 2009 meeting, Bald Eagles are known to the project investigation area and vicinity. An active Bald Eagle nest site (spring 2009) was located across the river from the landfill on the forested river slope in York County. Conejohela Flats Important Bird Area (IBA) #56 is situated approximately 1 mile north of the landfill and potential WTG locations.

Raptor / Eagle Migration Monitoring

The fall (2009) raptor and eagle migration survey is currently being conducted. The raptor and eagle migration surveys are being conducted in accordance with the PGC's *Wind Energy Cooperative Agreement, Exhibit A, Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*. The draft spring raptor and eagle migration monitoring report was submitted to the

PGC prior to the July 23, 2009 meeting and the fall migration survey report will be submitted upon completion following the survey. The bald eagle/osprey nest survey will be conducted in the 2009-2010 winter season, as requested by the PGC, to identify the locations of nests within the wooded hillsides (Lancaster and York borders) of the Susquehanna River in proximity of the proposed WTG locations. The nest survey will be conducted by helicopter boarded by two biologists. Data will be recorded and documented in a nest survey report and submitted to the PGC.

Thank you for your assistance with this project review. If you have any questions regarding this investigation, or if you require any additional information, please contact me by email at mcohen@armgroup.net or (717) 508-0528. Your time and attention to this request is greatly appreciated.

Sincerely,

ARM Group Inc.

Michelle S. Cohen

Michelle S. Cohen
Senior Scientist/Program Manager

Enclosures: PNDI Project Environmental Review Receipt and Form
Figure 1 – Project Vicinity Map
Figure 2 – Site Location Map

cc: Brooks Norris, LCSWMA
Steve Gabrielle, PPL

Signed Project Environmental Review Receipt and Form

1. PROJECT INFORMATION

Project Name: **LCSWMA/PPL WIND ENERGY PROJECT**
Date of review: **9/16/2009 9:33:47 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Wind power facility (wind farm, turbines) - new, expansion, modification**
Project Area: **7.3** acres
County: **Lancaster** Township/Municipality: **Manor**
Quadrangle Name: **SAFE HARBOR**
ZIP Code: **17516**
Decimal Degrees: **39.95956 N, --76.45519 W**
Degrees Minutes Seconds: **39° 57' 34.4" N, -76° 27' 18.7" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Conservation Measure**	**No Further Review Required, See Agency Comments**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

RESPONSE TO QUESTION(S) ASKED

Q1: "Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. ""Project"" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur ."
Your answer is: **"3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from a wetland specialist, and detailed project maps should document this.) "**

Q2: Accurately describe what is known about wetland presence in the project area or on the land parcel. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur .
Your answer is: **3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)**

Q3: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Casmerodius albus
Common Name: Great Egret
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Protonotaria citrea
Common Name: Prothonotary Warbler
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Threatened

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Ammannia coccinea
Common Name: Scarlet Ammannia
Current Status: Endangered
Proposed Status: Threatened

Scientific Name: Rotala ramosior
Common Name: Tooth-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

RESPONSE: Conservation Measure: Please avoid the introduction of invasive species in order to protect the integrity of nearby plant species of special concern. Voluntary cleaning of equipment/vehicles, using clean fill and mulch, and avoiding planting invasive species (http://www.dcnr.state.pa.us/forestry/invasivetutorial/index.htm) will help to conserve sensitive plant habitats.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Michelle Cohen
Company/Business Name: ARM Group Inc
Address: 1129 West Governor Road
City, State, Zip: Hershey, PA 17033
Phone:(717) 533-8600 Fax:(717) 533-8605
Email: mcohen@armgroup.net

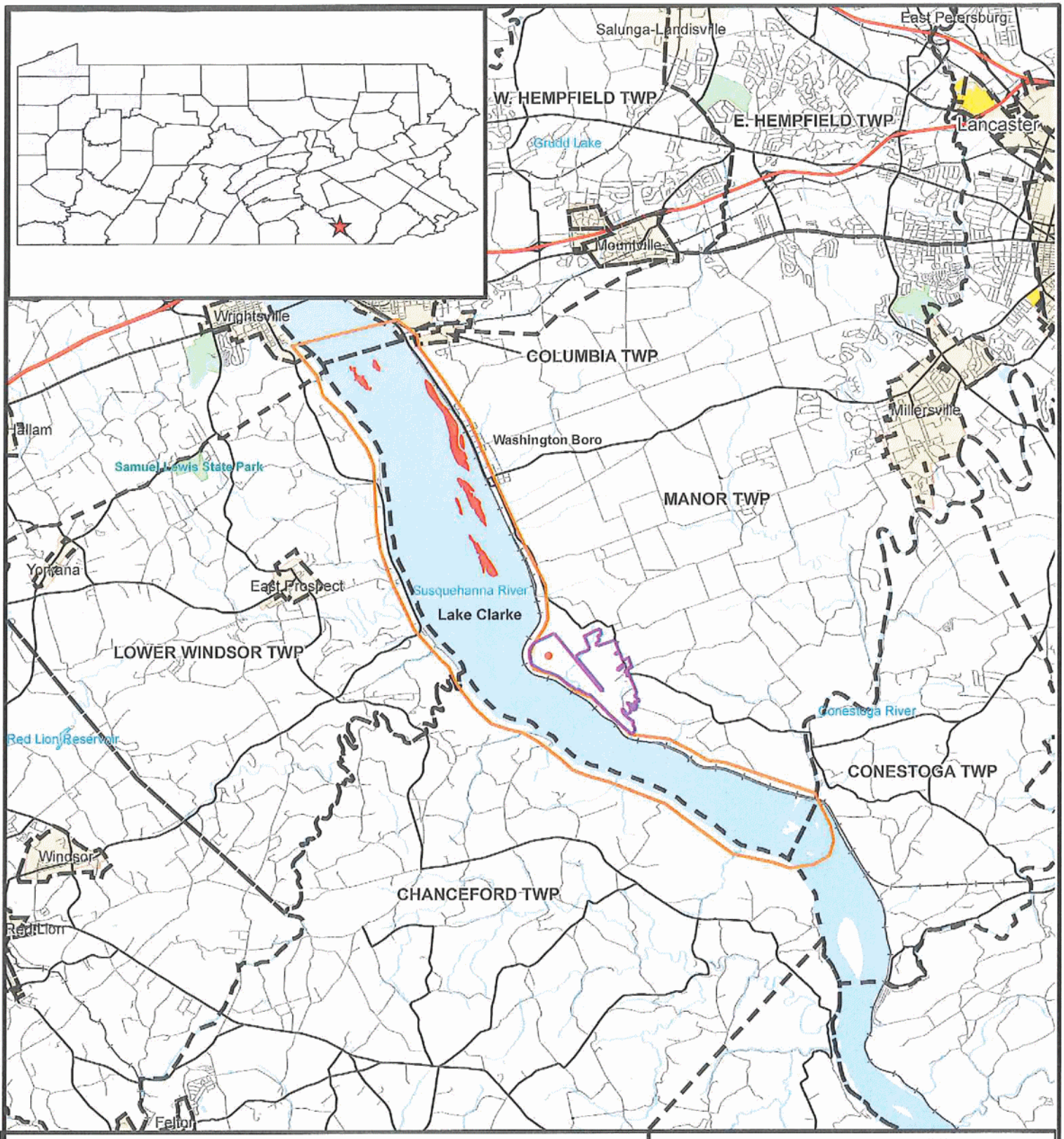
8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Michelle A Cohen 10/5/09

applicant/project proponent signature date

Figure 1 – Site Vicinity Map



LEGEND

- LCSWMA PROPERTY LINE
- CONEJOHELA FLATS IMPORTANT BIRD AREA
- CONEJOHELA FLATS
- MUNICIPAL BOUNDARY

0 5,000 10,000 20,000 30,000

Feet

N

Site Vicinity Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

May 2009	Scale: 1" = 10000'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 1

S:\06377 LCSWMA Wind Energy_Pdfs\SiteVicinityMap_buffer.pdf

Figure 2 – Site Location Map
(USGS Map showing tower locations)

Base map from Safe Harbor USGS 7½ minute quadrangle dated 1995.

LEGEND

- LCSWMA Property Boundary (Frey Farm/Creswell Landfill)
- Creswell Landfill Waste Limit (closed, inactive)
- Frey Farm Landfill (FFLF) Permitted Waste Limit
- Proposed Wind Turbine Location
- Conejohela Flats Important Bird Area

N

0 1,500 3,000 4,500

SCALE IN FEET

Site Location Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

August 2009	Scale: 1" = 1,500'	06377-5

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\06377_Figure 2 Site Location_USFWS.dwg

Letter from PGC November 30 2009

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110
"TO MANAGE ALL WILD BIRDS, MAMMALS AND THEIR HABITATS FOR CURRENT AND FUTURE GENERATIONS."

November 30, 2009 PNDI Number: 20090916210107

Michelle Cohen
ARM Group Inc.
119 West Governor Road
Hershey, PA 17033

PNDI Number: 20090916210107
Re: LCSWMA/PPL Wind Energy Project
Manor Township, Lancaster County, PA

Dear Ms. Cohen,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20090916210107 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office dated October 28, 2009, as well as PNDI data, and has determined that potential impacts to threatened, endangered or species of special concern may be associated with your project. Therefore, further coordination with this office is necessary to avoid potential impacts to the species listed below.

Scientific Name	Common Name	PA Status
Haliaeetus leucocephalus	Bald Eagle	THREATENED
Ardea alba	Great Egret	ENDANGERED

Next Steps

The proposed project is located adjacent to the Conejohela Flats Important Bird Area. This IBA has been designated as such because it has a significant concentration of waterfowl, it is the largest, most dependable migrant shorebird site in Pennsylvania, the site provides habitat for threatened, endangered, and species of special concern, and provides important feeding and resting area for a significant number of birds during migration.

The following surveys should be performed to assess the potential impacts to the above listed species and migrating birds from the proposed LCSWMA/PPL Wind Energy Project. Once the following surveys have been completed, please provide the results to the PGC so that a more accurate determination can be made:

- Spring and fall raptor and waterfowl migration surveys following protocols found in the PGC Wind Energy Voluntary Cooperative Agreement. The PGC requests a minimum of one full season of both spring and fall raptor migration surveys.
- Breeding bird surveys on entire project area following protocol found in the PGC Wind Energy Voluntary Cooperative Agreement. Breeding bird survey should include both point counts and area searches.
- Bald eagle nesting survey following the enclosed PGC protocol to document presence of nesting eagles within or surrounding project area. The PGC supports the USFWS request for a summertime survey of bald eagle movement and usage, including foraging activities, roosting activities, and identification of important roosting trees.

In addition to being protected under State law, the bald eagle is also protected under Federal law. The Bald and Golden Eagle Protection Act protects eagles from various forms of take, including disturbance. Please refer to the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines (http://www.fws.gov/migratorybirds/baldeagle.htm) for specific measures that should be taken to ensure bald eagles are not disturbed. If you have questions about when and how to obtain a federal permit because you believe your proposed project will disturb bald eagles, and you are not able to implement measures to avoid disturbance, please contact the Fish and Wildlife Service's Pennsylvania Field Office at 814-234-4090.

The operation of wind power projects in PA has resulted in mortality to birds and bats. The potential exists for mortality to federal and state-listed species of special concern and other species under the PGC's jurisdiction may occur due to tower operation. Of particular concern are the impacts during spring and fall migrations of birds and bats. In addition to the above surveys, the PGC strongly recommends investing the entire project area for caves and mine opening. If openings are found that have potential as bat hibernacula, they will need to be surveyed to determine the presence or absence of bat species using the attached *PGC Protocol for Assessing Abandoned Mines/Caves for Bat Surveys.* Also, the PGC recommends conducting pre-construction bat acoustic surveys following the monitoring protocols found in the PGC Wind Energy Voluntary Cooperative Agreement in order to assess the potential risk to migrating bats at this site. Likewise, the PGC strongly recommends mortality surveys for a minimum of two years post-construction following the standard mortality monitoring protocols found in the PGC Wind Energy Voluntary Cooperative Agreement to determine what the actual mortality of bats and birds is from this project's operation. The PGC Wind Energy Voluntary Cooperative Agreement and protocols are enclosed and can also be found on the PGC website, www.pgc.state.pa.us, click on "wind energy" in the "quick clicks" box on the right-hand side of the PGC homepage.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Tracey Librandi Mumma

Tracey Librandi Mumma
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3614
Fax: 717-787-6957
E-mail:tlibrandi@state.pa.us

A PNHP Partner

Pennsylvania Natural Heritage Program

Enclosure

PGC Wind Energy Voluntary Cooperative Agreement
PGC Bald Eagle Nesting Survey Protocol
PGC Protocol for Assessing Abandoned Mines/Caves for Bat Surveys

cc: Killough
Morgan
DuBrock
Brauning
Gross
Cindy Tibbott, U.S. Fish & Wildlife Service

PENNSYLVANIA GAME COMMISSION
WIND ENERGY VOLUNTARY COOPERATION AGREEMENT
February 23, 2007

The Pennsylvania Game Commission (Commission) seeks to coordinate wind energy projects with wind energy developers (Cooperator) in order to work collaboratively to ensure that wind-energy development project sites are developed in both an environmentally conscientious manner and with best regard to the conservation of the Commonwealth's wildlife resources.

Whereas, the Commission under its jurisdiction from Title 34 (Game and Wildlife Code) has authority to avoid, propagate, manage and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the laws of this Commonwealth relating thereto.

Whereas, both the Commission and Cooperator support renewable energy initiatives and are dedicated to arriving at uniform guidance, in the absence of comprehensive state regulations, on how best to avoid, minimize, and/or potentially mitigate adverse impacts to wildlife resources.

Whereas, the Commission and Cooperator, in an effort to best avoid, minimize, and/or mitigate potential adverse impacts with specific intent to birds and mammals, have entered into this Cooperative Agreement in an effort to standardize wildlife monitoring protocols and wildlife impact review methods associated with wind-energy development projects in a mutually beneficial and flexible manner and with high regard to both parties goals, objectives, and purviews.

Therefore, the Commission and Cooperator enter into this Cooperative Agreement and agree as follows:

1. The Cooperator will notify the Commission of any potential wind energy development sites (or an expansion of an existing site with the addition of 5 or more turbines), at least fourteen months prior to construction. The notification prior to the initiation of construction at the site will allow the Commission to provide as much known information on bird and mammal resources which may be present and/or potentially impacted by the development of the proposed wind-energy project. The notification should include a brief narrative of the project's planned development and proposed construction times and include as much detailed information as available such as: an original copy of the U.S.G.S.

topographic map(s) depicting the proposed project area boundary limits with the quadrangle name and associated county identified on it, the proposed project site's general infrastructure delineations (both known and planned) to include access roads, electric transmission lines, wind turbine locations, planned surface impact areas, development and future maintenance of the project, and any known wetland areas or predetermined wildlife habitat regimes which are deemed to be of critical importance or high value.

For those projects, which the Cooperator has already initiated prior to the effective date of this agreement, or that are planned for construction prior to the fourteen-month time frame noted herein, the Cooperator shall submit the required information within ninety days (90) from the date of this agreement.

For all other projects, which are currently under construction prior to the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* (post-construction bird & bat mortality) as contained herein. Further, within 90 days of the agreement date, the Cooperator can provide to the Commission a listing of all projects, which are planned for construction to begin within 12 months from the date of this agreement. The listing will include all available site-specific project information as more clearly specified within this paragraph for each project identified on the list. For each project identified on the list which construction commences within 12 months from the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* as contained herein. All other paragraphs, provisions, terms and conditions, which are not inconsistent to the above, shall remain in full force and effect.

2. It is understood between the Cooperator and Commission that both parties may support the use of other potential funding mechanisms or processes which directly or indirectly reduce the overall costs associated with the Cooperator's monitoring requirements as identified herein providing further the intent of those monitoring requirements remain the same.

3. The Commission and Cooperator will share all relevant information concerning wildlife resources under the jurisdiction of the Commission in and around the project area and the potential adverse impact to those resources. Shared information will include all known publicly available data from past/current/future monitoring efforts and pre and post-construction study results relative to the subject project area. The Commission further agrees to consider all existing relevant wildlife resource information provided by the Cooperator and the Commission will reduce to the fullest extent possible any further requests made to the Cooperator to provide additional relevant data and/or monitoring results which can be ascertained from known existing data regarding potential known wildlife impacts.

4. The Commission will provide the Cooperator with the results of all its internal reviews and provide written comment and or meet with the Cooperator within 45 days of receiving the information specified in Paragraph 1, as well as the results of the Pennsylvania Natural Diversity Inventory, and all pre and post-monitoring methods and recommendations on how best to avoid and reduce direct and indirect impacts to birds and mammals. Additional coordination will occur from the Commission for actions needed in regards to species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) to include all state threatened and endangered bird and mammal species known to occur or determined to exist within or adjacent to the project area.

5. The Commission in consultation with the Cooperator will determine the risk level for monitoring and survey efforts. If needed, the risk level may be adjusted based on new relevant information. The Commission may request the Cooperator conduct an additional year's post-construction monitoring if a T&E species is killed or other mortality is deemed to be at an unacceptable level for any species. The Cooperator may request a reduction in the mortality monitoring effort for the second year based on the first year's mortality results. Such a request by either party for additional or reduced monitoring shall be made in writing by the party requesting a change and an informal meeting will be arranged between the parties to discuss and mutually agree upon any changes in monitoring efforts.

6. All suggested pre-construction and some post-construction techniques are designed to reduce the exposure of state-listed species in order to avoid, minimize or mitigate potential adverse risk to species of special concern.

i. Birds

Migrating Raptors and Eagle Surveys

Goal: Assess risk to migrating raptors from development of wind power at a particular site in order to avoid, minimize, and mitigate adverse impacts.

Objective 1) Observe raptors to determine the number, height of flight, time of day, flight path, avoidance behavior, and species passing through the project area and zone of greatest risk.

Objective 2) Use the survey data to make recommendations to decrease potential adverse impacts to the wildlife resource.

1. Migrating Raptors Survey – If recommended by the Commission, raptor surveys will be conducted according to the attached protocol Exhibit A. The maximum level of effort per project will be one person per five days per week during the pre-construction phase and post construction phase, in both the spring and fall seasons during March and from August 15 through December 15. The minimum level of effort will be that no raptor survey is requested or conducted.

2. Eagles – If the project area is within proximity to a known migratory fly route for eagles, then additional monitoring shall occur in the spring in conjunction with the monitoring criteria noted in Paragraph 6-(i.) The maximum level of effort per project will be one person per five days per week for the entire month of March during the first years monitoring effort. The minimum level of effort

will be that no eagle survey is requested or conducted

3. Breeding Bird Surveys–

Goal: Assess risk to bird species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) in order to avoid and minimize direct and indirect impacts to these species and evaluate the potential for habitat enhancement/mitigation measures.

Objective 1) Proactively evaluate critical wildlife resources that may cause risk to the future stability of project operation.

Objective 2) Use the data to help develop and implement the most appropriate post-construction habitat reclamation and management for the site.

Objective 3) Determine if state listed species are present. If present then further coordination with the Commission is required in order to avoid, minimize, or mitigate potential impacts to the species or their habitat.

If the project area is within an Important Bird Area (IBA) as previously designated by the Audubon process, or within an area supporting birds identified as those priority species of "greatest conservation concern" within the Pennsylvania Comprehensive Wildlife Conservation Strategy, the Cooperator will conduct a survey to confirm or deny the presence of the species. The survey will consist of three days of effort (one day in May, two in June, separated by at least one week). Projects with existing data on species of special concern will be coordinated with the Commission as to the appropriate survey methods required to be used by the Cooperator.

4. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

ii. Bats

Hibernacula

Goal: Determine if any hibernacula exist within the project area in order to avoid and minimize impacts to active hibernacula and the associated bat species due to project development and its operation.

Objective 1) Conduct an on site field review to locate and determine use of potential bat hibernacula in the project area.

Objective 2) Survey bat hibernacula for species presence and abundance in order to assess potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid, minimize, and mitigate adverse impacts to bats and or enhance their habitat from project construction and operations.

1. Pre-construction survey- If recommended by the Commission, the Cooperator is responsible for surveying the project area for any caves, abandoned mine portals, or other openings that may harbor bats as per the Commission's protocol. All openings with potential as suitable bat hibernacula will be surveyed by a qualified bat biologist according to Exhibit B.

Goal: Determine those bat hibernacula existing within 5 miles of the project area that may induce additional avoidance and minimization measures due to anticipated adverse bat impacts from project operations.

Objective 1) The Commission will conduct surveys to locate and determine use of potential bat hibernacula within 5 miles of the project area boundary.

Objective 2) The Commission will survey bat hibernacula (outside of the project area) for species presence and abundance in order to establish potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid and minimize adverse impacts to bats and their habitat from project construction and operations.

2. Prior to the Cooperator conducting the field survey(s) as noted in Paragraph 6 (ii), the Commission will conduct a literature search for other mine portals/caves/openings which are suitable and/or known bat hibernacula and are on or within 5 miles of the proposed wind-energy project boundary delineation. The information will be provided to the Cooperator along with the relevant known bat hibernacula as per the Commission's review and the Commission's recommendations on the need for the Cooperator to conduct additional surveys based on the probable presence of Pennsylvania listed threatened, endangered, and/or candidate bat species. If the Commission recommends additional surveys, the Cooperator will conduct those surveys with a qualified bat biologist according to the attached protocol Exhibit B.

3. Cooperator will conduct pre and post-monitoring surveys as outlined in the Commission's attached Exhibit B & C. The maximum level of effort per project is one-year pre-construction survey and two years post-construction. The minimum level of effort is no bat survey is required.

4. Acoustic Monitoring

Goal: Determine the presence, activity, and temporal use of the project area by bats in order to avoid and minimize potential adverse impacts.

Objective 1) Surveys will be conducted to evaluate the levels of bat activity within the project area and determine their temporal patterns.

Objective 2) Evaluate the potential to avoid and minimize adverse impacts to bats based on their probable use of the project area during the project's construction and future operations.

Cooperator will conduct pre- and post-construction acoustic surveys based on priority level. This survey will assess the level of bat activity for both hibernating and tree bats. The priority level will be used for acoustic monitoring due to a lack of knowledge on the temporal and spatial activity of tree bats, as outlined in the Commission's attached Exhibit B. The maximum level of effort per project is one-year pre-construction and one-year post-construction from April 1 through November 15. The minimum level of effort is from July 15 to October 15 before and after construction.

5. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

6 iii. Post-Construction Bat & Bird Mortality Monitoring

Goal 1) Determine the mortality of bats and birds from project operation and whether those mortality rates would cause an unacceptable level of impact and if needed induce additional minimization or mitigation measures.

Objective 1) Conduct mortality surveys in the most cost-effective and proficient manner.

Objective 2) Provide a mechanism to evaluate the proficiency of the project's mortality survey methodology.

Goal 2) Assess the predictive value of pre-construction monitoring, minimization and avoidance measures by comparing those results with post-construction mortality.

Objective 1) Identify those protocols or monitoring methods that need revision, adaptation, replacement, or abandonment because of their level of success.

Objective 2) To make appropriate adjustments to monitoring protocol and future effort as indicated by the acquired information.

1. The Cooperator will perform the bird and bat mortality monitoring as outlined in the Commission's attached mortality protocol Exhibit C for a minimum of two years post-construction. Mortality studies shall be conducted from April 1 through November 15 by a qualified biologist(s) having expertise in the identification of bats and/or birds and at the interval as noted in the attached Exhibit C.

2. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

7. Cooperator agrees to utilize to the greatest extent possible, all reasonable and feasible generally accepted wind industry and Commission best management practices relevant to the conservation of wildlife resources during construction and subsequent operation of the wind-energy facility. The Commission shall provide copies of all known and updated best management practices to the Cooperator on an annual basis.

8. Commission agrees to issue a special use permit defining the terms and conditions for use throughout the project area by the Cooperator's designated biologist(s) for all bats, birds, and state listed threatened or endangered species which are collected while conducting the Commission's approved monitoring plan and

mortality protocol. The general format for the special use permit is attached as Exhibit D and may be automatically renewed upon the anniversary date of the permit, providing further that the permit terms and conditions have been strictly adhered to and this Cooperation Agreement remains in effect.

9. The Commission agrees not to pursue liability against the Cooperator due to any incidental takings of the Commonwealth's bird and mammal resources for which it has purview under Title 34 (Game & Wildlife Code) as a result of the Cooperator's wind-energy development and operations within the Commonwealth of Pennsylvania providing further such incidental takings were not malicious in their intent and the Cooperator remains in compliance with the terms and conditions of this agreement and has with a good faith effort avoided and minimized potential adverse impacts by way of implementing best management practices and Commission guidance as noted herein.

   The Commission and Cooperator agree to work cooperatively in the future to avoid, and minimize further impacts to the Commonwealth's bird and mammal resources as new relevant project information becomes available. In the event that an incidental take occurs upon a Pennsylvania listed threatened or endangered species of bird or mammal during the operation of any of the Cooperator's wind-energy facilities, the Cooperator agrees to take all reasonable measures as deemed appropriate by the Commission and the Cooperator to further avoid, minimize and/or mitigate such wildlife losses in the future.

10. Commission recommendations or decisions under the Cooperative Agreement do not supercede any comments, decisions, or recommendations of the United States Fish & Wildlife Service.

11. The Cooperator agrees to provide coordinated access, upon prior notice during normal business hours, to all its wind-energy facilities as deemed necessary by Commission staff in order to ensure both parties compliance to this agreement. All Commission access shall be coordinated as far in advance as possible and subject to all the normal safety measures implemented by the Cooperator with regard to access to the facility.

12. Either party upon their own discretion and reason can terminate this agreement in its entirety after having first provided the other party written notification of such termination forty-five (45) days in advance of such termination date. Said written notification to be sent certified mail to the respective parties place of address as noted herein. Termination can be conditioned to exclude those projects identified, which remain in compliance with the agreement.

13. It is understood between the parties that information resulting from the Cooperator's compliance with this agreement shall be treated with the highest affordable level of confidentiality available unless otherwise agreed to in writing by both parties OR if it is necessary to support the Commission's waiver of liability set forth in Paragraph 9 hereof. It is the intent of both parties to release to the general public relevant project monitoring & mortality information deemed to be in the best interest of both the Commission and Cooperator. Release of information will be by mutual consent only.

14. Assignment: The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any affiliate (as defined below) without the approval or consent of the Commission provided that (i) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment and (ii) the Cooperator notifies the Commission of any proposed assignment in accordance with this Agreement. The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any non-affiliate (as defined below) provided that (a) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment, (b) the proposed assignee has agreed in writing to be bound by all of the terms and conditions of this Agreement, (c) the Commission has met with the proposed assignee and the Cooperator, after being notified of the proposed assignment, to discuss the terms and conditions of the project(s) covered by the assignment and (d) the Commission consents to the proposed assignment in writing, which consent shall not be unreasonably withheld, conditioned or delayed. For purposes of this section, an "affiliate" of the Cooperator refers to any person, corporation or entity that (i) has a direct or indirect ownership interest in the Cooperator or vice

versa or (ii) is subject to common operating control and is operated as part of the same system or enterprise as the Cooperator. Any person, corporation or entity that is not an "affiliate" as defined above shall be a non-affiliate for purposes of this section. At the request of the Cooperator, the Commission and the assignee shall execute, after said assignment is approved if required, a new Agreement with terms identical to the terms of the Agreement at the time of the assignment.

15. Notices. All notices demands or requests required or permitted under this Agreement shall be in writing and shall be personally delivered or sent by certified United States mail (postage prepaid, return receipt requested), overnight express mail, courier service, facsimile transmission or electronic mail with confirming receipt (in the case of facsimile transmission and electronic mail with the original transmitted by any of the other aforementioned delivery methods) addressed as follows:

If to Commission to: Pennsylvania Game Commission
ATTN: William A. Capouillez, Director
Bureau of Wildlife Habitat Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

and

If to Cooperator to:

or to such other person at such other address as a Party shall designate by like Notice to the other Party. Unless otherwise provided herein, all Notices hereunder shall be effective at the close of business on the Day actually received, if received during business hours on a Business Day, and otherwise shall be effective at the close of business on the first Business Day after the Day on which received.

16. No Third-Party Beneficiaries. This Agreement is not intended to, and does not, confer upon any Person other than the Parties hereto and their respective successors and permitted assigns, any rights or remedies hereunder.

17. Entire Agreement. This Agreement, including all Schedules hereto, constitutes the entire agreement between the Parties hereto with respect to the matters contained herein and therein, and all prior agreements with respect to the matters covered herein are superseded, and each Party confirms that it is not relying upon any representations or warranties of the other Party, except as specifically set forth herein or incorporated by reference hereto.

18. Amendment. This Agreement may not be amended or modified except by a written instrument signed by each of the Parties hereto.

IN WITNESS WHEREOF, Commission and Cooperator have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION

ATTEST:

_____

Executive Director Date

COOPERATOR

ATTEST:

_____

President or Vice-President Date

_____

Company Name

EXHIBIT A (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Pre and Post-Construction Monitoring of Birds

Following is a classification of raptor concentration locations across Pennsylvania based on the number and type of species found. Pre-construction bird monitoring efforts at wind energy developments will be scaled based on this classification. A complete listing of Pennsylvania sites in which raptors concentrate is provided at the end of this document (Table 1).

Competent and experienced field ornithologists that are mutually agreed upon by the Cooperator and the PGC shall conduct migratory raptor or breeding bird surveys.

I. Classification of Monitoring Effort for Raptors

A three-tiered approach is recommended for raptor migration monitoring at prospective wind development sites:

A. High Priority Sites – Major raptor concentration points, including areas documented in migration.

Raptor Migration Survey Effort: At least one year full-time fall and spring monitoring with a corresponding effort post-construction.

B. Moderate Priority Sites -- Lesser disconnected ridges in the Valley and Ridge Province and near escarpments in the Allegheny Plateau Province.

Raptor Migration Survey Effort – At least one year full-time fall monitoring pre-construction and a corresponding effort post-construction, and where eagle migration is noted, spring monitoring.

C. Low Priority Sites -- Sites of flat terrain where there are no updrafts and low-priority sites as listed separately.

Raptor Migration Survey Effort – None.

Several sites designated as Low Priority. They lack a standard set of raptor migration data, but there may be significant migration at the site at some time of year. It is not required, but prudent to do a field check for raptors during periods when migration is most likely to occur to avoid risk to raptors migrating there.

II. Protocols for Diurnal Raptor Monitoring

Golden eagles tend to use the north-south trajectory of the ridges in south-central and southwestern parts of the state. Unlike other raptors, their spring route northward is similar to their fall migration route southward.

Diurnal raptor surveys should follow standards and forms used by the Hawk Migration Association of North America (www.hmana.org). The HMANA daily log form and instructions are attached as one sheet.

1. Site Location: The diurnal raptor monitoring site should be chosen with maximum count of migration as the goal. A good view of the escarpment, looking into the direction where most raptors are expected to fly (the windward side of the mountain) is necessary for a thorough count. A secondary site may be needed to see raptors during different prevailing winds. The site location and the reason for the change should always be indicated on the field form. Geographical information for the site should also be collected (coordinates in Latitude / Longitude, directions to site) for general reporting.

2. Field Season: The fall field season includes the period August 15 through December 15 and spring field season is March 1 through March 31.

3. Time and Frequency: Count hours are 9:00 to 5:00 EDT from August 15 through October 30, and 8:00 to 4:00 EST from November 1 through December 15. Emphasis shall be placed on periods when migration is greatest in numbers or when high priority species are most likely to occur. Therefore, sampling can be reduced to three days a week from 15 August through 15 September, but should cover days when a large flight can be expected.

4. Equipment: The counter should use binoculars and or a scope. Hand-held weather instrument are preferred for gathering weather data. A laser rangefinder would be useful for measuring distance of raptors to the escarpment or proposed turbine sites.

5. Data Collection: All raptors considered migratory will be tallied by date and hour using the HMANA Daily Reporting forms. Data for both eagle species will be recorded on a separate form (see below). General instructions for entering data are provided in back of the HMANA form, including the codes for various weather data (e.g. sky, wind). Weather data will be recorded by the hour; wind data can be collected later from the meteorological tower. HMANA sites often use the Beaufort wind scale (see HMANA form), but directly measuring wind with a wind gauge also is acceptable.

   Flight Pattern Notes: Keep separate tally of raptors observed flying in the zone of the anticipated rotor sweep area where raptors may be at greatest risk. Separate tallies can be made on the HMANA form by designating the position of the birds or by using multiple HMANA forms for one day with a form designated for each of the three sectors delineated below. Participants are invited to devise their own form to accommodate this collection of behavior data. *This should be accomplished without compromising the total raptor count conducted with the HMANA protocol.* Raptors that are not using the ridge for migration should also be noted on the field form.

The relative position of raptors should be categorized with respect to the anticipated wind turbine rotor zones for the specific development in question. All raptors should be recorded passing the area, divided into the three sectors:

Code	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

If birds changed sectors, this should be indicated by sequential letters (e.g., AB, BC, ABC). Each individual bird should be classified by flight pattern.

Behavior: The type of flight should be recorded according to the following categories:

Code	Type of Flight
D	Direct flight with few changes in direction, all less than 30 degrees
I	Indirect flight during which more than one circle was recorded, but more than 50% of flight is without such turns
S	Soaring flight during which more than 50% of time is circling/
H	Flight that appeared to be for hunting
P	Birds that perched

6. Flight Altitude: Use the following table to describe the *general flight* of raptors at the site for each hour of observation. Additional notes on the flights of golden and bald eagles or other species of interest should also be recorded either as part of the Golden and Bald Eagle Data Form (Page 5) or field notes to be added to the data file of the site observation.

Code	Flight Altitude
0	Below eye level
1	Eye level to 30 meters
2	Birds easily seen with unaided vision (eyeglasses not counted as aids)
3	At limit of unaided vision
4	Beyond limit of unaided vision but visible with binoculars to 10X

5	At limit of binoculars
6	Beyond limit of binoculars 10X or less but can detect with binoculars or scope of greater power (note magnification)
7	No predominate height

All birds observed at the site are to be counted. Residents, or other individuals suspected to be previously counted, should be recorded.

7. Golden and Bald Eagle Data Collection: Eagle observations should be recorded on the Golden and Bald Eagle Data Sheet. (The eagle form also can be used to document details of flight line and behavior of other high priority species.) The eagle form includes a simple set of codes that allow for location and behavior options. These codes are provided at the bottom of the form. The weather can be recorded on the form in the style (codes) used on the HMANA form. Observers should fill in notes about behavior liberally in the right hand column or on extra sheets and use extra sheets as necessary.

Golden and Bald Eagle Data Sheet

Use as addendum to HMANA form

LOCATION:	**Date:**		**Sky:**
OBSERVER:	**Start:**	**Stop:**	**Wind:**

For Data Codes, see bottom of form.

#	Sps.[a] BE,GE	Time [b] (military)	Age [c] (J/Sub/Ad)	View [d] (D/V)	Height of Flight [e] (L/M/H)	Direct. of Flight [f] (NE, N...)	Flight Type [g] (P, G, S)	Flight Path [h] (RT, PRS, PRN, ..)	Behavioral Notes Interactions with other birds
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

[a] Species: Bald Eagle = BE, Golden Eagle = GE, see HMANA form for other species. [b] Time: use military time (0800, etc.), [c] Age: indicate either Juvenile (J), Sub-adult (S), or Adult (A). More detail on BE plumage types are appreciated but not necessary (e.g. Basic I,II, III, etc.). [d] View: D -= Dorsal, V = ventral, DV = Both. [e] Height of flight: L = 100 feet (30 m), M = 100 – 400 ft. (approx. tower ht.), H = above 400 ft. (tower ht.). [f] Direction of flight: N, NE, E, SE, S, SW, W, NW. [g] Flight type: P = Powered (flapping), G = Gliding, S = Soaring. [h] RT – Moving along Ridge Top, PRN = Parallel to Ridgetop Northside, PRS Parallel to Ridgetop Southside, VS = Valley to South, VN = Valley to North, XR = Crossed ridge, LR – left ridge.

Use additional sheets if necessary.

III. Pre-Construction Sampling for Breeding Birds

1. Survey Methods: Breeding bird surveys should be conducted once in May and two visits in June. Points should be established systematically at 250-meter intervals (or at 500 meters in grassland settings) using a grid or track that covers the projected development site. Based on overall project size and project configuration, the PGC will be flexible with regard to breeding bird survey sampling intervals.

A circle is delineated around each point of 50-meters and allowance is made for detecting birds outside that ring (unlimited circle). Observers should be experienced or be trained at judging distances, using a range-finder and local landscape features as cues. Sample period should be divided into three periods, starting with the first three minutes, the subsequent two minutes, and the final five minutes. These time bands allow comparisons between these data sets with other point-counts (including the BBS route data) of 3- and 5-minute lengths (Ralph et al. 1995).

Sampling should occur in the morning when detection of birds is greatest. Counts should not be conducted in periods of heavy rains or high winds. Each location should be approached quietly in order to avoid disturbance of the birds and to observe birds near the sample point, but outside of the detection circle. Each bird should be recorded in the first period it is observed. A small bull's eye is provided on the point count data sheet for registering the general location of the bird. The up position is North with the lines dividing the circle into four quadrants. Additional notes on location of birds can be made on separate sheets. Birds detected while flying over should be counted separately.

The location of each point should be registered on a separate form using GPS (Attachment Form Wind 7008). The use of standard four-letter species alpha codes, breeding bird atlas codes, and other standard abbreviations are helpful to the standardized collection of data (Ralph et al. 1993, Hamel et al. 1996, PA Breeding Bird Atlas website). A stopwatch or other chronometry is very helpful to ensure conformity to the time band data periods. A compass or GPS unit with compass capacity is needed to identify the position of the birds.

The field observer should provide evidence of rare or unexpected species by taking photographs, making field recordings, or field sketches. Digital recordings are preferable because of their ease of storage and transfer.

In each successive time-band, the observer should attempt to relocate each singing bird and record its detection in that period. Each observation should be categorized as either inside or outside the designated center circle (50 meter radius). If a bird moves from one side to the other of the count circle, it should be designated as the original position to inside, the original observation point should be noted. There are columns for non-singing observations provided for birds within and outside the circle. Care is needed to avoid duplicate counting of individuals at the same point or at multiple points.

The data collected with the removal method point-counts should be analyzed with methods outlined by Farnsworth et al. (2002). The program SURVIV also is used for finding estimates of densities and associated variables (White 1983). This program is available from the U.S.G.S. Patuxent Wildlife Research Center website (http://www.mbr-pwrc.usgs.gov/software.html#a).

Alternate point count methodologies that address observer detection effects, such as spot-mapping (I.B.C.C. 1970, Ralph et al. 1993) or distance sampling (Buckland et al. 2001, Rosenstock et al. 2002), may be used as an alternative to the point count data collection described herein.

2. Area Searches are effective for developing a species site list and detecting birds not as effectively detected by point counts (Ralph et al. 1993). This approach may replace or supplement the point count method.

The observer visits the variety of habitats at a site and records all birds encountered. As for any field survey, the weather conditions and field times also are recorded. The field time can be used as a measure of effort made by the observer and the bird data can be interpreted as birds per party hour or a similar efforts measure. There is a form for use in Area Search Surveys that will organize observations (Attachment Form Wind 7008). Any breeding behavior should be recorded using standardized Breeding Bird Atlas codes (see 2nd Pennsylvania Breeding Bird Atlas website and point count form). The locations of Species of Special Concern and Watch List species should be recorded (NAD27 format). Additional information about bird sightings and behavior can be recorded separately.

At least three area-searches should be conducted at the construction site and these searches include periods when Birds of Conservation Concern are most detectable (http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=164510). Since many raptors are more easily detected fairly early in the nesting season, a full sample protocol should include a field trip conducted from mid-March to April 30. A second trip in May would also be appropriate for earlier nesting species and has the potential for early-arriving forest migrants. A third trip should be taken in the peak of the nesting season for most songbirds in the period from June 1 through July 10 (but, June would be more effective than a July date). Some early-nesting species also can be detected in post-nesting period when dependent young are easily detected.

Data collected on these forms, maps, and associated documents shall be sent to the Pennsylvania Game Commission as outlined in the Special Use Permit.

FORM Wind-70008-BBPC-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Breeding Bird Point Count			
Site:	Observer:		Date:
Point #	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Indiv. & Posit.	**Species Code**[a]	**1 0 – 3 min.**		**2 3 – 5 min.**		**3 5 – 10 min.**		**Non-song Cues**		**Fly Over #**	**Breeding Code, Behavior, and Other Notes**
		<50m	**>50m**	**<50m**	**>50m**	**<50m**	**>50m**	**<50m**	**>50m**		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

[a] *Use standard 4-letter alpha codes for species names available at PBBA website, USGS, and various references.*

Notes:

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Codes for Breeding Bird Point Counts and Area Searches

Sky Condition Codes	
Code	Sky condition indicator
0	Clear or a few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy (broken) or overcast
4	Fog or smoke
5	Drizzle
7	Snow
8	Showers

Wind Speed Codes (Beaufort Scale)	
Code	Wind Speed Indicators
0	Smoke rises vertically (< 1 mph, <2 kph)
1	Wind direction shown by wind drift (1-3 mph, 2-5 kph)
2	Wind felt on face; leaves rustle (4-7 mph, 6-12 kph)
3	Leaves, small twigs in constant motion (9-12 mph, 20-29 kph)
4	Dust rises; small branches move (13-18 mph, 20 – 29 kph)
5	Small trees in leaf begin to sway (19-24 mph, 30-38 kph)

Pennsylvania Breeding Bird Atlas Breeding Codes (BC)

For further explanations of BCs, Safe Dates, and other Breeding Bird Information, see the website of the 2nd Pennsylvania Breeding Bird Atlas

Observed	
O	Observed within safe dates, but not in suitable habitat
Possible	
X	Bird seen or heard in suitable nesting habitat within safe dates
Probable	
T	Territorial behavior observed
P	Pair observed
C	Courtship behavior observed
U	Used nest of species found
A	Agitated behavior or anxiety calls given by adults
Confirmed	
CN	Bird seen carrying nesting material
NB	Nest building observed at nest site
DD	Distraction display
FL	Recently fledged young observed
CF	Adult carrying food or fecal sac
ON	Occupied nest found, contents unknown
NE	Nest found containing eggs
NY	Nest found containing young

FORM Wind-70008-PCL-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Point Count Locations at this Project.
Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
And datum used (NAD27 Preferred)

Project Name:_____ Page: _____ of _____

Total Number of Points:_____

Lat/Lon GPS Location Information (DMS) for All Points

DATUM used:

Point No.	Latitude			Longitude			Habitat:
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-BBPC-2
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Bird Survey Area Search Form			
Site:	Observer:		Date:
Area:	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Species Code	Breeding Code / Behavior Notes [a]	Habitat	GPS Location Data (NAD 27)					
			Latitude			Longitude		
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘
			o	‘	o	‘	o	‘

[a] Use Breeding Codes recommended for point counts. Also note if an audio-lure (tape-playback) was used to attract the bird observed.

Additional Notes on Survey:

Table 1: Tiered Approach to Classifying Risk to Migrant Raptors by Wind Power Development

**Risk assessment based on concerns for general raptor migration, for Bald Eagle (BAEA) or Golden Eagle (GOEA) migration or concentrations.*

High Potential Risk Sites					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Allegheny Front	Bedford, Blair, Clearfield, Centre	General, BAEA, GOEA	Yes	#84 Allegheny Front	Yes
Bald Eagle / Brush Mountains	Centre, Blair, Huntington	General, GOEA	Yes	#32 Bald Eagle Ridge	Yes
Conneaut Marsh / Geneva Marsh	Crawford	BAEA	Yes	#7 Conneaut / Geneva Marsh	No
Kittatinny Ridge / Blue Mountain	Monroe, Northampton, Carbon, Lehigh, Berks, Schuylkill, Perry, Franklin, Cumberland	General, BAEA, GOEA	Yes	# 51 Kittatinny Ridge / Hawk Mt. Sanctuary	Yes
Lake Erie Shore	Erie	General, BAEA	Yes	# 1 Presque Isle, # 2 Roderick Reserve	Yes (NY)
Lower Susquehanna River	York, Lancaster, Dauphin, Perry	BAEA	Yes	#56 Conjohela Flats, #57 Conowingo Reservoir, Muddy Run, #46 Sheets Island Archepeligo	No
Pymatuning Res. / Hartstown Complex	Crawford, Mercer	BAEA	Yes	#3 Pymatuning, Hartstown Complex	No
Second Mountain / Mauch Chunk Ridge	Lebanon, Schuylkill, Carbon	General, BAEA, GOEA	No?	#43 St. Anthony's Wilderness, #44 Second Mountain Corridor	Yes
Tuscarora / Cove Mountains	Franklin, Fulton, Perry, Huntington, Juniata	General	Yes	#36 Tuscarora Ridge / The Pulpit	Yes

High Potential Risk Sites (continued)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Tussey Mountain	Bedford, Blair, Huntington, Centre	General, GOEA	Yes	#81 Greater Tussey Mountain, #35 Rothrock State Forest	Yes
Upper Delaware River	Wayne, Pike, Monroe	BAEA	Yes	#60 Upper Delaware Scenic River	No
Moderate Potential Risk Sites					
Allegheny Ridge	Lycoming	General, GOEA	Yes	None Listed	No
Backlog Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Bald Mountain	Luzerne	General	No	None Listed	No
Berry Mountain	Dauphin, Perry	General	Yes	None Listed	No
Big / Sugar Valley Mountains	Clinton	General	No	None Listed	No
Brush Mountain	Centre	General	No	None Listed	No
Catawissa Mountain	Columbia, Luzerne	General	No	None Listed	No
Dunning / Evitts / Loop / Lock / Canoe Mountains	Bedford, Blair	General, GOEA	Yes	# 76 Canoe Creek Watershed	No
Jack's Mountain	Huntington, Mifflin, Snyder	General, GOEA	Yes	None Listed	Yes
Line / Little Mountains.	Northumberland	General, GOEA	No	None Listed	No
Mahantango / Buffalo Mountains	Dauphin, Schuylkill, Perry	General	Yes	None Listed	No
Meadow Mountain	Somerset	General	Yes	None Listed	None
Moosic Mountain	Lackawanna, Wayne	General	No	None Listed	No
Nescopeck Mt.	Columbia, Luzerne	General, BAEA	No	None Listed	No
Nittany Mountain	Centre	General, GOEA	Yes	None Listed	No

Moderate Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
North White Deer Ridge	Lycoming	General, GOEA	Yes	None Listed	Yes (historic)
Penobscot / Lee / Wilkes-barre / Wyoming Mts.	Luzerne, Columbia	General, BAEA	No	None Listed	Yes
Peter's Mountain	Dauphin, Perry	General	No	# 43 St. Anthony's Wilderness	Yes (historical)
Shade Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Shamokin Mountain / Montour Ridge	Union, Snyder, Montour, Northumberland	General	Yes	None Listed	No
Sharp / Pisgah Mountains	Lebanon, Schuylkill, Carbon	General	No	None Listed	No
Sideling Hill	Fulton, Huntington	General, GOEA	Yes	None Listed	No
South Mountain	Adams, Franklin	General	Yes	#40 Michaux State Forest	No
Spring Mountain	Carbon	General	No	None Listed	No
Stone Mountain	Huntington	General, GOEA	Yes	#35 Rothrock State Forest / Stone Mountain	Yes
Town Ray Hills	Fulton, Bedford	General, GOEA	Yes	None Listed	No
Wills Mountain	Bedford, Blair	General, GOEA	Yes	None Listed	No
Low Potential Risk Sites					
Big Mountain	Northumberland, Columbia	General	No	None Listed	No
Broad Mountain	Franklin	General	No	None Listed	No
Buck Mountain	Columbia, Luzerne	General	No	None Listed	No
Buffalo Mountain	Centre, Union	General	No	#37 The Hook Natural Area	No

Low Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Chestnut Ridge	Fayette, Westmoreland	General	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
First / Thick Mountains	Centre	General	No	None Listed	No
Front Mountain	Mifflin	General	Yes	None Listed	No
Laurel Hill	Fayette, Westmoreland, Somerset, Cambria	General, GOEA	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
Little Allegheny Mt.	Somerset, Bedford	General	No	None Listed	No
Locust / Nesquehoning Mts.	Schuylkill, Carbon	General	Yes	None Listed	No
Long Mountain	Mifflin, Centre	General	No	None Listed	No
Mahanoy Mountain	Northumberland	General	No	None Listed	No
Martin Mountain	Bedford	General	No	None Listed	No
Negro Mountain	Somerset	General	No	None Listed	No
North Mountain	Columbia, Sullivan, Luzerne, Wyoming	General	Yes	# 42 Loyalsock State Forest, # 48 Dutch Mt. Wetlands, # 49 Ricketts Glen State Park	No
Paddy Mountain	Centre, Union	General	No	None Listed	No
Polish Mountain	Bedford	General	No	None Listed	No
Savage Mountain	Bedford	General	No	None Listed	No
Warrior Mountain	Bedford	General	No	None Listed	No

Bird Protocol References:

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling. Oxford University Press, Oxford, United Kingdom.

Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simmons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. Auk 119: 414-425.

Hamel, P. B., W. P. Smith, D. J. Twedt, J. R. Woehr, E. Morris, R. B. Hamilton, and R. J. Cooper. 1996. A land manager's guide to point counts of birds in the Southeast. Gen. Tech. Rep. SO-120. New Orleans, LA: U.S. Dept. Of Agriculture, Forest Service, Southern Research Station. 39 pp.

Hawk Migration Association of North America (HMANA). 2006. (Data collection protocol). Forms available on-line at: http://www.hmana.org/forms.php (viewed 25 July 2006).

I.B.C.C. (International Bird Census Committee). 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24: 722-726.

Mulvihill, R. and M. Lanzone. 2006. 2nd Pennsylvania Breeding Bird Atlas Website. Carnegie Museum of Natural History. http://www.carnegiemnh.org/atlas/home.htm

Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission. [L. Williams, editor.] 2005. Pennsylvania Comprehensive Wildlife Strategy, Version 1.0. Harrisburg, PA.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. U. S. Dept. of Agriculture, Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-144.

_____, J. R. Sauer, and S. Droege (Tech. Eds.). 1995. Monitoring Bird Populations by Point Counts. Gen. Tech. Rep. PSW-GTR-149. Albany, CA: Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture.

Rosenstock, S. S., D. R. Anderson, K. M. Giesen, T. Leikering, and M. F. Carter. 2002. Landbird counting techniques: Current practices and an alternative. Auk 119: 46-53. White, G. C. 1983. Numerical estimation of survival rates from band-recovery and biotelemetry data. Journal of Wildlife Management 47: 716 – 728.

White, G.C.. 1992. PC SURVIV Users Manual. Dept. of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO. Found at U.S.G.S. Patuxent Wildlife Research Center website: http://www.mbr-pwrc.usgs.gov/software/index.html#a.

Exhibit B (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Pre and Post-Construction Monitoring of Bat Populations at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

I. Classification of Monitoring Effort for Bats for Pre and Post-Construction Monitoring

Pre- and post-construction bat monitoring efforts will be scaled to the type of bat activity on or within 5 miles of the proposed wind power project area, as identified in the following three site types. A **Hibernacula of Concern** is identified as a known hibernaculum that houses a large number of bats (1000+ counted in an internal survey or 100+ captured via trapping), one that supports a diverse number of bat species (4 or more species), or which houses the state threatened small-footed bat (*Myotis leibii*) or the state and federally listed endangered Indiana bat (*Myotis sodalis*) in Pennsylvania.

Sites are classified in the following three categories:

A. High Priority Sites:

1) Hibernacula of Concern exist on or within 1 mile of the project area or several hibernacula occur within 1 mile of the project area.
2) A hibernaculum with >5000 bats is on or within 5 miles of the project area.
3) Any known occurrence supporting breeding or hibernating state-listed threatened or endangered species is present on or within 5 miles of the project area.

Pre-construction work required:

1) Consultation with PGC required for state-listed bat occurrences.
2) Site-specific surveys include: spring migration and/or fall telemetry of a maximum of 10 or more individuals as determined by the PGC to determine areas of high use and travel corridors.
3) One season (April 1-November 15) of acoustic monitoring to determine activity levels of bats within the project area.
4) One season of mist netting following USFWS guidelines to determine the presence of Indiana bats and potential use of the area as maternity colonies. Work is conducted by approved bat consultants that are prepared to adhere with the transmitter requirements.

Post-construction work required:

1) Two years of mortality monitoring with possible extension based on severity of impacts.
2) Post-construction acoustic monitoring for one season (April 1 – November 15) and concurrent with mortality monitoring.

B. Moderate Priority Sites:

1) Hibernacula of Concern exist between 1 and 5-mile radius of project area.
2) Any hibernacula on or within 5 miles of the project area contains between 1,000 and 5,000 bats.
3) One hibernaculum containing between 100 and 1000 bats on or within 1 mile of the project area.

Pre-construction work required:

1) Pre-construction acoustic monitoring for a spring (April 1- April 30) and fall season (July 15 – November 15), and concurrent with mortality monitoring.

Post-construction work required:

1) Two years of mortality monitoring.
2) Post-construction acoustic monitoring for a spring (April 1- April 15) season and a fall season (July 15 – November 15), and concurrent with mortality monitoring.

C. Low Priority Sites: Criteria

1) No known presence of state-listed bats on or within 5 miles of the project area.
2) No known Hibernacula of Concern on or within 5 miles of the project area.
3) No hibernaculum with more than 100 bats exists in the project area.

Pre-construction requirements: Acoustic monitoring from July 15-October 15.
Post-construction: Standard post-construction mortality monitoring.

II. Protocols for Locating and Surveying Potential Hibernacula

Hibernacula (natural caves, mines, tunnels, and other underground workings) within the project area should be located using mineral literature (The Pennsylvania Cave Database, maps and records from the Office of Surface Mining, and the PA Bureau of Abandoned Mines) and properly investigated by a USFWS approved bat consultant.

Due to the increased bat activity around such sites and/or the presence of threatened and endangered species, Hibernacula of Concern on or within five miles of a proposed wind development site triggers bat monitoring efforts. The Pennsylvania Game Commission (PGC) will notify the developer if such a hibernaculum is known on or within five miles of the proposed project and the developer should enter into consultation with the PGC to determine if additional protection or investigation will be useful to siting turbines. The PGC may conduct a survey in or around the project area for potential hibernacula that are not currently known and survey them for the developer. In the event that the PGC survey results confirm a previously unknown hibernaculum the PGC will notify the Cooperator and further coordination will be required. If a mine is located and contains multiple entrances, then all the bats captured at each entrance will be added together to determine if the site qualifies as a Hibernaculum of Concern.

The following progression of action should generally be followed in order to meet the agreement, as fits the site classification hierarchy above:

1) A consultant/cooperator will perform a literature search for potential hibernacula within project area.
2) Following the literature review, a consultant will conduct ground searches to examine each identified potential hibernaculum, record the location with a GPS, and search for unknown openings (mine collapse, abandoned tunnels, new caves, etc) within the project area.
3) Consult with PGC to determine if any sites have ever been surveyed for bats.
4) PGC may conduct literature and ground searches for a potential hibernaculum located up to 5 miles from the project area.
5) PGC may survey hibernacula up to 5 miles from the project area.
6) Newly discovered sites, and sites that have not been investigated within 10 years, will be surveyed via the methods and protocols set forth in the USFWS mine sampling protocol.
7) Bat consultants from the USFWS approved list must be hired to examine any potential hibernacula within the project area.
8) If a state-listed species is located within the project area, the bat consultant will consult with the Cooperator and PGC to discuss telemetry protocols, effort levels and site specific details.
9) If the federally endangered Indiana bat is known to exist at any time within 5 miles, telemetry may be requested, and areas of use are to be determined. Buffer areas around the Indiana bat location should not be included in the project area.
10) Data must be entered on provided sheets (Appendix A) and submitted to the PGC before construction. Maps should indicate all turbines, hibernacula surveys, and results of telemetry if applicable.
11) All captures of state-listed bats must be photo documented as described in Appendix A.
12) Genetic samples (wing punches) and hair sample collection need to be taken on all individual state listed species Each individual will also be banded with a unique band of appropriate size (Indiana bat bands must be obtained by the consultant from the PGC). Consultants should contact the PGC prior to performing work.

III. Protocols for Mist Netting Surveys

The length of the project area (or summation of all roads, whichever is longer) will be tallied. There will be 1 mist netting station per kilometer of the project area. For projects that are not linear in design, a polygon surrounding the entire project area will be tallied and there will be 2 stations per square kilometer.

1) Mist netting shall follow USFWS guidelines in terms of both level of effort and sampling protocol except for the below additions:
2) All bat consultants to perform this work must be on the USFWS approved Indiana bat list and obtain a special use permit from the PGC.
3) Proposals should be submitted and approved by PGC before work commences and include a map of the project area, locations of the turbines, and estimated locations targeted for net deployment.
4) All captures of Indiana bats should be photo-documented with profile shots of the head and shots of the foot and keeled calcar for Indiana bats as shown in Appendix A. Photos of small-footed bats should clearly show the entire facial mask and foot as well.

5) Genetic samples (wing punches) and hair samples should be collected and marked for all Indiana, small-footed, red, hoary, and silver-haired bats. Consultants should be prepared to attach a unique band to each of these species and should consult with the PGC prior to the commencement of work, with all data recorded on data sheets provided (Appendix A).
6) The bat consultant should have transmitters prepared for all captures of small-footed and Indiana bats in order to locate roost trees. Transmitters should be capable of operating for 21 days on the state frequency of 172 MHz. The PGC must be notified no later than 72 hours post capture and attachment of the transmitter.

IV. Protocols for Standardized Acoustic Monitoring of Bats

The recommendations following for acoustical monitoring are geared towards assessing temporal and spatial activity of bats, with an emphasis on the migratory tree bats.

1) All met towers installed on site should be equipped with acoustic monitoring devices as close to rotor zone as possible. It is suggested to have contractor attach equipment before tower is raised.
2) If possible, Met towers should be maintained for at least one year following construction in order to complete acoustic monitoring.
3) All projects should use the same type of detector throughout the study.
4) Detectors should record from 30 minutes prior to sunset to 30 minutes following sunrise every day.
5) Acoustical monitoring will record the number of bat passes per hour and will be entered on data sheet provided.
6) All recorded calls should be permanently archived for possible research needs and submitted with final report.
7) Provide data regarding wind speed, humidity, and ambient temperature every 10 minutes from the project area and concurrent with acoustic and mortality monitoring surveys.
8) All met tower locations must be recorded with GPS unit (decimal degrees, NAD 27 preferred) and should be reported on project maps.
9) All information gathered must be entered on Pennsylvania Game Commission survey forms (Appendix A).
10) Copies of all acoustic data sheets will be submitted in conclusive end-of-year reports to the PGC Harrisburg, PA at the end of every calendar year.

APPENDIX A
COMMONWEALTH OF PENNSYLVANIA

Pennsylvania Game Commission, Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Procedure and format for permittee reports to the PA Game Commission when conducting wind turbine pre-construction bat netting and bat detector surveys.

The report is divided into five sections which include: (1) Cover page, (2) Site Survey Record, (3) Bat Measurement and Capture Data Forms, (4) Maps and (5) Photo Documentation.

Section 1 - Cover

A separate cover page should be provided for each project with the accompanying data of Sections 2 through 5 contained within. An example is provided.

Section 2 - Bat Netting/Acoustic Survey Record

(FORM Wind-70008-PRE)

This is a **mandatory** two-page summary of site(s) surveyed, captures and bat detector tallies of bat passes. It should be completed for all sites surveyed, including those with no captures. If an additional technique other than mist netting and bat detector work is conducted, it should be described in remarks. Complete 1 for each site survey night (If site is trapped twice, 2 site survey records are required, etc.).

This form may not be modified for reporting because it is used for data entry. If necessary, supplemental pages may be added to report unique data.

Section 3 - Bat Measurement and Capture Data Form

(FORM P-70008-M)

This form is **mandatory** for:

1. *Myotis sodalis* captures
2. *Myotis leibii* captures
3. Bats you are banding and all band recaptures
4. All radio-tagged bats (describe transmitter in remarks)
5. Bat species not usually found in Pennsylvania*.

* Pennsylvania species: *Myotis lucifugus, Myotis septentrionalis, Myotis leibii, Myotis sodalis, Eptesicus fuscus, Pipistrellus subflavus, Lasiurus borealis, Lasiurus cinereus, and Lasionycteris noctivagans*

This form may not be modified for reporting because it is used for data entry.

The surveyor also has the option to use this form for measuring and reporting all bats. All measurements should follow North American collector standards (Nagorsen, D. W. and R. L. Peterson. 1980. Measurements and Weights. Pp. 22-26 in Mammal Collectors' Manual. Royal Ontario Museum, Publications in Life Sciences). Banded bat information will be maintained in a database and future recaptures of your bands will be reported to you.

Section 4 - Maps

An example is provided. All survey sites will be reported on a map (preferably a 7.5' USGS Topographic Map) so that locations can be accurately located and coordinates verified.

Section 5 - Photo Documentation

An example is provided. It is required that photographs be taken of identification characteristics of all *M.sodalis*, *M.leibii*, and species not usually found in PA. The photos should be labeled with the site, date and capture number.

Return reports to address on the heading of this page within 90 days of project completion.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

WIND FARM PERMITTEE
BAT CAPTURE / ACOUSTIC MONITORING PRE-CONSTRUCTION SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address: _____

_____

_____

Phone: (_____)_____-_____ **Fax:** (_____)_____-_____

E-Mail:_____

Project Supervisor Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____

_____

_____

FORM Wind-70008-PRE
02/05
Section 2

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

BAT -NETTING/ACOUSTIC SITE SURVEY RECORD

1. Survey Date:_____ **2. Company Name:**_____

3. Reporter:_____ **4. Assistants:**_____

5. Site Name and/or Number:_____

6. Site is (circle one): hibernation site summer habitat

7a. If hibernation site circle one: limestone mine, coal mine, limestone cave, sandstone cave, RR tunnel,

other structure, describe -_____.

7b. If summer habitat, describe area being sampled (e.g. forested stream or forest clearing with stream):

_____

8. County:_____ **9. 7.5' Quad.:**_____

10. Was site GPS'd (required) YES - NO

11. Geographic Coordinates (D-M-S): Latitude: _____°-_____'-_____"N, Longitude: _____°-_____'-_____"W

Datum *(circle one)*: **NAD27** (Preferred), NAD83, WGS84, Other:_____

12. Ownership and Access: *(Who owns site or controls access? Give name and address.)*_____

_____

13. Time *(military)* **& Temperature:** Start Time_____h Stop Time_____h Total Minutes:_____

Start Temp._____°C End Temp._____°C

14. General Weather *(circle one)*: Clear; Partly Cloudy; Mostly Cloudy; Cloudy; Drizzle; Intermittent Rain; Steady Rain; Thunderstorms; Snow; Other:_____.

15. General Wind Conditions *(circle one)*: Calm, Breezy (Leaves Rustling), Windy (trees swaying).

16. Capture Setup at Site *(Minimum of 2 sets required at each site)*:

Set #	Type	Count	Dimensions	Description	TOTAL AREA (m)
1	**Nets**	*4*	*12m x 2.6m*	*Stacked over trail*	*124.8 sq. m*

Total Capture Area:_____sq. m

(Site Survey Record – Continued) **Site Name/No.:** _____ **Date:**_____

17. Describe habitat 150 m around site: *(topography and vegetation including dominant tree species.)*

18. Was reproductive status checked? YES / NO *(if "NO" only enter numbers in* **Total** *columns)*

***CAPTURE RESULTS**

Species	Number of Adult Females				No. Juv. Fem.	Total No. Fem.	Number of Adult Males		No. Juv. Male	Total No. Males	Species Totals
	NR	PG	L	PL			SCR	NR			
Eptesicus fuscus	2		1			3	2	1	1	4	7
Myotis lucifugus											
Myotis septentrionalis											
Myotis leibii											
Myotis sodalis											
Eptesicus fuscus											
Pipistrellus subflavus											
Lasiurus borealis											
Lasiurus cinereus											
Lasionycteris noctivagans											
Other – specify:											
Other – specify:											

Reproductive Status: **NR**= nonreproductive, **PG**= pregnant, **L**= lactating, **PL**= post lactating, **SCR**= scrotal/epididymis swollen. **Grand Total**

***Complete Measurement and Capture Data Form for all:**
(1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA.

Comments:

DATE:_____

19. ACOUSTIC MONITORING: ***(Tallies of bat passes / hour. Use military time and record sunset/sunrise times in comments.)***

Hour # ___	Hour # ___	Hour # ___	Hour # ___	Hour # ___
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C
For bat detector passes where calls can be identified by Genus and/or species, record identification data below by call tallies				
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____	Genus: _____ Species: _____ No. of Calls:_____
Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____	Hr # No. of Unk. Calls:_____
Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____

Comments:

DRAFT

FORM P-70008-M
12/01
Section 3

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Page#_____ of _____

Bat Measurement and Capture Data Form

(Complete for all (1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA)

Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

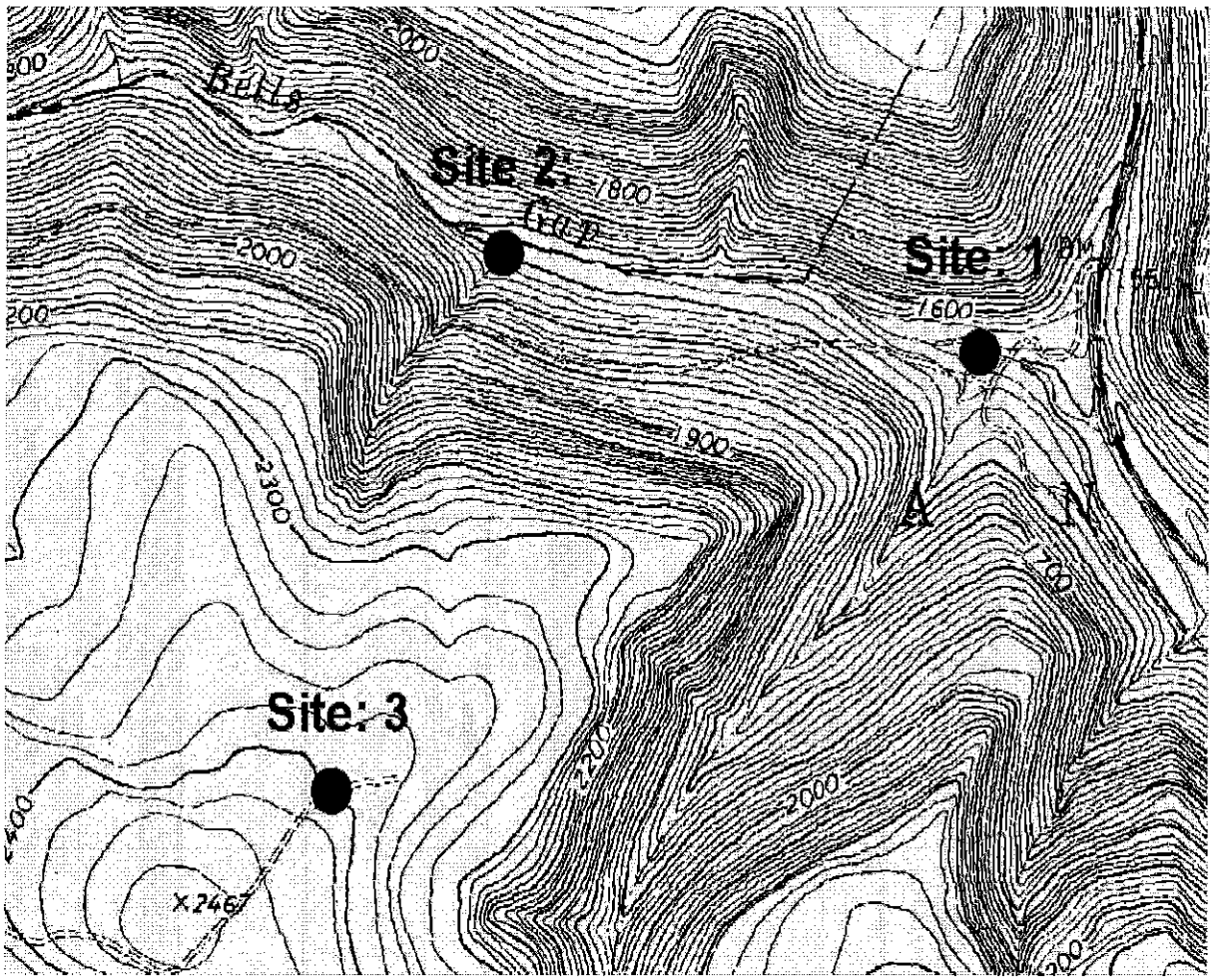
Site Name Or Number:				Date:				Set No. Captured In:		Name of Person Identifying the Bat:					*Capture Number:	
Height in meters captured above ground surface: _____ m				Body Measurements *(grams and millimeters)*						Band Information *(if banded)* *(Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)*						Transmitter Attached? If so: Frequency *(mHz)*
Species	Sex	Age	Repro. Condition	Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right		
Time of Capture	Photo Taken Yes / No		Remarks:													

*Capture Number = number in sequence by site

DRAFT

Section 4 - Maps *(example)*

Blair Co., Blandburg Quadrangle, Bells Gap Area.
Location of Sites 1, 2, and 3 for Project PA-24

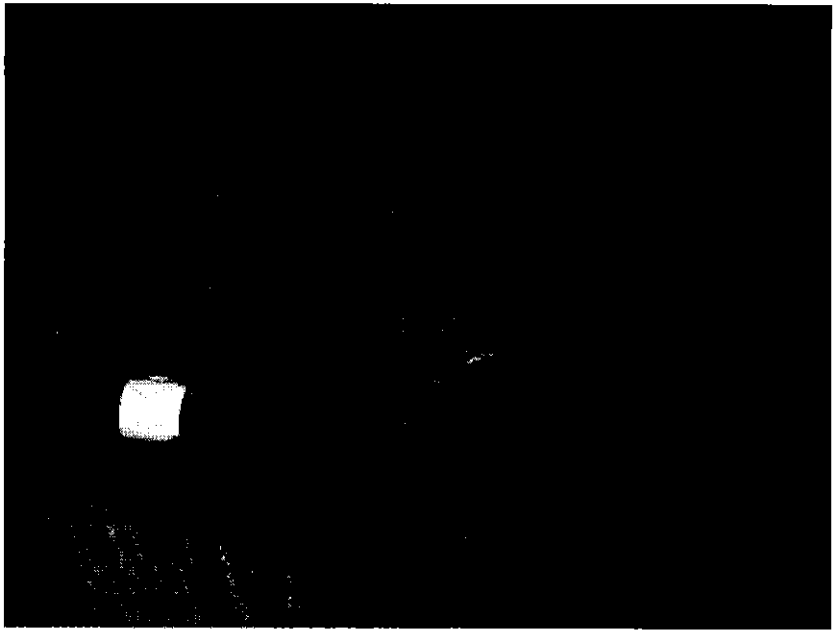


DRAFT

Section 5 - Photos *(example)*

Male *Myotis sodalis* captured at **Site 1**
Capture date: **7/18/01**
Capture Number: **06**

Portrait



Keeled Calcar

Exhibit C (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bat & Bird Mortality at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Post-Construction Mortality Monitoring

I. Duration and Frequency of Monitoring:

All mortality monitoring should take place daily for the period between April 1 and November 15 for 2 complete years following construction, unless other mortality information is available and the PGC can adequately justify a reduced monitoring effort. For higher risk golden eagle migration routes, as designated in page 11 of Exhibit A, additional monitoring may be requested. Mortality monitoring should commence at sunrise and an appropriate number of surveyors must be hired to complete surveys of all turbines within 8 hours. Turbines that are being chosen for monitoring should be determined with the initial proposal so the location of acoustic monitoring devices can be coordinated to occur at the same locations.

II. Number of Turbines to Monitor:

The number of turbines monitored will follow the guidelines below as per "Standard Mortality Transect Survey", and will include at least one validation procedure to correct bias. Validation procedures can include, but are limited to the use of nets, the use of dogs, thermal imaging, or night optical device. Monitored turbines shall be identified in consultation between the parties and based upon pre-determined bat and bird risk assessment. A minimum of 10 turbines will be sampled, or a maximum of 20% of the turbines in the project area (whichever is greater). If the project contains less than 10 turbines, all turbines in the project area will be sampled unless otherwise agreed to by the Commission.

III. Mortality Monitoring Procedure

Carcass removal and searcher efficiency trials will be performed, and the duration, frequency and number of turbines to monitor are the same.

At each turbine to be monitored, a rectangular plot that is 120 meters by 120 meters will be centered on the turbine. Although evidence suggests that > 80% of the bat fatalities fall within ½ the maximum distance of turbine height to ground (Erickson 2003a,b) search areas vary and often do not allow surveys to consistently extend to this distance. Therefore, the searchable area underneath turbines will be delineated and mapped, and estimates of mortality will be produced. Maps are to be constructed illustrating all turbine locations, a designated numbering system for turbines, 120 meter plot, boundaries of survey areas, and searchable areas (broken down into visibility classes and transect numbering if performing standard transect surveys).

1) Times spent surveying each turbine should be recorded daily and remain consistent.
2) All information gathered (i.e. specimen location, species, transect/net grid number, etc.) should be entered on data sheets provided. Any mortality that occurs to state listed endangered or threatened species should be reported to the PGC within 72 hours.
3) Any large mortality events (> 50 total animals) or mortality of any eagle, or threatened or endangered species that occur outside of the survey periods are to be reported to the PGC within 72 hours.
4) Separate data sheets will be used for each date of survey completed. All carcasses are to be picked up and bagged upon discovery. They are to be identified, handled, and labeled properly, in accordance with the special use permit, with the date, turbine number, transect number, and unique specimen number.
5) All specimens located should have an azimuth **from** tower and distance to turbine, and recorded on data sheet. It is appropriate to use a numbered flag for each specimen and record distance and azimuth upon completion of transect searches, so long as flags are removed after each day/turbine.
6) All carcasses are to be properly identified, labeled, frozen daily, and submitted with data sheets every 2 months to the local regional office of the PGC.
7) A summary report of this monitoring, including all data sheets and maps are to be submitted with the annual reports (due December 31) until monitoring is complete. A complete set of post-

construction bat mortality data sheets, all acoustic data sheets with passes/hour, species identification charts, etc. should be included.

Standard Mortality Transect Surveys:

The basis for the methods to be followed for this procedure are set forth by Erickson 2003a, 2003b, Bats and Wind Energy Cooperative 2005 final report, and Kerns and Kerlinger 2004. Areas defined for surveys should be mapped and depict not only prominent structures and area, but in addition to previous studies, label search areas into 1 of 4 visibility classes. All visibility classes represented should be included in the map and proportion of each noted in report. Each visibility class will be equally tested with a minimum of 200 trials using carcasses returned by the PGC.

Visibility Classes: Each turbine will have the vegetation in the searchable area defined into one of the following 4 classes and mapped for submission.

Class 1 (easy): Bare ground 90% or greater; all ground cover sparse and 6 inches or less in height (i.e. gravel pad or dirt road).

Class 2 (moderate): Bare ground 25% or greater; all ground cover 6 inches or less in height and mostly sparse.

Class 3 (difficult): Bare ground 25% or less; 25% or less of ground cover over 12 inches in height.

Class 4 (very difficult): Little or no bare ground; more than 25% of ground cover over 12 inches in height.

1) Following the establishment of searchable areas, the breakdown of this area into visibility classes, and mapping of each turbine, transects should be established at no greater than 6 meters apart and marked every 10 meters.

2) Each transect will be walked with ½ of the distance between transects equal to the distance on each side to be examined by the searcher.
3) As transects are searched, carcasses should be bagged and labeled properly (date, turbine number, transect number, carcass number) and a numbered flag placed in their place. At completion of each turbine, the distance and bearing from each turbine should be recorded and then all flags removed.
4) Searches will be abandoned if severe weather is present, and continue if it clears. The time spent searching at all turbines will be recorded and should be consistent.

V. Validation Guidelines

Performing carcass removal by scavenger and searcher efficiency are the standard methods performed together to correct for biases in data collection. Below are accepted techniques to perform this correction. However, please note the PGC will consider alternative methods of validation, to include but not limiting to the use of dogs, thermal imaging, night optical devises etc.

Carcass Removal Trials

Because there are numerous variables that may make every turbine unique, we suggest placing an equal number of carcasses per turbine to be monitored for removal by scavengers. Additionally, all 4-visibility classes should have an equal sample size. A random bearing and distance from the turbine should be selected to determine placement of the carcass. For these trials, carcasses must be placed within the surveyed area underneath turbines after sunset and under darkness, and monitored for removal every 12 hours. Ideally, the total number of bird and bat carcasses used should be representative of the actual size and species of killed animals, with no less than 50 specimens monitored per year. These trials should be performed periodically throughout each monitoring session. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction and have its location recorded. Records shall include the turbine number, a brief

description of immediate vegetation that may impede visibility, classification using one of the 4 visibility classes described above, and length of time before removal.

VI. Searcher Efficiency Trials

To produce the best estimates of mortality, a high number of searcher efficiency trials will be performed. A minimum of 200 individual trials will be performed to test searchers. The carcasses will be toe clipped to identify and number them. Carcasses missed by searchers will be picked up after their survey is complete and will be used again. Because a number of samples will be collected from all dead bats, each carcass recovered will be submitted to the PGC and the appropriate number needed for testing will be returned. The habitat surrounding turbines may vary considerably and searcher efficiency appears highly correlated to visibility and habitat types. Therefore, the search area defined for each turbine surveyed will be divided into the 4 visibility classes (illustrated on map). An equal number of carcasses will be placed in each visibility class, and will be placed at a random azimuth and distance. Each turbine monitored by searchers should be examined, with an equal number of carcasses placed at each turbine.

Testing should occur sporadically throughout monitoring periods and searchers should not be made aware they are being tested. An effort should be made to test searchers equally during both inclement and good weather, with weather conditions recorded. Carcasses placed should be representative of the percentage and number of species found during the mortality monitoring, and should replicate the manner in which the majority of bats are found in that visibility class (i.e. crawled under vegetation). An effort to maximize the number of carcasses placed is best, with no less than 200 per year.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

IV. WIND FARM PERMITTEE
V. POST-CONSTRUCTION BAT MORTALITY SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address:_____
_____
_____
_____

Phone: (_____)_____-_____ Fax: (_____)_____-_____

E-Mail:_____

Project Supervisor Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____
_____

FORM Wind-70008-Mort-1
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

GPS Locations of All Wind Turbines at this Project.

(Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
Also provide datum used (NAD27 Preferred)

Project Name:_____ Page: _____ of _____

Total No. of Turbines:_____

Lat/Lon GPS Location Information (DMS) for All Turbines.

DATUM used:

Turbine No.	Latitude			Longitude			Comments
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-Mort-2 **COMMONWEALTH OF PENNSYLVANIA**

02/05 **Pennsylvania Game Commission**

Description of Wind Turbine Searched for Carcasses

Project Name:_____ **Turbine Number:**_____

1. Diameter of Blade Span: _____m **Number of Blades:**_____

2. Blade Height Above Ground- Max.:_____m;
Min.:_____m

3. Surface Area of Search Plot:_____m^2

4. Attach map of each turbine with 120 meter plot, search boundaries, location and numbering of transects/area covered by nets, and vegetation classification if applicable on separate sheet.

5. Attach a spreadsheet with weather data collected at 10-minute intervals. Data should include wind speed, temperature, precipitation, cloud ceiling height, and height and altitude of monitoring device.

6. General Habitat Description and Topography within 100 m of Turbine:

7. General Habitat Description and Topography >100m from Turbine:

FORM Wind-70008-Mort-3a
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Daily Search Summary
Page: _____ of _____
Project Name:_____ *(complete each day of search)*

	Turbine		Time			Number of Carcasses Found				
Date	Number	Observer	Start	End	Weather[a]	Bat	Bird	Other	Total	Comments

[a]Weather: F= fog, D= drizzle, R= steady rain (Use additional Pages as needed)

FORM Wind-70008-Mort-3b **COMMONWEALTH OF PENNSYLVANIA** **Observer**
Name:_____
02/05 Pennsylvania Game Commission

Date:_____

Project Name:_____ Carcass Data Sheet

(Use to record all carcasses found)

% Cloud Cover: _____ **%;** **Temperature:** _____ **°C;** **Precipitation:** _____ **(fog, drizzle, steady rain)**

	Carcass Tag Information[a]				Check One[b]		From Turbine					
Time (h)	**Turbine No.**	**Date**	**Transect No.**	**Specimen No.**	**Bat**	**Bird**	**Azimuth**	**Dist.(m)**	**Species**	**Age[c]**	**Sex[d]**	**Condition[e]**

[a]Carcass Number= Turbine # - Date - Transect No. - Sequential Specimen No.; [b]If other than bat/bird leave blank and complete remainder of information; [c]Age= A (adult), J (juvenile) Unk (unknown);
[d]Sex= M(male), F(female), Unk (unknown); [e]Condition: E= excellent, F= fair, P= poor.

PENNSYLVANIA GAME COMMISSION **(9/22/09)**
BALD EAGLE NESTING SURVEY PROTOCOL

The bald eagle (*Haliaeetus leucocephalus*) is a state listed threatened species known to nest in wooded areas in the vicinity of large bodies of water or wetlands. The nest is typically placed in a fork high in a tree, usually 40 to 100 feet above ground. White pine, sycamore, red oak and red maple seem to be preferred nesting trees in Pennsylvania. The nest trees typically are in large mature stands of timber with an open and discontinuous canopy that allows for an easy flight path to and from the nest. Occasionally isolated trees, snags, or artificial structures are used. Most eagle nests in Pennsylvania have been placed in view of a large body of water and within 1 mile from their primary food although new sites are sometimes 2 or more miles from large bodies of water. Mature forests associated with bodies of water greater than 20 acres or major rivers are considered potential habitat for nesting bald eagles.

This protocol provides a framework for conducting surveys to determine presence or absence of the species in and adjacent to a project area. The following surveys should be conducted after the Pennsylvania Game Commission (PGC) has indicated the presence of potential eagle nesting activity in or adjacent to the project area. Coordination on state listed endangered, threatened, and special concern species of birds and mammals is done through the Division of Environmental Planning and Habitat Protection located at the PGC office in Harrisburg, PA.

SURVEY METHODS

Bald eagles are easily surveyed because of their large (5-10ft diameter) and conspicuous nests that are located in tall trees usually within sight of bodies of water. Surveys should be conducted between February 1 and May 1 in any area over, adjacent, or within 2 miles of large bodies of water or major rivers. The surveys should be conducted at least 3 times with a minimum of 3 weeks between survey dates. The bald eagle is prone to indirect disturbance factors that can cause them to abandon a nest site. In order to assess potential impacts it is required that the nest site surveys be conducted within the project area and extend 1/4 mile beyond the outer project area boundary.

Surveyors should not approach any closer to active nests than is needed to identify the species, determine the nest location, and determine the nesting status. Approaching too close to the nest or multiple visits can disrupt nesting activity and may cause nest abandonment. If a nest is located the PGC should be contacted immediately for further instructions.

A brief report should be developed and sent to the Pennsylvania Game Commission, Division of Environmental Planning and Habitat Protection, that includes the project description, days and times the surveys were conducted, nest location (s), species heard or seen (bald eagle plus any other species of special concern), weather conditions, a map of the survey areas and nest location (s), photographs of the surveyed wetlands, etc.

For additional information contact: Pennsylvania Game Commission
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17013
(717) 783-5957

* In addition to being protected under State law, the bald eagle is also protected under Federal law. The U.S. Fish and Wildlife Service may require additional surveys (aerial or others) above and beyond those recommended by the PGC.

Commonwealth of Pennsylvania
Pennsylvania Game Commission, Bureau of Wildlife Management
Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Protocol for Assessing Abandoned Mines/Caves for Bat Surveys

In general, openings can be dismissed from bat surveys when:

1. There is only one horizontal opening less than 6 inches in diameter and no or very little airflow is detected.
2. Vertical shafts <1 foot in diameter.
3. Passage continues less than 50 feet and terminates with no fissures that bats can access.
4. Mines that are prone to flooding, collapsed shut and completely sealed, or otherwise inaccessible to bats.
5. Openings, which have occurred recently (within 1 year) due to subsidence.

Additional notes: Bats can access mines via old open buildings such as a fan house. Foliage and other vegetation in front of mine openings do not stop use by bats. They can navigate through foliage. Collapsed entrances with multiple crevices between boulders etc. are accessible to bats and should be sampled. Collapses completely sealed with fine soil are of course inaccessible to bats.

Sampling Dates, Times and Temperature Criteria

1. Spring sampling will be conducted between: April 10 thru May 10
2. Fall sampling will be conducted between: September 15 thru October 31
3. Sampling will start ½ hour before sunset and continue for at least 5 hours.
4. Weather must provide for:
   a. Temperatures ≥50°F (10°C) for first 2 hours of sampling and not fall below 35°F (1.6°C) by midnight.
   b. At least 3 hours free of heavy rain and thunderstorms.
5. Sampling will be conducted on two evenings. If no captures occur and no bat activity is noted with a bat detector on the first evening during acceptable weather conditions, sampling can be suspended for the site.
6. The shining of lights, and noise will be kept to a minimum with no smoking around the sample site. The use of radios, campfires, running vehicles, punk sticks, citronella candles and other disturbances will not be permitted within 300 feet of site during surveys.
7. Before conducting surveys, local residents and/or law enforcement agencies should be informed of the scheduled nighttime activities.

Equipment

No equipment, litter or other debris will be left unattended at site that could result in the capture or entanglement of any animals. Any equipment stored at site between sampling sessions will be clearly labeled with contact information.

Harp Trap: Place in front of opening and block surrounding space with plastic sheeting or bird netting. Traps should be tended at least once per hour. When the catch rate is high (>25 bats per hour) or during inclement weather, traps should be tended more frequently.

Mist Nets: 50 denier, 38mm mesh. Place in front or around opening. Nets need to be monitored closely and checked at least once every 20 minutes. At sites with a heavy bat swarm, the net may need to be monitored continuously.

Bat Detector: A bat detector should be on site to monitor bat activity when trapping or netting. Bat passes should be monitored and tallied for at least one hour after 10pm. Bat tallies should be reported along with the time sampled. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.

Other: In situations where it is too dangerous to approach an entrance, bat detectors and/or night vision/infrared recording devices may be used to monitor and record bat activity to determine bat use of the site. Bat activity in or around the entrance can be monitored by counting bat passes with a bat detector, or night vision/infrared video tapes can be made providing actual counts of bats entering the opening. As with trapping, monitoring should be conducted for 5 hours. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.

Reporting

In addition to reports for the client, the Pennsylvania Game Commission requires copies of the report as part of the vendor's permitting requirement. To simplify data entry, mandatory sampling summary forms are also required by the PA Game Commission for bat surveys within the Commonwealth. If the vendor did not receive a copy of the data form with the permit, they can be obtained by contacting the:

Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
717/787-5740

INTERIOR WINTER HIBERNACULA SURVEYS

Sites that are determined to be safe for entry to conduct winter counts (primarily caves & stable hard rock mines) will be coordinated with the PA Game Commission, Wildlife Diversity Section and scheduled for interior surveys between January 1 and March 10. Contact information for the Wildlife Diversity Section is:

PA Game Commission
Bureau of Wildlife Management, Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
(717) 787-5529

Letter to USFWS October 6 2009

LANCASTER COUNTY SOLID WASTE MANAGEMENT AUTHORITY

1299 HARRISBURG PIKE
P.O. BOX 4425
LANCASTER, PA 17604
PHONE: (717) 397-9968
FAX: (717) 397-9973
www.lcswma.org

October 6, 2009

Ms. Melinda Turner
United States Fish and Wildlife Service
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

Re: LCSWMA/PPL Wind Energy Project
Manor Township, Lancaster County, PA

Dear Ms. Turner,

Per our telephone conversation, the Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Development Company, LLC (PPL) are requesting informal consultation with the United States Fish and Wildlife Service (USFWS) regarding the above referenced proposed Wind Energy Project. This consultation is being requested as suggested by Ms. Tracey Librandi Mumma (Wind Project Coordinator for the Pennsylvania Game Commission) and in accordance with the USFWS *National Bald Eagle Management Guidelines*, May 2007 (referred to as Guidelines) in order to confirm compliance with the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, as Bald Eagles are known to the project area.

Project Description and Site Location

PPL and LCSWMA are proposing to install wind turbine generators (WTG) at the Frey Farm Landfill (FFLF), Manor Township, Lancaster County,PA (Figure 1, Project Vicinity Map).The project is situated south of Columbia Boro and along the Susquehanna River at Lake Clarke. To mitigate against potential migratory bird impacts, the proposed project size has been reduced from four (4) WTGs to two (2) WTGs. The two (2) proposed WTGs are rated to generate 3.2 megawatts of electricity. The hub height of the wind turbines will be approximately 80 meters above grade with the the rotor diameter approximating 77 meters. The wind turbines would also include a section of new transmission line to connect the wind turbines to either an end user location, which is located on an adjacent property, or to the grid. The proposed project is situated adjacent to an active municipal solid waste landfill; accordingly, land disturbances are minimal and access is readily available.

The approximate locations of the WTG locations and the associated investigation area are illustrated on the enclosed Figure 2, Site Location Map (Safe Harbor, United States Geological Survey (USGS) 7 ½ minute quadrangle dated 1995). Although five (5) potential turbine sites are shown, only two (2) turbine sites ("Tower 1" and "Tower 2") will be selected.

Access for the proposed WTGs during construction will be made using existing landfill roads. Upon project completion, areas surrounding the turbines will be planted with native grasses and regularly maintained to minimize potential raptor activity in and around the wind turbines.

Existing WGT Investigation Area and Site Conditions at the Frey Farm Landfill

The WTGs are proposed within the landfill property and adjacent to landfill activities. The investigation area includes five (5) potential WTG locations but only two (2) turbine locations will be selected. Existing habitat at the proposed WTG locations is primarily comprised of active hayland, maintained grass areas and herbaceous vegetated soil stockpiles.

Bald Eagles are known to the project investigation area and vicinity. An active bald eagle nest site (spring 2009) was located across the Susquehanna River from the landfill on the forested river slope in York County. Conejohela Flats Important Bird Area (IBA) #56 is situated greater than 1 mile north of the landfill and potential WTG locations.

Agency Coordination

Consultation has been initiated with the Pennsylvania Game Commission (PGC). PPL and LCSWMA representatives met with Ms. Tracey Librandi Mumma, Wind Project Coordinator for the PGC on July 23, 2009. During the meeting, Ms. Librandi Mumma suggested that PPL and LCSWMA initiate consultation with the USFWS.

Preliminary Threatened and Endangered Species Review

The Pennsylvania Natural Heritage Program's Environmental Review Tool determined that there are "no known impacts" on species of concern under jurisdiction of the USFWS and no further review is required by the USFWS. A signed copy of the Environmental Review Receipt and Form are attached for your review.

Raptor / Eagle Migration Monitoring

PPL and LCSWMA initiated a spring 2009 raptor and eagle migration survey in order to gather ecological data early in the project development phase. The raptor and eagle migration survey was conducted in accordance with the Pennsylvania Game Commission's *Wind Energy Cooperative Agreement, Exhibit A, Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*. The draft spring monitoring report was submitted to the PGC; as will the fall survey.

Bald Eagle and Osprey Nest Survey

An active Bald Eagle nest was observed approximately 1.5 miles away on the wooded hillside on the western border of the Susquehanna River opposite the landfill during the spring 2009 pre-construction migration monitoring. A Bald Eagle and Osprey nest survey was requested by the PGC during the July 23, 2009 wind energy voluntary cooperative agreement meeting between the PGC, PPL and LCSWMA. The nest survey will be conducted in the 2009-2010 winter season to identify the locations of nests within the wooded hillsides (Lancaster and York borders) of the Susquehanna River in proximity of the proposed WTG locations. The nest survey will be

conducted by helicopter boarded by two biologists. Data will be recorded and documented in a nest survey report.

Thank you for your assistance with this project review. If you have any questions regarding this investigation, or if you require any additional information, feel free to contact me by email at bnorris@lcswma.org or (717) 735-0163. Your time and attention to this request is greatly appreciated.

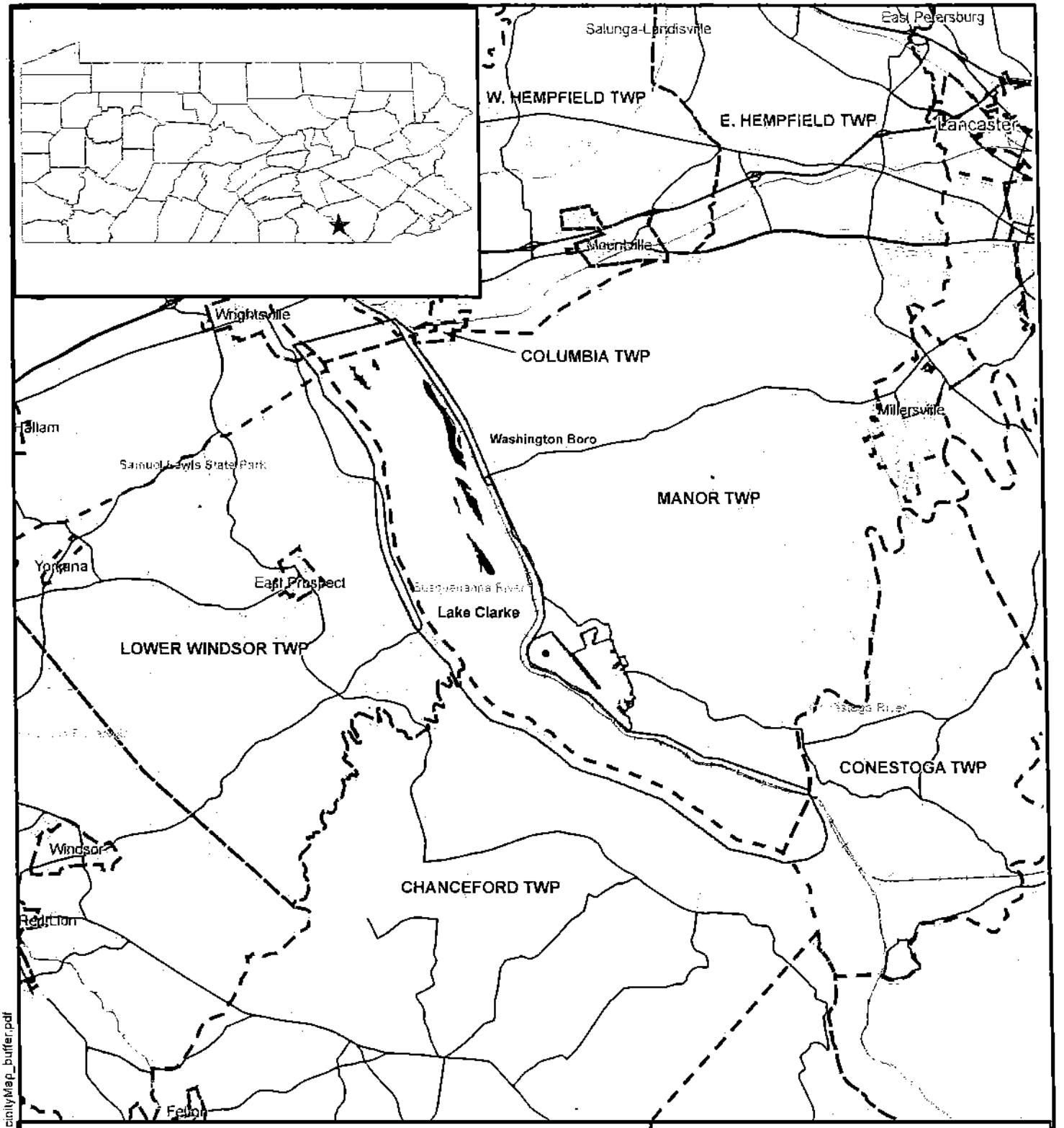
Sincerely,
Brooks K. Norris

Brooks K. Norris

Senior Manager, Technical Services

Enclosures: PNDI Project Environmental Review Receipt and Form
Figure 1 – Project Vicinity Map
Figure 2 – USGS Map

Cc: Mr. Jim Warner; LCSWMA
Mr. Steve Gabrielle; PPL
Ms. Michelle Cohen; ARM Group
Ms. Tracey Librandi Mumma; PGC



LEGEND

- LCSWMA PROPERTY LINE
- CONEJOHELA FLATS IMPORTANT BIRD AREA
- CONEJOHELA FLATS
- MUNICIPAL BOUNDARY

0 5,000 10,000 20,000 30,000

Feet

Site Vicinity Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

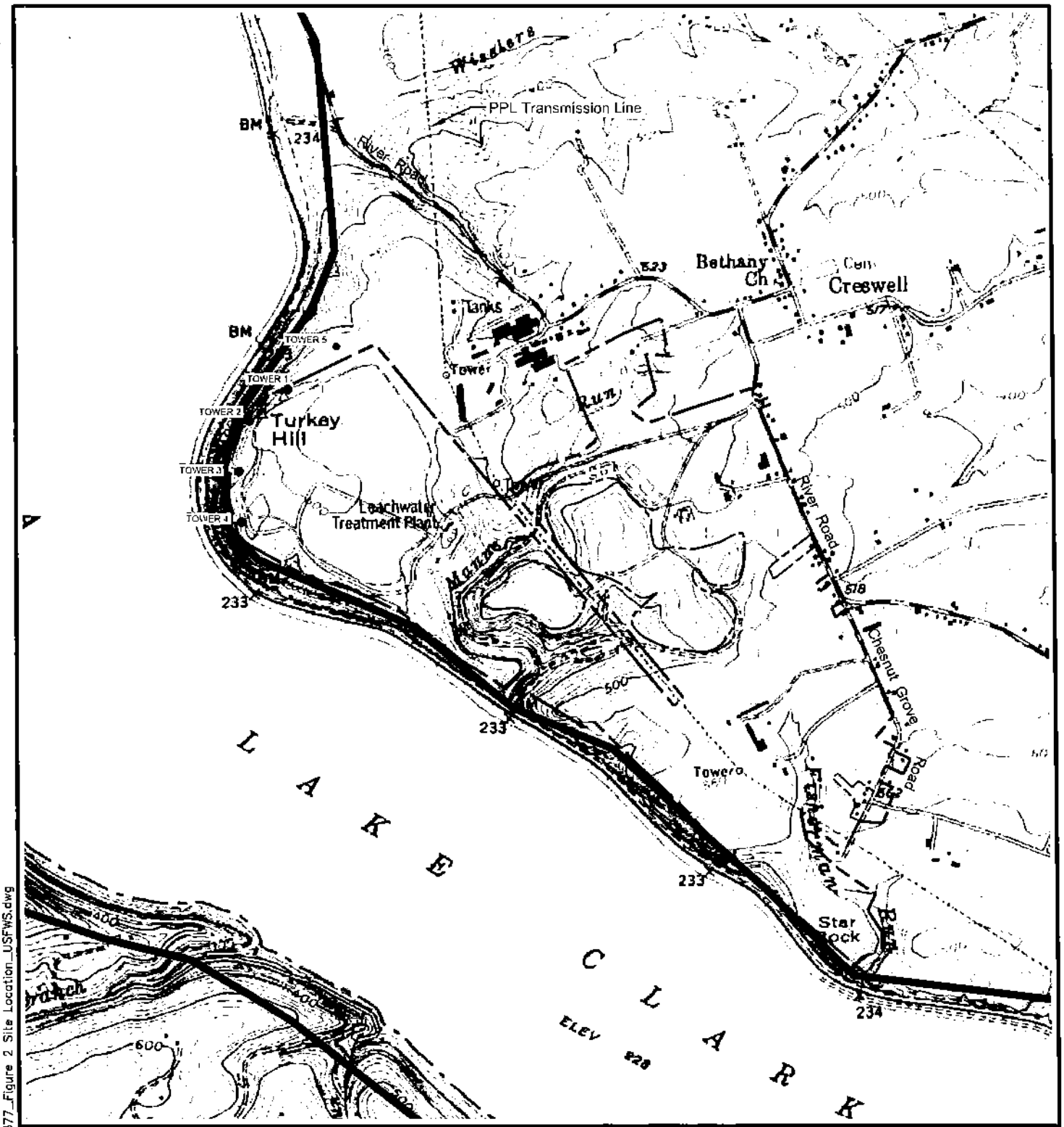
May 2009	Scale: 1" = 10000'	06377

ARM Group Inc.

Earth Resource Engineers and Consultants
4129 East Governor Road • Hershey, PA 17033-9707

Figure 1

S:\06377 LCSWMA Wind Energy_Pdfs\SiteVicinityMap_buffer.pdf



Base map from Safe Harbor USGS 7½ minute quadrangle dated 1995.

LEGEND

- LCSWMA Property Boundary (Frey Farm/Creswell Landfill)
- Creswell Landfill Waste Limit (closed, inactive)
- Frey Farm Landfill (FFLF) Permitted Waste Limit
- Proposed Wind Turbine Location
- Conejohela Flats Important Bird Area

0 1,500 3,000 4,500

SCALE IN FEET

N

Site Location Map

FFLF Wind Energy Project
Raptor and Eagle
Migration Survey

August 2009	Scale: 1" = 1,500'	06377-5

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\06377_Figure 2 Site Location_USFWS.dwg

Pennsylvania Natural Diversity Inventory

Project Planning & Environmental Review Form

This form provides site information necessary to perform an Environmental Review for special concern species and resources listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat code or the Pennsylvania Game and Wildlife Code.

Applicant Information

Name: Ppl Development Company Llc Attn: David Orinski
Address: 2 North 9th Street (GENPL8), Allentown, PA 18101
Phone Number: (610) 774-3867 Fax Number: 610-774-4198

Contact Person Information - if different from applicant

Name: Arm Group, Inc. Attn: Michelle Cohen
Address: 1129 W. Governor Road, Hershey, Pa 17033
Phone Number: 717 533-8600 Fax Number: 717 533-8605

Project Information

Project Name: Frey Farm Landfill Wind Energy Project
Project Location: Frey Farm Landfill
Municipality: Manor Township County: Lancaster
☒ Attach a copy of a U.S.G.S. 7 ½ Minute Quadrangle Map with Project Boundaries clearly marked.
U.S.G.S. Quad Name: Safe Harbor

Project Description

Proposed Project Activity (including ALL earth disturbance areas and current conditions)

Refer to the attached cover letter for a detailed project description. PPL and the Lancaster County Solid Waste Management Authority (LCSWMA) are proposin g to install wind turbines at the Frey Farm Landfill. Five potential wind turbine generators (WTGs) are being investigated. However two proposed WTG will be selected. The two WTGs are expected to generate approximately 4 megawatts of electricity. The hub height will be approximately 80-100 m (meters) and the rotor diameter is expected to be approximately 70-90 m. The WTGs will be located in upland areas within a non-operational portion of the FFLF property. Existing land use at the turbine locations and the proposed construction disturbance areas is primarily comprised of hayland, maintained grass areas and herbaceous vegetated soil stockpiles.

Total Acres of Property: 20 Acreage to be Impacted: 5

1. Will the entire project occur in or on an existing building, parking lot, driveway, road, maintained road shoulder, street, runway, paved area, railroad bed, or maintained lawn? Yes ☐ No ☒
2. Are there any waterways or waterbodies (intermittent or perennial rivers, streams, creeks, tributaries, lakes or ponds) in or near the project area, or on the land parcel? If so, how many feet away is the project?
   Yes ☒ 350 Feet No ☐
3. Are wetlands located in or within 300 feet of the project area? Yes ☐ No ☒ If No, is this the result of a wetland delineation? No

If you have a "PNDI Project Environmental Review Receipt" with potential impacts, please send a receipt copy, this completed form, and a USGS Quad Map to the agency/agencies noted on the receipt. If you are unable to generate a PNDI Receipt because you do not have Internet access, complete this form, attach a USGS Quad Map, and send them to your local DEP or County Conservation District. For review of a "Large Project," please send form and map to all the agencies listed below. See page 2 for more information.

Dept. of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market St., PO Box 8552
Harrisburg, PA 17105
fax: 717-772-0271

PA Fish and Boat Commission
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823
fax 814-359-5175

PA Game Commission
Bureau of Land Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797
fax: 717-787-6957

US Fish and Wildlife Service
Endangered Species Biologist
315 South Allen St., Suite 322
State College, PA 16801
no faxes please

How to Use the PNDI Project Planning & Environmental Review Form

How do I access the PNDI Environmental Review Tool?

Visit www.naturalheritage.state.pa.us. Click on "PNDI Project Planning and Environmental Review" on the bottom left corner of the homepage to access the tool. Follow this link to access the ER Tool and for step-by-step instructions on using the ER Tool, FAQ's and access to an electronic version of the PNDI Form.

When do I use this form?

1. ***Before conducting the PNDI online search***

The Applicant can complete the PNDI Form and submit it to the person conducting the online PNDI Project Planning and Environmental Review Tool search. This person performing the search could be someone from DEP, the County Conservation Districts, or a consultant. Alternatively, if the Applicant plans to conduct the PNDI online search his or herself—a search form is not needed prior to the PNDI online search.

2. ***After conducting the PNDI online search***

If your PNDI Project Environmental Review Receipt has "Potential Impacts," DEP and the jurisdictional agencies require that you submit additional information to the agencies noted on the Receipt for further review. Please send a copy of the PNDI Receipt, a completed PNDI Form, and a USGS 7.5 minute quadrangle map with project boundaries delineated on the map to the agencies referenced on your PNDI Receipt.

3. ***If your Project is a "Large Project"***— too large/long to search on the online system

Projects are considered "Large Projects" when the ENTIRE project is:

- Linear/Large Projects that exceed map limits: approximately 2-2.84 miles depending on browser size
- Projects that will not fit on 1:24,000 scale map. Project Maximums: 1024 x 768 browsers: 2625 acres; 15,000 feet long x 7600 feet wide; approximately 2.84 miles 800 x 600 browsers: 1050 acres; 11,000 feet long x 4000 feet wide; approximately 2 miles
- Township-wide, Countywide or Statewide Projects. Examples: Act 537 Sewage Plans, Wind Farms, Roadway Improvements exceeding map limits above.

For "Large Project" review, please forward a completed PNDI Form and a USGS 7.5 minute quadrangle with project boundaries and quad name marked on the map to DCNR, PFBC, PGC, and USFWS (contact information on page 1 of form). Due to system limitations and agency requirements, projects should not be submitted piecemeal. The entire project area including roads and infrastructure should be submitted as a single unit.

PNDI Form Definitions

Applicant: Person that owns the property or is proposing the project or activity

Contact Person: Person to receive response if different than applicant (e.g. Consultant)

Project Name: Descriptive title of project (e.g. Twin Pines Subdivision, Miller Bridge Replacement)

Project Location: Description of actual location (e.g. Intersection of Smith and Clay Rd., Latitude & Longitude)

Proposed Activity: Include ALL earth disturbance activities for project (e.g. for a timber sale—include stream crossings, cutting areas and new roadway accesses). Also include Current Conditions (e.g. housing, farmland, current land cover), and how Construction/Maintenance Activity is to be accomplished

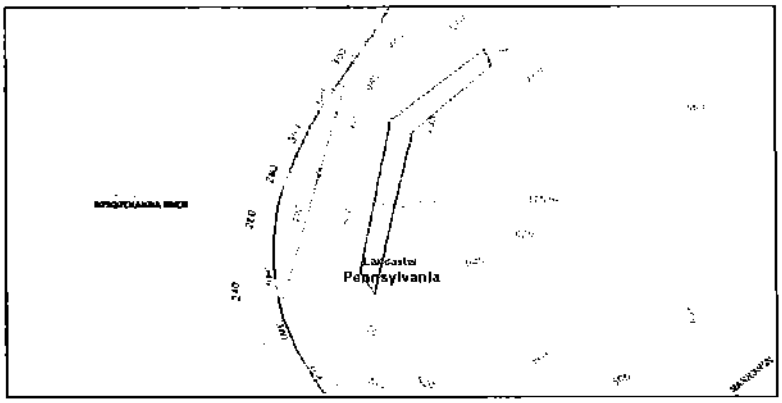
Total Acres of Property: Entire site acreage (e.g. timber sale property—including road access (200 acres)

Acreage to be Impacted: Disturbance acreage (e.g. timber sale—if the property is 200 acres, but only 100 acres will be disturbed, for example: cutting on 90 acres, a road impacting 10 acres); include all temporary and permanent activities

PNDI Project Environmental Review Receipt Project Search ID: 20090916210107

1. PROJECT INFORMATION

Project Name: **LCSWMA/PPL WIND ENERGY PROJECT**
Date of review: **9/16/2009 9:33:47 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Wind power facility (wind farm, turbines) - new, expansion, modification**
Project Area: **7.3** acres
County: **Lancaster** Township/Municipality: **Manor**
Quadrangle Name: **SAFE HARBOR**
ZIP Code: **17516**
Decimal Degrees: **39.95956 N, --76.45519 W**
Degrees Minutes Seconds: **39° 57' 34.4" N, -76° 27' 18.7" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Conservation Measure**	**No Further Review Required, See Agency Comments**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

RESPONSE TO QUESTION(S) ASKED

Q1: "Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. ""Project"" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly – by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur ."
Your answer is: **"3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from a wetland specialist, and detailed project maps should document this.) "**

Q2: Accurately describe what is known about wetland presence in the project area or on the land parcel. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected – either directly or indirectly – by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur .
Your answer is: **3. Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)**

Q3: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Casmerodius albus
Common Name: Great Egret
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Prolonotaria citrea
Common Name: Prothonotary Warbler
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Threatened

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Ammannia coccinea
Common Name: Scarlet Ammannia
Current Status: Endangered
Proposed Status: Threatened

Scientific Name: Rotala ramosior
Common Name: Tooth-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

RESPONSE: Conservation Measure: Please avoid the introduction of invasive species in order to protect the integrity of nearby plant species of special concern. Voluntary cleaning of equipment/vehicles, using clean fill and mulch, and avoiding planting invasive species (http://www.dcnr.state.pa.us/forestry/invasivetutorial/index.htm) will help to conserve sensitive plant habitats.

PA Fish and Boat Commission

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to federally listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Michelle Cohen
Company/Business Name: AEM Group Inc.
Address: 1129 West Governor Road
City, State, Zip: Hershey, PA 17033
Phone:(717) 533 8600 Fax:(717) 533-8605
Email: mcohen@aemgroup.net

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Michelle A. Cohen 10/5/09
applicant/project proponent signature date

RESPONSE TO PGC AND USFWS

ARM Group Inc.
Earth Resource Engineers and Consultants

December 23, 2009

Ms. Jennifer Kagel
United States Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, PA 16801-4850

Re: Frey Farm Landfill Wind Energy Project
Manor Township, Pennsylvania
USFWS Project # 2010-0026

Dear Ms. Kagel,

ARM Group Inc. (ARM), on behalf of the Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Renewable Energy, LLC (PPL), has prepared this letter to address the informal consultation response letter dated November 13, 2009, regarding the proposed Frey Farm Landfill (FFLF) Wind Energy Project in Manor Township, Lancaster County, Pennsylvania. This response letter follows the resource agency meeting held on December 14, 2009 with PPL, ARM, United States Fish and Wildlife Service (USFWS) and the Pennsylvania Game Commission (PGC) to discuss the project. This response letter discusses the main concerns outlined in the USFWS's November 13, 2009 letter and includes a summary of the preliminary results of the 2009 fall raptor/eagle migration survey. The information contained in this letter is provided to assist the USFWS in evaluating the project with respect to species of special concern within the agency's jurisdiction.

LCSWMA and PPL have implemented all reasonable measures to avoid and minimize impacts upon avian species during the design and development phase of this small-scale wind energy project. Federal stimulus funding for this project provides that wind turbines need to be ordered by February 1, 2010 or else the project may not proceed. LCSWMA and PPL kindly request a response of support for this project, or at least a written indication that USFWS is satisfied to the extent that the project may proceed as scheduled, from USFWS by January 15, 2010.

PROJECT BACKGROUND

As you are aware, LCSWMA and PPL are proposing a relatively small wind energy project to provide electricity to the adjacent Turkey Hill Dairy. Under Pennsylvania's Alternative Energy Portfolio Standards Act, PPL, as an electricity generator, has the obligation to provide electricity via alternative energy sources. LCSWMA, PPL and Turkey Hill Dairy are currently partners in an existing landfill gas to energy plant, which is operated by PPL. The plant provides waste steam energy to Turkey Hill Dairy to facilitate operations. The proposed 3.2-Megawatt (MW) wind energy project will meet approximately 25 percent of Turkey Hill's annual electricity needs. Meeting Turkey Hill Dairy's entire electrical demand would require eight wind turbines

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

of the size proposed for this project. The project was originally planned as a four turbine project. In an effort to minimize potential wildlife impacts and to provide the minimum-sized project that is economically viable for project stakeholders, the project was reduce in scope from four turbines to two turbines.

FUNDING HISTORY

In 2009, the proposed project received a grant from the Pennsylvania Department of Environmental Protection (PADEP) via the Pennsylvania Energy Development Authority (PEDA), which was supported by "stimulus" dollars through the American Recovery and Reinvestment Act (ARRA). The competitive grant was awarded to the project based upon its unique structure (i.e., relatively small wind project providing electricity directly to an adjacent commercial end user); to provide emission-free energy; to create jobs associated with completing the project; and to control electricity costs thereby leading to job preservation at Turkey Hill Dairy. Electric costs at Turkey Hill Dairy are expected to increase as PPL electric rate caps expire December 31, 2009. As a result, the electricity generated from the wind turbine facility will serve as a contributing factor in benefiting the overall economic viability of the Turkey Hill Dairy by providing discounted electricity pricing. The project will also offer the opportunity to learn about this green energy project through an environmental education center planned for development in nearby Columbia, and through scheduled tours of the wind facility available to the public. A criterion of the awarded grant is that the project be completed within specific timelines. In order for the project developers to receive the grant proceeds, the project must be completed by December 31, 2010 and commissioned and fully operational by February 1, 2011. Due to the lengthy lead time for wind turbine procurement, and to complete the project by the end of 2010, the wind turbines, which constitute nearly half of the overall project cost, must be ordered from General Electric by February 1, 2010.

ENVIRONMENTAL STEWARDSHIP

With an eminent history of environmental support and stewardship in the Lower Susquehanna Valley, LCSWMA and PPL are committed to developing the proposed wind energy project in an environmentally conscientious manner with regard to the conservation of Pennsylvania's wildlife resources, through pre-construction monitoring, agency coordination and implementation of all practicable measures to avoid and minimize impacts upon eagles and other wildlife during site development and construction. The development team's good faith efforts to assess existing raptor and eagle migration trends, its commitment to compliance with wildlife protection regulations, its adherence to the Pennsylvania Game Commission and USFWS's *Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines*, 2003 (USFWS Interim Guidance), resulted in the initial coordination with the PGC and USFWS.

Specific examples of the contributions that PPL and LCSWMA have made toward the sustainability and stewardship of Pennsylvania's wildlife resources are henceforth discussed. PPL maintains thousands of acres of nature preserves, provides educational centers and programming, monitors Bald Eagle and Osprey nests, and maintains nest boxes for American Kestrel and Eastern Bluebirds. PPL's wildlife resource activities are posted for the public at *http://www.pplweb.com/community+partners/our+communities/environmental+preserves/home.htm*. LCSWMA is a member of the Wildlife Habitat Council and is in the process of becoming

an accredited facility, demonstrating that the Authority meets the requirements for promoting, enhancing and maintaining wildlife resources at its FFLF facility. LCSWMA also monitors and maintains 70 Eastern Bluebird nest boxes and 20 American Kestrel boxes, and bands (by a Master Bander) young American Kestrels. The FFLF also conducts activities to minimize impacts upon grassland nesting birds in non-active portions of the landfill by delaying mowing activities. The FFLF allows access to the Lancaster County Bird Club annually to conduct the Christmas Bird Count. The long-term perspective of bird population trends made possible by the Christmas Bird Count is vital for conservationists. It guides strategies to protect birds and their habitat, and helps identify environmental issues with implications for people as well (www.audubon.org/Bird/cbc/howcbchelpsbirds.html). The willingness of LCSWMA and FFLF to allow access to the Lancaster County Bird Club to conduct the Christmas Bird Count is an important contribution to conservation in the state of Pennsylvania. Additionally, the FFLF has an exceptional environmental performance record over the last 13 years with zero environmental violations issued by PADEP. No other solid waste facility in Pennsylvania has a better environmental record.

COORDINATION SUMMARY

Overall project planning and coordination with the state and federal resource agencies, to date, have included:

- Pre-project Screening – April 2008
- Spring Migratory Bird Study Planning – January 2009
- PGC Consultation Meeting – July 23, 2009
- Pennsylvania Department of Conservation and Natural Resources Pennsylvania Natural Heritage Program – September 16, 2009
- USFWS Coordination – October 6, 2009
- USFWS Response – November 13, 2009
- PGC Coordination Letter – October 28, 2009
- PGC Response – November 30, 2009
- Resource Agency Meeting with USFWS and PGC – December 14, 2009

A pre-project screening (April 2008) was conducted prior to initiating the project, which included a review of the Pennsylvania Natural Heritage Program's on-line review tool to access the Pennsylvania Natural Diversity Inventory (PNDI) database as well as a review of *A Natural Areas Inventory of Lancaster County, Pennsylvania* (June 1990) and *Lancaster County Natural Areas Inventory Update* (1993) and the Audubon Pennsylvania website (http://pa.audubon.org/iba/) for Important Bird Area (IBA) information.

The coordination efforts resulted in the identification of some concerns that were unanticipated based on the initial project screening efforts and based on initial wildlife impact concerns expressed during a consultation meeting between the PGC, LCSWMA and PPL on July 23, 2009. In its November 13, 2009 response letter, the USFWS recommended extensive pre-construction surveys to evaluate the potential for impacts upon the Bald Eagle (*Haliaeetus leucocephalus*), federally endangered species (i.e., Indiana bat, *Myotis sodalis*) and migratory birds, and recommended three years of post-construction surveys. Specific wildlife species impact concerns

expressed by the USFWS are addressed below and are presented in the following subsections: Raptor/Eagle Migration Survey Results Summary, Bald Eagles, Bats, Siting Considerations, Avoidance and Minimization, Aquatic Resources, Post-construction Monitoring.

WILDLIFE SPECIES IMPACT CONCERNS

Prior to addressing the additional surveys/monitoring requested by the USFWS, it is important to discuss the results of the spring and fall raptor/eagle migration surveys.

Eagle/Raptor Migration Survey Results Summary

The 2009 spring and fall eagle/raptor surveys conducted at the proposed wind energy project site have been completed in accordance with the pre-construction monitoring protocol for birds (*Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*) recommended by the PGC. The surveys satisfy the minimum requirement of one full season of both spring and fall raptor migration survey. No further raptor/eagle migration surveys are planned.

The raptor/eagle surveys have entailed a tremendous amount of effort by professional biologists totaling 647.2 hours of observation for the fall migration survey and 174 hours for the spring migration survey, for a total of 821 hours of observation to date. The 2009 spring raptor/eagle migration survey involved observations of the proposed project area for the month of March for five days per week for eight hours per day. The 2009 fall raptor/eagle migratory survey involved observations of the proposed project area from August 15 to September 15 for three days per week for eight hours per day, followed by observations from September 15 to December 15 for eight hours per day for five days per week.

The estimated cost of the voluntary surveys exceeds $120,000 for the 2009 spring and fall migration surveys and $15,000 for the aerial nest survey and roosting survey. Additional costs will occur to conduct the ground-based searches for nests and roosting areas within the vicinity of the probable locations of the two wind turbine generators and for the planned two years of post-construction mortality monitoring.

Results of the 2009 spring and fall raptor/eagle migration surveys are summarized below, and a *Preliminary Summary of Findings Report* is included as an attachment to this letter. A drawing (Sheet 1) showing the proposed tower locations and the probable wind turbine locations is also attached to this letter.

- A total of 14 species of raptors/eagles were observed (Broad-winged Hawk and Merlin represented two additional birds not recorded during the spring survey).
- A total of 6,733 raptor observations were recorded in the fall and 1,006 during the spring.
- Turkey vultures represented the greatest observations during the spring and fall surveys.
- Black vultures were the second most recorded species during the spring and fall surveys.
- Four species observed in the spring and fall surveys are of state concern; Bald Eagle, Osprey, Peregrine Falcon, and Northern Harrier.
- Proposed tower T-2 in the spring and fall had the greatest number of observations recorded for species of special concern.

- Proposed tower T-5 had the least occurrences of raptor/eagles observed and the least occurrences of raptor species of concern (Eagles, Osprey, Peregrine Falcon and Northern Harrier) within a possible rotor swept area of the turbine.
- Proposed towers T-2 and T-4 continue to be the highest with respect to occurrences of raptors/eagles within a possible rotor swept zone of a given tower location based on the spring and fall migration survey.

Probable wind turbines A and B, which are most closely associated with proposed towers T-1 and T-5, were offset from proposed tower locations T-1 and T-5 to minimize potential avian impacts and to maintain necessary siting requirements with respect to increasing the setbacks from the River and riverine forested habitat as well as satisfying property line, access road and utility setbacks. Probable wind turbine B was moved 232 feet to the southwest of proposed tower T-5 to be closer to landfill use activities and to be further away from the wooded riparian corridor along the Susquehanna River. Probable wind turbine A was moved slightly away from proposed tower T-1 to avoid landfill operations and establish a setback from the landfill access road.

Bald Eagles

The Bald Eagle is known to the project area year round and a potential impact upon the species is of concern to the USFWS, which has the jurisdiction to protect the species under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The Bald Eagles in the project area and the vicinity use the lower Susquehanna River for migration, feeding, and breeding/nesting and rearing. A Bald Eagle Usage Map is included as Figure 2 within the attached *Preliminary Summary of Findings Report.* The Bald Eagle Usage Map illustrates general usage patterns within the immediate project vicinity by Bald Eagles, based upon recalled observations by survey biologists. More occurrences of Bald Eagle usage was noted on the Susquehanna River side (i.e., west) of the project area.

Bald Eagle habitat for nesting and feeding is abundant within the lower Susquehanna River corridor. The approximately 10-acre project area is located adjacent to the Conejohela Flats IBA as well as the Conowingo Reservoir IBA, which totals approximately 23,712 acres of primarily forest land adjacent to the River, and approximately 15,715 acres of open water. This vast expanse of available habitat for feeding and nesting is a contributing element to the success of the Bald Eagle population on the lower Susquehanna River.

Disturbances to the Bald Eagles' feeding behavior in the project area are unlikely. The eagles primarily use the vast open water habitat to feed, based upon general observations during the fall migration survey. On a few occasions, eagles were observed possessing fish. Additionally, Bald Eagles are opportunistic and will feed on waterfowl and carrion. Food is abundant in consideration of the riverine habitat and Lancaster County's agricultural land use practices. No Bald Eagles were observed landing in the active landfill area during the spring or fall migration surveys. Furthermore, FFLF primarily accepts construction/demolition waste and incinerated municipal waste (i.e., ash) so carrion or garbage is not readily available as a potential food source.

Disturbances to eagle nesting behavior are unlikely. No known Bald Eagle nest sites are immediately adjacent to the project area. One Bald Eagle nest was observed across the

Susquehanna River on the western shore and across from FFLF. The nest was considered a primary nest and active as Bald Eagles were observed in the nest during the 2009 spring migration survey. A winter Bald Eagle nest survey was requested by the PGC during the July 23, 2009 meeting. LCSWMA and PPL agreed to complete the nest survey following leaf-off conditions. An aerial bald eagle nest survey of forested areas along the eastern shore (approximately 2 miles in length), performed by two biologists (3 man hours) in a chartered helicopter on December 21, 2009, confirmed the absence of nests within the immediate vicinity of project area. Additionally, the helicopter pilot took the biologists to the known (2009) active primary nest site located on the western shore (York County) to obtain a visual search image to assist in the survey on the eastern shore.

The project area and immediate vicinity (i.e., 0.25 mile from the project area) is also influenced by human activities, which can reduce the value of the habitat for nesting; approximately 14 percent is in agricultural use, 2 percent is associated with Turkey Hill Dairy, 27 percent is landfill and 5 percent is railroad corridor. The remaining area within the proposed project area and vicinity is comprised of approximately 22 percent forested riverine corridor and 30 percent open water. The forested riverine corridor along the Susquehanna River is available for potential nesting, but is situated between the landfill and the active railroad and contains the Turkey Hill Trail, a local hiking trail maintained by the Lancaster Conservancy. These potential disturbances, along with the noise emissions from the landfill, make other forested areas along the River more attractive nest sites.

Eagles in flight appear to be acclimated to the activities at the landfill and aware of on-going construction activities as well as the ever changing landscape at the landfill. Occasionally, Bald Eagles will cross the landfill to fly east over Lancaster County, or will bypass the westward bend of the River to move up river. As a result, the activities at the landfill do not appear to disturb the eagles with respect to movement, hunting or breeding.

With respect to the USFWS's request to extend the migration survey for an additional nesting season through fall/winter 2010/2011, conducting a summertime movement and usage (i.e., foraging, roosting activities) study within a 4-mile radius of each nest found, and conducting a risk assessment model would not appreciably add to the knowledge base of the Bald Eagle use at the project site. Based on recent Bald Eagle population growth trends, it is likely that the Bald Eagle will continue to expand its existing population throughout the Lower Susquehanna River basin due to abundant habitat availability and food supply. Like any tall structure (e.g., communication towers, high-voltage transmission towers) constructed within the known habitat of the Bald Eagle (i.e., much of Lancaster and York Counties), the potential for an unavoidable, non-purposeful take to the Bald Eagle exists at the project site due to the installation of the proposed wind turbines. However, avoidance and minimization measures have been implemented to reduce possible impacts upon Bald Eagles to the fullest extent practicable within the constraints of land availability, project economics, and technology. A summertime nest survey of Bald Eagle movement and usage within a 4-mile radius of nest sites, as well as other surveys extending beyond March 2010, are not feasible due to the grant funding schedule criteria, and would effectively terminate this renewable energy project.

In an effort to further minimize potential impacts upon Bald Eagles, the area (encompassing a radius of 660 feet [National *Bald Eagle Management Guidelines*, USFWS May 2007]) around

each wind turbine (full rotor extent) will again be investigated, just prior to construction of the wind turbines, to verify Bald Eagle nests and roost trees are absent and to ensure conservation of the species.

Bats

The Indiana bat is a federally listed endangered species and is a concern to the USFWS, which has jurisdiction under the Endangered Species Act of 1973, as amended, to protect this species. As part of the threatened and endangered species assessment for the proposed wind energy project, initial steps involved accessing the Pennsylvania Department of Conservation and Natural Resource Natural Heritage Program's on-line review tool to review the PNDI database to determine if the potential existed for the occurrence of state or federal species of special concern. This approach is an accepted standard to screen for potential threatened or endangered species presence within a project area. The results of the review indicted that impacts to federally listed or proposed species were not anticipated. Therefore, no further consultation/coordination under the Endangered Species Act was required at the federal level with the USFWS. However, the USFWS, in a letter dated November 13, 2009, indicated that the Indiana bat, listed as endangered at the federal level, is a concern as a result of the project. An on-line search was also conducted to determine if caves providing habitat for bat species of concern were known to the project area. No caves serving as bat hibernacula were identified within 5 miles of the project area based upon information reviewed on-line.

LCSWMA and PPL were not anticipating conflicts with federally listed species based upon a lack of evidence for this species in the project area (including the on-line PNDI review) as well as discussions at an early coordination meeting with the PGC. The PGC did not express a concern for the Indiana bat (a state-endangered species) during a July 23, 2009 coordination meeting, indicating that the project area was considered "low risk" for bats and a bat survey was not requested.

In the USFWS's letter dated November 13, 2009, the agency requested a survey for caves, which could serve as hibernacula for bats. No caves are known to the immediate project area based upon field investigations by ARM personnel and biologists while conducting other studies at the site. The project is not expected to affect hibernacula for bats, including the Indiana bat. Furthermore, measures will be implemented to ensure that the project will not affect roosting or nursing habitat for bats, especially the Indiana bat. As stated by the USFWS "Indiana bats are known to usually roost in dead or living trees with exfoliating bark or living or dead trees with crevices or cavities. Female Indiana bats form nursery colonies under the exfoliating bark of dead or living trees, such as shagbark hickory, in upland or riparian areas. As a result land clearing especially forested areas may adversely affect Indiana bats by killing, injuring or harassing roosting bats and by removing or reducing the quality of foraging and roosting habitat."

The proposed wind energy project is situated in an area that contains compatible land use for a wind energy development project due to its proximity to an active landfill; therefore, forest land disturbances are minimal. The proposed project will involve minimal losses of forested area. A loss of approximately two acres of wooded area is expected. The wooded area planned for removal represents a relatively young white pine (*Pinus strobus*) tree row (approximately 1 acre)

along the FFLF's former perimeter fence as well as some relatively young deciduous trees (approximately 1 acre) along the northwestern property line. Representative tree species along the perimeter of the project area include, northern hackberry (*Celtis occidentalis*), black cherry (*Prunus serotina*), black locust (*Robinia pseudoacacia*), pawpaw (*Asimina triloba*), and red maple (*Acer rubrum*). Oak species (*Quercus sp*.) and hickory species (*Carya sp*.) are present further downslope, closer to the River. Many of the trees are overgrown with mile-a-minute (*Polygonum perfoliatum*) and river bank grape (*Vitis riparia*). White pine trees are not known for usage by Indiana bats for roosting or nursing. The trees would be removed prior to March 31, 2010 in the vicinity of proposed tower T-1 (Probable Wind Turbine A) to minimize potential impacts upon passerine and bats.

Based on the available information about bats at the site, and based on the proposed avoidance and minimization measures cited herein, it is ARM's opinion that additional bat monitoring surveys at the 10-acre project site are unnecessary. Furthermore, a survey to determine potential impacts upon birds and bats using a combination of marine radar, acoustic monitoring, mist netting and infrared radar for a period of three years cannot be conducted. A survey of this scope is not practical due to mandated schedule requirements, is economically infeasible for the scale of the project, and would effectively terminate this renewable energy project.

SITING CONSIDERATIONS

The attached Sheet 1 illustrates the proposed project site and the siting constraints that were considered prior to locating the proposed wind turbines. A number of siting considerations were evaluated for the wind energy project at FFLF including the following:

- topography;
- prevailing wind direction;
- site elevation;
- proximity to electrical interconnection;
- proximity to the meteorological tower location;
- accessibility;
- turbine spacing;
- constructability; and
- physical siting constraints (i.e., landfill footprint, property boundaries and adjacent trail).

The proposed wind turbine locations (wind turbines A and B on Sheet 1) are situated along a landform, referred to as Turkey Hill Point, which extends out into the Susquehanna River at Lake Clarke and forms a steep bluff adjacent to the river. This unique landform is responsible for causing higher wind speeds to occur at the proposed project site than in surrounding areas as the wind must accelerate up and over the steep bluff. Only the northern and western edges of the FFLF are suitable for a wind energy project due to the need to have uninterrupted exposure to the west-northwesterly prevailing wind direction. In addition to favorable exposure to the prevailing wind direction, the northern and western edges of the FFLF constitute the highest elevations at the site, which translates to higher sustained wind speeds. Based on these features, the wind resource assessment at the site was performed using information collected from a meteorological (met) tower located on the northwestern edge of the landfill. The 12-month wind resource assessment provided the basis for the wind energy production estimates that demonstrated the

viability of the project. It is important that the wind turbines are situated near the met tower location to ensure the dependability of the energy production estimates.

In addition to the wind turbines being located near the met tower location, it was important that the turbines be located near the electrical interconnection point at Turkey Hill Dairy and in accessible locations that would minimize new road construction. The proposed wind turbine locations are within one mile of the interconnection point to deliver energy to Turkey Hill Dairy, which minimizes environmental disturbances and reduces construction costs. The wind turbine locations are also located adjacent to the active landfill, which is a compatible land use for the wind energy project because accessibility is available for construction and maintenance and overall environment impacts associated with new access road construction are reduced.

Wind turbine orientation and spacing were also important criteria during the siting process. The proposed wind turbines at FFLF are roughly perpendicular to the prevailing wind direction to maximize energy generation. Additionally, the potential wind turbines at FFLF have been provided with the minimal spacing between turbines that will prevent wake interference between the turbines.

Physical siting constraints at the landfill were also considered and include: the active landfill footprint; property boundaries; existing utilities; and the Turkey Hill Trail. Siting wind turbines on an active landfill is not permitted since foundation stability requirements would not be satisfied. Therefore, the possible wind turbine locations were limited to the western and northern periphery of the FFLF. Existing utilities (e.g., PPL's high voltage electrical transmission line and the Sprint-Nextel cellular tower) limited the movement of the proposed wind turbine A and B locations further east. Moving the proposed turbine locations further west was limited by the steep bluff and by the proximity to the Turkey Hill Trail.

The proposed wind energy project was originally planned as a 6-MW project utilizing four wind turbines. The four originally proposed tower locations were evaluated as part of the 2009 spring raptor/eagle migration survey. Based on the results of the spring migration survey, it was estimated by the project biologists that potential wildlife impacts could be reduced by moving the wind turbines inland from Turkey Hill Point and by reducing the number of wind turbines from four turbines to two turbines. Accordingly, a fifth proposed tower location (T-5) was assessed on a neighboring parcel to the north of the FFLF, away from the riverine forested corridor and back from the steep riverine slope. In order to permit the evaluation of T-5, LCSWMA began exploring the feasibility of acquiring the land on which it was sited. When it was determined that the acquisition of the triangular-shaped parcel to the north of FFLF could be acquired, proposed tower T-5 was added to the fall raptor/eagle migratory survey and LCSWMA purchased the land in September 2009 to accommodate the wind project.

Based on the wind characteristics of the site, the physical siting constraints, and the preliminary results of the raptor/eagle migration surveys, it was determined that probable wind turbine A and B locations are the most favorable and suitable locations with respect to minimizing potential wildlife impacts while maintaining the economic viability of the project.

AVOIDANCE AND MINIMIZATION

Because the wind project area is located adjacent to an area known for concentrations of birds, especially during the migration season, the turbine locations were adjusted to avoid and minimize impacts upon birds. The USFWS Interim Guidance was followed to the extent practicable.

Avoidance of Bird Concentration Areas and Landscape Features Known to Attract Birds

Birds are known to use the wooded habitat along the Susquehanna River. Therefore, the proposed wind turbines were moved as far back from the Susquehanna River corridor as possible to minimize potential impacts to avian species. LCSWMA purchased an additional 16 acres of land adjacent to the FFLF to facilitate the relocation of proposed wind turbines A and B to the north of the landfill and to accommodate a desired setback from the River, which is expected to minimize potential impacts to avian species. Additionally, to further reduce potential impacts upon birds, the location of proposed tower T-5 (probable wind turbine B) was moved 232 feet to the southwest to be closer to landfill use activities and to be further away from the wooded riparian along the Susquehanna River. The position of proposed tower T-1 (probable wind turbine A) was adjusted slightly to avoid landfill operations and to establish a manufacturer-recommended setback from the landfill access road.

Reduce Project Area Disturbance

The proposed project was evaluated to determine if the project could be reduced to minimize the project disturbance footprint while still satisfying the energy needs of Turkey Hill Dairy. As a result of the evaluation, the proposed project was reduced from a planned four wind turbine project to a two wind turbine project. This resulted in the elimination of two turbines in the areas of the site most sensitive to potential avian impacts (i.e., the western side of the landfill that extends out into the Susquehanna River).

Turbine Configuration

The proposed wind turbines have been configured to avoid potential mortality, where feasible. The turbines are spaced as close together as possible following recommended USFWS Interim Guidance. The turbine towers have been moved away from the River corridor to the extent possible. The turbine configuration balances potential wildlife impacts with wind patterns, siting requirements, and topographic conditions.

Reduce Habitat Fragmentation

The proposed wind energy project and turbine tower locations are situated primarily on land already altered and/or cultivated and adjacent to an active landfill. Studies have shown that wind energy projects located within agricultural fields or grasslands, versus forested ridgelines, tend to have lower bird mortality rates.

Minimal habitat loss is expected as a result of the project. The project will not result in fragmentation of forest habitat. A row of planted white pine trees that exists along a former

security perimeter fence will be removed. Secure access to the site exists and the existing road network will be used to construct and maintain the wind energy site.

Habitat Restoration

The design plans will include measures to minimize potential impacts upon wildlife following construction and during the operational phase of the project. Grass beneath the wind turbines will be regularly cut to reduce the value of the habitat for wildlife and decrease habitat attractiveness for wildlife species. Existing nest boxes in the vicinity of the wind turbine generators have already been removed.

Turbine Design

Guy wires will not be used for support of the wind turbines. Also, lattice towers, which have become roosting sites for birds at other wind projects, will not be used to support the wind turbines.

Aviation Lighting

Aviation lighting will be in compliance with the Federal Aviation Administration (FAA) to minimize bird and bat impacts. White strobe lights will be used at the minimum number, minimum intensity and minimum number of flashes per minute allowable by the FAA. Solid red or pulsating red warning lights will be avoided. The project has received final approval from the FAA.

Electric Transmission Lines

Electric transmission lines from the wind turbine generators to the end user will be placed underground to avoid electrocution of birds. Bald Eagles in the Lancaster County area have recently died (within the last two years) from electrocution from transmission lines (*Lancaster New Era and Intelligencer Journal*).

AQUATIC RESOURCES

The proposed wind turbine locations will not affect regulated watercourses or wetlands. The turbine staging areas and transmission line corridors will be investigated by a wetland biologist once the final locations are determined. However, a preliminary review of topographic mapping does not indicate the presence of wetland or water resources within the project area. As a result, encroachment permits from the United States Army Corps of Engineers and Pennsylvania Department of Environmental Protection are not expected.

POST-CONSTRUCTION MONITORING

LCSWMA and PPL have agreed to two years of post-construction monitoring for bird and bats. The two years of monitoring was accepted by the PGC at the July 23, 2009 consultation meeting.

The post-construction monitoring will follow the *Protocols to Monitor Bat and Bird Mortality at Industrial Wind Turbine Sites* (PGC's *Wind Energy Voluntary Cooperation Agreement*, February 23, 2007).

SUMMARY

LCSWMA and PPL have in good-faith made every possible effort to develop this renewable energy project in an environmentally conscientious manner with regard to the conservation of Pennsylvania's wildlife resources, especially avian species. The project developers have voluntarily completed the following pre-construction surveys to assess potential risks to bird species of concern:

- 2009 (March) Spring Raptor/Eagle Migration Survey
- 2009 Fall (August – December) Raptor/Eagle Migration Survey
- 2009 (December) Aerial Eagle Nest Survey

The migration surveys were completed in accordance with the PGC's *Wind Energy Voluntary Cooperation Agreement* (February 23, 2007). Like any tall structure (e.g., communication towers, high-voltage transmission towers) constructed within the known habitat of the Bald Eagle, the potential for an unavoidable, non-purposeful take to the Bald Eagle exists at the project site due to the installation of the proposed wind turbines. Avoidance and minimization measures have been implemented to reduce possible impacts upon Bald Eagles to the fullest extent practicable within the constraints of land availability, project economics, and technology.

LCSWMA and PPL have agreed to conduct post-construction mortality surveys for bats and birds for two years as per the PGC's *Wind Energy Voluntary Cooperation Agreement, Exhibit C* (February 23, 2007).

The locations of probable wind turbine A (Tower 1) and probable wind turbine B (Tower 5) were selected based upon a host of siting considerations and constraints and based upon the least number of avian occurrences within a rotor swept area, including the Bald Eagle, which was the most representative species of special concern. The USFWS's *Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines* (2003) was followed during the project siting and preliminary design phase.

A summary of avoidance and minimization measures include: implementing setbacks from the riverine corridor and purchasing adjacent lands to implement the setback measures; grouping turbines as closely as possible; siting the turbines in maintained areas and agricultural areas; minimizing forested habitat losses; developing a habitat restoration management plan to avoid attracting wildlife or prey to the wind turbine area; specifying white strobe lighting on the turbines; and placing electric power lines underground. Furthermore, LCSWMA and PPL have agreed to conduct a survey within a 660- foot radius of the rotor swept area of probable wind turbines A and B in January 2010, and prior to construction, to verify the absence of roost trees.

Additional measures will be implemented to remove necessary trees prior to March 31, 2010 within the vicinity of probable wind turbines A and B to ensure potential bat roosting trees will

not be affected during construction. No caves are known to the area based upon investigations by biologists while conducting other studies at the landfill.

The following requests were made by the USFWS, but are considered infeasible due to scheduling constraints of the stimulus funding supporting the project and due to the sensitive economics of a relatively small wind energy project:

- Extend the raptor/eagle migration survey and nest survey through the fall/winter of 2010/2011;
- Conduct a summertime survey of the bald eagle movements and usage within a four-mile radius of each nest found, including foraging activities, roosting activities, and identification of important roosting trees;
- Conduct a risk assessment model to determine the risk of the project to the Bald Eagles within the area of the project;
- Conduct a marine radar study24/7 for a "full season";
- Conduct pre-construction monitoring of bird and bat use for three years;
- Conduct an acoustic survey, mist-netting and infrared radar survey; and
- Post-construction monitoring for three years.

While these additional studies are deemed infeasible, PPL and LCSWMA are committed to working with the USFWS to collect valuable post-construction information to help minimize mortality risk to birds and bats from relatively small wind energy projects.

CLOSING

LCSWMA and PPL kindly request a written indication that USFWS is satisfied to the extent that the project may proceed as scheduled, from USFWS by January 15, 2010. If the wind turbines are not ordered by February 1, 2010, the project will not be able to proceed.

If you have any questions or wish to further discuss this project, please contact Steve Gabrielle of PPL Renewable Energy at 610-737-6812. Thank you for your time and attention to this project.

Sincerely,
ARM Group Inc.

Michelle S. Cohen
Senior Biologist

Attachments

cc: Ms. Tracey Librandi Mumma, PGC
Ms. Cindy Tibbott, USFWS
Steve Gabrielle, PPL Renewable Energy
Brooks Norris, LCSWMA
Jim Warner, LCSWMA
Bryan Wehler, ARM Group, Inc.

ARM Group Inc.
Earth Resource Engineers and Consultants

December 23, 2009

Ms. Tracey Librandi Mumma
Division of Environmental Planning and Habitat Protection
Bureau of Wildlife Habitat Management
Pennsylvania Game Commission
2001 Elmerton Avenue
Harrisburg, PA 17110

Re: Frey Farm Landfill Wind Energy Project
Manor Township, Pennsylvania
PNDI # 20090916210107
ARM Project 06377-6-3

Dear Ms. Librandi Mumma,

ARM Group Inc. (ARM) on behalf of The Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Development Company, LLC (PPL) has prepared this letter to address the Pennsylvania Game Commission's (PGC) consultation response letter dated November 30, 2009, regarding the Frey Farm Landfill (FFLF) Wind Energy Project in Manor Township, Lancaster County, Pennsylvania. This response letter follows the resource agency meeting held on December 14, 2009 with LCSWMA, PPL, ARM, PGC and the United States Fish and Wildlife Service (USFWS) to discuss the project. This response letter discusses the main concerns outlined in the PGC's November 30, 2009 letter and includes a summary of the preliminary results of the 2009 fall raptor/eagle migration survey. The information contained in this letter is provided to assist the PGC in evaluating the project with respect to species of special concern within the agency's jurisdiction.

LCSWMA and PPL have implemented all reasonable measures to avoid and minimize impacts upon avian species during the design and development phase of this small-scale wind energy project. Federal stimulus funding for this project provides that wind turbines need to be ordered by February 1, 2010 or else the project may not proceed. LCSWMA and PPL kindly request a response of support for this project, or at least a written indication that the PGC is satisfied to the extent that the project may proceed as scheduled, from the PGC by January 15, 2010.

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

PROJECT BACKGROUND

As you are aware, LCSWMA and PPL are proposing a relatively small wind energy project to provide electricity to the adjacent Turkey Hill Dairy. Under Pennsylvania's Alternative Energy Portfolio Standards Act, PPL, as an electricity generator, has the obligation to provide electricity via alternative energy sources. LCSWMA, PPL and Turkey Hill Dairy are currently partners in an existing landfill gas to energy plant, which is operated by PPL. The plant provides waste steam energy to Turkey Hill Dairy to facilitate operations. The proposed 3.2-Megawatt (MW) wind energy project will meet approximately 25 percent of Turkey Hill's annual electricity needs. Meeting Turkey Hill Dairy's entire electrical demand would require eight wind turbines of the size proposed for this project. The project was originally planned as a four turbine project. In an effort to minimize potential wildlife impacts and to provide the minimum-sized project that is economically viable for project stakeholders, the project was reduced in scope from four turbines to two turbines.

FUNDING HISTORY

In 2009, the proposed project received a grant from the Pennsylvania Department of Environmental Protection (PADEP) via the Pennsylvania Energy Development Authority (PEDA), which was supported by "stimulus" dollars through the American Recovery and Reinvestment Act (ARRA). The competitive grant was awarded to the project based upon its unique structure (i.e., relatively small wind project providing electricity directly to an adjacent commercial end user); to provide emission-free energy; to create jobs associated with completing the project; and to control electricity costs thereby leading to job preservation at Turkey Hill Dairy. Electric costs at Turkey Hill Dairy are expected to increase as PPL electric rate caps expire December 31, 2009. As a result, the electricity generated from the wind turbine facility will serve as a contributing factor in benefiting the overall economic viability of the Turkey Hill Dairy by providing discounted electricity pricing. The project will also offer the opportunity to learn about this green energy project through an environmental education center planned for development in nearby Columbia, and through scheduled tours of the wind facility available to the public. A criterion of the awarded grant is that the project be completed within specific timelines. In order for the project developers to receive the grant proceeds, the project must be completed by December 31, 2010 and commissioned and fully operational by February 1, 2011. Due to the lengthy lead time for wind turbine procurement, and to complete the project by the end of 2010, the wind turbines, which constitute nearly half of the overall project cost, must be ordered from General Electric by February 1, 2010.

ENVIRONMENTAL STEWARDSHIP

With an eminent history of environmental support and stewardship in the Lower Susquehanna Valley, LCSWMA and PPL are committed to developing the proposed wind energy project in an environmentally conscientious manner with regard to the conservation of Pennsylvania's wildlife resources, through pre-construction monitoring, agency coordination and implementation of all practicable measures to avoid and minimize impacts upon eagles and other wildlife during site development and construction. The development team's good faith efforts to assess existing raptor and eagle migration trends, its commitment to compliance with wildlife protection regulations, its adherence to the Pennsylvania Game Commission and USFWS's *Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines*, 2003 (USFWS Interim Guidance), resulted in the initial coordination with the PGC and USFWS.

Specific examples of the contributions that PPL and LCSWMA have made toward the sustainability and stewardship of Pennsylvania's wildlife resources are henceforth discussed. PPL maintains thousands of acres of nature preserves, provides educational centers and programming, monitors Bald Eagle and Osprey nests, and maintains nest boxes for American Kestrel and Eastern Bluebirds. PPL's wildlife resource activities are posted for the public at *http://www.pplweb.com/community+partners/our+communities/environmental+preserves/home.htm*. LCSWMA is a member of the Wildlife Habitat Council and is in the process of becoming an accredited facility, demonstrating that the Authority meets the requirements for promoting, enhancing and maintaining wildlife resources at its FFLF facility. LCSWMA also monitors and maintains 70 Eastern Bluebird nest boxes and 20 American Kestrel boxes, and bands (by a Master Bander) young American Kestrels. The FFLF also conducts activities to minimize impacts upon grassland nesting birds in non-active portions of the landfill by delaying mowing activities. The FFLF allows access to the Lancaster County Bird Club annually to conduct the Christmas Bird Count. The long-term perspective of bird population trends made possible by the Christmas Bird Count is vital for conservationists. It guides strategies to protect birds and their habitat, and helps identify environmental issues with implications for people as well (www.audubon.org/Bird/cbc/howcbchelpsbirds.html). The willingness of LCSWMA and FFLF to allow access to the Lancaster County Bird Club to conduct the Christmas Bird Count is an important contribution to conservation in the state of Pennsylvania. Additionally, the FFLF has an exceptional environmental performance record over the last 13 years with zero environmental violations issued by PADEP. No other solid waste facility in Pennsylvania has a better environmental record.

COORDINATION SUMMARY

Overall project planning and coordination with the state and federal resource agencies, to date, have included:

- Pre-project Screening – April 2008
- Spring Migratory Bird Study Planning – January 2009
- PGC Consultation Meeting – July 23, 2009
- Pennsylvania Department of Conservation and Natural Resources Pennsylvania Natural Heritage Program – September 16, 2009
- USFWS Coordination – October 6, 2009
- USFWS Response – November 13, 2009
- PGC Coordination Letter – October 28, 2009
- PGC Response – November 30, 2009
- Resource Agency Meeting with USFWS and PGC – December 14, 2009

A pre-project screening (April 2008) was also conducted prior to initiating the project, which included a review of the Pennsylvania Natural Heritage Program's on-line review tool to access the Pennsylvania Natural Diversity Inventory (PNDI) database as well as a review of *A Natural Areas Inventory of Lancaster County, Pennsylvania* (June 1990) and *Lancaster County Natural Areas Inventory Update* (1993) and the Audubon Pennsylvania website (http://pa.audubon.org/iba/) for Important Bird Area (IBA) information.

The coordination efforts resulted in the identification of some concerns that were unanticipated based on the initial project screening efforts and based on initial wildlife impact concerns expressed during a consultation meeting between the PGC, LCSWMA and PPL on July 23, 2009. In its November 30, 2009 response letter, the PGC requested pre-construction migration surveys for raptors, including eagles and waterfowl; breeding bird surveys; nesting surveys for the Bald Eagle; and a summer time survey of Bald Eagle movement and usage (including foraging activities, roosting activities and identification of important roosting trees). Additionally, the PGC recommended an acoustic survey and a survey for caves to determine potential impacts on bats. The PGC also recommended a two year post-construction monitoring survey. Specific wildlife species impact concerns expressed by the PGC are addressed below and are presented in the following subsections: Eagle/Raptor Migration Survey Results Summary, Bald Eagles, Bats, Other Birds of State Concern, Siting Considerations, Avoidance and Minimization, Aquatic Resources, Post-construction Monitoring.

WILDLIFE SPECIES IMPACT CONCERNS

During an initial consultation meeting with the PGC on July 23, 2009 raptors and Bald Eagles were of primary concern to the PGC, in regard to the proposed project. A fall eagle and raptor migration survey was requested at the meeting by the PGC, in addition to the voluntarily completed spring 2009 raptor and eagle migration survey. A winter eagle/osprey nest survey was also requested by the PGC during the July 23, 2009 meeting.

The Pennsylvania Department of Conservation and Natural Resource Natural Heritage Program's on-line review tool was used to access (April 2008) and review the PNDI database to determine if any additional state or federal threatened or endangered species that were not identified during the initial consultation process may occur in the project area. As a result of the latest PNDI review, three species of concern were identified under the jurisdiction of the PGC, and included the Great Egret, Pennsylvania endangered; the Prothontary Warbler (*Prothonotaria critrea*), Species of Special Concern; and an unidentified State sensitive species, Pennsylvania threatened. Coordination was conducted with the PGC on October 28, 2009 and the PGC noted in a response letter dated November 30, 2009 that the two species of concern with respect to the project included the Bald Eagle and the Great Egret.

In addition to the Bald Eagle, two other Pennsylvania raptor species of priority concern (high level concern, PGC's *Pennsylvania Comprehensive Wildlife Conservation Strategy*, September 2005) were identified in the project area during the spring and fall migration surveys that were not specifically identified as a concern by the PGC. The two raptor species are the Northern Harrier (*Circus cyaneus*) and the Peregrine Falcon (*Falco peregrines*). Additionally, the Osprey (*Pandioun haliaetus*) was observed in the project area and is considered a Pennsylvania threatened species with a Pennsylvania vulnerable status.

The PGC recommended, in its letter dated November 30, 2009, the following surveys:

- Spring and fall raptor and waterfowl migration survey;
- Breeding Bird Survey;
- Bald Eagle Nesting Survey (following PGC protocol);
- Acoustic Survey for bats and birds; and
- Cave investigation for bat hibernacula.

Prior to addressing the additional surveys/monitoring requested by the PGC, it is important to discuss the results of the spring and fall raptor/eagle migration surveys.

Eagle/Raptor Migration Survey Results Summary

The 2009 spring and fall eagle/raptor surveys conducted at the proposed wind energy project site have been completed in accordance with the pre-construction monitoring protocol for birds (*Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*) recommended by the PGC. The surveys satisfy the minimum requirement of one full season of both spring and fall raptor migration survey. No further raptor/eagle migration surveys are planned.

The raptor/eagle surveys have entailed a tremendous amount of effort by professional biologists totaling 647.2 hours of observation for the fall migration survey and 174 hours for the spring migration survey, for a total of 821 hours of observation to date. The 2009 spring raptor/eagle

migration survey involved observations of the proposed project area for the month of March for five days per week for eight hours per day. The 2009 fall raptor/eagle migratory survey involved observations of the proposed project area from August 15 to September 15 for three days per week for eight hours per day, followed by observations from September 15 to December 15 for eight hours per day for five days per week.

The estimated cost of the voluntary surveys exceeds $120,000 for the 2009 spring and fall migration surveys and $15,000 for the aerial nest survey and roosting survey. Additional costs will occur to conduct the ground-based searches for nests and roosting areas within the vicinity of the probable locations of the two wind turbine generators and for the planned two years of post-construction mortality monitoring.

Results of the 2009 spring and fall raptor/eagle migration surveys are summarized below, and a *Preliminary Summary of Findings Report* is included as an attachment to this letter. A drawing (Sheet 1) showing the proposed tower locations and the probable wind turbine locations is also attached to this letter.

- A total of 14 species of raptors/eagles were observed (Broad-winged Hawk and Merlin represented two additional birds not recorded during the spring survey).
- A total of 6,733 raptor observations were recorded in the fall and 1,006 during the spring.
- Turkey vultures represented the greatest observations during the spring and fall surveys.
- Black vultures were the second most recorded species during the spring and fall surveys.
- Four species observed in the spring and fall surveys are of state concern; Bald Eagle, Osprey, Peregrine Falcon, and Northern Harrier.
- Proposed tower T-2 in the spring and fall had the greatest number of observations recorded for species of special concern.
- Proposed tower T-5 had the least occurrences of raptor/eagles observed and the least occurrences of raptor species of concern (Eagles, Osprey, Peregrine Falcon and Northern Harrier) within a possible rotor swept area of the turbine.
- Proposed towers T-2 and T-4 continue to be the highest with respect to occurrences of raptors/eagles within a possible rotor swept zone of a given tower location based on the spring and fall migration survey.

Probable wind turbines A and B, which are most closely associated with proposed towers T-1 and T-5, were offset from proposed tower locations T-1 and T-5 to minimize potential avian impacts and to maintain necessary siting requirements with respect to increasing the setbacks from the River and riverine forested habitat as well as satisfying property line, access road and utility setbacks. Probable wind turbine B was moved 232 feet to the southwest of proposed tower T-5 to be closer to landfill use activities and to be further away from the wooded riparian corridor along the Susquehanna River. Probable wind turbine A was moved slightly away from proposed tower T-1 to avoid landfill operations and establish a setback from the landfill access road.

Bald Eagles

The Bald Eagle is known to the project area and a potential impact upon the species is of concern to the PGC, which has the jurisdiction to protect the species under the Pennsylvania Game and Wildlife Code. The Bald Eagles in the project area and the vicinity use the lower Susquehanna River for migration, feeding, and breeding/nesting and rearing. A Bald Eagle Usage Map is included as Figure 2 within the attached *Preliminary Summary of Findings Report.* The Bald Eagle Usage Map illustrates general usage patterns within the immediate project vicinity by Bald Eagles, based upon recalled observations by survey biologists. More occurrences of Bald Eagle usage was noted on the Susquehanna River side (i.e., west) of the project area.

Bald Eagle habitat for nesting and feeding is abundant within the lower Susquehanna River corridor. The approximately 10-acre project area is located adjacent to the Conejohela Flats IBA as well as the Conowingo Reservoir IBA, which totals approximately 23,712 acres of primarily forest land adjacent to the River, and approximately 15,715 acres of open water. This vast expanse of available habitat for feeding and nesting is a contributing element to the success of the Bald Eagle population on the lower Susquehanna River.

Disturbances to the Bald Eagles' feeding behavior in the project area are unlikely. The eagles primarily use the vast open water habitat to feed, based upon general observations during the fall migration survey. On a few occasions, eagles were observed possessing fish. Additionally, Bald Eagles are opportunistic and will feed on waterfowl and carrion. Food is abundant in consideration of the riverine habitat and Lancaster County's agricultural land use practices. No Bald Eagles were observed landing in the active landfill area during the spring or fall migration surveys. Furthermore, FFLF primarily accepts construction/demolition waste and incinerated municipal waste (i.e., ash) so carrion or garbage is not readily available as a potential food source.

Disturbances to eagle nesting behavior are unlikely. No known Bald Eagle nest sites are immediately adjacent to the project area. One Bald Eagle nest was observed across the Susquehanna River on the western shore and across from FFLF. The nest was considered a primary nest and active as Bald Eagles were observed in the nest during the 2009 spring migration survey. A winter Bald Eagle nest survey was requested by the PGC during the July 23, 2009 meeting. LCSWMA and PPL agreed to complete the nest survey following leaf-off conditions. An aerial bald eagle nest survey of forested areas along the eastern shore (approximately 2 miles in length), performed by two biologists (3 man hours) in a chartered helicopter on December 21, 2009, confirmed the absence of nests within the immediate vicinity of project area. Additionally, the helicopter pilot took the biologists to the known (2009) active primary nest site located on the western shore (York County) to obtain a visual search image to assist in the survey on the eastern shore.

The project area and immediate vicinity (i.e., 0.25 mile from the project area) is also influenced by human activities, which can reduce the value of the habitat for nesting; approximately 14 percent is in agricultural use, 2 percent is associated with Turkey Hill Dairy, 27 percent is landfill and 5 percent is railroad corridor. The remaining area within the proposed project area and vicinity is comprised of approximately 22 percent forested riverine corridor and 30 percent open water. The forested riverine corridor along the Susquehanna River is available for potential nesting, but is situated between the landfill and the active railroad and contains the Turkey Hill Trail, a local hiking trail maintained by the Lancaster Conservancy. These potential disturbances, along with the noise emissions from the landfill, make other forested areas along the River more attractive nest sites.

Eagles in flight appear to be acclimated to the activities at the landfill and aware of on-going construction activities as well as the ever changing landscape at the landfill. Occasionally, Bald Eagles will cross the landfill to fly east over Lancaster County, or will bypass the westward bend of the River to move up river. As a result, the activities at the landfill do not appear to disturb the eagles with respect to movement, hunting or breeding.

With respect to the PGC's request to extend the migration survey for an additional nesting season and conducting a summertime movement study, the performance of these additional studies would not appreciably add to the knowledge base of the Bald Eagle use at the project site. Based on recent Bald Eagle population growth trends, it is likely that the Bald Eagle will continue to expand its existing population throughout the Lower Susquehanna River basin due to abundant habitat availability and food supply. Like any tall structure (e.g., communication towers, high-voltage transmission towers) constructed within the known habitat of the Bald Eagle (i.e., much of Lancaster and York Counties), the potential for an unavoidable, non-purposeful take to the Bald Eagle exists at the project site due to the installation of the proposed wind turbines. However, avoidance and minimization measures have been implemented to reduce possible impacts upon Bald Eagles to the fullest extent practicable within the constraints of land availability, project economics, and technology. A summertime nest survey of Bald Eagle movement and usage within a 4-mile radius of nest sites, as well as other surveys extending beyond March 2010, are not feasible due to the grant funding schedule criteria, and would effectively terminate this renewable energy project.

In an effort to further minimize potential impacts upon Bald Eagles, the area (encompassing a radius of 660 feet [National *Bald Eagle Management Guidelines*, USFWS May 2007]) around each wind turbine (full rotor extent) will again be investigated, just prior to construction of the wind turbines, to verify Bald Eagle nests and roost trees are absent and to ensure conservation of the species.

Bats

Bats are a concern to the PGC, which has jurisdiction of the species under the Pennsylvania Game and Wildlife Code. However, several steps were taken to determine the potential for involvement with bats species of State as well as federal concern, including the Indiana bat (*Myotis sodalis*). As part of the threatened and endangered species assessment for the proposed wind energy project, initial steps involved accessing the Pennsylvania Department of Conservation and Natural Resource Natural Heritage Program's on-line review tool to review the PNDI database to determine if the potential existed for the occurrence of state species of special concern. This approach is an accepted standard to screen for potential threatened or endangered species presence within a project area. State endangered or threatened bat species were not specifically identified as a species of concern in the project area as a result of the PNDI review. An on-line search was also conducted to determine if caves providing habitat for bat species of concern were known to the project area. No caves serving as bat hibernacula were identified within 5 miles of the project area based upon information reviewed on-line.

The PGC indicated in the July 23, 2009 meeting that the area was considered "low risk" for bats and a bat survey was not requested and thus, not conducted. LCSWMA and PPL were not anticipating conflicts with bat species of concern based upon a lack of evidence for this species in the project area (including the on-line PNDI review) as well as discussions at an early coordination meeting with the PGC.

In the PGC's letter dated November 30, 2009, the agency requested a survey for caves, which may serve as hibernacula for bats. No caves are known to the immediate project area based upon field investigations by ARM personnel and biologists while conducting other studies at the site. The project is not expected to affect hibernacula for bats, including the Indiana bat. Furthermore, measures will be implemented to ensure that the project will not affect roosting or nursing habitat for bats, especially the Indiana bat. As stated by the USFWS, "Indiana bats are known to usually roost in dead or living trees with exfoliating bark or living or dead trees with crevices or cavities. Female Indiana bats form nursery colonies under the exfoliating bark of dead or living trees, such as shagbark hickory, in upland or riparian areas. As a result land clearing especially forested areas may adversely affect Indiana bats by killing, injuring or harassing roosting bats and by removing or reducing the quality of foraging and roosting habitat."

The proposed wind energy project is situated in an area that contains compatible land use for a wind energy development project due to its proximity to an active landfill. The proposed project will involve minimal losses of forested area. A loss of approximately two acres of wooded area is expected. The wooded area planned for removal represents a relatively young white pine (*Pinus strobus*) tree row (approximately 1 acre) along the FFLF's former perimeter fence as well as some relatively young deciduous trees (approximately 1 acre) along the northwestern property line. Representative tree species along the perimeter of the project area include, northern

hackberry (*Celtis occidentalis*), black cherry (*Prunus serotina*), black locust (*Robinia pseudoacacia*), pawpaw (*Asimina triloba*), and red maple (*Acer rubrum*). Oak species (*Quercus sp*.) and hickory species (*Carya sp*.) are present further downslope, closer to the River. Many of the trees are overgrown with mile-a-minute (*Polygonum perfoliatum*) and river bank grape (*Vitis riparia*). White pine trees are not known for usage by Indiana bats for roosting or nursing. The trees would be removed prior to March 31, 2010 in the vicinity of proposed tower T-1 (Probable Wind Turbine A) to minimize potential impacts upon passerine and bats.

Based on the available information about bats at the site, and based on the proposed avoidance and minimization measures cited herein, it is ARM's opinion that additional bat monitoring surveys at the 10-acre project site are unnecessary.

Other Birds of State Concern

LCSWMA and PPL have implemented all reasonable measures to avoid and minimize impacts upon migratory birds during the design and development phase of the wind energy project. The project team has followed, to the extent practicable, the USFWS's voluntary *Interim Guidelines on Avoiding and Minimizing Impacts from Wind Turbines.*

Waterfowl Migration Survey

The 2009 spring and fall raptor and eagle migration surveys did not include a survey for waterfowl. The wind energy project is not situated in the river and has been placed as far back from the riverine corridor as possible. Additionally, a waterfowl survey was not requested during the initial consultation meeting with the PGC on July 23, 2009. Biologists conducting the raptor/eagle migration survey will describe the general observations of waterfowl in the fall raptor/eagle migration monitoring report. As a general note, waterfowl were occasionally observed, in small numbers, over the landfill.

The following describes general observations recalled from the survey biologists during the 2009 fall migration. Canada Geese (*Branta canadensis*) and Snow Geese (*Chen caerulescens*) were observed over the Susquehanna River. During the fall migration survey period, Snow Geese were observed flying south and Canada Geese were observed flying north and south over the River. The Canada Geese were sometimes noted flying over the landfill during the fall migration period, but at heights greater than 200 meters. Canada Geese have also been observed east of the landfill property. Mallards (*Anas platyrhynchos*) were the only waterfowl observed to land within the active FFLF. The Mallards were sometimes observed in the temporary open water trench that contains stormwater, which is piped to the LCSWMA treatment facility. The Mallards typically flew into the swale from the south and departed the swale flying south. A Double-crested Cormorant (*Phalacrocorax auritus*) on two separate occasions was observed over the landfill flying south.

Breeding Bird Survey

A breeding bird survey was not requested during the initial consultation meeting with the PGC on July 23, 2009, and ARM did not believe that a breeding bird survey was necessary due to the existing land use at the site and ARM's existing knowledge of the site. Existing habitat in the vicinity of the proposed wind turbines is vegetated soil stockpile for proposed landfill use purposes, maintained grass and active agricultural land. Proposed towers T-1 (probable wind turbine A), T-2, T-3, and T-4 are within the permit area of the landfill and the habitat and surface cover is continually changing due to landfill operations. Additionally, the area immediately east of proposed tower T-5 (probable wind turbine B) will be actively used for soil stockpile placement purposes prior to construction of the turbine. Grassland habitat will not be present in the proposed wind turbine area for probable wind turbine A and probable wind turbine B during the spring due to planned construction activities for a soil stockpile (The PGC granted clearance for the stockpile area project in a letter dated October 29, 2009, which indicated no impacts upon species and resources of concern under its jurisdiction.). Trees in the vicinity of proposed tower T-1 (probable wind turbine A) will be removed prior to March 31, 2010 to minimize potential impacts to passerines that may use the forested riverine corridor. A survey will be conducted prior to removal to verify that the trees are not serving as Bald Eagle nest sites or roost areas.

Great Egret

During the 2009 spring and fall surveys, which covered the month of March, most of August and September, and the months of October, November and December, Great Egrets were not observed flying over the landfill or proposed wind turbine tower areas. Great Egrets were observed over the Susquehanna River, mostly flying north (up-river) to the Conejohela Flats area. Great Egrets were often observed in the Susquehanna River at the islands associated with Conejohela Flats. Habitat for the Great Egret is not present in the project area.

SITING CONSIDERATIONS

The attached Sheet 1 illustrates the proposed project site and the siting constraints that were considered prior to locating the proposed wind turbines. A number of siting considerations were evaluated for the wind energy project at FFLF including the following:

- topography;
- prevailing wind direction;
- site elevation;
- proximity to electrical interconnection;
- proximity to the meteorological tower location;
- accessibility;
- turbine spacing;

- constructability; and
- physical siting constraints (i.e., landfill footprint, property boundaries and adjacent trail).

The proposed wind turbine locations (wind turbines A and B on Sheet 1) are situated along a landform, referred to as Turkey Hill Point, which extends out into the Susquehanna River at Lake Clarke and forms a steep bluff adjacent to the river. This unique landform is responsible for causing higher wind speeds to occur at the proposed project site than in surrounding areas as the wind must accelerate up and over the steep bluff. Only the northern and western edges of the FFLF are suitable for a wind energy project due to the need to have uninterrupted exposure to the west-northwesterly prevailing wind direction. In addition to favorable exposure to the prevailing wind direction, the northern and western edges of the FFLF constitute the highest elevations at the site, which translates to higher sustained wind speeds. Based on these features, the wind resource assessment at the site was performed using information collected from a meteorological (met) tower located on the northwestern edge of the landfill. The 12-month wind resource assessment provided the basis for the wind energy production estimates that demonstrated the viability of the project. It is important that the wind turbines are situated near the met tower location to ensure the dependability of the energy production estimates.

In addition to the wind turbines being located near the met tower location, it was important that the turbines be located near the electrical interconnection point at Turkey Hill Dairy and in accessible locations that would minimize new road construction. The proposed wind turbine locations are within one mile of the interconnection point to deliver energy to Turkey Hill Dairy, which minimizes environmental disturbances and reduces construction costs. The wind turbine locations are also located adjacent to the active landfill, which is a compatible land use for the wind energy project because accessibility is available for construction and maintenance and overall environment impacts associated with new access road construction are reduced.

Wind turbine orientation and spacing were also important criteria during the siting process. The proposed wind turbines at FFLF are roughly perpendicular to the prevailing wind direction to maximize energy generation. Additionally, the potential wind turbines at FFLF have been provided with the minimal spacing between turbines that will prevent wake interference between the turbines.

Physical siting constraints at the landfill were also considered and include: the active landfill footprint; property boundaries; existing utilities; and the Turkey Hill Trail. Siting wind turbines on an active landfill is not permitted since foundation stability requirements would not be satisfied. Therefore, the possible wind turbine locations were limited to the western and northern periphery of the FFLF. Existing utilities (e.g., PPL's high voltage electrical transmission line and the Sprint-Nextel cellular tower) limited the movement of the proposed wind turbine A and B locations further east. Moving the proposed turbine locations further west was limited by the steep bluff and by the proximity to the Turkey Hill Trail.

The proposed wind energy project was originally planned as a 6-MW project utilizing four wind turbines. The four originally proposed tower locations were evaluated as part of the 2009 spring raptor/eagle migration survey. Based on the results of the spring migration survey, it was estimated by the project biologists that potential wildlife impacts could be reduced by moving the wind turbines inland from Turkey Hill Point and by reducing the number of wind turbines from four turbines to two turbines. Accordingly, a fifth proposed tower location (T-5) was assessed on a neighboring parcel to the north of the FFLF, away from the riverine forested corridor and back from the steep riverine slope. In order to permit the evaluation of T-5, LCSWMA began exploring the feasibility of acquiring the land on which it was sited. When it was determined that the acquisition of the triangular-shaped parcel to the north of FFLF could be acquired, proposed tower T-5 was added to the fall raptor/eagle migratory survey and LCSWMA purchased the land in September 2009 to accommodate the wind project.

Based on the wind characteristics of the site, the physical siting constraints, and the preliminary results of the raptor/eagle migration surveys, it was determined that probable wind turbine A and B locations are the most favorable and suitable locations with respect to minimizing potential wildlife impacts while maintaining the economic viability of the project.

AVOIDANCE AND MINIMIZATION

Because the wind project area is located adjacent to an area known for concentrations of birds, especially during the migration season, the turbine locations were adjusted to avoid and minimize impacts upon birds. The USFWS Interim Guidance was followed to the extent practicable.

Avoidance of Bird Concentration Areas and Landscape Features Known to Attract Birds

Birds are known to use the wooded habitat along the Susquehanna River. Therefore, the proposed wind turbines were moved as far back from the Susquehanna River corridor as possible to minimize potential impacts to avian species. LCSWMA purchased an additional 16 acres of land adjacent to the FFLF to facilitate the relocation of proposed wind turbines A and B to the north of the landfill and to accommodate a desired setback from the River, which is expected to minimize potential impacts to avian species. Additionally, to further reduce potential impacts upon birds, the location of proposed tower T-5 (probable wind turbine B) was moved 232 feet to the southwest to be closer to landfill use activities and to be further away from the wooded riparian along the Susquehanna River. The position of proposed tower T-1 (probable wind turbine A) was adjusted slightly to avoid landfill operations and to establish a manufacturer-recommended setback from the landfill access road.

Reduce Project Area Disturbance

The proposed project was evaluated to determine if the project could be reduced to minimize the project disturbance footprint while still satisfying the energy needs of Turkey Hill Dairy. As a result of the evaluation, the proposed project was reduced from a planned four wind turbine project to a two wind turbine project. This resulted in the elimination of two turbines in the areas of the site most sensitive to potential avian impacts (i.e., the western side of the landfill that extends out into the Susquehanna River).

Turbine Configuration

The proposed wind turbines have been configured to avoid potential mortality, where feasible. The turbines are spaced as close together as possible following recommended USFWS Interim Guidance. The turbine towers have been moved away from the River corridor to the extent possible. The turbine configuration balances potential wildlife impacts with wind patterns, siting requirements, and topographic conditions.

Reduce Habitat Fragmentation

The proposed wind energy project and turbine tower locations are situated primarily on land already altered and/or cultivated and adjacent to an active landfill. Studies have shown that wind energy projects located within agricultural fields or grasslands, versus forested ridgelines, tend to have lower bird mortality rates.

Minimal habitat loss is expected as a result of the project. The project will not result in fragmentation of forest habitat. A row of planted white pine trees that exists along a former security perimeter fence will be removed. Secure access to the site exists and the existing road network will be used to construct and maintain the wind energy site.

Habitat Restoration

The design plans will include measures to minimize potential impacts upon wildlife following construction and during the operational phase of the project. Grass beneath the wind turbines will be regularly cut to reduce the value of the habitat for wildlife and decrease habitat attractiveness for wildlife species. Existing nest boxes in the vicinity of the wind turbine generators have already been removed.

Turbine Design

Guy wires will not be used for support of the wind turbines. Also, lattice towers, which have become roosting sites for birds at other wind projects, will not be used to support the wind turbines.

Aviation Lighting

Aviation lighting will be in compliance with the Federal Aviation Administration (FAA) to minimize bird and bat impacts. White strobe lights will be used at the minimum number, minimum intensity and minimum number of flashes per minute allowable by the FAA. Solid red or pulsating red warning lights will be avoided. The project has received final approval from the FAA.

Electric Transmission Lines

Electric transmission lines from the wind turbine generators to the end user will be placed underground to avoid electrocution of birds. Bald Eagles in the Lancaster County area have recently died (within the last two years) from electrocution from transmission lines (*Lancaster New Era and Intelligencer Journal*).

AQUATIC RESOURCES

The proposed wind turbine locations will not affect regulated watercourses or wetlands. The turbine staging areas and transmission line corridors will be investigated by a wetland biologist once the final locations are determined. However, a preliminary review of topographic mapping does not indicate the presence of wetland or water resources within the project area. As a result, encroachment permits from the United States Army Corps of Engineers and Pennsylvania Department of Environmental Protection are not expected.

POST-CONSTRUCTION MONITORING

LCSWMA and PPL have agreed to two years of post-construction monitoring for bird and bats. The two years of monitoring was accepted by the PGC at the July 23, 2009 consultation meeting. The post-construction monitoring will follow the *Protocols to Monitor Bat and Bird Mortality at Industrial Wind Turbine Sites* (PGC's *Wind Energy Voluntary Cooperation Agreement*, February 23, 2007).

SUMMARY

LCSWMA and PPL have in good-faith made every possible effort to develop this renewable energy project in an environmentally conscientious manner with regard to the conservation of Pennsylvania's wildlife resources, especially avian species. The project developers have voluntarily completed the following pre-construction surveys to assess potential risks to bird species of concern:

- 2009 (March) Spring Raptor/Eagle Migration Survey
- 2009 Fall (August – December) Raptor/Eagle Migration Survey
- 2009 (December) Aerial Eagle Nest Survey

The migration surveys were completed in accordance with the PGC's *Wind Energy Voluntary Cooperation Agreement* (February 23, 2007). Like any tall structure (e.g., communication towers, high-voltage transmission towers) constructed within the known habitat of the Bald Eagle, the potential for an unavoidable, non-purposeful take to the Bald Eagle exists at the project site due to the installation of the proposed wind turbines. Avoidance and minimization measures have been implemented to reduce possible impacts upon Bald Eagles to the fullest extent practicable within the constraints of land availability, project economics, and technology.

LCSWMA and PPL have agreed to conduct post-construction mortality surveys for bats and birds for two years as per the PGC's *Wind Energy Voluntary Cooperation Agreement*, *Exhibit C* (February 23, 2007).

The locations of probable wind turbine A (Tower 1) and probable wind turbine B (Tower 5) were selected based upon a host of siting considerations and constraints and based upon the least number of avian occurrences within a rotor swept area, including the Bald Eagle, which was the most representative species of special concern. The USFWS's *Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines* (2003) was followed during the project siting and preliminary design phase.

A summary of avoidance and minimization measures include: implementing setbacks from the riverine corridor and purchasing adjacent lands to implement the setback measures; grouping turbines as closely as possible; siting the turbines in maintained areas and agricultural areas; minimizing forested habitat losses; developing a habitat restoration management plan to avoid attracting wildlife or prey to the wind turbine area; specifying white strobe lighting on the turbines; and placing electric power lines underground. Furthermore, LCSWMA and PPL have agreed to conduct a survey within a 660- foot radius of the rotor swept area of probable wind turbines A and B in January 2010, and prior to construction, to verify the absence of roost trees.

Additional measures will be implemented to remove necessary trees prior to March 31, 2010 within the vicinity of probable wind turbines A and B to ensure potential bat roosting trees will not be affected during construction. No caves are known to the area based upon investigations by biologists while conducting other studies at the landfill.

The following requests were made by the PGC, but are considered infeasible due to scheduling constraints of the stimulus funding supporting the project and due to the sensitive economics of a relatively small wind energy project:

- Waterfowl migration survey;
- Breeding bird survey (point counts and area searches) for the entire project;
- Bald Eagle nesting survey from February 1 to May;
- Summertime bald eagle movement and usage survey, including foraging activities, roosting activities, and identification of important roosting trees; and
- Conduct a pre-construction bat acoustic survey.

While these additional studies are deemed infeasible, PPL and LCSWMA are committed to working with the PGC to collect valuable post-construction information to help minimize mortality risk to birds and bats from relatively small wind energy projects.

CLOSING

LCSWMA and PPL kindly request a written indication that the PGC is satisfied to the extent that the project may proceed as scheduled, from the PGC by January 15, 2010. If the wind turbines are not ordered by February 1, 2010, the project will not be able to proceed.

If you have any questions or wish to further discuss this project, please contact Steve Gabrielle of PPL Renewable Energy at 610-737-6812. Thank you for your time and attention to this project.

Sincerely,
ARM Group Inc.

Michelle S. Cohen
Senior Biologist

Attachments

cc: Ms. Jennifer Kagel, USFWS
Ms. Cindy Tibbott, USFWS
Steve Gabrielle, PPL Renewable Energy
Brooks Norris, LCSWMA
Jim Warner, LCSWMA
Bryan Wehler, ARM Group, Inc.

Base map from PAMAP Program 2005 Color Orthophotos of Pennsylvania, photos 23002330PAS and 24002330PAS.

LEGEND

- LCSWMA PROPERTY BOUNDARY
- EXISTING CONTOURS (350)
- FENCE
- REMOVE FENCE
- LIMIT OF STOCKPILE
- PROPOSED RELOCATED FENCE
- PROPOSED VEGETATION REMOVAL AREA
- TREE REMOVAL FOR WIND ENERGY PROJECT
- FREY FARM LANDFILL (FFLF) PERMITTED BOUNDARY
- PROPOSED WIND TURBINE GENERATOR TOWER LOCATION
- PROBABLE WIND TURBINE GENERATOR LOCATION
- OBSERVATION POINT LOCATION

Probable Wind Turbine Generator Locations

FFLF Wind Energy Project
Lancaster County Solid Waste Management Authority
Lancaster County, PA

February 2010	Scale: 1" = 500'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 1

S:\06377 LCSWMA Wind Energy_Drwg\8x11_Probable Ref – Wind Turbine Generator Locations.dwg

***PRELIMINARY* SUMMARY OF RESULTS**
2009 FALL RAPTOR AND EAGLE MIGRATION SURVEY

FREY FARM LANDFILL WIND ENERGY PROJECT
Manor Township, Lancaster County, Pennsylvania

December 23, 2009

Eagle/Raptor Fall Migration Survey

77 days of avian observations were completed by the project biologists during the 2009 fall migration survey. A total of 647.2 hours of observation hours were recorded during the fall survey. The 2009 fall raptor/eagle migratory survey involved observations of the proposed project area from August 15 to September 15 for 3 days per week for 8 hours per day followed by observations from September 15 to December 15 for 8 hours per day for 5 days per week. As a point of reference, a total of 174 hours of avian observations were recorded during the spring migration survey for a total of 821.2 hours of observation to date. The 2009 spring raptor/eagle migratory survey entailed observations of the proposed project area for the month of March for 5 days per week for 8 hours per day.

Total Observations

Fourteen total species of raptors and eagles were observed during the 2009 fall migration period. The Broad-winged Hawk and Merlin represented new species recorded during the 2009 fall survey in comparison to the species recorded during the 2009 spring survey. A total of 6,733 raptor observations were recorded within the project vicinity through December 15, 2009. Turkey Vultures represented the greatest recorded observations, totaling 4,652 (69.1 percent); Black Vulture observations totaled 1,209 (18 percent) and Bald Eagles observations totaled 559 (8.3 percent). Figure 1 graphically demonstrates the percentage of total birds observed by species.

Table 1 summarizes the raptor observation data. A total of 10.4 raptors per hour were observed. The total raptors per hour is 1.34, excluding Turkey Vultures and Black Vultures. Turkey Vultures and Black Vultures had the highest daily "passage" rates of 57.5 and 14.9 respectively. The Bald Eagle had the third highest daily "passage" rate of 6.9.

Species of Special Concern

Species of special concern observed in the project area include the Bald Eagle, *Haliaeetus leucocephalus* (Pennsylvania Threatened); Osprey, *Pandion haliaetus* (Pennsylvania

Threatened); Peregrine Falcon, *Falco peregrinus* (Pennsylvania Endangered); and the Northern Harrier, *Circus cyaneus* (*Pennsylvania Vulnerable*, *Pennsylvania Comprehensive Wildlife Conservation Strategy*, PGC, 20005). A total of 561 eagles were observed, of which 559 were recorded as Bald Eagles. The remaining two eagles were recorded as unidentified eagles. A total of 303 eagles (54 percent) were not recorded within a possible wind turbine tower zone. A total of 27 Ospreys were recorded and 17 (63 percent) were not within a possible wind turbine tower zone. Four Peregrine Falcons were observed and were not within a possible wind turbine tower zone. Seven Northern Harriers were observed and five (71 percent) were not within a possible wind turbine tower zone. Bald Eagle observations were most commonly recorded with wind directions from the north, west or northwest. Eagle observations were the least common with winds from an easterly direction.

Table 2 summarizes the raptor species of concern within the potential rotor zone swept area (greater than 20 meters and less than 100 meters) by turbine tower. Eagles, when compared to other raptor species of concern, had the highest occurrences within the possible rotor swept area of a turbine due to the high number of eagle occurrences at the site. The greatest number of observations for eagles occurred within the rotor swept area of proposed tower T-2 with 68 observations (37 percent). Proposed tower T-4 also had a higher occurrence of eagles with 65 observations (35 percent) within the rotor swept area. The least recorded number of observations for eagles within the rotor swept zone occurred at proposed tower T-5 with 31 observations (17 percent). Proposed tower T-3 had the least eagle occurrences with 43 observations (23 percent), and proposed tower T-1 had a moderate occurrence of eagles with 53 observations (29 percent). Proposed tower T-2 represented the most recorded tower and tower combinations involving eagles. Raptor species of concern within a turbine rotor swept area are listed in order by proposed tower number from the least occurrences to the greatest occurrences: T-5, T-3, T-1, T-4 and T-2. The same pattern is reflected when the other three raptor species of concern (Osprey, Northern Harrier and Peregrine Falcon) are included. Proposed tower T-2 had the greatest number of observations recorded (74) for a raptor/eagle classified as a species of special concern and proposed tower T-5 had the least (32).

Proposed Tower Locations

A total of 6,733 raptor/eagles were observed, and of this quantity, 3,037 raptor/eagles (45 percent) were not observed within a possible tower zone, but were within the project study zones (Zone A or Zone C of the PGC's *Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites*). Table 3 summarizes raptor/eagle species within the possible rotor zone swept area (greater than 20 meters and less than 100 meters) by turbine tower. Overall, proposed tower T-4 had the most occurrences of birds within its rotor swept zone. A total of 866 (33 percent) observations were recorded in the vicinity of proposed tower T-4 or a combination of proposed towers including T-4. Proposed tower T-5 had the least recorded observations (614 observations

(23 percent)) within the tower zone or a zone representing a combination of proposed towers including T-5. The following summarizes the raptor/eagles observed by tower during the fall study within the rotor swept zone of a turbine.

- A total of 614 (23 percent) observations were recorded in the vicinity of proposed tower T-5 or a combination of towers including T-5.
- A total of 666 (25 percent) observations were recorded in the vicinity of proposed tower T-1 or a combination of towers including T-1.
- A total of 677 (26 percent) observations were recorded in the vicinity of proposed tower T-3 or a combination of towers including T-3.
- A total of 764 (29 percent) observations were recorded in the vicinity of proposed tower T-2 or a combination of towers including T-2.
- A total of 866 (33 percent) observations were recorded in the vicinity of proposed tower T-4 or a combination of towers including T-4.

Raptors/eagles observed at proposed tower T-5 have the least occurrences within the rotor swept zone of a turbine tower. Proposed towers T-2 and T-4 continue to be the highest with respect to occurrences of raptors/eagles within a possible rotor swept zone of a proposed tower. When considering all raptors/eagles, proposed tower T-1, in conjunction with T-5, have the least occurrences of species within a possible rotor swept zone of a turbine. Turkey Vultures and Black Vultures were recorded within the zones of all five proposed towers. Proposed tower T-1 represents the most recorded tower and tower combination.

Proposed tower locations T-1 and T-5 have been modified slightly, via the insertion of probable wind turbines A and B, to minimize potential avian impacts and to maintain necessary siting requirements with respect to increasing the setbacks from the River and riverine forested habitat as well as satisfying property line, access road and utility setbacks. Proposed tower T-5 (probable wind turbine B) was moved 232 feet to the southwest to be closer to landfill use activities and to be further away from the wooded riparian corridor along the Susquehanna River. The position of proposed tower T-1 (probable wind turbine A) was adjusted slightly to avoid landfill operations and to establish a setback from the landfill access road. The results of the 2009 fall migration survey for proposed towers T-1 and T-5 correlate to probable wind turbine A and probable wind turbine B, respectively, due to proximity.

Eagle Usage

Bald Eagles were observed regularly throughout the fall migration survey. Bald Eagles use the project area and the vicinity for foraging, nesting/breeding, roosting and wintering. A Bald Eagle Usage Map (Figure 2) is attached to this preliminary summary report. The Bald Eagle Usage Map illustrates general trends of eagle use in the area based on observations by the survey

biologists from the survey observation locations. Bald Eagles were mostly observed in Zone A and Zone B and to a lesser extent in Zone C, indicating the River and riverine corridor is a more likely area for use based on observations recorded. Zone A, Zone B and Zone C are defined on Figure 2, as per the Pennsylvania Game *Commission's Protocols for Monitoring Birds at Industrial Wind Sites*. Bald Eagles were also often observed flying north through the Manor Township valley, as indicated on the map (Figure 2).

Bald Eagles are opportunistic predators. Generally, food is unlikely to be a limiting resource for the bald eagles using the project area and vicinity. Bald Eagles will feed on fish and waterfowl, which are available in the vicinity of the project area. However, where food other than fish or waterfowl is available, open water is not a requirement, and terrestrial habitats will provide food resources. Livestock carrion, wildlife carrion, rabbits, and woodchucks are a source of food, which are also highly available in the vicinity of the project area. The landfill did not appear to be a source of food for the Bald Eagle. Bald Eagles were never observed during the spring or fall migration survey landing in the active landfill area.

Bald Eagle nest sites are known to exist near the vicinity of the project. Bald Eagle nests are known to the entire lower Susquehanna River valley. One nest site was observed along the western shore of the Susquehanna River and across the River from the landfill during the 2009 spring raptor/eagle migration survey. No Bald Eagle nests are known to exist on the eastern shore approximately 1 mile up-river and 1 mile down-river of the project area, based on the December 21, 2009 aerial nest survey. One possible Bald Eagle nest was observed during the aerial nest survey at the southern point of an island associated with Conejohela Flats.

Bald Eagles are known to winter in the lower Susquehanna River. Bald Eagles were observed during the survey in mid-December. Some Bald Eagles are expected to remain in the project area and vicinity through the winter. Winter and summer roost sites are not known to the area based on general observations by biologists and LCSWMA personnel. Additionally, the project site is along the eastern shore and is exposed to the predominant prevailing winds from the west-northwest, which could be unsuitable conditions for roosting. The area (660-foot radius from the proposed turbine rotor swept area) in the vicinity of probable wind turbines A and B will be investigated to determine the presence of roosting trees in January 2010, and prior to construction of the turbines.

WIND ENERGY VOLUNTARY COOPERATION AGREEMENT

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110-9797

January 12, 2010

Denise Sale
PPL Renewable Energy, LLC
Two North Ninth Street, GENPL8
Allentown, PA 18101-1179

Dear Ms. Sale:

Enclosed please find a fully executed copy of the Pennsylvania Game Commission Wind Energy Voluntary Cooperation Agreement for PPL Renewable Energy, LLC.

Your participation and continued commitment with this unprecedented "Voluntary Cooperation Agreement" clearly defines your company as a leader in conservation of our Commonwealth's wildlife resources.

The Commission looks forward to working with you to support and facilitate the Commonwealth's green energy initiatives. Should you have any questions concerning this matter, please feel free to contact our wind energy project coordinator, Tracey Librandi Mumma at (717) 787-4250 x 3614.

Sincerely,

William A. Capouillez, Director
Bureau of Wildlife Habitat Management

cc: Librandi Mumma, file

PENNSYLVANIA GAME COMMISSION
WIND ENERGY VOLUNTARY COOPERATION AGREEMENT
February 23, 2007

The Pennsylvania Game Commission (Commission) seeks to coordinate wind energy projects with wind energy developers (Cooperator) in order to work collaboratively to ensure that wind-energy development project sites are developed in both an environmentally conscientious manner and with best regard to the conservation of the Commonwealth's wildlife resources.

Whereas, the Commission under its jurisdiction from Title 34 (Game and Wildlife Code) has authority to avoid, propagate, manage and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the laws of this Commonwealth relating thereto.

Whereas, both the Commission and Cooperator support renewable energy initiatives and are dedicated to arriving at uniform guidance, in the absence of comprehensive state regulations, on how best to avoid, minimize, and/or potentially mitigate adverse impacts to wildlife resources.

Whereas, the Commission and Cooperator, in an effort to best avoid, minimize, and/or mitigate potential adverse impacts with specific intent to birds and mammals, have entered into this Cooperative Agreement in an effort to standardize wildlife monitoring protocols and wildlife impact review methods associated with wind-energy development projects in a mutually beneficial and flexible manner and with high regard to both parties goals, objectives, and purviews.

Therefore, the Commission and Cooperator enter into this Cooperative Agreement and agree as follows:

1. The Cooperator will notify the Commission of any potential wind energy development sites (or an expansion of an existing site with the addition of 5 or more turbines), at least fourteen months prior to construction. The notification prior to the initiation of construction at the site will allow the Commission to provide as much known information on bird and mammal resources which may be present and/or potentially impacted by the development of the proposed wind-energy project. The notification should include a brief narrative of the project's planned development and proposed construction times and include as much detailed information as available such as: an original copy of the U.S.G.S.

topographic map(s) depicting the proposed project area boundary limits with the quadrangle name and associated county identified on it, the proposed project site's general infrastructure delineations (both known and planned) to include access roads, electric transmission lines, wind turbine locations, planned surface impact areas, development and future maintenance of the project, and any known wetland areas or predetermined wildlife habitat regimes which are deemed to be of critical importance or high value.

For those projects, which the Cooperator has already initiated prior to the effective date of this agreement, or that are planned for construction prior to the fourteen-month time frame noted herein, the Cooperator shall submit the required information within ninety days (90) from the date of this agreement.

For all other projects, which are currently under construction prior to the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* (post-construction bird & bat mortality) as contained herein. Further, within 90 days of the agreement date, the Cooperator can provide to the Commission a listing of all projects, which are planned for construction to begin within 12 months from the date of this agreement. The listing will include all available site-specific project information as more clearly specified within this paragraph for each project identified on the list. For each project identified on the list which construction commences within 12 months from the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* as contained herein. All other paragraphs, provisions, terms and conditions, which are not inconsistent to the above, shall remain in full force and effect.

2. It is understood between the Cooperator and Commission that both parties may support the use of other potential funding mechanisms or processes which directly or indirectly reduce the overall costs associated with the Cooperator's monitoring requirements as identified herein providing further the intent of those monitoring requirements remain the same.

3. The Commission and Cooperator will share all relevant information concerning wildlife resources under the jurisdiction of the Commission in and around the project area and the potential adverse impact to those resources. Shared information will include all known publicly available data from past/current/future monitoring efforts and pre and post-construction study results relative to the subject project area. The Commission further agrees to consider all existing relevant wildlife resource information provided by the Cooperator and the Commission will reduce to the fullest extent possible any further requests made to the Cooperator to provide additional relevant data and/or monitoring results which can be ascertained from known existing data regarding potential known wildlife impacts.

4. The Commission will provide the Cooperator with the results of all its internal reviews and provide written comment and or meet with the Cooperator within 45 days of receiving the information specified in Paragraph 1, as well as the results of the Pennsylvania Natural Diversity Inventory, and all pre and post-monitoring methods and recommendations on how best to avoid and reduce direct and indirect impacts to birds and mammals. Additional coordination will occur from the Commission for actions needed in regards to species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) to include all state threatened and endangered bird and mammal species known to occur or determined to exist within or adjacent to the project area.

5. The Commission in consultation with the Cooperator will determine the risk level for monitoring and survey efforts. If needed, the risk level may be adjusted based on new relevant information. The Commission may request the Cooperator conduct an additional year's post-construction monitoring if a T&E species is killed or other mortality is deemed to be at an unacceptable level for any species. The Cooperator may request a reduction in the mortality monitoring effort for the second year based on the first year's mortality results. Such a request by either party for additional or reduced monitoring shall be made in writing by the party requesting a change and an informal meeting will be arranged between the parties to discuss and mutually agree upon any changes in monitoring efforts.

6. All suggested pre-construction and some post-construction techniques are designed to reduce the exposure of state-listed species in order to avoid, minimize or mitigate potential adverse risk to species of special concern.

i. Birds

Migrating Raptors and Eagle Surveys

Goal: Assess risk to migrating raptors from development of wind power at a particular site in order to avoid, minimize, and mitigate adverse impacts.

Objective 1) Observe raptors to determine the number, height of flight, time of day, flight path, avoidance behavior, and species passing through the project area and zone of greatest risk.

Objective 2) Use the survey data to make recommendations to decrease potential adverse impacts to the wildlife resource.

1. Migrating Raptors Survey – If recommended by the Commission, raptor surveys will be conducted according to the attached protocol Exhibit A. The maximum level of effort per project will be one person per five days per week during the pre-construction phase and post construction phase, in both the spring and fall seasons during March and from August 15 through December 15. The minimum level of effort will be that no raptor survey is requested or conducted.

2. Eagles – If the project area is within proximity to a known migratory fly route for eagles, then additional monitoring shall occur in the spring in conjunction with the monitoring criteria noted in Paragraph 6-(i.) The maximum level of effort per project will be one person per five days per week for the entire month of March during the first years monitoring effort. The minimum level of effort

will be that no eagle survey is requested or conducted

3. Breeding Bird Surveys–

Goal: Assess risk to bird species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) in order to avoid and minimize direct and indirect impacts to these species and evaluate the potential for habitat enhancement/mitigation measures.

Objective 1) Proactively evaluate critical wildlife resources that may cause risk to the future stability of project operation.

Objective 2) Use the data to help develop and implement the most appropriate post-construction habitat reclamation and management for the site.

Objective 3) Determine if state listed species are present. If present then further coordination with the Commission is required in order to avoid, minimize, or mitigate potential impacts to the species or their habitat.

If the project area is within an Important Bird Area (IBA) as previously designated by the Audubon process, or within an area supporting birds identified as those priority species of "greatest conservation concern" within the Pennsylvania Comprehensive Wildlife Conservation Strategy, the Cooperator will conduct a survey to confirm or deny the presence of the species. The survey will consist of three days of effort (one day in May, two in June, separated by at least one week). Projects with existing data on species of special concern will be coordinated with the Commission as to the appropriate survey methods required to be used by the Cooperator.

4. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

ii. Bats

Hibernacula

Goal: Determine if any hibernacula exist within the project area in order to avoid and minimize impacts to active hibernacula and the associated bat species due to project development and its operation.

Objective 1) Conduct an on site field review to locate and determine use of potential bat hibernacula in the project area.

Objective 2) Survey bat hibernacula for species presence and abundance in order to assess potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid, minimize, and mitigate adverse impacts to bats and or enhance their habitat from project construction and operations.

1. Pre-construction survey- If recommended by the Commission, the Cooperator is responsible for surveying the project area for any caves, abandoned mine portals, or other openings that may harbor bats as per the Commission's protocol. All openings with potential as suitable bat hibernacula will be surveyed by a qualified bat biologist according to Exhibit B.

Goal: Determine those bat hibernacula existing within 5 miles of the project area that may induce additional avoidance and minimization measures due to anticipated adverse bat impacts from project operations.

Objective 1) The Commission will conduct surveys to locate and determine use of potential bat hibernacula within 5 miles of the project area boundary.

Objective 2) The Commission will survey bat hibernacula (outside of the project area) for species presence and abundance in order to establish potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid and minimize adverse impacts to bats and their habitat from project construction and operations.

2. Prior to the Cooperator conducting the field survey(s) as noted in Paragraph 6 (ii), the Commission will conduct a literature search for other mine portals/caves/openings which are suitable and/or known bat hibernacula and are on or within 5 miles of the proposed wind-energy project boundary delineation. The information will be provided to the Cooperator along with the relevant known bat hibernacula as per the Commission's review and the Commission's recommendations on the need for the Cooperator to conduct additional surveys based on the probable presence of Pennsylvania listed threatened, endangered, and/or candidate bat species. If the Commission recommends additional surveys, the Cooperator will conduct those surveys with a qualified bat biologist according to the attached protocol Exhibit B.

3. Cooperator will conduct pre and post-monitoring surveys as outlined in the Commission's attached Exhibit B & C. The maximum level of effort per project is one-year pre-construction survey and two years post-construction. The minimum level of effort is no bat survey is required.

4. Acoustic Monitoring

Goal: Determine the presence, activity, and temporal use of the project area by bats in order to avoid and minimize potential adverse impacts.

Objective 1) Surveys will be conducted to evaluate the levels of bat activity within the project area and determine their temporal patterns.

Objective 2) Evaluate the potential to avoid and minimize adverse impacts to bats based on their probable use of the project area during the project's construction and future operations.

Cooperator will conduct pre- and post-construction acoustic surveys based on priority level. This survey will assess the level of bat activity for both hibernating and tree bats. The priority level will be used for acoustic monitoring due to a lack of knowledge on the temporal and spatial activity of tree bats, as outlined in the Commission's attached Exhibit B. The maximum level of effort per project is one-year pre-construction and one-year post-construction from April 1 through November 15. The minimum level of effort is from July 15 to October 15 before and after construction.

5. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

6 iii. Post-Construction Bat & Bird Mortality Monitoring

Goal 1) Determine the mortality of bats and birds from project operation and whether those mortality rates would cause an unacceptable level of impact and if needed induce additional minimization or mitigation measures.

Objective 1) Conduct mortality surveys in the most cost-effective and proficient manner.

Objective 2) Provide a mechanism to evaluate the proficiency of the project's mortality survey methodology.

Goal 2) Assess the predictive value of pre-construction monitoring, minimization and avoidance measures by comparing those results with post-construction mortality.

Objective 1) Identify those protocols or monitoring methods that need revision, adaptation, replacement, or abandonment because of their level of success.

Objective 2) To make appropriate adjustments to monitoring protocol and future effort as indicated by the acquired information.

1. The Cooperator will perform the bird and bat mortality monitoring as outlined in the Commission's attached mortality protocol Exhibit C for a minimum of two years post-construction. Mortality studies shall be conducted from April 1 through November 15 by a qualified biologist(s) having expertise in the identification of bats and/or birds and at the interval as noted in the attached Exhibit C.

2. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

7. Cooperator agrees to utilize to the greatest extent possible, all reasonable and feasible generally accepted wind industry and Commission best management practices relevant to the conservation of wildlife resources during construction and subsequent operation of the wind-energy facility. The Commission shall provide copies of all known and updated best management practices to the Cooperator on an annual basis.

8. Commission agrees to issue a special use permit defining the terms and conditions for use throughout the project area by the Cooperator's designated biologist(s) for all bats, birds, and state listed threatened or endangered species which are collected while conducting the Commission's approved monitoring plan and

mortality protocol. The general format for the special use permit is attached as Exhibit D and may be automatically renewed upon the anniversary date of the permit, providing further that the permit terms and conditions have been strictly adhered to and this Cooperation Agreement remains in effect.

9. The Commission agrees not to pursue liability against the Cooperator due to any incidental takings of the Commonwealth's bird and mammal resources for which it has purview under Title 34 (Game & Wildlife Code) as a result of the Cooperator's wind-energy development and operations within the Commonwealth of Pennsylvania providing further such incidental takings were not malicious in their intent and the Cooperator remains in compliance with the terms and conditions of this agreement and has with a good faith effort avoided and minimized potential adverse impacts by way of implementing best management practices and Commission guidance as noted herein.

   The Commission and Cooperator agree to work cooperatively in the future to avoid, and minimize further impacts to the Commonwealth's bird and mammal resources as new relevant project information becomes available. In the event that an incidental take occurs upon a Pennsylvania listed threatened or endangered species of bird or mammal during the operation of any of the Cooperator's wind-energy facilities, the Cooperator agrees to take all reasonable measures as deemed appropriate by the Commission and the Cooperator to further avoid, minimize and/or mitigate such wildlife losses in the future.

10. Commission recommendations or decisions under the Cooperative Agreement do not supercede any comments, decisions, or recommendations of the United States Fish & Wildlife Service.

11. The Cooperator agrees to provide coordinated access, upon prior notice during normal business hours, to all its wind-energy facilities as deemed necessary by Commission staff in order to ensure both parties compliance to this agreement. All Commission access shall be coordinated as far in advance as possible and subject to all the normal safety measures implemented by the Cooperator with regard to access to the facility.

12. Either party upon their own discretion and reason can terminate this agreement in its entirety after having first provided the other party written notification of such termination forty-five (45) days in advance of such termination date. Said written notification to be sent certified mail to the respective parties place of address as noted herein. Termination can be conditioned to exclude those projects identified, which remain in compliance with the agreement.

13. It is understood between the parties that information resulting from the Cooperator's compliance with this agreement shall be treated with the highest affordable level of confidentiality available unless otherwise agreed to in writing by both parties OR if it is necessary to support the Commission's waiver of liability set forth in Paragraph 9 hereof. It is the intent of both parties to release to the general public relevant project monitoring & mortality information deemed to be in the best interest of both the Commission and Cooperator. Release of information will be by mutual consent only.

14. Assignment: The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any affiliate (as defined below) without the approval or consent of the Commission provided that (i) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment and (ii) the Cooperator notifies the Commission of any proposed assignment in accordance with this Agreement. The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any non-affiliate (as defined below) provided that (a) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment, (b) the proposed assignee has agreed in writing to be bound by all of the terms and conditions of this Agreement, (c) the Commission has met with the proposed assignee and the Cooperator, after being notified of the proposed assignment, to discuss the terms and conditions of the project(s) covered by the assignment and (d) the Commission consents to the proposed assignment in writing, which consent shall not be unreasonably withheld, conditioned or delayed. For purposes of this section, an "affiliate" of the Cooperator refers to any person, corporation or entity that (i) has a direct or indirect ownership interest in the Cooperator or vice

versa or (ii) is subject to common operating control and is operated as part of the same system or enterprise as the Cooperator. Any person, corporation or entity that is not an "affiliate" as defined above shall be a non-affiliate for purposes of this section. At the request of the Cooperator, the Commission and the assignee shall execute, after said assignment is approved if required, a new Agreement with terms identical to the terms of the Agreement at the time of the assignment.

15. Notices. All notices demands or requests required or permitted under this Agreement shall be in writing and shall be personally delivered or sent by certified United States mail (postage prepaid, return receipt requested), overnight express mail, courier service, facsimile transmission or electronic mail with confirming receipt (in the case of facsimile transmission and electronic mail with the original transmitted by any of the other aforementioned delivery methods) addressed as follows:

If to Commission to: Pennsylvania Game Commission
ATTN: William A. Capouillez, Director
Bureau of Wildlife Habitat Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

and

If to Cooperator to:
PPL Renewable Energy, LLC
Two North Ninth Street
Allentown, PA 18101

or to such other person at such other address as a Party shall designate by like Notice to the other Party. Unless otherwise provided herein, all Notices hereunder shall be effective at the close of business on the Day actually received, if received during business hours on a Business Day, and otherwise shall be effective at the close of business on the first Business Day after the Day on which received.

16. No Third-Party Beneficiaries. This Agreement is not intended to, and does not, confer upon any Person other than the Parties hereto and their respective successors and permitted assigns, any rights or remedies hereunder.

17. Entire Agreement. This Agreement, including all Schedules hereto, constitutes the entire agreement between the Parties hereto with respect to the matters contained herein and therein, and all prior agreements with respect to the matters covered herein are superseded, and each Party confirms that it is not relying upon any representations or warranties of the other Party, except as specifically set forth herein or incorporated by reference hereto.

18. Amendment. This Agreement may not be amended or modified except by a written instrument signed by each of the Parties hereto.

IN WITNESS WHEREOF, Commission and Cooperator have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION

ATTEST:

Executive Director — Date: 12/31/09

COOPERATOR

ATTEST:

President or Vice-President — Date: 12/29/2009

FFL RENEWABLE ENERGY, LLC
Company Name

OFFICE OF GENERAL COUNSEL
BY:
DATE 12-29-09

EXHIBIT A (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Pre and Post-Construction Monitoring of Birds

Following is a classification of raptor concentration locations across Pennsylvania based on the number and type of species found. Pre-construction bird monitoring efforts at wind energy developments will be scaled based on this classification. A complete listing of Pennsylvania sites in which raptors concentrate is provided at the end of this document (Table 1).

Competent and experienced field ornithologists that are mutually agreed upon by the Cooperator and the PGC shall conduct migratory raptor or breeding bird surveys.

I. Classification of Monitoring Effort for Raptors

A three-tiered approach is recommended for raptor migration monitoring at prospective wind development sites:

A. High Priority Sites – Major raptor concentration points, including areas documented in migration.

Raptor Migration Survey Effort: At least one year full-time fall and spring monitoring with a corresponding effort post-construction.

B. Moderate Priority Sites -- Lesser disconnected ridges in the Valley and Ridge Province and near escarpments in the Allegheny Plateau Province.

Raptor Migration Survey Effort – At least one year full-time fall monitoring pre-construction and a corresponding effort post-construction, and where eagle migration is noted, spring monitoring.

C. Low Priority Sites -- Sites of flat terrain where there are no updrafts and low-priority sites as listed separately.

Raptor Migration Survey Effort – None.

Several sites designated as Low Priority. They lack a standard set of raptor migration data, but there may be significant migration at the site at some time of year. It is not required, but prudent to do a field check for raptors during periods when migration is most likely to occur to avoid risk to raptors migrating there.

II. Protocols for Diurnal Raptor Monitoring

Golden eagles tend to use the north-south trajectory of the ridges in south-central and southwestern parts of the state. Unlike other raptors, their spring route northward is similar to their fall migration route southward.

Diurnal raptor surveys should follow standards and forms used by the Hawk Migration Association of North America (www.hmana.org). The HMANA daily log form and instructions are attached as one sheet.

1. Site Location: The diurnal raptor monitoring site should be chosen with maximum count of migration as the goal. A good view of the escarpment, looking into the direction where most raptors are expected to fly (the windward side of the mountain) is necessary for a thorough count. A secondary site may be needed to see raptors during different prevailing winds. The site location and the reason for the change should always be indicated on the field form. Geographical information for the site should also be collected (coordinates in Latitude / Longitude, directions to site) for general reporting.

2. Field Season: The fall field season includes the period August 15 through December 15 and spring field season is March 1 through March 31.

3. Time and Frequency: Count hours are 9:00 to 5:00 EDT from August 15 through October 30, and 8:00 to 4:00 EST from November 1 through December 15. Emphasis shall be placed on periods when migration is greatest in numbers or when high priority species are most likely to occur. Therefore, sampling can be reduced to three days a week from 15 August through 15 September, but should cover days when a large flight can be expected.

4. Equipment: The counter should use binoculars and or a scope. Hand-held weather instrument are preferred for gathering weather data. A laser rangefinder would be useful for measuring distance of raptors to the escarpment or proposed turbine sites.

5. Data Collection: All raptors considered migratory will be tallied by date and hour using the HMANA Daily Reporting forms. Data for both eagle species will be recorded on a separate form (see below). General instructions for entering data are provided in back of the HMANA form, including the codes for various weather data (e.g. sky, wind). Weather data will be recorded by the hour; wind data can be collected later from the meteorological tower. HMANA sites often use the Beaufort wind scale (see HMANA form), but directly measuring wind with a wind gauge also is acceptable.

   Flight Pattern Notes: Keep separate tally of raptors observed flying in the zone of the anticipated rotor sweep area where raptors may be at greatest risk. Separate tallies can be made on the HMANA form by designating the position of the birds or by using multiple HMANA forms for one day with a form designated for each of the three sectors delineated below. Participants are invited to devise their own form to accommodate this collection of behavior data. *This should be accomplished without compromising the total raptor count conducted with the HMANA protocol.* Raptors that are not using the ridge for migration should also be noted on the field form.

The relative position of raptors should be categorized with respect to the anticipated wind turbine rotor zones for the specific development in question. All raptors should be recorded passing the area, divided into the three sectors:

Code	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

If birds changed sectors, this should be indicated by sequential letters (e.g., AB, BC, ABC). Each individual bird should be classified by flight pattern.

Behavior: The type of flight should be recorded according to the following categories:

Code	Type of Flight
D	Direct flight with few changes in direction, all less than 30 degrees
I	Indirect flight during which more than one circle was recorded, but more than 50% of flight is without such turns
S	Soaring flight during which more than 50% of time is circling/
H	Flight that appeared to be for hunting
P	Birds that perched

6. Flight Altitude: Use the following table to describe the *general flight* of raptors at the site for each hour of observation. Additional notes on the flights of golden and bald eagles or other species of interest should also be recorded either as part of the Golden and Bald Eagle Data Form (Page 5) or field notes to be added to the data file of the site observation.

Code	Flight Altitude
0	Below eye level
1	Eye level to 30 meters
2	Birds easily seen with unaided vision (eyeglasses not counted as aids)
3	At limit of unaided vision
4	Beyond limit of unaided vision but visible with binoculars to 10X

5	At limit of binoculars
6	Beyond limit of binoculars 10X or less but can detect with binoculars or scope of greater power (note magnification)
7	No predominate height

All birds observed at the site are to be counted. Residents, or other individuals suspected to be previously counted, should be recorded.

7. Golden and Bald Eagle Data Collection: Eagle observations should be recorded on the Golden and Bald Eagle Data Sheet. (The eagle form also can be used to document details of flight line and behavior of other high priority species.) The eagle form includes a simple set of codes that allow for location and behavior options. These codes are provided at the bottom of the form. The weather can be recorded on the form in the style (codes) used on the HMANA form. Observers should fill in notes about behavior liberally in the right hand column or on extra sheets and use extra sheets as necessary.

FORM Wind-70008-GBEt-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Golden and Bald Eagle Data Sheet

Use as addendum to HMANA form

LOCATION:	**Date:**		**Sky:**
OBSERVER:	**Start:**	**Stop:**	**Wind:**

For Data Codes, see bottom of form.

#	Sps.[a] BE,GE	Time [b] (military)	Age [c] (J/Sub/Ad)	View [d] (D/V)	Height of Flight [e] (L/M/H)	Direct. of Flight [f] (NE, N...)	Flight Type [g] (P, G, S)	Flight Path [h] (RT, PRS, PRN, ..)	Behavioral Notes Interactions with other birds
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

[a] Species: Bald Eagle = BE, Golden Eagle = GE, see HMANA form for other species. [b] Time: use military time (0800, etc.), [c] Age: indicate either Juvenile (J), Sub-adult (S), or Adult (A). More detail on BE plumage types are appreciated but not necessary (e.g. Basic I,II, III, etc.). [d] View: D -= Dorsal, V = ventral, DV = Both. [e] Height of flight: L = 100 feet (30 m), M = 100 – 400 ft. (approx. tower ht.), H = above 400 ft. (tower ht.). [f] Direction of flight: N, NE, E, SE, S, SW, W, NW. [g] Flight type: P = Powered (flapping), G = Gliding, S = Soaring. [h] RT – Moving along Ridge Top, PRN = Parallel to Ridgetop Northside, PRS Parallel to Ridgetop Southside, VS = Valley to South, VN = Valley to North, XR = Crossed ridge, LR – left ridge.

Use additional sheets if necessary.

III. Pre-Construction Sampling for Breeding Birds

1. Survey Methods: Breeding bird surveys should be conducted once in May and two visits in June. Points should be established systematically at 250-meter intervals (or at 500 meters in grassland settings) using a grid or track that covers the projected development site. Based on overall project size and project configuration, the PGC will be flexible with regard to breeding bird survey sampling intervals.

A circle is delineated around each point of 50-meters and allowance is made for detecting birds outside that ring (unlimited circle). Observers should be experienced or be trained at judging distances, using a range-finder and local landscape features as cues. Sample period should be divided into three periods, starting with the first three minutes, the subsequent two minutes, and the final five minutes. These time bands allow comparisons between these data sets with other point-counts (including the BBS route data) of 3- and 5-minute lengths (Ralph et al. 1995).

Sampling should occur in the morning when detection of birds is greatest. Counts should not be conducted in periods of heavy rains or high winds. Each location should be approached quietly in order to avoid disturbance of the birds and to observe birds near the sample point, but outside of the detection circle. Each bird should be recorded in the first period it is observed. A small bull's eye is provided on the point count data sheet for registering the general location of the bird. The up position is North with the lines dividing the circle into four quadrants. Additional notes on location of birds can be made on separate sheets. Birds detected while flying over should be counted separately.

The location of each point should be registered on a separate form using GPS (Attachment Form Wind 7008). The use of standard four-letter species alpha codes, breeding bird atlas codes, and other standard abbreviations are helpful to the standardized collection of data (Ralph et al. 1993, Hamel et al. 1996, PA Breeding Bird Atlas website). A stopwatch or other chronometry is very helpful to ensure conformity to the time band data periods. A compass or GPS unit with compass capacity is needed to identify the position of the birds.

The field observer should provide evidence of rare or unexpected species by taking photographs, making field recordings, or field sketches. Digital recordings are preferable because of their ease of storage and transfer.

In each successive time-band, the observer should attempt to relocate each singing bird and record its detection in that period. Each observation should be categorized as either inside or outside the designated center circle (50 meter radius). If a bird moves from one side to the other of the count circle, it should be designated as the original position to inside, the original observation point should be noted. There are columns for non-singing observations provided for birds within and outside the circle. Care is needed to avoid duplicate counting of individuals at the same point or at multiple points.

The data collected with the removal method point-counts should be analyzed with methods outlined by Farnsworth et al. (2002). The program SURVIV also is used for finding estimates of densities and associated variables (White 1983). This program is available from the U.S.G.S. Patuxent Wildlife Research Center website (http://www.mbr-pwrc.usgs.gov/software.html#a).

Alternate point count methodologies that address observer detection effects, such as spot-mapping (I.B.C.C. 1970, Ralph et al. 1993) or distance sampling (Buckland et al. 2001, Rosenstock et al. 2002), may be used as an alternative to the point count data collection described herein.

2. Area Searches are effective for developing a species site list and detecting birds not as effectively detected by point counts (Ralph et al. 1993). This approach may replace or supplement the point count method.

The observer visits the variety of habitats at a site and records all birds encountered. As for any field survey, the weather conditions and field times also are recorded. The field time can be used as a measure of effort made by the observer and the bird data can be interpreted as birds per party hour or a similar efforts measure. There is a form for use in Area Search Surveys that will organize observations (Attachment Form Wind 7008). Any breeding behavior should be recorded using standardized Breeding Bird Atlas codes (see 2nd Pennsylvania Breeding Bird Atlas website and point count form). The locations of Species of Special Concern and Watch List species should be recorded (NAD27 format). Additional information about bird sightings and behavior can be recorded separately.

At least three area-searches should be conducted at the construction site and these searches include periods when Birds of Conservation Concern are most detectable (http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=164510). Since many raptors are more easily detected fairly early in the nesting season, a full sample protocol should include a field trip conducted from mid-March to April 30. A second trip in May would also be appropriate for earlier nesting species and has the potential for early-arriving forest migrants. A third trip should be taken in the peak of the nesting season for most songbirds in the period from June 1 through July 10 (but, June would be more effective than a July date). Some early-nesting species also can be detected in post-nesting period when dependent young are easily detected.

Data collected on these forms, maps, and associated documents shall be sent to the Pennsylvania Game Commission as outlined in the Special Use Permit.

FORM Wind-70008-BBPC-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Breeding Bird Point Count			
Site:	Observer:		Date:
Point #	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Indiv. & Posit.	Species Code[a]	1 (0 – 3 min.)		2 (3 – 5 min.)		3 (5 – 10 min.)		Non-song Cues		Fly Over #	Breeding Code, Behavior, and Other Notes
		<50m	>50m	<50m	>50m	<50m	>50m	<50m	>50m		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

[a] *Use standard 4-letter alpha codes for species names available at PBBA website, USGS, and various references.*

Notes:

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Codes for Breeding Bird Point Counts and Area Searches

Sky Condition Codes	
Code	Sky condition indicator
0	Clear or a few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy (broken) or overcast
4	Fog or smoke
5	Drizzle
7	Snow
8	Showers

Wind Speed Codes (Beaufort Scale)	
Code	Wind Speed Indicators
0	Smoke rises vertically (< 1 mph, <2 kph)
1	Wind direction shown by wind drift (1-3 mph, 2-5 kph)
2	Wind felt on face; leaves rustle (4-7 mph, 6-12 kph)
3	Leaves, small twigs in constant motion (9-12 mph, 20-29 kph)
4	Dust rises; small branches move (13-18 mph, 20 – 29 kph)
5	Small trees in leaf begin to sway (19-24 mph, 30-38 kph)

Pennsylvania Breeding Bird Atlas Breeding Codes (BC)

For further explanations of BCs, Safe Dates, and other Breeding Bird Information, see the website of the 2nd Pennsylvania Breeding Bird Atlas

Observed	
O	Observed within safe dates, but not in suitable habitat
Possible	
X	Bird seen or heard in suitable nesting habitat within safe dates
Probable	
T	Territorial behavior observed
P	Pair observed
C	Courtship behavior observed
U	Used nest of species found
A	Agitated behavior or anxiety calls given by adults
Confirmed	
CN	Bird seen carrying nesting material
NB	Nest building observed at nest site
DD	Distraction display
FL	Recently fledged young observed
CF	Adult carrying food or fecal sac
ON	Occupied nest found, contents unknown
NE	Nest found containing eggs
NY	Nest found containing young

FORM Wind-70008-PCL-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Point Count Locations at this Project.
Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
And datum used (NAD27 Preferred)

Page: _____ of _______

Project Name:_______________________________

Total Number of Points:________

Lat/Lon GPS Location Information (DMS) for All Points

DATUM used:

Point No.	Latitude			Longitude			Habitat:
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-BBPC-2
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Pennsylvania Bird Survey Area Search Form			
Site:	Observer:		Date:
Area:	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Species Code	Breeding Code / Behavior Notes [a]	Habitat	GPS Location Data (NAD 27) Latitude			Longitude		
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'
			°	'	°	'	°	'

[a] Use Breeding Codes recommended for point counts. Also note if an audio-lure (tape-playback) was used to attract the bird observed.

Additional Notes on Survey:

Table 1: Tiered Approach to Classifying Risk to Migrant Raptors by Wind Power Development

**Risk assessment based on concerns for general raptor migration, for Bald Eagle (BAEA) or Golden Eagle (GOEA) migration or concentrations.*

High Potential Risk Sites					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Allegheny Front	Bedford, Blair, Clearfield, Centre	General, BAEA, GOEA	Yes	#84 Allegheny Front	Yes
Bald Eagle / Brush Mountains	Centre, Blair, Huntington	General, GOEA	Yes	#32 Bald Eagle Ridge	Yes
Conneaut Marsh / Geneva Marsh	Crawford	BAEA	Yes	#7 Conneaut / Geneva Marsh	No
Kittatinny Ridge / Blue Mountain	Monroe, Northampton, Carbon, Lehigh, Berks, Schuylkill, Perry, Franklin, Cumberland	General, BAEA, GOEA	Yes	# 51 Kittatinny Ridge / Hawk Mt. Sanctuary	Yes
Lake Erie Shore	Erie	General, BAEA	Yes	# 1 Presque Isle, # 2 Roderick Reserve	Yes (NY)
Lower Susquehanna River	York, Lancaster, Dauphin, Perry	BAEA	Yes	#56 Conjohela Flats, #57 Conowingo Reservoir, Muddy Run, #46 Sheets Island Archepeligo	No
Pymatuning Res. / Hartstown Complex	Crawford, Mercer	BAEA	Yes	#3 Pymatuning, Hartstown Complex	No
Second Mountain / Mauch Chunk Ridge	Lebanon, Schuylkill, Carbon	General, BAEA, GOEA	No?	#43 St. Anthony's Wilderness, #44 Second Mountain Corridor	Yes
Tuscarora / Cove Mountains	Franklin, Fulton, Perry, Huntington, Juniata	General	Yes	#36 Tuscarora Ridge / The Pulpit	Yes

High Potential Risk Sites (continued)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Tussey Mountain	Bedford, Blair, Huntington, Centre	General, GOEA	Yes	#81 Greater Tussey Mountain, #35 Rothrock State Forest	Yes
Upper Delaware River	Wayne, Pike, Monroe	BAEA	Yes	#60 Upper Delaware Scenic River	No
Moderate Potential Risk Sites					
Allegheny Ridge	Lycoming	General, GOEA	Yes	None Listed	No
Backlog Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Bald Mountain	Luzerne	General	No	None Listed	No
Berry Mountain	Dauphin, Perry	General	Yes	None Listed	No
Big / Sugar Valley Mountains	Clinton	General	No	None Listed	No
Brush Mountain	Centre	General	No	None Listed	No
Catawissa Mountain	Columbia, Luzerne	General	No	None Listed	No
Dunning / Evitts / Loop / Lock / Canoe Mountains	Bedford, Blair	General, GOEA	Yes	# 76 Canoe Creek Watershed	No
Jack's Mountain	Huntington, Mifflin, Snyder	General, GOEA	Yes	None Listed	Yes
Line / Little Mountains.	Northumberland	General, GOEA	No	None Listed	No
Mahantango / Buffalo Mountains	Dauphin, Schuylkill, Perry	General	Yes	None Listed	No
Meadow Mountain	Somerset	General	Yes	None Listed	None
Moosic Mountain	Lackawanna, Wayne	General	No	None Listed	No
Nescopeck Mt.	Columbia, Luzerne	General, BAEA	No	None Listed	No
Nittany Mountain	Centre	General, GOEA	Yes	None Listed	No

Moderate Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
North White Deer Ridge	Lycoming	General, GOEA	Yes	None Listed	Yes (historic)
Penobscot / Lee / Wilkes-barre / Wyoming Mts.	Luzerne, Columbia	General, BAEA	No	None Listed	Yes
Peter's Mountain	Dauphin, Perry	General	No	# 43 St. Anthony's Wilderness	Yes (historical)
Shade Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Shamokin Mountain / Montour Ridge	Union, Snyder, Montour, Northumberland	General	Yes	None Listed	No
Sharp / Pisgah Mountains	Lebanon, Schuylkill, Carbon	General	No	None Listed	No
Sideling Hill	Fulton, Huntington	General, GOEA	Yes	None Listed	No
South Mountain	Adams, Franklin	General	Yes	#40 Michaux State Forest	No
Spring Mountain	Carbon	General	No	None Listed	No
Stone Mountain	Huntington	General, GOEA	Yes	#35 Rothrock State Forest / Stone Mountain	Yes
Town Ray Hills	Fulton, Bedford	General, GOEA	Yes	None Listed	No
Wills Mountain	Bedford, Blair	General, GOEA	Yes	None Listed	No
Low Potential Risk Sites					
Big Mountain	Northumberland, Columbia	General	No	None Listed	No
Broad Mountain	Franklin	General	No	None Listed	No
Buck Mountain	Columbia, Luzerne	General	No	None Listed	No
Buffalo Mountain	Centre, Union	General	No	#37 The Hook Natural Area	No

Low Potential Risk Sites (cont.)					
Site	**Counties**	**Raptor Concern***	**Spring Migr.**	**Important Bird Areas at Location**	**Hawkwatch Sites (HMANA)**
Chestnut Ridge	Fayette, Westmoreland	General	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
First / Thick Mountains	Centre	General	No	None Listed	No
Front Mountain	Mifflin	General	Yes	None Listed	No
Laurel Hill	Fayette, Westmoreland, Somerset, Cambria	General, GOEA	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
Little Allegheny Mt.	Somerset, Bedford	General	No	None Listed	No
Locust / Nesquehoning Mts.	Schuylkill, Carbon	General	Yes	None Listed	No
Long Mountain	Mifflin, Centre	General	No	None Listed	No
Mahanoy Mountain	Northumberland	General	No	None Listed	No
Martin Mountain	Bedford	General	No	None Listed	No
Negro Mountain	Somerset	General	No	None Listed	No
North Mountain	Columbia, Sullivan, Luzerne, Wyoming	General	Yes	# 42 Loyalsock State Forest, # 48 Dutch Mt. Wetlands, # 49 Ricketts Glen State Park	No
Paddy Mountain	Centre, Union	General	No	None Listed	No
Polish Mountain	Bedford	General	No	None Listed	No
Savage Mountain	Bedford	General	No	None Listed	No
Warrior Mountain	Bedford	General	No	None Listed	No

Bird Protocol References:

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling. Oxford University Press, Oxford, United Kingdom.

Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simmons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. Auk 119: 414-425.

Hamel, P. B., W. P. Smith, D. J. Twedt, J. R. Woehr, E. Morris, R. B. Hamilton, and R. J. Cooper. 1996. A land manager's guide to point counts of birds in the Southeast. Gen. Tech. Rep. SO-120. New Orleans, LA: U.S. Dept. Of Agriculture, Forest Service, Southern Research Station. 39 pp.

Hawk Migration Association of North America (HMANA). 2006. (Data collection protocol). Forms available on-line at: http://www.hmana.org/forms.php (viewed 25 July 2006).

I.B.C.C. (International Bird Census Committee). 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24: 722-726.

Mulvihill, R. and M. Lanzone. 2006. 2nd Pennsylvania Breeding Bird Atlas Website. Carnegie Museum of Natural History. http://www.carnegiemnh.org/atlas/home.htm

Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission. [L. Williams, editor.] 2005. Pennsylvania Comprehensive Wildlife Strategy, Version 1.0. Harrisburg, PA.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. U. S. Dept. of Agriculture, Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-144.

_____, J. R. Sauer, and S. Droege (Tech. Eds.). 1995. Monitoring Bird Populations by Point Counts. Gen. Tech. Rep. PSW-GTR-149. Albany, CA: Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture.

Rosenstock, S. S., D. R. Anderson, K. M. Giesen, T. Leikering, and M. F. Carter. 2002. Landbird counting techniques: Current practices and an alternative. Auk 119: 46-53.
White, G. C. 1983. Numerical estimation of survival rates from band-recovery and biotelemetry data. Journal of Wildlife Management 47: 716 – 728.

White, G.C.. 1992. PC SURVIV Users Manual. Dept. of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO. Found at U.S.G.S. Patuxent Wildlife Research Center website: http://www.mbr-pwrc.usgs.gov/software/index.html#a.

Exhibit B (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Pre and Post-Construction Monitoring of Bat Populations at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

I. Classification of Monitoring Effort for Bats for Pre and Post-Construction Monitoring

Pre- and post-construction bat monitoring efforts will be scaled to the type of bat activity on or within 5 miles of the proposed wind power project area, as identified in the following three site types. A **Hibernacula of Concern** is identified as a known hibernaculum that houses a large number of bats (1000+ counted in an internal survey or 100+ captured via trapping), one that supports a diverse number of bat species (4 or more species), or which houses the state threatened small-footed bat (*Myotis leibii*) or the state and federally listed endangered Indiana bat (*Myotis sodalis*) in Pennsylvania.

Sites are classified in the following three categories:

A. High Priority Sites:

1) Hibernacula of Concern exist on or within 1 mile of the project area or several hibernacula occur within 1 mile of the project area.
2) A hibernaculum with >5000 bats is on or within 5 miles of the project area.
3) Any known occurrence supporting breeding or hibernating state-listed threatened or endangered species is present on or within 5 miles of the project area.

Pre-construction work required:

1) Consultation with PGC required for state-listed bat occurrences.
2) Site-specific surveys include: spring migration and/or fall telemetry of a maximum of 10 or more individuals as determined by the PGC to determine areas of high use and travel corridors.
3) One season (April 1-November 15) of acoustic monitoring to determine activity levels of bats within the project area.
4) One season of mist netting following USFWS guidelines to determine the presence of Indiana bats and potential use of the area as maternity colonies. Work is conducted by approved bat consultants that are prepared to adhere with the transmitter requirements.

Post-construction work required:

1) Two years of mortality monitoring with possible extension based on severity of impacts.
2) Post-construction acoustic monitoring for one season (April 1 – November 15) and concurrent with mortality monitoring.

B. Moderate Priority Sites:

1) Hibernacula of Concern exist between 1 and 5-mile radius of project area.
2) Any hibernacula on or within 5 miles of the project area contains between 1,000 and 5,000 bats.
3) One hibernaculum containing between 100 and 1000 bats on or within 1 mile of the project area.

Pre-construction work required:

1) Pre-construction acoustic monitoring for a spring (April 1- April 30) and fall season (July 15 – November 15), and concurrent with mortality monitoring.

Post-construction work required:

1) Two years of mortality monitoring.
2) Post-construction acoustic monitoring for a spring (April 1- April 15) season and a fall season (July 15 – November 15), and concurrent with mortality monitoring.

C. Low Priority Sites: Criteria

1) No known presence of state-listed bats on or within 5 miles of the project area.
2) No known Hibernacula of Concern on or within 5 miles of the project area.
3) No hibernaculum with more than 100 bats exists in the project area.

Pre-construction requirements: Acoustic monitoring from July 15-October 15.
Post-construction: Standard post-construction mortality monitoring.

II. Protocols for Locating and Surveying Potential Hibernacula

Hibernacula (natural caves, mines, tunnels, and other underground workings) within the project area should be located using mineral literature (The Pennsylvania Cave Database, maps and records from the Office of Surface Mining, and the PA Bureau of Abandoned Mines) and properly investigated by a USFWS approved bat consultant.

Due to the increased bat activity around such sites and/or the presence of threatened and endangered species, Hibernacula of Concern on or within five miles of a proposed wind development site triggers bat monitoring efforts. The Pennsylvania Game Commission (PGC) will notify the developer if such a hibernaculum is known on or within five miles of the proposed project and the developer should enter into consultation with the PGC to determine if additional protection or investigation will be useful to siting turbines. The PGC may conduct a survey in or around the project area for potential hibernacula that are not currently known and survey them for the developer. In the event that the PGC survey results confirm a previously unknown hibernaculum the PGC will notify the Cooperator and further coordination will be required. If a mine is located and contains multiple entrances, then all the bats captured at each entrance will be added together to determine if the site qualifies as a Hibernaculum of Concern.

The following progression of action should generally be followed in order to meet the agreement, as fits the site classification hierarchy above:

1) A consultant/cooperator will perform a literature search for potential hibernacula within project area.
2) Following the literature review, a consultant will conduct ground searches to examine each identified potential hibernaculum, record the location with a GPS, and search for unknown openings (mine collapse, abandoned tunnels, new caves, etc) within the project area.
3) Consult with PGC to determine if any sites have ever been surveyed for bats.
4) PGC may conduct literature and ground searches for a potential hibernaculum located up to 5 miles from the project area.
5) PGC may survey hibernacula up to 5 miles from the project area.
6) Newly discovered sites, and sites that have not been investigated within 10 years, will be surveyed via the methods and protocols set forth in the USFWS mine sampling protocol.
7) Bat consultants from the USFWS approved list must be hired to examine any potential hibernacula within the project area.
8) If a state-listed species is located within the project area, the bat consultant will consult with the Cooperator and PGC to discuss telemetry protocols, effort levels and site specific details.
9) If the federally endangered Indiana bat is known to exist at any time within 5 miles, telemetry may be requested, and areas of use are to be determined. Buffer areas around the Indiana bat location should not be included in the project area.
10) Data must be entered on provided sheets (Appendix A) and submitted to the PGC before construction. Maps should indicate all turbines, hibernacula surveys, and results of telemetry if applicable.
11) All captures of state-listed bats must be photo documented as described in Appendix A.
12) Genetic samples (wing punches) and hair sample collection need to be taken on all individual state listed species Each individual will also be banded with a unique band of appropriate size (Indiana bat bands must be obtained by the consultant from the PGC). Consultants should contact the PGC prior to performing work.

III. Protocols for Mist Netting Surveys

The length of the project area (or summation of all roads, whichever is longer) will be tallied. There will be 1 mist netting station per kilometer of the project area. For projects that are not linear in design, a polygon surrounding the entire project area will be tallied and there will be 2 stations per square kilometer.

1) Mist netting shall follow USFWS guidelines in terms of both level of effort and sampling protocol except for the below additions:
2) All bat consultants to perform this work must be on the USFWS approved Indiana bat list and obtain a special use permit from the PGC.
3) Proposals should be submitted and approved by PGC before work commences and include a map of the project area, locations of the turbines, and estimated locations targeted for net deployment.
4) All captures of Indiana bats should be photo-documented with profile shots of the head and shots of the foot and keeled calcar for Indiana bats as shown in Appendix A. Photos of small-footed bats should clearly show the entire facial mask and foot as well.

5) Genetic samples (wing punches) and hair samples should be collected and marked for all Indiana, small-footed, red, hoary, and silver-haired bats. Consultants should be prepared to attach a unique band to each of these species and should consult with the PGC prior to the commencement of work, with all data recorded on data sheets provided (Appendix A).
6) The bat consultant should have transmitters prepared for all captures of small-footed and Indiana bats in order to locate roost trees. Transmitters should be capable of operating for 21 days on the state frequency of 172 MHz. The PGC must be notified no later than 72 hours post capture and attachment of the transmitter.

IV. Protocols for Standardized Acoustic Monitoring of Bats

The recommendations following for acoustical monitoring are geared towards assessing temporal and spatial activity of bats, with an emphasis on the migratory tree bats.

1) All met towers installed on site should be equipped with acoustic monitoring devices as close to rotor zone as possible. It is suggested to have contractor attach equipment before tower is raised.
2) If possible, Met towers should be maintained for at least one year following construction in order to complete acoustic monitoring.
3) All projects should use the same type of detector throughout the study.
4) Detectors should record from 30 minutes prior to sunset to 30 minutes following sunrise every day.
5) Acoustical monitoring will record the number of bat passes per hour and will be entered on data sheet provided.
6) All recorded calls should be permanently archived for possible research needs and submitted with final report.
7) Provide data regarding wind speed, humidity, and ambient temperature every 10 minutes from the project area and concurrent with acoustic and mortality monitoring surveys.
8) All met tower locations must be recorded with GPS unit (decimal degrees, NAD 27 preferred) and should be reported on project maps.
9) All information gathered must be entered on Pennsylvania Game Commission survey forms (Appendix A).
10) Copies of all acoustic data sheets will be submitted in conclusive end-of-year reports to the PGC Harrisburg, PA at the end of every calendar year.

APPENDIX A
COMMONWEALTH OF PENNSYLVANIA

Pennsylvania Game Commission, Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Procedure and format for permittee reports to the PA Game Commission when conducting wind turbine pre-construction bat netting and bat detector surveys.

The report is divided into five sections which include: (1) Cover page, (2) Site Survey Record, (3) Bat Measurement and Capture Data Forms, (4) Maps and (5) Photo Documentation.

Section 1 - Cover

A separate cover page should be provided for each project with the accompanying data of Sections 2 through 5 contained within. An example is provided.

Section 2 - Bat Netting/Acoustic Survey Record

(FORM Wind-70008-PRE)

This is a **mandatory** two-page summary of site(s) surveyed, captures and bat detector tallies of bat passes. It should be completed for all sites surveyed, including those with no captures. If an additional technique other than mist netting and bat detector work is conducted, it should be described in remarks. Complete 1 for each site survey night (If site is trapped twice, 2 site survey records are required, etc.).

This form may not be modified for reporting because it is used for data entry. If necessary, supplemental pages may be added to report unique data.

Section 3 - Bat Measurement and Capture Data Form

(FORM P-70008-M)

This form is **mandatory** for:

1. *Myotis sodalis* captures
2. *Myotis leibii* captures
3. Bats you are banding and all band recaptures
4. All radio-tagged bats (describe transmitter in remarks)
5. Bat species not usually found in Pennsylvania*.

* Pennsylvania species: *Myotis lucifugus, Myotis septentrionalis, Myotis leibii, Myotis sodalis. Eptesicus fuscus, Pipistrellus subflavus, Lasiurus borealis, Lasiurus cinereus, and Lasionycteris noctivagans*

This form may not be modified for reporting because it is used for data entry.

The surveyor also has the option to use this form for measuring and reporting all bats. All measurements should follow North American collector standards (Nagorsen, D. W. and R. L. Peterson. 1980. Measurements and Weights. Pp. 22-26 in Mammal Collectors' Manual. Royal Ontario Museum, Publications in Life Sciences). Banded bat information will be maintained in a database and future recaptures of your bands will be reported to you.

Section 4 - Maps

An example is provided. All survey sites will be reported on a map (preferably a 7.5' USGS Topographic Map) so that locations can be accurately located and coordinates verified.

Section 5 - Photo Documentation

An example is provided. It is required that photographs be taken of identification characteristics of all *M.sodalis*, *M.leibii*, and species not usually found in PA. The photos should be labeled with the site, date and capture number.

Return reports to address on the heading of this page within 90 days of project completion.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

WIND FARM PERMITTEE
BAT CAPTURE / ACOUSTIC MONITORING PRE-CONSTRUCTION SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address: _____

_____

_____

Phone: (_____)_____-_____ **Fax:** (_____)_____-_____

E-Mail:_____

Project Supervisor Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____

_____

_____

FORM Wind-70008-PRE
02/05
Section 2

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

BAT -NETTING/ACOUSTIC SITE SURVEY RECORD

1. Survey Date:_____ **2. Company Name:**_____

3. Reporter:_____ **4. Assistants:**_____

5. Site Name and/or Number:_____

6. Site is (circle one): hibernation site summer habitat

7a. If hibernation site circle one: limestone mine, coal mine, limestone cave, sandstone cave, RR tunnel,

other structure, describe -_____.

7b. If summer habitat, describe area being sampled (e.g. forested stream or forest clearing with stream):

_____

8. County:_____ **9. 7.5' Quad.:**_____

10. Was site GPS'd (required) YES - NO

11. Geographic Coordinates (D-M-S): Latitude: _____°-_____'-_____"N, Longitude: _____°-_____'-_____"W

Datum *(circle one)*: **NAD27** (Preferred), NAD83, WGS84, Other:_____

12. Ownership and Access: *(Who owns site or controls access? Give name and address.)*_____

_____

13. Time *(military)* **& Temperature:** Start Time_____h Stop Time_____h Total Minutes:_____

Start Temp._____°C End Temp._____°C

14. General Weather *(circle one)*: Clear; Partly Cloudy; Mostly Cloudy; Cloudy; Drizzle; Intermittent Rain; Steady Rain; Thunderstorms; Snow; Other:_____.

15. General Wind Conditions *(circle one)*: Calm, Breezy (Leaves Rustling), Windy (trees swaying).

16. Capture Setup at Site *(Minimum of 2 sets required at each site)*:

Set #	Type	Count	Dimensions	Description	TOTAL AREA (m)
1	**Nets**	*4*	*12m x 2.6m*	*Stacked over trail*	*124.8 sq. m*

Total Capture Area:_____sq. m

(Site Survey Record – Continued) **Site Name/No.:** _____ **Date:**_____

17. Describe habitat 150 m around site: *(topography and vegetation including dominant tree species.)*

18. Was reproductive status checked? YES / NO *(if "NO" only enter numbers in* **Total** *columns)*

***CAPTURE RESULTS**

Species	Number of Adult Females				No. Juv. Fem.	Total No. Fem.	Number of Adult Males		No. Juv. Male	Total No. Males	Species Totals
	NR	PG	L	PL			SCR	NR			
Eptesicus fuscus	*2*		*1*			*3*	*2*	*1*	*1*	*4*	*7*
Myotis lucifugus											
Myotis septentrionalis											
Myotis leibii											
Myotis sodalis											
Eptesicus fuscus											
Pipistrellus subflavus											
Lasiurus borealis											
Lasiurus cinereus											
Lasionycteris noctivagans											
Other – specify:											
Other – specify:											

Reproductive Status: **NR**= nonreproductive, **PG**= pregnant, **L**= lactating, **PL**= post lactating, **SCR**= scrotal/epididymis swollen.

Grand Total

***Complete Measurement and Capture Data Form for all:**
(1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA.

Comments:

DATE: _____

19. ACOUSTIC MONITORING: ***(Tallies of bat passes / hour. Use military time and record sunset/sunrise times in comments.)***

Hour #	Hour #	Hour #	Hour #	Hour #
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C	Start Temp: _____°C
Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h	Start Time: _____h
End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C	End Temp: _____°C
For bat detector passes where calls can be identified by Genus and/or species, record identification data below by call tallies				
Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____
Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____
Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____
Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____
Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____	Genus: _____ Species: _____ No. of Calls: _____
Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____
Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____

Comments:

DRAFT

FORM P-70008-M
12/01
Section 3

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Page#_____ of _____

Bat Measurement and Capture Data Form

(Complete for all (1) Myotis sodalis, (2) Myotis leibii, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA)

Site Name Or Number:	Date:	Set No. Captured In:	Name of Person Identifying the Bat:	*Capture Number:
Height in meters captured above ground surface: _____ m				

Species	Sex	Age	Repro. Condition	Body Measurements (grams and millimeters) Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.) Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right	Transmitter Attached? If so: Frequency (mHz)

Time of Capture	Photo Taken Yes / No	Remarks:

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

Site Name Or Number:	Date:	Set No. Captured In:	Name of Person Identifying the Bat:	*Capture Number:
Height in meters captured above ground surface: _____ m				

Species	Sex	Age	Repro. Condition	Body Measurements (grams and millimeters) Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.) Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right	Transmitter Attached? If so: Frequency (mHz)

Time of Capture	Photo Taken Yes / No	Remarks:

Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen

Site Name Or Number:	Date:	Set No. Captured In:	Name of Person Identifying the Bat:	*Capture Number:
Height in meters captured above ground surface: _____ m				

Species	Sex	Age	Repro. Condition	Body Measurements (grams and millimeters) Wt. (g)	Ear	Tragus	Fore-arm	Hind Foot		Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.) Recapture Yes/No	Band Material	Band Color	Band Inscription	Band on Left/Right	Transmitter Attached? If so: Frequency (mHz)

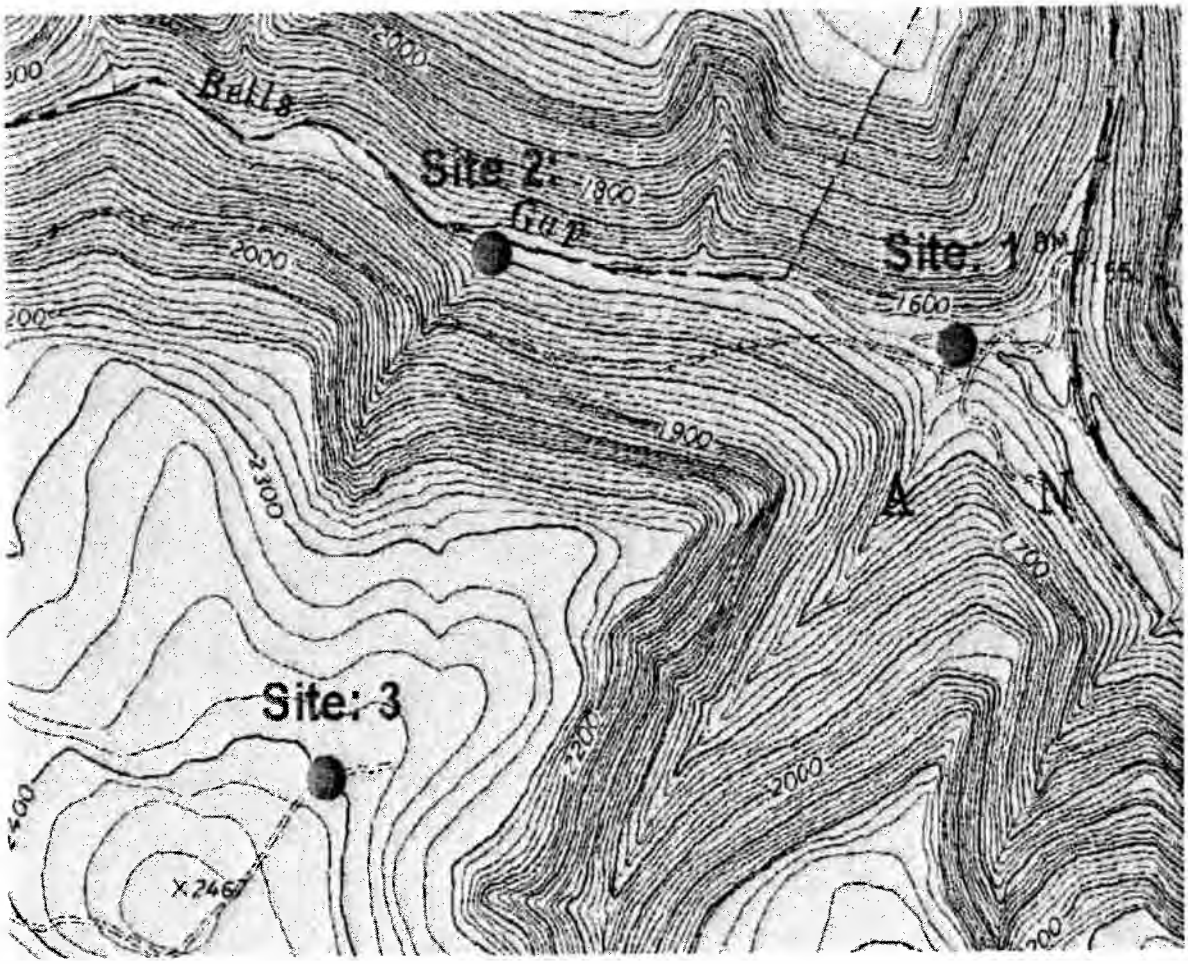
Time of Capture	Photo Taken Yes / No	Remarks:

*Capture Number = number in sequence by site.

DRAFT

Section 4 - Maps *(example)*

Blair Co., Blandburg Quadrangle, Bells Gap Area.
Location of Sites 1, 2, and 3 for Project PA-24

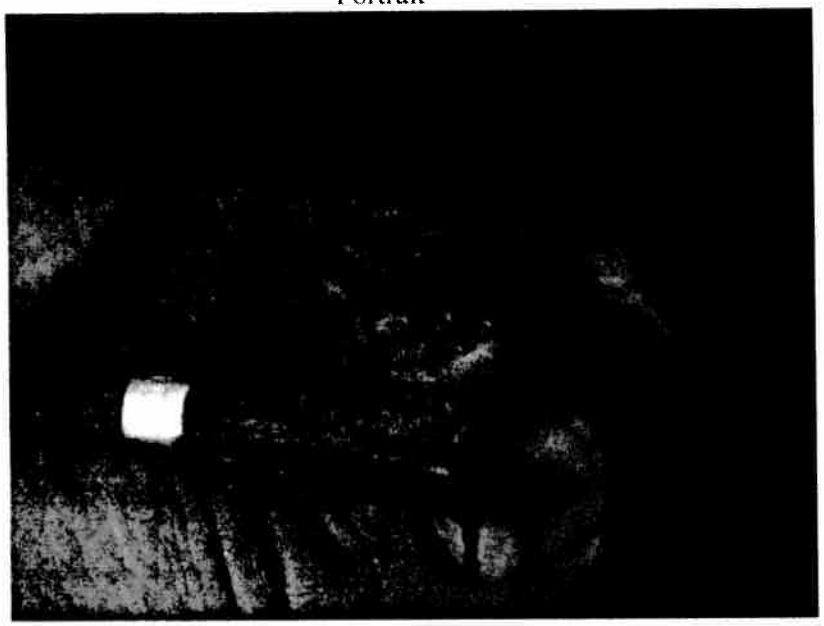


DRAFT

Section 5 - Photos *(example)*

Male *Myotis sodalis* captured at **Site 1**
Capture date: **7/18/01**
Capture Number: **06**

Portrait



Keeled Calcar

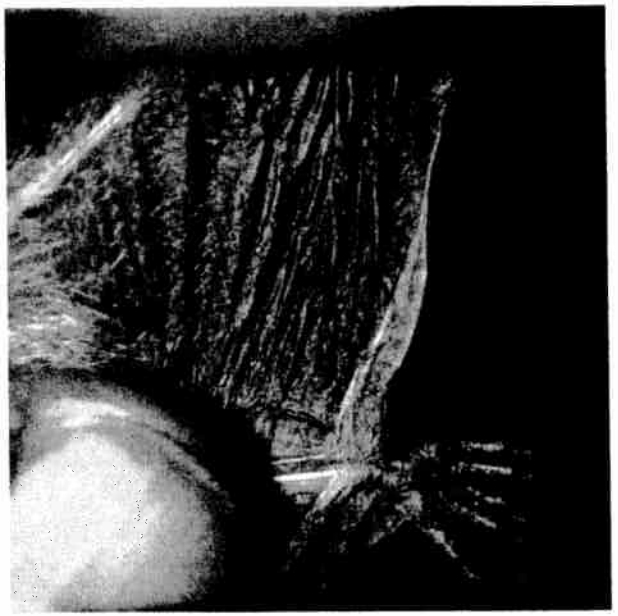


Exhibit C (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bat & Bird Mortality at Industrial Wind Turbines Sites

Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007

Post-Construction Mortality Monitoring

I. Duration and Frequency of Monitoring:

All mortality monitoring should take place daily for the period between April 1 and November 15 for 2 complete years following construction, unless other mortality information is available and the PGC can adequately justify a reduced monitoring effort. For higher risk golden eagle migration routes, as designated in page 11 of Exhibit A, additional monitoring may be requested. Mortality monitoring should commence at sunrise and an appropriate number of surveyors must be hired to complete surveys of all turbines within 8 hours. Turbines that are being chosen for monitoring should be determined with the initial proposal so the location of acoustic monitoring devices can be coordinated to occur at the same locations.

II. Number of Turbines to Monitor:

The number of turbines monitored will follow the guidelines below as per "Standard Mortality Transect Survey", and will include at least one validation procedure to correct bias. Validation procedures can include, but are limited to the use of nets, the use of dogs, thermal imaging, or night optical device. Monitored turbines shall be identified in consultation between the parties and based upon pre-determined bat and bird risk assessment. A minimum of 10 turbines will be sampled, or a maximum of 20% of the turbines in the project area (whichever is greater). If the project contains less than 10 turbines, all turbines in the project area will be sampled unless otherwise agreed to by the Commission.

III. Mortality Monitoring Procedure

Carcass removal and searcher efficiency trials will be performed, and the duration, frequency and number of turbines to monitor are the same.

At each turbine to be monitored, a rectangular plot that is 120 meters by 120 meters will be centered on the turbine. Although evidence suggests that > 80% of the bat fatalities fall within ½ the maximum distance of turbine height to ground (Erickson 2003a,b) search areas vary and often do not allow surveys to consistently extend to this distance. Therefore, the searchable area underneath turbines will be delineated and mapped, and estimates of mortality will be produced. Maps are to be constructed illustrating all turbine locations, a designated numbering system for turbines, 120 meter plot, boundaries of survey areas, and searchable areas (broken down into visibility classes and transect numbering if performing standard transect surveys).

1) Times spent surveying each turbine should be recorded daily and remain consistent.
2) All information gathered (i.e. specimen location, species, transect/net grid number, etc.) should be entered on data sheets provided. Any mortality that occurs to state listed endangered or threatened species should be reported to the PGC within 72 hours.
3) Any large mortality events (> 50 total animals) or mortality of any eagle, or threatened or endangered species that occur outside of the survey periods are to be reported to the PGC within 72 hours.
4) Separate data sheets will be used for each date of survey completed. All carcasses are to be picked up and bagged upon discovery. They are to be identified, handled, and labeled properly, in accordance with the special use permit, with the date, turbine number, transect number, and unique specimen number.
5) All specimens located should have an azimuth **from** tower and distance to turbine, and recorded on data sheet. It is appropriate to use a numbered flag for each specimen and record distance and azimuth upon completion of transect searches, so long as flags are removed after each day/turbine.
6) All carcasses are to be properly identified, labeled, frozen daily, and submitted with data sheets every 2 months to the local regional office of the PGC.
7) A summary report of this monitoring, including all data sheets and maps are to be submitted with the annual reports (due December 31) until monitoring is complete. A complete set of post-

construction bat mortality data sheets, all acoustic data sheets with passes/hour, species identification charts, etc. should be included.

Standard Mortality Transect Surveys:

The basis for the methods to be followed for this procedure are set forth by Erickson 2003a, 2003b, Bats and Wind Energy Cooperative 2005 final report, and Kerns and Kerlinger 2004. Areas defined for surveys should be mapped and depict not only prominent structures and area, but in addition to previous studies, label search areas into 1 of 4 visibility classes. All visibility classes represented should be included in the map and proportion of each noted in report. Each visibility class will be equally tested with a minimum of 200 trials using carcasses returned by the PGC.

Visibility Classes: Each turbine will have the vegetation in the searchable area defined into one of the following 4 classes and mapped for submission.

Class 1 (easy): Bare ground 90% or greater; all ground cover sparse and 6 inches or less in height (i.e. gravel pad or dirt road).

Class 2 (moderate): Bare ground 25% or greater; all ground cover 6 inches or less in height and mostly sparse.

Class 3 (difficult): Bare ground 25% or less; 25% or less of ground cover over 12 inches in height.

Class 4 (very difficult): Little or no bare ground; more than 25% of ground cover over 12 inches in height.

1) Following the establishment of searchable areas, the breakdown of this area into visibility classes, and mapping of each turbine, transects should be established at no greater than 6 meters apart and marked every 10 meters.

2) Each transect will be walked with ½ of the distance between transects equal to the distance on each side to be examined by the searcher.
3) As transects are searched, carcasses should be bagged and labeled properly (date, turbine number, transect number, carcass number) and a numbered flag placed in their place. At completion of each turbine, the distance and bearing from each turbine should be recorded and then all flags removed.
4) Searches will be abandoned if severe weather is present, and continue if it clears. The time spent searching at all turbines will be recorded and should be consistent.

V. Validation Guidelines

Performing carcass removal by scavenger and searcher efficiency are the standard methods performed together to correct for biases in data collection. Below are accepted techniques to perform this correction. However, please note the PGC will consider alternative methods of validation, to include but not limiting to the use of dogs, thermal imaging, night optical devises etc.

Carcass Removal Trials

Because there are numerous variables that may make every turbine unique, we suggest placing an equal number of carcasses per turbine to be monitored for removal by scavengers. Additionally, all 4-visibility classes should have an equal sample size. A random bearing and distance from the turbine should be selected to determine placement of the carcass. For these trials, carcasses must be placed within the surveyed area underneath turbines after sunset and under darkness, and monitored for removal every 12 hours. Ideally, the total number of bird and bat carcasses used should be representative of the actual size and species of killed animals, with no less than 50 specimens monitored per year. These trials should be performed periodically throughout each monitoring session. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction and have its location recorded. Records shall include the turbine number, a brief

description of immediate vegetation that may impede visibility, classification using one of the 4 visibility classes described above, and length of time before removal.

VI. Searcher Efficiency Trials

To produce the best estimates of mortality, a high number of searcher efficiency trials will be performed. A minimum of 200 individual trials will be performed to test searchers. The carcasses will be toe clipped to identify and number them. Carcasses missed by searchers will be picked up after their survey is complete and will be used again. Because a number of samples will be collected from all dead bats, each carcass recovered will be submitted to the PGC and the appropriate number needed for testing will be returned. The habitat surrounding turbines may vary considerably and searcher efficiency appears highly correlated to visibility and habitat types. Therefore, the search area defined for each turbine surveyed will be divided into the 4 visibility classes (illustrated on map). An equal number of carcasses will be placed in each visibility class, and will be placed at a random azimuth and distance. Each turbine monitored by searchers should be examined, with an equal number of carcasses placed at each turbine.

Testing should occur sporadically throughout monitoring periods and searchers should not be made aware they are being tested. An effort should be made to test searchers equally during both inclement and good weather, with weather conditions recorded. Carcasses placed should be representative of the percentage and number of species found during the mortality monitoring, and should replicate the manner in which the majority of bats are found in that visibility class (i.e. crawled under vegetation). An effort to maximize the number of carcasses placed is best, with no less than 200 per year.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

IV. WIND FARM PERMITTEE
V. POST-CONSTRUCTION BAT MORTALITY SURVEY REPORT

Permit Number_____

Project Name:_____

Company/
Organization/
Permittee Name:_____

Address:_____
_____
_____
_____

Phone: (_____)_____-_____ Fax: (_____)_____-_____

E-Mail:_____

Project Supervisor
Name:_____

Supervisor Contact: Phone: (_____)_____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

_____
_____

FORM Wind-70008-Mort-1
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

GPS Locations of All Wind Turbines at this Project.

(Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
Also provide datum used (NAD27 Preferred)

Project Name:_____ Page: _____ of _____

Total No. of Turbines:_____

Lat/Lon GPS Location Information (DMS) for All Turbines.

DATUM used:

Turbine No.	Latitude			Longitude			Comments
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	
	o	‘	“	o	‘	“	

Use additional pages if necessary

FORM Wind-70008-Mort-2 **COMMONWEALTH OF PENNSYLVANIA**

02/05 **Pennsylvania Game Commission**

Description of Wind Turbine Searched for Carcasses

Project Name:_____ **Turbine Number:**_____

1. Diameter of Blade Span: _____m **Number of Blades:**_____

2. Blade Height Above Ground- Max.:_____m;
Min.:_____m

3. Surface Area of Search Plot:_____m^2

4. Attach map of each turbine with 120 meter plot, search boundaries, location and numbering of transects/area covered by nets, and vegetation classification if applicable on separate sheet.

5. Attach a spreadsheet with weather data collected at 10-minute intervals. Data should include wind speed, temperature, precipitation, cloud ceiling height, and height and altitude of monitoring device.

6. General Habitat Description and Topography within 100 m of Turbine:

7. General Habitat Description and Topography >100m from Turbine:

FORM Wind-70008-Mort-3a
02/05

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Daily Search Summary
Page: _____ of _____
Project Name:_____ *(complete each day of search)*

	Turbine		Time			Number of Carcasses Found				
Date	Number	Observer	Start	End	Weather[a]	Bat	Bird	Other	Total	Comments

[a]Weather: F= fog, D= drizzle, R= steady rain (Use additional Pages as needed)

FORM Wind-70008-Mort-3b **COMMONWEALTH OF PENNSYLVANIA** **Observer**
Name:_____
02/05 Pennsylvania Game Commission

Date:_____

Project Name:_____ Carcass Data Sheet

(Use to record all carcasses found)

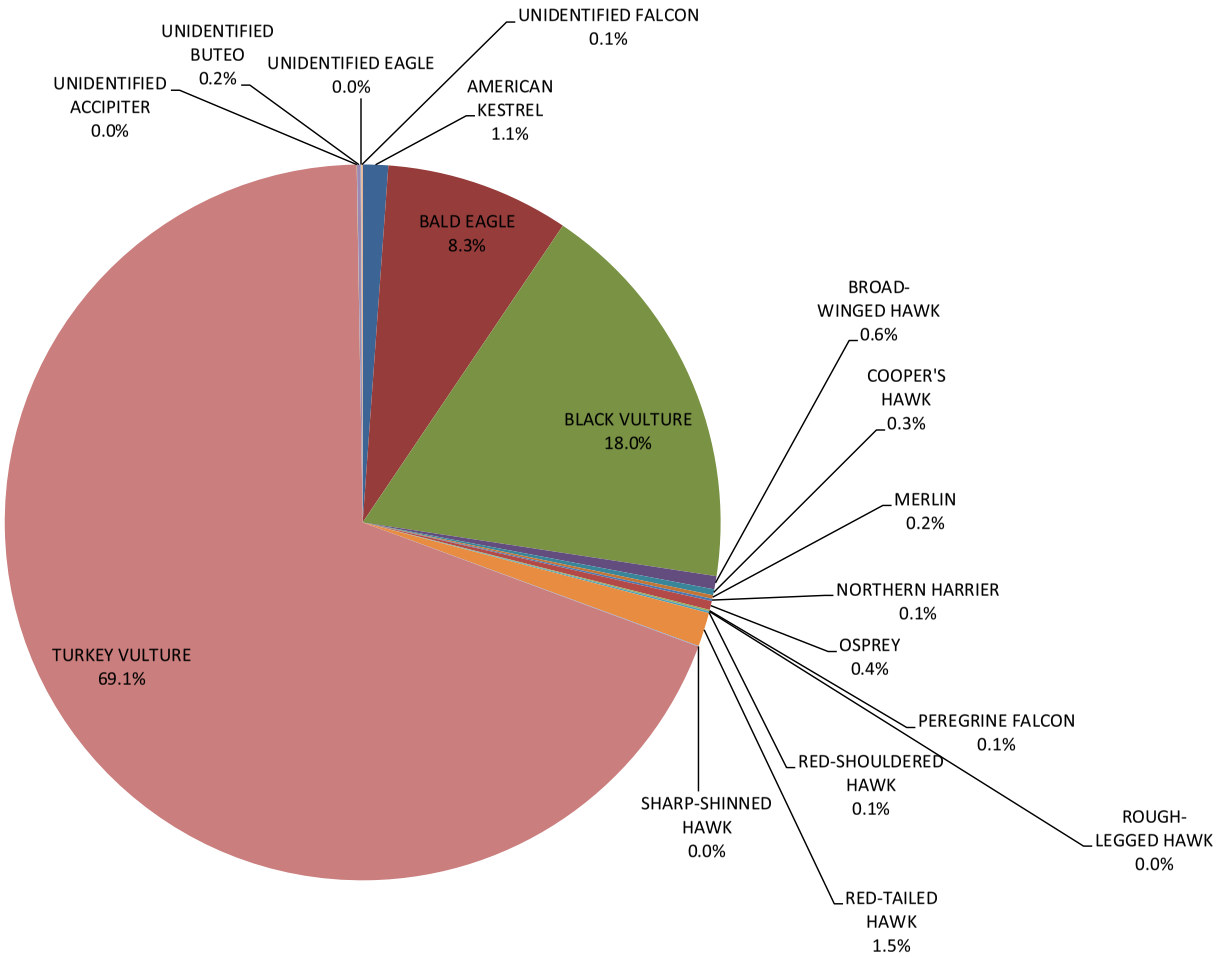
% Cloud Cover:_____**%;** **Temperature:**_____**°C;** **Precipitation:**_____**(fog, drizzle, steady rain)**

	Carcass Tag Information[a]				**Check One**[b]		From Turbine					
Time (h)	**Turbine No.**	**Date**	**Transect No.**	**Specimen No.**	**Bat**	**Bird**	**Azimuth**	**Dist.(m)**	**Species**	**Age**[c]	**Sex**[d]	**Condition**[e]

[a]Carcass Number= Turbine # - Date - Transect No. - Sequential Specimen No.; [b]If other than bat/bird leave blank and complete remainder of information; [c]Age= A (adult), J (juvenile) Unk (unknown);
[d]Sex= M(male), F(female), Unk (unknown); [e]Condition: E= excellent, F= fair, P= poor.

FIGURES

FIGURE 1
PERCENTAGE OF BIRDS OBSERVED BY SPECIES



Sector	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated.
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

NOTE: THE PREDOMINANT BALD EAGLE USE AREA IS ESTIMATED BASED ON OBSERVATIONS MADE BY SURVEY BIOLOGISTS DURING THE 2009 SPRING AND FALL MIGRATORY BIRD SURVEY STUDIES. BALD EAGLES WERE NOT LIMITED TO THIS AREA BUT WERE OBSERVED LESS FREQUENTLY IN THE UNHATCHED AREAS.

Base map from PAMAP Program 2005 Color Orthophotos of Pennsylvania, photos 23002330PAS and 24002330PAS.

LEGEND

- LCSWMA PROPERTY BOUNDARY
- 350 – EXISTING CONTOURS
- FENCE
- FREY FARM LANDFILL (FFLF) PERMITTED BOUNDARY
- PREDOMINANT BALD EAGLE USE AREA (SEE NOTE)
- PROPOSED WIND TURBINE GENERATOR TOWER LOCATION
- PROBABLE WIND TURBINE GENERATOR LOCATION
- X – OBSERVATION POINT LOCATION

Bald Eagle Use Area

FFLF Wind Energy Project Lancaster County Solid Waste Management Authority Lancaster County, PA

February 2010	Scale: 1" = 1,500'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\8x11_Bald Eagle Use Area.dwg

TABLES

TABLE 1
SUMMARY OF RAPTOR OBSERVATION DATA

Total Raptors	Total Hours	Raptors per Hour	No. of Species
6733	647.217	10.4	14

	Daily Passage Rates
American Kestrel	1.0
Bald Eagle	6.9
Black Vulture	14.9
Broad-Winged Hawk	0.49
Cooper's Hawk	0.22
Merlin	0.14
Northern Harrier	0.09
Osprey	0.33
Peregrine Falcon	0.05
Rough-Legged Hawk	0.01
Red-Shouldered Hawk	0.06
Red-Tailed Hawk	1.3
Sharp-Shinned Hawk	0.02
Turkey Vulture	57.5
Unidentified Accipter	0.01
Unidentified Buteo	0.14
Unidentified Eagle	0.02
Unidentified Falcon	0.05

TABLE 2
RAPTOR SPECIES OF PENNSYLVANIA CONCERN WITHIN THE ROTOR SWEPT AREA (>20M AND <100M)
BY POSSIBLE WIND TURBINE TOWER

Species of Concern	Count of Sector B[1]	Count of TowerT1	Count of TowerT2	Count of TowerT3	Count of TowerT4	Count of TowerT5	Count of NA
Bald Eagle	**183**	**53**	**68**	**43**	**65**	**31**	**184**
Northern Harrier	**3**		**1**	**2**			**4**
Osprey	**9**	**1**	**5**	**1**		**1**	**11**
Peregrine Falcon	**2**						**3**
Grand Total	**197**	**54**	**74**	**46**	**65**	**32**	**202**

[1]Sector B is defined as "along the summit within 200m swath, where the turbines would likely be situated", according to the PGC's Protocols to Monitoring Bird Populations at Industrial Wind Turbine Sites.

Notes: • Possible wind turbine towers, listed in order from those with the least occurrences of raptor species of concern to the most occurrences are: T5, T3, T1, T4 and T2 within a turbine rotor swept area.

- The counts represent the number of observations through an individual wind turbine tower zone as well as through a combination of tower areas, so if a raptor flew through the rotor swept area of Tower 1 and Tower 2, the observation number includes both occurrences.

TABLE 3
RAPTOR/EAGLE SPECIES WITHIN THE ROTOR SWEPT AREA (>20M AND <100M)
BY POSSIBLE WIND TURBINE TOWER

Raptors	Count of Sector B	Count of TowerT1	Count of TowerT2	Count of TowerT3	Count of TowerT4	Count of TowerT5	Count of NA
American Kestrel	17	6	9	1	2	2	13
Bald Eagle	183	53	68	43	65	31	184
Black Vulture	337	69	103	122	153	70	217
Broad-Winged Hawk	6					6	
Cooper's Hawk	4	2	1	1	2	1	8
Merlin	1			1	1		1
Northern Harrier	3		1	2			4
Osprey	9	1	5	1		1	11
Peregrine Falcon	2						3
Rough-Legged Hawk							1
Red-Shouldered Hawk	1						3
Red-Tailed Hawk	30	9	10	5	6	11	34
Sharp-Shinned Hawk	1		1				
Turkey Vulture	2021	526	565	501	637	492	1235
Unidentified Buteo	3		1				4
Unidentified Falcon							2
Grand Total	2618	666	764	677	866	614	1720

[1] Section B is defined as "along the summit within 200m swath, were the turbines would likely be situated", according to the PGC's *Protocols to Monitoring Bird Populations at Industrial Wind Turbine Sites* .

Notes: • Possible wind turbine towers T5 and T1 have the least occurrences of raptor species within a turbine rotor swept area.

- The counts represent the number of observations through an individual wind turbine tower zone as well as through a combination of tower areas, so if a raptor flew through the rotor swept area of Tower 1 and Tower 2, the observation number includes both occurrences.

- "NA" designates raptors which entered Sector B but were not within the likely strike zone of a tower.

PHMC COORDINATION

K2 CONSULTING SERVICES LLC

701 GOOD HOPE ROAD • MECHANICSBURG, PA 17050 • 717-433-4784

January 21, 2010

Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

HAND DELIVER

Attn: Mr. Douglas C. McLearen, Chief
Division of Archaeology and Protection

Subject: Historical and Archaeological Review
Request for Section 106 Consultation
Frey Farm Landfill Wind Energy Project
Frey Farm Landfill
Manor Township, Lancaster County
K2 Project No: FFWEP – 010
ARM Project No: 06377-5-9

Dear Mr. McLearen:

On behalf of the ARM Group Inc. (ARM) for the Lancaster County Solid Waste Management Authority (LCSWMA) and PPL Renewable Energy, LLC (PPL), K2 Consulting Services, LLC (K2) is providing the enclosed historical and archeological review (Section 106 Consultation Initiation) request form and associated supporting information to the Pennsylvania Historical and Museum Commission (PHMC) for the above-referenced project. K2 is requesting the PHMC's review of the project to determine the probability of cultural resources within the project area.

Project Narrative

PPL and LCSWMA are proposing to install wind turbine generators (WTG) at the Frey Farm Landfill (FFLF), Manor Township, Lancaster County, Pennsylvania (Figure 1, Probable Wind Turbine Location Map). The project is situated south of Columbia Boro and along the Susquehanna River at Lake Clarke.

Currently, two WTGs are proposed and are expected to generate approximately 3.2 megawatts of electricity. The hub height of the wind turbines will be approximately 80m (meters) and the rotor diameter is expected to be approximately 82.5m.

A National Pollutant Discharge Elimination System (NPDES) permit is required for the project. The proposed wind energy project also received a $1.5 million grant from the Pennsylvania Department of Environmental Protection (PADEP) via the Pennsylvania Energy Development Authority (PEDA), which was supported by "stimulus" dollars through the American Recovery and Reinvestment Act (ARRA). Therefore the project is considered to be subject to National Environmental Policy Act (NEPA) requirements, including implementing the Section 106 process of the National Historic Preservation Act (NHPA), of 1966, as amended.

The approximate locations of five potential WTG locations and the associated investigation area are illustrated on the enclosed Figure 2, Site Location Map (Safe Harbor, United States Geological Survey (USGS) 7 ½ minute quadrangle dated 1995). Although five potential turbine sites are being evaluated and shown on the mapping, only two turbine sites will be selected. At this time, probable wind turbines A and B (location modifications of turbine tower 1 and 5), as illustrated on the map, are the preferred turbine locations.

The wind turbines would also include a section of new electrical lines to connect the wind turbines to Turkey Hill Dairy, which is located on an adjacent property (Figure 3). The proposed project is situated adjacent to an active municipal solid waste landfill. Access for the proposed WTGs during construction will be made using existing landfill roads, where possible.

The total anticipated area of disturbance is less than 10 acres, which includes the two WTG pad locations and electric line. However, a portion of the project area that includes the preferred WTGs A and B locations and a portion of the transmission line has been previously surveyed (ER# 1986-1460-071). No National Register of Historic Places archaeological sites, structures or districts were identified in that portion of the project area. It is recommended that no further archaeological investigations are necessary for that portion of the proposed Frey Farm Landfill Wind Energy Project. Additionally, a portion of the transmission line is anticipated to utilize an existing underground duct bank (within the Turkey Hill Dairy complex) that will eventually connect to the existing Turkey Hill switchgear (Figure 3).

Therefore, it is proposed that the Area of Potential Effect (APE) to cultural resources for the Frey Farm Landfill Wind Energy Project consists of the portion of the transmission line in areas not previously surveyed and does not utilize existing underground infrastructure. This portion measures approximately 500 (152 meters) feet long and

runs from the existing underground duct bank southwest along an existing farm road and ends approximately at the tree line, as illustrated in Figure 3. The proposed APE is comprised primarily of a farm lane and the adjacent to open, active crop land. It is anticipated that the width of the transmission line corridor will measure approximately 10 feet (3.04 meters), for a total APE of 5000 feet (1524 meters).

A search of the PHMC's Cultural Resource Geographic Information Systems database (CRGIS) indicates that there are a total of eleven (11) known prehistoric archaeological sites within the project area located on the Turkey Hill Summit landform. No known sites are recorded within the proposed APE.

The CRGIS database also indicates that there are no structures eligible or listed on the NRHP within the proposed APE. A portion of the NR eligible Enola Branch Rail Line; Atglen & Susquehanna Branch, A & S is located along the Susquehanna River in the vicinity of the APE. However, direct and indirect effects to the resource are not anticipated.

Thank you for your consultation with this Section 106 review. If you have any questions regarding this project, or if you require any additional information, please contact me (k2consultingllc@comcast.net) or Ms. Michelle Cohen (mcohen@armgroup.net) with ARM Group Inc. at (717) 508-0528. Your time and attention to this matter is greatly appreciated.

Very truly yours,

K2 Consulting Services LLC

By:

Marcia M. Kodlick, MA, RPA
Manager

Enclosures: PHMC's Compliance Request Form
Figure 1 – Probable Wind Turbine Location Map
Figure 2 – Site Location Map
Figure 3 – Electrical Transmission Line Map

Pennsylvania Historical & Museum Commission
Bureau for Historic Preservation

BHP Use Only
ER #

Request to Initiate Consultation in Compliance with the State History Code and Section 106 of the National Historic Preservation Act

Applicant Information (print neatly, this will be used in the return envelope)			
Applicant Name	PPL Renewable Energy, LLC	Steve Gabrielle	
Street Address	Two North 9th Street (GENPL8)		
City	Allentown	Phone Number	610-774-7095
State/ZIP	18101-1179		

Contact Person to Receive Response (if applicable) (print neatly, this will be used in the return envelope)			
Name/Company	Marcia Kodlick	K2Consulting Services, LLC	
Street Address	701 Good Hope Road		
City	Mechanicsburg	Phone Number	717-433-4784
State/ZIP	PA, 17050		

Project Information			
Project Title	Frey Farm Landfill Wind Energy Project		
Project Location and/address	Lancaster County Frey Farm Landfill 3049 River Road, Conestoga, PA		
Municipality	Manor Township	**County Name**	Lancaster

If this project was ever reviewed before, include previous ER # **(portion of project reviewed under ER #:1986-1460-071**

Project Type (Check all that apply)

Government Funded/Sponsored or On Government Land?
☒ **Yes** **No** **Specify Agency and/or Program Name Below**

State Agency:		Local:	Lancaster County
Federal Agency:	Department of Energy	Other:	

Permits or Approvals Required
x Yes ☐ **No** **Specify Agency and/or Program Name Below**

Anticipated Permits:			
State Agency:	PADEP	Program:	NPDES permit
Federal Agency:		Program:	

Agency Office to Receive Response (Check all that apply)

Army Corps of Engineers: ☐ Philadelphia ☐ Baltimore ☐ Pittsburgh

DEP Office:	☐ Central Office	☒ Regional Office:	Southcentral Regional Office
☐ District Mining Office:		☐ Oil & Gas Office:	
☐ Other: (provide address)			

Pennsylvania Historical & Museum Commission
Bureau for Historic Preservation

BHP Use Only
ER #

Required Project Information for BHP/SHPO Review

x Total Acres in the property under review: 10acres

x Total acres of earth disturbance for this proposed activity: 10 acres (two wind turbine/electric line)

x Are there any buildings or structures within the project area? Yes ☒ No

X Project located in or adjacent to a historic district? ☐ Yes x No ☐ Unsure

Name of Historic District _____

Submissions Must Also Include:

x MAP LOCATION: A 7.5 USGS Map showing the project boundary and the Area of Potential Effect (APE). The APE should include indirect effects, such as visual and audible impacts. Federal Projects must provide an explanation of how the APE was determined.

PHOTOS: Photos of all buildings or structures in the APE over 50 years old. If the property is over 50 years old submit a Historic Resource Form with this initial request. The forms are available at http://www.phmc.state.pa.us/bhp/inventories.

x PROJECT DESCRIPTION NARRATIVE: Provide a detailed project description describing the project, any ground disturbance, any previous land use, and age of all effected buildings in the project area. Attach a site map showing the location of all buildings in the project area.

x I have reviewed all DEP Permit Exemptions listed on the DEP website www.dep.state.pa.us.

In addition, federal agencies must provide:

Measures that will be taken to identify consulting parties including Native Americans.

Measures that will be taken to notify and involve the public.

The information on this form is needed to determine whether potential historic or archaeological resources are present. Additional historic information or investigation may be requested to determine the significance of the resources or the effects of the project on those resources. ***Form and attachments must be submitted by mail. Submissions via e-mail will not be accepted.***

Signature Block

Applicant's Signature _____ Date 1/21/10

Please Print and Mail Completed Form and Required Information to:

PA Historical & Museum Commission
Bureau for Historic Preservation
400 North Street
Commonwealth Keystone Building 2nd Floor
Harrisburg, PA 17120-0093

Base map from PAMAP Program 2005 Color Orthophotos of Pennsylvania, photos 23002330PAS and 24002330PAS.

LEGEND

- LCSWMA PROPERTY BOUNDARY
- EXISTING CONTOURS (350)
- FENCE
- REMOVE FENCE
- LIMIT OF STOCKPILE
- PROPOSED RELOCATED FENCE
- PROPOSED VEGETATION REMOVAL AREA
- TREE REMOVAL FOR WIND ENERGY PROJECT
- FREY FARM LANDFILL (FFLF) PERMITTED BOUNDARY
- PROPOSED WIND TURBINE GENERATOR TOWER LOCATION
- PROBABLE WIND TURBINE GENERATOR LOCATION
- OBSERVATION POINT LOCATION

Probable Wind Turbine Generator Locations

FFLF Wind Energy Project
Lancaster County Solid Waste Management Authority
Lancaster County, PA

February 2010	Scale: 1" = 500'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 1

S:\06377 LCSWMA Wind Energy_Drwg\8x11_Probable Ref – Wind Turbine Generator Locations.dwg

Base map from Safe Harbor USGS 7½ minute quadrangle dated 1995.

LEGEND

- LCSWMA Property Boundary (Frey Farm/Creswell Landfill)
- Creswell Landfill Waste Limit (closed, inactive)
- Frey Farm Landfill (FFLF) Permitted Waste Limit
- Proposed Wind Turbine Location
- Probable Wind Turbine Location
- Conejohela Flats Important Bird Area

0 1,500 3,000 4,500

SCALE IN FEET

N

Site Location Map

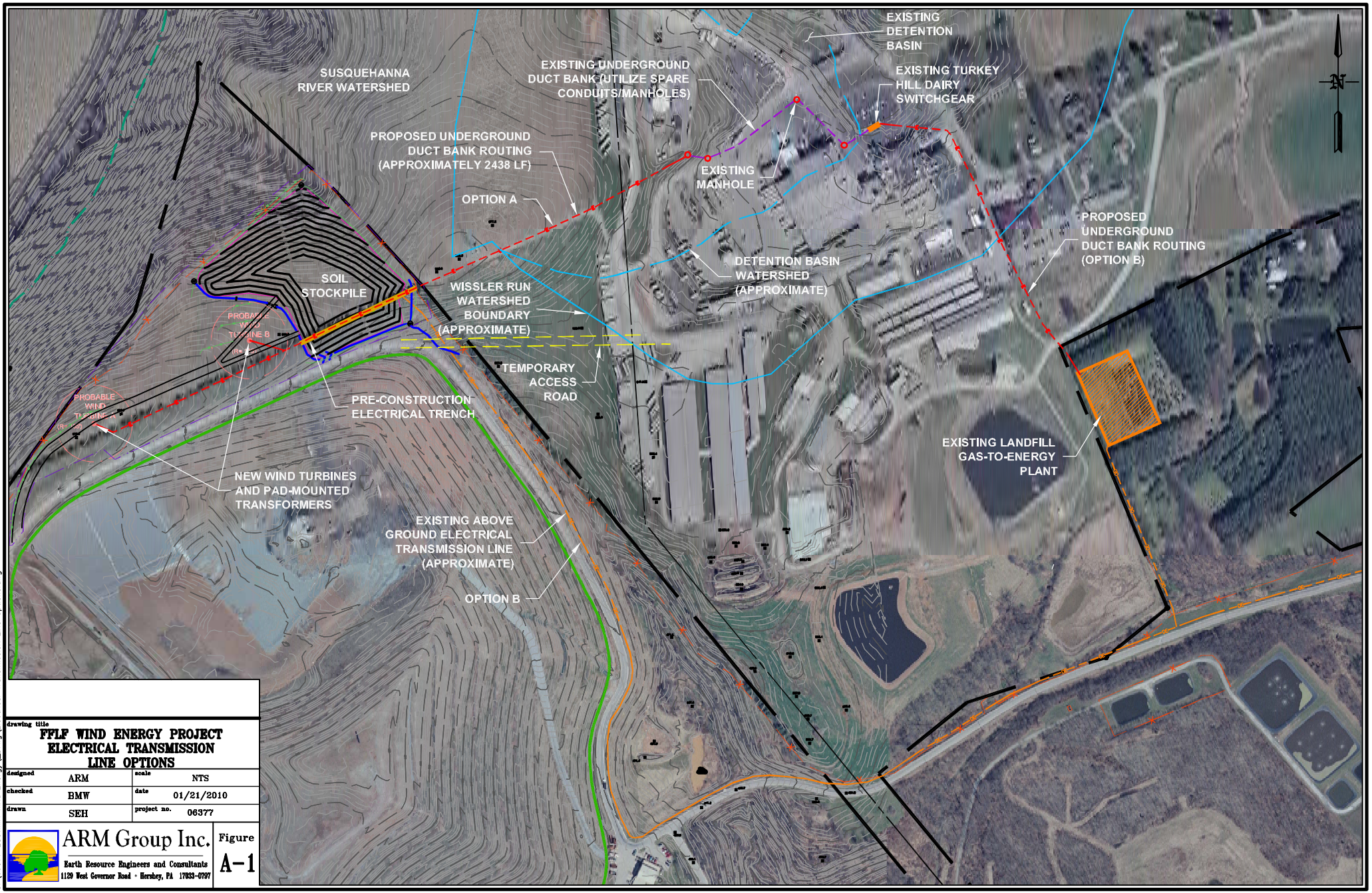
FFLF Wind Energy Project
Environmental Assessment

January 2010	Scale: 1" = 1,500'	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\06377_Figure 2 Environmental Assessment_rev012110.dwg



drawing title

FFLF WIND ENERGY PROJECT ELECTRICAL TRANSMISSION LINE OPTIONS

designed	ARM	scale	NTS
checked	BMW	date	01/21/2010
drawn	SEH	project no.	06377

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

Figure A-1

S:\06377 LCSWMA Wind Energy_Dwg\Electrical Transmission Line Options.dwg

PHMC PHASE I ARCHEOLOGICAL SURVEY DETERMINATION [PROPOSED STOCKPILE AREA]

Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us

January 7, 2010

Marcia M. Kodlick
K2Consulting Services
701 Good Hope Road
Mechanicsburg, PA 17050

RE: 1986-1460-071-E
Proposed Stockpile Area
Alternate Property
Lancaster County Solid Waste Management Authority, Manor Township, Lancaster County

Dear Ms. Kodlick:

The Bureau for Historic Preservation has reviewed the above named project under the authority of the Environmental Rights amendment, Article 1, Section 27 of the Pennsylvania Constitution and the Pennsylvania History Code, 37 Pa. Cons. Stat. Section 500 et seq. (1988). This review includes comments on the project's potential effect on both historic and archaeological resources.

We are in receipt of the draft final report of the Phase I archaeological survey of the referenced project. We concur with your recommendations that archaeological site 36LA939 is not eligible for the National Register of Historic Places and that no additional archaeological investigations are warranted for this project area.

Please send four copies of this report (one unbound and three with spiral or comb binding) for our files and the various repositories.

If you have any questions, please contact me at (717) 772-0925 or dmclearen@state.pa.us.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology & Protection

cc: DEP, Southcentral Region Office
Michelle Cohen, ARM Group
Brooks Norris, LCSWMA

APPENDIX C

AGENCY AND OTHER APPROVALS

FAA APPROVALS

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-WTE-11911-OE

Issued Date: 12/22/2009

Bryan Wehler
ARM Energy Solutions
1129 West Governor Road
P.O. Box 797
Hershey, PA 17033-0797

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine A
Location:	Conestoga, PA
Latitude:	39-57-31.32N NAD 83
Longitude:	76-27-24.81W
Heights:	398 feet above ground level (AGL) 1008 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked and/or lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

This determination expires on 12/22/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-WTE-11911-OE.

Signature Control No: 666340-121008256 (DNE -WT)
Michael Blaich
Specialist

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-WTE-11912-OE

Issued Date: 12/22/2009

Bryan Wehler
ARM Energy Solutions
1129 West Governor Road
P.O. Box 797
Hershey, PA 17033-0797

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine B
Location:	Conestoga, PA
Latitude:	39-57-34.13N NAD 83
Longitude:	76-27-17.72W
Heights:	398 feet above ground level (AGL) 988 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked and/or lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

This determination expires on 12/22/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-WTE-11912-OE.

Signature Control No: 666341-121008257 (DNE -WT)
Michael Blaich
Specialist

NTIA APPROVAL

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

JAN 5 2010

Mr. Sean McCarthy, E. I. T.
Staff Engineer
ARM Group, Inc.
8965 Guilford Road, Ste. 100
Columbia, MD 21046

Re: Frey Farm Landfill Wind Project, (revision 1), in Lancaster County, PA

Dear Mr. McCarthy:

In response to your request on November 8, 2009, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Frey Farm Landfill Wind Project, (revision 1), in Lancaster County, Pennsylvania.

After a 45 day period of review, no federal agencies identified any concerns regarding blockage of their radio frequency transmissions.

While the IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review these proposals.

Sincerely,

Edward M. Davison
Deputy Associate Administrator
Office of Spectrum Management

SPRINT NEXTEL NON-INTERFERENCE DETERMINATION

A R M G r o u p I n c .

Sprint
Together with NEXTEL

Sprint Nextel
6391 Sprint Parkway, Mail Stop KSOPHT0101-Z2650
Overland Park, KS 66251-2650
Office: (800) 357-7641 Fax: (913) 523-9735

Donald Strickland
RF Manager

January 4, 2010

VIA UPS Tracking #

ARM Energy Solutions
Attn. Mr. Bryan Wehler, P.G., E.I.T.
1129 West Governor Road
Hershey, PA 17033- 0797

RE: Frey Farm Landfill Wind Energy Project – Revised Wind Turbines Locations
Nextel Cell Site ID# PA910P-A- Washington Boro

Wind Turbine Installer: **ARM Group Inc.**
Sprint Nextel Site Reference: **PA910P-A- Washington Boro**
Site Address: **2565 River Road, Conestoga, PA 17516**

Dear Mr. Wehler:

This Letter is a written response to your inquiry regarding possible interference concerns surrounding Sprint Nextel Telecommunications equipment and antennas due to the revised proposed construction of two (2) wind turbines in the immediate vicinity of the Communication Tower identify by Nextel Site ID# PA910P. Upon review of the information provided to us, which included: revised turbine location coordinates, turbine dimensions and turbine elevations, we have not identified any concerns regarding access issues, nor the blockage of the radio frequency transmissions or other form of transmissions to and from the mentioned Communications Tower.

This letter rescinds and supersedes the Letter dated June 8th, 2009 sent to ARM Energy Solutions with the preliminary Wind Turbines locations. While the information provided to us by ARM Group Inc. (ARM) indicates that no harmful interference is anticipated with the said Communication Tower, we understand the revised Wind Turbine locations provided may change as the project proceeds. If the final locations of the Wind Turbines differ significantly from the revised locations provided to us, ARM will notify Sprint Nextel to resolve any resulting interference issues.

Sincerely,
Sprint Nextel,

Donald Strickland
RF Manager

CC: Sean McCarthy, ARM Group

JUAN DOMINGUEZ
646-448-8086
ERICSSON SUS DEPLOYMENT
1166 AVENUE OF THE AMERICAS
NEW YORK NY 10036

0.0 LBS LTR 1 OF 1

SHIP TO:
ATTN. MR. BRYAN WEHLER
410- 290- 7775
ARM ENERGY SOLUTIONS
1129 WEST GOVERNOR ROAD
HERSHEY PA 17033-9590

PA 171 9-20

UPS NEXT DAY AIR **1**
TRACKING #: 1Z 212 67A 01 9195 0689

BILLING: P/P

Cost Center: 05457

CS 12.0.14. WORLD60 96.0A 10/2009 TM

FOLD HERE

MANOR TOWNSHIP ZONING BOARD
VARIANCE APPROVAL

BEFORE THE ZONING HEARING BOARD OF MANOR TOWNSHIP
LANCASTER COUNTY, PENNSYLVANIA

IN RE:	:	
	:	
APPLICATION OF	:	No. 6-09
LANCASTER COUNTY SOLID	:	
WASTE MANAGEMENT	:	VARIANCE
AUTHORITY	:	

I. BACKGROUND

The application of Lancaster County Solid Waste Management Authority, with address at 1299 Harrisburg Pike, P.O. Box 4425, Lancaster, Pennsylvania 17604, ("Applicant"), seeks a variance to the provisions of Section 302.5 of the Manor Township Zoning Ordinance, adopted May 7, 2001, as amended and reenacted ("Zoning Ordinance") regulating the maximum height of Wind Energy Conversion Systems ("WECS") on property located at 3049 River Road, Conestoga, Pennsylvania 17516.

A hearing was held in this matter on December 9, 2009 at the Manor Township Municipal Office, 950 West Fairway Drive, Lancaster, Pennsylvania. Among those in attendance were Walter R. Schlemmer, Barbara M. Douglas and John Wenzel, constituting the full membership of the Manor Township Zoning Hearing Board ("Board"); Bruce Ott, Zoning Officer of Manor Township; James R. McManus, III, Esquire, counsel to the Board; the Applicant by its counsel, Stacey L. Morgan, Esquire; and several Township residents, none of whom requested party.

Notice of the hearing was advertised and the property which is the subject of this application was posted in accordance with the provisions of the Pennsylvania Municipalities Planning Code ("MPC"), the Zoning Ordinance and the Sunshine Act.

II. FINDINGS OF FACT

1. Applicant is Lancaster County Solid Waste Management Authority, with address at 1299 Harrisburg Pike, P.O. Box 4425, Lancaster, Pennsylvania 17604.

2. Applicant is the owner of a tract of land containing approximately 261 acres known as the Frey Farm Landfill located at 3049 River Road, Conestoga, Pennsylvania 17516, Account No. 4106960100000 ("Tract").

3. Applicant is the operator of a landfill facility on the Tract.

4. The Tract is located wholly within the Rural (R) zoning district ("R-District"), as indicated on the Zoning Map of Manor Township and regulated by the Zoning Ordinance.

5. The greater portion of the Tract is located west of River Road and east of lands of Pennsylvania Lines, LLC also known as the Norfolk Southern railroad.

6. The property of Pennsylvania Lines, LLC is located between the Tract and the Susquehanna River.

7. The property of Pennsylvania Lines, LLC located between the Tract and the Susquehanna River is largely wooded, steeply slopes to the railroad bed adjacent to the River and is located within the C-Conservation zoning district as indicated on the Zoning Map of Manor Township and regulated by the Zoning Ordinance.

8. A portion of a proposed trail known as the Turkey Hill Trail intended for public usage runs along and through the property of Pennsylvania Lines, LLC.

9. A 16.26 acre portion of the Tract was incorporated into the Tract as Lot 1A of a lot add-on subdivision plan recorded in the Office of the Recorder of Deeds in and for Lancaster County, Pennsylvania at Subdivision Plan No. 5812986 ("WECS Site").

10. The WECS Site is located in the northwestern portion of the Tract, adjoins the property of Pennsylvania Lines, LLC and has vehicular access by way of the landfill's access road which boarders the southern portion of the WECS Site.

11. The WECS Site is not intended for use by Applicant for landfill activities other than the possible storage of soil for deposit within the landfill portion of the Tract.

12. Applicant proposes to erect two (2) Wind Energy Conversion Systems units ("WECS Units") on the WECS Site.

13. WECS Units are permitted in both the R-Rural and C-Conservation zoning districts as uses accessory to 'public uses and public utilities structures' as defined in the Zoning ordinance.

14. Applicant's by agreement with the Pennsylvania Power and Light Corporation, a public utility regulated by the Pennsylvania Public Utility Commission, will generate and distribute electric power from the proposed WECS Unit project.

15. The proposed WECS Units will primarily provide electricity to the neighboring Turkey Hill Dairy business facility but may additionally provide electricity to the region's power grid.

16. The WECS Units consist of two (2) standard size wind turbines, each of which is 398 feet in height, measured from the topmost portion of the extended blades.

17. Two WECS Units are the minimum number necessary to provide a reasonable amount of the energy needs of the Turkey Hill Dairy business facility.

18. One of the wind turbines, Turbine A, is proposed be located to within 114.4 feet from the westerly property line of the WECS Site, adjacent to the property of Pennsylvania Lines, LLC.

19. The provisions of Section 302.5 of the Zoning Ordinance restrict the height of a WECS Unit to distance not more than the shortest distance from the WECS Unit measured horizontally from the unit to any lot line.

20. The proposed locations of the wind turbines are the only feasible locations on the WECS Site for their intended use.

21. The WECS Site is ideally suited for the location and operation of Wind Energy Conversion Systems by virtue of prevailing winds which together with the site's elevation and proximity to a substantial water body accelerate wind velocities through the WECS Units.

22. The proposed wind turbines begin to operate only when wind velocity reaches approximately four meters per second and will automatically shut down in excessive wind conditions.

23. The blades of the proposed wind turbines are expected to be in motion from 60 to 80 percent of the time.

24. The nearest residence to the proposed wind turbines is more than 2,500 feet.

25. No noise generated from the proposed WECS Units will occasion any nuisance to neighboring properties.

26. The operation of Turbine A at the proposed location will cause no dust, glare, odor, vibrations or significant traffic.

27. Applicant proposed to enclose the WECS Units within a six foot high security fence area.

28. The proposed location of the wind Turbine A is such that there is no foreseeable danger to persons or property either on the WECS Site or on adjoining properties in the event of a structural failure of the unit.

29. An unnecessary hardship would result if the Turbine A facility were limited in height to 114.4 feet.

30. The requested variance is the minimum relief necessary to permit the development of two (2) WECS Units on property uniquely suited for such usage.

31. The requested variance will not adversely affect access to the Tract or other adjoining or neighboring properties.

32. The requested variance will not adversely affect the public welfare.

33. The requested variance will not detract from the use and enjoyment of adjoining or nearby properties.

34. The requested variance will not substantially change the character of the neighborhood within which the Tract is located.

III. CONCLUSIONS OF LAW

A dimensional variance may be justified where the relief granted is not injurious to the public. In such instances a variance may be authorized as de minimus. Pyzdrowski v. Pittsburgh Board of Adjustment, 437 Pa. 481, 263 A.2d 426 (1970). Moreover, in its consideration of variances other than use variances, a zoning hearing board may consider such facts as the minimal impact of the requested variance on the surrounding neighborhood. Hertzberg v. Zoning Board of Adjustment of the City of Pittsburgh, 721 A2d. 43 (1998); South Coventry Township Board of Supervisors v. Zoning Hearing Board of South Coventry Township, 732 A.2d 12, Pa. Cmwth. Ct. (1999).

The Applicant has demonstrated compliance with the forgoing with respect to the proposed location and height of wind Turbine A. Additionally, the location of the proposed wind Turbine A will not be injurious to the public health, safety or general welfare.

IV. DECISION

Based upon the foregoing, the application of Lancaster County Solid Waste Management Authority, for a variance to the provisions of Section 302.5 of the Manor Township Zoning Ordinance to erect a wind Turbine of 398 feet in height, designated by Applicant as wind Turbine A, to not less than 114.4 feet from the property line forming the western boundary of the Wind Energy Conversion Systems Site on which it is to be located at 3049 River Road, Conestoga, Pennsylvania 17516, Account No. 4106960100000, is hereby granted.

The approval of the aforesaid variance is subject to the following conditions:

1. The location of Turbine A shall be in accordance with the plan entitled Zoning Sketch Plan Proposed Wind Energy Project, Manor Township, prepared by ARM Group, Inc. Exhibit No. 2, submitted 12-09-09.

2. Turbine A shall not exceed 398 feet in height.

3. Turbine A shall not be located nearer than 114.4 feet from the property line forming the western boundary of the Wind Energy Conversion Systems Site.

4. Applicant shall at all times comply with and adhere to the plans and all other evidence presented to the Board by Applicant or on its behalf at the hearing held on December 9, 2009.

5. Applicant shall comply with all applicable Federal, State and local regulations regarding the construction, use and operation of the proposed facility.

6. Applicant shall obtain all approvals and permits required by all applicable State, County and Manor Township codes and ordinances.

7. Applicant shall provide a plan for the removal of wind Turbine A when it shall become functionally obsolete or is no longer in use together with such financial security acceptable to Manor Township to cover the cost of the removal of the structure.

Any violation of the conditions contained in this Decision shall be a violation of the Zoning Ordinance and shall be subject to the penalties and remedies as set forth in the Pennsylvania Municipalities Planning Code.

The foregoing Decision shall be binding upon the Applicant, its successors in interest and assigns.

ZONING HEARING BOARD OF MANOR TOWNSHIP

Dated: Jan 6, 2010

By: Walter R Schlemmer
Walter R. Schlemmer

By: Barbara M Douglas
Barbara M. Douglas

By: John Wenzel
John Wenzel

APPENDIX D

ANALYSIS AND SUPPORTING DOCUMENTATION

SHADOW FLICKER ANALYSIS

ARM GROUP INC.

Memo

To: Steve Gabrielle, PPL
Brooks Norris, LCSWMA

From: Bryan M. Wehler, P.E., P.G., ARM

CC: Jim Warner, LCSWMA
Stacey Morgan, Esq

Date: December 9, 2009

Subject: FFLF Wind Energy Project – Shadow Flicker Analysis

ARM Group, Inc. (ARM) was requested by PPL Renewable Energy (PPL) to evaluate predicted shadow flicker impacts surrounding the proposed Frey Farm Landfill (FFLF) Wind Energy Project, located in Conestoga, Pennsylvania. The proposed wind energy project will consist of two wind turbines at a hub height of 80 meters and a rotor diameter of 82.5 meters.

Shadow flicker caused by wind turbines is commonly defined as alternating changes in light intensity caused by rotating blades casting shadows on the ground and stationary objects, such as a window at a dwelling. No flicker shadow will be cast when the sun is obscured by clouds/fog or when the turbine is not rotating. Shadow flicker can occur in project area homes when the turbine is located near a home and is in a position where the blades interfere with very low angle sunlight. The most typical effect is the visibility of an intermittent light reduction in the rooms of the home facing the wind turbines and subject to the shadow flicker (Ref 1). Such locations are here referred to as shadow flicker receptors. Obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow flicker receptor significantly reduce or eliminate shadow flicker effects.

ARM identified a study produced by Meridian Energy that evaluated the effects of shadow flicker and concluded that the nearest affected receptors should be no closer than 10 rotor diameters from the turbines (Ref 1). A second study from the *Planning for Renewable Energy* guide from the United Kingdom stated the following: "Flicker effects have been proven to occur only within ten rotor diameters of a turbine. Therefore, if the turbine has 80 meter blades, the potential shadow flicker effect could be felt up to 800 meters from a turbine" (Ref 2). At the FFLF Wind Energy Project, a distance of 10 rotor diameters equates to approximately 2,710 feet. Within a distance of 2,710 feet, ARM identified three occupied dwellings. The nearest occupied dwelling to a proposed wind turbine is approximately 2,550 feet. The potential shadow flicker effects on these dwellings will be subsequently discussed.

While it is commonly recommended that wind turbines be sited at least 10 rotor diameters away from occupied dwellings to minimize shadow flicker effects, the proposed wind turbines will cast shadows beyond a distance of 2,710 feet. However, as the distance from the wind turbines increases, the shadow flicker effect diminishes as the low-angle light bends around objects and becomes diffuse. At a distance of a mile, even if the angle is ideal for producing shadow flicker, the shadow flicker intensity will be extremely low and hardly noticeable even under ideal conditions for producing shadow flicker (Ref 3). Due to the potential for shadow flicker effect to extend out to a mile, ARM evaluated the potential shadow flicker impacts on occupied dwellings within a 1-mile radius of the nearest wind turbine.

ARM utilized a sun tracking tool and a United States Geological Survey (USGS) digital elevation model of the site area within AutoCAD to evaluate the potential shadow flicker effects on potential receptors within 1 mile of the nearest wind turbine. A minimum sun angle of 3 degrees was applied to the model. Using the proposed turbine locations and sizes, ARM determined what occupied dwellings within a 1-mile radius of the project site could be impacted by shadow flicker effects, based on sun angles and topography only. Once these potential receptors were identified, ARM used satellite imagery to determine if potential receptors could actually be impacted by shadow flicker effects based on obstructions (e.g., buildings and/or vegetation). If it was determined that a potential receptor was unobstructed, ARM computed the duration of possible shadow flicker effects in terms of the number of days and the average number of minutes per day at each location. The results of ARM's analysis are presented on attached Figures 1-4.

Below is a summary of the results presented on the attached Figures:

- The proposed wind turbines are not visible from the nearest potential receptor as shown on Figure 1.
- There are two potential receptors shown on Figure 2, at a distance of approximately 5,150 feet from the nearest wind turbine that may experience shadow flicker effects for approximately 12 minutes per day for a period of 10 days, for a total possible shadow flicker impact of 2 hours/year. The other potential receptors shown on Figure 2 are obstructed by vegetation during the time of potential impact.
- There are three potential receptors shown on Figure 3, at a distance ranging from approximately 4,950 feet to 5,700 feet from the nearest wind turbine that may experience shadow flicker effects for approximately 11 minutes per day for a period of 8 days, for a total possible shadow flicker impact of approximately 1.5 hours/year. The other potential receptors shown on Figure 3 are obstructed by vegetation during the time of potential impact.
- None of the occupied dwellings displayed on Figure 4 will be impacted by shadow flicker due to obstructions including the Turkey Hill Dairy facility and vegetation.

ARM's shadow flicker assessment is conservative in that it does not factor in fog or cloud cover, which would reduce the number of days that shadow flicker may occur. Furthermore, the analysis does not account for wind turbine operation time. The wind turbines must be spinning in order to generate a shadow flicker effect. The wind turbines only spin when wind speeds exceed 4 m/s. Since the wind turbines will only be operating 50-70 percent of the time, the shadow flicker effect will be less than what was estimated by this analysis. Finally, the analysis assumes that the turbine blades are operating perpendicular to the sun path line to the potential receptor. Depending on the wind direction, the alignment of the turbine blades will vary such that the flicker effect will be less than what was assumed for this analysis.

Conclusions

Based on this shadow flicker effect evaluation, the three occupied dwellings within a distance of 10 rotor diameters from the nearest turbine have fully obstructed views of the turbines and, therefore, will not be impacted by shadow flicker effects. Within a radius of 1 mile, and based on this conservative analysis, there are five occupied dwellings that may experience shadow flicker effects for up to 2 hours/year. Considering that the three potential receptors within the recommended 10 rotor diameter setback distance are obstructed, and the five identified potential receptors within 1 mile of the project area are predicted to experience shadow flicker effects for only 2 hours/year, the proposed siting of the wind turbines conforms to industry standards and has a minimal shadow flicker impact on the surrounding occupied dwellings. If shadow flicker effect is determined to be a nuisance at the five identified potential receptors following the installation of the wind energy facility, mitigation measures can be implemented. Effective mitigation measures include: covering windows with curtains, blinds, or shutters during shadow flicker generation periods, and/or providing screening in the form of vegetation to reduce or prevent shadow flicker.

References

1) *Project West Wind: Shadow Flicker Assessment Report*, Meridian Energy, June 22, 2005.

2) *Planning for Renewable Energy, A Companion Guide to PPS22*, Office of Deputy Prime Minister, Queen's Printer and Controller of Her Majesty's Stationary Office, 2004.

3) Shadow Flicker Modeling for Wild Horse, WA, Wind Engineers, Inc., November, 2003.

FFLF WIND ENERGY PHOTO RENDERINGS

LCSWMA Wind Turbine Photos

Photo 1 – Klines's Run Park, Leibharts Corner, York County

Photo 2 – Susquehanna River public access, Long Level, York County

Photo 3 – Green Branch Road at Mahala Run, York County

Photo 4 – Chestnut Grove Road, Highville, Lancaster County

Photo 5 – River Road, Highville, Lancaster County

Photo 6 – Soccer field, River Road, Creswell, Lancaster County

Photo 7 – Entrance to landfill, Creswell, Lancaster County – Proposed towers obscured by trees on the right

Photo 8 – Creswell Lane between Letort Road and Breneman Road, Creswell, Lancaster County

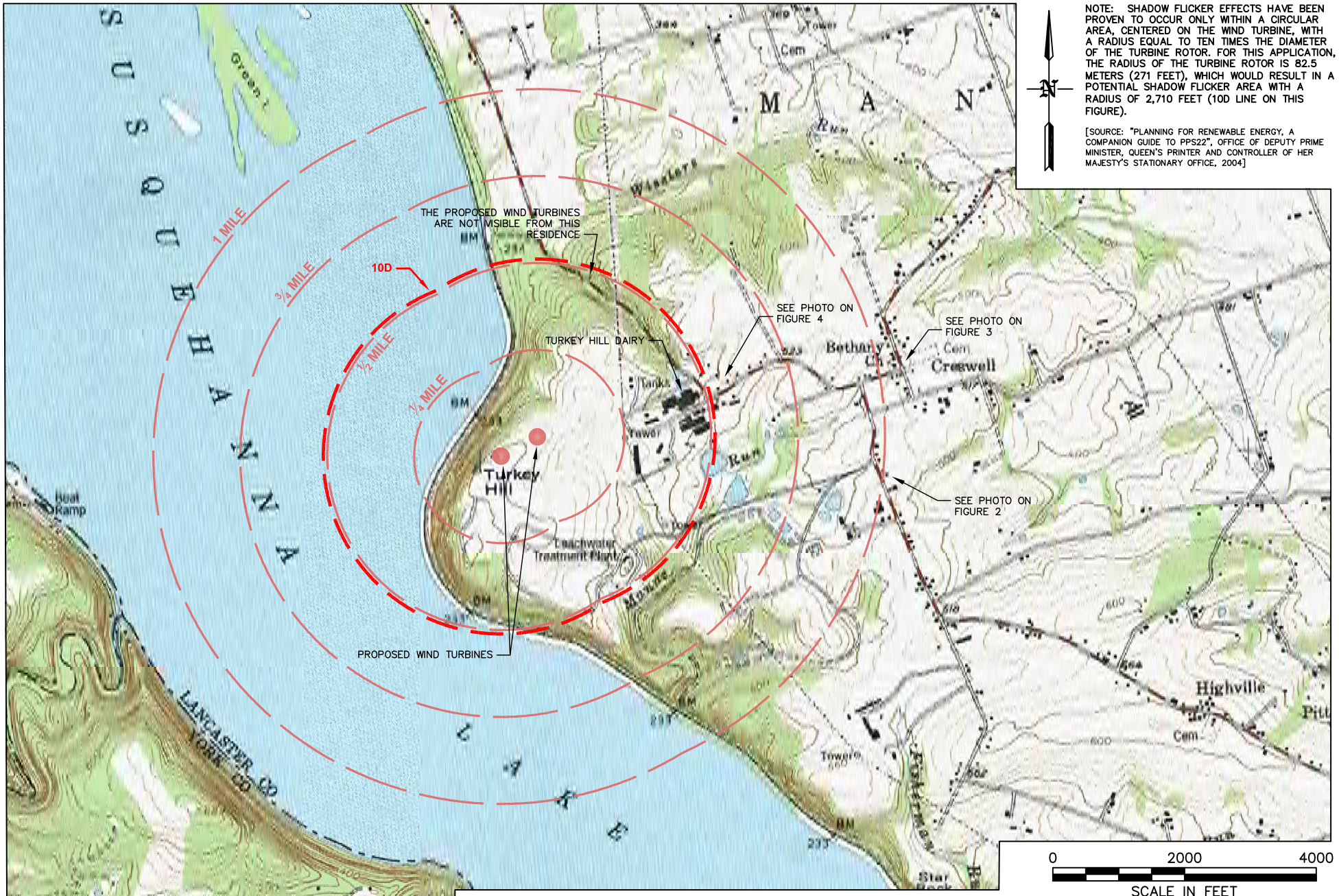
Photo 9 – Bethany Church cemetery, Letort Road, Creswell, Lancaster County

Photo 10 – Wastewater treatment plant, Blue Rock Road, Creswell, Lancaster County

Photo 11 – Blue Rock Road near Prospect Road, Creswell, Lancaster County

SHADOW STUDY FIGURES

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg



S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg

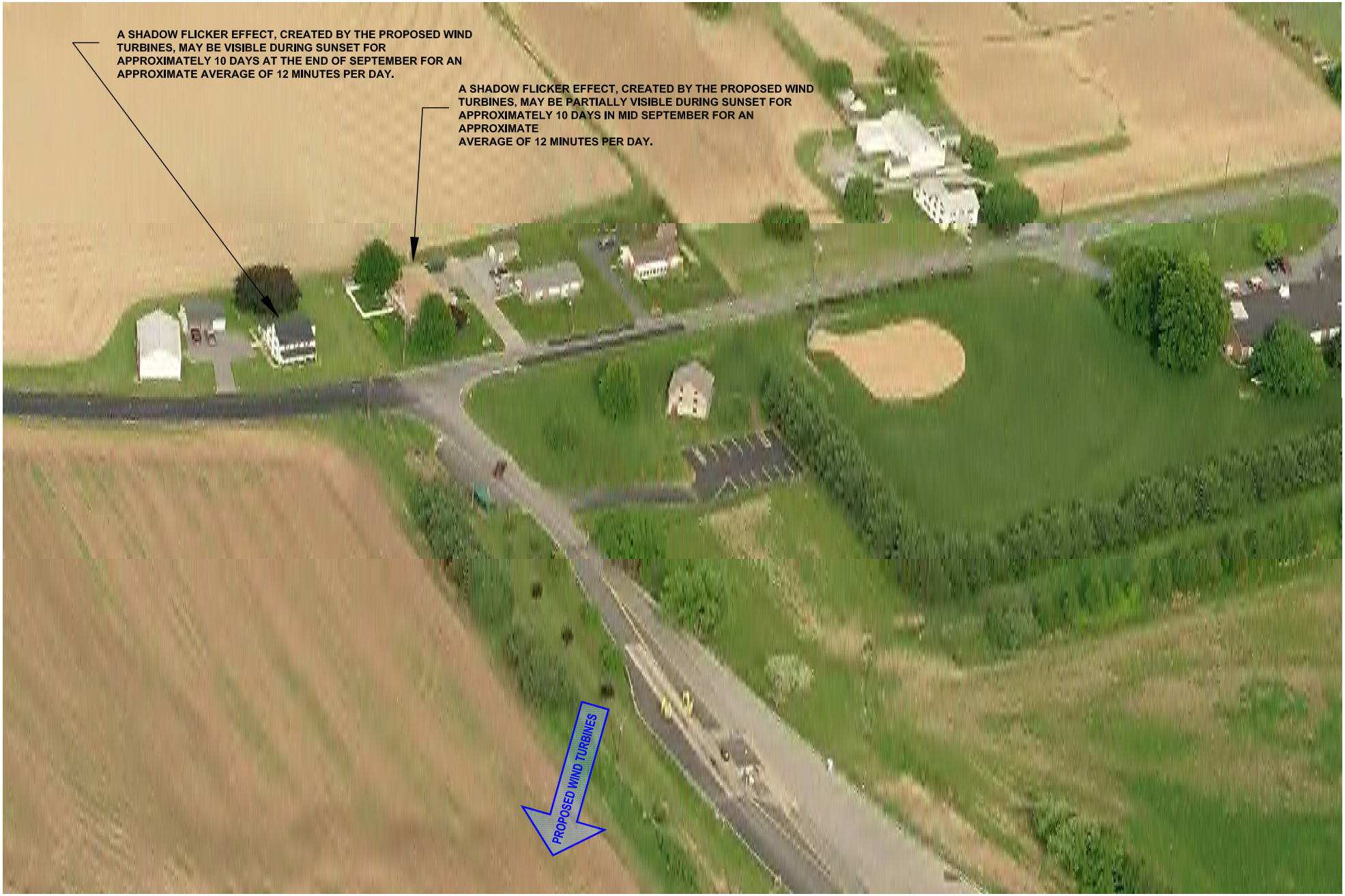
ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

WIND TURBINE SHADOW STUDY
FREY FARM LANDFILL
WIND ENERGY PROJECT

12/07/2009
1" = 2000'
06377-6-7

Figure
1

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg



THE PROPOSED WIND TURBINES ARE OBSCURED FROM ALL RESIDENCES ON THIS PHOTO BY STRUCTURES AND/OR VEGETATION, EXCEPT AS NOTED.

THE PROPOSED WIND TURBINES ARE APPROXIMATELY ONE MILE FROM THIS GROUP OF STRUCTURES.

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

WIND TURBINE SHADOW STUDY

FREY FARM LANDFILL
WIND ENERGY PROJECT

12/07/2009

NTS

06377-6-7

Figure 2

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg

THE PROPOSED WIND TURBINES ARE OBSCURED FROM ALL RESIDENCES ON THIS PHOTO BY STRUCTURES AND/OR VEGETATION, EXCEPT AS NOTED.

THE PROPOSED WIND TURBINES ARE APPROXIMATELY ONE MILE FROM THIS GROUP OF STRUCTURES.

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

WIND TURBINE SHADOW STUDY

FREY FARM LANDFILL
WIND ENERGY PROJECT

12/07/2009

NTS

06377-6-7

Figure 3

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg

S:\06377 LCSWMA Wind Energy_Drwg\8x11_ShadowMap.dwg

THE PROPOSED WIND TURBINES ARE OBSCURED FROM ALL RESIDENCES ON THIS PHOTO BY STRUCTURES AND/OR VEGETATION, EXCEPT AS NOTED.

THE PROPOSED WIND TURBINES ARE APPROXIMATELY ONE MILE FROM THIS GROUP OF STRUCTURES.

ARM Group Inc.
Earth Resource Engineers and Consultants
1129 West Governor Road • Hershey, PA 17033-0797

WIND TURBINE SHADOW STUDY
FREY FARM LANDFILL
WIND ENERGY PROJECT

12/07/2009
NTS
06377-6-7

Figure 4