DOE/EA-1819

FINAL
ENVIRONMENTAL ASSESSMENT

FOR

KILOWATTS FOR KENSTON WIND ENERGY PROJECT

CHAGRIN FALLS
GEAUGA COUNTY, OHIO

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
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COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

TITLE: Final Environmental Assessment for Kilowatts for Kenston Wind Energy Project, Chagrin Falls, Geauga County, Ohio (DOE/EA-1819)

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ABSTRACT: The U.S. Department of Energy (DOE) has provided Federal funding to the Ohio Department of Development (ODOD) under the State Energy Program (SEP). ODOD would provide $1,105,500 of its SEP funds to the Kenston Local School District. Kenston Local School District would use these Federal funds to construct a single 750-kilowatt wind turbine at the Kenston High School at 9500 Bainbridge Road, Chagrin Falls, Ohio. DOE has authorized ODOD to use a percentage of the Federal funding for preliminary activities, which include preparation of this EA, conducting analysis, and agency consultation. Such activities are associated with the proposed project and do not significantly impact the environment nor represent an irreversible or irretrievable commitment by DOE in advance of completing the EA. The wind turbine would provide 750 kilowatts of renewable energy to fulfill nearly 70 percent of the school's annual electricity demand and help to reduce greenhouse gas emissions. Kenston has selected the Aeronautica 750 model, which has a 177-foot rotor diameter and a 213-foot tower height. Overall, the turbine would stand 302 feet at its tallest blade tip. Approximately 600 feet of associated underground electrical transmission equipment would be installed to connect the wind turbine to the existing school switchgear. No new access roads or road improvements would be required for this project.

This EA analyzes the potential environmental impacts as a result of the proposed construction, operation, and decommissioning of the Kenston Local School District's wind energy project and the alternative of not implementing this project (the No-Action Alternative).

AVAILABILITY: This EA is available for review on the DOE Golden Field Office Reading Room Website, http://www.eere.energy.gov/golden/Reading_Room.aspx, and the DOE NEPA Website, http://nepa.energy.gov/DOE_NEPA_documents.htm.

ACRONYMS

APE	area of potential effect
ARRA	*American Recovery and Reinvestment Act of 2009*
BMP	best management practice
CFR	*Code of Federal Regulations*
dBA	decibel on an A-weighted scale, used to approximate the human ear's response to sound
DNL	Day Night Average Sound Level (also L_{dn})
DOE	U.S. Department of Energy
EA	environmental assessment
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
IBA	Important Bird Area
Kenston	Kenston Local School District
L_{max}	maximum sound level
L_{min}	minimum sound level
L_{eq}	equivalent sound level
L_{xx}	percentile-exceeded sound level
MBTA	*Migratory Bird Treaty Act*
NEPA	*National Environmental Policy Act*
NHPA	*National Historic Preservation Act*
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System
NTIA	National Telecommunications and Information Administration
ODOD	Ohio Department of Development
ODNR	Ohio Department of Natural Resources
ODOW	Ohio Department of Natural Resources Division of Wildlife
OHPO	Ohio Historic Preservation Office
OSHA	Occupational Safety and Health Administration
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
SEP	State Energy Program
Stat.	United States Statutes at Large
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

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1. INTRODUCTION

1.1 National Environmental Policy Act

The *National Environmental Policy Act* (42 U.S.C. 4321 *et seq*.; NEPA), the Council on Environmental Quality's NEPA regulations [40 *Code of Federal Regulations* (CFR) Parts 1500 to 1508], and the U.S. Department of Energy's (DOE's) NEPA implementing procedures (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.

This Environmental Assessment (EA):

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

This EA provides DOE and other decisionmakers the information needed to make an informed decision about the installation, operation, and eventual decommissioning of the proposed wind turbine. The EA evaluates the potential individual and cumulative impacts of the proposed project. For purposes of comparison, this EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumes the project would not proceed. The EA does not analyze other action alternatives.

1.2 Background

The Kenston Local School District (Kenston) proposes to construct, operate, and eventually decommission a single 750-kilowatt wind turbine, along with approximately 600 linear feet of associated underground electronic transmission equipment, at Kenston High School, located at 9500 Bainbridge Road, Chagrin Falls, Ohio (see Appendix A, Figure 1). The current estimated project cost is $1,875,000. The Ohio Department of Development's (ODOD's) Energy Resources Division selected this project to receive a $1,105,500 grant. This grant would come from money that the State of Ohio received from DOE under the *American Recovery and Reinvestment Act of 2009* (Pub. L. 111-5, 123 Stat. 115; ARRA) and 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. SEP is authorized under the *Energy Policy and Conservation Act*, as amended (42 U.S.C. 6321 *et seq*.).

States can use SEP funds for a wide variety of activities related to energy efficiency and renewable energy (42 U.S.C. 6321 *et seq*. and 10 CFR Part 420). In ARRA, Congress appropriated $3.1 billion to DOE's SEP, and the State of Ohio received $96,083,000, pursuant to a Federal statutory formula for distributing these funds. The potential use of Federal SEP funds to assist in the financing of the proposed project constitutes a Federal action subject to review under NEPA.

In compliance with NEPA regulations, this EA examines the potential environmental impacts of the DOE's Proposed Action (providing funding for the proposed project) and the No-Action Alternative, under which DOE assumes the proposed project would not proceed. This EA also describes options that the sub-recipient (Kenston) considered during development of its application to the State of Ohio, which is the recipient of Federal funding under DOE's SEP. This EA will provide DOE with the information needed to make an informed decision about whether allowing the State of Ohio to provide certain Federal funds for the proposed project might result in significant environmental impacts.

1.3 Purpose and Need

1.3.1 DOE'S PURPOSE AND NEED

DOE's purpose and need is to ensure that SEP funds are used for activities that meet congressional statutory aims to improve energy efficiency, reduce dependence on imported oil, decrease energy consumption, create and retain jobs, and promote renewable energy. Providing funding as part of the Ohio SEP grant to Kenston would partially satisfy the need of DOE's SEP to assist U.S. cities, counties, states, territories, and American Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs

Congress enacted ARRA to create jobs and restore economic growth through measures that, among other things, modernize the nation's infrastructure and improve energy efficiency. Provision of SEP funds for the proposed project would partially meet these goals.

1.3.2 OHIO'S PURPOSE AND NEED

Ohio's purpose and need is to grow the economy of the state by connecting companies and communities to financial and technical resources to deploy renewable energy technologies, and to support the goals of SEP and ARRA to reduce energy costs, reduce reliance on imported energy and to preserve and create jobs.

1.4 Ohio's SEP Project Selection Process

Ohio's SEP, administered by ODOD, includes five sub-programs:

- Deploying Renewable Energy in Ohio
- Making Efficiency Work
- Targeting Industry Efficiency
- Banking on New Energy Financing
- Setting the Stage for Ohio's Carbon Management Strategy

ODOD selected the proposed project to receive a grant through its sub-program, "Deploying Renewable Energy in Ohio," which provides grants to public and private entities to fund a variety of renewable energy projects, including solar, wind, fuel cell, and waste to energy technologies. ODOD issued a Request for Proposals for the "Deploying Renewable Energy in Ohio" sub-program and used the following criteria for selection: project readiness; matching capabilities, financing, and cost effectiveness; economic impact on Ohio; project characteristics and potential for innovation; and a project's ability to (1) provide emission-free energy, and (2) create jobs during the construction of the project.

A criterion of the SEP grant is that funds must be obligated to sub-recipients by September 30, 2010, and spent by March 2012; therefore, all conditions on SEP awards must be removed by March 2012. Kenston was one of eight wind energy grant applicants awarded SEP funds by ODOD in 2009. A total of $5,831,000 was awarded to these eight applicants, and Kenston was awarded $1,105,500.00 conditioned on completion of NEPA review. For this project, DOE is the Federal agency, ODOD is the recipient of Federal funding, and Kenston is the sub-recipient of this funding. The project would be implemented on Kenston High School property.

1.5 Public and Agency Involvement

1.5.1 DOE'S PUBLIC SCOPING PROCESS

When it began preparing this EA, DOE sent notices of public scoping to stakeholders and interested parties including local, State, and Federal agencies; certain organizations; the 24 tribal representatives that are regularly notified of Federal actions in northeastern Ohio; and the general public (see Appendix D, Attachment D1). The notices solicited comments from all of these parties. DOE published the scoping letter on the DOE Golden Field Office Public Reading Room Website to solicit comments. The scoping letter described the Proposed Action and requested assistance in identifying potential issues to be evaluated in this EA. These letters are contained in Appendix D, Attachment D1, of this document. On August 26, 2010, DOE sent postcards announcing the public scoping process and directing stakeholders to the DOE Golden Field Office Public Reading Room, where the scoping letter was available for review. The scoping letter described DOE's Proposed Action and the proposed project, and requested assistance in identifying potential issues the EA could evaluate. The public comment period closed on September 9, 2010.

In response to the scoping letters, DOE received a letter from the U.S. Fish and Wildlife Service (USFWS) that was part of the ongoing consultation between DOE and the USFWS (see Appendix C, Attachments C2 and C3) and is discussed in detail in Section 3.2.2.6 of this EA. To conclude the consultation, the USFWS sent a subsequent letter dated October 29, 2010 (see Appendix C, Attachment C4), indicating that the USFWS believed that the proposed project is not likely to result in the take of or adverse impact to the Indiana bat (*Myotis sodalis*).

1.5.2 KENSTON PUBLIC INVOLVEMENT

Kenston has provided opportunities for public involvement since Monday, October 17, 2005, in an attempt to educate the public about this project and to provide an opportunity for public comment. These opportunities have included public meetings (see Appendix D, Attachment D2) as well as coverage of the project in local media outlets (see Appendix D, Attachment D3). Table 1-1 is a list of the meetings that representatives from the Kenston project attended and provided information to those in attendance. A timeline of public outreach efforts is provided in Appendix D, Attachment D2.

Table 1-1. List of Meetings with Meeting Dates

Meeting Date	Documented Meeting
10/17/2005	Kenston Board of Education Meeting, Superintendent's Report
10/16/2006	Kenston Board of Education Meeting, 2006-129 Wind Study Report
02/12/2007	Kenston Board of Education Meeting, Superintendent's Report
06/18/2007	Kenston Board of Education Meeting, Superintendent's Report
09/17/2007	Kenston Board of Education Meeting, Superintendent's Report
09/17/2007	Kenston Board of Education Meeting, Educational Agreement with (CSU)
12/10/2007	Kenston Board of Education Meeting, Superintendent's Report
02/11/2008	Kenston Board of Education Meeting, Superintendent's Report
03/17/2008	Kenston Board of Education Meeting, Superintendent's Report
03/17/2008	Kenston Board of Education Meeting, Superintendent's Report
03/17/2008	Kenston Board of Education Meeting, 2008-30 Notice to Proceed
04/17/2008	Kenston Citizens Advisory Committee
04/21/2008	Kenston Board of Education Meeting, Renaissance Group
04/21/2008	Kenston Board of Education Meeting, Superintendent's Report
05/19/2008	Kenston Board of Education Meeting, Advertise for Bids
05/19/2008	Kenston Board of Education Meeting, Superintendent's Report
05/29/2008	Geauga County Renewable Energy Meeting
06/16/2009	Kenston Board of Education Meeting, Superintendent's Report
06/24/2008	Kenston Citizens Advisory Committee
07/14/2008	Kenston Board of Education Meeting, New Fund Approval
07/14/2008	Kenston Board of Education Meeting, Superintendent's Report
08/18/2008	Kenston Board of Education Meeting, Superintendent's Report
08/28/2008	Kenston Citizens Advisory Committee
09/15/2008	Kenston Board of Education Meeting, Superintendent's Report
10/15/2008	Business Advisory
10/16/2008	Kenston Board of Education Meeting, Special Rejection of Bid
10/20/2008	Kenston Board of Education Meeting, Superintendent's Report
11/05/2008	Bainbridge Civic Club
11/17/2008	Kenston Board of Education Meeting, Superintendent's Report
11/20/2008	Kenston Citizens Advisory Committee
12/04/2008	Kenston Citizens Advisory Committee
12/10/2008	Business Advisory
12/15/2008	Kenston Board of Education Meeting, Advertise for Bids
12/15/2008	Kenston Board of Education Meeting, Superintendent's Report
01/28/2009	Kenston Citizens Advisory Committee
02/11/2009	Business Advisory
03/04/2009	Kenston Citizens Advisory Committee
04/16/2009	Kenston Citizens Advisory Committee
04/29/2009	Business Advisory
06/30/2009	CAFR

Table 1-1. List of Meetings with Meeting Dates (continued)

Meeting Date	Documented Meeting
09/25/2009	PTO Council
10/14/2009	Business Advisory
11/13/2009	PTO Council
12/09/2009	Business Advisory
01/29/2009	PTO Council
020/3/2009	Business Advisory
03/18/2010	PTO Council

In addition, Kenston contacted the following agencies and organizations:

- Ohio Historic Preservation Office (OHPO)
- Ohio Department of Natural Resources (ODNR), Division of Wildlife (ODOW)
- Ohio Department of Transportation, Office of Aviation
- ODOD Energy Resources Division
- Bainbridge Board of Zoning Appeals
- Geauga County Historical Society
- Federal Aviation Administration (FAA)

1.5.3 DOE PUBLIC INVOLVEMENT

DOE has contacted the following agencies and organizations regarding the proposed project:

- USFWS
- U.S. Department of Commerce, National Telecommunications and Information Administration (NTIA)
- The 24 tribal representatives with historic ties to northeastern Ohio.

1.5.4 DRAFT ENVIRONMENTAL ASSESSMENT COMMENT AND RESPONSES

DOE issued the Draft EA for comment on January 3, 2011, and posted it on the Golden Field Office Reading Room Website (http://www.eere.energy.gov/golden/Reading_Room.aspx) and the DOE NEPA Website (http://nepa.energy.gov). DOE sent postcards to the individuals listed in Appendix D, Attachment D4 of this EA to notify them of the EA's availability on the web and to announce a 15-day public comment period on the EA. DOE published the Notice of Availability (NOA) in the local newspaper, *The Chagrin Valley Times* (see Appendix D, Attachment D5). The comment period ended on January 17, 2011.

DOE received one comment from an individual related to cumulative impacts and DOE's assessment. DOE has made changes to the cumulative impacts section and prepared a response to that comment (see Appendix F, Attachment F1).

2. PROPOSED ACTION AND ALTERNATIVES

2.1 DOE's Proposed Action

DOE is proposing to authorize ODOD's expenditure of Federal SEP funding to design construct a 750-kilowatt wind turbine to provide renewable energy to Kenston High School (proposed project).

DOE authorized ODOD and Kenston to use a percentage of the Federal funding for preliminary activities, which included EA preparation and studies. Such activities are associated with the proposed project and would not significantly impact the environment nor represent an irreversible or irretrievable commitment of resources in advance of DOE completing the NEPA process for the proposed project.

2.2 Ohio's Proposed Project

The proposed project was chosen based on the following ODOD criteria: project readiness; cost effectiveness; economic impact on Ohio; project characteristics and potential for innovation; and its ability to (1) provide emission-free energy and (2) create jobs during the construction of the project. For this proposed project, DOE is the Federal agency whose Proposed Action is to authorize funding, ODOD is the recipient of Federal funding and Kenston is the sub-recipient of this funding. The project would be implemented on the Kenston High School campus in Chagrin Falls, Ohio.

The proposed project would include the installation and operation of a single 750-kilowatt wind turbine on the school's campus. The turbine model would be an Aeronautica 750 with a 177-foot rotor diameter and a 213-foot tower height. Overall, the turbine would stand 302 feet at its tallest blade tip extension. The turbine would be designed to be mounted on a monopole made up of tubular conical steel segments. This design would eliminate the need for guy wires for support of the wind turbine. The electrical grid interconnect of the turbine would be composed of the turbine's controller (contained within the turbine tower-based section), approximately 600 linear feet of buried 4-inch electrical conduits, including the portions of the run embedded within the turbine tower foundation, a 690- to 12,480-volt transformer, an automatic disconnect switch, a UL1741-compliant monitoring and control device, and a fused disconnect within the school's electrical room's existing switchgear. The system would also have a parallel run of 2-inch conduit for data transfer and control runs. The full system would meet all local, State, and Federal codes and regulations.

Guy wires can be a challenge for birds and bats to locate and maneuver around, which can lead to injury or death, and therefore would not be used for support of the wind turbine. The proposed design also would not include the use of lattice towers for support, which have been found to be roosting sites for birds at other wind project sites.

2.2.1 PROJECT LOCATION

The turbine would be located in the center of the approximate 189-acre school campus between the southwest corner of the football field and the tennis courts. Surrounding the proposed turbine

site are Kenston's administration building, approximately 900 feet to the north, the middle school, approximately 390 feet southeast, and the new high school, approximately 1,060 feet to the east. There is also a maintenance building located approximately 365 feet northwest of the proposed turbine site (see Appendix A, Figures 1a, 1b, 2, and 3) The approximate center point of the proposed turbine is 41 degrees north Latitude and 81 degrees west Longitude at 1,557 feet above mean sea level (see Appendix C, Attachment C8). Once installed, the final ground-level footprint of the turbine base would be 256 square feet.

2.2.2 CONSTRUCTION AND INSTALLATION

Site construction would include installation of the turbine, transformer, electrical distribution wiring, and foundation systems (see Figure 2-1 and Appendix A, Figure 3). No access roads and road improvements would be required due to accessibility to the site's existing roadways.

The turbine nacelle (the enclosure around the turbine engine), blades, and tower would be staged at Buckeye Excavating directly across Washington Street to the north of the project site. Final transport of project materials and construction vehicles would occur through the north entrance of the campus.

An area equal to the possible fall zone (within a 332-foot radius) would be closed during the erection phase of the project. Crane pads would be used during erection as needed to protect the existing school roadways. The foundation for the turbine would be composed of approximately 300 cubic yards of reinforced concrete. The foundation would be placed at a depth of 10 feet (and may require a pier placement at a depth of 24 feet) and require approximately 23,000 pounds of reinforcing steel.

The electrical grid interconnect of the turbine would be composed of the turbine's controller (contained within the turbine tower-based section), approximately 600 linear feet of buried 4-inch electrical conduits, including the portions of the run embedded within the turbine tower foundation, a 690- to 12,480-volt transformer, an automatic disconnect switch, a UL1741-compliant monitoring and control device, and a fused disconnect within the school's electrical room's existing switchgear. The system would also have a parallel run of 2-inch conduit for data transfer and control runs. The full system would meet all local, State, and Federal codes and regulations.

Construction would be performed in accordance with an approved Erosion and Sedimentation Control Plan and in compliance with all other local, State, and Federal applicable requirements. Kenston would use best management practices (BMPs) and employ *Clean Water Act* National Pollutant Discharge Elimination System (NPDES) requirements during construction and operation to protect topsoil and to minimize soil erosion. Construction activities for wind turbine foundations, tower erection, turbine nacelle placement, and blade installation would be contingent on temperature and weather conditions. The turbine nacelle and blades would be installed during calm wind periods. Foundations would not be installed during cold winter months. These and similar factors would determine the final construction timeline.

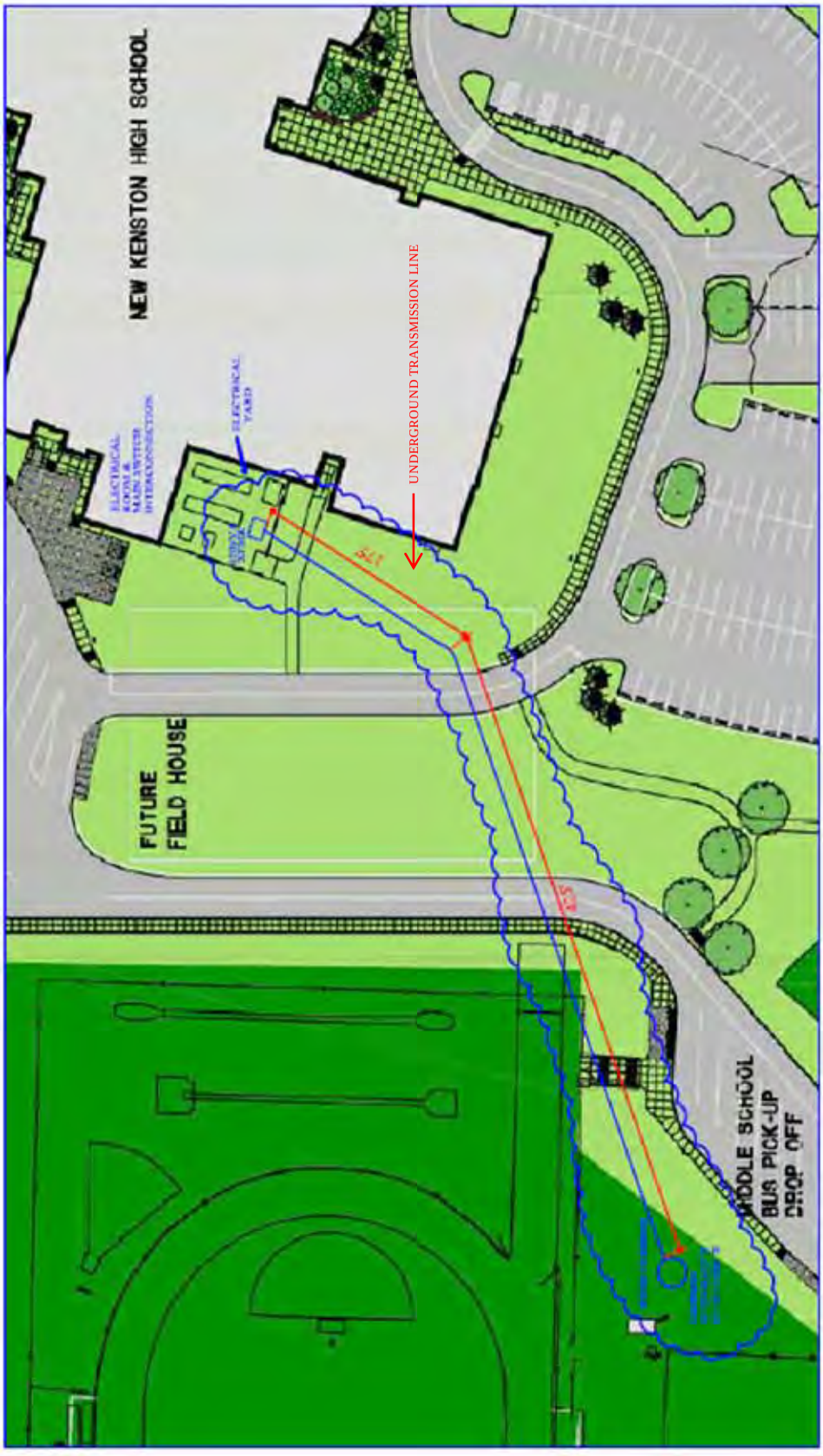


Figure 2-1. Site Plan

The proposed project, including site preparation, erection, final commissioning, generator installation, and overall systems tie-in and startup would be planned to be completed within approximately 10 months of groundbreaking.

Construction activities would occur within a 2-acre footprint that is currently used as open space and overflow parking within the school's campus. During construction and for safety measures, these areas would be closed and secured using fencing, danger signs, and locked gates to prevent unauthorized individuals from entering the work zone.

The project has been reviewed by and received a favorable aeronautical determination from the FAA on November 9, 2010 (see Appendix C, Attachment C8).

White strobe lights at the minimum number, minimum intensity, and minimum number of flashes per minute allowable by the FAA would be used at this site to ensure aviation safety.

2.2.3 OPERATIONS AND MAINTENANCE

Kenston would operate and maintain the proposed project according to operating, maintenance, and safety procedures and requirements specifically recommended by the turbine's manufacturer, Aeronautica. Routine preventive maintenance and inspection of the turbine would be necessary to maximize performance and identify potential problems or escalating maintenance issues. The turbine would be remotely monitored daily to ensure operations are proceeding efficiently. This monitoring would occur through the use of trained onsite staff and remote monitoring via a service provider contract. The turbine would have equipment installed with the ability to monitor and report faults both locally and remotely, as well as automatically shut itself down, if a fault should occur outside the normal operating parameters of the turbine per the manufacturer's specifications. The turbine would also have the ability for onsite and remote shutdown by authorized personnel. For the first 5 years of operation, the school district would contract out all formal service and maintenance functions to a nationally experienced firm. During this period, local staff and resources would be trained and gain experience in the maintenance and service procedures for the machine. A 5-year extended warranty would also be included in the initial purchase contract of the turbine from the original provider to optimize performance and safety. After this 5-year period, the service and maintenance plans and providers would be reevaluated and contracted as necessary. All routine servicing would be performed without using a crane to remove the turbine from the tower.

2.2.4 DECOMMISSIONING

Impacts evaluated with respect to the decommissioning of the turbine would be similar to those examined in the construction section of this EA. The turbine and other infrastructure would be expected to have a useful life of at least 20 years. Retrofitting the turbine with upgrades may allow the turbine to produce efficiently for many years after the original useful life. 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 ground surface. The aboveground area would be restored as closely as possible to its original condition. Underground facilities would either 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 and approved disposal sites. All decommissioning construction activities would be performed in accordance with the manufacturer's guidelines as well as all applicable Federal, State, and local regulations.

2.3 Alternatives

2.3.1 DOE ACTION ALTERNATIVE

Ohio's SEP funds are from a formula grant, in which the amount granted to the State is determined pursuant to a formula established in DOE's SEP grant procedures (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 these funds.

This EA examines the potential environmental impacts of the DOE's Proposed Action (providing funding for the proposed project) and the No-Action Alternative. This EA also describes options that Kenston (sub-recipient) considered during development of its application to the State of Ohio, which is the recipient of Federal funding under the SEP. This EA provides DOE with the information necessary to make an informed decision about whether allowing the State of Ohio to provide some of its Federal funds for the proposed project might result in significant environmental impacts. Based on the analysis in this EA, DOE may issue a FONSI, which could include mitigation measures, or determine that additional study is needed in the form of a more detailed environmental impact statement.

2.3.2 DOE NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not allow Ohio to use its SEP funds for the proposed project. DOE assumed for purposes of this EA that the project would not proceed without SEP funding. This assumption allows a comparison between the potential impacts of the project as proposed and the impacts of not proceeding with the project. Without the proposed project, the school's operations would continue as otherwise planned, but without the installation or operation of the proposed wind turbine.

2.3.3 SITING OPTIONS CONSIDERED BY KENSTON

Kenston considered three main sites for the location of the wind turbine at the school's campus in Chagrin Falls, Ohio. Although other sites on the campus were briefly considered, they were quickly ruled out due to their poor evaluation by almost all of the criteria listed below. All of the potential campus sites are owned by Kenston and are similar with regards to environmental considerations, such as wildlife impact avoidance, wetland and stream avoidance, and compatibility with existing zoning and land uses. Further considerations used by Kenston for siting the turbine on the school's campus are the following:

- Distance from adjacent properties
- Maximization of distances to occupied structures (no closer than 1.25 times the blade tip height)
- Ease of access and adequate room for construction, installation, and maintenance
- Proximity to existing hardened roadways (minimization of new construction)

- Minimization of disruption to the school's operations
- Availability for educational programs (school, community, and college partnerships)
- Minimization of wind turbulence due to adjacent buildings and trees
- Utilization of previously disturbed land (avoidance of natural areas)
- Soil conditions (foundation suitability)
- Maximum avoidance of potential wildlife habitats
- Topography
- Wind resource optimization
- Existing infrastructure avoidance
- Utility interconnect distances
- Architectural, visual balance and icon siting

The selected site scored the best of the three proposed sites in almost all categories. It has the most unobstructed, least turbulent wind profile; offers the best installation staging; and is the farthest away from structures occupied by students during the day (the closest building is the maintenance garage to the northwest and the stadium to the north). The project site would allow the construction area to be controlled without having to close off a portion of the student parking area to the south.

2.4 Required Agency Permits and Approval Types

Prior to construction, all required Federal, State, and local permits and approvals would be obtained. The required permits and approvals are listed in Table 2-1. All permit documentation and approval letters are contained in Appendix C and Appendix E.

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

Agency	Permit Approval / Type
Federal	
FAA	FAA Aeronautical Determination (issued November 9, 2010) (Appendix C, Attachment C8)
NTIA	Radio Frequency Transmission Approval (issued October 18, 2010) (Appendix C, Attachment C9)
USFWS	Compliance with the *Endangered Species Act*, the *Migratory Bird Treaty Act*, and the *Bald and Golden Eagle Protection Act* (letter issued October 29, 2010) (Appendix C, Attachment C4)
State	
OHPO	Compliance with the *National Historic Preservation Act* (OHPO issued Determination of No Effect on June 21, 2010) (Appendix E, Attachment E1)
Ohio Department of Natural Resources, Division of Wildlife	Concurrence that the proposed project does not pose a substantial risk to State-protected species, including birds and bats (pursuant to Ohio Revised Code Chapter 1531; received August 27, 2010) (Appendix C, Attachment C1)
Local	
Bainbridge Township Planning & Zoning Commission	Height Variance Approval (issued May 4, 2010) (Appendix C, Attachment C10)

2.5 Project Proponent-Committed Practices

Kenston has committed to the following measures and procedures to minimize or avoid environmental impacts if the proposed project is implemented.

2.5.1 BIRD, BAT, AND RAPTOR AVOIDANCE AND MINIMIZATION MEASURES

Project coordination occurred with USFWS and ODNR concerning the project's location and potential impacts on birds, bats, and other wildlife; rare, threatened and endangered species; and other protected natural features. There are no nests of bald eagle or observations of Indiana bat, which are both Federally and State-listed endangered or protected species, within 5 miles of the project site. USFWS and ODNR issued letters for the proposed project on October 29, 2010 (Appendix C, Attachment C4), and August 27, 2010 (Appendix C, Attachment C1), respectively, wherein the agencies determined that the proposed project is not likely to result in adverse impacts to the Indiana bat or bald eagles.

Kenston considered the USFWS *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) and would take actions to minimize any potential adverse effects on wildlife associated with the proposed project through the following actions: use of previously developed site, a smooth monopole tower (no guy wires or lattice towers), wildlife-friendly FAA obstruction lighting equipment and operation procedures, soil erosion/run-off prevention measures, proper recycling and waste management procedures; minimization of construction areas; and contractual obligation of contractors and subcontractors to all above procedures.

Kenston would voluntarily conduct post-construction avian and bat mortality surveys. Voluntary monitoring likely would consist of one initial post-construction fall migration season (approximately 8 to 12 weeks, based predominantly on Indiana bat migration habits). Kenston plans to implement the voluntary monitoring with in-kind support and/or oversight from qualified local university/college faculty/staff. This monitoring will provide data to the USFWS, DOE, and ODOW on potential avian and bat mortality associated with single wind turbines. DOE is working with USFWS Region 3 to establish an appropriate protocol for the post-construction monitoring. The final protocol is expected to include details related to timing, frequency, and reporting. Kenston would implement monitoring consistent with the final protocol.

2.5.2 HEALTH, SAFETY, AND NOISE

Kenston has prepared a Health and Safety Plan; this plan, as well as all Occupational Safety and Health Administration (OSHA) requirements, and Aeronautica 750 guidelines, would be followed. Therefore, all facilities would include high-voltage warning signs. All construction activities would occur during normal working hours (7 Am to 7 PM Monday through Saturday) in order to avoid noise disturbances to surrounding areas. The construction of the proposed project would comply with all applicable Federal, State, and local requirements.

2.5.3 SOIL

Soil disturbance would not exceed 1 acre and would not require an NPDES permit under the *Clean Water Act* (33 U.S.C. 1251 *et seq*.). Kenston would implement BMPs during construction and operation to protect topsoil and to minimize soil erosion. BMPs would include, at a minimum, the following: containing excavated material, using silt fences, protecting exposed soil, stabilizing restored material, and revegetating disturbed areas with native plant species.

2.5.4 WASTE MANAGEMENT

Any waste generated during construction, operation, and decommissioning, including used lubricants, would be handled, collected, transferred, and reused/recycled in accordance with applicable Federal, State, and local regulations.

2.5.5 CULTURAL RESOURCES

Based on the archaeological and cultural study results (see Appendix E), encountering archaeological resources during excavation activities is not anticipated. However, if archaeological resources were identified in areas that would be excavated, all ground-disturbing activities would be halted and OHPO would be consulted for resolution.

2.5.6 FLICKER EFFECTS

Based on the shadow flicker assessment (see Appendix B, Attachment B2) prepared for this project, shadow flicker is not expected to have a significant impact on any potential receptors (e.g., a private residence or business). However, if shadow flicker becomes a nuisance to spectators during sporting events, Kenston would temporarily shut down the turbine to lessen the shadow's impact on the stadium and public ball fields during periods when shadowing events would overlap scheduled sporting or other use events. Additionally, should a local resident find shadow flicker to be an annoyance, Kenston would plant screening trees or purchase window coverings acceptable to the resident.

2.5.7 ICING AND FIRE

The turbine system would have an automated system fault shut-off triggered by the following sensors: system temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing-induced imbalances would automatically shut down the turbine). This system would be designed to automatically send fault codes to preauthorized personnel through a web interface. The turbine's nacelle would have a cold-weather package including nacelle heaters. All icing related turbine shutdowns would require a direct inspection and an onsite manual restart. The site personnel and the system maintenance personnel would shut down the turbine in the event of icing on the blades. The site would adopt an ice safety zone that covers the blade radius around the turbine for implementation during icing events, should they occur. Section 3.2.2.7 of this EA further discusses this topic.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This chapter of this EA examines in detail the potential environmental impacts of the proposed project and the No-Action Alternative on the affected environmental resource areas.

3.1 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the use of Federal funds for the design, construction, and operation of the proposed project and thus assumes, for purposes of this EA, that the project would not go forward without SEP funding. Therefore, there would not be any impacts to the resource areas analyzed in this EA; however, the school would continue to use fossil fuels to create energy and no additional jobs would be created.

If the proposed project was not implemented, the amount of the school's electrical power that the proposed project could provide (70 percent) would continue to be purchased from First Energy Solutions. In 2009, First Energy Solutions generated electricity using coal (72.8 percent), oil (0.4 percent), natural gas (2.7 percent), nuclear (22.3 percent), and renewable energy sources (1.1 percent), which is similar to the overall national composition and includes emissions of carbon dioxide, nitrogen oxides and sulfur dioxide (EPA 2010a). Thus, carbon dioxide emissions from electricity generation to serve the school would be higher under the No-Action Alternative, and ODOD would not meet its objective of deploying emission-free energy.

3.2 Ohio's Proposed Project

Consistent with NEPA implementing regulations and guidance, DOE focuses the analysis in an EA on topics with the greatest potential for significant environmental impact. For the reasons discussed below, the proposed project is not expected to have any measurable effects on certain resources; therefore, these resources are not carried forward for further analysis.

3.2.1 CONSIDERATIONS NOT CARRIED FORWARD FOR FURTHER ANALYSIS

3.2.1.1 Water Resources

Floodplains and Wetlands

Pursuant to 10 CFR Part 1022, DOE reviewed USFWS National Wetlands Inventory maps (USFWS 2010) and Federal Emergency Management Agency floodplain maps (FEMA 2009) and identified no floodplains, wetlands, or surface water sources, such as streams or drainage channels that are located on the proposed project site or that could be affected by the construction and operation of the proposed project (see Appendix A, Figures 4 and 5). The nearest surface water body is a small pond located adjacent to a residence approximately 0.25 mile to the northeast of the proposed project site.

Wild and Scenic Rivers

No Ohio scenic rivers or waterways included in the National Wild and Scenic River System occur in the project vicinity. The closest Ohio scenic river is the Chagrin River, located in Lake County, located approximately 6.5 miles east of the proposed project site. The proposed project

would not be visible from the Chagrin River (ODNR 2010). The closest national scenic river is Little Beaver Creek located mainly in Columbiana County and about 55 miles southeast of the school (USDA 2009) (see Appendix A, Figure 6). The proposed project would not affect Federal- or State-designated wild and scenic rivers.

Groundwater

Based on the review of existing Ohio Environmental Protection Agency and ODNR groundwater resource maps, the proposed project site is not located in an endorsed wellhead protection area, where certain activities are restricted within an Ohio Environmental Protection Agency-designated protection area. Additionally, the proposed project site is not located within any designated Public Water System supply areas (sole-source aquifer, community/non-community systems, or drinking water source protection areas using groundwater/surface water). No private well water supplies on or near the project site would be affected by the proposed project. The proposed project would have no adverse effect on any groundwater resources.

Surface Water

In compliance with the *Clean Water Act*, the proposed project site was investigated for surface water. The nearest stream is an unnamed ephemeral stream located about 0.25 miles to the southeast of the school, which is part of the Lake Erie drainage system. No runoff or discharges from the construction of the proposed project would directly enter neighboring bodies of water, including the ephemeral stream to the southeast. Because ground-disturbing activity would affect less than 1 acre, an NPDES permit would not be required prior to any construction-related earthwork. However, Kenston has committed to using sediment and erosion pollution control BMPs in conformance with a plan specific to the proposed project.

3.2.1.2 Waste Management

Solid wastes that are 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 that are anticipated to be generated during decommissioning include dismantled equipment, which would likely be recycled and construction-related material debris. Hazardous, regulated nonhazardous, 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 handled, collected, transferred, reused/recycled, and disposed of in accordance with all applicable Federal, State, and local regulations. Used oil (e.g., spent gear box oil, hydraulic fluid, and gear grease) would not be considered a waste because it can be reused and/or recycled. Used oil would be generated during operations of the proposed project and recycled utilizing a qualified recycling facility.

3.2.1.3 Intentional Destructive Acts

DOE considers intentional destructive acts (i.e., acts of sabotage or terrorism) in all its EAs and environmental impact statements (DOE 2006). Construction and operation of the proposed project would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. The proposed project would not offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts on human life, heath, or safety.

3.2.2 CONSIDERATIONS CARRIED FORWARD FOR FURTHER ANALYSIS

This section of this EA examines in detail the potential environmental impacts of the proposed project on the following resource areas:

- Land use
- Visual quality
- Noise
- Cultural resources
- Geology and soils
- Biological resources
- Human health and safety
- Transportation
- Socioeconomics and environmental justice
- Air Quality and climate change
- Utilities and energy

3.2.2.1 Land Use

The project site is located on the Kenston High School campus. The school is bounded in all four directions by single- or double-lane local roads. Snyder Road (Township Highway 192) is located west of the campus, East Washington Street (County Route 606) is located north and east of the campus, and Bainbridge Road (County Route 11) and U.S. Highway 422 are located south of the campus.

The majority of land in the immediate vicinity of the school is zoned as Residential. There are several communities found within a half-mile of the project site. There are no special designated zoning areas within the project site. In addition to Residential, the following zoning areas exist within 2 miles of the site: General Business (B-1), Rural Residential (R-3A), and Active Park district (AP-1) (Auburn Township Zoning Commission 2008; Geauga County Zoning Commission 2008) (see Appendix A, Figures 7 and 8). The Bainbridge Township Zoning Department reviewed and approved the zoning application (Permit Application Certification Number X4005) for the proposed project on May 4, 2010 (see Appendix C, Attachment C10).

The landscape surrounding the school is generally rural to residential interspersed with large tracts of trees, lakes, natural areas, and public lands. Tanglewood Lake, Lake Lucerne, Kenston Lake, and Lake Taylor are all located over a mile away to the west and Eastview Lake is located over a mile away to the east of the project site. The Auburn Marsh Wilderness Area is approximately 3 miles east of the project site. Tanglewood National Golf Course is located west of the project site and is adjacent to Tanglewood Lake. Auburn Springs Country Club is located approximately 1 mile to the northeast of the project site.

Direct and Indirect Impacts

Implementation of the proposed project would permanently commit 256 square feet of aboveground surface area and 600 linear feet (1,200 square feet) for the underground transmission line of previously disturbed and developed land. The aboveground area of disturbance for the transmission line would be returned to its previous state once installation was

completed. The overall use of the general area would not change as a result of construction and operation of the proposed project.

Neither direct nor indirect impacts on land use are expected to occur outside of the immediate project site. Land disturbing activities would be relegated to the area needed for construction and operation of the proposed project. No other zoned or public lands, including golf courses, natural, or residential areas, would be affected.

3.2.2.2 Visual Quality

Viewshed

The Kenston school property and turbine site is located in a somewhat rural community composed mainly of widely spaced, large lot residences with large tracts of wooded areas interspersed. There are also some scattered mowed grass tracts of land in the immediate vicinity of the proposed project. The landscape surrounding the school property is generally flat, but the large tracts of trees and scattered nature of the residences act to limit views. Existing viewer groups in the area include residents, roadway users, recreationists, and occupants of nearby commercial facilities, and educational facilities. Potential receptors in the surrounding landscape include nearby residences and the Kenston school property (Figure 3-1).

Figure 3-1. Location of the Project Site (WTG) and Nearest Receptors (blue dots)

Figure 3-2. Nearby Communication Tower

The residences that are nearest to the school have the most direct, ground level views of the project site. Trees vary in height, but tend to be mainly mature stands that are upwards of 30 to 50 feet tall. Vertical elements present in the landscape include school and other buildings, power line poles, and communication towers (Figure 3-2); however, only communication towers, some which measure over 200 feet in height, are most often seen rising above the tree line (Figures 3-3 and 3-4).

A visual analysis was conducted for the proposed project to assess potential impacts on the local viewshed (Appendix B, Attachment B1). The results of a visual analysis were intended to give a sense of how the proposed wind turbine would appear to potential nearby receptors (residences and businesses in the area) in the surrounding landscape. The actual visibility of the wind turbine in the surrounding area is affected by many factors: the size of the machine; tower and blade tip heights; turbine color; distance to the viewer; obstructions such as trees, hills, and buildings; atmospheric conditions; sun angle; and the curvature of the earth. Of these factors, the overall height of a turbine, obstructions in the sightline between the viewer and the turbine, and the distance between the machine and the viewer have the potential for the greatest impact. Visual simulations were used to illustrate the effect of the proposed project from vantages that are representative of typical views that would be affected and include the 213-foot tower and blades, for a combined total height of 302 feet to the tallest blade.

Figure 3-3. View of Nearby Communication Tower

Figure 3-4. View of Nearby Communication Tower

Visual simulations for the following properties are located in Appendix B, Attachment B1. Table 3-1 shows readings from the visualization log.

Table 3-1. Kenston Visualizations Log

Set Number	Picture Number	Distance from Turbine (miles)	Site Description	Latitude	Longitude	Direction
1	1269	0.15	Entrance near Radio Station/Tennis Courts	41° 23' 40.48" N	81° 18' 28.79" W	90°
2	1291	0.16	17446 Snyder	41° 23' 46.59" N	81° 18' 28.10" W	136°
3	1298	0.26	9490 Washington	41° 23' 53.66" N	81° 18' 14.09" W	194°
4	1302	0.43	17485 Indian Hills Drive	41° 23' 34.87" N	81° 17' 49.08" W	285°
5	1310	0.44	South Entrance of School	41° 23' 17.50" N	81° 18' 13.88" W	352°
6	1332	0.80	From 422	41° 23' 01.71" N	81° 18' 37.69" W	21°

Source: Appendix B, Attachment B1 of this EA.

As one example, Figure 3-5 depicts the results of a visual simulation of how the proposed project would look from the school's entrance near the radio station and tennis courts. As another illustration, figure 3-6 shows the results of the visual simulation from nearby Route 422. The remaining visual simulations can be found in Appendix B, Attachment B1.

Figure 3-5. Visual Simulation Depicted from the Radio Station/ Tennis Court Entrance of the Kenston Local School Campus

Figure 3-6. Visual Simulation Depicted from Nearby Route 422

Direct and Indirect Impacts to the Viewshed

The visual simulation shows that the proposed turbine would be readily seen in the foreground from vantages within the school property and would be a prominent visual element whose light-colored surface makes it stand out against its surroundings. While the turbine appears to be of similar height to the stadium and parking lot light poles and the nearby cell tower, the turbine is much wider, which creates a larger visual impact.

The results of the visual analysis indicate that the proposed project would not be clearly visible to the scattered nearby residences due to obstruction proximities and densities to typical sights such as trees and buildings (see Appendix B, Attachment B1). Residential, public facility, and commercial buildings are widely scattered with large tracts of trees interspersed. Orientation of buildings and the presence of these trees limit views to the immediate surroundings for most viewers, precluding views of the proposed project. In addition, existing vegetation within the town further acts to limit views. However, some of the surrounding residents and occupants of commercial facilities would be able to see the wind turbine, at least partially due to the proximity and the overall flat terrain surrounding the project site. The turbine would appear as a small

vertical element of the skyline from most locations, similar to the region's existing communication towers and granaries. The sites nearest the school would have the most prominent view of the turbine such as the property listed at 9490 Washington (see above Table 3-1 and Figure 3-7). The turbine would be easily viewed from this location. However, it should be noted that existing power lines are more readily viewed at this location than the turbine would be, as seen below in Figure 3-7.

In addition, views of the wind turbine would be seen by residents adjacent to the school while entering or exiting buildings or school property and most of these viewers would often focus on their immediate surroundings. FAA-required lighting, such as safety light intensity and the number of lights installed, would not be a source of light pollution such that it would distract viewers in the project vicinity. Therefore, effects on the local viewshed are anticipated to be minimal.

Figure 3-7. Visual Simulation Depicted from 9490 Washington

Shadow Flicker

Shadow flicker is the moving/flickering shadows produced when sunlight passes through the spinning rotor blades of a turbine. This phenomenon can become an annoyance to nearby residents when the shadows pass directly over their line of sight, i.e., windows or other transparent surfaces. While the adverse effects of shadows can be subjective, the shadows themselves can be precisely modeled for location and duration.

For shadow receptor sites within a turbine shadow's reach (10 rotor diameters is standard, but the model used 6,560 feet, well beyond 10 rotor diameters), not all would receive shadow due to existing obstructions that block the shadows path such as other buildings, hills or trees. While evergreen trees would fairly consistently block shadows year-round, deciduous trees would have

a lesser impact in the winter months when they have no leaves. Additionally, the farther an observer is from the wind turbine, the smaller the portion of the sun being blocked and the distance allows the shadow to diffuse (weaken). Although no official U.S. policy has been adopted, international standards appear to be in consensus that flickering shadows in excess of 30 hours per year impacting a particular location are considered a potential nuisance (Appendix B, Attachment B2).

A shadow flicker analysis (Appendix B, Attachment B2) was completed to evaluate the amount of shadow flicker that the below receptors would experience. The analysis considered several aspects affecting the casting of shadows and potential impacts on these receptors, including the distance to receptors, angle of incoming solar insolation (exposure to the sun's rays), and the amount of sunlight experienced at the project site during each of the four seasons.

The following are the closest receptors to the proposed wind turbine:

Receptor A: Elementary School to east, approximately 990 feet. Shadows would be rare, but possible in mid-April to early-May and from mid-August to late-August evenings with a total average of less than 7 hours of moving shadow per year possible.

Receptor B: 17430 Snyder Road, approximately 930 feet. Shadows would not impact this receptor.

Receptor C: 17360 Wood Acre Trail, approximately 1,830 feet. Shadows would not impact this receptor.

Receptor D: 17405 Snyder Road, approximately 1,805 feet. Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees, but shadow flicker is possible during portions of mid to late May and the first couple of days in August with a total average of less than 11 hours of moving morning shadow per year.

Receptor E: 17406 Snyder Road approximately 1,030 feet. Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees including evergreens, but shadow flicker is possible during portions of very late-January to late-February and mid-October to mid-November mornings with a total average of less than 5 hours of moving shadow per year.

Receptor F: 17446 Snyder Road, approximately 930 feet. Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees, but shadow flicker is possible during portions of mid-March to mid-April and middle September mornings with a total average of less than 6 hours of moving morning shadow per year.

Receptor G: 17476 Snyder Road, approximately 950 feet. Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees, but shadow flicker is possible during portions of mid to late May and early-August mornings with a total average of less than 17 hours of moving morning shadow per year.

Receptor H: High School Stadium, approximately 150 feet. Shadows would be distinct during most evenings of the year on some portion of the stadium field except late-May to mid-August

with a total average of less than 147 hours of moving shadow per year. This effect would be mitigated by Kenston by turning off the turbine during sporting events during those timeframes.

Because of the strobe-like effect of shadow flicker, there have been investigations into whether it might have the potential to produce epileptic seizures in individuals with photosensitivity. It has been determined that modern utility-scale wind turbines do not have the potential to cause these types of problems because of their relatively slow blade rotation. One study (Harding et al. 2008) reported that flickers with a frequency greater than 3 hertz could pose a potential for inducing photosensitive seizures (that is, a light flashing at a rate of more than 3 times per second). The American Epilepsy Foundation reports that lights flashing in the range of 5 to 30 hertz are most likely to trigger seizures and recommends that flash rates of visual alarms be kept under 2 hertz (Epilepsy Foundation 2010). A wind turbine with three blades would have to make a full revolution every second (or 60 revolutions per minute) to reach a frequency of 3 hertz. The Aeronautica 750 wind turbine proposed for this project operates at 25.3 revolutions per minute (Appendix D, Attachment D6). This would indicate a flicker frequency created by this wind turbine at less than one-half the rates identified with photosensitivity issues.

Some data suggest that shadow flicker has the potential to cause a disorienting effect on a small segment of the population. The data also suggest that rotor rotation below 2.5 hertz can avoid such effects (BLM 2005). As stated above, the rotor speeds involved with the project would be well below this level.

Direct and Indirect Impacts from Shadow Flicker

The shadow flicker study completed for the proposed project indicated that no homes or occupied business structures outside the owner's property within the turbine's shadow influence of over 10 rotor diameters would receive flickering shadows of over 30 hours per year. Two to three houses to the southwest of the site could receive less than 10 hours of moving shadows per year, but the shadows likely would be highly diffused or completely blocked due to existing trees. While part of Kenston Middle School to the northwest of the site would receive shadowing of over 30 hours per year, this portion of the school structure, which includes the maintenance garage, has no windows facing the turbine. The tennis courts to the southwest would receive moving morning shadows up to almost 50 hours per year during sunny late fall to early spring mornings. The stadium to the northeast of the project site would receive moving shadows throughout much of the year from late afternoon into the evenings. To a lesser extent, the playing fields farther to the east and northeast would receive moving shadows for 10 to 20 hours per year. For the periods when shadowing events would overlap scheduled sporting or other use events for any of these locations, Kenston has adopted a policy that would temporarily shut down the turbine during the period the shadows if they were found to have an impact on the playing fields to athletic participants or spectators. Shadow flicker impacts as a result of the proposed project would be minimal.

3.2.2.3 Noise

Noise is any unwanted, undesirable sound. It has the potential to interfere with communication, damage hearing, and, in many cases, is viewed as an annoyance. Noise can occur at different levels and frequencies, depending on the type of source and the distance away from the listener.

Sound is a result of fluctuating air pressure. The standard unit for measuring sound pressure levels is the decibel. A decibel is a unit that describes the amplitude (or difference between levels) of sound, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, which is 20 micropascals. Typically, environmental and occupational sound pressure levels are measured in decibels on an A-weighted scale (dBA). The A-weighted scale de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear [i.e., using the A-weighting filter adjusts certain frequency ranges (those that humans detect poorly)] (Colby et al. 2009). Table 3-2 shows some sound pressure levels associated with common activities measured in dBA. Table 3-3 defines commonly used frequency terms.

Table 3-2. Typical Sound Pressure Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Carrier deck jet operation	140	
	130	Pain threshold
Jet takeoff (200 feet)	120	
Auto horn (3 feet)	110	Maximum vocal effort
Jet takeoff (1000 feet) Shout (0.5 feet)	100	
N.Y. subway station Heavy truck (50 feet)	90	Very annoying Hearing damage (8-hour, continuous exposure)
Pneumatic drill (50 feet)	80	Annoying
Freight train (50 feet) Freeway traffic (50 feet)	70 to 80	
	70	Intrusive (Telephone use difficult)
Air conditioning unit (20 feet)	60	
Light auto traffic (50 feet)	50	Quiet
Living room Bedroom	40	
Library Soft whisper (5 feet)	30	Very quiet
Broadcasting/Recording studio	20	
	10	Just audible

Adapted from Table E, "Assessing and Mitigating Noise Impacts", NY DEC, February 2001.
Table 3-2 is cited in Colby et al. 2009.

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at rate of 6 decibels per doubling of distance. For a line source such as free flowing traffic on a freeway, sound attenuates at a rate of 3 decibels per doubling of distance. Atmospheric conditions including wind, temperature gradients, molecular absorption, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation for sources located close to the ground. Sound that travels over an

acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically about 1.5 decibels per doubling of distance (Caltrans 2009). Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Table 3-3. Definitions of Commonly Used Acoustical Terms

Sound Measurements	Definition
Decibel	A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.
A-Weighted decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Maximum Sound Level (L_{max})	The maximum sound level measured during the measurement period.
Minimum Sound Level (L_{min})	The minimum sound level measured during the measurement period.
Equivalent Sound Level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy as a time-varying sound level.
Percentile-Exceeded Sound Level (L_{xx})	The sound level exceeded "×" percent of a specific time period. L_{10} is the sound level exceeded 10 percent of the time. L_{90} is the sound level exceeded 90 percent of the time. L_{90} is often considered to be representative of the background ambient noise level in a given area.
Day Night Level (DNL or L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 decibels added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Frequency: hertz	The number of complete pressure fluctuations per second above and below atmospheric pressure.

DNL = Day Night Average Sound Level.

Noise Guidelines and Regulations

The U.S. Environmental Protection Agency (EPA) identifies noise levels necessary to protect public health and welfare against hearing loss, annoyance, and activity interference in its document, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA 1974). This document recommends an exterior Day Night Average Sound Level (DNL) of 55 dBA for residential uses. However, this document contains recommendations only and the levels are not Federally enforceable. Furthermore, in 1981, the Federal Government concluded that noise issues were best handled at the State or local government level. As a result, EPA phased out Federal oversight of noise issues to transfer the primary responsibility of regulating noise to the State and local governments. However, EPA recommendations remain useful for assessing the affected environment.

EPA has also evaluated general public response to changes in noise levels. In general, an increase to ambient or average noise levels of 5 decibels would be noticeable to most people and may elicit widespread complaints. An increase of 20 decibels would likely result in vigorous community response. An increase of ambient noise levels of less than 3 dBA is usually considered minute.

Section 509.08 of the Codified Ordinances of Chagrin Falls is related to noise. The section does not specify limits on noise:

> No person shall cause, create, allow, or permit to be made within the Village any unreasonably loud, disturbing and unnecessary noise, or noises of such character, intensity and duration as to be detrimental to the life and health of any individual.

Background Information on Wind Turbines and Noise

Operating wind turbines can generate two types of sound: first, the mechanical sound from components such as gearboxes, generators, yaw drives, and cooling fans, and second, the aerodynamic sound from the flow of air over and past the rotor blades. Modern wind turbine design has greatly reduced mechanical sound and it generally can be ignored in comparison to the aerodynamic sound, which is often described as a "swishing" or "whooshing" sound (BLM 2005).

Wind turbines produce a broadband sound; that is, the sound occurs over a wide range of frequencies, including low-frequencies. Low-frequency sounds are in the range of 20 to 100 hertz and infrasonic sound (or infrasound) is low-frequency sound of less than 20 hertz. Compared to higher frequency sound, low-frequency sound propagates over longer distances, is transmitted through buildings more readily, and can excite structural vibrations (for example, rattling windows or doors). The threshold of perception, in decibels, also increases as the frequency decreases. For example, in the frequency range where humans hear best (in the low kilohertz), the threshold of hearing is at about 0 decibels, but at a frequency of only 10 hertz, the threshold of human hearing is at about 100 decibels (Rogers et al. 2006).

Older designs of wind turbines, particularly those in which the blades were on the downwind side of the turbine tower, produced more low frequency sound as a result of the blades passing through more turbulent air as a result of the tower blocking wind flow. Modern, upwind turbines produce a broad band sound emission that includes low-frequency sounds, but not at the levels produced by older wind turbines. A primary cause for low-frequency sounds in modern turbines is the blade passing through the change in air flow at the front of the tower and this can be aggravated by unusually turbulent wind conditions.

The University of Massachusetts at Amherst reported (Rogers et al. 2006) on noise measurements made at four different wind turbines ranging in size from 450 kilowatts to 2 megawatts. The results indicated that at distances of no more than 387 feet from the turbines, all infrasound levels were below human perception levels. The report further states that there is "no reliable evidence that infrasound below the hearing threshold produces physiological or psychological effects." This lack of effects at levels below the hearing threshold was supported by a scientific advisory panel comprised of medical doctors, audiologists, and acoustic professionals established by the American and Canadian Wind Energy Associations to review wind turbine sound and health effects (Colby et al. 2009). It was also supported by the findings from Canadian and Australian government reviews of available scientific literature (CMOH 2010; Australia NHMRC 2010).

Existing Noise Conditions

Ambient noise monitoring was conducted to establish baseline sound conditions in the area of the proposed wind turbine. Ambient noise monitoring was conducted at three locations indicated in Figure 3-8. The monitoring sites surround the proposed wind turbine site and were selected to

be representative of several residential receptor areas near the wind turbine. The measurement positions (Figure 3-8; Appendix A, Figure 9) were as follows:

- Position 1 - 17150 Indian Hills
- Position 2 - 9551 East Washington Street
- Position 3 - 17476 Snyder Road

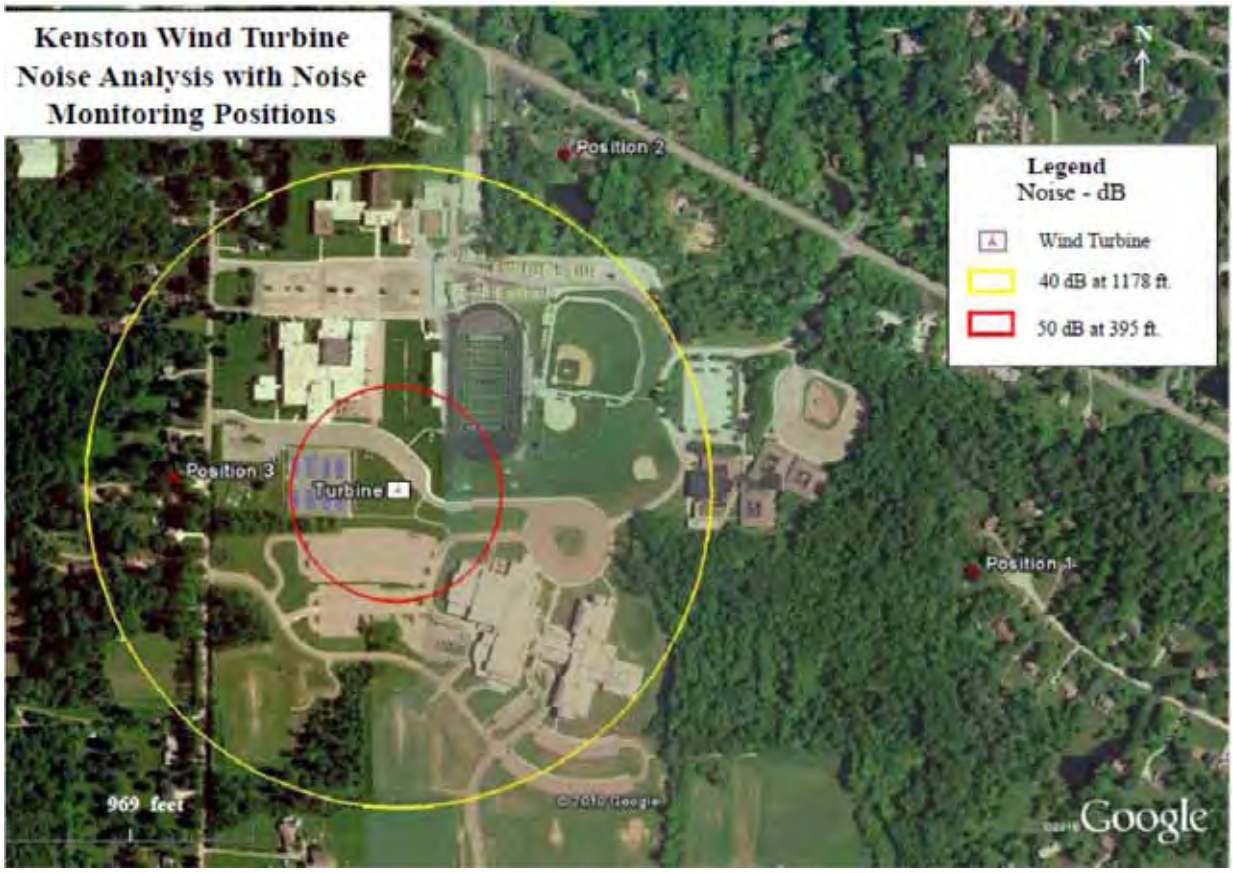


Figure 3-8. Monitoring Sites for Measuring Baseline Sound Conditions and Predicted Turbine Sound Level Contours

Measurements were conducting using Larson-Davis Model 820 Type I sound level meters. Data at each site were collected between 3 p.m. on Thursday November 11, 2010, and 3 p.m. on Thursday November 12, 2010. Table 3-4 provides a summary of the baseline sound monitoring results.

The types of sources of baseline sounds heard in and around the site during the site visits were from auto and truck traffic, air-conditioning units, insects, birds, and the activities at the school.

Table 3-4. Summary of Baseline Sound Monitoring Results (dBA)

Monitoring Site	Distance to Turbine Site (feet)	L_{eq} 24 Hours	Hourly L_{90} Range	L_{eq} Daytime	L_{eq} Nighttime	DNL
Position 1	2,160	45.8	29.1 to 48.4	47.2	41.1	49.1
Position 2	1,360	50.6	31.0 to 51.2	51.8	47.2	54.7
Position 3	840	52.7	42.4 to 51.3	53.9	49.2	56.7

Daytime: 7 a.m. to 10 p.m.
Nighttime: 10 p.m. to 7 a.m.
DNL = Day Night Average Sound Level.

Direct and Indirect Impacts

Construction of the wind turbine would temporarily result in increased noise and vibration. Operation of the wind turbine would be a permanent source of noise until the turbine is decommissioned.

Construction of the turbine would involve the use of heavy construction including the equipment listed in Table 3-5. Table 3-5 also summarizes typical noise levels produced by this equipment. L_{max} sound levels at 50 feet are shown along with the typical acoustic use factor. The acoustic use factor is the percentage of time each piece of construction equipment is assumed to be operating at full power (i.e., its noisiest condition) during construction operation and is used to estimate L_{eq} values from L_{max} values. For example the L_{eq} value for a piece of equipment that operates at full power 50 percent of the time (acoustical use factor of 50) is 3 decibels less than the L_{max} value.

Table 3-5. Typical Construction Noise Emission Levels

Equipment	Typical Noise Level (L_{max})[a]	Acoustical Use Factor	Typical Noise Level (L_{eq})[a]
Compactor (ground)	83	20	76
Dozer	82	40	78
Dump Truck	76	40	72
Excavator	81	40	77
Generator	81	50	78
Grader	85	40	81
Pickup Truck	75	40	71
Warning Horn	83	5	70
Crane	81	16	73

Source: US DOT 2006.
a. A-weighted decibel level, measured at 50 feet.

The three noisiest pieces of equipment likely to operate at the same time include a grader, a dozer, and a generator. Simultaneous operation of this equipment would result in a noise level of 84 dBA (L_{eq}) at 50 feet. Based on the assumed simple geometric attenuation of 6 decibels per doubling of distance the noise level at the nearest residences (at about 800 feet) would be 60 dBA (L_{eq}). Because construction noise would be temporary and intermittent during daytime hours, no adverse effect from construction noise is expected. With regard to vibration, no highly dynamic equipment, such as a pile driver, would be used. Given this and the fact that residences are about 800 feet from the turbine site, no adverse vibration impacts from construction activity would occur.

Kenston has selected the Aeronautica 750 wind turbine[1], which has several characteristics that reduce aerodynamic sounds levels in comparison to other and primarily older wind turbine designs. It is an upwind turbine, meaning the turbine faces into the wind and the wind encounters the rotor blades before the tower and the nacelle, which makes for quieter operations than a downwind turbine. It has relatively low rotational speeds and pitch control on the rotors, both of which reduce sound levels. Complete technical information including sound data is provided in Appendix D, Attachment D6.

Figure 3-9 shows A-weighted wind turbine sound pressure levels at 1.5 meters (5 feet) above the ground calculated by the wind turbine manufacturer at a wind speed of 8 meters (26 feet) per second.

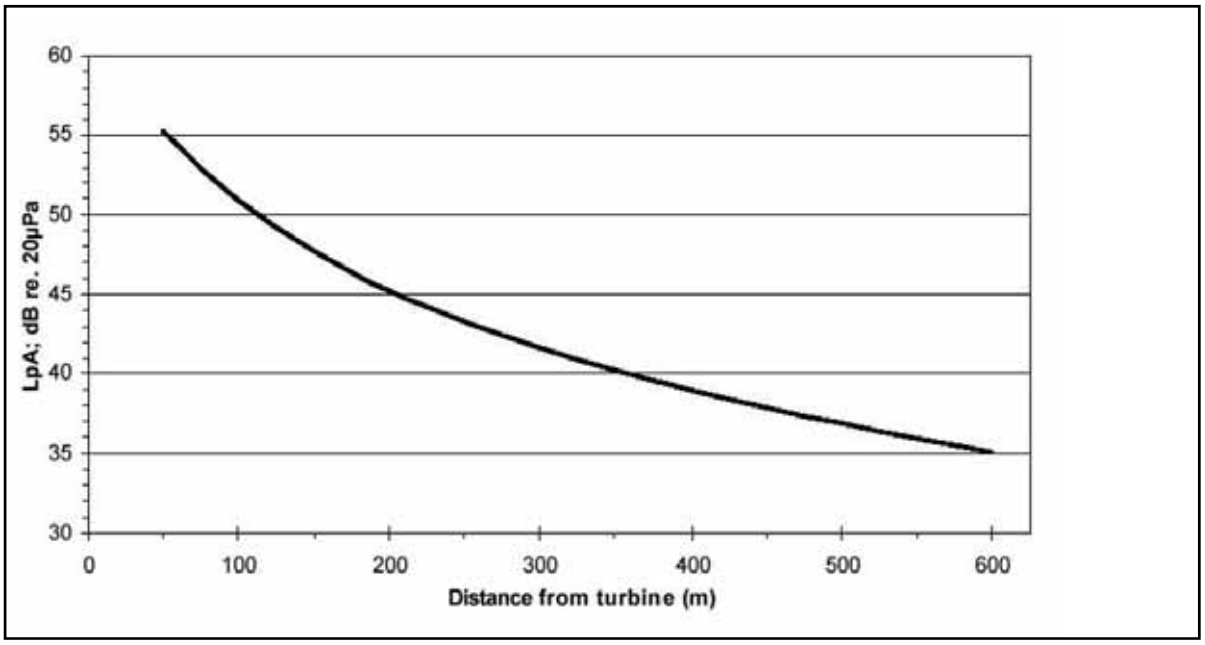


Figure 3-9. Aeronautica 54-750 Sound Pressure Level as a Function of Distance

Table 3-6 summarizes following key sound level values that have also been provided by the manufacturer.

Table 3-6. Turbine Sound Levels at Various Distances

Distance (feet)	A-Weighted Sound Level
1,992	35
1,178	40
676	45

Table 3-7 summarizes the predicted steady state turbine sound level and the corresponding DNL value at each receptor location where measurements were taken. Measured DNL values are also shown. DNL can be calculated from the steady state sound level value assuming that the turbine

1. The noise analysis presented in this EA represents data for the Aeronautica 47-750 turbine as the version for the 54-750 was not available. However, both the 54-750 and 47-750 are reported to have an A-weighted sound power level of 100.0 decibels. Accordingly, data for the Aeronautica 47-750 are considered to be representative of the Aeronautica 54-750, which is the turbine that will be used at Kenston High School.

operates continuously over a 24-hour period. The conversion between a steady state sound level and DNL is 6.4 decibels. Seven decibels has been added to the steady state sound level to estimate DNL.

Table 3-7. Predicted Turbine DNL Sound Levels

Monitoring Site	Distance to Turbine Site (feet)	Predicted Turbine Steady State Sound Level (dBA)	Predicted Turbine DNL	Measured DNL
Position 1	2,160	34	41	49.1
Position 2	1,360	39	46	54.7
Position 3	840	42	49	56.7

dBA = A-weighted decibel.
DNL = Day Night Average Sound Level.

Because the Village of Chagrin Falls does not have a specific limit on noise, the EPA-recommended sound level of 55 DNL is used here. The predicted turbine sound levels in the range of 41 to 49 DNL are below this level and the DNL values measured at each position.

Figure 3-8 (above) shows the estimated 40 dBA and 50 dBA wind turbine noise contours. These contours indicate that no receptors would be included within the 48 dBA (equivalent to 55 DNL) noise contour. Table 3-8 compares predicted steady state turbine sound levels to the range of L_{90} values measured at each site.

Table 3-8. Comparison of Predicted Turbine Noise Levels to Measured L_{90} Values

Monitoring Site	Distance to Turbine Site (feet)	Predicted Turbine Steady State Sound Level (dBA)	Hourly L_{90} Range
Position 1	2,160	34	29.1 to 48.4
Position 2	1,360	39	31.0 to 51.2
Position 3	840	42	42.4 to 51.3

dBA = A-weighted decibel.

Table 3-8 indicates that predicted wind turbine noise levels are expected to be at or above many of the hourly L_{90} values measured at each site. Therefore turbine sound may be audible at nearby residences. Audibility does not necessarily mean an adverse noise effect would occur. The magnitude of the increase in noise level relative to ambient noise conditions is evaluated to determine the severity of the noise impact.

An adverse noise impact is considered to occur if the wind turbine noise is predicted to increase the ambient daytime or nighttime L_{eq} value at residences by more than 3 dBA. Tables 3-9 and 3-10 summarize the noise impact analysis.

Table 3-9. Daytime Noise Impact Analysis

Site	Daytime Ambient L_{eq} (dBA)	Turbine Sound (dBA)	Daytime Ambient plus Turbine Sound	Increase (dBA)
1	47.2	34	47.4	0.2
2	51.8	39	52.0	0.2
3	53.9	42	54.2	0.3

dBA = A-weighted decibel.

Table 3-10. Nighttime Noise Impact Analysis

Site	Nighttime Ambient L_{eq} (dBA)	Turbine Sound (dBA)	Nighttime Ambient plus Turbine Sound	Increase (dBA)
1	41.1	34	41.9	0.8
2	47.2	39	47.8	0.6
3	49.2	42	50.0	0.8

dBA = A-weighted decibel.

The results in Tables 3-9 and 3-10 indicate that operation of the proposed wind turbine would not result in noise increases greater than 3 dBA at residences in the project vicinity. Operation of the proposed wind turbine is therefore not expected to result in an adverse noise impact.

3.2.2.4 Cultural Resources

The *National Historic Preservation Act* (16 U.S.C. 470 *et seq.*; NHPA) is the primary Federal law protecting cultural, historic, American Indian, and Native Hawaiian resources. Section 106 of the NHPA (36 CFR Part 800) requires Federal agencies to assess and determine the potential effects of their proposed undertakings on prehistoric and historic resources (e.g., sites, buildings, structures, and objects) and to develop measures to avoid or mitigate any adverse effects. Compliance with Section 106 requires consultation with a State Historic Preservation Officer (SHPO).

On August 28, 2009, DOE executed a memorandum authorizing its ARRA grant applicants under the Energy Efficiency and Conservation Block Grant, Weatherization Assistance Program, and SEP to initiate Section 106 consultations pursuant to 36 CFR 800.2(c)(4). As of that date, applicants and their authorized representatives could consult with the SHPO to initiate the review process established under 36 CFR Part 800. On May 7, 2010, the Ohio Historic Preservation Officer (OHPO) signed the Programmatic Agreement with the DOE, which further solidified a recipient's ability to initiate consultation with a SHPO. In accordance with this authorization, Kenston initiated Section 106 Consultation with the OHPO on May 25, 2010 (Appendix E, Attachment E4). In response to the May 25, 2010, submission, the OHPO requested additional information and expansion of the proposed area of potential effect (APE) from the 189-acre school campus and immediate vicinity to 1.5 miles. The OHPO response letter dated June 7, 2010 (Appendix E, Attachment E3) also requested that effects from vibration and noise be included in the subsequent analysis. Kenston submitted the analysis to the OHPO on June 16, 2010, and, after additional correspondence, the OHPO ultimately responded that there would be no adverse effects on historic resources and that the likelihood of finding archaeological remains was very low (Appendix E, Attachment E1).

In addition, pursuant to Section 106, DOE is required to consult with American Indian tribes about the potential effects of DOE's proposed undertakings on prehistoric and historic resources and to develop measures to avoid or mitigate any adverse effects. DOE uses a list maintained by the U.S. Bureau of Indian Affairs, entitled "Indian Entities Recognized and Eligible to Receive Services from the U.S. Bureau of Indian Affairs" (72 FR 13648, March 22, 2007), to determine which tribes to contact. Based on this document, DOE determined that there are no Federally-recognized tribes in the state of Ohio. Moreover, there is no Tribal Historic Preservation Officer for the state of Ohio according to the National Association of Tribal Historic Preservation Officers . However, DOE provided the notice of scoping and the NOA of the Draft EA to 24

Tribal Nation representatives that are regularly notified of Federal actions in northeastern Ohio[2]. To date, none of the tribal representatives contacted has responded to DOE's scoping letter or the Draft EA. DOE will continue its outreach to these tribal representatives by providing them with the NOA of this Final EA.

Consulting Party Participation

As part of DOE's responsibilities under NHPA, DOE will send a copy of this Final EA and appendices related to historic and cultural resources to the following consulting parties identified as part of Kenston's Section 106 consultation with OHPO:

- Geauga County Community and Economic Development
- Geauga County Planning Commission
- Western Reserve Historical Society
- Western Reserve Heritage Association

Although Kenston has conducted a great deal of public outreach for the proposed project, to ensure DOE's compliance with NHPA, the public was afforded the opportunity to comment on historic resources via the same method for commenting on the Draft EA. No comments related to historic resources were received.

Archaeological and Aboveground APEs

The direct APE is defined as the area disturbed for construction of a project. However there is no definitive rule for determining an indirect APE for a wind turbine, which can create both visual and audible effects on the adjacent properties, otherwise known as the aboveground APE.

Aboveground Historic Resources

At the request of the OHPO, on June 16, 2010, Kenston provided additional information to the OHPO regarding an expansion of the APE (Appendix E, Attachment E2). In the subsequent submission, Kenston indicated that there were a total of 21 potentially historic properties within 1.5 miles that contained the requisite features and characteristics.

Belowground Archaeological Resources

The APE established for archaeological resources focuses on the zone of direct ground disturbance associated with the construction of the proposed project. The installation of the proposed project would result in temporary ground-disturbing activities to 1,600 square feet for the turbine foundation (ultimately a 256-square-foot permanent footprint).

Direct and Indirect Impacts to Archaeological Resources

The visual historic resources associated with the above-mentioned 21 potentially historic properties would not be adversely affected by the turbine. Additionally, based on the lack of vibration associated with the proposed turbine and the fact that noise levels would be below 45 decibels at the school property line, within local zoning requirements, there would be no adverse effects to historic resources anticipated from noise.

2. List used by the U.S. Army Corps of Engineers Buffalo District for actions occurring in northeastern Ohio.

Because the installation of the wind turbine would occur entirely within the previously disturbed 189-acre campus [and specifically within the 256-square-foot footprint of the turbine foundation and 600 linear feet (1,200 square feet) for the underground transmission line], there are no direct effects to archaeological resources expected from the project. If archaeological resources were encountered during construction, ground-disturbing activities would immediately cease, and the OHPO would be contacted for resolution and further instruction regarding additional studies and/or potential avoidance, minimization, or mitigation measures in accordance with the NHPA.

Based on the information provided to the OHPO by Kenston pursuant to the Memorandum and Programmatic Agreement, DOE concurs with Kenston's assessment that the proposed project would not have an adverse effect on historic or archaeological resources. In a letter dated June 21, 2010, OHPO concurred with Kenston's assessment that no adverse impacts on historic or cultural resources would occur as a result of the construction and operation of the proposed project (Appendix E, Attachment E1).

3.2.2.5 Geology and Soils

The majority (74 percent) of the soil found within the 189-acre project site consists of Wadsworth silt loam and Loudonville silt loam (12 percent) (NRCS 2010) (see Appendix D, Attachment D7). Table 3-11 shows a complete list of soils present within the project site. No soils listed by the U.S. Department of Agriculture as prime farmlands or unique or rare soils exist within the project area (NRCS 2010).

Table 3-11. Geauga County, Ohio Project Site Soil Composition

Map Unit Symbol	Map Unit Name	Acres in Area of Interest	Percent of Area of Interest
LyB	Loudonville silt loam, 2 to 6 percent slopes	6.1	2.8
LyC	Loudonville silt loam, 6 to 12 percent slopes	25.4	11.7
RsB	Rittman silt loam, 2 to 6 percent slopes	7.2	3.3
RsC	Rittman silt loam, 6 to 12 percent slopes	5.4	2.5
RsC2	Rittman silt loam, 6 to 12 percent slopes, eroded	12.9	6.0
WbB	Wadsworth silt loam, 2 to 6 percent slopes	159.1	73.6
Totals for Area of Interest		**216.0**	**100.0**

Seismic activity in Geauga County is not considered a significant risk. Northeast Ohio has experienced approximately 80 earthquakes that were felt since 1836, most of which were small (ODNR 2007). The only earthquake to result in minor damage (cracked plaster, broken windows) was on January 31, 1986, which had a magnitude of 5.0.

Direct and Indirect Impacts

Soil disturbance would occur as a result of site preparation and project construction. As part of project construction, approximately 0.02 acre of current open space would be disturbed for the foundation and another approximately 0.04 acre of open space would be disturbed for the electrical interconnecting trench, for a total of approximately 0.06 acre. Ground-disturbing activities would be less than 1 acre and would not require an NPDES Storm Water Program

Permit. However, Kenston has committed to using sediment and erosion pollution control BMPs in conformance with a plan specific to the proposed project.

Data reviewed from the Ohio Department of Natural Resources suggest there is a low risk of seismic activity jeopardizing the structural integrity of the proposed wind turbine and foundation.

3.2.2.6 Biological Resources

Biological resources include native or naturalized plants and animals and the habitats that support their various stages of life. Species that are considered sensitive, either pursuant to Federal or State law or regulations publicized by agencies, are specifically addressed in this section.

Project Site

The proposed project site consists of a fully developed high school site on approximately 189 acres that includes various classroom, administration, and physical activity buildings and parking facilities. There are also tennis courts, ball fields, and a football stadium. All land within the school site is disturbed ground, asphalt, or mowed and maintained grass. The greater surrounding area is mainly suburban, large lot residential intermixed with wooded lots and agricultural fields. The nearest wood lot is approximately 850 feet west of the proposed turbine site, and there are no stream corridors in the vicinity of the project site. Potentially suitable roosting or maternity habitat might be located within the surrounding area beyond the nearest wooded lot, but is not present within the approximately 189-acre school site. According to the USFWS letter dated October 29, 2010, the proposed project is approximately 7 miles from several caves where small numbers of the Indiana bat have been documented swarming in the fall, but have never been documented emerging in the spring despite multiple years of survey (see Appendix C, Attachment C4).

Federally and State-listed Species

Information regarding the potential occurrence of Federally listed species was reviewed using the USFWS Endangered Species Website and a list of potentially occurring listed species for Geauga County, Ohio (USFWS 2010). The only species with a potential to occur in Geauga County according to the USFWS is the Indiana bat (*Myotis sodalis*) .

ODNR was contacted to complete a review of the proposed project. According to its letter regarding the proposed project dated August 27, 2010, ODNR conducts reviews "by an interdisciplinary team within ODNR in accordance with its authority under the *Fish and Wildlife Coordination Act* (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*.), NEPA, the *Coastal Zone Management Act*, Ohio Revised Code, and other applicable laws and regulations" (Appendix C, Attachment C1).

ODOW, a division under ODNR, provided the following information concerning the project's potential impacts on wildlife species (Appendix C, Attachment C1)[3] and stated that the ODNR Ohio Biodiversity Database did not contain data at this project site. ODOW also determined that

3. The sandhill crane (*Grus canadensis*) is also a State-listed endangered species. This species was not included in the ODOW August 27, 2010 response letter. If ODOW wishes to consult further with respect to sandhill crane, DOE will do so.

the project lies within the range of the Indiana bat (*Myotis sodalis*), a Federally and State-listed endangered species. Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed below with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed below with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. ODNR identified the following species of trees as having relatively high value as potential Indiana bat roost trees: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), shingle oak (*Quercus imbricaria*), northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sassafras (*Sassafras albidum*), post oak (*Quercus stellata*), and white oak (*Quercus alba*).

In its response, the ODOW indicated that the proposed project site was within the range of several other State-listed species, including the snuffbox (*Epioblasma triquetra*) and the eastern pondmussel (*Ligumia nasuta*) – State-listed endangered mussels (which require streams or other aquatic environments); the American emerald (*Cordulia shurtleffi*), the frosted whiteface (*Leucorrhinia frigida*), and the racket-tailed emerald (*Dorocordulia libera*) – State-listed endangered dragonflies; the black bear (*Ursus americanus*), snowshoe hare (*Lepus americanus*), and the bobcat (*Lynx rufus*) – State-listed endangered species; and the yellow-bellied sapsucker (*Sphyrapicus varius*) – a State-listed endangered bird.

Migratory Birds and Bald Eagle

The *Migratory Bird Treaty Act* (16 U.S.C. 703-7012; MBTA) implements four international conventions that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possessing, transporting, and importing migratory birds, their eggs, parts, and nests, except when specifically authorized by the U.S. Department of the Interior. While the MBTA has no provision for allowing unauthorized take, USFWS recognizes that some migratory birds may be taken during activities such as wind turbine operation even if all reasonable measures to avoid a take have been implemented.

Bald and golden eagles are included under the MBTA, and are afforded additional legal protection under the *Bald and Golden Eagle Protection Act* (16 U.S.C. 668-668d). In its letter dated September 18, 2009, USFWS indicated that although bald eagles are known in Geauga County, no bald eagle nests exist within 5 miles of the project site. Therefore, bald eagles are not likely to regularly occur in the project area (see Appendix C, Attachment C2). In a subsequent letter from the USFWS dated September 2, 2010, the USFWS noted that eagle nests are not known to occur within the project area or within 5 miles and that the project area does not provide suitable habitat for eagles (see Appendix C, Attachment C3).

The proposed project site is located in an area that contains predominantly medium to large scattered stands of trees interspersed with residential development. The nearest Important Bird Area (IBA) is approximately 6 miles west of the proposed turbine location. This IBA encompasses approximately 43,431 acres that run along the Chagrin River Corridor and is a relatively intact contiguous riparian corridor surrounded by developed residential areas. It consists of the riparian corridor, featuring ravines and forested areas that are mostly mature, over 75 years in age, with a mixture of beech-maple to hemlock-hardwood. It includes 19 constructed

ponds and lakes and numerous natural wetlands. Although some continuity between the IBA and the project site exists, there are also numerous residential developments and rural towns located between the main riparian corridor and the project site. The medium to large stands of trees that surround the project site have potential to provide migratory bird nesting and foraging habitat as well as stopover habitat during migration.

The USFWS indicated in its letters dated September 18, 2009, and September 2, 2010, that no bald eagle nests are known to occur in the vicinity of the proposed project site, as did ODNR in its letter of August 27, 2010.

Direct and Indirect Impacts

An initial letter sent to the recipient in September 2009 from the USFWS (Appendix C, Attachment C2) indicated that the proposed project would have no effect on Indiana bat based on lack of suitable habitat at the project site. In a subsequent letter sent to the DOE in September 2010 (Appendix C, Attachment C3), the USFWS indicated that although the project site did not provide suitable habitat for Indiana bat, the site was within 1,000 feet of a wooded lot, which, based on new information, may be considered suitable habitat for Indiana bat. Kenston provided additional information to the USFWS regarding the project site and specifics related to the residential nature of the area surrounding the project site and the lack of habitat on the approximately 189-acre school site.

Based on the additional information Kenston provided, the USFWS reviewed the proposed project and surrounding area further. In USFWS's letter dated October 29, 2010, the USFWS indicated that summer Indiana bats typically stay within 1,000 feet of stream corridors and forested areas, and although the proposed project site was located 850 feet from wooded lots, the site complex of approximately 100 acres is substantially developed and that Indiana bats would likely stay close to the forested areas and would be unlikely to fly over the 100-acre open area (Appendix C, Attachment C4).[4]

Because of this and the small rotor sweep of a single turbine, the USFWS concluded that it would be very unlikely that an Indiana bat would be exposed to the single turbine during the migratory season. In addition, although the proposed project area is approximately 7 miles from several caves where small numbers of Indiana bats have been documented swarming in the fall, none have been documented emerging in the spring despite multiple years of survey. This indicates that Indiana bats might just be swarming in the caves in the fall or they may be hibernating in very small numbers (see Appendix C, Attachment C4). Because suitable habitat is so plentiful in the surrounding landscape, including in areas near the caves, and because the Indiana bat has been detected in such low numbers, the USFWS indicated that fall-swarming Indiana bats are unlikely to be exposed to a single, small turbine 7 miles away from the caves, in a developed area (Appendix C, Attachment C4).

Although potentially suitable roosting and maternity habitat is located in the woodlands surrounding the project site, based on the foregoing, the USFWS concluded that take of Indiana bat as a result of the proposed project is extremely unlikely and the project was not likely to result in adverse impacts to this species (Appendix C, Attachment C4). Additionally, ODOW

4. Although the USFWS letter states the school site is approximately 100 acres, it is actually 189 acres.

concluded that the proposed project was not likely to adversely affect the Indiana bat unless tree removal was planned as part of the project (Appendix C, Attachment C1). No tree removal is proposed to occur; therefore, the project is not likely to adversely affect the Indiana bat.

In its letter dated August 27, 2010, the ODOW indicated that the Ohio Biodiversity Database currently has no records of bald eagle near the project site and, based on the lack of records for bald eagle near the project site, the proposed project is not anticipated to affect this species. The USFWS concluded that bald eagle nests are not known in the vicinity of the proposed project site and that adverse impacts to this species were not anticipated.

ODOW's letter also indicated that although the project site lies within the range of snuffbox and the eastern pondmussel, project activities do not include in-water work, and therefore, no impacts to these species would result from the proposed project.

The project site is also within the range of the American emerald, frosted whiteface, and the racket-tailed emerald dragonflies. However, ODOW concluded that, due to the mobility of these species, the proposed project is not likely to impact these species.

ODOW also concluded in its August 27, 2010, letter that due to the mobility of the black bear and the bobcat and due to the location of the project site and the habitat requirements of the yellow-bellied sapsucker and the snowshoe hare, the proposed project is not likely to impact these species.

The medium to large stands of trees that surround the project site have potential to provide migratory bird nesting and foraging habitat as well as stopover habitat during migration. However, a single turbine within an approximately 189-acre developed area is not likely to take large numbers of migratory birds. Based on the foregoing, impacts on migratory birds as a result of the proposed project are anticipated to be minimal.

During turbine siting, design, and installation of the proposed project, Kenston gave consideration to the recommendations contained within the *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) and incorporated those recommendations, including them as applicant-committed measures as appropriate, to avoid and minimize potential impacts on migratory birds and bald and golden eagles. The proposed project is a single wind turbine located in an area that is already developed and is part of the school's property. The proposed turbine design is a monopole, no external features are proposed to the design, and all electric lines would be placed underground. The area around the turbine is mainly landscaped grass or sparsely vegetated ground and does not provide significant bird habitat. The project site is surrounded by medium to large stands of trees, interspersed with residential development, but the single turbine would not fragment highly suitable migratory bird or other wildlife habitat. The proposed project would make use of an existing 0.8-acre area that is used as overflow parking for staging and would not require temporary construction roads or additional excavation for equipment laydown. Aviation lighting would utilize the minimum required by FAA to minimize potential bird and bat impacts.

Kenston would voluntarily conduct post-construction avian and bat mortality surveys. Voluntary monitoring likely would consist of one initial post-construction fall migration season

(approximately 8 to 12 weeks, based predominantly on Indiana bat migration habits). Kenston plans to implement the voluntary monitoring with in-kind support and/or oversight from qualified local university/college faculty/staff. This monitoring will provide data to the USFWS, DOE, and ODOW on potential avian and bat mortality associated with single wind turbines. DOE is working with USFWS Region 3 to establish an appropriate protocol for the post-construction monitoring. The final protocol is expected to include details related to timing, frequency, and reporting. Kenston would implement monitoring consistent with the final protocol.

3.2.2.7 Human Health and Safety

Workers have the potential to 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.

Collapse of a turbine or breakage (and throwing) of one or more turbine blades is possible, but both are very unlikely occurrences. Debris falling from these occurrences would likely be limited to a calculated fall zone, calculated at 1.1 times the full turbine height, or 332 feet, which is defined to approximate the area around the base of the turbine that would likely receive the tower and turbine if it were to fall. The southwest corner of the football stadium is within the 332-foot fall zone (approximately 322 feet away from the turbine site) as is the eastern half of the tennis court (approximately 191 feet from the proposed turbine site). Estimates of blade throw vary, but MacQueen et al. (1983) estimate the probability of being struck outside the fall zone (i.e., within one blade diameter of the tower base) is about 10^{-7} per year for a fixed building, and substantially less for people who are mobile.

Another potential source of accidents is ice shedding and lightning. Ice shedding, or ice throw, refers to the phenomenon that can occur when ice accumulates on rotor blades and subsequently breaks free or melts and falls to the ground. Although a potential safety concern, it is important to note that, while more than 90,000 wind turbines have been installed worldwide, there has been no reported injury caused by ice thrown from a turbine (Tetra Tech EC, Inc. 2007). The proposed project would be supplied with ice sensors on the turbine blades. When ice forms, the sensors would engage and the turbine would not be permitted to rotate until the ice had melted. This technology is intended to prevent ice throws. Ice that has accumulated on the blades would fall to the foot of the turbine as it melts. To prevent accident or injury from ice that falls as it melts, the turbine requires the area directly underneath to be a clear zone.

A study conducted for the National Renewable Energy Laboratory was successful in identifying damage mechanisms due to direct and indirect effects of lightning strikes on wind turbines. Lightning strikes can cause extensive damage to the turbine blades, controllers, and power electronics (NREL 2002). However, this damage can be reduced by protection from tall nearby communication towers, integral blade protection in the form of conductors, bonding to minimize arcing, good turbine grounding, controller cable and controller shielding, and transient voltage surge suppression. The amount of lightning damage is a factor of the lightning activity in the area, the height and prominence of the turbine, the terrain, and the lightning protection system in

place. According to the National Oceanic and Atmospheric Organization Illinois has mid-range lightning activity (between 40 and 50 annual thunderstorm days).

Because no fuel is used in wind energy projects, there would be no process waste streams generated during operation of the wind turbine that could cause health and safety concerns. Some 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.

A previous Environmental Real Estate Assessment Phase 1, which included a soils study, was conducted prior to the Kenston's purchase of the 28-acre Bainbridge property in 2003 to construct Kenston High School. The entire 28-acre parcel was cleared from environmental hazards.

Three airports are within 10 miles of the project site: Auburn Airport in Chagrin Falls, Ohio; Harper Ridge Airport in Solon, Ohio; and Rataiczak Airport in Russell Center, Ohio. All structures taller than 200 feet, as is the case with the proposed project, are required to have aircraft warning lights in accordance with requirements specified by the FAA.

The term electromagnetic field (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, collector lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMFs can occur indoors and outdoors. The question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. However, wind turbines are not considered a significant source of EMF exposure since emissions levels around wind farms are low (CMOH 2010).

Direct and Indirect Impacts

No adverse public security impacts are anticipated due to the proposed project. Safety signage would be posted around the tower (where necessary); transformers and other high-voltage facilities would be in conformance with applicable Federal and State regulations.

All contractors, subcontractors, and their personnel are required to comply with all Federal and State worker safety requirements, specifically all of the applicable requirements of OSHA. Safety procedures specific to the Aeronautica 750 turbine would be observed whenever work is being done on the turbine.

As described earlier, risk of turbine collapse is very rare (Klepinger 2007). The blade and tower impact area should have restricted access with very limited public use. Based on the extreme rarity of tower collapse or blade throw, the risk to public safety due to such occurrences can be mitigated by limiting access within the fall zone and areas, such as portions of the stadium or tennis courts that are within the fall zone, that are intermittently occupied during sporting events and not at all during winter months and portions of the summer. Therefore, risk of impacts to individuals in these areas as a result of tower collapse is considered very unlikely.

The same access management strategies can mitigate the risks to public safety due to ice throw or shedding conditions, which are in effect only on a limited temporal basis. The turbine system would have an automated system fault shut-off triggered at a minimum by the following sensors: system temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances would automatically shut down the turbine). This system would also automatically send fault codes to preauthorized personnel through a web interface. The turbine's nacelle would have a cold-weather package including nacelle heaters. These heaters are designed to maintain nacelle temperatures above the dew point and well above freezing. This system would automatically melt snow and ice accumulation on top of the nacelle. The turbine system would have staff-accessible emergency shut-offs. All icing-related turbine shutdowns would require a direct inspection and an onsite manual restart. The site personnel and the system maintenance personnel would shut down the turbine in the event of an icing condition. The site shall adopt an ice safety zone around the turbine for implementation during icing events, when they occur.

The FAA issued a Determination of No Hazard to Air Navigation on November 9, 2010 (Appendix C, Attachment C8), for the proposed project. Based on this determination, the proposed project is not anticipated to have a substantial effect on the safe and efficient utilization of navigable airspace by aircraft or on the operation of air navigation facilities. Aviation lighting would be in compliance with FAA standards (FAA 2007).

The turbine is not anticipated to impact public health and safety due to EMF because wind turbines are not considered a significant source of EMF.

The soil sample collected as part of the initial soil field and laboratory study exhibited concentrations of volatile organic compounds, semivolatile organic compounds, and metals well below Ohio Voluntary Action Program standards. Therefore, excavation of the soils would pose no risks to contractor health or to the environment in general (EDP 2008).

3.2.2.8 Transportation

The project site can be accessed by Snyder Road (Township Highway 192), East Washington Street (County Route 606), Bainbridge Road (County Route 11), and U.S. Highway 422. Access to the Interstate transportation system is available at the I-480/I-271 interchange, approximately 12 miles to the west of the project site. No new access or other roads would be necessary for construction and operation of the proposed project.

Direct and Indirect Impacts

During the construction phase of the project, a minor increase in vehicular traffic on the local roads surrounding the project site is anticipated. This traffic increase would occur for a period of approximately 10 months throughout the course of construction. No long-term or permanent impacts on the local transportation systems would occur as a result of the proposed project. No new access or other roads would be required for construction and operation of the proposed project.

The turbine nacelle, blades, and tower would be staged at Buckeye Excavating directly across Washington Street to the north of the project site. Final transport of project materials and construction vehicles would occur through the north entrance of the campus.

3.2.2.9 Socioeconomics and Environmental Justice

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 Geauga County in the 2000 Census was 96.8 percent white, compared with 84.7 percent for the state of Ohio as a whole, with the remainder of both populations constituting minorities. The median household income in 2000 dollars for a household in Geauga County in 2008 was $62,223, compared with $48,011 for the state of Ohio as a whole. About 6.9 percent of individuals were below the poverty level in 2008, compared with 13.3 percent for the state of Ohio as a whole (Bureau of the Census 2010).

Direct and Indirect Impacts

No potential for adverse impacts to human health or environmental effects have been identified as part of the proposed project. Therefore, there would be no disproportionately high and adverse socioeconomics- or environmental justice-related impacts on minority populations and low-income populations.

The construction of the proposed project is expected to generate short-term and small increase in employment due to temporary construction related jobs for the wind turbine. Operation of the proposed project is not anticipated to generate new jobs, as it would be maintained by the school district.

3.2.2.10 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 oxides, ozone, and lead. EPA has established National Ambient Air Quality affected environment and environmental impacts standards for these pollutants. There are two 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 Northeast Ohio Areawide Coordinating Agency, Geauga County is in attainment for carbon monoxide, sulfur dioxide, PM_{10}, nitrogen oxides, ozone, and lead, which means that the levels of these pollutants in the air are below the EPA standards. However, in 2004 Geauga County was given moderate nonattainment status with respect to a new Federal 8-hour ozone standard (NOACA 2005). The EPA has found that the "aggregate group of the well-mixed greenhouse gases" constitutes an air pollutant that contributes to climate change. Carbon dioxide is a greenhouse gas and the Kenston wind turbine would have an indirect impact on reducing carbon dioxide emissions from fossil fuel sources.

Electricity is provided to the school by First Energy Solutions. First Energy Solutions currently has a mix of fuel sources (Table 3-12). First Energy Solutions reports an average estimated grid

line loss of 6.14 percent, resulting in higher realized grid power offsets for renewable energy generating sites than their actual onsite production (EPA 2010b).

Table 3-12. First Energy Fuel Mix and Emissions

Source Fuel Mix (percent)	
Coal	72.8
Oil	0.4
Natural Gas	2.7
Nuclear	22.3
Renewable	1.1

Direct and Indirect Impacts

The proposed project would be an emissions-free energy generation project that would not degrade air quality. Grading and construction for the proposed project would result in short-term air quality impacts, such as dust generated by clearing and grading activities, exhaust emissions from gas- and diesel-powered construction equipment, and vehicular emissions associated with the commuting of construction workers. Emissions from construction would be minimized to the extent practicable (for example, by watering dry roads), following BMPs.

First Energy Solutions generated electricity using coal (72.8 percent), oil (0.4 percent), natural gas (2.7 percent), nuclear (22.3 percent), and renewable energy sources (1.1 percent),

The information reported from the EPA's eGRID database for calendar year 2005 shows the fuel mix for the Chagrin Falls area as 72.8 percent coal, 2.7 percent natural gas, and 0.4 percent oil, which equals 75.9 percent fossil fuel use (EPA 2010a). Based on the wind turbine analysis prepared as part of the turbine siting process for the project area wind speeds and wind days were analyzed and it was determined that the turbine would supply 70 percent of the school's energy needs (1,366,305 kilowatt hours per year). Therefore, the project carbon reduction is calculated as follows:

> 75.9 percent fossil fuel use × 2.0562 pounds of carbon dioxide per kilowatt-hour × 1,336,305 kilowatt-hours per year = 2,085,512 pounds of carbon dioxide per year.

The proposed project would reduce Kenston's carbon footprint by reducing its reliance on fossil fuels.

3.2.2.11 Utilities and Energy

The school is well served by utility infrastructure, including electric power transmission and municipal potable water and sanitary sewer. No microwave communications exist in the area surrounding the project site.

The NTIA is responsible for managing the Federal spectrum and is involved in resolving technical telecommunications issues for the Federal government and private sector. This information aids in siting wind turbines, so they do not cause interference in radio, microwave, radar, and other frequencies, disrupting critical lines of communication. Upon submittal by a

wind project proponent, the NTIA provides project specific information to the members of the Administration's Interdepartment Radio Advisory Committee for review and comment on whether the proposed project could potentially interfere with Federal radio communication links.

Direct and Indirect Impacts

The electrical grid interconnect of the proposed project would be composed of the turbine's controller (contained within the turbine tower-based section), approximately 600 feet of buried 4-inch electrical conduits including the portions of the run embedded within the turbine tower foundation, a 690- to 12,480-volt transformer, an automatic disconnect switch, a UL1741-compliant monitoring and control device, and a fused disconnect within the school's existing switchgear. The system would also have a parallel run of 2-inch conduit for data transfer and control runs. The full system would meet all local, State, and Federal codes and regulations.

The proposed project would have a nameplate capacity of 750 kilowatts and generate approximately 1,336,305 kilowatt-hours per year on average, or enough electricity to supply up to 127 homes each year (DOE 2010). The wind energy generated from the proposed project would meet approximately 70 percent of the school's annual electricity needs. The proposed project is anticipated to produce a total of 26,726,100 kilowatt-hours of clean electricity for the 20-year design life of the project.

The proposed project would not result in any adverse energy impacts. Approximately 70 percent of electricity used by the school would be supplied by the proposed project and not by the burning of fossil fuels. This would reduce carbon emissions by 2,085,512 pounds of carbon dioxide per year and allow Kenston to meet its objective to reduce its carbon footprint.

On October 18, 2010, DOE received a letter from NTIA indicating that no Federal agencies identified any concerns regarding the blockage of their radio frequency transmissions (Appendix C, Attachment C9). No microwave communications exist in the areas surrounding the project site.

3.3 Irreversible and Irretrievable Commitment of Resources

A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource or limit those factors that are renewable only over long periods of time. Examples of nonrenewable resources are minerals, including petroleum. An irretrievable commitment of resources refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Examples of irretrievable resources are the loss of a recreational use of an area. While an action may result in the loss of a resource that is irretrievable, the action may be reversible. Irreversible and irretrievable commitments of resources are primarily related to construction activities.

For the proposed project, resources consumed during construction of the project, including labor, fossil fuels and construction materials, would be committed for the life of the project. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline- and diesel-powered construction equipment during construction. Approximately 256 square feet of land would be irreversibly committed during the functional life of the project. The expenditure of ARRA funding from DOE would also be irreversible.

3.4 Unavoidable Adverse Impacts

Unavoidable adverse impacts associated with the proposed project include:

- Long-term loss of approximately 256 square feet of vegetation resulting from the construction of the tower foundation;
- A minimal increase in noise levels during construction and operation;
- Introduction of an additional vertical element into the existing viewshed;
- Minimal shadow flicker impacts for the stadium and tennis courts; and
- A risk of tower collapse within 332 feet of the turbine tower.

These impacts are both temporary, in the case of the construction noise, and long-term, in regard to the loss of vegetation, visual and shadow flicker impacts, and the risk of tower collapse. Overall, impacts of the proposed project on the environment and human health would be minimal.

3.5 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term use of the environment, as the term is used in this document, is that used during the life of the project, whereas long-term productivity refers to the period of time after the project has been decommissioned, the equipment removed, and the land reclaimed and stabilized. The short-term use of the project area for the proposed project would not affect the long-term productivity of the area. If it is decided at some time in the future that the project has reached its useful life, the turbine, tower, and foundation could be decommissioned and the site reclaimed and revegetated to resemble the pre-disturbance conditions (mowed grass). The installation of a wind turbine at this site would not preclude using the land for purposes that were suitable prior to this project.

4. CUMULATIVE IMPACTS

Cumulative impacts are those 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 other 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 considered other proposed wind turbine projects for which ARRA grants have been sought in Ohio, as well as the proposed 20-megawatt offshore wind turbine project in Lake Erie anticipated to begin construction in 2012, in connection with this project with respect to potential cumulative impacts. According to the Ohio Siting Board (http://www.opsb.ohio.gov/Opsb/), there are three other proposed wind turbine projects in Ohio, all located from 130 to 210 miles from the project site. The following is a list of ARRA SEP-awarded project. Specific locations are shown in Appendix A, Figure 10. NEPA documentation related to these projects is available on the DOE Golden Field Office Reading Room Website at http://www.eere.energy.gov/golden/Reading_Room.aspx.

Green City Growers Wind Development – DOE/EA-1817
(Notice of Scoping issued August 2010)
1.5-megawatt wind turbine
Inner City of Cleveland Greenhouse 55th St. and Woodland Ave, Cleveland, Ohio 44104

Archbold Area Schools Wind Energy Project – DOE/EA-1820
(Draft EA issued January 2011)
500-kilowatt wind turbine
600 Lafayette Street, Archbold, Ohio 43502

Pettisville Local Schools Wind Energy Project – DOE/EA-1818
(Draft EA to be issued February 2011)
500-kilowatt wind turbine
232 Summit Street, Pettisville, Ohio 43553

Toledo Joint Apprenticeship and Training Committee – Categorical Exclusion
(Issued February 2010)
100-kilowatt wind turbine
803 Lime City Road, Rossford, Ohio, 43460

Lincoln Electric – DOE/EA-1777
(Final EA and FONSI issued August 2010)
2.5-megawatt wind turbine
22800 St. Clair Ave, Euclid, OH

Cuyahoga County Agriculture Society – DOE/EA-1815
(Draft EA issued November 2010)
600-kilowatt wind turbine
Cuyahoga County Fairgrounds, 164 Eastland Road, Berea, Ohio 44017

City of Toledo – EA
(Project is in early design phase)
1- megawatt Wind Turbine at Collins Park Wastewater Treatment Facility
Toledo, Ohio

Each of the DOE-funded projects includes the construction and operation of a single turbine. None is located in Geauga County. The closest, the Lincoln Electric project in Cuyahoga County, is over 17 miles west of the Kenston site in a highly urbanized area that was determined to not provide habitat for Indiana bats. Further, these projects are not likely to share a known migration pathway for birds. The Cuyahoga County Agricultural Society wind turbine project is approximately 40 miles southwest of the project site and the Archbold and Pettisville wind turbine projects are over 160 miles west of the site. The Toledo Joint Apprenticeship and Training Committee and City of Toledo projects are over 100 miles west of the project site. Cuyahoga County, Lincoln Electric and the Lake Erie wind turbine projects are the nearest projects to the Kenston site, and these were reviewed for potential cumulative impacts to biological resources. The proposed offshore wind farm on Lake Erie is approximately 35 miles from the Kenston site and will be installed approximately 5 miles offshore and these projects do not likely share a migratory pathway for birds. The nearest non-prioritized[5], suspected Indiana bat hibernacula lies approximately 8 miles southwest of Kenston and 7 miles east-northeast of the Cuyahoga County Wind Turbine Project, near the city of Twinsburg, Ohio. The USFWS determined that the proposed project and the Cuyahoga County project were not likely to adversely affect the Indiana bat; however, these sites are within the overall range of migrating Indiana bats. Although impacts to migrating Indiana bats as a result of the proposed project are thought to be very unlikely, the proposed project might add to the overall small potential cumulative impact to migrating Indiana bats. The addition of the proposed project to potential cumulative impacts to migratory birds is considered very low.

4.2 Summary of Cumulative Impacts

4.2.1 GREENHOUSE GAS IMPACTS AND CLIMATE CHANGE

While the scientific understanding of climate change continues to evolve, the Intergovernmental Panel on Climate Change Fourth Assessment Report has stated that warming of the 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 Panel's 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,

5. *The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision* (USFWS 2007) prioritizes hibernacula based on field surveys to determine the number of Indian bats utilizing the hibernacula. The suspected hibernacula located near Twinsburg, Ohio, has not been prioritized because it is not feasible to conduct a survey of the suspected cave due to inaccessibility.

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 may be irreversible (IPCC 2007).

The proposed project would not have direct greenhouse gas emissions but would result in some emissions of greenhouse gases associated with electricity from sources used to power the facility. The facility would consume 1,336,305 kilowatts of electricity per year, corresponding to 2,085,512 tons per year of carbon dioxide-equivalent emissions. There would also be small amounts of greenhouse gases emitted as a result of construction and transportation activities related to the facility.

The release of anthropogenic greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. Greenhouse gas emissions from the proposed facility are relatively small compared with the 8,026 million tons of carbon dioxide-equivalent greenhouse gases emitted in the United States in 2007 (DOE 2007) and the 54 billion tons of carbon dioxide-equivalent anthropogenic greenhouse gases emitted globally in 2004 (IPCC 2007). However, emissions from the proposed project in combination with past and future emissions from all other sources would contribute incrementally to the climate change impacts described above. At present, there is no methodology that would allow DOE to estimate the specific impacts (if any) this increment of climate change would produce in the vicinity of the facility or elsewhere.

4.2.2 VISUAL RESOURCES

None of the projects listed in Section 4.1 would present significant cumulative impacts on visual resources. Because of the small scale of each DOE-funded individual project and the distance between the proposed project and those projects, no cumulative visual impacts from these projects are anticipated. Additionally, there would be limited visibility of the offshore wind farm from any upland vantage point due to its distance from the shoreline. Further, the wind farm is over 30 miles from the proposed project, which precludes cumulative visual impacts. The closest communications tower is approximately 155 feet tall and already located on Kenston property. The addition of the proposed wind turbine would provide an additional vertical structure within the viewshed. Overall, the only cumulative impact on the viewshed would be from the addition of the wind turbine at the school property, but this would be a small cumulative impact on visual resources.

4.2.3 BIOLOGICAL RESOURCES

All of the DOE-funded wind turbine projects are reasonably foreseeable single wind turbine projects and have received a letter from the USFWS and ODNR indicating that the Indiana bat is not at risk as a result of the turbines individually (with the exception of the City of Toledo project which is still in early design phase and the Toledo Joint Apprenticeship which was issued a categorical exclusion). ODOW and USFWS would require all of the above-referenced wind projects to consider or have considered the recommendations contained in the *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) as part of their siting, design, and installation, thereby reducing potential impacts to migratory birds and other species. The closest wind projects (Cuyahoga County, Green City Growers, and Lincoln

Electric) do not share a known migratory bird pathway with the proposed project, and the areas between these projects consist mainly of developed and suburban land, with scattered wooded areas and agricultural fields. The potential for cumulative impacts on migratory birds is minimal. The installation of single wind turbines in this part of eastern Ohio would negligibly increase a potentially low cumulative impact on migrating Indiana bats.

Because of the small scale of each individual DOE-funded project and the sufficient distance between projects, DOE concluded that there are no reasonably foreseeable potential cumulative impacts.

5. REFERENCES

Auburn Township Zoning Commission 2008. *Auburn Township Zoning Map*. Appendix B. January. Available online at: http://www.co.geauga.oh.us/Portals/0/resources/County%20Documents/planning%20commission/zoning%20maps/auburn.pdf (accessed December 21, 2010).

Australia NHMRC (Australia National Health and Medical Research Council) 2010. *Wind Turbines and Health – A Rapid Review of the Evidence.* July. Available online at: http://www.nhmrc.gov.au/publications/synopses/new0048.htm (accessed September 8, 2010).

BLM (Bureau of Land Management) 2005. "Chapter 5. Potential Impacts of Wind Energy Development and Analysis of Mitigation Measures." *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States.* FES -5-11. June. U.S. Department of the Interior, Bureau of Land Management.

Bureau of the Census 2010. *Geauga County QuickFacts*. Available online at: http://quickfacts.census.gov/qfd/states/39/39055.html (accessed September 28, 2010).

Caltrans (California Department of Transportation) 2009. "Technical Noise Supplement." *Traffic Noise Analysis Protocol*. Sacramento, California. http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf

CMOH (Ontario Chief Medical Officer of Health) 2010. *The Potential Health Impact of Wind Turbines*. http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf (accessed September 19, 2010).

Colby, W.D.; Dobie, R.; Leventhall, G.; Lipscomb, D.M.; McCunney, R.J.; Seilo, M.T.; and Søndergaard, B. 2009. *Wind Turbine Sound and Health Effects: An Expert Panel Review*, prepared for American Wind Energy Association and Canadian Wind Energy Association. Available online at: http://www.awea.org/documents/AWEA_CanWEA_SoundWhitePaper_ExecSumm.pdf

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.

DOE (U.S. Department of Energy) 2007. *Emissions of Greenhouse Gases in the United States 2006*. DOE/EIA-0573(2006). Energy Information Administration. Available online at: http://www.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057306.pdf (accessed December 30, 2010).

DOE (U.S. Department of Energy) 2010. "Frequently Asked Questions – Electricity," *Energy Information Administration: Independent Statistics and Analysis.* Available online at: http://www.eia.doe.gov/energyexplained/index.cfm?page=electricity_home#tab2 (accessed December 29, 2010).

EDP 2008. *Kenston Local School District Wind Turbine Foundation, Chagrin Falls, Ohio, Project* #08099G. May 14.

EPA (U.S. Environmental Protection Agency) 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. EPA Publication No. 550/9-74-004, April 2, 1974. Washington, DC: U.S. Government Printing Offices.

EPA (U.S. Environmental Protection Agency) 2010a. *Kenston, Ohio Pollution Mix Current Grid Fuel Mixes and Resulting Pollution*, eGrid Online Database. Available online at: http://cfpub.epa.gov/egridweb/index.cfm (accessed December 15, 2010).

EPA (U.S. Environmental Protection Agency) 2010b. *How Clean is the Electricity I use? –Power Profiler*. Available online at: http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html (accessed December 15, 2010).

Epilepsy Foundation (American Epilepsy Foundation) 2000. "Photosensitivity and Epilepsy, Photosensitivity and Seizures." Available online at: http://www.epilepsyfoundation.org/about/photosensitivity (accessed March 20, 2010).

FAA (Federal Aviation Administration) 2007. "Obstruction Marking and Lighting," Advisory Circular, AC 70/7460-1K, Change 2. U.S. Department of Transportation.

FEMA (Federal Emergency Management Agency) 2009. "Flood Insurance Rate Map for Geauga County, Ohio." Panel 218 of 375, Map # 39055C0218D. January.

Geauga County Zoning Commission 2008. *Bainbridge Township Zoning Map*, January.

Harding, G.; Harding, P.; and Wilkins, A., 2008. "Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them." *Epilepsia*, 49(6): 1095-1098.

IPCC (Intergovernmental Panel on Climate Change) 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp. Available online at: http://www.ipcc.ch/ipccreports/ar4-wg1.htm (accessed August 18, 2010).

Klepinger, M. 2007. *Michigan Land Use Guidelines for Siting Wind Energy Systems*. Extension Bulletin WO-1053. Michigan State University Extension. October 2007. Available online at: http://www.emdc.msue.msu.edu/Bulletin/PDF/WO1053.pdf (accessed December 29, 2010).

MacQueen, J.F.; Ainslie, J.F.; Milborrow, D.J.; Turner, D.M.; Swift-Hook, D.T. 1983. "Risks associated with wind-turbine blade failures." Abstract. In *IEE Proceedings, Part A - Physical Science, Measurement and Instrumentation, Management and Education, Reviews* (ISSN 0143-702X), vol. 130, pt. A, no. 9, Dec. 1983, pp. 574-586.

NOACA (Northeast Ohio Areawide Coordinating Agency) 2005. *Ohio 8-Hour Ozone Nonattainment Areas and Ohio PM2.5 Nonattainment Areas*. Fact Sheet. Available online at: http://www.noaca.org/Nonattainmentfactsheet.pdf (accessed September 28, 2010).

NRCS (Natural Resources Conservation Service) 2010. *Soil Survey Map of Geauga County, Ohio, Web Soil Survey*. U.S. Department of Agriculture. Available online at: http://websoilsurvey.nrcs.usda.gov (accessed August 2010).

NREL (National Renewable Energy Laboratory) 2002. Wind Turbine Lightning Protection Project 1999 – 2001. NREL/SR-500-31115, May 2002. Prepared by McNiff Light Industry for NREL. Available online at: http://www.nrel.gov/docs/fy02osti/31115.pdf (accessed October 19, 2010).

ODNR (Ohio Department of Natural Resources) 2007. "Earthquakes and Seismic Risks in Ohio." *GeoFacts No. 3*. Available online at: http://www.dnr.state.oh.us/Portals/10/pdf/GeoFacts/geof03.pdf (accessed December 29, 2010).

ODNR (Ohio Department of Natural Resources) 2010. "Ohio Scenic Rivers Program." Available online at: http://www.dnr.state.oh.us/tabid/985/default.aspx (accessed September 27, 2010).

Rogers, A.L.; Manwell, J.F.; and Wright, S. 2006. "Wind Turbine Acoustic Noise," a white paper prepared by the Renewable Energy Research Laboratory, Department of Mechanical and Industrial Engineering, University of Massachusetts at Amherst. Available online at: http://www.windpoweringamerica.gov/ne_issues_sound.asp (accessed August 24, 2010).

Tetra Tech EC, Inc. 2007. "Exhibit 14 - Wind Turbine Ice Blade Throw." *Ice Shedding/Blade Throw Analysis*. Available online at: http://www.horizonwindfarms.com/northeast-region/documents/under-dev/arkwright/Exhibit14_IceSheddingandBladeThrowAnalysis.pdf (accessed December 15, 2010).

USDA (U.S. Department of Agriculture) Forest Service 2009. "National Wild and Scenic Rivers Map." Continental United States, U.S. Forest Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, and National Atlas of the United States. Available online at: http://www.rivers.gov/maps/zoom/conus/conus.html (accessed September 27, 2010).

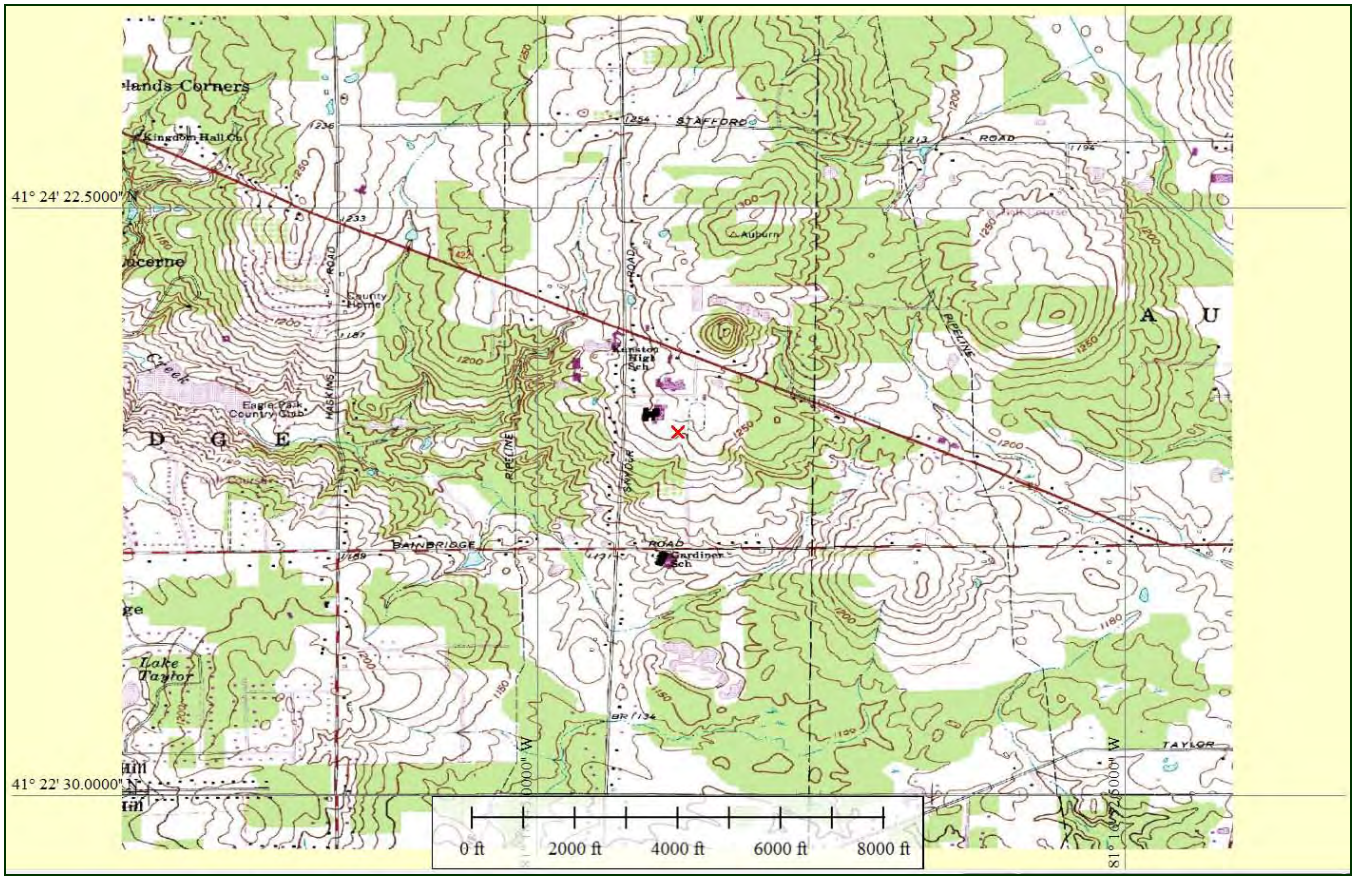
US DOT (U.S. Department of Transportation) 2006. C*onstruction Noise Handbook.* Final Report FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. NTIS No. PB2006-109102. August 2006. Research and Innovative Technology Administration. Available online at: http://www.fhwa.dot.gov/Environment/noise/handbook/index.htm (accessed August 5, 2010).

USFWS (U.S. Fish and Wildlife Service) 2003. "Service Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines." Letter to Regional Directors dated May 13, 2003. Washington, D.C. Available online at: http://www.fws.gov/habitatconservation/wind.pdf (accessed December 15, 2010).

USFWS (U.S. Fish and Wildlife Service) 2010. "National Wetlands Inventory for Kenston, Ohio." Available online at: http://www.fws.gov/wetlands/Data/Mapper.html (accessed August 2, 2010).

APPENDIX A: FIGURES

Kenston Schools Wind Turbine Location



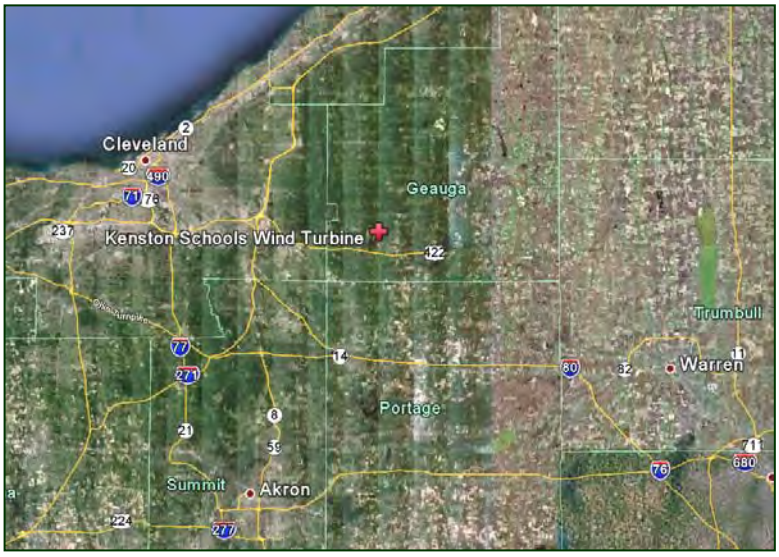
USGS South Russell Quad

× Wind Turbine Site Location:

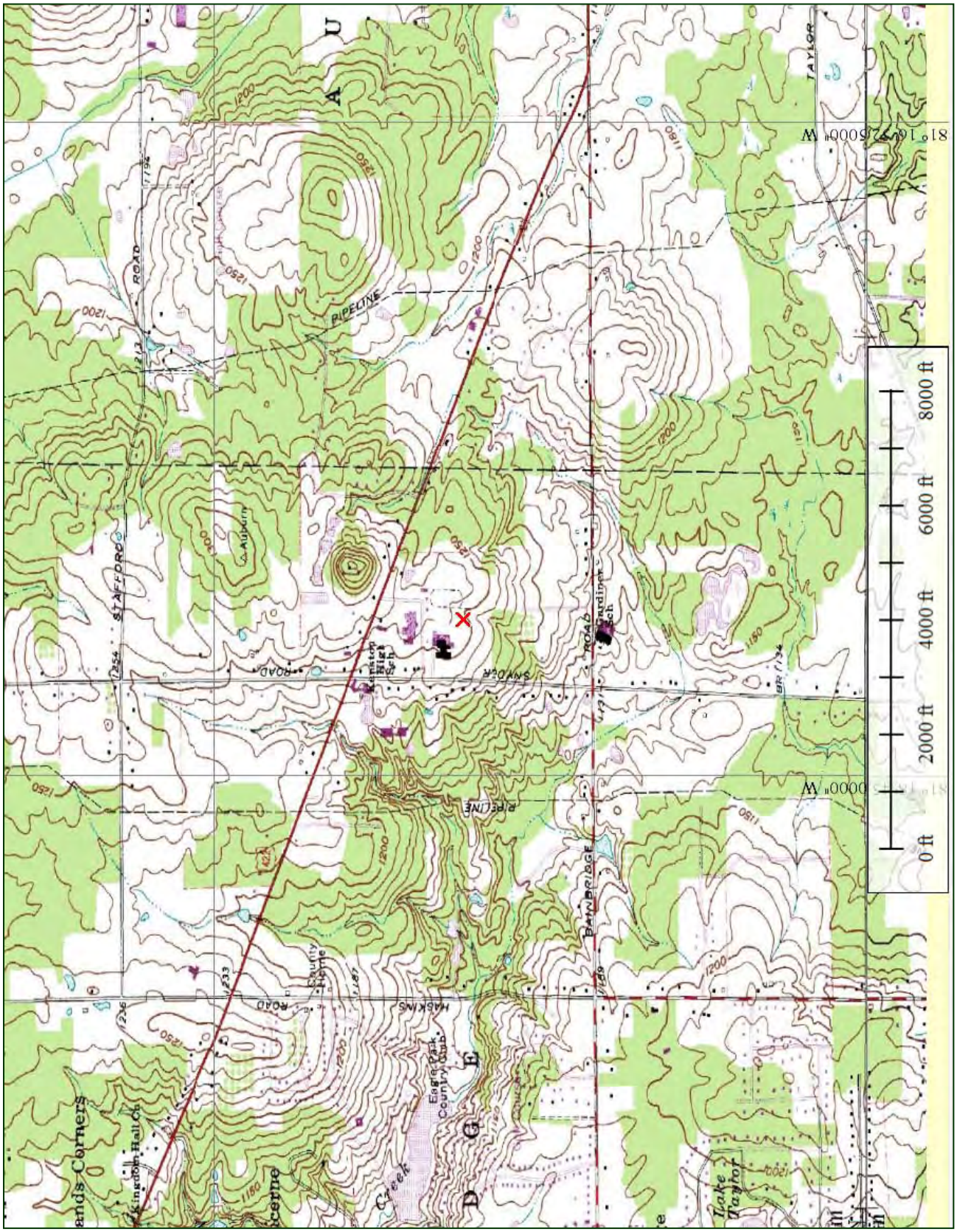
Kenston Local Schools
17419 Snyder Road
Chagrin Falls, Ohio 44023

Latitude: 41.394337
Longitude: -81.304999

Elevation: 748 Feet

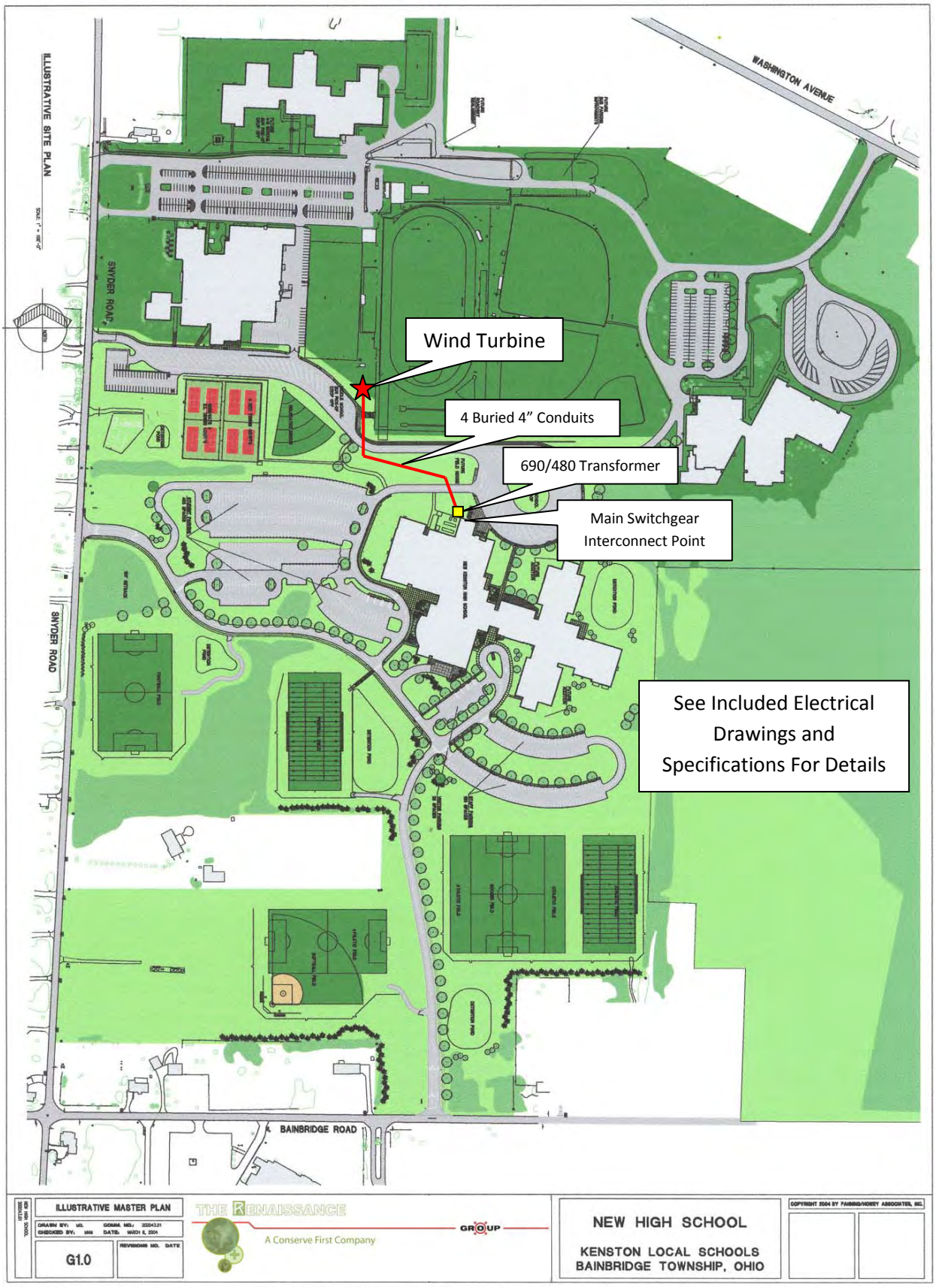


Project Name: ***Kenston Local Schools Wind Turbine***	THE RENAISSANCE GROUP — A Conserve First Company — TRG
Source Information: *USGS, TRG Survey*	
Notes: × *Turbine Location*	Figure Name*: Turbine Location*



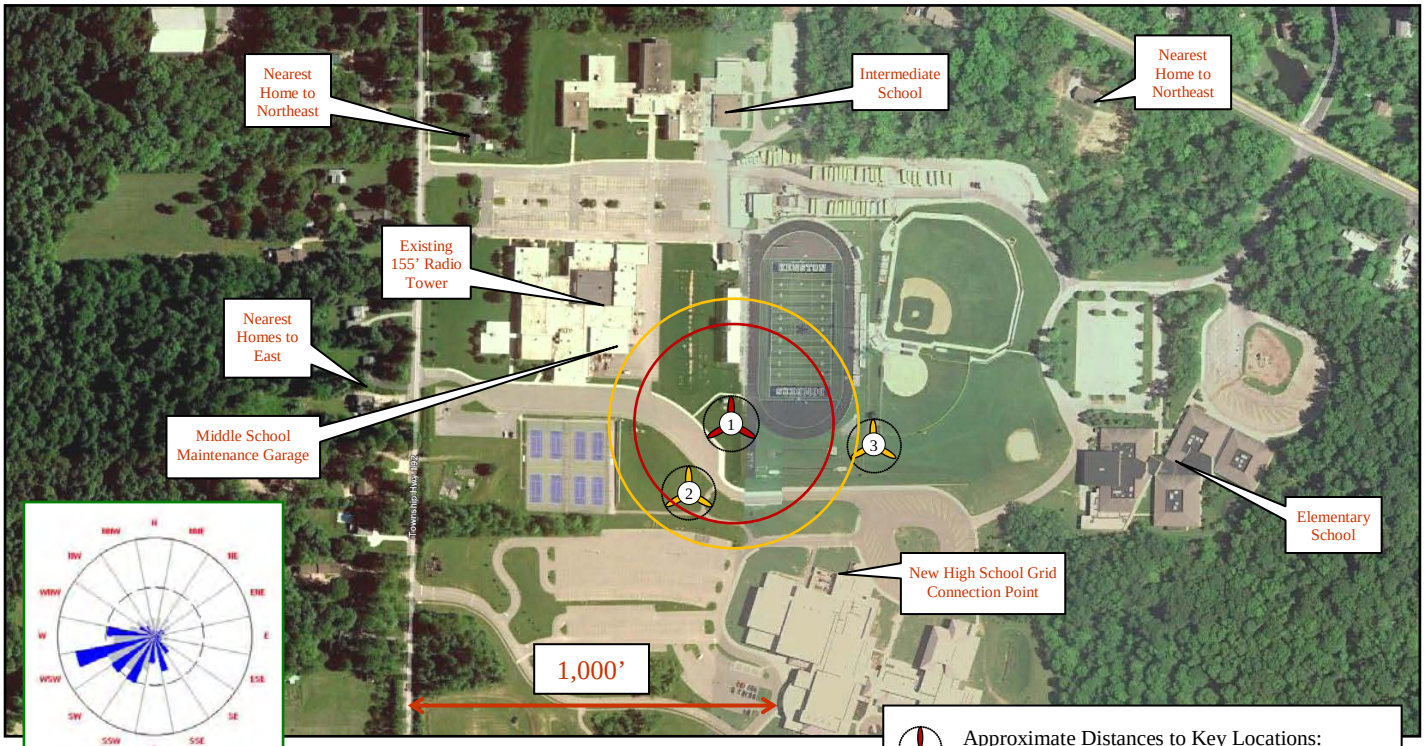
Project Name: ***Kenston Local Schools Wind Turbine***	THE RENAISSANCE GROUP — A Conserve First Company — TRG
Source Information: *USGS, TRG Survey*	
Notes: ✕ *Turbine Location, USGS South Russell Quad*	Figure Name*: Turbine Location*

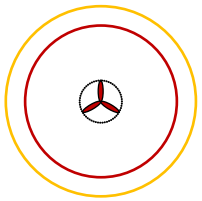
Kenston Schools Turbine Plan with Turbine and Interconnect Placement
17419 Snyder Road, Chagrin Fall, Ohio 44023



The Renaissance Group, Installer/Project Manager, 440-256-2800

Kenston Local Schools Turbine Placement, Fall Zone and Alternate Locations





Maximum Radius (1X Blade Tip Height) 269'
Maximum Radius (1,25X Blade Tip Height) 336'
Maximum Hub Height: 197'
Actual Blade Reach (Critical Fall Zone)

Proposed Turbine Location:

41° 23' 39.61" N
81° 18' 17.99" W
Elevation 1,252' (above sea-level)

Approximate Distances to Key Locations:

- 336' to Middle School Maintenance Garage
- 415' to High School
- 940' to Nearest Houses to the West
- 975' to Nearest House to Northwest
- 1,275' to Nearest House to Northeast

Alternate Locations Considered

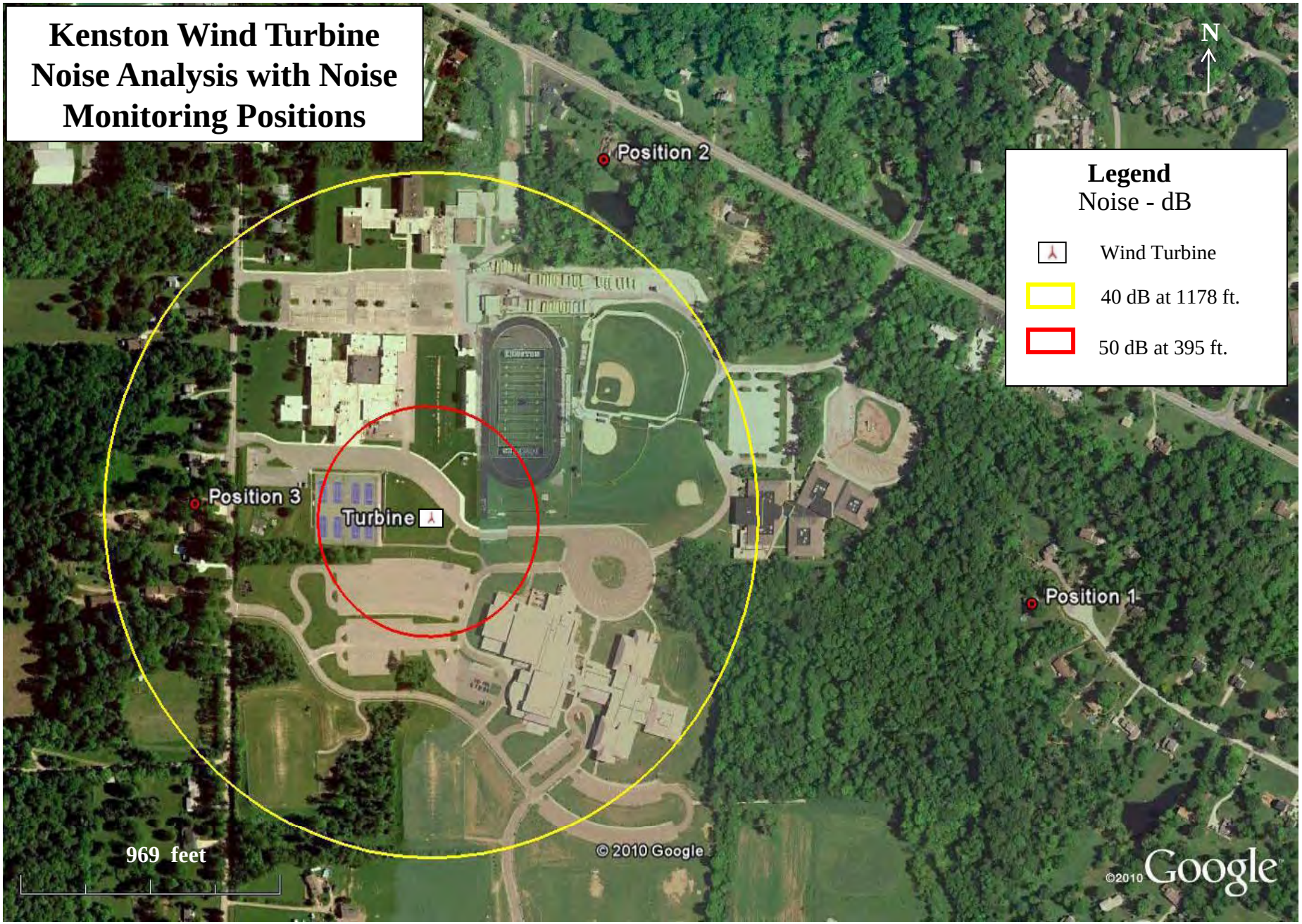
The following criteria were used to evaluate the potential turbine locations:

- Distance from adjacent properties
- Maximization of distances to occupied structures (no closer than 1.25 times the blade tip height)
- Ease of access and adequate room for construction, installation and maintenance
- Proximity to existing hardened roadways (minimization of new construction)
- Minimization of disruption to Kenston's operations
- Availability for educational programs (school, community and college partnerships)
- Minimization of wind turbulence due to adjacent buildings and trees
- Utilization of previously disturbed land (avoidance of natural areas)
- Soil Conditions (foundation suitability)
- Maximum avoidance of potential wildlife habitats
- Topography
- Wind resource optimization
- Existing infrastructure avoidance
- Utility interconnect distances
- Architectural, visual balance and icon siting

All three sites scored within acceptable ranges in the categories to the left, but Site 1 scored on-net the best. It has the most unobstructed, least turbulent wind resource, offers the best installation staging and is the furthest away from student occupied structures (note the building area to the northwest is the maintenance garage). Site 1 would allow the construction area to be controlled without having to close off a portion of the student parking area to the south. Other than this issue and a slightly more turbulent wind resource, Site 2 would score very near Site 1 and possibly have slightly lower installation costs. Site 3 also scored well, but would likely have higher construction costs due to limited hardened access and the need to bypass a retaining wall to the south of the site. Site 3 would also likely receive a higher level of turbulence as the winds flowed over the high-school, as this structure is in direct path of the sites prevailing southwest winds and thus present lower power output.

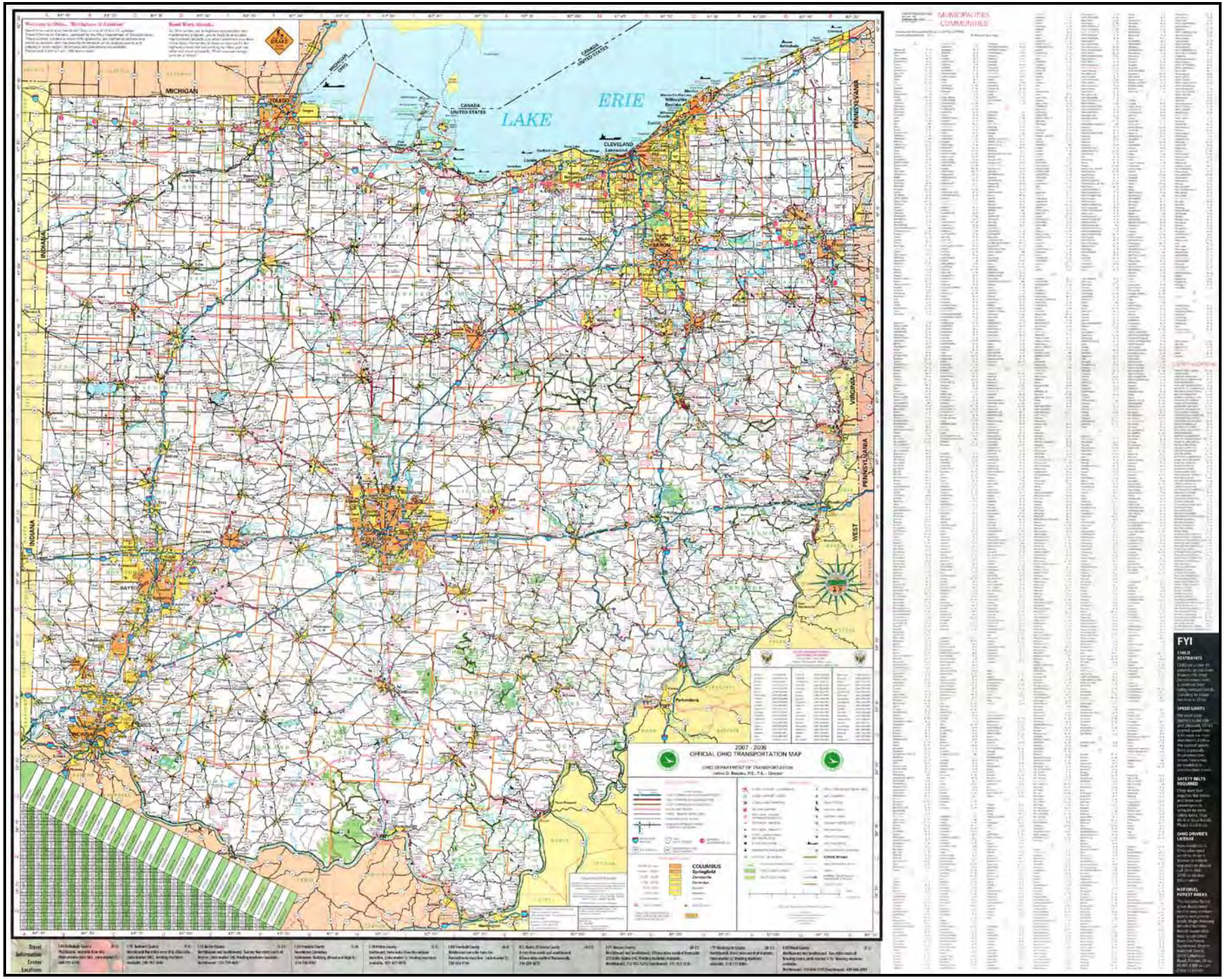
All sites are located on previously developed land and have similar benign environmental resource attributes and thus did not play into the final site selections. (Concurrence from ODNR and USFWS on selected site.)

Project Name: ***Kenston Local Schools Wind Turbine***	THE RENAISSANCE A Conserve First TRG
Source Information: *Aerial Photo, TRG Survey*	
Notes: *Turbine Location*	Figure Name: *Turbine Placement, Fall Zone and Alternate Locations*


Kenston Wind Turbine Noise Analysis with Noise Monitoring Positions
N
Position 2
Legend
Noise - dB
Wind Turbine
40 dB at 1178 ft.
50 dB at 395 ft.
Position 3
Turbine
Position 1
969 feet
© 2010 Google
©2010 Google

ARRA SEP - Awarded Wind Turbine Projects in Ohio

Project Name: ***Applicable to All Ohio ARRA Wind Turbine Projects***	THE RENAISSANCE GROUP A Conserve First Company TRG
Source Information: *TRG Survey*	
Notes:	Figure Name: *ARRA SEP – Awarded Wind Turbine Projects in Ohio*


MICHIGAN
TOLEDO
CANADA
UNITED STATES
LAKE
ERIE
CLEVELAND
PENNSYLVANIA
INDIANA
AKRON
DAYTON
WEST VIRGINIA
2007 - 2008
OFFICIAL OHIO TRANSPORTATION MAP
OHIO DEPARTMENT OF TRANSPORTATION
COLUMBUS
Springfield
Zanesville
MUNICIPALITIES
COMMUNITIES
FYI

Ohio Department of Natural Resources
Natural Areas, Ohio Scenic Rivers Program
2045 Morse Road, Building C-3
Columbus, OH 43229-6693
(614) 265-6453

Ohio Scenic Rivers Program

Ohio Rivers also listed as National Wild and Scenic Rivers
Little Beaver Creek, Big and Little Darby Creeks and Little Miami River

THE NATIONAL WILD AND SCENIC RIVERS SYSTEM
www.rivers.gov

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in the lower 48 states and one-half mile on rivers outside national parks in Alaska in order to protect river-related values.

Rivers are classified as wild, scenic, or recreational.

(1) Wild river areas — Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) Scenic river areas — Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) Recreational river areas — Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Regardless of classification, each river in the National System is administered with the goal of protecting and enhancing the values that caused it to be designated. Designation neither prohibits development nor gives the federal government control over private property. Recreation, agricultural practices, residential development, and other uses may continue. Protection of the river is provided through voluntary stewardship by landowners and river users and through regulation and programs of federal, state, local, or tribal governments. In most cases not all land within boundaries is, or will be, publicly owned, and the Act limits how much land the federal government is allowed to acquire from willing sellers. Visitors to these rivers are cautioned to be aware of and respect private property rights.

The Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the country's most outstanding free-flowing rivers. To accomplish this, it prohibits federal support for actions, such as the construction of dams or other instream activities, that would harm the river's free-flowing condition, water quality, or outstanding resource values. However, designation does not affect existing water rights or the existing jurisdiction of states and the federal government over waters as determined by established principles of law.

With the passage of the Omnibus Public Land Management Act of 2009, the National System protects more than 12,500 miles of 203 rivers in 39 states and the Commonwealth of Puerto Rico; this is a little more than one-third of one percent of the nation's rivers. By comparison, more than 75,000 large dams across the country have modified at least 600,000 miles, or about 17%, of American rivers.

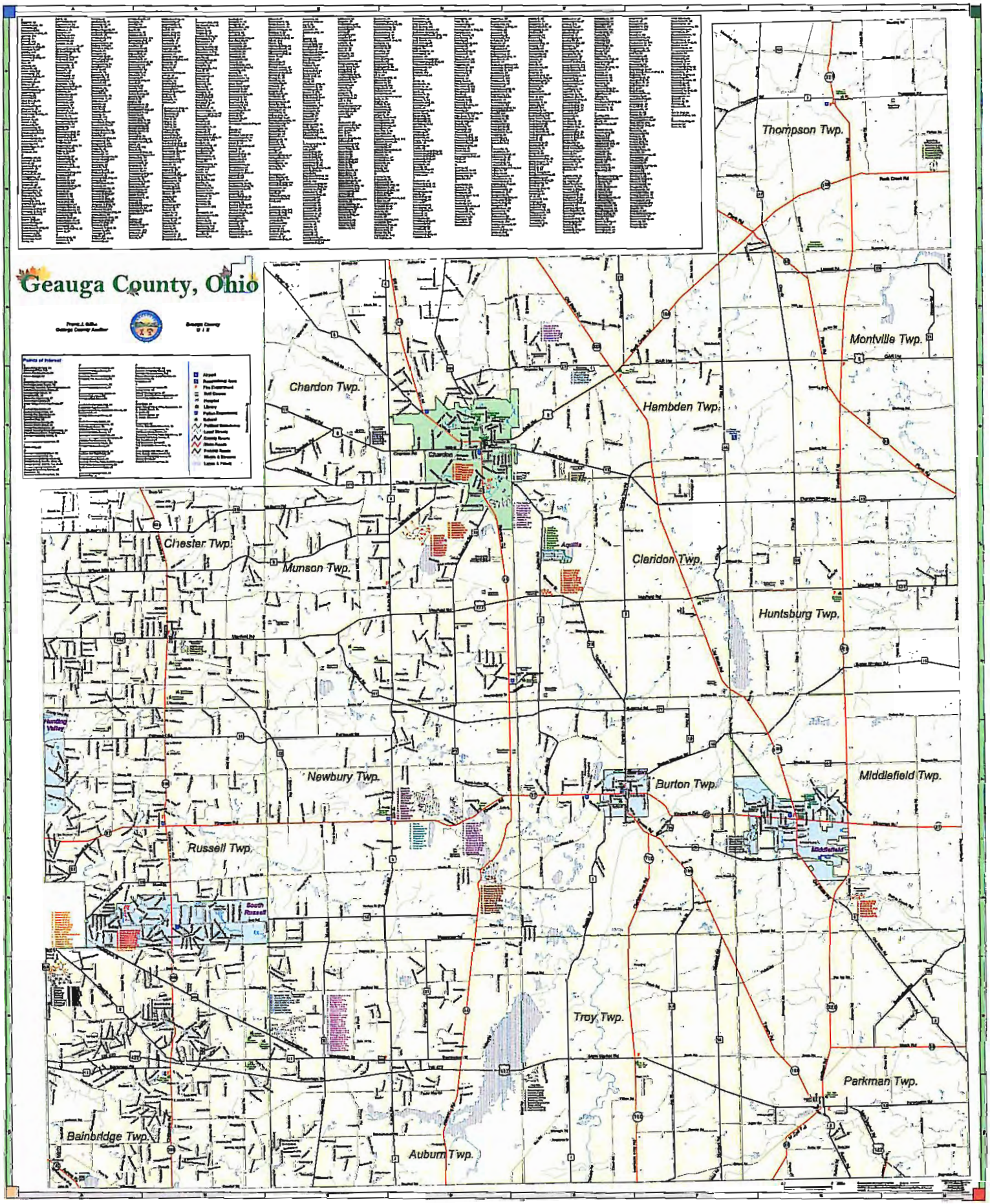
For general questions concerning the wild and scenic rivers program, refer to the Interagency Wild and Scenic Rivers Coordinating Council website at **www.rivers.gov** or contact one of the following:

USDA Forest Service
U.S. Department of Agriculture
Wilderness and Wild and Scenic Rivers
201 - 14th Street, SW
Washington, DC 20250

Bureau of Land Management
U.S. Department of the Interior
National Landscape Conservation Service
1620 L Street, NW
Washington, DC 20036

U.S. Fish and Wildlife Service
U.S. Department of the Interior
National Wildlife Refuge System
Division of Natural Resources
4401 North Fairfax Drive (ARL-670)
Arlington, VA 22203

National Park Service
U.S. Department of the Interior
Conservation and Outdoor Recreation
1849 C Street, NW
Org Code - 2240
Washington, DC 20240


Geauga County, Ohio
Thompson Twp.
Montville Twp.
Chardon Twp.
Hambden Twp.
Chester Twp.
Munson Twp.
Claridon Twp.
Huntsburg Twp.
Newbury Twp.
Burton Twp.
Middlefield Twp.
Russell Twp.
Troy Twp.
Parkman Twp.
Bainbridge Twp.
Auburn Twp.

Soil Map—Geauga County, Ohio

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:6,390 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Geauga County, Ohio
Survey Area Data: Version 13, Jan 27, 2010

Date(s) aerial images were photographed: 7/1/2004

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Geauga County, Ohio (OH055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
LyB	Loudonville silt loam, 2 to 6 percent slopes	3.9	2.3%
LyC	Loudonville silt loam, 6 to 12 percent slopes	16.1	9.5%
RsB	Rittman silt loam, 2 to 6 percent slopes	6.5	3.8%
RsC	Rittman silt loam, 6 to 12 percent slopes	2.3	1.4%
RsC2	Rittman silt loam, 6 to 12 percent slopes, eroded	10.6	6.3%
WbB	Wadsworth silt loam, 2 to 6 percent slopes	130.5	76.8%
Totals for Area of Interest		**170.0**	**100.0%**

U.S. Fish and Wildlife Service

National Wetlands Inventory

Kenston

Aug 2, 2010

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deetwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

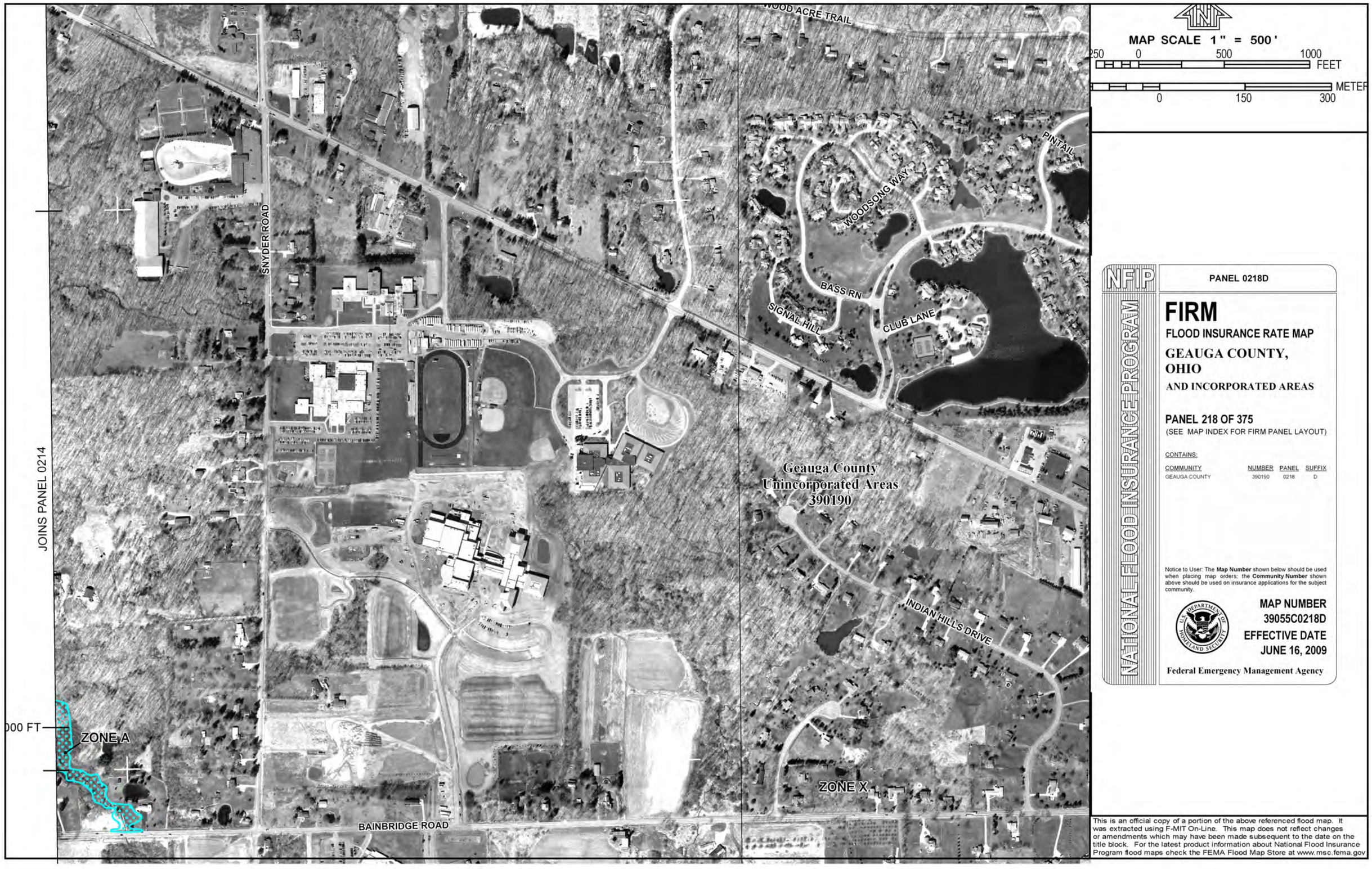
Riparian

- Herbaceous
- Forested/Shrub

Status

- Digital
- Scan
- Non-Digital
- No Data

User Remarks:



MAP SCALE 1" = 500'

250 0 500 1000 FEET

0 150 300 METER

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0218D

FIRM

FLOOD INSURANCE RATE MAP

GEAUGA COUNTY, OHIO

AND INCORPORATED AREAS

PANEL 218 OF 375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GEAUGA COUNTY	390190	0218	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

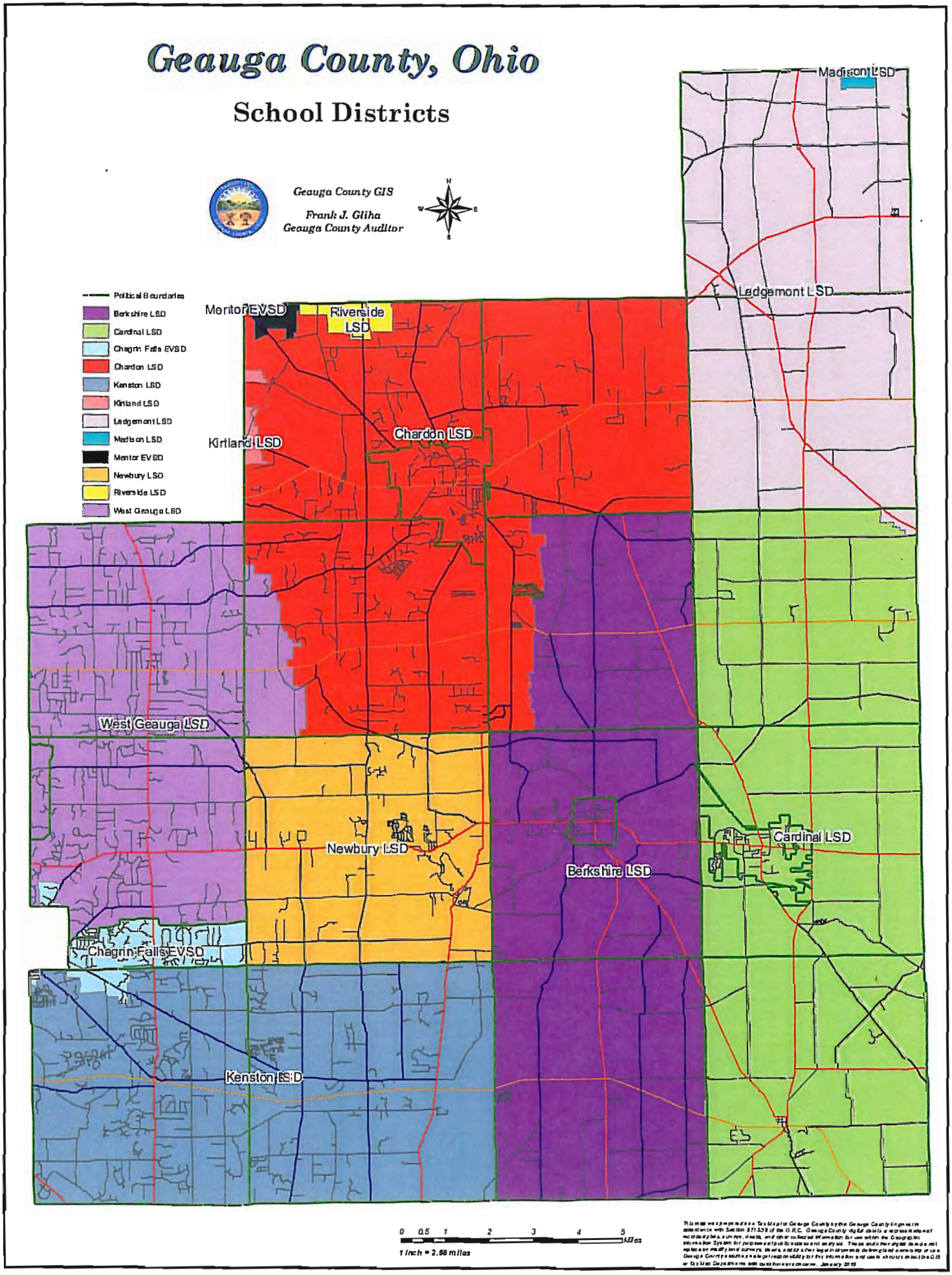
MAP NUMBER
39055C0218D
EFFECTIVE DATE
JUNE 16, 2009

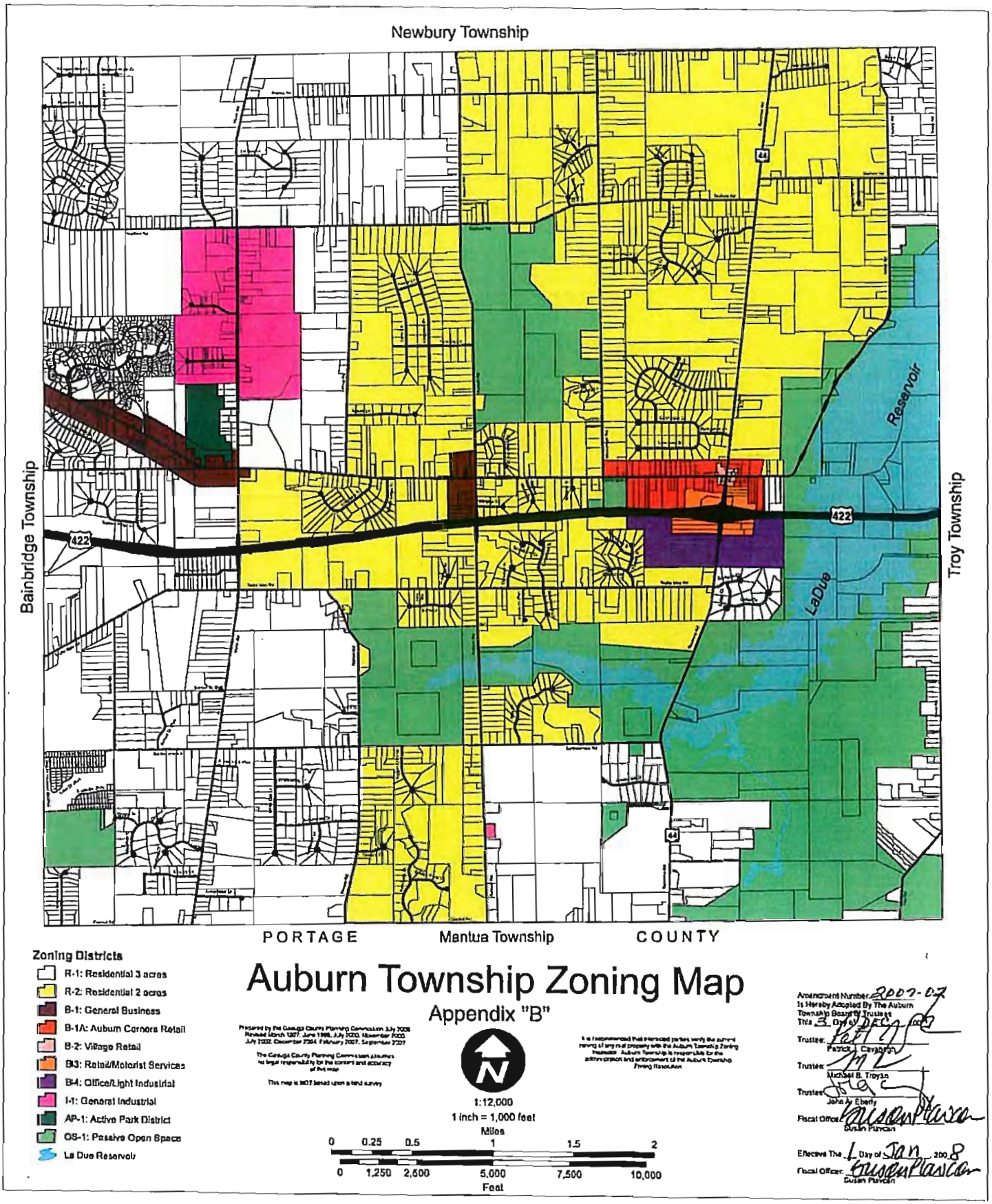
Federal Emergency Management Agency

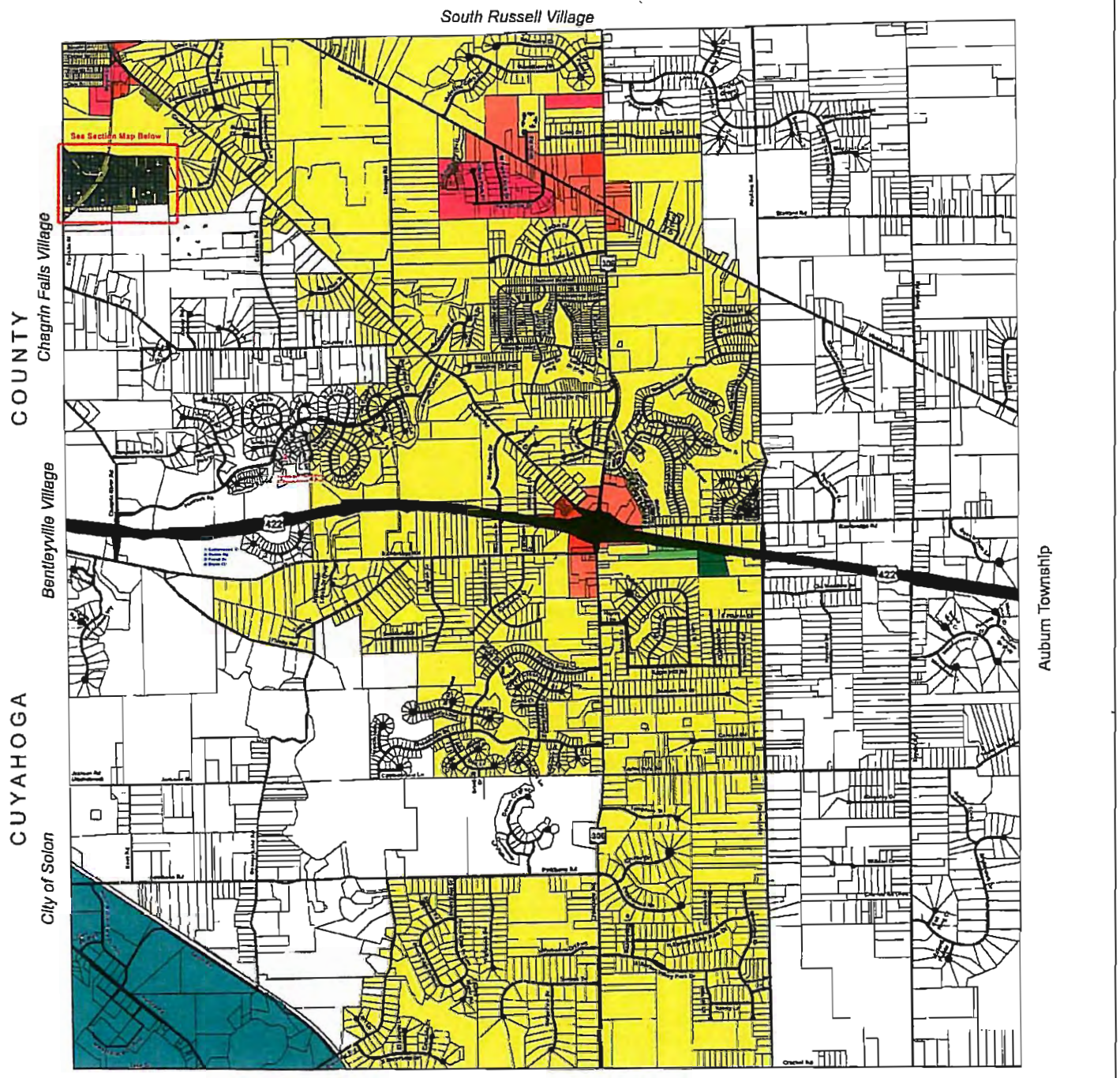
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Geauga County, Ohio

School Districts




Newbury Township
Bainbridge Township
Troy Township
PORTAGE
Mantua Township
COUNTY
422
44
LaDue Reservoir
Zoning Districts
R-1: Residential 3 acres
R-2: Residential 2 acres
B-1: General Business
B-1A: Auburn Corners Retail
B-2: Village Retail
B3: Retail/Motorist Services
B-4: Office/Light Industrial
I-1: General Industrial
AP-1: Active Park District
OS-1: Passive Open Space
La Due Reservoir
Auburn Township Zoning Map
Appendix "B"
1:12,000
1 inch = 1,000 feet
Miles
0 0.25 0.5 1 1.5 2
0 1,250 2,500 5,000 7,500 10,000
Feet
Amendment Number 2007-07
Is Hereby Adopted By The Auburn
Township Geauga Trustees
This 3 Day of DEC
Trustee: Patrick J. Clayton
Trustee: Michael B. Troyan
Trustee: John A. Eberly
Fiscal Officer: Susan Plasco
Effective The 1 Day of Jan 2008
Fiscal Officer: Susan Plasco



Bainbridge Township Zoning Map

Section Map of Chagrin Falls Park

Prepared by: The Geauga County Planning Commission * 971.
Rev May 1993, Dec. 1993, May 1994, August 2000, November 2000
Note: The Geauga County Planning Commission does not warrant the accuracy of this map. It is not based upon a land survey.
Revised January 2008.

Zoning Districts

- R-3A: Rural Residential
- R-5A: Rural Open Residential
- CB: Convenience Business
- CR: Commercial Recreation
- PO: Professional Office
- LIR: Light Industry Restricted
- PPP: Passive Public Park
- APP: Active Public Park

1 inch = 1,000 feet

0 1,000 2,000 4,000 6,000 8,000 Feet

Amendment No. Z-00-4 is Hereby Adopted By The Bainbridge Township Board Of Trustees This 6th Day Of November, 2000

Charles S. Hanna, Trustee
Christopher Horn, Trustee
Samuel Desiderio, Trustee

Effective The 6th Day of December, 2000.

Susan Angelino, Clerk

Lot Lines And Roads Updated This 25 Day Of June 2008

Linda W. White, Trustee

Jeffrey S. Hunkley, Trustee

Susan R. Langhorn, Fiscal Officer

APPENDIX B:

VISUALIZATION, PHOTO ANALYSIS & SHADOW FLICKER ANALYSIS

THE RENAISSANCE GROUP

A Conserve First Company

Kenston Local Schools
Wind Turbine Project
Turbine Visualization and Photo Analysis

Prepared for:
Kenston Local Schools

Prepared by:
The Renaissance Group, a Conserve First LLC Company
AAron Godwin, Founder, AAron@ConserveFirst.com
Dick Kotapish, GIS Specialist, Dick@ConserveFirst.com
8281 Euclid Chardon Road, Suite E
Kirtland, OH, 44094
(440) 256-2800
www.ConserveFirst.com

Submitted September 2, 2010

Thank You for Choosing The Renaissance Group, a Conserve First LLC Company

Introduction

Although the visual impact of wind turbine installations is highly subjective, some people consider them a tremendous asset to their landscape and community and others say "not in my backyard". This said, it is often beneficial to get a sense of what an installation will look like before it is installed. The actual visibility of a turbine installation is affected by many factors: the size of the machine, the number of machines, tower and blade tip heights, turbine color, distance to the viewer, obstructions such as trees, hills and buildings, atmospheric conditions, Sun angle and even the curvature of the Earth. All things considered, the overall height of a turbine, obstructions in the sightline between the viewer and the turbine and the distance between the machine and the viewer has the greatest impact. Even in open unobstructed ground very tall towers become very small in the distance and even the largest of machines can be blocked by relatively short obstructions close to the viewer. All this said, when in an open sightline in close proximity, a modern wind turbine can be an imposing or an awe inspiring presence in the view-shed pending ones point of view. In all such cases, few would argue that the turbine was not a significant element of the said view-shed. (Further understanding concerning the relative view-shed size of turbines at distance and their visibility in relation to obstructions can be viewed on the following addendums at the end of this report: Horizon View Impact Calculator, Example Turbine View Calculator, Wind Turbine Visibility Over Obstruction Tables and Sample Wind Turbine View Calculator.)

Methods

Using field surveys, mathematical modeling and stake holder interests, the study team identified representative sightline locations for actual turbine visualization studies. At these sites, precise location logs were taken with accompanying photographs toward the turbine site. Camera bearings were confirmed using detailed maps and compass bearings. The camera height above ground was approximately 68" and the tilt was maintained at zero degrees/level. The camera's focal length was maintained at 28 mm which was entered into the rendering software and which approximates a typical person's field of view for the camera used, or approximately 65%. WindPro 2.7, an internationally accepted wind project modeling software, was used to create the visualizations. The software uses the input data such as turbine location, viewer location, topographical baselines maps, turbine model and height, camera bearing, camera tilt and camera focal length to calculate the distance of the turbine, its perspective height, differential ground levels and Sun angles to correctly locate, scale and shade the turbine onto the base sightline photograph. The technician then verifies for scale and location using secondary plots. The technician also manually removes the portions of the turbine overlay that would be blocked by the obstruction shown in the photo that would between the viewer and the turbine.

Special consideration was given to identifying potentially historically or culturally significant view-sheds for historic buildings, sites and landscapes. This review was done in conjunction with the local Historical Society and utilizing the Ohio Historic Preservation Office database.

Panoramic photos were also taken at sample locations including the turbine installation site.

A Sony DSC-HX1 camera was used for all source imagery.

Results

See the following pages for representative turbine visualizations. Due to local obstruction proximities and densities to typical sightlines such as trees and buildings, much of the community will not be able to see the turbine. Due to local topography, the turbine will be most visible for sites to the South. This said, due to

perspective, the turbine will appear as a very small element of the skyline for most locations where it is visible similar to the regions existing communication towers and granaries.

No historical or cultural site view-sheds were found that would be significantly impacted by the turbines installation.

For sites not modeled, the Report's included "Visualization Tables" can be used to determine approximate turbine visibility in relationship to viewer obstructions. A "Sample Wind Turbine View Calculator" has also been developed to mathematically model locations of concern upon community request, a sample of which is included in this report.

Kenston Visualizations Log

Set Number	Picture Number	Distance from Turbine (miles)	Site Description	Latitude	Longitude	Direction
1	1269	0.15	Entrance near Radio Station/Tennis Courts	41° 23' 40.48" N	81° 18' 28.79" W	90°
2	1291	0.16	17446 Snyder	41° 23' 46.59" N	81° 18' 28.10" W	136°
3	1298	0.26	9490 Washington	41° 23' 53.66" N	81° 18' 14.09" W	194°
4	1302	0.43	17485 Indian Hills Drive	41° 23' 34.87" N	81° 17' 49.08" W	285°
5	1310	0.44	South Entrance of School	41° 23' 17.50" N	81° 18' 13.88" W	352°
6	1332	0.80	From 422	41° 23' 01.71" N	81° 18' 37.69" W	21°

Proposed Site Panoramic Photos Looking Out

Looking East

Looking South

Looking West

Looking North

Turbine View Visualizations

K-V-1

Entrance near Radio Station/Tennis Courts

K-V-2

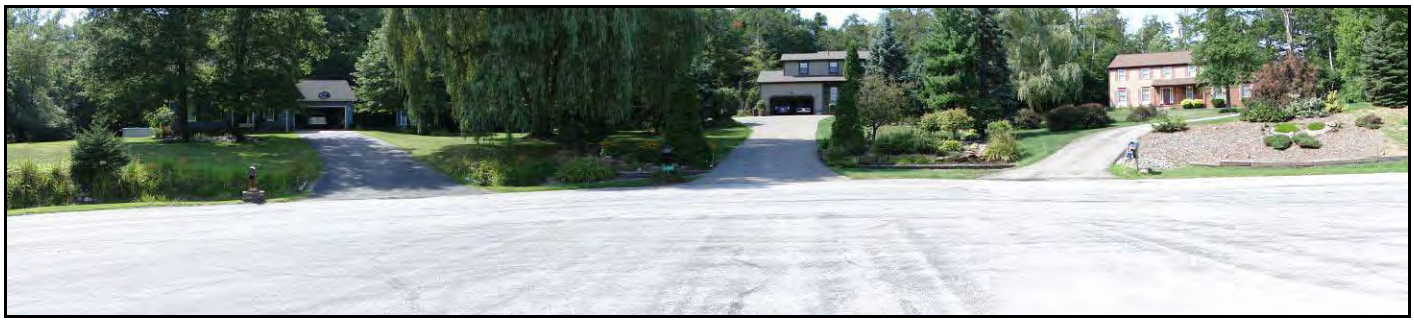
17446 Snyder

K-V-3

9490 Washington

K-V-4

17485 Indian Hills Drive
Not Visible Behind Trees



K-V-5

South Entrance of School

K-V-6

From 422
Barely Visible Behind Trees

Example Images of Other Regional Tall Structures

Radio Tower on Kenston Middle School (155')

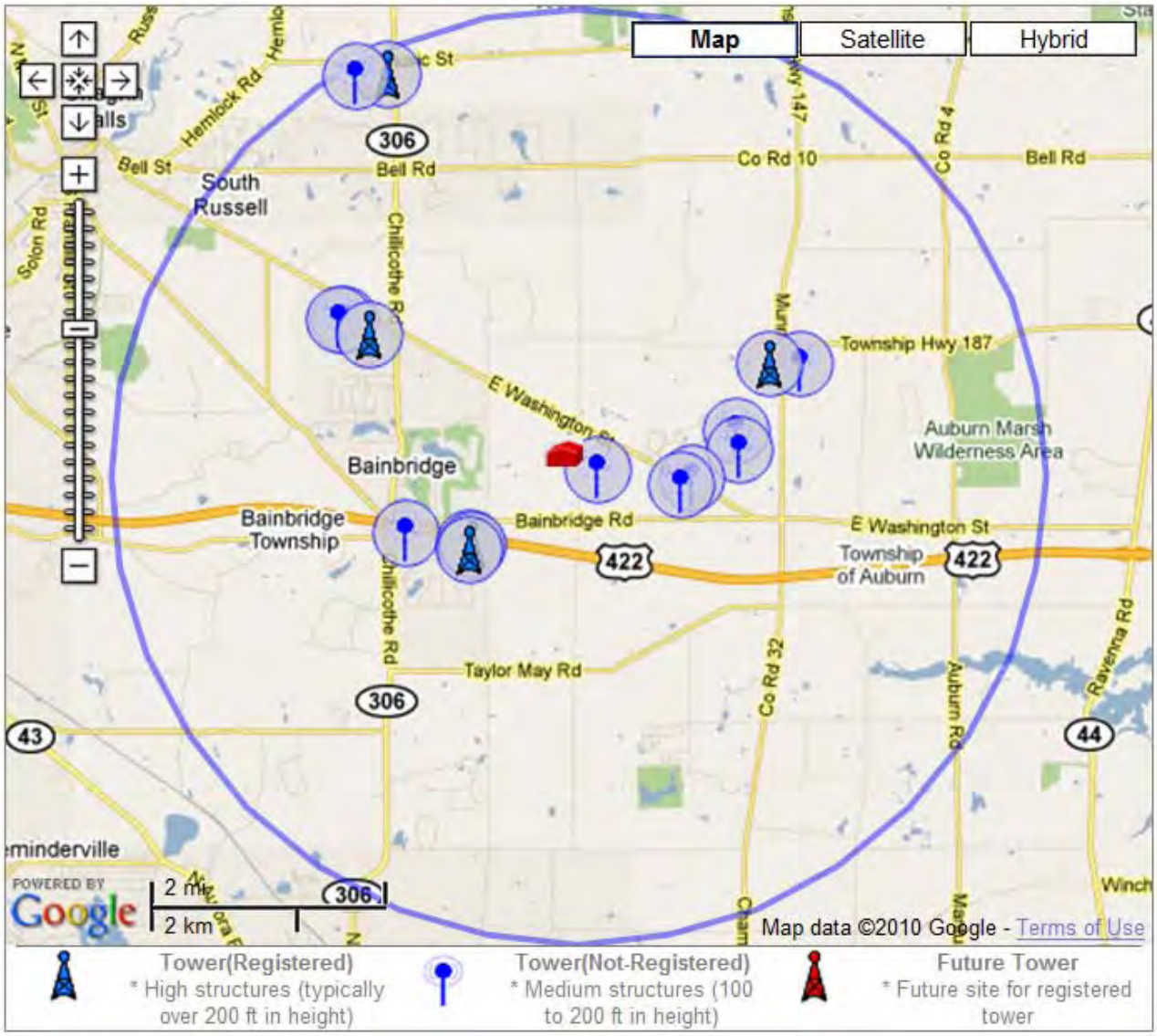
Cell Tower Behind Indian Hills Drive

Cell Tower Off of Washington Street

(Also See Tall Tower Map and Tables Below)

Existing Tall Towers Within 4 Miles of The Proposed Turbine Site

- **Tower Structures - (17419 Snyder Rd, Chagrin Falls, OH 44023)**



Registered Towers			
1	American Towers, Inc.	294 feet	1.21 miles
2	Towerco Assets Llc	264 feet	2.12 miles
2	New Cingular Wireless Pcs, Llc	199 feet	2.43 miles
4	Alltel Ohio Limited Partnership	269 feet	3.69 miles

Non-Registered Towers			
1	Kenston Local School District	275 feet	.20 miles
2	At&t Wireless Pcs Inc	199 feet	1.05 miles
3	Nextel West Corp	199 feet	1.16 miles
4	American Tower	294 feet	1.26 miles
5	Verizon Wireless	190 feet	1.65 miles
6	Com Net Construction Services	295 feet	1.66 miles
7	Com Net Construction Services Inc	300 feet	1.83 miles
8	Sprintcom Inc	265 feet	2.42 miles
9	At&t Wireless Services	184 feet	2.70 miles
10	Sprintcom Inc	190 feet	2.75 miles
11	Nextel West Corp	187 feet	3.85 miles

Future Towers			
1	Geauga,county Of	259 feet	1.28 miles

Multiple Antennas on Listed Towers

1	Nextel License Holdings 4, Inc.	187 feet	3.86 miles
	Nextel License Holdings 4, Inc	187 feet	3.86 miles
	Nextel License Holdings 4, Inc.	187 feet	3.86 miles
2	Bainbridge Fire Dept	259 feet	1.28 miles
	Geauga, County Of	259 feet	1.28 miles
	Bainbridge, Township Of	NA	1.27 miles
	Bainbridge, Township Of	NA	1.27 miles
3	Geauga, County Of	259 feet	1.30 miles
	Geauga, County Of	NA	1.30 miles
4	Bainbridge, Township Of	36 feet	2.06 miles
	Ohio, State Of, Highway Patrol	46 feet	2.06 miles
	Bainbridge, Township Of	49 feet	2.06 miles
5	Chargin Valley Citizens Radio Group	NA	3.94 miles
	Chargin Valley Citizens Radio Group	51 feet	3.94 miles
6	Alltel Ohio Limited Partnership	295 feet	1.26 miles
	Fibertower Network Services Corp.	280 feet	1.25 miles

See the Website below for full details on these sites including precise locations, heights and frequencies.

http://www.antennasearch.com/

Single Antennas on Area Towers

7	Nextel License Holdings 4, Inc.	199 feet	1.16 miles
8	Kenston School District	16 feet	.26 miles
9	Kenston Local Schools	NA	.40 miles
10	Bainbridge, Township Of	49 feet	1.11 miles
11	Tanglewood Country Club	NA	1.32 miles
12	Resource America Inc	NA	1.46 miles
13	Wegener, Dave	NA	1.92 miles
14	Cathan Farms	NA	1.96 miles
15	Margan Ent Inc	NA	2.02 miles
16	Bainbridge, Township Of	39 feet	2.28 miles
17	Solon Excavators Sand & Gravel Inc	NA	2.56 miles
18	South Russell, Village Of	NA	2.99 miles
19	Chagrin Falls Exempted Schools	16 feet	3.27 miles
20	Russell, Township Of	NA	3.58 miles
21	Auburn Volunteer Fire Dept Inc	135 feet	3.75 miles
22	Kenston Local School District	151 feet	.11 miles
23	Metropolitan Area Networks, Inc.	294 feet	1.23 miles
24	New Par	190 feet	1.66 miles
25	Mci Worldcom Network Services Inc	170 feet	1.67 miles
26	Fibertower Network Services Corp.	199 feet	2.45 miles
27	Fibertower Network Services Corp.	185 feet	3.71 miles

See the Website below for full details on these sites including but not limited to: precise locations, heights, frequencies and owners.

http://www.antennasearch.com/

Horizon View Impact Calculator

Rotor Diameter	144.3	Feet

Viewer Distance From Turbine		Percent of Total Horizon View-shed Affected	Percent of Total Average Persons Field of View Affected
Feet	Miles		
100	0.02	22.97%	100.00%
200	0.04	11.48%	68.90%
400	0.08	5.74%	34.45%
800	0.15	2.87%	17.22%
1,600	0.30	1.44%	8.61%
3,200	0.61	0.72%	4.31%
5,280	1.00	0.43%	2.61%
10,560	2.00	0.22%	1.30%
15,840	3.00	0.14%	0.87%
21,120	4.00	0.11%	0.65%
26,400	5.00	0.09%	0.52%
52,800	10.00	0.04%	0.26%

Assumptions:

Model assumes absolute worst case for all variables.

Viewer is stationary, focused and looking directly at and centered on the turbine.

Viewer's field of view is 60 degrees.

Model assumes no sightline obstructions, crystal clear atmospheric visibility and 100% of the turbine is visible.

Model assumes the largest rotor diameter under consideration for the site.

Model assumes the turbine rotor is perpendicular to and fully visible to the viewer.

Model assumes worst case as if the turbine rotor diameter influences the entire column of the horizon as if the turbine was a solid plane covering the entire portion of the horizon at a width of the turbine's rotor.

Sample Turbine View Calculations

Baselines For Calculations

Turbine Height to Blade Tip	273	Feet
Turbine Height to Hub	196.8	Feet
Persons Eye Height	5.5	Feet

Based on Level Ground.

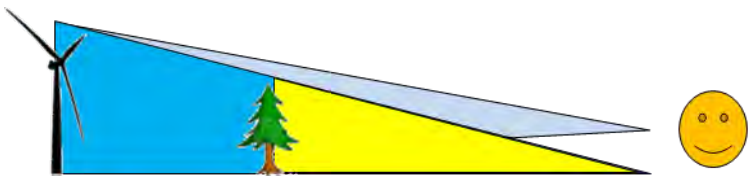
Listed Obstruction Height (Feet)
Will Block Turbine View
Within Listed Distance of Viewer (Feet)

		Typical One Story House or Short Tree		Typical Two Story House or Tree		Typical Tall Tree or Tall Building		Apparent Height of Turbine at 3' Arm's Length (Inches Tall) (If You Could See the Entire Turbine)
Obstruction Height (Feet)		17.5		35		70		
Minimum Visible Target to be Blocked		Hub Up	Blade Tip	Hub Up	Blade Tip	Hub Up	Blade Tip	
Viewer Distance From Turbine (Feet)	500	23	18	57	44	126	97	23.9
	1000	47	36	115	88	251	193	11.9
	1500	70	54	172	133	377	290	8.0
	2000	93	72	230	177	502	387	6.0
	2500	117	90	287	221	628	483	4.8
	3000	140	108	344	265	753	580	4.0
	3500	163	126	402	310	879	677	3.4
	4000	187	144	459	354	1004	774	3.0
	4500	210	162	517	398	1130	870	2.7
	5000	234	180	574	442	1255	967	2.4

Example: At a distance of 2,500 feet from the turbine your view of the turbine would be blocked by any 17.5 foot structure or tree if it was less than 90 feet from you. The apparent height of an unobstructed turbine view at this distance would 4.8 inches tall at a 3 foot arms length from your eye.

Typical community and natural obstructions will block the view of the turbine for many residences and businesses, even some in close proximity to the site.

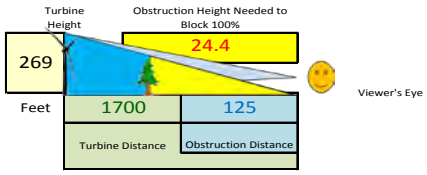
Values are approximate.



Sample Wind Turbine Visibility Over Obstructions Tables

Turbine Information:

	Feet	Meters
Tower Height	196.9	60.0
Rotor Diameter	144.4	44.0
Tip Height	269.0	82.0
Eye Height	5.0	1.5



Example: Using the tables below, a wind turbine 1700 feet away from you would be blocked by any obstruction over 24.8 feet tall 125 feet or less away from you. Based on flat ground and provided eye height. As can be seen, relatively low obstructions close to the viewer typical of many residential, urban or wooded areas will completely obstruct your view of a wind turbine.

Obstruction Height \ Turbine Distance	100	125	150	175	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
10	31.4	26.1	22.6	20.1	18.2	13.8	11.6	10.3	9.4	8.8	8.3	7.9	7.6	7.4	7.2	7.0	6.9	6.8	6.7	6.6	6.5	6.4	6.3
20	57.8	47.2	40.2	35.2	31.4	22.6	18.2	15.6	13.8	12.5	11.6	10.9	10.3	9.8	9.4	9.1	8.8	8.5	8.3	8.1	7.9	7.8	7.6
30	84.2	68.4	57.8	50.3	44.6	31.4	24.8	20.8	18.2	16.3	14.9	13.8	12.9	12.2	11.6	11.1	10.7	10.3	10.0	9.7	9.4	9.2	9.0
40	110.6	89.5	75.4	65.3	57.8	40.2	31.4	26.1	22.6	20.1	18.2	16.7	15.6	14.6	13.8	13.1	12.5	12.0	11.6	11.2	10.9	10.6	10.3
50	137.0	110.6	93.0	80.4	71.0	49.0	38.0	31.4	27.0	23.9	21.5	19.7	18.2	17.0	16.0	15.2	14.4	13.8	13.3	12.8	12.3	11.9	11.6
60	163.4	131.7	110.6	95.5	84.2	57.8	44.6	36.7	31.4	27.6	24.8	22.6	20.8	19.4	18.2	17.2	16.3	15.6	14.9	14.3	13.8	13.3	12.9
70	189.8	152.9	128.2	110.6	97.4	66.6	51.2	42.0	35.8	31.4	28.1	25.5	23.5	21.8	20.4	19.2	18.2	17.3	16.6	15.9	15.3	14.7	14.2
80	216.2	174.0	145.8	125.7	110.6	75.4	57.8	47.2	40.2	35.2	31.4	28.5	26.1	24.2	22.6	21.2	20.1	19.1	18.2	17.4	16.7	16.1	15.6
90	242.6	195.1	163.4	140.8	123.8	84.2	64.4	52.5	44.6	38.9	34.7	31.4	28.8	26.6	24.8	23.3	22.0	20.8	19.9	19.0	18.2	17.5	16.9
100	269.0	216.2	181.0	155.9	137.0	93.0	71.0	57.8	49.0	42.7	38.0	34.3	31.4	29.0	27.0	25.3	23.9	22.6	21.5	20.5	19.7	18.9	18.2
125	NA	269.0	225.0	193.6	170.0	115.0	87.5	71.0	60.0	52.1	46.3	41.7	38.0	35.0	32.5	30.4	28.6	27.0	25.6	24.4	23.3	22.4	21.5
150	NA	NA	269.0	231.3	203.0	137.0	104.0	84.2	71.0	61.6	54.5	49.0	44.6	41.0	38.0	35.5	33.3	31.4	29.8	28.3	27.0	25.8	24.8
175	NA	NA	NA	269.0	236.0	159.0	120.5	97.4	82.0	71.0	62.8	56.3	51.2	47.0	43.5	40.5	38.0	35.8	33.9	32.2	30.7	29.3	28.1
200	NA	NA	NA	NA	269.0	181.0	137.0	110.6	93.0	80.4	71.0	63.7	57.8	53.0	49.0	45.6	42.7	40.2	38.0	36.1	34.3	32.8	31.4
225	NA	NA	NA	NA	NA	203.0	153.5	123.8	104.0	89.9	79.3	71.0	64.4	59.0	54.5	50.7	47.4	44.6	42.1	39.9	38.0	36.3	34.7
250	NA	NA	NA	NA	NA	225.0	170.0	137.0	115.0	99.3	87.5	78.3	71.0	65.0	60.0	55.8	52.1	49.0	46.3	43.8	41.7	39.7	38.0
500	NA	NA	NA	NA	NA	NA	NA	269.0	225.0	193.6	170.0	151.7	137.0	125.0	115.0	106.5	99.3	93.0	87.5	82.7	78.3	74.5	71.0
1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	269.0	245.0	225.0	208.1	193.6	181.0	170.0	160.3	151.7	144.0	137.0

Obstruction Height \ Turbine Distance	2100	2200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300
10	6.3	6.2	7.0	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.3	6.2	6.1	6.1	6.1	6.0	6.0	5.9	5.9	5.9	5.9	5.8	5.8
20	7.5	7.4	9.1	8.8	8.5	8.3	8.1	7.9	7.8	7.6	7.5	7.4	7.3	7.2	7.1	7.0	7.0	6.9	6.8	6.8	6.7	6.7	6.6
30	8.8	8.6	11.1	10.7	10.3	10.0	9.7	9.4	9.2	9.0	8.8	8.6	8.4	8.3	8.2	8.0	7.9	7.8	7.7	7.6	7.6	7.5	7.4
40	10.0	9.8	13.1	12.5	12.0	11.6	11.2	10.9	10.6	10.3	10.0	9.8	9.6	9.4	9.2	9.1	8.9	8.8	8.6	8.5	8.4	8.3	8.2
50	11.3	11.0	15.2	14.4	13.8	13.3	12.8	12.3	11.9	11.6	11.3	11.0	10.7	10.5	10.3	10.1	9.9	9.7	9.6	9.4	9.3	9.1	9.0
60	12.5	12.2	17.2	16.3	15.6	14.9	14.3	13.8	13.3	12.9	12.5	12.2	11.9	11.6	11.3	11.1	10.9	10.7	10.5	10.3	10.1	10.0	9.8
70	13.8	13.4	19.2	18.2	17.3	16.6	15.9	15.3	14.7	14.2	13.8	13.4	13.0	12.7	12.4	12.1	11.8	11.6	11.4	11.2	11.0	10.8	10.6
80	15.1	14.6	21.2	20.1	19.1	18.2	17.4	16.7	16.1	15.6	15.1	14.6	14.2	13.8	13.4	13.1	12.8	12.5	12.3	12.0	11.8	11.6	11.4
90	16.3	15.8	23.3	22.0	20.8	19.9	19.0	18.2	17.5	16.9	16.3	15.8	15.3	14.9	14.5	14.1	13.8	13.5	13.2	12.9	12.7	12.4	12.2
100	17.6	17.0	25.3	23.9	22.6	21.5	20.5	19.7	18.9	18.2	17.6	17.0	16.5	16.0	15.6	15.2	14.8	14.4	14.1	13.8	13.5	13.3	13.0
125	20.7	20.0	30.4	28.6	27.0	25.6	24.4	23.3	22.4	21.5	20.7	20.0	19.3	18.8	18.2	17.7	17.2	16.8	16.4	16.0	15.6	15.3	15.0
150	23.9	23.0	35.5	33.3	31.4	29.8	28.3	27.0	25.8	24.8	23.9	23.0	22.2	21.5	20.8	20.2	19.7	19.1	18.7	18.2	17.8	17.4	17.0
175	27.0	26.0	40.5	38.0	35.8	33.9	32.2	30.7	29.3	28.1	27.0	26.0	25.1	24.3	23.5	22.8	22.1	21.5	20.9	20.4	19.9	19.4	19.0
200	30.1	29.0	45.6	42.7	40.2	38.0	36.1	34.3	32.8	31.4	30.1	29.0	28.0	27.0	26.1	25.3	24.6	23.9	23.2	22.6	22.0	21.5	21.0
225	33.3	32.0	50.7	47.4	44.6	42.1	39.9	38.0	36.3	34.7	33.3	32.0	30.8	29.8	28.8	27.8	27.0	26.2	25.5	24.8	24.2	23.6	23.0
250	36.4	35.0	55.8	52.1	49.0	46.3	43.8	41.7	39.7	38.0	36.4	35.0	33.7	32.5	31.4	30.4	29.4	28.6	27.8	27.0	26.3	25.6	25.0
500	67.9	65.0	106.5	99.3	93.0	87.5	82.7	78.3	74.5	71.0	67.9	65.0	62.4	60.0	57.8	55.8	53.9	52.1	50.5	49.0	47.6	46.3	45.0
1000	130.7	125.0	208.1	193.6	181.0	170.0	160.3	151.7	144.0	137.0	130.7	125.0	119.8	115.0	110.6	106.5	102.8	99.3	96.0	93.0	90.2	87.5	85.0

Obstruction Height \ Turbine Distance	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500	4600	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600
10	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
20	6.6	6.5	6.5	6.4	6.4	6.4	6.3	6.3	6.3	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.0	6.0	6.0	6.0	6.0	5.9
30	7.3	7.3	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.8	6.7	6.7	6.7	6.6	6.6	6.6	6.5	6.5	6.5	6.4	6.4
40	8.1	8.0	7.9	7.9	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.3	7.3	7.2	7.2	7.2	7.1	7.1	7.0	7.0	7.0	6.9	6.9
50	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.4
60	9.7	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8
70	10.4	10.3	10.1	10.0	9.9	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.9	8.8	8.7	8.6	8.6	8.5	8.4	8.4	8.3
80	11.2	11.0	10.9	10.7	10.6	10.4	10.3	10.2	10.0	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.1	9.0	8.9	8.8	8.8
90	12.0	11.8	11.6	11.4	11.3	11.1	10.9	10.8	10.7	10.5	10.4	10.3	10.2	10.1	10.0	9.8	9.8	9.7	9.6	9.5	9.4	9.3	9.2
100	12.8	12.5	12.3	12.1	11.9	11.8	11.6	11.4	11.3	11.1	11.0	10.9	10.7	10.6	10.5	10.4	10.3	10.2	10.1	10.0	9.9	9.8	9.7
125	14.7	14.4	14.2	13.9	13.7	13.5	13.3	13.0	12.9	12.7	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.3	11.2	11.1	11.0	10.9
150	16.6	16.3	16.0	15.7	15.4	15.2	14.9	14.7	14.4	14.2	14.0	13.8	13.6	13.4	13.3	13.1	12.9	12.8	12.6	12.5	12.3	12.2	12.1
175	18.6	18.2	17.8	17.5	17.2	16.8	16.6	16.3	16.0	15.7	15.5	15.3	15.0	14.8	14.6	14.4	14.2	14.1	13.9	13.7	13.6	13.4	13.3
200	20.5	20.1	19.7	19.3	18.9	18.5	18.2	17.9	17.6	17.3	17.0	16.7	16.5	16.2	16.0	15.8	15.6	15.4	15.2	15.0	14.8	14.6	14.4
225	22.5	22.0	21.5	21.1	20.6	20.2	19.9	19.5	19.1	18.8	18.5	18.2	17.9	17.6	17.4	17.1	16.9	16.6	16.4	16.2	16.0	15.8	15.6
250	24.4	23.9	23.3	22.8	22.4	21.9	21.5	21.1	20.7	20.4	20.0	19.7	19.3	19.0	18.8	18.5	18.2	17.9	17.7	17.5	17.2	17.0	16.8
500	43.8	42.7	41.7	40.7	39.7	38.8	38.0	37.2	36.4	35.7	35.0	34.3	33.7	33.1	32.5	31.9	31.4	30.9	30.4	29.9	29.4	29.0	28.6
1000	82.7	80.4	78.3	76.4	74.5	72.7	71.0	69.4	67.9	66.4	65.0	63.7	62.4	61.2	60.0	58.9	57.8	56.8	55.8	54.8	53.9	53.0	52.1

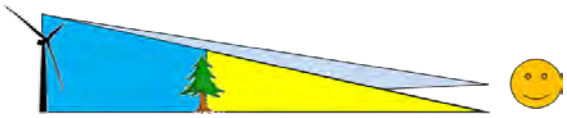
Obstruction Height \ Turbine Distance	5700	5800	5900	6000	6100	6200	6300	6400	6500	6600	6700	6800	6900	7000	7100	7200	7300	7400	7500	7600	7700	7800	7900
10	5.5	5.5	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.3	5.3	5.3	5.3
20	5.9	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
30	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.0	6.0	6.0	6.0
40	6.9	6.8	6.8	6.8	6.7	6.7	6.7	6.7	6.6	6.6	6.6	6.6	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.4	6.4	6.3
50	7.3	7.3	7.2	7.2	7.2	7.1	7.1	7.1	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.8	6.8	6.8	6.8	6.7	6.7	6.7	6.7
60	7.8	7.7	7.7	7.6	7.6	7.6	7.5	7.5	7.4	7.4	7.4	7.3	7.3	7.3	7.2	7.2	7.2	7.1	7.1	7.1	7.1	7.0	7.0
70	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.8	7.7	7.7	7.6	7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.4	7.3
80	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.9	7.8	7.8	7.7	7.7	7.7
90	9.2	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0
100	9.6	9.6	9.5	9.4	9.3	9.3	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3
125	10.8	10.7	10.6	10.5	10.4	10.3	10.2	10.2	10.1	10.0	9.9	9.9	9.8	9.7	9.6	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.2
150	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.7	10.6	10.5	10.4	10.4	10.3	10.2	10.1	10.1	10.0
175	13.1	13.0	12.8	12.7	12.6	12.5	12.3	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.2	11.1	11.0	10.9	10.8
200	14.3	14.1	14.0	13.8	13.7	13.5	13.4	13.3	13.1	13.0	12.9	12.8	12.7	12.5	12.4	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7
225	15.4	15.2	15.1	14.9	14.7	14.6	14.4	14.3	14.1	14.0	13.9	13.7	13.6	13.5	13.4	13.3	13.1	13.0	12.9	12.8	12.7	12.6	12.5
250	16.6	16.4	16.2	16.0	15.8	15.6	15.5	15.3	15.2	15.0	14.9	14.7	14.6	14.4	14.3	14.2	14.0	13.9	13.8	13.7	13.6	13.5	13.4
500	28.2	27.8	27.4	27.0	26.6	26.3	26.0	25.6	25.3	25.0	24.7	24.4	24.1	23.9	23.6	23.3	23.1	22.8	22.6	22.4	22.1	21.9	21.7
1000	51.3	50.5	49.8	49.0	48.3	47.6	46.9	46.3	45.6	45.0	44.4	43.8	43.3	42.7	42.2	41.7	41.2	40.7	40.2	39.7	39.3	38.8	38.4

Sample Wind Turbine View Calculator

		Address	Longitude	Latitutude
Project Turbine	Kenston Local Schools	17419 Snyder Road Chagrin Falls Ohio	81° 18' 17.99" W	41° 23' 39.61" W

Suject Viewpoint Property

Point of View — Sample



	User Inputs	Calculations

Turbine Information:	Feet	Meters	Notes:
Tower Height	196.9	60.0	
Rotor Diameter	144.4	44.0	
Tip Height	269.0	82.0	
Turbine Location Elevation Above Sea-level	1252.0	381.6	

Viewpoint Information:	Feet	Meters	Notes:
Viewpoint Distance From Turbine	500.0	152.4	
Viewpoint Eye Height Above Ground	5.5	1.7	
Viewpoint Ground Elevation Above Sea-level	1260.0	384.0	
Net Viewpoint Ground Elevation Above Sea-level	1265.5	385.7	Eye height + ground elevation above sea-level (Level Line For Calculations)

Obstruction Information:	Feet	Meters	Notes:
Obstruction Distance From Viewpoint	125.0	38.1	
Obstruction Height Above Ground	35.0	10.7	
Obstruction Ground Elevation Above Sea-level	1265.0	385.6	
Net Obstruction Height Above Sea-Level	1300.0	396.2	

Results:			Notes:	
Will The Turbine Be Visible?	Yes	48.7%	Percent of Total Turbine and Tower	
Relative Visible Turbine Height at Obstruction Distance	32.8	10.0	Feet / Meters	Usefull for landscape scale
Actual Portion of Turbine Showing	131.0	39.9	Feet / Meters	
Will Blades Be Visible?	Yes	91%	Percent Rotor Diameter	
Will Hub Be Visible?	Yes			
Apparent Height of Visible Portion of Turbine, at Distance From Eye Below	0.524	0.2	Feet / Meters	
	6.3	16.0	Inches / Centimeters	
Distance From Eye	2	0.61	Feet / Meters	

Although this calculator does take into account relative topography, it does not take into account the width of obstructions or their shape. It calculates on a single vertical plane at a time. Although a good guide, it should only be used as a rough indicator of the magnitude of potential turbine visibility from a particular viewpoint.

THE RENAISSANCE GROUP

A Conserve First Company

Kenston Local Schools
Wind Turbine Project
Shadow Flicker Analysis

Prepared for:
Kenston Local Schools

Prepared by:
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Submitted September 2, 2010

Thank You for Choosing The Renaissance Group, a Conserve First LLC Company

Introduction

Proposed Turbine Location: Kenston Local Schools
17419 Snyder Road
Chagrin Falls, Ohio 44023

Latitude: 41° 23' 39.61" N
Longitude: 81° 18' 17.99" W

While all tall objects cast shadows, wind turbines, due to their spinning blades, can cause moving/flickering shadows which can become an annoyance, especially in residential areas when they pass over windows. Fortunately, while the adverse effects of shadows can be subjective, the shadows themselves can be precisely modeled for location and duration. While modeling shadows for location knowing the latitude of site, the topography and the height and rotor diameter of a wind turbine is a precise science, quantifying the frequency of the shadow's actual occurrence is more difficult due to changing weather patterns affecting the actual Sun's intensity and presence. Further, weather patterns affect the orientation of the wind turbines blades as they follow the wind and hence their orientation to the Sun and the site. In short, on a cloudy day, there will be no shadows, and similarly, when the blades are parallel or close to parallel to the observer, none to limited moving shadow will be visible, and of course, if the wind is not sufficiently blowing to rotate the blades of the turbine, you will not have any moving shadow. Further, it is important to note the higher the angle of the Sun, the shorter the reach of the shadow and the smaller the area of potential impact. Further yet, it also important to note, due to the diffusion of light over distance, shadow intensity drops off significantly with distance. The thickness of the obstruction to the Sun, in this case the blades, also plays significantly into the actual apparent intensity and realized length of shadows. It is for these reasons that shadow distances over ten rotor diameters away from the turbine are considered insignificant. For shadow receptor sites within a turbine's shadow's reach, not all will receive shadow due to existing obstructions that block the shadows path such as other buildings, hills or trees. While evergreen trees will fairly consistently block shadows year-round, deciduous trees will have a lesser impact in the winter months when they have no leaves. Pending the density of the tree stand, single tree to an entire wooded area, winter shadows in these situations can go from being just slightly diffused to still totally obstructed. To properly model the true impacts of shadow flicker, all these considerations must be taken into account. Unobstructed shadows in latitudes similar to this study site will typically have a bow tie or flatten cross shape. In the winter, the sun rises lower on the horizon in the Southeast and sets in the Southwest and in the Summer, the Sun rises in the Northeast and sets in the Northwest all creating a path or area of potential shadow. The southern portion of the bowtie typically is larger due to there being more sunny days in the Summer although Winter shadows will be longer overall and tend to last for longer periods due to the lower angle of the Sun's rays. You will typically see more impacts in alignment with the site's predominate wind direction due to the corresponding predominate turbine blade orientation perpendicular to this direction and thus more visible moving shadows in this direction.

Although no official US policy has been adopted, international standards appear to be in consensus that flickering shadows in excess of thirty hours per year impacting a particular location are considered a potential nuisance.[i] This said, the qualitative impacts of the shadows are subjective.

When considering potential health impacts from wind turbine shadows/flicker, photosensitivity triggered epilepsy is the only issue that is discussed and has been dismissed for mid to large scale modern wind turbines such as the one being considered by the site due to turbine operating frequencies being too low to trigger seizures. According to the British Epilepsy Association, approximately five percent of individuals with epilepsy have sensitivity to light, and most people with photosensitive epilepsy are sensitive to flickering around 16-25Hz (Hertz or Hz = 1 flash per second), although some people may be sensitive to rates as low as 3Hz and as high as 60Hz (British Epilepsy Association, 2007). Specific to wind power projects, the British Epilepsy Association (2007) states that there is no evidence that wind turbines can trigger seizures, and newer wind commercial scale turbines are built to operate at a frequency of 1Hz or less. This conclusion is also supported by the epilepsy thresholds published by the American Epilepsy Foundation.[ii] Therefore, health effects due to projected shadow flicker are not anticipated or further evaluated. The primary concern with shadow flicker is the annoyance it could cause for adjacent home and business owners.

Methods

WindPro 2.7, an internationally accepted software modeling tool, was used to generate the areas of potential shadow flicker impact around the proposed turbine installation site. The software imports historic weather variable averages from the nearest national weather station to obtain average numbers of days with sunshine and the average wind direction distributions. Local Latitude drives the solar path models. Local topographical information is input to determine if there are any natural geographic influences such as hills or valleys. The turbine information including tower height and rotor diameter are input as variables to the location's shadow source models. Rotor diameter is also used to determine the study area of influence, a ten rotor diameters radius around the turbine or 1,443 feet for the largest rotor diameter being considered for this site, based on internationally accepted standards.[iii] Wind turbine operational variables for the site are also input which correspond to the turbine's overall percentage of operational time such as percentage of time when the wind speed is too low to rotate the blades and industry norms for availability driven from scheduled and unscheduled maintenance downtime. Wind speed Weibull distributions are from The Renaissance Group and State of Ohio wind data sets and models. Trees and other local obstructions are not considered in the base model (although can be added if desired) and thus the model can be considered a worst case, as if no obstructions existed. If a particular shadow receptor is found to be of potential concern, a receptor specific analysis of potential shadow flicker hours and occurrence periods/times is conducted, otherwise, the results are plotted for the area as a whole as average not-to-exceed threshold iso-lines on the map. Models were run at a two thousand meter hyper-conservative distance well beyond the likely observable shadows for this location and the turbines under consideration. For the playing field locations, extra-wide

and tall receptor windows were used of 100' x 100' to better insure potential impact recording. With this in mind, it is important to note that the model records all potential impacts as if they impacted the entire receptor, while in reality, they will only impact a relatively small portion of these large receptors at a given time.

Results

See "Kenston WTG Shadow Flicker Analysis" map for a visualization of the results. No homes or occupied business structures outside the owner's property within the turbines shadow influence will receive significant flickering shadows of over 30 hours per year. Two to three houses to the Southwest of the site could receive less than ten hours of moving shadows per year, but the shadows would likely be highly diffused to completely blocked due to existing trees. While portions of the Middle School to the Northwest of the site will receive significant shadowing of over 30 hours per year, the structure has no windows facing the turbine. It is also worth noting that the portion of the building closest to the turbine is the maintenance garage. The tennis courts to the Southwest will receive moving morning shadows up to almost fifty hours per year during sunny late fall to early spring mornings. The stadium to the Northeast of the site will receive significant moving shadows throughout much of the year from late afternoon into the evenings. To a lesser extent, the playing fields further to the East and Northeast will also receive moving shadows for 10 to 20 hours per year. For the periods when shadowing events will overlap scheduled sporting or other use events for any of these locations, the school has adopted a policy that will temporarily shut down the turbine during the shadows impact on the playing fields. The financial loss to the school district from this policy will be minimal due to the short duration of the shadow events and the fact the sporting events typically last only a few hours, and further, that shutdowns will only need to occur during sunny weather. (See below for further information and recommendations for the potentially impacted receptor sites.) (Also see "Turbine Use, Safety Policies and General Background" document for information on the Schools Turbine policies relating to shadow flicker.)

Models were run using a hyper-conservative two thousand meters, a distance well beyond the industry norm of ten rotor diameters, to insure full reporting of potential impacts. The models show the same iso-lines contour results for general shadow hour thresholds based on the actual average site conditions, but the tabular information shows worse case shadow hours and the potential hours of impact for particular receptor locations, as if it was always sunny. Also, note the further away from the turbine a receptor is the less intense the shadow will be. Beyond ten rotor diameters, shadows will be diffuse and difficult to see.

Overview of Tabular Results for Particular Sample Receptors:

- Receptor A: 990 Feet Away: Elementary School to East: Shadows will be rare, but possible in mid-April to early-May and from mid-August to late-August evenings with a total average of less than 7 hours of moving shadow per year possible.
- Receptor B: 930 Feet Away: 17430 Snyder Road: Shadows will not impact this receptor.
- Receptor C: 1830 Feet Away: 17360 Wood Acre Trail Shadows will not impact this receptor

- Receptor D: 1,085 Feet Away: 17405 Snyder Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees, but possible during portions of mid to late May and the first couple of days in August with a total average of less than 11 hours of moving morning shadow per year.

- Receptor E: 1,030 Feet Away: 17406 Snyder Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees including evergreens, but possible during portions of very late-January to late-February and mid-October to mid-November mornings with a total average of less than 5 hours of moving shadow per year.

- Receptor F: 920 Feet Away: 17446 Snyder Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees, but possible during portions of mid-March to mid-April and middle September mornings with a total average of less than 6 hours of moving morning shadow per year.

- Receptor G: 950 Feet Away: 17476 Snyder Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees, but possible during portions of mid to late May and early-August mornings with a total average of less than 17 hours of moving morning shadow per year.

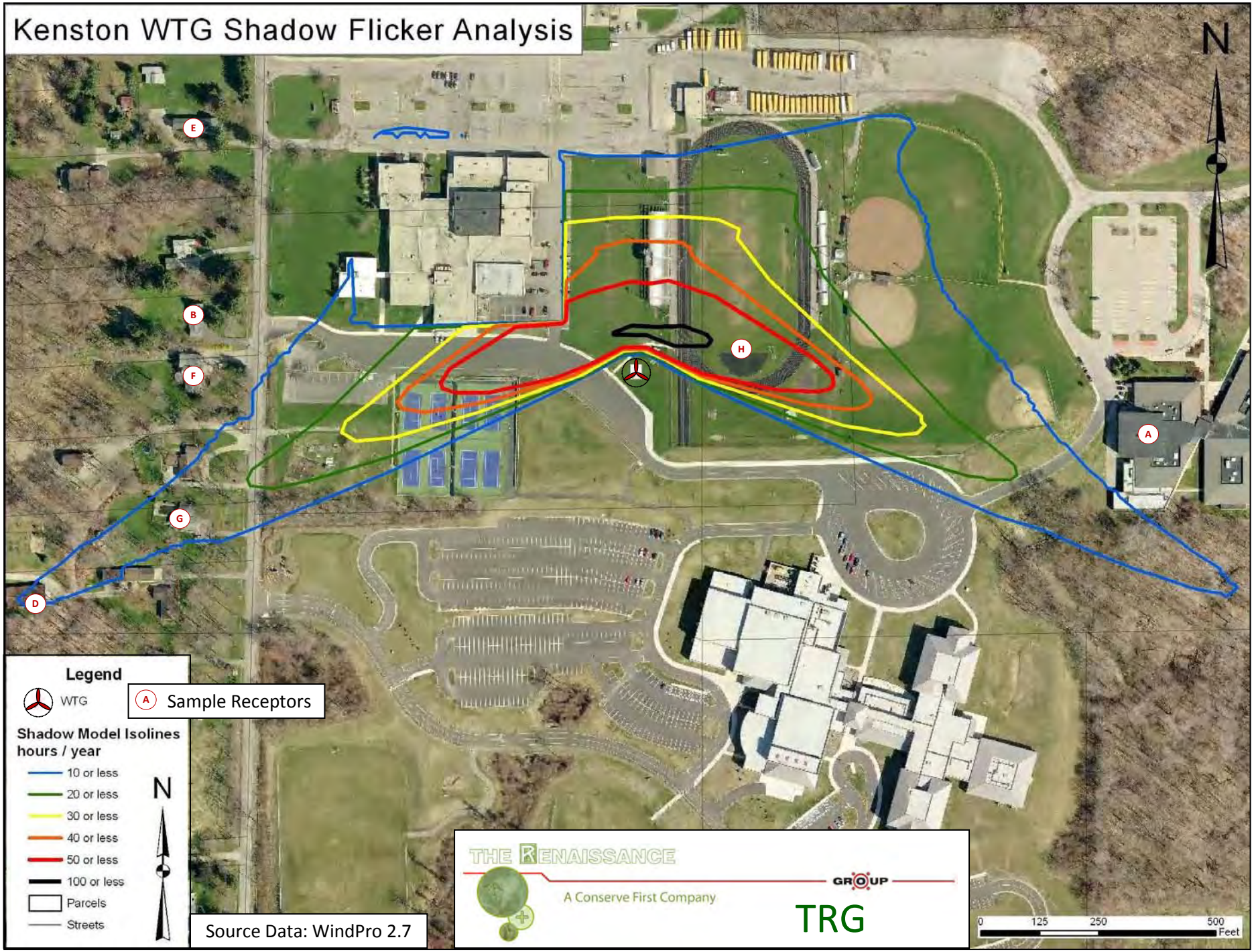
- Receptor H: 150 Feet Away: Stadium: Shadows will be distinct during most evenings of the year on some portion of the stadium field except late-May to mid-August with a total average of less than 147 hours of moving shadow per year.

The duration of particular shadow events can vary from a minute to hours pending the receptor. See the following tables at the end of this report for precise dates and times where shadows could occur for each listed sample receptor.

Note the iso-line diagram on the following page shows hour thresholds of shadow impact based on average site conditions with results being referenced to one meter squares of potential impact, i.e. a meter square area within an iso-line area will receive up to the threshold of shadow hours per year. As the tabular information represents larger areas and adds up the entire receptor as if it was one location, its cumulative hour results may be higher. This equates to watching if a shadow will enter a window to watching if it will enter any portion of an entire ball field or yard. Although impacts can be subjective, shadows impacting a specific receptor window are considered significantly more severe than those that impact a yard.

Recommendations

Based on the study findings, no occupied structure will receive over 30 hours of moving shadow per year, the currently accepted consensus on nuisance thresholds for moving shadows/flickering. No local, State or Federal policy or regulation exists to govern shadow flicker thresholds. This said, some receptors will receive some shadow which the affect of will be subjective to the receptor owners' views on the project and their sensitivity. With this in mind, the study authors would recommend that the project site owner follow the guidelines and mediation strategies outlined in "Turbine Use, Safety Policies and General Background".



Project:
Kenston Shadow Receptor Potential Impacts Analysis, 2000 Meters

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Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Main Result

Calculation: Shadow081410

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
380	329	251	247	262	379	436	377	417	706	782	866

W	WNW	NW	NNW	Sum
679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: 2ftAubBain.wpo (2)
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10 m

Scale 1:12,500
New WTG
Shadow receptor

WTGs

	UTM WGS84 Zone: 17				WTG type						Shadow data	
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
	UTM WGS84 Zone: 17		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	474,503	4,582,579	381.7	Kenston WTG	No	BONUS	MK IV-600/120	600	44.0	60.0	2,000	27.0

Shadow receptor-Input

No.	UTM WGS84 Zone: 17 East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	474,833	4,582,536	378.0	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
B	474,220	4,582,661	376.3	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
C	474,978	4,582,902	377.5	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
D	474,106	4,582,446	362.3	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
E	474,219	4,582,743	376.5	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
F	474,217	4,582,614	374.8	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
G	474,207	4,582,496	368.9	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
H	474,561	4,582,638	383.4	30.0	30.0	0.2	-180.0	90.0	"Green house mode"

Project:
Kenston

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AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Main Result

Calculation: Shadow081410

Calculation Results

Shadow receptor

No.	**Shadow, expected values** Shadow hours per year [h/year]
A	6:27
B	0:00
C	0:00
D	10:27
E	4:19
F	5:52
G	16:32
H	146:50

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	Kenston WTG	762:49	185:38

Project:
Kenston

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AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** A - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (1)

Assumptions for shadow calculations

Maximum distance for influence	2,000	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April		May		June	July	August		September	October	November	December
1	07:52	07:38	07:01	07:10		06:24	18:58 (1)	05:55	05:56	06:20		06:51	07:22	06:56	07:32
	17:06	17:41	18:16	19:50		20:21	22 19:20 (1)	20:52	21:03	20:45		20:02	19:09	17:22	16:57
2	07:52	07:37	07:00	07:08		06:23	18:59 (1)	05:54	05:56	06:21		06:52	07:23	06:58	07:33
	17:07	17:42	18:17	19:51		20:23	19 19:18 (1)	20:52	21:03	20:44		20:00	19:07	17:21	16:57
3	07:52	07:36	06:58	07:07		06:21	19:01 (1)	05:54	05:57	06:22		06:53	07:24	06:59	07:34
	17:08	17:44	18:18	19:52		20:24	15 19:16 (1)	20:53	21:03	20:42		19:57	19:05	17:19	16:57
4	07:52	07:35	06:57	07:05		06:20	19:03 (1)	05:54	05:57	06:23		06:54	07:25	07:00	07:35
	17:09	17:45	18:19	19:53		20:25	11 19:14 (1)	20:54	21:03	20:41		19:55	19:04	17:18	16:57
5	07:52	07:34	06:55	07:03		06:19		05:53	05:58	06:24		06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55		20:26		20:55	21:03	20:40		19:53	19:02	17:17	16:56
6	07:52	07:33	06:54	07:02		06:18		05:53	05:58	06:25		06:56	07:27	07:02	07:37
	17:11	17:47	18:21	19:56		20:27		20:55	21:02	20:39		19:52	19:00	17:16	16:56
7	07:52	07:32	06:52	07:00		06:16		05:53	05:59	06:26		06:57	07:28	07:04	07:38
	17:12	17:49	18:23	19:57		20:28		20:56	21:02	20:38		19:50	18:59	17:15	16:56
8	07:52	07:30	07:50	06:59		06:15		05:52	06:00	06:27	19:16 (1)	06:58	07:29	07:05	07:39
	17:13	17:50	19:24	19:58		20:29		20:57	21:02	20:37	4 19:20 (1)	19:48	18:57	17:14	16:56
9	07:52	07:29	07:49	06:57		06:14		05:52	06:00	06:28	19:12 (1)	06:59	07:30	07:06	07:39
	17:14	17:51	19:25	19:59		20:30		20:57	21:01	20:35	12 19:24 (1)	19:47	18:55	17:13	16:56
10	07:52	07:28	07:47	06:55		06:13		05:52	06:01	06:29	19:10 (1)	07:00	07:31	07:07	07:40
	17:15	17:53	19:26	20:00		20:31		20:58	21:01	20:34	16 19:26 (1)	19:45	18:54	17:11	16:56
11	07:51	07:27	07:45	06:54		06:12		05:52	06:02	06:30	19:07 (1)	07:01	07:32	07:09	07:41
	17:16	17:54	19:27	20:00		20:32		20:58	21:01	20:33	20 19:27 (1)	19:43	18:52	17:10	16:56
12	07:51	07:26	07:44	06:52	19:08 (1)	06:11		05:52	06:02	06:31	19:06 (1)	07:02	07:33	07:10	07:42
	17:17	17:55	19:28	20:01	8 19:16 (1)	20:33		20:59	21:00	20:31	22 19:28 (1)	19:41	18:51	17:09	16:56
13	07:51	07:24	07:42	06:50	19:05 (1)	06:10		05:52	06:03	06:32	19:04 (1)	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	15 19:20 (1)	20:34		20:59	21:00	20:30	25 19:29 (1)	19:40	18:49	17:09	16:56
14	07:50	07:23	07:40	06:49	19:02 (1)	06:09		05:52	06:04	06:33	19:03 (1)	07:04	07:36	07:12	07:44
	17:19	17:58	19:31	20:03	20 19:22 (1)	20:35		21:00	20:59	20:29	27 19:30 (1)	19:38	18:47	17:08	16:57
15	07:50	07:22	07:39	06:47	19:00 (1)	06:08		05:52	06:05	06:34	19:02 (1)	07:05	07:37	07:13	07:44
	17:20	17:59	19:32	20:04	23 19:23 (1)	20:36		21:00	20:59	20:27	28 19:30 (1)	19:36	18:46	17:07	16:57
16	07:50	07:20	07:37	06:46	18:59 (1)	06:07		05:52	06:05	06:35	19:02 (1)	07:06	07:38	07:15	07:45
	17:22	18:00	19:33	20:05	25 19:24 (1)	20:37		21:01	20:58	20:26	29 19:31 (1)	19:35	18:44	17:06	16:57
17	07:49	07:19	07:35	06:44	18:57 (1)	06:06		05:52	06:06	06:36	19:01 (1)	07:07	07:39	07:16	07:46
	17:23	18:01	19:34	20:06	27 19:24 (1)	20:38		21:01	20:58	20:25	30 19:31 (1)	19:33	18:43	17:05	16:57
18	07:49	07:18	07:34	06:43	18:57 (1)	06:05		05:52	06:07	06:37	19:00 (1)	07:08	07:40	07:17	07:46
	17:24	18:02	19:35	20:07	28 19:25 (1)	20:39		21:01	20:57	20:23	31 19:31 (1)	19:31	18:41	17:04	16:58
19	07:48	07:16	07:32	06:41	18:56 (1)	06:04		05:52	06:08	06:38	19:00 (1)	07:09	07:41	07:18	07:47
	17:25	18:04	19:36	20:09	29 19:25 (1)	20:40		21:02	20:56	20:22	31 19:31 (1)	19:29	18:40	17:04	16:58
20	07:47	07:15	07:30	06:40	18:55 (1)	06:03		05:52	06:09	06:39	19:00 (1)	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	31 19:26 (1)	20:41		21:02	20:56	20:20	31 19:31 (1)	19:28	18:38	17:03	16:59
21	07:47	07:13	07:29	06:38	18:54 (1)	06:02		05:52	06:10	06:40	18:59 (1)	07:11	07:44	07:20	07:48
	17:27	18:06	19:38	20:11	31 19:25 (1)	20:42		21:02	20:55	20:19	32 19:31 (1)	19:26	18:37	17:02	16:59
22	07:46	07:12	07:27	06:37	18:55 (1)	06:01		05:52	06:11	06:41	18:59 (1)	07:12	07:45	07:22	07:49
	17:29	18:07	19:39	20:12	31 19:26 (1)	20:43		21:03	20:54	20:17	31 19:30 (1)	19:24	18:35	17:01	16:59
23	07:46	07:11	07:25	06:35	18:55 (1)	06:01		05:53	06:11	06:42	18:59 (1)	07:13	07:46	07:23	07:49
	17:30	18:09	19:40	20:13	31 19:26 (1)	20:44		21:03	20:53	20:16	31 19:30 (1)	19:22	18:34	17:01	17:00
24	07:45	07:09	07:24	06:34	18:54 (1)	06:00		05:53	06:12	06:43	19:00 (1)	07:14	07:47	07:24	07:50
	17:31	18:10	19:42	20:14	31 19:25 (1)	20:45		21:03	20:52	20:14	29 19:29 (1)	19:21	18:32	17:00	17:01
25	07:44	07:08	07:22	06:32	18:55 (1)	05:59		05:53	06:13	06:44	19:00 (1)	07:15	07:48	07:25	07:50
	17:32	18:11	19:43	20:15	30 19:25 (1)	20:46		21:03	20:52	20:13	28 19:28 (1)	19:19	18:31	17:00	17:01
26	07:43	07:06	07:20	06:31	18:54 (1)	05:58		05:53	06:14	06:45	19:00 (1)	07:16	07:49	07:26	07:50
	17:34	18:12	19:44	20:16	30 19:24 (1)	20:47		21:03	20:51	20:11	27 19:27 (1)	19:17	18:30	16:59	17:02
27	07:42	07:05	07:19	06:29	18:55 (1)	05:58		05:54	06:15	06:46	19:01 (1)	07:18	07:50	07:27	07:51
	17:35	18:13	19:45	20:17	29 19:24 (1)	20:47		21:03	20:50	20:10	25 19:26 (1)	19:16	18:28	16:59	17:02
28	07:42	07:03	07:17	06:28	18:56 (1)	05:57		05:54	06:16	06:47	19:02 (1)	07:19	07:52	07:28	07:51
	17:36	18:14	19:46	20:18	27 19:23 (1)	20:48		21:03	20:49	20:08	22 19:24 (1)	19:14	18:27	16:58	17:03
29	07:41		07:15	06:27	18:56 (1)	05:57		05:55	06:17	06:48	19:03 (1)	07:20	07:53	07:30	07:51
	17:37		19:47	20:19	26 19:22 (1)	20:49		21:03	20:48	20:06	19 19:22 (1)	19:12	18:26	16:58	17:04
30	07:40		07:13	06:25	18:57 (1)	05:56		05:55	06:18	06:49	19:05 (1)	07:21	07:54	07:31	07:52
	17:39		19:48	20:20	24 19:21 (1)	20:50		21:03	20:47	20:05	15 19:20 (1)	19:11	18:24	16:58	17:05
31	07:39		07:12			05:55			06:19	06:50	19:09 (1)		07:55		07:52
	17:40		19:49			20:51			20:46	20:03	7 19:16 (1)		18:23		17:05
Potential sun hours	297	297	370	399		449		453	460	429		375	345	297	287
Total, worst case					96	4	7		6		72	5			
Sun reduction					0.57		0.62				0.65				
Oper. time red.					0.87		0.87				0.87				
Wind dir. red.					0.64		0.64				0.64				
Total reduction					0.32		0.34				0.36				
Total, real					57	1	3		2	07		2			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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8/28/2010 7:34 PM / 4

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** B - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (2)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:52	07:38	07:01	07:10	06:24	05:55	05:56	06:20	06:51	07:22	06:56	07:32
	17:07	17:41	18:16	19:50	20:21	20:52	21:03	20:45	20:02	19:09	17:22	16:57
2	07:52	07:37	07:00	07:08	06:23	05:55	05:56	06:21	06:52	07:23	06:58	07:33
	17:07	17:42	18:17	19:51	20:23	20:52	21:03	20:44	20:00	19:07	17:21	16:57
3	07:52	07:36	06:58	07:07	06:21	05:54	05:57	06:22	06:53	07:24	06:59	07:34
	17:08	17:44	18:18	19:52	20:24	20:53	21:03	20:43	19:57	19:05	17:19	16:57
4	07:52	07:35	06:57	07:05	06:20	05:54	05:57	06:23	06:54	07:25	07:00	07:35
	17:09	17:45	18:19	19:53	20:25	20:54	21:03	20:41	19:55	19:04	17:18	16:57
5	07:52	07:34	06:55	07:04	06:19	05:53	05:58	06:24	06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55	20:26	20:55	21:03	20:40	19:53	19:02	17:17	16:56
6	07:52	07:33	06:54	07:02	06:18	05:53	05:58	06:25	06:56	07:27	07:02	07:37
	17:11	17:48	18:21	19:56	20:27	20:55	21:02	20:39	19:52	19:00	17:16	16:56
7	07:52	07:32	06:52	07:00	06:16	05:53	05:59	06:26	06:57	07:28	07:04	07:38
	17:12	17:49	18:23	19:57	20:28	20:56	21:02	20:38	19:50	18:59	17:15	16:56
8	07:52	07:30	07:50	06:59	06:15	05:52	06:00	06:27	06:58	07:29	07:05	07:39
	17:13	17:50	19:24	19:58	20:29	20:57	21:02	20:37	19:48	18:57	17:14	16:56
9	07:52	07:29	07:49	06:57	06:14	05:52	06:00	06:28	06:59	07:30	07:06	07:39
	17:14	17:51	19:25	19:59	20:30	20:57	21:02	20:35	19:47	18:56	17:13	16:56
10	07:52	07:28	07:47	06:55	06:13	05:52	06:01	06:29	07:00	07:31	07:07	07:40
	17:15	17:53	19:26	20:00	20:31	20:58	21:01	20:34	19:45	18:54	17:12	16:56
11	07:51	07:27	07:45	06:54	06:12	05:52	06:02	06:30	07:01	07:32	07:09	07:41
	17:16	17:54	19:27	20:00	20:32	20:58	21:01	20:33	19:43	18:52	17:11	16:56
12	07:51	07:26	07:44	06:52	06:11	05:52	06:02	06:31	07:02	07:33	07:10	07:42
	17:17	17:55	19:28	20:01	20:33	20:59	21:00	20:31	19:41	18:51	17:10	16:56
13	07:51	07:24	07:42	06:50	06:10	05:52	06:03	06:32	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	20:34	20:59	21:00	20:30	19:40	18:49	17:09	16:56
14	07:50	07:23	07:40	06:49	06:09	05:52	06:04	06:33	07:04	07:36	07:12	07:44
	17:19	17:58	19:31	20:03	20:35	21:00	20:59	20:29	19:38	18:48	17:08	16:57
15	07:50	07:22	07:39	06:47	06:08	05:52	06:05	06:34	07:05	07:37	07:13	07:44
	17:21	17:59	19:32	20:04	20:36	21:00	20:59	20:27	19:36	18:46	17:07	16:57
16	07:50	07:20	07:37	06:46	06:07	05:52	06:05	06:35	07:06	07:38	07:15	07:45
	17:22	18:00	19:33	20:05	20:37	21:01	20:58	20:26	19:35	18:44	17:06	16:57
17	07:49	07:19	07:35	06:44	06:06	05:52	06:06	06:36	07:07	07:39	07:16	07:46
	17:23	18:01	19:34	20:06	20:38	21:01	20:58	20:25	19:33	18:43	17:05	16:57
18	07:49	07:18	07:34	06:43	06:05	05:52	06:07	06:37	07:08	07:40	07:17	07:46
	17:24	18:02	19:35	20:07	20:39	21:01	20:57	20:23	19:31	18:41	17:04	16:58
19	07:48	07:16	07:32	06:41	06:04	05:52	06:08	06:38	07:09	07:41	07:18	07:47
	17:25	18:04	19:36	20:09	20:40	21:02	20:56	20:22	19:29	18:40	17:04	16:58
20	07:47	07:15	07:30	06:40	06:03	05:52	06:09	06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41	21:02	20:56	20:20	19:28	18:38	17:03	16:59
21	07:47	07:13	07:29	06:38	06:02	05:52	06:10	06:40	07:11	07:44	07:20	07:48
	17:28	18:06	19:38	20:11	20:42	21:02	20:55	20:19	19:26	18:37	17:02	16:59
22	07:46	07:12	07:27	06:37	06:01	05:52	06:11	06:41	07:12	07:45	07:22	07:49
	17:29	18:07	19:39	20:12	20:43	21:03	20:54	20:17	19:24	18:35	17:01	17:00
23	07:46	07:11	07:25	06:35	06:01	05:53	06:11	06:42	07:13	07:46	07:23	07:49
	17:30	18:09	19:40	20:13	20:44	21:03	20:53	20:16	19:23	18:34	17:01	17:00
24	07:45	07:09	07:24	06:34	06:00	05:53	06:12	06:43	07:14	07:47	07:24	07:50
	17:31	18:10	19:42	20:14	20:45	21:03	20:52	20:14	19:21	18:32	17:00	17:01
25	07:44	07:08	07:22	06:32	05:59	05:53	06:13	06:44	07:15	07:48	07:25	07:50
	17:32	18:11	19:43	20:15	20:46	21:03	20:52	20:13	19:19	18:31	17:00	17:01
26	07:43	07:06	07:20	06:31	05:58	05:54	06:14	06:45	07:17	07:49	07:26	07:50
	17:34	18:12	19:44	20:16	20:47	21:03	20:51	20:11	19:17	18:30	16:59	17:02
27	07:43	07:05	07:19	06:29	05:58	05:54	06:15	06:46	07:18	07:51	07:27	07:51
	17:35	18:13	19:45	20:17	20:47	21:03	20:50	20:10	19:16	18:28	16:59	17:02
28	07:42	07:03	07:17	06:28	05:57	05:54	06:16	06:47	07:19	07:52	07:28	07:51
	17:36	18:15	19:46	20:18	20:48	21:03	20:49	20:08	19:14	18:27	16:58	17:03
29	07:41		07:15	06:27	05:57	05:55	06:17	06:48	07:20	07:53	07:30	07:51
	17:37		19:47	20:19	20:49	21:03	20:48	20:06	19:12	18:26	16:58	17:04
30	07:40		07:14	06:25	05:56	05:55	06:18	06:49	07:21	07:54	07:31	07:52
	17:39		19:48	20:20	20:50	21:03	20:47	20:05	19:11	18:24	16:58	17:05
31	07:39		07:12		05:55		06:19	06:50		07:55		07:52
	17:40		19:49		20:51		20:46	20:03		18:23		17:05
Potential sun hours	297	297	370	399	449	453	460	429	375	345	297	287
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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8/28/2010 7:34 PM / 5

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** C - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (3)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:52	07:38	07:01	07:10	06:24	05:55	05:56	06:20	06:51	07:22	06:56	07:32
	17:06	17:41	18:16	19:50	20:21	20:52	21:03	20:45	20:02	19:09	17:22	16:57
2	07:52	07:37	07:00	07:08	06:23	05:54	05:56	06:21	06:52	07:23	06:58	07:33
	17:07	17:42	18:17	19:51	20:23	20:52	21:03	20:44	20:00	19:07	17:20	16:57
3	07:52	07:36	06:58	07:07	06:21	05:54	05:57	06:22	06:53	07:24	06:59	07:34
	17:08	17:44	18:18	19:52	20:24	20:53	21:03	20:42	19:57	19:05	17:19	16:57
4	07:52	07:35	06:57	07:05	06:20	05:54	05:57	06:23	06:54	07:25	07:00	07:35
	17:09	17:45	18:19	19:53	20:25	20:54	21:03	20:41	19:55	19:04	17:18	16:57
5	07:52	07:34	06:55	07:03	06:19	05:53	05:58	06:24	06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55	20:26	20:55	21:03	20:40	19:53	19:02	17:17	16:56
6	07:52	07:33	06:54	07:02	06:18	05:53	05:58	06:25	06:56	07:27	07:02	07:37
	17:11	17:47	18:21	19:56	20:27	20:55	21:02	20:39	19:52	19:00	17:16	16:56
7	07:52	07:32	06:52	07:00	06:16	05:53	05:59	06:26	06:57	07:28	07:04	07:38
	17:12	17:49	18:23	19:57	20:28	20:56	21:02	20:38	19:50	18:59	17:15	16:56
8	07:52	07:30	07:50	06:59	06:15	05:52	06:00	06:27	06:58	07:29	07:05	07:39
	17:13	17:50	19:24	19:58	20:29	20:57	21:02	20:37	19:48	18:57	17:14	16:56
9	07:52	07:29	07:49	06:57	06:14	05:52	06:00	06:28	06:59	07:30	07:06	07:39
	17:14	17:51	19:25	19:59	20:30	20:57	21:01	20:35	19:47	18:55	17:13	16:56
10	07:52	07:28	07:47	06:55	06:13	05:52	06:01	06:29	07:00	07:31	07:07	07:40
	17:15	17:53	19:26	20:00	20:31	20:58	21:01	20:34	19:45	18:54	17:11	16:56
11	07:51	07:27	07:45	06:54	06:12	05:52	06:02	06:30	07:01	07:32	07:09	07:41
	17:16	17:54	19:27	20:00	20:32	20:58	21:01	20:33	19:43	18:52	17:10	16:56
12	07:51	07:26	07:44	06:52	06:11	05:52	06:02	06:31	07:02	07:33	07:10	07:42
	17:17	17:55	19:28	20:01	20:33	20:59	21:00	20:31	19:41	18:51	17:09	16:56
13	07:51	07:24	07:42	06:50	06:10	05:52	06:03	06:32	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	20:34	20:59	21:00	20:30	19:40	18:49	17:09	16:56
14	07:50	07:23	07:40	06:49	06:09	05:52	06:04	06:33	07:04	07:36	07:12	07:44
	17:19	17:58	19:31	20:03	20:35	21:00	20:59	20:29	19:38	18:47	17:08	16:57
15	07:50	07:22	07:39	06:47	06:08	05:52	06:05	06:34	07:05	07:37	07:13	07:44
	17:20	17:59	19:32	20:04	20:36	21:00	20:59	20:27	19:36	18:46	17:07	16:57
16	07:50	07:20	07:37	06:46	06:07	05:52	06:05	06:35	07:06	07:38	07:15	07:45
	17:22	18:00	19:33	20:05	20:37	21:01	20:58	20:26	19:35	18:44	17:06	16:57
17	07:49	07:19	07:35	06:44	06:06	05:52	06:06	06:36	07:07	07:39	07:16	07:46
	17:23	18:01	19:34	20:06	20:38	21:01	20:58	20:25	19:33	18:43	17:05	16:57
18	07:49	07:18	07:34	06:43	06:05	05:52	06:07	06:37	07:08	07:40	07:17	07:46
	17:24	18:02	19:35	20:07	20:39	21:01	20:57	20:23	19:31	18:41	17:04	16:58
19	07:48	07:16	07:32	06:41	06:04	05:52	06:08	06:38	07:09	07:41	07:18	07:47
	17:25	18:04	19:36	20:09	20:40	21:02	20:56	20:22	19:29	18:40	17:04	16:58
20	07:47	07:15	07:30	06:40	06:03	05:52	06:09	06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41	21:02	20:56	20:20	19:28	18:38	17:03	16:59
21	07:47	07:13	07:29	06:38	06:02	05:52	06:10	06:40	07:11	07:44	07:20	07:48
	17:27	18:06	19:38	20:11	20:42	21:02	20:55	20:19	19:26	18:37	17:02	16:59
22	07:46	07:12	07:27	06:37	06:01	05:52	06:11	06:41	07:12	07:45	07:22	07:49
	17:29	18:07	19:39	20:12	20:43	21:03	20:54	20:17	19:24	18:35	17:01	16:59
23	07:46	07:11	07:25	06:35	06:01	05:53	06:11	06:42	07:13	07:46	07:23	07:49
	17:30	18:09	19:40	20:13	20:44	21:03	20:53	20:16	19:22	18:34	17:01	17:00
24	07:45	07:09	07:24	06:34	06:00	05:53	06:12	06:43	07:14	07:47	07:24	07:50
	17:31	18:10	19:42	20:14	20:45	21:03	20:52	20:14	19:21	18:32	17:00	17:01
25	07:44	07:08	07:22	06:32	05:59	05:53	06:13	06:44	07:15	07:48	07:25	07:50
	17:32	18:11	19:43	20:15	20:46	21:03	20:52	20:13	19:19	18:31	17:00	17:01
26	07:43	07:06	07:20	06:31	05:58	05:53	06:14	06:45	07:16	07:49	07:26	07:50
	17:34	18:12	19:44	20:16	20:47	21:03	20:51	20:11	19:17	18:30	16:59	17:02
27	07:42	07:05	07:19	06:29	05:58	05:54	06:15	06:46	07:18	07:50	07:27	07:51
	17:35	18:13	19:45	20:17	20:47	21:03	20:50	20:10	19:16	18:28	16:59	17:02
28	07:42	07:03	07:17	06:28	05:57	05:54	06:16	06:47	07:19	07:52	07:28	07:51
	17:36	18:14	19:46	20:18	20:48	21:03	20:49	20:08	19:14	18:27	16:58	17:03
29	07:41		07:15	06:27	05:56	05:55	06:17	06:48	07:20	07:53	07:30	07:51
	17:37		19:47	20:19	20:49	21:03	20:48	20:06	19:12	18:26	16:58	17:04
30	07:40		07:13	06:25	05:56	05:55	06:18	06:49	07:21	07:54	07:31	07:52
	17:39		19:48	20:20	20:50	21:03	20:47	20:05	19:10	18:24	16:58	17:05
31	07:39		07:12		05:55		06:19	06:50		07:55		07:52
	17:40		19:49		20:51		20:46	20:03		18:23		17:05
Potential sun hours	297	297	370	399	449	453	460	429	375	345	297	287
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

Printed/Page
8/28/2010 7:34 PM / 6

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** D - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (4)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:52	07:38	07:01	07:10	06:24	05:55	06:53 (1) 05:56	07:02 (1) 06:20	07:10 (1) 06:51	07:22	06:56	07:32
	17:07	17:41	18:16	19:50	20:21	20:52 24	07:17 (1) 21:03 17	07:19 (1) 20:45 8	07:18 (1) 20:02	19:09	17:22	16:57
2	07:52	07:37	07:00	07:08	06:23	05:55	06:53 (1) 05:56	07:02 (1) 06:21	06:52	07:23	06:58	07:33
	17:07	17:42	18:17	19:51	20:23	20:52 23	07:16 (1) 21:03 18	07:20 (1) 20:44	20:00	19:07	17:21	16:57
3	07:52	07:36	06:58	07:07	06:21	05:54	06:54 (1) 05:57	07:01 (1) 06:22	06:53	07:24	06:59	07:34
	17:08	17:44	18:18	19:52	20:24	20:53 22	07:16 (1) 21:03 19	07:20 (1) 20:43	19:57	19:05	17:19	16:57
4	07:52	07:35	06:57	07:05	06:20	05:54	06:54 (1) 05:57	07:02 (1) 06:23	06:54	07:25	07:00	07:35
	17:09	17:45	18:19	19:53	20:25	20:54 23	07:17 (1) 21:03 19	07:21 (1) 20:41	19:55	19:04	17:18	16:57
5	07:52	07:34	06:55	07:04	06:19	05:53	06:54 (1) 05:58	07:01 (1) 06:24	06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55	20:26	20:55 22	07:16 (1) 21:03 20	07:21 (1) 20:40	19:53	19:02	17:17	16:56
6	07:52	07:33	06:54	07:02	06:18	05:53	06:55 (1) 05:58	07:01 (1) 06:25	06:56	07:27	07:02	07:37
	17:11	17:48	18:21	19:56	20:27	20:55 21	07:16 (1) 21:02 21	07:22 (1) 20:39	19:52	19:00	17:16	16:56
7	07:52	07:32	06:52	07:00	06:16	05:53	06:56 (1) 05:59	07:01 (1) 06:26	06:57	07:28	07:04	07:38
	17:12	17:49	18:23	19:57	20:28	20:56 20	07:16 (1) 21:02 22	07:23 (1) 20:38	19:50	18:59	17:15	16:56
8	07:52	07:30	07:50	06:59	06:15	05:52	06:56 (1) 06:00	07:01 (1) 06:27	06:58	07:29	07:05	07:39
	17:13	17:50	19:24	19:58	20:29	20:57 20	07:16 (1) 21:02 22	07:23 (1) 20:37	19:48	18:57	17:14	16:56
9	07:52	07:29	07:49	06:57	06:14	05:52	06:56 (1) 06:00	07:01 (1) 06:28	06:59	07:30	07:06	07:39
	17:14	17:51	19:25	19:59	20:30	20:57 19	07:15 (1) 21:02 22	07:23 (1) 20:35	19:47	18:56	17:13	16:56
10	07:52	07:28	07:47	06:55	06:13	05:52	06:57 (1) 06:01	07:01 (1) 06:29	07:00	07:31	07:07	07:40
	17:15	17:53	19:26	20:00	20:31	20:58 18	07:15 (1) 21:01 23	07:24 (1) 20:34	19:45	18:54	17:12	16:56
11	07:51	07:27	07:45	06:54	06:12	07:02 (1) 05:52	06:57 (1) 06:02	07:00 (1) 06:30	07:01	07:32	07:09	07:41
	17:16	17:54	19:27	20:00	20:32 3	07:05 (1) 20:58 18	07:15 (1) 21:01 24	07:24 (1) 20:33	19:43	18:52	17:11	16:56
12	07:51	07:26	07:44	06:52	06:11	06:58 (1) 05:52	06:58 (1) 06:02	07:01 (1) 06:31	07:02	07:33	07:10	07:42
	17:17	17:55	19:28	20:01	20:33 11	07:09 (1) 20:59 17	07:15 (1) 21:00 24	07:25 (1) 20:31	19:41	18:51	17:10	16:56
13	07:51	07:24	07:42	06:50	06:10	06:56 (1) 05:52	06:59 (1) 06:03	07:01 (1) 06:32	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	20:34 14	07:10 (1) 20:59 16	07:15 (1) 21:00 24	07:25 (1) 20:30	19:40	18:49	17:09	16:56
14	07:50	07:23	07:40	06:49	06:09	06:55 (1) 05:52	06:59 (1) 06:04	07:00 (1) 06:33	07:04	07:36	07:12	07:44
	17:19	17:58	19:31	20:03	20:35 17	07:12 (1) 21:00 16	07:15 (1) 20:59 25	07:25 (1) 20:29	19:38	18:48	17:08	16:57
15	07:50	07:22	07:39	06:47	06:08	06:54 (1) 05:52	06:59 (1) 06:05	07:00 (1) 06:34	07:05	07:37	07:13	07:44
	17:21	17:59	19:32	20:04	20:36 19	07:13 (1) 21:00 16	07:15 (1) 20:59 25	07:25 (1) 20:27	19:36	18:46	17:07	16:57
16	07:50	07:20	07:37	06:46	06:07	06:53 (1) 05:52	07:00 (1) 06:05	07:00 (1) 06:35	07:06	07:38	07:15	07:45
	17:22	18:00	19:33	20:05	20:37 21	07:14 (1) 21:01 15	07:15 (1) 20:58 26	07:26 (1) 20:26	19:35	18:44	17:06	16:57
17	07:49	07:19	07:35	06:44	06:06	06:52 (1) 05:52	07:00 (1) 06:06	07:01 (1) 06:36	07:07	07:39	07:16	07:46
	17:23	18:01	19:34	20:06	20:38 22	07:14 (1) 21:01 15	07:15 (1) 20:58 25	07:26 (1) 20:25	19:33	18:43	17:05	16:57
18	07:49	07:18	07:34	06:43	06:05	06:52 (1) 05:52	07:00 (1) 06:07	07:01 (1) 06:37	07:08	07:40	07:17	07:46
	17:24	18:02	19:35	20:07	20:39 24	07:16 (1) 21:01 15	07:15 (1) 20:57 26	07:27 (1) 20:23	19:31	18:41	17:04	16:58
19	07:48	07:16	07:32	06:41	06:04	06:52 (1) 05:52	07:01 (1) 06:08	07:00 (1) 06:38	07:09	07:41	07:18	07:47
	17:25	18:04	19:36	20:09	20:40 24	07:16 (1) 21:02 14	07:15 (1) 20:56 26	07:26 (1) 20:22	19:29	18:40	17:04	16:58
20	07:47	07:15	07:30	06:40	06:03	06:51 (1) 05:52	07:02 (1) 06:09	07:01 (1) 06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41 25	07:16 (1) 21:02 14	07:16 (1) 20:56 25	07:26 (1) 20:20	19:28	18:38	17:03	16:59
21	07:47	07:13	07:29	06:38	06:02	06:51 (1) 05:52	07:02 (1) 06:10	07:01 (1) 06:40	07:11	07:44	07:20	07:48
	17:28	18:06	19:38	20:11	20:42 25	07:16 (1) 21:02 14	07:16 (1) 20:55 25	07:26 (1) 20:19	19:26	18:37	17:02	16:59
22	07:46	07:12	07:27	06:37	06:01	06:51 (1) 05:52	07:02 (1) 06:11	07:01 (1) 06:41	07:12	07:45	07:22	07:49
	17:29	18:07	19:39	20:12	20:43 25	07:16 (1) 21:03 14	07:16 (1) 20:54 26	07:27 (1) 20:17	19:24	18:35	17:02	17:00
23	07:46	07:11	07:25	06:35	06:01	06:51 (1) 05:53	07:02 (1) 06:11	07:02 (1) 06:42	07:13	07:46	07:23	07:49
	17:30	18:09	19:40	20:13	20:44 26	07:17 (1) 21:03 14	07:16 (1) 20:53 25	07:27 (1) 20:16	19:23	18:34	17:01	17:00
24	07:45	07:09	07:24	06:34	06:00	06:51 (1) 05:53	07:03 (1) 06:12	07:02 (1) 06:43	07:14	07:47	07:24	07:50
	17:31	18:10	19:42	20:14	20:45 26	07:17 (1) 21:03 14	07:17 (1) 20:52 24	07:26 (1) 20:14	19:21	18:32	17:00	17:01
25	07:44	07:08	07:22	06:32	05:59	06:51 (1) 05:53	07:02 (1) 06:13	07:03 (1) 06:44	07:15	07:48	07:25	07:50
	17:32	18:11	19:43	20:15	20:46 25	07:16 (1) 21:03 15	07:17 (1) 20:52 23	07:26 (1) 20:13	19:19	18:31	17:00	17:01
26	07:43	07:06	07:20	06:31	05:58	06:51 (1) 05:54	07:02 (1) 06:14	07:02 (1) 06:45	07:17	07:49	07:26	07:50
	17:34	18:12	19:44	20:16	20:47 26	07:17 (1) 21:03 15	07:17 (1) 20:51 23	07:25 (1) 20:11	19:17	18:30	16:59	17:02
27	07:43	07:05	07:19	06:29	05:58	06:51 (1) 05:54	07:03 (1) 06:15	07:03 (1) 06:46	07:18	07:51	07:27	07:51
	17:35	18:13	19:45	20:17	20:47 26	07:17 (1) 21:03 15	07:18 (1) 20:50 21	07:24 (1) 20:10	19:16	18:28	16:59	17:02
28	07:42	07:03	07:17	06:28	05:57	06:52 (1) 05:54	07:02 (1) 06:16	07:04 (1) 06:47	07:19	07:52	07:28	07:51
	17:36	18:15	19:46	20:18	20:48 25	07:17 (1) 21:03 16	07:18 (1) 20:49 20	07:24 (1) 20:08	19:14	18:27	16:58	17:03
29	07:41		07:15	06:27	05:57	06:52 (1) 05:55	07:02 (1) 06:17	07:05 (1) 06:48	07:20	07:53	07:30	07:51
	17:37		19:47	20:19	20:49 25	07:17 (1) 21:03 16	07:18 (1) 20:48 18	07:23 (1) 20:06	19:12	18:26	16:58	17:04
30	07:40		07:14	06:25	05:56	06:52 (1) 05:55	07:02 (1) 06:18	07:06 (1) 06:49	07:21	07:54	07:31	07:52
	17:39		19:48	20:20	20:50 25	07:17 (1) 21:03 17	07:19 (1) 20:47 16	07:22 (1) 20:05	19:11	18:24	16:58	17:05
31	07:39		07:12		05:55	06:52 (1)	06:19	07:08 (1) 06:50		07:55		07:52
	17:40		19:49		20:51 25	07:17 (1)	20:46 12	07:20 (1) 20:03		18:23		17:05
Potential sun hours	297	297	370	399	449	453	460	429	375	345	297	287
Total, worst case					59	4 18	5 86	6			8	
Sun reduction					0.62	0.62	0.69	0.65				
Oper. time red.					0.87	0.87	0.87	0.87				
Wind dir. red.					0.67	0.67	0.67	0.67				
Total reduction					0.36	0.36	0.40	0.38				
Total, real					64	1 86	1 74	2			3	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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8/28/2010 7:34 PM / 7

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** E - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (5)

Assumptions for shadow calculations

Maximum distance for influence	2,000	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January		February		March	April	May	June	July	August	September	October		November		December
1	07:52		07:38		08:23 (1)	07:01	07:10	06:24	05:55	05:56	06:20	06:51	07:22		06:56		07:47 (1)	07:32
	17:07		17:41	18	08:41 (1)	18:16	19:50	20:21	20:52	21:03	20:45	20:02	19:09		17:22	32	08:19 (1)	16:57
2	07:52		07:37		08:22 (1)	07:00	07:08	06:23	05:55	05:56	06:21	06:52	07:23		06:58		07:47 (1)	07:33
	17:07		17:42	21	08:43 (1)	18:17	19:51	20:23	20:52	21:03	20:44	20:00	19:07		17:21	32	08:19 (1)	16:57
3	07:52		07:36		08:21 (1)	06:58	07:07	06:21	05:54	05:57	06:22	06:53	07:24		06:59		07:47 (1)	07:34
	17:08		17:44	23	08:44 (1)	18:18	19:52	20:24	20:53	21:03	20:43	19:57	19:05		17:19	31	08:18 (1)	16:57
4	07:52		07:35		08:20 (1)	06:57	07:05	06:20	05:54	05:57	06:23	06:54	07:25		07:00		07:49 (1)	07:35
	17:09		17:45	26	08:46 (1)	18:19	19:53	20:25	20:54	21:03	20:41	19:55	19:04		17:18	29	08:18 (1)	16:57
5	07:52		07:34		08:20 (1)	06:55	07:04	06:19	05:53	05:58	06:24	06:55	07:26		07:01		07:49 (1)	07:36
	17:10		17:46	27	08:47 (1)	18:20	19:55	20:26	20:55	21:03	20:40	19:53	19:02		17:17	29	08:18 (1)	16:56
6	07:52		07:33		08:19 (1)	06:54	07:02	06:18	05:53	05:58	06:25	06:56	07:27		07:02		07:50 (1)	07:37
	17:11		17:47	29	08:48 (1)	18:21	19:56	20:27	20:55	21:02	20:39	19:52	19:00		17:16	27	08:17 (1)	16:56
7	07:52		07:32		08:19 (1)	06:52	07:00	06:16	05:53	05:59	06:26	06:57	07:28		07:04		07:51 (1)	07:38
	17:12		17:49	30	08:49 (1)	18:23	19:57	20:28	20:56	21:02	20:38	19:50	18:59		17:15	25	08:16 (1)	16:56
8	07:52		07:30		08:19 (1)	07:50	06:59	06:15	05:52	06:00	06:27	06:58	07:29		07:05		07:52 (1)	07:39
	17:13		17:50	30	08:49 (1)	19:24	19:58	20:29	20:57	21:02	20:37	19:48	18:57		17:14	23	08:15 (1)	16:56
9	07:52		07:29		08:18 (1)	07:49	06:57	06:14	05:52	06:00	06:28	06:59	07:30		07:06		07:53 (1)	07:39
	17:14		17:51	31	08:49 (1)	19:25	19:59	20:30	20:57	21:02	20:35	19:47	18:56		17:13	21	08:14 (1)	16:56
10	07:52		07:28		08:18 (1)	07:47	06:55	06:13	05:52	06:01	06:29	07:00	07:31		07:07		07:54 (1)	07:40
	17:15		17:53	31	08:49 (1)	19:26	20:00	20:31	20:58	21:01	20:34	19:45	18:54		17:12	18	08:12 (1)	16:56
11	07:51		07:27		08:18 (1)	07:45	06:54	06:12	05:52	06:02	06:30	07:01	07:32		07:09		07:57 (1)	07:41
	17:16		17:54	32	08:50 (1)	19:27	20:00	20:32	20:58	21:01	20:33	19:43	18:52		17:11	14	08:11 (1)	16:56
12	07:51		07:26		08:18 (1)	07:44	06:52	06:11	05:52	06:02	06:31	07:02	07:33		07:10		08:00 (1)	07:42
	17:17		17:55	32	08:50 (1)	19:28	20:01	20:33	20:59	21:00	20:31	19:41	18:51		17:10	8	08:08 (1)	16:56
13	07:51		07:24		08:18 (1)	07:42	06:50	06:10	05:52	06:03	06:32	07:03	07:35		07:11			07:43
	17:18		17:56	31	08:49 (1)	19:29	20:02	20:34	20:59	21:00	20:30	19:40	18:49		17:09			16:56
14	07:50		07:23		08:18 (1)	07:40	06:49	06:09	05:52	06:04	06:33	07:04	07:36		07:12			07:44
	17:19		17:58	31	08:49 (1)	19:31	20:03	20:35	21:00	20:59	20:29	19:38	18:48		17:08			16:57
15	07:50		07:22		08:19 (1)	07:39	06:47	06:08	05:52	06:05	06:34	07:05	07:37		07:13			07:44
	17:21		17:59	30	08:49 (1)	19:32	20:04	20:36	21:00	20:59	20:27	19:36	18:46		17:07			16:57
16	07:50		07:20		08:19 (1)	07:37	06:46	06:07	05:52	06:05	06:35	07:06	07:38		07:15			07:45
	17:22		18:00	29	08:48 (1)	19:33	20:05	20:37	21:01	20:58	20:26	19:35	18:44		17:06			16:57
17	07:49		07:19		08:20 (1)	07:35	06:44	06:06	05:52	06:06	06:36	07:07	07:39		07:16			07:46
	17:23		18:01	27	08:47 (1)	19:34	20:06	20:38	21:01	20:58	20:25	19:33	18:43		17:05			16:57
18	07:49		07:18		08:20 (1)	07:34	06:43	06:05	05:52	06:07	06:37	07:08	07:40		07:17			07:46
	17:24		18:02	26	08:46 (1)	19:35	20:07	20:39	21:01	20:57	20:23	19:31	18:41		17:04			16:58
19	07:48		07:16		08:22 (1)	07:32	06:41	06:04	05:52	06:08	06:38	07:09	07:41		07:18			07:47
	17:25		18:04	23	08:45 (1)	19:36	20:09	20:40	21:02	20:56	20:22	19:29	18:40		17:04			16:58
20	07:47		07:15		08:24 (1)	07:30	06:40	06:03	05:52	06:09	06:39	07:10	07:42		08:58 (1)		07:19	07:48
	17:26		18:05	19	08:43 (1)	19:37	20:10	20:41	21:02	20:56	20:20	19:28	18:38	11	09:09 (1)		17:03	16:59
21	07:47		07:13		08:25 (1)	07:29	06:38	06:02	05:52	06:10	06:40	07:11	07:44		08:55 (1)		07:20	07:48
	17:28		18:06	15	08:40 (1)	19:38	20:11	20:42	21:02	20:55	20:19	19:26	18:37	17	09:12 (1)		17:02	16:59
22	07:46		07:12		08:29 (1)	07:27	06:37	06:01	05:52	06:11	06:41	07:12	07:45		08:53 (1)		07:22	07:49
	17:29		18:07	8	08:37 (1)	19:39	20:12	20:43	21:03	20:54	20:17	19:24	18:35	20	09:13 (1)		17:01	17:00
23	07:46		07:11			07:25	06:35	06:01	05:53	06:11	06:42	07:13	07:46		08:52 (1)		07:23	07:49
	17:30		18:09			19:40	20:13	20:44	21:03	20:53	20:16	19:23	18:34	24	09:16 (1)		17:01	17:00
24	07:45		07:09			07:24	06:34	06:00	05:53	06:12	06:43	07:14	07:47		08:51 (1)		07:24	07:50
	17:31		18:10			19:42	20:14	20:45	21:03	20:52	20:14	19:21	18:32	25	09:16 (1)		17:00	17:01
25	07:44		07:08			07:22	06:32	05:59	05:53	06:13	06:44	07:15	07:48		08:49 (1)		07:25	07:50
	17:32		18:11			19:43	20:15	20:46	21:03	20:52	20:13	19:19	18:31	28	09:17 (1)		17:00	17:01
26	07:43		07:06			07:20	06:31	05:58	05:54	06:14	06:45	07:17	07:49		08:48 (1)		07:26	07:50
	17:34		18:12			19:44	20:16	20:47	21:03	20:51	20:11	19:17	18:30	30	09:18 (1)		16:59	17:02
27	07:43		07:05			07:19	06:29	05:58	05:54	06:15	06:46	07:18	07:51		08:49 (1)		07:27	07:51
	17:35		18:13			19:45	20:17	20:47	21:03	20:50	20:10	19:16	18:28	30	09:19 (1)		16:59	17:02
28	07:42		07:03			07:17	06:28	05:57	05:54	06:16	06:47	07:19	07:52		08:48 (1)		07:28	07:51
	17:36		18:15			19:46	20:18	20:48	21:03	20:49	20:08	19:14	18:27	31	09:19 (1)		16:58	17:03
29	07:41					07:15	06:27	05:57	05:55	06:17	06:48	07:20	07:53		08:47 (1)		07:30	07:51
	17:37					19:47	20:19	20:49	21:03	20:48	20:06	19:12	18:26	32	09:19 (1)		16:58	17:04
30	07:40	08:28 (1)				07:14	06:25	05:56	05:55	06:18	06:49	07:21	07:54		08:47 (1)		07:31	07:52
	17:39	8 08:36 (1)				19:48	20:20	20:50	21:03	20:47	20:05	19:11	18:24	32	09:19 (1)		16:58	17:05
31	07:39	08:25 (1)				07:12		05:55		06:19	06:50		07:55		08:48 (1)			07:52
	17:40	14 08:39 (1)				19:49		20:51		20:46	20:03		18:23	32	09:20 (1)			17:05
Potential sun hours	297		297			370	399	449	453	460	429	375	345			297		287
Total, worst case		22		569										312			289	
Sun reduction		0.36		0.41										0.51			0.27	
Oper. time red.		0.87		0.87										0.87			0.87	
Wind dir. red.		0.62		0.62										0.62			0.62	
Total reduction		0.20		0.22										0.28			0.15	
Total, real		4		126										86			43	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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8/28/2010 7:34 PM / 8

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
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4717
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Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** F - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (6)

Assumptions for shadow calculations

Maximum distance for influence	2,000	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March		April		May	June	July	August	September		October	November	December
1	07:52	07:38	07:01		07:10	08:08 (1)	06:24	05:55	05:56	06:20	06:51		07:22	06:56	07:32
	17:07	17:41	18:16		19:50	34 08:42 (1)	20:21	20:52	21:03	20:45	20:02		19:09	17:22	16:57
2	07:52	07:37	07:00		07:08	08:08 (1)	06:23	05:55	05:56	06:21	06:52		07:23	06:58	07:33
	17:07	17:42	18:17		19:51	33 08:41 (1)	20:23	20:52	21:03	20:44	20:00		19:07	17:21	16:57
3	07:52	07:36	06:58		07:07	08:09 (1)	06:21	05:54	05:57	06:22	06:53	08:15 (1)	07:24	06:59	07:34
	17:08	17:44	18:18		19:52	31 08:40 (1)	20:24	20:53	21:03	20:43	19:57	11 08:26 (1)	19:05	17:19	16:57
4	07:52	07:35	06:57		07:05	08:09 (1)	06:20	05:54	05:57	06:23	06:54	08:12 (1)	07:25	07:00	07:35
	17:09	17:45	18:19		19:53	30 08:39 (1)	20:25	20:54	21:03	20:41	19:55	17 08:29 (1)	19:04	17:18	16:57
5	07:52	07:34	06:55		07:04	08:11 (1)	06:19	05:53	05:58	06:24	06:55	08:09 (1)	07:26	07:01	07:36
	17:10	17:46	18:20		19:55	27 08:38 (1)	20:26	20:55	21:03	20:40	19:53	21 08:30 (1)	19:02	17:17	16:56
6	07:52	07:33	06:54		07:02	08:11 (1)	06:18	05:53	05:58	06:25	06:56	08:07 (1)	07:27	07:02	07:37
	17:11	17:48	18:21		19:56	25 08:36 (1)	20:27	20:55	21:02	20:39	19:52	25 08:32 (1)	19:00	17:16	16:56
7	07:52	07:32	06:52		07:00	08:12 (1)	06:16	05:53	05:59	06:26	06:57	08:06 (1)	07:28	07:04	07:38
	17:12	17:49	18:23		19:57	21 08:33 (1)	20:28	20:56	21:02	20:38	19:50	27 08:33 (1)	18:59	17:15	16:56
8	07:52	07:30	07:50		06:59	08:15 (1)	06:15	05:52	06:00	06:27	06:58	08:04 (1)	07:29	07:05	07:39
	17:13	17:50	19:24		19:58	17 08:32 (1)	20:29	20:57	21:02	20:37	19:48	30 08:34 (1)	18:57	17:14	16:56
9	07:52	07:29	07:49		06:57	08:17 (1)	06:14	05:52	06:00	06:28	06:59	08:03 (1)	07:30	07:06	07:39
	17:14	17:51	19:25		19:59	11 08:28 (1)	20:30	20:57	21:02	20:35	19:47	31 08:34 (1)	18:56	17:13	16:56
10	07:52	07:28	07:47		06:55		06:13	05:52	06:01	06:29	07:00	08:02 (1)	07:31	07:07	07:40
	17:15	17:53	19:26		20:00		20:31	20:58	21:01	20:34	19:45	33 08:35 (1)	18:54	17:12	16:56
11	07:51	07:27	07:45		06:54		06:12	05:52	06:02	06:30	07:01	08:01 (1)	07:32	07:09	07:41
	17:16	17:54	19:27		20:00		20:32	20:58	21:01	20:33	19:43	34 08:35 (1)	18:52	17:11	16:56
12	07:51	07:26	07:44		06:52		06:11	05:52	06:02	06:31	07:02	08:00 (1)	07:33	07:10	07:42
	17:17	17:55	19:28		20:01		20:33	20:59	21:00	20:31	19:41	34 08:34 (1)	18:51	17:10	16:56
13	07:51	07:24	07:42		06:50		06:10	05:52	06:03	06:32	07:03	07:59 (1)	07:35	07:11	07:43
	17:18	17:56	19:29		20:02		20:34	20:59	21:00	20:30	19:40	35 08:34 (1)	18:49	17:09	16:56
14	07:50	07:23	07:40		06:49		06:09	05:52	06:04	06:33	07:04	07:59 (1)	07:36	07:12	07:44
	17:19	17:58	19:31		20:03		20:35	21:00	20:59	20:29	19:38	35 08:34 (1)	18:48	17:08	16:57
15	07:50	07:22	07:39		06:47		06:08	05:52	06:05	06:34	07:05	07:59 (1)	07:37	07:13	07:44
	17:21	17:59	19:32		20:04		20:36	21:00	20:59	20:27	19:36	34 08:33 (1)	18:46	17:07	16:57
16	07:50	07:20	07:37		06:46		06:07	05:52	06:05	06:35	07:06	07:58 (1)	07:38	07:15	07:45
	17:22	18:00	19:33		20:05		20:37	21:01	20:58	20:26	19:35	35 08:33 (1)	18:44	17:06	16:57
17	07:49	07:19	07:35		06:44		06:06	05:52	06:06	06:36	07:07	07:58 (1)	07:39	07:16	07:46
	17:23	18:01	19:34		20:06		20:38	21:01	20:58	20:25	19:33	34 08:32 (1)	18:43	17:05	16:57
18	07:49	07:18	07:34		06:43		06:05	05:52	06:07	06:37	07:08	07:59 (1)	07:40	07:17	07:46
	17:24	18:02	19:35		20:07		20:39	21:01	20:57	20:23	19:31	32 08:31 (1)	18:41	17:04	16:58
19	07:48	07:16	07:32		08:22 (1)	06:41	06:04	05:52	06:08	06:38	07:09	07:59 (1)	07:41	07:18	07:47
	17:25	18:04	19:36	14	08:36 (1)	20:09	20:40	21:02	20:56	20:22	19:29	31 08:30 (1)	18:40	17:04	16:58
20	07:47	07:15	07:30		08:20 (1)	06:40	06:03	05:52	06:09	06:39	07:10	08:00 (1)	07:42	07:19	07:48
	17:26	18:05	19:37	20	08:40 (1)	20:10	20:41	21:02	20:56	20:20	19:28	29 08:29 (1)	18:38	17:03	16:59
21	07:47	07:13	07:29		08:17 (1)	06:38	06:02	05:52	06:10	06:40	07:11	08:00 (1)	07:44	07:20	07:48
	17:28	18:06	19:38	24	08:41 (1)	20:11	20:42	21:02	20:55	20:19	19:26	28 08:28 (1)	18:37	17:02	16:59
22	07:46	07:12	07:27		08:15 (1)	06:37	06:01	05:52	06:11	06:41	07:12	08:01 (1)	07:45	07:22	07:49
	17:29	18:07	19:39	27	08:42 (1)	20:12	20:43	21:03	20:54	20:17	19:24	25 08:26 (1)	18:35	17:02	17:00
23	07:46	07:11	07:25		08:13 (1)	06:35	06:01	05:53	06:11	06:42	07:13	08:03 (1)	07:46	07:23	07:49
	17:30	18:09	19:40	29	08:42 (1)	20:13	20:44	21:03	20:53	20:16	19:23	21 08:24 (1)	18:34	17:01	17:00
24	07:45	07:09	07:24		08:13 (1)	06:34	06:00	05:53	06:12	06:43	07:14	08:05 (1)	07:47	07:24	07:50
	17:31	18:10	19:42	31	08:44 (1)	20:14	20:45	21:03	20:52	20:14	19:21	16 08:21 (1)	18:32	17:00	17:01
25	07:44	07:08	07:22		08:11 (1)	06:32	05:59	05:53	06:13	06:44	07:15	08:09 (1)	07:48	07:25	07:50
	17:32	18:11	19:43	33	08:44 (1)	20:15	20:46	21:03	20:52	20:13	19:19	7 08:16 (1)	18:31	17:00	17:01
26	07:43	07:06	07:20		08:10 (1)	06:31	05:58	05:54	06:14	06:45	07:17		07:49	07:26	07:50
	17:34	18:12	19:44	34	08:44 (1)	20:16	20:47	21:03	20:51	20:11	19:17		18:30	16:59	17:02
27	07:43	07:05	07:19		08:10 (1)	06:29	05:58	05:54	06:15	06:46	07:18		07:51	07:27	07:51
	17:35	18:13	19:45	34	08:44 (1)	20:17	20:47	21:03	20:50	20:10	19:16		18:28	16:59	17:02
28	07:42	07:03	07:17		08:09 (1)	06:28	05:57	05:54	06:16	06:47	07:19		07:52	07:28	07:51
	17:36	18:15	19:46	35	08:44 (1)	20:18	20:48	21:03	20:49	20:08	19:14		18:27	16:58	17:03
29	07:41		07:15		08:09 (1)	06:27	05:57	05:55	06:17	06:48	07:20		07:53	07:30	07:51
	17:37		19:47	34	08:43 (1)	20:19	20:49	21:03	20:48	20:06	19:12		18:26	16:58	17:04
30	07:40		07:14		08:09 (1)	06:25	05:56	05:55	06:18	06:49	07:21		07:54	07:31	07:52
	17:39		19:48	35	08:44 (1)	20:20	20:50	21:03	20:47	20:05	19:11		18:24	16:58	17:05
31	07:39		07:12		08:09 (1)		05:55		06:19	06:50			07:55		07:52
	17:40		19:49	34	08:43 (1)		20:51		20:46	20:03			18:23		17:05
Potential sun hours	297	297	370			399	449	453	460	429	375		345	297	287
Total, worst case				384		229						625			
Sun reduction				0.41		0.57						0.55			
Oper. time red.				0.87		0.87						0.87			
Wind dir. red.				0.64		0.64						0.64			
Total reduction				0.23		0.32						0.31			
Total, real				88		73						192			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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8/28/2010 7:34 PM / 9

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8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** G - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (7)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:52	07:38	07:01	07:10	06:24	05:55	07:05 (1) 05:56	07:13 (1) 06:20	07:16 (1) 06:51	07:22	06:56	07:32
	17:07	17:41	18:16	19:50	20:21	20:52 31	07:36 (1) 21:03 26	07:39 (1) 20:45 28	07:44 (1) 20:02	19:09	17:22	16:57
2	07:52	07:37	07:00	07:08	06:23	05:55	07:04 (1) 05:56	07:13 (1) 06:21	07:17 (1) 06:52	07:23	06:58	07:33
	17:07	17:42	18:17	19:51	20:23	20:52 31	07:35 (1) 21:03 26	07:39 (1) 20:44 26	07:43 (1) 20:00	19:07	17:21	16:57
3	07:52	07:36	06:58	07:07	06:21	05:54	07:05 (1) 05:57	07:13 (1) 06:22	07:18 (1) 06:53	07:24	06:59	07:34
	17:08	17:44	18:18	19:52	20:24	20:53 31	07:36 (1) 21:03 26	07:39 (1) 20:43 24	07:42 (1) 19:57	19:05	17:19	16:57
4	07:52	07:35	06:57	07:05	06:20	05:54	07:06 (1) 05:57	07:13 (1) 06:23	07:19 (1) 06:54	07:25	07:00	07:35
	17:09	17:45	18:19	19:53	20:25	20:54 30	07:36 (1) 21:03 27	07:40 (1) 20:41 22	07:41 (1) 19:55	19:04	17:18	16:57
5	07:52	07:34	06:55	07:04	06:19	05:53	07:06 (1) 05:58	07:13 (1) 06:24	07:21 (1) 06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55	20:26	20:55 29	07:35 (1) 21:03 27	07:40 (1) 20:40 18	07:39 (1) 19:53	19:02	17:17	16:56
6	07:52	07:33	06:54	07:02	06:18	07:15 (1) 05:53	07:07 (1) 05:58	07:13 (1) 06:25	07:23 (1) 06:56	07:27	07:02	07:37
	17:11	17:48	18:21	19:56	20:27 10	07:25 (1) 20:55 28	07:35 (1) 21:02 28	07:41 (1) 20:39 14	07:37 (1) 19:52	19:00	17:16	16:56
7	07:52	07:32	06:52	07:00	06:16	07:12 (1) 05:53	07:07 (1) 05:59	07:13 (1) 06:26	07:26 (1) 06:57	07:28	07:04	07:38
	17:12	17:49	18:23	19:57	20:28 16	07:28 (1) 20:56 28	07:35 (1) 21:02 29	07:42 (1) 20:38 7	07:33 (1) 19:50	18:59	17:15	16:56
8	07:52	07:30	07:50	06:59	06:15	07:09 (1) 05:52	07:08 (1) 06:00	07:12 (1) 06:27	06:58	07:29	07:05	07:39
	17:13	17:50	19:24	19:58	20:29 20	07:29 (1) 20:57 27	07:35 (1) 21:02 30	07:42 (1) 20:37	19:48	18:57	17:14	16:56
9	07:52	07:29	07:49	06:57	06:14	07:08 (1) 05:52	07:08 (1) 06:00	07:13 (1) 06:28	06:59	07:30	07:06	07:39
	17:14	17:51	19:25	19:59	20:30 22	07:30 (1) 20:57 26	07:34 (1) 21:02 30	07:43 (1) 20:35	19:47	18:56	17:13	16:56
10	07:52	07:28	07:47	06:55	06:13	07:07 (1) 05:52	07:08 (1) 06:01	07:13 (1) 06:29	07:00	07:31	07:07	07:40
	17:15	17:53	19:26	20:00	20:31 25	07:32 (1) 20:58 26	07:34 (1) 21:01 31	07:44 (1) 20:34	19:45	18:54	17:12	16:56
11	07:51	07:27	07:45	06:54	06:12	07:06 (1) 05:52	07:09 (1) 06:02	07:12 (1) 06:30	07:01	07:32	07:09	07:41
	17:16	17:54	19:27	20:00	20:32 27	07:33 (1) 20:58 26	07:35 (1) 21:01 31	07:43 (1) 20:33	19:43	18:52	17:11	16:56
12	07:51	07:26	07:44	06:52	06:11	07:05 (1) 05:52	07:09 (1) 06:02	07:12 (1) 06:31	07:02	07:33	07:10	07:42
	17:17	17:55	19:28	20:01	20:33 28	07:33 (1) 20:59 26	07:35 (1) 21:00 32	07:44 (1) 20:31	19:41	18:51	17:10	16:56
13	07:51	07:24	07:42	06:50	06:10	07:04 (1) 05:52	07:10 (1) 06:03	07:12 (1) 06:32	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	20:34 30	07:34 (1) 20:59 25	07:35 (1) 21:00 33	07:45 (1) 20:30	19:40	18:49	17:09	16:56
14	07:50	07:23	07:40	06:49	06:09	07:04 (1) 05:52	07:10 (1) 06:04	07:12 (1) 06:33	07:04	07:36	07:12	07:44
	17:19	17:58	19:31	20:03	20:35 31	07:35 (1) 21:00 25	07:35 (1) 20:59 32	07:44 (1) 20:29	19:38	18:48	17:08	16:57
15	07:50	07:22	07:39	06:47	06:08	07:03 (1) 05:52	07:11 (1) 06:05	07:12 (1) 06:34	07:05	07:37	07:13	07:44
	17:21	17:59	19:32	20:04	20:36 32	07:35 (1) 21:00 24	07:35 (1) 20:59 33	07:45 (1) 20:27	19:36	18:46	17:07	16:57
16	07:50	07:20	07:37	06:46	06:07	07:03 (1) 05:52	07:11 (1) 06:05	07:12 (1) 06:35	07:06	07:38	07:15	07:45
	17:22	18:00	19:33	20:05	20:37 32	07:35 (1) 21:01 24	07:35 (1) 20:58 34	07:46 (1) 20:26	19:35	18:44	17:06	16:57
17	07:49	07:19	07:35	06:44	06:06	07:02 (1) 05:52	07:11 (1) 06:06	07:12 (1) 06:36	07:07	07:39	07:16	07:46
	17:23	18:01	19:34	20:06	20:38 33	07:35 (1) 21:01 24	07:35 (1) 20:58 34	07:46 (1) 20:25	19:33	18:43	17:05	16:57
18	07:49	07:18	07:34	06:43	06:05	07:03 (1) 05:52	07:11 (1) 06:07	07:12 (1) 06:37	07:08	07:40	07:17	07:46
	17:24	18:02	19:35	20:07	20:39 34	07:37 (1) 21:01 24	07:35 (1) 20:57 34	07:46 (1) 20:23	19:31	18:41	17:04	16:58
19	07:48	07:16	07:32	06:41	06:04	07:02 (1) 05:52	07:12 (1) 06:08	07:12 (1) 06:38	07:09	07:41	07:18	07:47
	17:25	18:04	19:36	20:09	20:40 35	07:37 (1) 21:02 23	07:35 (1) 20:56 34	07:46 (1) 20:22	19:29	18:40	17:04	16:58
20	07:47	07:15	07:30	06:40	06:03	07:02 (1) 05:52	07:13 (1) 06:09	07:12 (1) 06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41 34	07:36 (1) 21:02 23	07:36 (1) 20:56 34	07:46 (1) 20:20	19:28	18:38	17:03	16:59
21	07:47	07:13	07:29	06:38	06:02	07:02 (1) 05:52	07:13 (1) 06:10	07:12 (1) 06:40	07:11	07:44	07:20	07:48
	17:28	18:06	19:38	20:11	20:42 34	07:36 (1) 21:02 23	07:36 (1) 20:55 35	07:47 (1) 20:19	19:26	18:37	17:02	16:59
22	07:46	07:12	07:27	06:37	06:01	07:02 (1) 05:52	07:13 (1) 06:11	07:12 (1) 06:41	07:12	07:45	07:22	07:49
	17:29	18:07	19:39	20:12	20:43 34	07:36 (1) 21:03 23	07:36 (1) 20:54 35	07:47 (1) 20:17	19:24	18:35	17:02	17:00
23	07:46	07:11	07:25	06:35	06:01	07:02 (1) 05:53	07:13 (1) 06:11	07:12 (1) 06:42	07:13	07:46	07:23	07:49
	17:30	18:09	19:40	20:13	20:44 35	07:37 (1) 21:03 23	07:36 (1) 20:53 35	07:47 (1) 20:16	19:23	18:34	17:01	17:00
24	07:45	07:09	07:24	06:34	06:00	07:02 (1) 05:53	07:13 (1) 06:12	07:13 (1) 06:43	07:14	07:47	07:24	07:50
	17:31	18:10	19:42	20:14	20:45 35	07:37 (1) 21:03 23	07:36 (1) 20:52 34	07:47 (1) 20:14	19:21	18:32	17:00	17:01
25	07:44	07:08	07:22	06:32	05:59	07:02 (1) 05:53	07:13 (1) 06:13	07:13 (1) 06:44	07:15	07:48	07:25	07:50
	17:32	18:11	19:43	20:15	20:46 34	07:36 (1) 21:03 24	07:37 (1) 20:52 34	07:47 (1) 20:13	19:19	18:31	17:00	17:01
26	07:43	07:06	07:20	06:31	05:58	07:03 (1) 05:54	07:13 (1) 06:14	07:12 (1) 06:45	07:17	07:49	07:26	07:50
	17:34	18:12	19:44	20:16	20:47 34	07:37 (1) 21:03 24	07:37 (1) 20:51 34	07:46 (1) 20:11	19:17	18:30	16:59	17:02
27	07:43	07:05	07:19	06:29	05:58	07:03 (1) 05:54	07:14 (1) 06:15	07:13 (1) 06:46	07:18	07:51	07:27	07:51
	17:35	18:13	19:45	20:17	20:47 33	07:36 (1) 21:03 24	07:38 (1) 20:50 33	07:46 (1) 20:10	19:16	18:28	16:59	17:02
28	07:42	07:03	07:17	06:28	05:57	07:03 (1) 05:54	07:13 (1) 06:16	07:13 (1) 06:47	07:19	07:52	07:28	07:51
	17:36	18:15	19:46	20:18	20:48 34	07:37 (1) 21:03 25	07:38 (1) 20:49 33	07:46 (1) 20:08	19:14	18:27	16:58	17:03
29	07:41		07:15	06:27	05:57	07:03 (1) 05:55	07:13 (1) 06:17	07:14 (1) 06:48	07:20	07:53	07:30	07:51
	17:37		19:47	20:19	20:49 33	07:36 (1) 21:03 25	07:38 (1) 20:48 31	07:45 (1) 20:06	19:12	18:26	16:58	17:04
30	07:40		07:14	06:25	05:56	07:04 (1) 05:55	07:13 (1) 06:18	07:14 (1) 06:49	07:21	07:54	07:31	07:52
	17:39		19:48	20:20	20:50 33	07:37 (1) 21:03 26	07:39 (1) 20:47 31	07:45 (1) 20:05	19:11	18:24	16:58	17:05
31	07:39		07:12		05:55	07:04 (1)	06:19	07:15 (1) 06:50		07:55		07:52
	17:40		19:49		20:51 32	07:36 (1)	20:46 29	07:44 (1) 20:03		18:23		17:05
Potential sun hours	297	297	370	399	449	453	460	429	375	345	297	287
Total, worst case					80	7 71	7 75	9 39	1			
Sun reduction					0.62	0.62	0.69	0.65				
Oper. time red.					0.87	0.87	0.87	0.87				
Wind dir. red.					0.66	0.66	0.66	0.66				
Total reduction					0.36	0.36	0.40	0.38				
Total, real					77	2 75	2 88	3 2		5		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

Printed/Page
8/28/2010 7:34 PM / 10

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** H - Shadow Receptor: 30.0 × 30.0 Azimuth: -180.0° Slope: 90.0° (8)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	January		February		March		April		May		June
1	07:52		13:44 (1)	07:38		13:47 (1)	07:01		13:40 (1)	07:10		15:33 (1)	06:24	05:55
	17:06	170	16:34 (1)	17:41	194	17:01 (1)	18:16	202	17:02 (1)	19:50	101	17:14 (1)	20:21	20:52
2	07:52		13:44 (1)	07:37		13:47 (1)	07:00		13:40 (1)	07:08		15:34 (1)	06:23	05:54
	17:07	170	16:34 (1)	17:42	194	17:01 (1)	18:17	201	17:01 (1)	19:51	98	17:12 (1)	20:23	20:52
3	07:52		13:45 (1)	07:36		13:47 (1)	06:58		13:41 (1)	07:07		15:37 (1)	06:21	05:54
	17:08	170	16:35 (1)	17:44	195	17:02 (1)	18:18	200	17:01 (1)	19:52	94	17:11 (1)	20:24	20:53
4	07:52		13:45 (1)	07:35		13:46 (1)	06:57		13:41 (1)	07:05		15:39 (1)	06:20	05:54
	17:09	171	16:36 (1)	17:45	197	17:03 (1)	18:19	198	16:59 (1)	19:53	90	17:09 (1)	20:25	20:54
5	07:52		13:45 (1)	07:34		13:46 (1)	06:55		13:42 (1)	07:03		15:41 (1)	06:19	05:53
	17:10	172	16:37 (1)	17:46	197	17:03 (1)	18:20	197	16:59 (1)	19:55	85	17:06 (1)	20:26	20:55
6	07:52		13:45 (1)	07:33		13:46 (1)	06:54		13:43 (1)	07:02		15:44 (1)	06:18	05:53
	17:11	173	16:38 (1)	17:47	198	17:04 (1)	18:21	195	16:58 (1)	19:56	81	17:05 (1)	20:27	20:55
7	07:52		13:45 (1)	07:32		13:46 (1)	06:52		13:43 (1)	07:00		15:45 (1)	06:16	05:53
	17:12	174	16:39 (1)	17:49	198	17:04 (1)	18:23	193	16:56 (1)	19:57	78	17:03 (1)	20:28	20:56
8	07:52		13:46 (1)	07:30		13:46 (1)	07:50		14:44 (1)	06:59		15:48 (1)	06:15	05:52
	17:13	174	16:40 (1)	17:50	199	17:05 (1)	19:24	192	17:56 (1)	19:58	74	17:02 (1)	20:29	20:57
9	07:52		13:46 (1)	07:29		13:45 (1)	07:49		14:45 (1)	06:57		15:50 (1)	06:14	05:52
	17:14	175	16:41 (1)	17:51	200	17:05 (1)	19:25	190	17:55 (1)	19:59	70	17:00 (1)	20:30	20:57
10	07:52		13:46 (1)	07:28		13:45 (1)	07:47		14:46 (1)	06:55		15:51 (1)	06:13	05:52
	17:15	175	16:41 (1)	17:53	200	17:05 (1)	19:26	187	17:53 (1)	20:00	67	16:58 (1)	20:31	20:58
11	07:51		13:46 (1)	07:27		13:45 (1)	07:45		14:48 (1)	06:54		15:54 (1)	06:12	05:52
	17:16	177	16:43 (1)	17:54	201	17:06 (1)	19:27	184	17:52 (1)	20:00	62	16:56 (1)	20:32	20:58
12	07:51		13:47 (1)	07:26		13:45 (1)	07:44		14:49 (1)	06:52		15:55 (1)	06:11	05:52
	17:17	177	16:44 (1)	17:55	201	17:06 (1)	19:28	182	17:51 (1)	20:01	59	16:54 (1)	20:33	20:59
13	07:51		13:46 (1)	07:24		13:44 (1)	07:42		14:50 (1)	06:50		15:58 (1)	06:10	05:52
	17:18	179	16:45 (1)	17:56	201	17:05 (1)	19:29	179	17:49 (1)	20:02	55	16:53 (1)	20:34	20:59
14	07:50		13:47 (1)	07:23		13:44 (1)	07:40		14:52 (1)	06:49		16:00 (1)	06:09	05:52
	17:19	179	16:46 (1)	17:58	202	17:06 (1)	19:31	176	17:48 (1)	20:03	51	16:51 (1)	20:35	21:00
15	07:50		13:48 (1)	07:22		13:44 (1)	07:39		14:54 (1)	06:47		16:01 (1)	06:08	05:52
	17:20	180	16:48 (1)	17:59	202	17:06 (1)	19:32	172	17:46 (1)	20:04	48	16:49 (1)	20:36	21:00
16	07:50		13:47 (1)	07:20		13:43 (1)	07:37		14:55 (1)	06:46		16:04 (1)	06:07	05:52
	17:22	181	16:48 (1)	18:00	203	17:06 (1)	19:33	169	17:44 (1)	20:05	43	16:47 (1)	20:37	21:01
17	07:49		13:47 (1)	07:19		13:43 (1)	07:35		14:58 (1)	06:44		16:06 (1)	06:06	05:52
	17:23	182	16:49 (1)	18:01	203	17:06 (1)	19:34	165	17:43 (1)	20:06	39	16:45 (1)	20:38	21:01
18	07:49		13:48 (1)	07:18		13:42 (1)	07:34		15:00 (1)	06:43		16:09 (1)	06:05	05:52
	17:24	182	16:50 (1)	18:02	203	17:05 (1)	19:35	161	17:41 (1)	20:07	34	16:43 (1)	20:39	21:01
19	07:48		13:47 (1)	07:16		13:42 (1)	07:32		15:03 (1)	06:41		16:11 (1)	06:04	05:52
	17:25	184	16:51 (1)	18:04	204	17:06 (1)	19:36	155	17:38 (1)	20:09	29	16:40 (1)	20:40	21:02
20	07:47		13:48 (1)	07:15		13:42 (1)	07:30		15:06 (1)	06:40		16:16 (1)	06:03	05:52
	17:26	184	16:52 (1)	18:05	204	17:06 (1)	19:37	151	17:37 (1)	20:10	21	16:37 (1)	20:41	21:02
21	07:47		13:48 (1)	07:13		13:41 (1)	07:29		15:08 (1)	06:38		16:21 (1)	06:02	05:52
	17:28	185	16:53 (1)	18:06	204	17:05 (1)	19:38	147	17:35 (1)	20:11	11	16:32 (1)	20:42	21:02
22	07:46		13:48 (1)	07:12		13:41 (1)	07:27		15:10 (1)	06:37			06:01	05:52
	17:29	185	16:53 (1)	18:07	204	17:05 (1)	19:39	143	17:33 (1)	20:12			20:43	21:03
23	07:46		13:48 (1)	07:11		13:40 (1)	07:25		15:12 (1)	06:35			06:01	05:53
	17:30	187	16:55 (1)	18:09	205	17:05 (1)	19:40	139	17:31 (1)	20:13			20:44	21:03
24	07:45		13:48 (1)	07:09		13:41 (1)	07:24		15:15 (1)	06:34			06:00	05:53
	17:31	188	16:56 (1)	18:10	204	17:05 (1)	19:42	135	17:30 (1)	20:14			20:45	21:03
25	07:44		13:48 (1)	07:08		13:40 (1)	07:22		15:17 (1)	06:32			05:59	05:53
	17:32	188	16:56 (1)	18:11	204	17:04 (1)	19:43	130	17:27 (1)	20:15			20:46	21:03
26	07:43		13:48 (1)	07:06		13:40 (1)	07:20		15:19 (1)	06:31			05:58	05:54
	17:34	189	16:57 (1)	18:12	204	17:04 (1)	19:44	126	17:25 (1)	20:16			20:47	21:03
27	07:42		13:48 (1)	07:05		13:40 (1)	07:19		15:22 (1)	06:29			05:58	05:54
	17:35	190	16:58 (1)	18:13	203	17:03 (1)	19:45	122	17:24 (1)	20:17			20:47	21:03
28	07:42		13:47 (1)	07:03		13:41 (1)	07:17		15:24 (1)	06:28			05:57	05:54
	17:36	191	16:58 (1)	18:14	202	17:03 (1)	19:46	118	17:22 (1)	20:18			20:48	21:03
29	07:41		13:47 (1)				07:15		15:26 (1)	06:27			05:57	05:55
	17:37	192	16:59 (1)				19:47	114	17:20 (1)	20:19			20:49	21:03
30	07:40		13:47 (1)				07:14		15:29 (1)	06:25			05:56	05:55
	17:39	193	17:00 (1)				19:48	109	17:18 (1)	20:20			20:50	21:03
31	07:39		13:47 (1)				07:12		15:31 (1)				05:55	
	17:40	193	17:00 (1)				19:49	105	17:16 (1)				20:51	
Potential sun hours	297			297			370			399			449	453
Total, worst case		5610			5626			5037			1290			
Sun reduction		0.36			0.41			0.41			0.57			
Oper. time red.		0.87			0.87			0.87			0.87			
Wind dir. red.		0.66			0.66			0.66			0.66			
Total reduction		0.21			0.24			0.24			0.33			
Total, real		1181			1346			1201			426			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

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Calculated:
8/28/2010 7:33 PM/2.7.473

SHADOW - Calendar

Calculation: Shadow081410**Shadow receptor:** H - Shadow Receptor: 30.0 × 30.0 Azimuth: -180.0° Slope: 90.0° (8)

Assumptions for shadow calculations

Maximum distance for influence	2,000	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
380	329	251	247	262	379	436	377	417	706	782	866	679	631	491	423	7,656

Idle start wind speed: Cut in wind speed from power curve

	July		August		September		October		November		December	
1	05:56		06:20		06:51		07:22		06:56		07:32	
	21:03		20:45		20:02	62	15:53 (1)	181	14:29 (1)	200	13:15 (1)	177
							16:55 (1)		17:30 (1)		16:35 (1)	
							19:09		17:22		16:57	
												13:28 (1)
												16:25 (1)
2	05:56		06:21		06:52		07:23		06:58		07:33	
	21:03		20:44		20:00	67	15:50 (1)	184	14:27 (1)	199	13:15 (1)	176
							16:57 (1)		17:31 (1)		16:34 (1)	
							19:07		17:21		16:57	
												13:29 (1)
												16:25 (1)
3	05:57		06:22		06:53		07:24		06:59		07:34	
	21:03		20:43		19:57	70	15:48 (1)	186	14:25 (1)	199	13:15 (1)	175
							16:58 (1)		17:31 (1)		16:34 (1)	
							19:05		17:19		16:57	
												13:29 (1)
												16:24 (1)
4	05:57		06:23		06:54		07:25		07:00		07:35	
	21:03		20:41		19:55	74	15:45 (1)	189	14:23 (1)	198	13:16 (1)	174
							16:59 (1)		17:32 (1)		16:34 (1)	
							19:04		17:18		16:57	
												13:30 (1)
												16:24 (1)
5	05:58		06:24		06:55		07:26		07:01		07:36	
	21:03		20:40		19:53	78	15:42 (1)	190	14:22 (1)	198	13:16 (1)	174
							17:00 (1)		17:32 (1)		16:34 (1)	
							19:02		17:17		16:56	
												13:30 (1)
												16:24 (1)
6	05:58		06:25		06:56		07:27		07:02		07:37	
	21:02		20:39		19:52	81	15:40 (1)	193	14:20 (1)	197	13:16 (1)	173
							17:01 (1)		17:33 (1)		16:33 (1)	
							19:00		17:16		16:56	
												13:31 (1)
												16:24 (1)
7	05:59		06:26		06:57		07:28		07:04		07:38	
	21:02		20:38		19:50	85	15:37 (1)	194	14:19 (1)	196	13:17 (1)	172
							17:02 (1)		17:33 (1)		16:33 (1)	
							18:59		17:15		16:56	
												13:32 (1)
												16:24 (1)
8	06:00		06:27		06:58		07:29		07:05		07:39	
	21:02		20:37		19:48	90	15:34 (1)	196	14:17 (1)	196	13:17 (1)	172
							17:04 (1)		17:33 (1)		16:33 (1)	
							18:57		17:14		16:56	
												13:32 (1)
												16:24 (1)
9	06:00		06:28		06:59		07:30		07:06		07:39	
	21:01		20:35		19:47	93	15:32 (1)	198	14:16 (1)	194	13:18 (1)	171
							17:05 (1)		17:34 (1)		16:32 (1)	
							18:56		17:13		16:56	
												13:33 (1)
												16:24 (1)
10	06:01		06:29		07:00		07:31		07:07		07:40	
	21:01		20:34		19:45	97	15:29 (1)	199	14:15 (1)	194	13:18 (1)	171
							17:06 (1)		17:34 (1)		16:32 (1)	
							18:54		17:11		16:56	
												13:33 (1)
												16:24 (1)
11	06:02		06:30		07:01		07:32		07:09		07:41	
	21:01		20:33		19:43	101	15:26 (1)	200	14:14 (1)	193	13:19 (1)	170
							17:07 (1)		17:34 (1)		16:32 (1)	
							18:52		17:10		16:56	
												13:34 (1)
												16:24 (1)
12	06:02		06:31		07:02		07:33		07:10		07:42	
	21:00		20:31		19:41	105	15:22 (1)	201	14:14 (1)	192	13:19 (1)	169
							17:07 (1)		17:35 (1)		16:31 (1)	
							18:51		17:10		16:56	
												13:35 (1)
												16:24 (1)
13	06:03		06:32		07:03		07:35		07:11		07:43	
	21:00		20:30		19:40	109	15:19 (1)	201	14:14 (1)	192	13:19 (1)	168
							17:08 (1)		17:35 (1)		16:31 (1)	
							18:49		17:09		16:56	
												13:35 (1)
												16:23 (1)
14	06:04		06:33		07:04		07:36		07:12		07:44	
	20:59		20:29		19:38	113	15:17 (1)	202	14:13 (1)	191	13:20 (1)	169
							17:10 (1)		17:35 (1)		16:31 (1)	
							18:47		17:08		16:57	
												13:35 (1)
												16:24 (1)
15	06:05		06:34		07:05		07:37		07:13		07:44	
	20:59		20:27		19:36	117	15:14 (1)	203	14:12 (1)	191	13:20 (1)	168
							17:11 (1)		17:35 (1)		16:31 (1)	
							18:46		17:07		16:57	
												13:36 (1)
												16:24 (1)
16	06:05		06:35		07:06		07:38		07:15		07:45	
	20:58		20:26		19:35	121	15:11 (1)	203	14:12 (1)	189	13:21 (1)	168
							17:12 (1)		17:35 (1)		16:30 (1)	
							18:44		17:06		16:57	
												13:37 (1)
												16:25 (1)
17	06:06		06:36		07:07		07:39		07:16		07:46	
	20:58		20:25		19:33	125	15:08 (1)	204	14:11 (1)	188	13:21 (1)	167
							17:13 (1)		17:35 (1)		16:29 (1)	
							18:43		17:05		16:57	
												13:37 (1)
												16:24 (1)
18	06:07		06:37		07:08		07:40		07:17		07:46	
	20:57		20:23		19:31	129	15:05 (1)	204	14:12 (1)	188	13:22 (1)	167
							17:14 (1)		17:36 (1)		16:30 (1)	
							18:41		17:04		16:58	
												13:38 (1)
												16:25 (1)
19	06:08		06:38		07:09		07:41		07:18		07:47	
	20:56		20:22		19:29	134	15:02 (1)	204	14:12 (1)	187	13:22 (1)	167
							17:16 (1)		17:36 (1)		16:29 (1)	
							18:40		17:04		16:58	
												13:38 (1)
												16:25 (1)
20	06:09		06:39		07:10		07:42		07:19		07:48	
	20:56		20:20		19:28	138	14:59 (1)	204	14:12 (1)	185	13:23 (1)	166
							17:17 (1)		17:36 (1)		16:28 (1)	
							18:38		17:03		16:59	
												13:39 (1)
												16:25 (1)
21	06:10		06:40		07:11		07:44		07:20		07:48	
	20:55		20:19		19:26	142	14:56 (1)	204	14:12 (1)	185	13:23 (1)	166
							17:18 (1)		17:36 (1)		16:28 (1)	
							18:37		17:02		16:59	
												13:40 (1)
												16:26 (1)
22	06:11		06:41		16:24 (1)		07:12		07:22		07:49	
	20:54		20:17	13	16:37 (1)		19:24	146	17:19 (1)	205	17:36 (1)	184
									14:53 (1)		14:11 (1)	
									07:45			
									18:35		17:01	
												13:40 (1)
												16:26 (1)
23	06:11		06:42		16:19 (1)		07:13		07:23		07:49	
	20:53		20:16	23	16:42 (1)		19:22	150	17:20 (1)	203	17:36 (1)	184
									14:50 (1)		14:13 (1)	
									07:46			
									18:34		17:01	
												13:24 (1)
												16:26 (1)
24	06:12		06:43		16:15 (1)		07:14		07:24		07:50	
	20:52		20:14	29	16:44 (1)		19:21	154	17:21 (1)	203	17:36 (1)	182
									14:47 (1)		14:13 (1)	
									07:47			
									18:32		17:00	
												13:25 (1)
												16:27 (1)
25	06:13		06:44		16:11 (1)		07:15		07:25		07:50	
	20:52		20:13	35	16:46 (1)		19:19	159	17:23 (1)	203	17:36 (1)	182
									14:44 (1)		14:13 (1)	
									07:48			
									18:31		17:00	
												13:25 (1)
												16:28 (1)
26	06:14		06:45		16:08 (1)		07:16		07:26		07:50	
	20:51		20:11	40	16:48 (1)		19:17	163	17:24 (1)	202	17:35 (1)	181
									14:41 (1)		14:13 (1)	
									07:49			
									18:30		16:59	
												13:26 (1)
												16:27 (1)
27	06:15		06:46		16:06 (1)		07:18		07:27		07:51	
	20:50		20:10	43	16:49 (1)		19:16	167	17:25 (1)	202	17:36 (1)	180
									14:38 (1)		14:14 (1)	
									07:51			
									18:28		16:59	
												13:27 (1)
												16:27 (1)
28	06:16		06:47		16:03 (1)		07:19		07:28		07:51	
	20:49		20:08	48	16:51 (1)		19:14	171	17:26 (1)	202	17:36 (1)	179
									14:35 (1)		14:14 (1)	
									07:52			
									18:27		16:58	
												13:27 (1)
												16:26 (1)
29	06:17		06:48		16:00 (1)		07:20		07:30		07:51	
	20:48		20:06	52	16:52 (1)		19:12	174	17:27 (1)	201	17:35 (1)	178
									14:33 (1)		14:14 (1)	
									07:53			
									18:26		16:58	
												13:28 (1)
												16:26 (1)
30	06:18		06:49		15:58 (1)		07:21		07:31		07:52	
	20:47		20:05	55	16:53 (1)		19:11	178	17:29 (1)	201	17:35 (1)	178
									14:31 (1)		14:14 (1)	
									07:54			
									18:24		16:58	
												13:28 (1)
												16:25 (1)
31	06:19		06:50		15:55 (1)				07:55		14:15 (1)	
	20:46		20:03	59	16:54 (1)				18:23	200	17:35 (1)	
												07:52
												17:05
												13:44 (1)
												16:33 (1)
Potential sun hours	460		429		375		345		297		287	
Total, worst case			397		3593		6162		5679		5252	
Sun reduction			0.65		0.55		0.51		0.27		0.20	
Oper. time red.			0.87		0.87		0.87		0.87		0.87	
Wind dir. red.			0.66		0.66		0.66		0.66		0.66	
Total reduction			0.38		0.32		0.30		0.16		0.12	
Total, real			150		1151		1835		903		617	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Kenston

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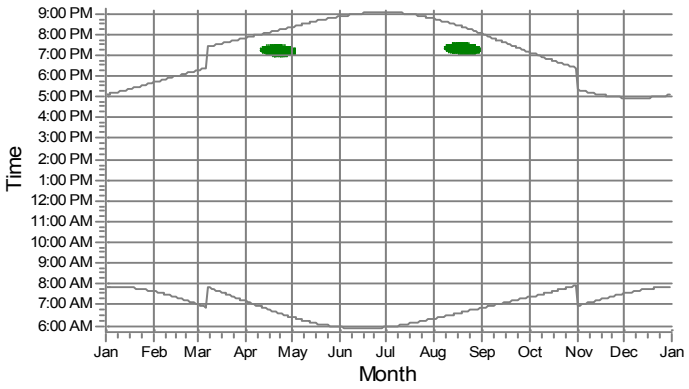
Calculated:
8/28/2010 7:33 PM/2.7.473

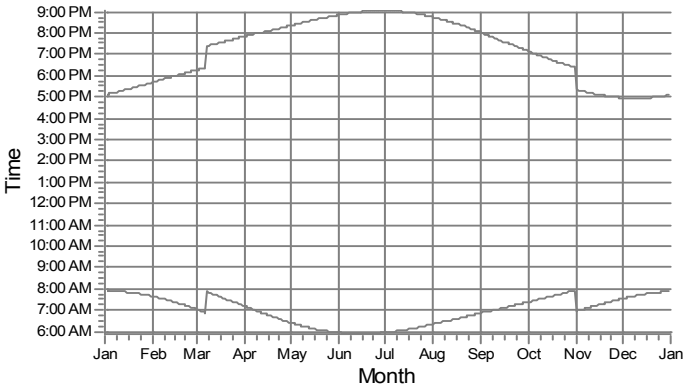
SHADOW - Calendar, graphical

Calculation: Shadow081410

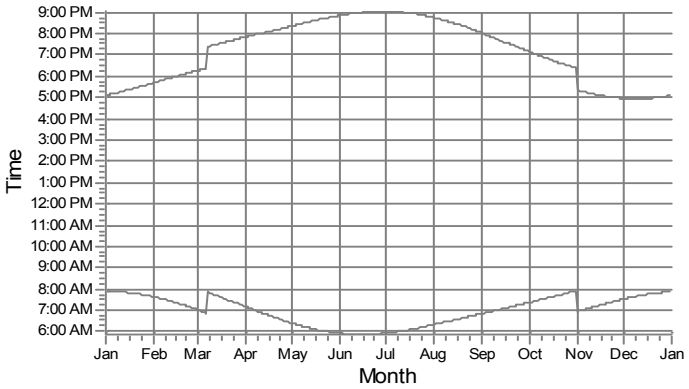
A: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (1)



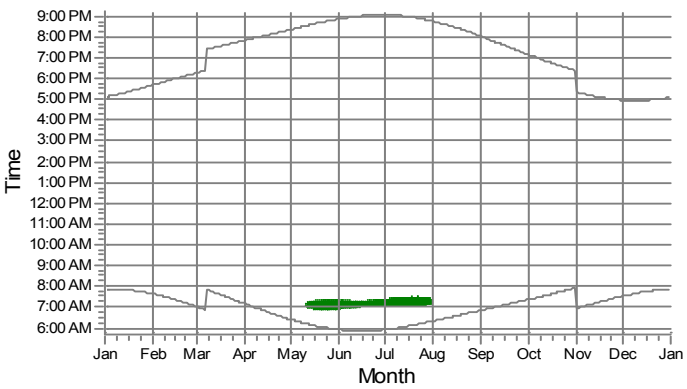
B: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (2)



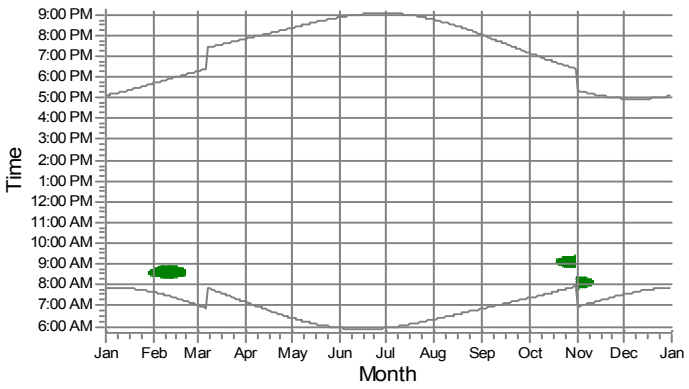
C: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (3)



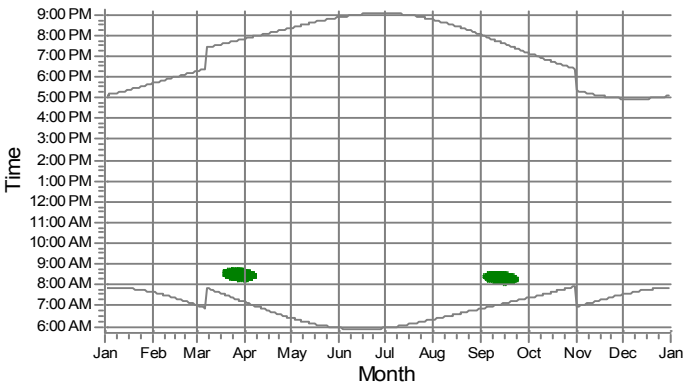
D: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (4)



E: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (5)



F: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (6)



WTGs

1: Kenston WTG

Project:
Kenston

THE RENAISSANCE GROUP — A Conserve First Company

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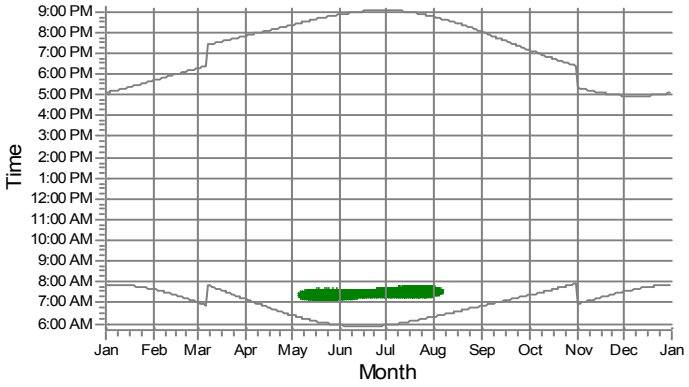
Calculated:
8/28/2010 7:33 PM/2.7.473

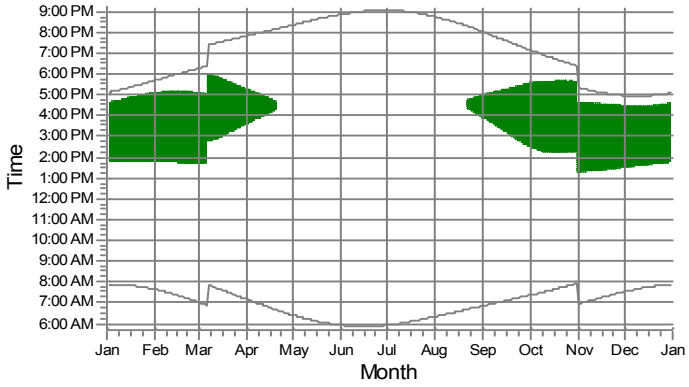
SHADOW - Calendar, graphical

Calculation: Shadow081410

G: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (7)



H: Shadow Receptor: 30.0 × 30.0 Azimuth: -180.0° Slope: 90.0° (8)



WTGs

1: Kenston WTG

Turbine Use, Safety Policies and General Background

Security:

- Tower Climbing: The wind turbine utilizes a smooth exterior monopole tower with no climbing surfaces or apparatus. Tower climbing is only achieved through the use of an internal ladder system. This system is only reachable through a locked plate steel door.
- Availability: Only preauthorized personnel will be given access to the internal tower and turbine systems.

Tower Climbing Safety:

- Safety Climb: For maintenance personnel climbing of the tower, an OSHA approved "safety climb" system is included in the tower climbing system. This system is comprised of a ladder, a steel cable for the safety climb device, a full body harness designed and approved for the purpose, a locking safety climb device, safety lanyards with self-locking clips and additional tie-in points throughout the turbine system where a cable system is not available.
- OSHA approved safety equipment such as hardhats will be worn by all maintenance personnel climbing or working on the turbine.
- No individual shall climb the tower without a partner.

Electrical Safety:

- All electrical components and their installations shall meet all Local, State and Federal applicable laws and regulations.
- The turbine system shall meet UL1741 and IEC requirements for Utility Grid Protection in case of Grid power failures or power quality abnormalities.
- All electrical supply/grid interconnect services to and from the turbine shall be in buried conduits.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.

- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- All safety sensors and equipment shall fault to a turbine fault state in case of their own failure.

Fire:

- The turbine shall have fire detection devices at the tower base and within the nacelle that shall be linked to the Site's existing fire detection/alarm systems (if present).
- The local fire department shall be contacted and a fire/emergency response plan shall be adopted.
- Although formal fire suppression systems are extremely rare for wind turbines, the site shall investigate passive and active fire suppression systems for possible implementation in the turbine system.
- Local fire department approved fire extinguishers shall be located within the tower base and within the nacelle.
- The turbine system will have staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- Safety zones similar to any fire related incident will be utilized, if a fire should occur.

Lightening:

- The turbine system is equipped with a full grounding loop meeting or exceeding all Local, State and Federal regulations concerning grounding and lightening protection.
- Surge suppressing technology will be utilized to protect key electronics.
- See fire policies above.

Icing:

- Although icing of wind turbines is very rare and safety issues related to icing even rarer, it can occur, similar to any built structure (roofs, power lines, stadium lights, etc.).
- Although not an absolute brake, blade icing induced airfoil shape spoiling will naturally reduce the efficiency of the blades and thus reduce their rotational speed.
- Although formal icing detection systems are extremely rare for wind turbines, the site shall investigate active icing detection systems for possible implementation in the turbine system.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- The turbine's nacelle will have a cold-weather package including nacelle heaters. These heaters are designed to maintain nacelle temperatures above the dew-point and well above freezing. This system will automatically melt snow and ice accumulation on top of the nacelle.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- All icing related turbine shut-downs will require a direct inspection and an on-site manual restart.
- The site personnel and the system maintenance personnel will shut down the turbine in the event of an icing condition.
- The site shall adopt an ice safety zone around the turbine for implementation during icing events, if they should occur.

High Wind:

- The turbine automatically shuts down in high winds and turns itself out of the wind.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration,

over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.

Aviation Safety:

- The project has been review by both FAA and ODOT and "No Hazard to Aviation" determinations were issued.
- An FAA approved red obstruction marking light will be located on top of the nacelle.

Shadow Flicker:

- Although all structures cast shadows, shadows from wind turbines that reach occupied structures or areas can be considered a nuisance due to the fact that they move or flicker as the blades rotate in front of the Sun.
- A formal shadow flicker study has been conducted for the site based on the turbine's rotor diameter and height, the site latitude and longitude, weather records, existing site topography and the existing area obstructions.
- Per international standards, shadow flicker impacting a particular location above 30 hours per year is considered a potential nuisance. While the turbine's shadow will reach some of the area properties, no residential or business property locations will receive more than 30 hours of shadow per year. Other factors that mitigate the shadows' impact include:
    - Shadow intensity drops off with distance. Shadow edges soften and shadow bodies become more muted. Shadows beyond ten rotor diameters from the tower base are considered insignificant with shadows within five rotor diameters being the most significant.
    - Shadows move and do not remain in one spot for extended periods of time.
    - The longest extended period shadows occur in the winter when there are fewer sunny days.
    - Many local natural and built environmental elements such as trees will block or significantly diffuse shadows.
- If extended adverse shadows should impact a particular dwelling, the wind turbine site owner will take one or more of the following mitigating measures:
    - Plant evergreen trees to block the shadow.
    - Provide blinds for the dwelling.
    - Turn off the turbine during the shadowing periods that excessively affect the dwelling.

Sound:

- Wind turbines of the size to be installed are inherently quite devices, especially over distance, and are typically very hard to hear over the wind itself and the existing ambient area noise levels.
    - Sound from a single wind turbines typically comes from the following areas:
        - Wind noise off of the blades as they are driven by the wind (swooshing that drops off over distance and typically competes with the area's natural wind noise).
        - Drive-train noise (mechanical sound typically not heard outside the immediate vicinity of the turbine).
        - Yaw system noise (mechanical sound typically not heard outside the immediate vicinity of the turbine and that is only present when the turbine turns into the wind).
        - Electrical noise from the turbine's electrical equipment and transformer (buzz, typically not heard outside the immediate vicinity of the turbine).
- Sound modeling for the proposed wind turbine supports that turbine produced audio levels will not exceed any local code or ordinance at the site's property lines. To be conservative, this modeling was done at an 8 mps/17.9 mph wind speed, well above site averages.
- Sound measurement of existing ambient sound levels for both day and evening periods at multiple locations surrounding the site show existing ambient sound levels above what the wind turbine will produce.

References

British Epilepsy Association. 2007.
Photosensitive Epilepsy. Epilepsy Action, Yeadon Leeds, UK. Department for Business Enterprise & Regulatory Reform (BERR).
http://www.berr.gov.uk/whatwedo/energy/sources/renewables/planning/onshore-wind

Business Enterprise and Regulatory Reform (BERR), United Kingdom Department. 2009.
Onshore Wind: Shadow Flicker.
http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file35240.pdf

Graham Harding, Pamela Harding, Arnold Wilkins (2008)
Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them.
http://www.mfe.govt.nz/rma/call-in-turitea/submissions/186changeappendix3.pdf

Klepinger, Michael. February 2007.
Michigan Land Use Guidelines for Siting Wind Energy Systems.
Michigan State Extension Bulletin.

National Research Council (NRC) of the National Academies. 2007.
Environmental Impacts of Wind Energy Projects.
Committee on Environmental Impacts of Wind Energy Projects, Board on Environmental Studies and Toxicology. Division of Earth and Life Sciences. The National Academies Press, Washington, DC.

Sustainable Energy Authority Victoria. 2003.
Policy Planning and Guidelines for Development of Wind Energy Facilities in Victoria.
Sustainable Energy Authority Victoria, Melbourne Victoria, Australia.

US Department of Interior (DOI). 2005.
Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States.
Bureau of Land Management.

[i] The only known shadow flicker regulation to date was enacted in Germany, where a court ruled that the maximum allowable flicker would be 30 hours per year (Klepinger, 2007). In addition, Dobesch and Kury (2001) recommended that shadow flicker should not exceed 30 hours per year, and the guidelines for wind power development in the State of Victoria, Australia state that shadow flicker may not exceed 30 hours per year at any dwelling in the surrounding area (Sustainable Energy Authority Victoria, 2003). Since there are no known national or local regulations that govern shadow flicker in the United States, New York State, or Steuben County, the 30-hour per year threshold is used in this analysis to determine potentially impacted structures.
http://www.eon.com/en/downloads/Appendix_M_Shadow_Flicker_Modeling_Report.pdf

[ii] Epilepsy Foundation. (n.d.). Photosensitivity and Epilepsy.
http://www.epilepsyfoundation.org/about/photosensitivity/

[iii] As there is a possibility of a turbine model change on the project, the worst case largest model under consideration was used for the shadow flicker models.

APPENDIX C:

AGENCY COORDINATION AND APPROVALS

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

Aeronautical Study No.
2008-AGL-3977-OE

Issued Date: 01/15/2010

Dr. Robert Lee
Kenston Local School District
17419 Snyder Road
Chagrin Falls, OH 44023

**** Extension ****

A Determination was issued by the Federal Aviation Administration (FAA) concerning:

Structure:	Wind Turbine Kenston Schools Wind Turbine
Location:	Chagrin Falls, OH
Latitude:	41-23-39.61N NAD 83
Longitude:	81-18-17.98W
Heights:	275 feet above ground level (AGL) 1530 feet above mean sea level (AMSL)

In response to your request for an extension of the effective period of the determination, the FAA has reviewed the aeronautical study in light of current aeronautical operations in the area of the structure and finds that no significant aeronautical changes have occurred which would alter the determination issued for this structure.

Accordingly, pursuant to the authority delegated to me, the effective period of the determination issued under the above cited aeronautical study number is hereby extended and will expire on 01/15/2012 unless otherwise extended, revised, or terminated by this office.

This extension issued in accordance with 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerns the effect of the 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 (718) 553-2611. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2008-AGL-3977-OE.

Signature Control No: 576383-121893080 (EXT -WT)
Angelique Lestrad
Technician

cc: FCC

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

Aeronautical Study No.
2008-AGL-3977-OE

Issued Date: 07/15/2008

Dr. Robert Lee
Kenston Local School District
17419 Snyder Road
Chagrin Falls, OH 44023

**** 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 Kenston Schools Wind Turbine
Location:	Chagrin Falls, OH
Latitude:	41-23-39.61N NAD 83
Longitude:	81-18-17.98W
Heights:	275 feet above ground level (AGL) 1530 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 01/15/2010 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.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, 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.

A copy of this determination will be forwarded to the Federal Communications Commission if the structure is subject to their licensing authority.

If we can be of further assistance, please contact our office at (770) 909-4329. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2008-AGL-3977-OE.

Signature Control No: 576383-102322606 (DNE)
Michael Blaich
Specialist

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

Aeronautical Study No.
2010-WTE-14362-OE
Prior Study No.
2008-AGL-3977-OE

Issued Date: 11/09/2010

Dr. Robert Lee
Kenston Local School District
17419 Snyder Road
Chagrin Falls, OH 44023

**** 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 Kenston Schools Wind Turbine
Location:	Chagrin Falls, OH
Latitude:	41-23-37.95N NAD 83
Longitude:	81-18-19.03W
Heights:	305 feet above ground level (AGL) 1557 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 05/09/2012 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 E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO

SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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 2010-WTE-14362-OE.

Signature Control No: 131696804-132987517 (DNE -WT)
Michael Blaich
Specialist

Delivered by email
From: *Mitch, Brian (Brian.Mitch@dnr.state.oh.us)*
Sent: *Friday, August 27, 2010 12:21 PM*
To: *AAron Godwin (AAron@conservefirst.com)*
Subject: *10-0277; Ohio Wind Schools Wind Turbine Projects*

ODNR COMMENTS TO:
Aaron Goodwin, The Renaissance Group, 8281 Euclid Chardon Road, Suite E, Kirtland, Ohio 44094

Project: The project consists of the installation of several single wind turbine projects located in the cities of Archbold, Pettisville, Berea, Cleveland, and Chagrin Falls, Ohio. All turbines will be less than 750kW.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced projects. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Fish and Wildlife: The ODNR, Division of Wildlife (DOW) has the following comments.

Archbold Area Schools Project:
The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. The following species of trees have relatively high value as potential Indiana bat roost trees: Shagbark hickory (*Carya ovata*), Shellbark hickory (*Carya laciniosa*), Bitternut hickory (*Carya cordiformis),* Black ash (*Fraxinus nigra*), Green ash (*Fraxinus pennsylvanica*), White ash (*Fraxinus americana*), Shingle oak (*Quercus imbricaria*), Northern red oak (*Quercus rubra*), Slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (Populus deltoides), Silver maple (*Acer saccharinum*), Sassafras (*Sassafras albidum*), Post oak (*Quercus stellata*), and White oak (*Quercus alba*). Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed above with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed above with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. If suitable trees occur within the project area, these trees must be conserved. If suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. *If no tree removal is proposed, the project is not likely to impact this species.*

The project is within the range of the rayed bean (*Villosa fabalis*), a state endangered and federal candidate mussel species. If there is a history of mussels near the proposed project area, it may be necessary for a professional malacologist approved by the DOW to conduct a mussel survey in the project area. *If no in-water work is proposed, the project is not likely to impact this species and a survey would not be necessary.*

The project is within the range of the Eastern massasauga (*Sistrurus catenatus*), a state endangered and a federal candidate snake species. *Due to the location of the project, the project is not likely to impact this species.*

The ODNR, Ohio Biodiversity Database contains no data at this project site.

Pettisville Local Schools Project:

The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. The following species of trees have relatively high value as potential Indiana bat roost trees: Shagbark hickory (*Carya ovata*), Shellbark hickory (*Carya laciniosa*), Bitternut hickory (*Carya cordiformis),* Black ash (*Fraxinus nigra*), Green ash (*Fraxinus pennsylvanica*), White ash (*Fraxinus americana*), Shingle oak (*Quercus imbricaria*), Northern red oak (*Quercus rubra*), Slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (Populus deltoides), Silver maple (*Acer saccharinum*), Sassafras (*Sassafras albidum*), Post oak (*Quercus stellata*), and White oak (*Quercus alba*). Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed above with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed above with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. If suitable trees occur within the project area, these trees must be conserved. If suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. *If no tree removal is proposed, the project is not likely to impact this species.*

The project is within the range of the rayed bean (*Villosa fabalis*), a state endangered and federal candidate mussel species. If there is a history of mussels near the proposed project area, it may be necessary for a professional malacologist approved by the DOW to conduct a mussel survey in the project area. *If no in-water work is proposed, the project is not likely to impact this species and a survey would not be necessary.*

The project is within the range of the Eastern massasauga (*Sistrurus catenatus*), a state endangered and a federal candidate snake species. *Due to the location of the project, the project is not likely to impact this species.*

The ODNR, Ohio Biodiversity Database contains no data at this project site.

Cuyahoga County Fairgrounds Project:

The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. There is a record for this species about 4.3 miles from this project site. The following species of trees have relatively high value as potential Indiana bat roost trees: Shagbark hickory (*Carya ovata*), Shellbark hickory (*Carya laciniosa*), Bitternut hickory (*Carya cordiformis),* Black ash (*Fraxinus nigra*), Green ash (*Fraxinus pennsylvanica*), White ash (*Fraxinus americana*), Shingle oak (*Quercus imbricaria*), Northern red oak (*Quercus rubra*), Slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (Populus deltoides), Silver maple (*Acer saccharinum*), Sassafras (*Sassafras albidum*), Post oak (*Quercus stellata*), and White oak (*Quercus alba*). Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed above with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed above with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. If suitable trees occur within the project area, these trees must be conserved. If suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. *If no tree removal is proposed, the project is not likely to impact this species.*

The project is within the range of the bald eagle (*Haliaeetus leucocephalus*), a state threatened species. *However, the Ohio Biodiversity Database currently has no records of this species near the project area.*

The project is within the range of the Canada darner (*Aeshna canadensis*), a state endangered dragonfly. *Due to the mobility of this species, the project is not likely to impact this species.*

The project is within the range of the black bear (*Ursus americanus*), a state endangered species, and the bobcat (*Lynx rufus*), a state endangered species. *Due to the mobility of these species, the project is not likely to have an impact on these species.*

The project is within the range of the golden-winged warbler (*Vermivora chrysoptera*), a state endangered bird, the piping plover (*Charadrius melodus*), a state and federally endangered bird species, the king rail (*Rallus elegans*), a state endangered bird, and the yellow-bellied sapsucker (*Sphyrapicus varius*), a state endangered bird. *Due to the location of the project and the habitat requirements of these species, the project is not likely to impact these species.*

The ODNR, Ohio Biodiversity Database contains no data at this project site.

Kenston Local Schools Project:

The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. There is a record for this species about seven miles from the project area. The following species of trees have relatively high value as potential Indiana bat roost trees: Shagbark hickory (*Carya ovata*), Shellbark hickory (*Carya laciniosa*), Bitternut hickory (*Carya cordiformis),* Black ash (*Fraxinus nigra*), Green ash (*Fraxinus pennsylvanica*), White ash (*Fraxinus americana*), Shingle oak (*Quercus imbricaria*), Northern red oak (*Quercus rubra*), Slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (Populus deltoides), Silver maple (*Acer saccharinum*), Sassafras (*Sassafras albidum*), Post oak (*Quercus stellata*), and White oak (*Quercus alba*). Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed above with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed above with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. If suitable trees occur within the project area, these trees must be conserved. If suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. *If no tree removal is proposed, the project is not likely to impact this species.*

The project is within the range of the bald eagle (*Haliaeetus leucocephalus*), a state threatened species. *However, the Ohio Biodiversity Database currently has no records of this species near the project area.*

The project is within the range of the snuffbox (*Epioblasma triquetra*), a state endangered mussel, and the eastern pondmussel *(Ligumia nasuta*), a state endangered mussel. If there is a history of mussels near the proposed project area, it may be necessary for a professional malacologist approved by the DOW to conduct a mussel survey in the project area. *If no in-water work is proposed, the project is not likely to impact these species and a survey would not be necessary.*

The project is within the range of the American emerald (*Cordulia shurtleffi*), a state endangered dragonfly, the frosted whiteface (*Leucorrhinia frigida*), a state endangered dragonfly, and the racket-tailed emerald (*Dorocordulia libera*), a state endangered dragonfly. *Due to the mobility of these species, the project is not likely to impact these species.*

The project is within the range of the black bear (*Ursus americanus*), a state endangered species, and the bobcat (*Lynx rufus*), a state endangered species. *Due to the mobility of these species, the project is not likely to have an impact on these species.*

The project is within the range of the yellow-bellied sapsucker (*Sphyrapicus varius*), a state endangered bird. *Due to the location of the project and the habitat requirements of this species, the project is not likely to have an impact on this species.*

The project is in the range of the snowshoe hare (*Lepus americanus*), a state endangered species. *Due to the location of the project area, the project is not likely to have an impact on this species.*

The ODNR, Ohio Biodiversity Database contains no data at this project site.

Geological Survey: The ODNR, Division of Geological Survey has the following comments.
The Archbold site is on soft lacustrine silt and clay and the bedrock is 150 feet deep. The Pettisville site is on soft lacustrine sand and the bedrock is 145 feet deep. Both of these sites may require deepened foundations.

The Division of Geological Survey has no significant geologic concerns with the other two sites.

ODNR appreciates the opportunity to provide these comments. Please contact Brian Mitch at (614) 265-6378 if you have questions about these comments or need additional information.

Brian Mitch, Environmental Review Manager
Ohio Department of Natural Resources
Environmental Services Section
2045 Morse Road, Building F-3
Columbus, Ohio 43229-6693
Office: (614) 265-6378
Fax: (614) 262-2197
brian.mitch@dnr.state.oh.us

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / FAX (614) 416-8994

September 18, 2009

Mr. AAron Godwin
The Renaissance Group
10299 Longview Drive
Kirtland, Ohio 44094

TAILS# 31420-2009-TA-1159

Dear Mr. Godwin:

This is in response to your September 14, 2009 letter requesting our review of a proposed wind energy project in Geauga County, Ohio. The project involves installation of a small (225 kW-750 kW), single wind turbine at the Kenston School Site, Geauga County, Ohio. Currently, the project area is composed of an existing school facility. The landscape surrounding the school is residential and forested in nature. This information is solicited to support an application for ARRA stimulus funding.

There are no Federal wilderness areas, wildlife refuges, or designated critical habitat within the vicinity of the project area.

The following comments are being provided pursuant to the Endangered Species Act (ESA), Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Fish and Wildlife Act of 1956. This information is being provided to assist you in making an informed decision regarding wildlife issues, site selection, project design, and compliance with applicable laws.

The Fish and Wildlife Service (Service) supports the development of wind power as an alternative energy source, however, wind power projects can have negative impacts on wildlife and their habitats if not sited and designed with potential wildlife and habitat impacts in mind. Selection of the best sites for turbine placement is enhanced by ruling out sites with known, high concentrations of birds and/or bats passing within the rotoswept area of the turbines or where the effects of habitat fragmentation will be detrimental. In support of wind power generation as a wildlife-friendly, renewable source of power, development sites with comparatively low bird, bat and other wildlife values, would be preferable and would have relatively lower impacts on wildlife.

ENDANGERED SPECIES COMMENTS:

The proposed project lies within the range of the **Indiana bat** (*Myotis sodalis*), a Federally listed endangered species. Since first listed as endangered in 1967, their population has declined by nearly 60%. Several factors have contributed to the decline of the Indiana bat, including the loss and degradation of suitable hibernacula, human disturbance during hibernation, pesticides, and the loss and degradation of forested habitat, particularly stands of large, mature trees. Fragmentation of forest habitat may also contribute to declines. During the winter Indiana bats hibernate in caves and abandoned mines. Summer habitat requirements for the species are not well defined but the following are considered

important:

1. Dead or live trees and snags with peeling or exfoliating bark, split tree trunk and/or branches, or cavities, which may be used as maternity roost areas.

2. Live trees (such as shagbark hickory and oaks) which have exfoliating bark.

3. Stream corridors, riparian areas, and upland woodlots which provide forage sites.

The Service currently has no records for Indiana bats within 5 miles of the project area, and the immediate project area does not support suitable habitat. Therefore, we do not anticipate any impact on this species.

MIGRATORY BIRD COMMENTS:

The Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. Bald and golden eagles are afforded additional legal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Unlike the Endangered Species Act, neither the MBTA nor its implementing regulations at 50 CFR Part 21, provide for permitting of "incidental take" of migratory birds. While bald eagles are known to occur in Geauga County, none are within 5 miles of the project area and the project area does not provide suitable habitat. Therefore, we do not anticipate any impact on this species.

The Service's Office of Law Enforcement serves its mission to protect Federal trust wildlife species, in part, by actively monitoring industries known to negatively impact wildlife, and assessing their compliance with Federal law. These industries include oil/gas productions sites, cyanide heap/leach mining operations, industrial waste water sites, and wind power sites. There is no threshold as to the number of birds incidentally killed by wind power sites, or other industry, past which the Service will seek to initiate enforcement action. However, the Service is less likely to prioritize enforcement action against a site operator that is cooperative in seeking and implementing measures to mitigate takes of protected wildlife.

Research into the actual causes of bat and bird collisions with wind turbines is limited. To assist Service field staffs in review of wind farm proposals, as well as aid wind energy companies in developing best practices for siting and monitoring of wind farms, the Service published *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003). We encourage any company/licensee proposing a new wind farm to consider the following excerpted suggestions from the guidelines in an effort to minimize impacts to migratory birds and bats.

1) Pre-development evaluations of potential wind farm sites to be conducted by a team of Federal and/or State agency wildlife professions with no vested interest in potential sites;

2) Rank potential sites by risk to wildlife;

3) Avoid placing turbines in documented locations of federally-listed species;

4) Avoid locating turbines in known bird flyways or migration pathways, or near areas of high bird concentrations (i.e., rookeries, leks, refuges, riparian corridors, etc.);

5) Avoid locating turbines near known bat hibernation, breeding, or maternity colonies, in migration corridors, or in flight paths between colonies and feeding areas;

6) Configure turbine arrays to avoid potential avian mortality where feasible. Implement storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species;

7) Avoid fragmenting large, contiguous tracts of wildlife habitat;

8) Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities;

9) If taller turbines (top of rotorswept area is greater than 199 feet above ground level) require lights for aviation safety, the minimum amount of lighting specified by the Federal Aviation Administration (FAA) should be used. Unless otherwise requested by the FAA, only white strobe lights should be used at night, and should be of the minimum intensity and frequency of flashes allowable. Red lights should not be used, as they appear to attract night-migrating birds at a higher rate than white lights;

10) Adjust tower height to reduce risk of strikes in areas of high risk for wildlife.

The full text of the guidelines is available at http://www.fws.gov/habitatconservation/wind.pdf. The Service believes that implementing these guidelines may help reduce mortality caused by wind turbines. We encourage you to consider these guidelines in the planning and design of the project. We particularly encourage placement of turbines away from any large wetland, stream corridor, or wooded areas, including the areas mentioned previously, and avoid placing turbines between nearby habitat blocks.

Thank you for the opportunity to provide comments on this proposed project. Please contact biologist Megan Seymour at extension 16 in this office if we can be of further assistance.

Sincerely,

for Mary Knapp, Ph.D.
Supervisor

Cc: Mr. Keith Lott, ODNR, Old Woman Creek, 2514 Cleveland Road East, Huron, OH 44839
Mr. Brian Mitch, ODNR, REALM, Columbus, OH

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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September 2, 2010

DOE Golden Field Office
c/o Melissa Rossiter
1617 Cole Boulevard
Golden, CO 80401

Dear Ms. Rossiter:

This is in response to your Notice of Public Scoping for the proposed Kenston Local Schools Wind Turbine which involves the construction and operation of a single 600 kW wind turbine at the school located at 17419 Snyder road, Chagrin Falls, Geauga County, Ohio. Funding for the project is being sought through the Department of Energy (DOE). The following comments are being provided pursuant to the Endangered Species Act (ESA), Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Fish and Wildlife Act of 1956. This information is being provided to assist you in making informed decisions regarding wildlife issues, site selection, and project design, and to assist you with complying with the applicable Federal wildlife laws.

The Fish and Wildlife Service (Service) supports the development of wind power as an alternative energy source; however, wind power projects can have avoidable negative impacts on wildlife and their habitats if not sited and designed with potential wildlife and habitat impacts in mind. Generally speaking, selection of the best sites for turbine placement is enhanced by ruling out sites with known, high concentrations of birds and/or bats passing nearby the rotorswept area of the turbines or where the effects of habitat fragmentation will be detrimental.

ENDANGERED SPECIES COMMENTS:
The ESA prohibits the "take" of any listed species. Take is defined as, among other things, to harass, harm, wound, or kill. Harm and harass are further defined by regulation. Harm includes habitat modification or degradation that results in death or injury. Harass means to cause injury by disrupting normal behavior patterns such as breeding, feeding, or sheltering. The ESA also prohibits Federal agencies from funding, authorizing, or carrying-out, in full or in part, any action that is likely to adversely modify critical habitat. For reasons described below, we believe your project *is likely to adversely affect* Indiana bats, although we believe that by relocating the turbine to a position greater than 1000 feet from forest areas, adverse effects could be avoided (please see *Recommendations* section below). The project additionally lies within the range of the **rayed bean** (*Villosa fabalis*) and **eastern massasauga** (*Sistrurus catenatus catenatus*), Federal candidate species. However no suitable habitat for either of these species occurs within the project area and no impact to these species is anticipated.

Indiana Bat
Your proposed project lies within the range of the Indiana bat (*Myotis sodalis*), a federally listed endangered species. Since first listed as endangered in 1967, their population has declined by nearly 60 percent. Several factors have contributed to the decline of the Indiana bat, including the loss and

degradation of suitable hibernacula, human disturbance during hibernation, pesticides, and the loss, fragmentation, and degradation of forested habitat, particularly stands of large, mature trees.
During the winter, Indiana bats hibernate in caves and abandoned mines. These caves are critical for the survival of the species and several have been officially designated as critical habitat. In the spring and fall, Indiana bats migrate between their summer and winter habitats. Knowledge of the migratory behavior of Indiana bats is limited. Anecdotal information and available data give some insights into their flight behavior. Data from a few studies from the eastern portion of the range indicate that Indiana bats will fly at the canopy level during migration. Anecdotal information and data from closely related species, however, indicate that they may also fly at higher elevations especially over open areas. Upon arriving at their summer grounds, females form maternity colonies while males tend to roost singly. Summer habitat for Indiana bats includes roosting, foraging, and commuting areas. Roosting habitat is generally described as wooded areas containing trees or snags with peeling or exfoliating bark, split tree trunk and/or branches, or cavities. Foraging habitat includes stream corridors, riparian areas, and upland woodlots, and commuting habitat includes wooded areas, tree-lines or wooded hedgerows and other such wooded pathways that connect roosting and foraging areas. Information to date indicates that Indiana bats predominately forage, roost, and travel within wooded habitats or along their edges and are rarely found in open areas. Drawing from all existing data, we believe it is highly unlikely for summering Indiana bats to use open areas that are greater than 1000 feet from a wooded edge or area. Extensive research has shown that Indiana bats are highly philopatric to both their hibernation and summer areas. Thus, loss or degradation of these traditionally used areas is likely to cause harm to Indiana bats.

Wind energy facilities in various habitats across the U.S. and Canada have been documented to cause "widespread and often extensive fatalities of bats" (Arnett *et al.* 2008). At this time, research into the mechanisms that cause mortality of bats at wind power sites is ongoing but collision and barotrauma associated with moving turbine blades are clear proximate causes of death. Also, research on how to avoid fatalities is continuing. Currently, only a few operational tools have shown some success at avoiding or minimizing take, e.g., feathering of turbines during times when bats are most at risk has been shown to reduce mortality in some situations. Clearly, siting is important measure for avoiding and minimizing impacts. Siting recommendations to avoid impacts during the summer and winter periods are easier to provide, while the uncertainties relating to Indiana bat migration lend some difficulty to predicting where on the landscape we would expect Indiana bats to occur.

We have integrated what we know about Indiana bat ecology, the siting and operational specifics of your project, and what we know about turbine and bat interactions to assess the impacts of your project on Indiana bats. For reasons described below we believe your project is unlikely to adversely affect fall swarming and wintering Indiana bats but may adversely affect migrating and summering Indiana bats.

Winter (and fall swarming) Period
In fall just before entering caves for hibernation, Indiana bats use the surrounding forested area to forage and build up fat reserves for their 6-7 month hibernation period. Data available suggest that Indiana bats will forage up to 10 to 20 miles from their hibernacula. Turbines placed within this fall swarming range may take Indiana bats. As the location of your proposed wind turbine is not within 20 miles of any known or suspected Indiana bat hibernacula, we believe it is unlikely that your project will take Indiana bats during the fall swarming and hibernation periods.

Migration Period
The vast majority of the document fatalities across U.S. and Canada have occurred during the fall *migratory* season (Arnett *et al.* 2008). Most of these mortalities were "long-distant migratory tree bats," which are a group of bats that exhibit substantially different behaviors during migration than species like Indiana bat. It is currently suspected that these differences make the long-distant migratory tree bats more

susceptible to exposure to wind turbines than other guilds of bats. Although not as frequently recorded, there have been a notable number of fatalities for other species of bats as well, with a single Indiana bat mortality incident detected at a wind power facility in Indiana. These observations confirm that other bats, including Indiana bats, are also susceptible to mortality from wind turbines during the migration period.

Interactions between bats and wind turbines, particularly small-size, single turbines, are poorly understood, and therefore appropriate siting of wind power facilities to avoid and minimize take remains our most effective tool. Generally speaking, we expect that Indiana bats are substantially less vulnerable to take at small wind facilities. However, there is a confounding factor of blade height with the smaller-sized turbines. As indicated above, we lack data on the height at which Indiana bats fly while migrating. Mortality of little brown bat (*Myotis lucifugus*) at wind facilities across the range indicate that this closely related species migrates at heights typical of the rotorswept area of commercial turbines. This coupled with the record of an Indiana bat killed at a commercial wind facility suggest that Indiana bats may often fly at heights that intersect commercial sized turbines during migration. This mortality event occurred in an unforested area. Thus, we believe that Indiana bats are susceptible to wind turbine mortality anywhere within the range of Indiana bats. At small scale wind sites, the area of exposure is substantially less than the cumulative rotorswept area of a commercial sized facility, and thus, so too is the likelihood of an Indiana bat intersecting a turbine.

In areas where suitable habitat is nearby, however, the risk of mortality during migration is higher. Data from migration studies indicate that Indiana bats will fly at or above the tree canopy level during the migration period. The rotorswept area associated with small-size turbines will intersect the area that Indiana bats are known to use at times during migration. For this reason, we believe in order to minimize the chance of taking Indiana bats during the migratory period, the wind turbine should be located greater than 1000 feet from woodlots and forested streams corridors.

Summer Period

Although monitoring to date shows that mortality is greatest during the fall migration period, substantial bat fatalities have been recorded during the summer, including *Myotis* species. For this reason, we believe turbines sited within or near (1000 ft) suitable Indiana bat summer habitat may lead to the take of Indiana bats.

In addition to the direct take due to collision and barotrauma associated with turbine operation, habitat manipulation needed to construct the wind turbines can also have adverse effects on Indiana bats. Extensive research has been conducted on the behavior and habitat use of Indiana bats during the summer period. Briefly, female Indiana bats form colonies ranging from 25 to 300 adult bats, with an average around 80. Each female rears a single pup. The colony typically has a single tree within wooded areas in which they roost together for most of the summer with decreasing frequency/dependency in latter part of the summer. Male Indiana bats are sometimes found among females, but more typically they roost singly or smaller groups. At dusk, the adults and volant young depart the roost tree to search for insect prey throughout the night. Their foraging habitat is primarily restricted to woodlots and forested streams although they will forage along the forest edge and tend to avoid open areas. Although there are observations of Indiana bats flying over open space, the vast majority of the records are within 1000 feet of a forested edge. Thus, we believe wind turbines constructed within 1000 feet of suitable habitat are likely to pose a threat to Indiana bats. Data also show that colonies show strong fidelity to their summer areas. Loss, modification or fragmentation of their traditional summer areas—whether or not such destruction occurs during summer period--can lead to adverse impacts to colonies.

Recommendations
Given the above, we believe in order to sufficiently minimize the risk of taking of Indiana bats during the summer and migratory periods, the wind turbine should be located greater than 1000 feet from woodlots and forested streams corridors. Further, any associated construction activity should avoid potentially suitable roosting, foraging or commuting habitats. These measures will, we believe, substantially minimize the potential exposure of Indiana bats to your wind turbine and harm from habitat modification. If the turbine cannot be located greater than 1,000 ft from woodlots and forested stream corridors or habitat modification cannot be avoided, further consultation with this office is necessary to comply with the ESA.

> *Note: Research on the interaction of wind turbines and bats is active but in the beginning stages. As we indicated previously, there is still a great amount of uncertainty regarding the impacts of wind turbines on Indiana bat, particularly small scale wind facilities. Data are rapidly becoming available, and hence, our conclusions and recommendations necessarily evolve as this new information becomes available. We understand that DOE, in consultation with the Service, may be undertaking a regional monitoring program to help resolve some of the uncertainty surrounding impacts from small scale wind turbines. As these data become available, we will adapt our conclusions and recommendations accordingly. Please note that we currently believe that sufficient evidence suggests siting turbines greater than 20 miles from known hibernacula and farther than 1000 feet from summer habitat will likely avoid adverse impacts to Indiana bats. However, if new information reveals that these beliefs are in err, DOE will reinitiate consultation with the Service and you may be instructed to take further precautions (such as curtailing operations) to avoid or minimize the take of Indiana bats.*

MIGRATORY BIRD COMMENTS:
The Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the MBTA has no provision for allowing unauthorized take, the U.S. Fish and Wildlife Service (FWS) recognizes that some birds may be taken during activities such as wind turbine operation even if all reasonable measures to avoid take are implemented. The U.S. Fish and Wildlife Service's Office of Law Enforcement carries out its mission to protect migratory birds not only through investigation and enforcement, but also through fostering relationships with individuals and industries that proactively seeks to eliminate their impacts on migratory birds. Although it is not possible under the MBTA to absolve individuals, companies, or agencies from liability (even if they implement avian mortality avoidance or similar conservation measures), the Office of Law Enforcement focuses on those individuals, companies, or agencies that take migratory birds with disregard for their actions and the law, especially when conservation measures have been developed but are not properly implemented.

Your project lies within the range of the bald eagle (*Haliaeetus leucocephalus*), a species included under the Migratory Bird Treaty Act, but also afforded additional legal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). The Bald and Golden Eagle Act prohibits the take of eagles without a permit. Interactions between eagles and turbines, particularly small single turbines, are poorly understood, and therefore appropriate siting of wind power facilities to avoid and minimize take remains our most effective tool. Because so little is known about interactions between eagles and single, small turbines, and how multiple small turbines across the landscape may affect eagles, it is difficult to predict if and how this project may affect eagles. However, the siting of the turbine in areas that generally do not provide high quality eagle habitat, and the small size and rotor-swept area of the turbine, leads us to believe that take of bald eagles from operation of the turbine is unlikely to occur. Additionally, bald eagle

nests are not known to currently occur within the project area or within 5 miles from the project area. The FWS has recently finalized official agency guidelines to assist project proponents in avoiding and minimizing impacts to migratory birds, including bald eagles. We encourage you to consider those aspects of the guidelines detailed below to minimize impacts to all migratory birds.

> *Note: As explained above for endangered species, given the uncertainties associated with the effects of small scale turbines locally and cumulatively on birds and bats, we are working with DOE to develop a research program. Although the precise study design has yet to be agreed upon, we anticipate this program will entail monitoring at a subset of DOE-funded small-scale wind turbines. This would aid in our assessment of future wind power projects, test the assumptions we are currently making, and promote the conservation of eagles.*

The full text of the Service's guidelines is available at http://www.fws.gov/habitatconservation/wind.pdf. The Service believes that implementing these guidelines may help reduce mortality caused by wind turbines. We particularly encourage you to consider the following excerpted suggestions from the Service's guidelines in an effort to minimize impacts to all migratory birds and bats.

1) Pre-development evaluations of potential wind farm sites to be conducted by a team of Federal and/or State agency wildlife professions with no vested interest in potential sites.

2) Rank potential sites by risk to wildlife.

3) Avoid placing turbines in documented locations of federally-listed species.

4) Avoid locating turbines in known bird flyways or migration pathways, or near areas of high bird concentrations (i.e., rookeries, leks, State or Federal refuges, staging areas, wetlands, riparian corridors, etc.). Avoid known daily movement flyways and areas with a high incidence of fog, mist or low visibility.

5) Avoid placing turbines near known bat hibernation, breeding, or maternity colonies, in migration corridors, or in flight paths between colonies and feeding areas.

6) Configure turbine arrays to avoid potential avian mortality where feasible (i.e., group turbines and orient rows of turbines parallel to known bird movements). Implement storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species.

7) Avoid fragmenting large, contiguous tracts of wildlife habitat. Wherever practical, place turbines on lands already disturbed and away from intact healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.

8) Minimize roads, fences, and other infrastructure. Wherever possible, align collection lines and access roads to minimize disturbance.

9) Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species (i.e., avoid attracting prey animals used by raptors).

10) Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize

perching/nesting. Avoid use of guy wires for turbine or meteorological tower supports. All existing guy wires should be marked with bird deterrents (Avian Power Line Interaction Committee 1996).

11) If taller turbines (top of rotor-swept area is greater than 199 feet above ground level) require lights for aviation safety, the minimum amount of lighting specified by the Federal Aviation Administration (FAA) should be used. Unless otherwise requested by the FAA, only white strobe lights should be used at night, and should be of the minimum intensity and frequency of flashes allowable.

12) Adjust tower height to reduce risk of strikes in areas of high risk for wildlife.

13) Wherever feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the Avian Power Line Interaction Committee (1996) for any required above-ground lines, transformers, or conductors.

WATER RESOURCE COMMENTS:

Generally speaking, streams and wetlands provide valuable habitat for fish and wildlife resources, and the filtering capacity of wetlands helps to improve water quality. Naturally vegetated buffers surrounding these systems are also important in preserving their wildlife-habitat and water quality-enhancement properties. Furthermore, forested riparian systems (wooded areas adjacent to streams) provide important stopover habitat for birds and bats migrating through the region. As such, we also recommend that impacts to streams and wetlands be avoided, and buffers surrounding these systems be preserved even in areas where endangered species are not to occur. The proposed activities do not constitute a water-dependent activity, as described in the Section 404(b)(1) guidelines, 40 CFR 230.10. Therefore, practicable alternatives that do not impact aquatic sites are presumed to be available, unless clearly demonstrated otherwise. Therefore, before applying for a Section 404 permit, the client should closely evaluate all project alternatives that do not affect streams or wetlands, and if possible, select an alternative that avoids impacts to the aquatic resource. If water resources will be impacted, the Corps of Engineers should be contacted for possible need of a Section 404 permit.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Endangered Species Act of 1973, as amended, and are consistent with the intent of the National Environmental Policy Act of 1969 and the U. S. Fish and Wildlife Service's Mitigation Policy. This letter provides technical assistance only and does not serve as a completed section 7 consultation document.

Thank you for the opportunity to provide comments on this proposed project. Please contact Megan Seymour of this office for further information.

Sincerely,

Mary Knapp

Mary Knapp, Ph.D.
Field Supervisor

Cc: Brian Mitch, ODNR, Columbus, OH
Keith Lott, ODNR, Huron, OH

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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October 29, 2010

DOE Golden Field Office
c/o Melissa Rossiter
1617 Cole Boulevard
Golden, CO 80401

TAILS: 31420-2010-I-1114

Dear Ms. Rossiter:

This letter is in response to your Notice of Public Scoping for the proposed Kenston Local Schools Wind Turbine which involves the construction and operation of a single 600 kW wind turbine at the school located at 17419 Snyder Road, Chagrin Falls, Geauga County, Ohio. Funding for the project is being sought through the Department of Energy (DOE). The U.S. Fish and Wildlife Service (Service) has previously provided comments on this project in letters dated September 2, 2010, and September 18, 2009. Additionally, the Service and DOE and the Applicant have recently participated in numerous phone discussions and e-mails regarding this project and potential impacts on the **Indiana bat** (*Myotis sodalis*), a Federal endangered species. This letter summarizes the Service's current position regarding the proposed project and Indiana bat concerns.

The project area is an existing school complex comprising approximately 100 acres, and the proposed turbine location is a mowed grass area adjacent to a road and parking lot near the center of the complex. The majority of the school facility is composed of developed space, recreational fields, and mowed grass. The proposed turbine location is 850 feet away from the closest upland wooded area and there are no stream corridors within 1,000 feet of the project area. However the greater landscape of the project area is a mix of forested, suburban, and rural, with relatively large contiguous wooded areas to the north, east and west of the project area. The Service's initial review in 2009 focused on the lack of suitable habitat within the project area and the fact that no Indiana bats are known to occur within 5 miles of the project area, and documented that take was unlikely to occur. Our September 2, 2010 letter requested additional consultation with the Service if the turbine could not be relocated greater than 1,000 feet from woodlots because an Indiana bat mortality was recently documented at a utility scale wind farm in Indiana during fall migration, in an area that is dominated by agriculture and has few trees, indicating that Indiana bats may be susceptible to turbines even in areas that do not have suitable habitat.

The Service has further evaluated the proposed turbine project relative to the surrounding habitat, and relative to what is known about Indiana bat behavior and habitat use. Our conclusions are summarized below:

Summer Period
Although monitoring to date shows that wind turbine-related bat mortality is greatest during the fall migration period, substantial bat fatalities have been recorded during the summer, including *Myotis* species. For this reason, we believe turbines sited within or near (1000 ft) suitable Indiana bat summer habitat could lead to the take of Indiana bats. However, the proposed single turbine is located 850 feet

from suitable roosting or foraging habitat, and is located within a highly developed/impacted area, approximately 100 acres in size. Forested habitat outside of the project area and 850-foot buffer area is plentiful, and we believe that any Indiana bats that may use the greater project area during the summer would be likely to remain within or closely adjacent to existing forested areas, and would be unlikely to fly over 100 acres of buildings, recreational fields, and parking lots to forage. There are no areas suitable for roosting within the project area or the 850-foot buffer area and no suitable habitat will be impacted for construction of the project. Coupled with the smaller rotorswept area of the proposed turbine relative to commercial sized turbine the Service believes that it is extremely unlikely that Indiana bats would be exposed to the single turbine during the summer maternity season.

Migration Period

The vast majority of the documented bat fatalities across U.S. and Canada have occurred during the fall *migratory* season (Arnett *et al.* 2008). Most of these mortalities were "long-distant migratory tree bats," which are a group of bats that exhibit substantially different behaviors during migration than species like Indiana bat. Although not as frequently recorded, there have been a notable number of fatalities for other species of bats as well, with an Indiana bat mortality incident detected at a wind power facility in Indiana.

Interactions between bats and wind turbines, particularly small-size, single turbines, are poorly understood, and therefore appropriate siting of wind power facilities to avoid and minimize take remains our most effective tool. Generally speaking, we expect that Indiana bats are substantially less vulnerable to take at single, small turbines compared to utility-scale wind facilities. However, there is a confounding factor of blade height with the smaller-sized turbines. We lack data on the height at which Indiana bats fly while migrating. Mortality of little brown bat (*Myotis lucifugus*) at wind facilities across the range indicate that this closely related species migrates at heights typical of the rotorswept area of commercial turbines. This coupled with the record of an Indiana bat killed at a commercial wind facility suggest that Indiana bats may often fly at heights that intersect *commercial* sized turbines during migration. This mortality event occurred in an unforested area. Thus, we believe that Indiana bats are susceptible to wind turbine mortality anywhere within the range of Indiana bats. At small scale wind sites, the area of exposure is substantially less than the cumulative rotorswept area of a commercial sized facility, and thus, so too is the likelihood of an Indiana bat intersecting a turbine.

In areas where suitable habitat is nearby, however, the risk of mortality during migration is higher. Data from migration studies indicate that Indiana bats will fly at or above the tree canopy level during the migration period. While there is no conclusive data on Indiana bat landscape use during migration in the Midwest Recovery Unit (which includes Ohio), there is some evidence in the northeast region that bats go out of their way to follow tree lines, including riparian buffers along streams through otherwise developed areas, and avoid open areas (Turner 2006). We have evidence indicating that during the summer Indiana bats typically remain within 1,000 feet of forested areas and stream corridors. The layout and compositions of the school complex, which encompasses approximately 100 acres of developed areas, compared to the layout of the greater landscape, which includes multiple forested areas north, east, and west of the school complex area, are substantially different. We believe it is reasonable to assume that any Indiana bats migrating near the project area would be likely to remain within or closely adjacent to existing forested areas, and would be unlikely to fly over 100 acres of buildings and parking lots when they could stay east or west of the school complex within forested areas. Coupled with the smaller rotorswept area of the proposed turbine relative to commercial sized turbine, the Service believes that it is very unlikely that Indiana bats would be exposed to the single turbine during the migratory season.

Winter (and fall swarming) Period

In fall just before entering caves for hibernation, Indiana bats use the surrounding forested area to forage and build up fat reserves for their 6-7 month hibernation period. Data available suggest that Indiana bats

will forage up to 10 to 20 miles from their hibernacula. Turbines placed within this fall swarming range may take Indiana bats. The proposed project area is approximately 7 miles from several caves where small numbers of Indiana bats have been documented swarming in the fall, but have never been documented emerging in the spring despite multiple years of survey. This indicates that Indiana bats may just be swarming here in the fall, or they may be hibernating here in very small numbers. Because suitable habitat is so plentiful in the surrounding landscape, including in areas near the caves, and because Indiana bats have been detected in such low numbers, we believe it is reasonable to assume that fall swarming Indiana bats are unlikely to be exposed to this single small turbine 7 miles away from the caves, in a developed area, and therefore we believe it is unlikely that take of Indiana bats will occur during the fall swarming and hibernation period.

Recommendations
We have fully evaluated the potential exposure of Indiana bats at this single turbine project, and we believe that due to the site-specific layout of the project area, the surrounding landscape, and what we know and assume about Indiana bat habitat use and biology, that take of Indiana bats at this specific project is extremely unlikely to occur.

Research on the interaction of wind turbines and bats is active but in the beginning stages. As we indicated previously, there is still a great amount of uncertainty regarding the impacts of wind turbines on Indiana bat, particularly small scale wind facilities. Data are rapidly becoming available, and hence, our conclusions and recommendations necessarily evolve as this new information becomes available. We understand that DOE, in consultation with the Service, may be undertaking a regional monitoring program to help resolve some of the uncertainty surrounding impacts from small scale wind turbines. As these data become available, we will adapt our conclusions and recommendations accordingly. Please note that we currently believe that sufficient evidence suggests this project is not likely to result in take or adverse impacts to Indiana bats. However, if new information reveals that these beliefs are in err, DOE will reinitiate consultation with the Service and you may be instructed to take further precautions (such as curtailing operations) to avoid or minimize the take of Indiana bats.

These comments have been prepared under the authority of the Endangered Species Act of 1973, as amended, and are consistent with the intent of the National Environmental Policy Act of 1969 and the Service's Mitigation Policy. This letter provides technical assistance only and does not serve as a completed section 7 consultation document.

Thank you for the opportunity to provide comments on this proposed project. Please contact Megan Seymour of this office for further information.

Sincerely,

Mary Knapp, Ph.D.
Field Supervisor

Cc: Brian Mitch, ODNR, Columbus, OH
Keith Lott, ODNR, Huron, OH
AAron Godwin, The Renaissance Group, 8281 Euclid Chardon Road, Suite E, Kirtland, Ohio 44094

Citations:

Arnett, E.B., K. Brown, W.P. Erickson, J. Fiedler, T.H. Henry, G.D. Johnson, J. Kerns, R.R. Kolford, T. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersly. 2008. Patterns of fatality of bats at wind energy facilities in North America. Journal of Wildlife Management, 72:61–78.

Turner, G. G. 2006. Bat Migratory Behaviors and Routes in Pennsylvania and Maryland. Proceedings NWCC Wildlife Workgroup Research Planning Meeting VI, San Antonio, Texas, USA. November 14-15, 2006.

OHIO DEPARTMENT OF TRANSPORTATION
AVIATION
2829 W. DUBLIN-GRANVILLE ROAD • COLUMBUS, OH • 43235-2786

August 3, 2010

Kenston Schools
Attn: AAron Godwin
17419 Snyder Road
Chagrin Falls, OH 44023

Proposal: Wind Turbine
Lat: N41°-23'-39.61"
Lon: W81°-18'-17.98"
Height: 275 ft AGL 1530 ft AMSL

Subject: APPLICATION FOR CONSTRUCTION/ALTERATION PERMIT
Aeronautical Study No: 2010-DOT-659-OE

To Whom It May Concern,

The purpose of this letter is to notify you that your application concerning construction at the specified latitude, longitude and proposed height does not require a permit from this office. Your proposal falls outside the limits set forth in Section 4561.32 of the Ohio Revised Code. However, this does not exempt you from filing with the FAA or contacting local zoning authorities regarding compliance with local zoning ordinances.

If you have any questions, please call; (614)387-2346.

Respectively,

E-SIGNATURE
_____
John A. Milling, Aviation Specialist
ODOT Office of Aviation
2829 W. Dublin-Granville Road
Columbus, OH 43235

KENSTON SCHOOLS

Bainbridge Township Zoning Certificate

Exhibit 2

Exhibit 2

Zoning Certificate

BAINBRIDGE TOWNSHIP
Geauga County, Ohio
Zoning Department
17826 Chillicothe Road, Chagrin Falls, Ohio 44023
440 543-9871

Certificate Number: x4005

ADDRESS: **17425 Snyder Road**
PARCEL NO.: **02-711900** ZONING: **R-5-A**

NUMBER OF UNITS: **1**

ISSUED TO: **KENSTON BOARD OF**
17419 SNYDER RD
CHAGRIN OH 44022

PERMIT TYPE: **SCHOOL ADDITION**
DETAILS: **Wind Turbine(height exempt ch.161)**
PERMIT DATE: **05/04/2010**
FEE: **$0.00** EXPIRE DATE: **05/04/2012**

It is hereby certified that the above use as shown on the plats and plans submitted with the application conforms with all applicable provisions of the Bainbridge Township Zoning Resolution. The issuance of this Permit does not allow the violation of Bainbridge Township Zoning Resolutions or other governing Regulations.

The applicant is responsible for obtaining a building permit (if required) prior to commencing work on the proposed improvement. Contact the Zoning Department at 543-9871 prior to pouring footers and / or concrete slabs.

BEST STORM WATER MANAGEMENT PRACTICES TO BE OBSERVED AT ALL TIMES DURING CONSTRUCTION. FAILURE TO COMPLY SHALL RESULT IN CERTIFICATE REVOCATION.

APPROVED BY: DATE:

05/06/2010

Zoning Inspector

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

OCT 18 2010

Ms. Caroline Mann
Office of Energy Efficiency and Renewable Energy (EE-40)
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: Kilowatts Wind Project, in Geauga County, OH

Dear Ms. Mann:

In response to your request on August 19, 2010, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Kilowatts for Kenston Wind Energy Project, located in Geauga County, Ohio.

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

APPENDIX D:

SUPPORTING DOCUMENTATION

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

August 19, 2010

SUBJECT: Notice of Scoping – A-Sep-60 – *600 kW Single Wind Turbine at Kenston Local Schools*, Geauga County, Bainbridge Township, Chagrin Falls, Ohio

The U.S. Department of Energy (DOE) is proposing to provide federal funding to Kenston Local Schools to construct and operate an approximately 600 kW wind turbine in Geauga County, Ohio. The proposed project would construct and operate a wind turbine located on the Kenston School property within the town of Chagrin Falls. Details of the proposed wind turbine are provided in the attachment to this Scoping Notice. Pursuant to the requirements of the National Environmental Policy Act (NEPA) the Council on Environmental Quality (CEQ) regulations for implementing the procedural provision of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR 1021), DOE is preparing an Environmental Assessment (EA) to:

- Indentify any adverse environmental effects that cannot be avoided should this proposed project be implemented.
- Evaluate viable alternatives to the proposed project.
- Describe the relationship between local and short-tern uses of the environment and the maintenance and enhancement of long-term productivity.
- Characterize any irreversible and irretrievable commitments of resources that would be involved should this proposed project be implemented.

Potential Environmental Effects or Issues Identified for the Environmental Assessment

The EA will describe and analyze any potential impacts on the environment that would be caused by the project and will identify possible mitigation measures to reduce or eliminate those impacts. At a minimum, DOE will evaluate potential impacts that may result from the proposed project related to:

- Land Use
- Biological Resources
- Cultural Resources
- Noise
- Safety and Occupational Health
- Socioeconomics and Environmental Justice
- Utilities
- Traffic and Transportation
- Aviation Hazards
- Electromagnetic Interferences
- Aesthetics and Shadow Flicker
- Water Resources

Development of a Reasonable Range of Alternatives

DOE is required to consider a reasonable range of alternatives to the proposed action during an environmental review. The definition of alternatives is governed by the "rule of reason", as described within the CEQ regulations regarding the administration of NEPA. An EA must consider a reasonable range of options that could accomplish the agency's purpose and need and minimize environmental impacts. Reasonable alternatives are those that may be feasibly carried out based on environmental, technical, and economic factors.

The No Action Alternative will be addressed. The need for project redesign, or a project alternative, will be determined during the course of environmental review.

Public Scoping

The DOE is sending this letter to interested federal, state and local agencies to provide information on issues to be addressed in the EA. Agencies are invited to indentify the issues within their statutory responsibilities that should be considered in the EA. The general public is also invited to submit comments on the scope of the EA. The general public is also invited to submit comments on the scope of the EA.

This letter and the draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/Reading_Room.aspx.

The DOE Golden Field Office welcomes your input throughout our NEPA process, but to ensure that your comments are received in time to be considered in the draft EA, please provide them on or before September 8, 2010 to:

Melissa Rossiter
NEPA Document Manager
Department of Energy
1617 Cole Boulevard
Golden, CO 80401
Melissa.Rossiter@go.doe.gov

We look forward to hearing from you.

Sincerely,

Melissa Rossiter

Attachment

Kenston Local Schools Wind Turbine

The U.S. Department of Energy is proposing to provide up to $630,500 to Kenston Local Schools for construction and operation of an approximate 600 kW single wind turbine. The School District proposes to design, permit, construct, operate and maintain the approximate 600 kW wind turbine located at 17419 Snyder Road, Chagrin Falls. Ohio.

Latitude: 41-23-39.61N NAD 83
Longitude: 81-18-17.98W

The DOE funding for this project would be paid for by the American Recovery and Reinvestment Act of 2009 and would include the following components:

- A single reconditioned approximate 600 KW wind turbine on a 42 or 60 meter tower
- Associated generator and below ground collector cables
- Underground transmission lines and connection to Kenston Local School's meter

AERONAUTICA 54-750

When Megawatt-Class Turbines Are Just Too Big

These workhorses provide plenty of power for schools, industrial parks, shopping centers, neighborhood net-metering, Green Communities, wind parks and more!

- **3/4 Megawatt (750kW) design - for Class III winds**
- **Low profile: less than 270' tall on a 55m tower**
- **Active Stall Regulation (ASR) allows blades to be optimized for both low and high wind conditions**
- **Dual-wound 200/750 kW Generator**

Located in an IEC Class III wind area? *Aeronautica Windpower* is proud to introduce the 54-750: a Queen-size machine designed with a larger rotor for 'distributed wind' applications at lower wind sites. Many good wind sites just cannot accommodate huge, utility-scale turbines. A large number of sites, especially populated areas, are better suited to a smaller size machine. The 54-750 is the perfect fit.

More easily permitted, erected, and financed than its larger brothers, the 54-750 is a great choice for municipal projects, commercial/industrial sites, college or high school campuses, and other places where 'behind the meter', or net -metered power can be utilized.

With its low profile, ultra-low noise signature, and highly efficient output, the 54-750 provides the perfect balance between economic output and acceptable size. And *Aeronautica* wind turbines are *all manufactured in the United States*, reducing shipping costs and delivery times.

Fast Facts:

Orientation: *Upwind*	Rotor Diameter: *54m*
Rotor Speed: *~25.3RPM*	Active-Stall Regulated
Hub Height: *65 or 55m*	Blades: *Fiber Reinforced Polyester*

American Energy from America's Hometown

AERONAUTICA Windpower

Plymouth, MA **1-800-360-0132** www.AeronauticaWind.com

54-750 kW System Specifications:

Blades
3 blades, upwind orientation
Fiberglass reinforced polyester

Rotor

Power regulation:	Active Stall Regulation (ASR).
Rotor size:	54m diameter (177') (std—other configs. avail.)
Rotor speed:	25.3 rpm nominal
Swept area:	2,289 m^2
Tilt angle:	4°
Coning angle:	3.0° forward.
Tip speed:	62 – 63 m/s at full load.
Pitch angle:	Active Stall Regulation
Pitch bearings:	4-point ball bearings.
Air brake, normal:	Pitch to -20°, actuated by the Active Stall Regulation system.
Air brake, emergency:	Pitch to -85° fail safe, activated by accumulators in hub.
Nominal pitch speed:	7.5 °/sec
Mechanical brake:	A fail-safe type disk brake.
Brake torque:	1.8 times of nominal torque (approx).
RPM max. value:	1920 (60 Hz), 1600 (50 Hz), on the high-speed shaft.

Generator

Nom. Electric Power:	200/750 kW (dual wound)
Generator:	Closed, Synchronous induction, 4/6 pole DW, IP54 or 55.
Generator speed:	1200/1800 (60 Hz) or 1000/1500 (50 Hz) rpm synchronous
Loss in generator:	3 - 4 % at nominal power dependent on type
Generator cut-in:	Thyristor controlled gradual cut-in
Grid connection:	60 Hz – 690V or 50 Hz – 690V

Operational:

Yaw motors:	4 pcs. w/electrical brakes built in
Yaw brakes:	4 pcs. disk hydraulic brakes
Yaw bearing:	4-point ball bearing
Cut-in wind speed:	3-4 m/s, based on 10 min average
Cut-out wind speed:	25 m/s, based on 2 min average
Controller:	CC–Electronic (Mitsubishi PLC)
Noise:	100 dBA Sound Power (at Nacelle)

Monopole Tower
Conical Steel, White, 65m and 50m towers available
Nacelle access: interior tower ladder through locked door

Weights:

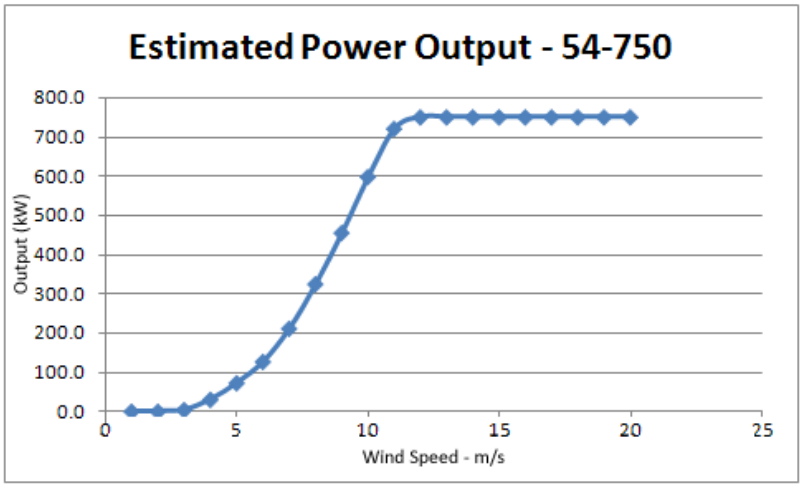
Mass of blades: (3):	Approx. 16,000 lbs (7,200 kg)
Mass of nacelle:	Approx. 48,400 lbs (22.000 kg)
Mass of hub:	Approx. 17,600 lbs (8.000 kg)
Mass total, excl tower:	Approx. 81,200 lbs (36.909 kg)

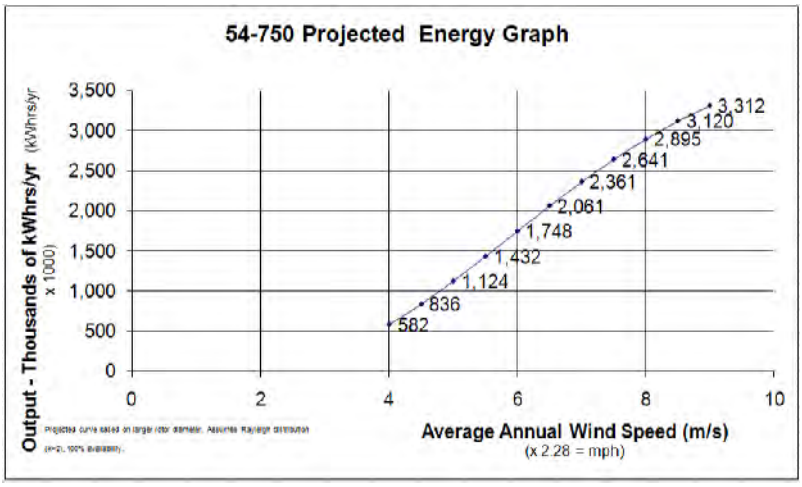
Certification: Variant of our 47-750 turbine, which is design Certified by DNV for IEC 61400 Ed. 3 Class IB and IIA

Safety Issues
Induction generator has inherent anti-islanding
Fail-safe hydraulic disk brake
Grid monitoring for shutdown and operational performance
Shipping: All Prices are FOB our plant

Warranty: Standard warranty is for two years on the drive train and on all major parts. Extended warranties are available.

Installation: Aeronautica Windpower, LLC is only a supplier of equipment. We can, however, refer you to local installers or dealers for a complete installation.
Service Agreements: Annual Service Contracts are strongly advised and are available from local dealers and installers.

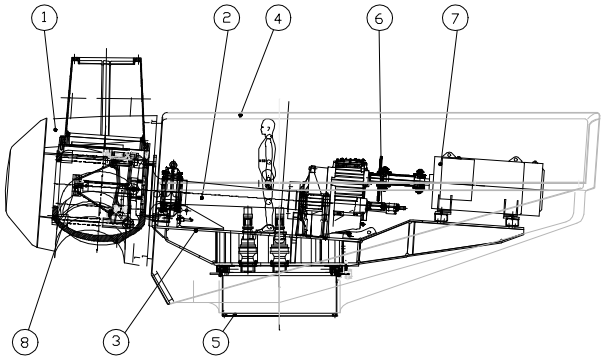




The Power and Energy Curves shown are estimated for a 750kW turbine, with a 54m rotor, double wound generator, and Active Stall Regulation. The power curve is valid for 1.225kg/m3 air density, clean blades and undisturbed horizontal air flow. For the Energy Graph, a Rayleigh wind speed distribution and 100% availability is assumed.

Power Curve Table

m/s	kW
1	0.0
2	0.0
3	4.0
4	30.4
5	72.6
6	126.7
7	211.2
8	324.7
9	455.4
10	598.0
11	720.7
12	750.0
13	750.0
14	750.0
15	750.0
16	750.0
17	750.0
18	750.0
19	750.0
20	750.0



1. Rotor System 2. Transmission 3. Yaw System and Mainframe 4. Nacelle Cover 5. Tower 6. Hydraulic Station (not shown) 7. Generator 8. Pitch system

AERONAUTICA Windpower llc
11 Resnik Road, Plymouth, MA 02360
1-800-360-0132 www.AeronauticaWind.com

Technical note

NOISE EMISSION FROM NORWIN-47-ASR-600 / 750 kW

Summary:

The noise emission at the reference wind speed 8 m/s, 10 m above ground, expressed as the A-weighted sound level in dB re. 1 pW, ($L_{WA,ref}$), is 100.00 dB. The relation between the noise emission and the wind speed is +0.3 dB pr. m/s.

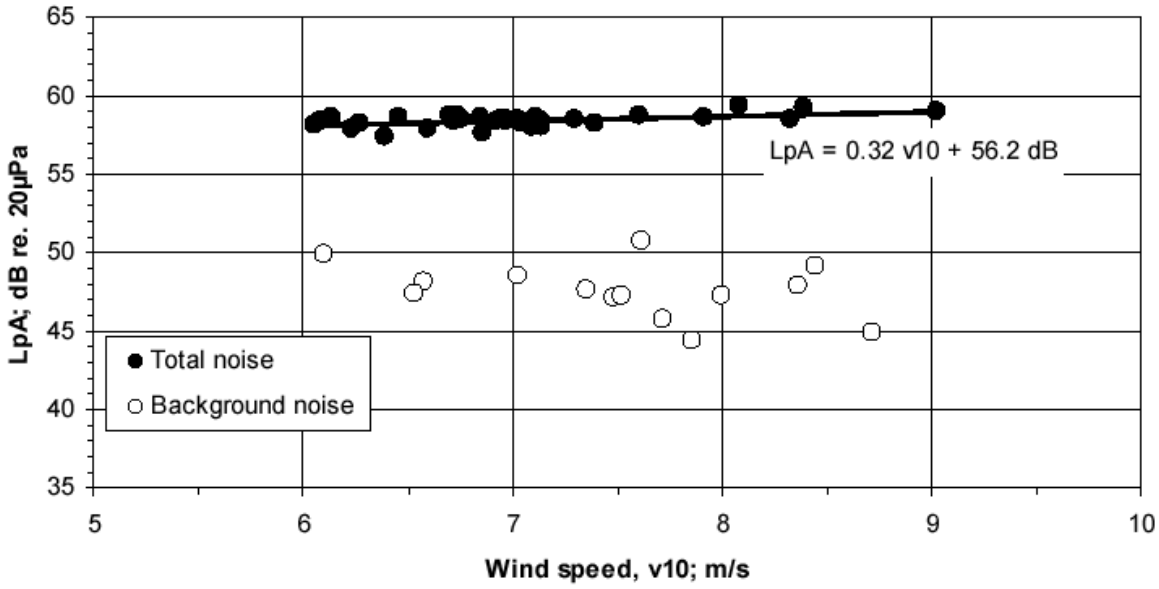
Measuring setup and method:

The noise emission is measured in compliance to the guidelines given in regulation no. 304/1991, *Bekendtgørelse om støj fra vindmøller*, published by the Danish Environmental Agency. The noise is measured with a microphone placed on the ground (acoustically reflecting plate 1.5 x 2.0 m^2), 50 m down-wind from the turbine. The noise is measured with and without the wind turbine operating, to establish the signal to noise relation.

The wind speed is measured with a cup-anemometer placed 10 m above ground, 50 m up-wind from the turbine.

Noise emission curves:

Figure 1.: A-weighted sound pressure level on the ground 50 m down-wind from the turbine.



There are no clearly audible tones present in the noise.

Figure 2.: The A-weighted sound pressure level, Lpa in dB re 20 µPa, 1.5 m above ground, calculated as function of the distance from the wind turbine, according to DEA regulation no. 304/1991

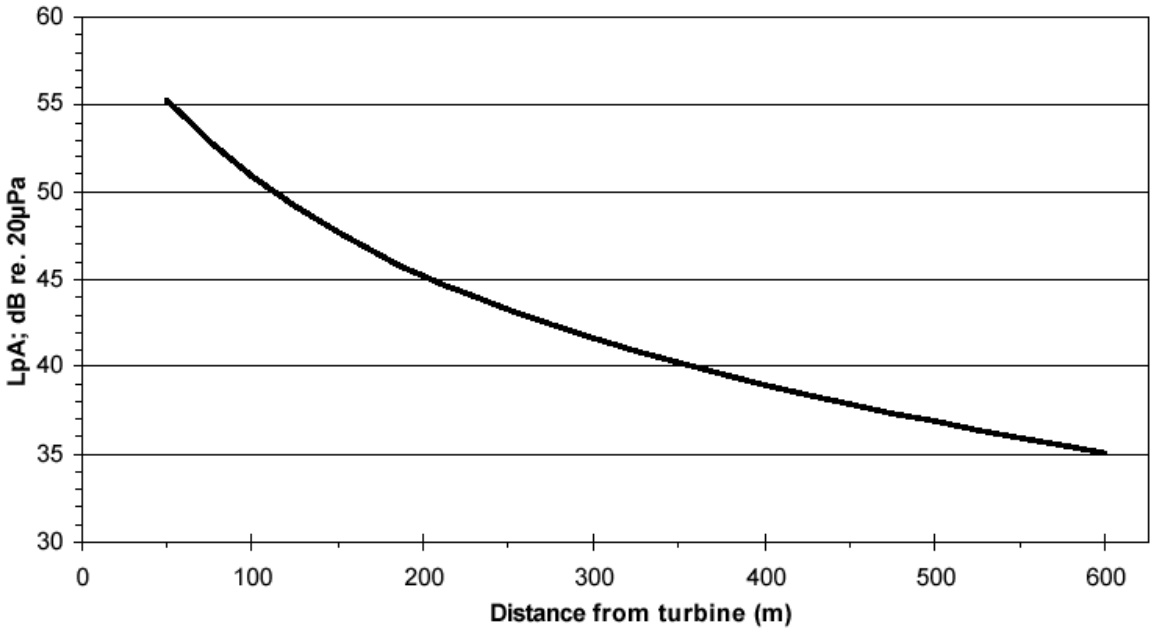


Figure 3.: From calculations the following key values have been extracted:

L_{pA}; dB re 20 µPa	Distance, m
35	607
40	359
45	206

Kenston High School
Wind Turbine Project
Avoided Pollution Model, Based On 1 Turbine
Aeronautica / Norwin 54-750
Estimated Avoided Pollution, First Energy Territory

Turbine Used For Calculations:	Aeronautica / Norwin 54-750
Yearly kWh Produced:	*1,336,305*
Grid Power Avoided (kWh)	*1,416,484*

70% of Meter Power

Includes an Estimated 6.14% Grid Line Loss (Data Source EPA)

65 Meters

Meter Description:	High School 1

Note, the values listed below are linked to the wind data and turbine sizing chosen at the time of printing. They will recalculate automatically as these parameters are changed.

Grid Power Source:	*First Energy*

Percent From:	
Coal:	72.8%
Oil:	4.0%
Natural Gas:	2.7%
Nuclear:	22.3%
Total Renewables:	1.1%
Hydro:	0.7%
Wind:	0.4%
Solar:	
Biomass:	

Fuel mix is per US EPA

***lbs/MWh per US EPA**

http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html

Resulting Pollution:			Equivalent Miles Driven:	Equivalent Trees Needed To Offset:	Resulting Effect of Pollution:
Although a good guide, these numbers are estimates. Actual values may vary depending on fuel mixes, fuel sources and actual generation cycles and efficiencies.					
Greenhouse Gases (CO_2)	2,178,552	Pounds*	2,339,657	128,800	Greenhouse Gas
Volatile Organic Compounds (VOC)	27	Pounds			Varied
Nitrogen Oxides (NO_X)	3,655	Pounds*	1,722,976		Smog
Carbon Monoxide (CO)	222	Pounds			Toxic
Sulfur Dioxide (SO_2)	13,853	Pounds*			Acid Rain
Particulates (PM 10)	246	Pounds			Varied
Mercury (Hg)	27,545	Milligrams	Although these numbers are small, consider the potency of these toxins and their cumulative long-term impact.		Toxins.
Nuclear Waste:	Difficult to Accurately Quantify	Pounds			Long-term Risks and Economics Associated with Nuclear Waste Containment.
High Level:		Pounds			
Low Level:		Pounds			

Impacts Not Listed or Included in Calculations Above:

Impacts Associated With Raw Material Extraction and Equipment Production

Impacts Associated With Fuel Extraction.

Land Use, Power Plant, Power Lines, and Mining.

Water Use and Aquatic Impacts.

World Security Issues Associated With Fuel Supply.

World Security Issues Associated With Nuclear Proliferation.

Impacts Associated With Fuel and Waste Transportation.

Possible Impacts:

Impacts Associated With Raw Material Extraction and Equipment Production.

Land Use For Power Lines, if Power Is Not Used On Site.

May Disturb Waterways. May Involve Land Use.

Land Use. May Have Impact on Birds and Bats.

Little If Any for Most Installations.

Depends on Type of Biomass.

Wind Resource Report, Site Wind Characteristics

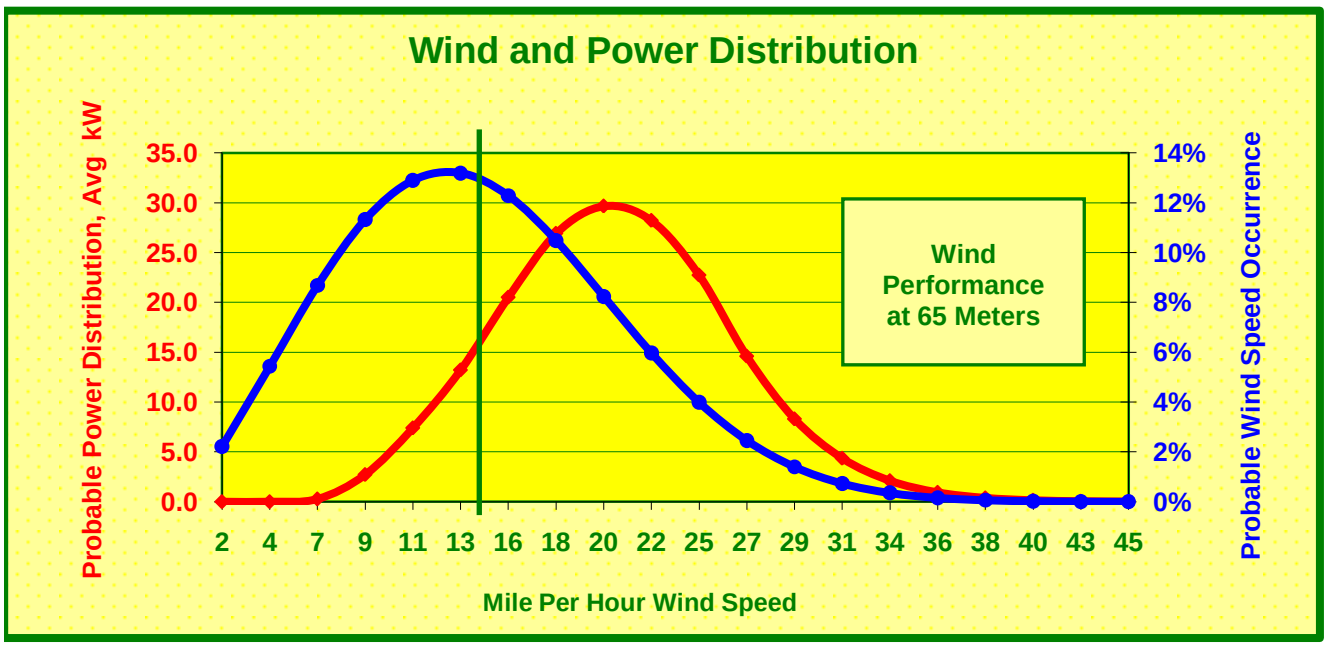
Kenston High School

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

Weibull Performance Calculations:

Yearly Average Wind Speed		Turbine Power Curve For Given Average Wind Speeds (kW)	Site Weather Constants	Wind Probability (f)	Average Net kW @ V	Area Wind Dist.:	Area Power Dist.:
Bin (m/s)	(mph)						
1	2.24	*0*	0.00	2.33%	0.000		
2	4.47	*0*	0.00	5.67%	0.000		
3	6.71	*4*	3.07	9.03%	0.277		
4	8.95	*30.4*	23.31	11.71%	2.729	67.7%	25.6%
5	11.18	*72.6*	55.68	13.23%	7.366		
6	13.42	*126.7*	97.16	13.40%	13.015		
7	15.66	*211.2*	161.96	12.31%	19.945		
8	17.90	*324.7*	249.01	10.35%	25.774		
9	20.13	*455.4*	349.24	7.98%	27.882		
10	22.37	*598*	458.59	5.66%	25.962	31.1%	70.7%
11	24.61	*720.7*	552.69	3.69%	20.410		
12	26.84	*750*	575.16	2.22%	12.746		
13	29.08	*750*	575.16	1.22%	7.034		
14	31.32	*750*	575.16	0.62%	3.567		
15	33.55	*750*	575.16	0.29%	1.661		
16	35.79	*750*	575.16	0.12%	0.709		
17	38.03	*750*	575.16	0.05%	0.277	1.1%	3.7%
18	40.26	*750*	575.16	0.02%	0.099		
19	42.50	*750*	575.16	0.01%	0.033		
20	44.74	*750*	575.16	0.00%	0.010		
			Totals	99.91%	169.496	99.9%	100.0%

14.18	Site Average Wind Speed (MPH) at 65 Meters



SUBSURFACE EXPLORATION
KENSTON LOCAL SCHOOLS
WIND TURBINE
CHAGRIN FALLS, OHIO
EDP PROJECT No.: 10263G
SEPTEMBER 28, 2010

Prepared at the request of:

Mr. John Camiscioni
Kenston Local School District
17419 Snyder Road
Chagrin Falls, Ohio 44023
Phone: 440-543-9677
Cell: 440-622-5007

EDP Consultants, Inc.
9375 Chillicothe Road
Kirtland, Ohio 44094-8501
Phone: 440-256-6500
Fax: 440-256-6507
www.edpconsultants.com

EDP Consultants, Inc.

September 28, 2010

Mr. John Camiscioni
Director of Facilities
Kenston Local School District
17419 Snyder Road
Chagrin Falls, Ohio 44023

Re: Kenston Schools Wind Turbine
Chagrin Falls, Ohio
EDP Project No. 10263G

Dear Mr. Camscioni:

We have completed the subsurface exploration for a wind turbine foundation proposed at the Kenston Local Schools Chagrin Falls campus. This letter summarizes the results of our field exploration and laboratory testing, and provides parameters for design of the structure's foundation.

FIELD AND LABORATORY TESTING

Subsurface conditions were studied by an exploration program consisting of one Standard Penetration Test boring in the area of the wind turbine. The boring location was marked in the field by EDP personnel, and its ground surface elevation was measured by differential leveling with reference to the top of a catch basin west of the visitor stands, with a given elevation of 1258.50 ft. The approximate test location and the measured ground surface elevation are shown on the enclosed *Boring Location Plan*.

B-1 was drilled and sampled in general accordance with ASTM Standards to a nominal depth of 22 ft, where auger refusal was encountered. Sampling consisted of driving a two inch O.D. split-barrel sampler at selected intervals. The number of blows of a 140 pound hammer dropping 30 inches was recorded for each six inch penetration interval at each sample location. When sampling in rock, where a penetration of less than six inches was obtained for 50 hammer blows, we recorded the actual blow count and depth of penetration in inches for that interval. The standard penetration number (N) can be obtained from the log data by summing the number of blows required for driving through the second and third six inch intervals.

The borehole was checked for the presence of groundwater during drilling, at the completion of the boring, and before backfilling. The borehole was backfilled with soil and rock cuttings at the completion of field testing.

Three inch O.D. thin-wall Shelby tube samples were hydraulically pressed at the depths indicated as "ST" on the boring log.

Samples were taken to our laboratory where they were examined and classified by a geotechnical engineer. Soil samples were classified in general accordance with ASTM Standards. Bedrock samples were classified following the guidelines in ASCE Manual 56, "Subsurface Investigation for Design and Construction of Foundations of Buildings," dated 1976. Our rock classifications are based on judgment using split-barrel samples. Split-barrel samples of relatively cohesive soils were tested for their water contents to provide indications of material consistency, strength, and compressibility. The results of these tests are presented on the enclosed boring log.

SUBSURFACE PROFILE

The area was grass-covered at the time of our field testing. Four inches of topsoil was present. Below the topsoil, brown, lean clay fill was encountered extending about 4½ ft below grade. The fill was underlain by medium stiff, gray, lean clay with organics extending about 8 ft below grade.

Below the fill and organic materials, stiff, brown, lean clay with sand layers and sandstone was encountered, extending to about 12½ ft below grade. The clay was underlain by very stiff to hard, brown and dark gray, sandy lean clay of residual origin, resulting from the weathering of its parent shale bedrock.

The residual clay was underlain by very soft, gray with brown, shale, beginning at a depth of about 13½ ft below grade. At 16 ft, very soft, brown and gray, sandstone was encountered. Layers of sandy lean clay were encountered in this very soft sandstone. B-1 was advanced through the softer shale and sandstone to encounter moderately hard, gray, sandstone at about 19 ft below grade.

Groundwater was not encountered during our exploration. Based upon the limited data that is available, it appears that the groundwater table is within the gray sandstone. Seepage will likely be encountered in more granular seams higher in the profile.

FOUNDATION DESIGN PARAMETERS

Considering the variability of the upper level soils at the currently proposed location, the wind turbine should be supported using a drilled pier foundation. Lateral subgrade modulus values for the suitable soil layers and the upper shale and sandstone, and the estimated unconfined compressive strength of the sandstone bedrock for use in the design of the drilled pier foundation are given in Table 1. These are all ultimate values. The term "D" in the expression for the subgrade modulus is the pier diameter in feet. The resulting units on K_h will be pounds per cubic inch (pci). Lateral resistance should be neglected for the upper 8 ft, through the fill and clay with organics.

Table 1. Recommended ultimate lateral subgrade modulus and compressive strength values for soil layers and shale and sandstone bedrock.

Soil Layer and approx. depth	Lateral Subgrade Modulus, K_h	ε_{50} (%)
Fill and clay with organics (0 to 8 ft)	--	--
Stiff to very stiff lean clay (8 to 13½ ft)	200/D pci, (using D in feet)	3
Very soft shale and sandstone (13½ to 19 ft)	2000/D pci, (using D in feet)	1
Sandstone (>19 ft)	Compressive strength 5,000 psi	N/A

We appreciate the opportunity to work with you on this project. If you have any questions relative to our findings, or if we can be of further assistance, please call.

Very truly yours,

EDP CONSULTANTS, INC.

Dagny A. Nycz, P.E.
Project Engineer

Alan J. Esser, P.E., D.GE
Reviewing Engineer

STATE OF OHIO
ALAN JAMES
ESSER
E-40092
REGISTERED
PROFESSIONAL ENGINEER

NOTE:

BENCHMARK (BM) IS TOP OF CATCH BASIN WITH GIVEN ELEVATION 1258.50 FT.

NOT TO SCALE

EDP Consultants, Inc.
9375 CHILLICOTHE RD., KIRTLAND, OH. 44094
PHONE 440-256-6500 FAX 440-256-6507

BORING LOCATION PLAN
KENSTON SCHOOLS WIND TURBINE

CHAGRIN FALLS, OHIO

PROJECT NO. 10263G

DWG DATE	DWG BY	APPROVED BY
9-22-10	HRP	DAH

LABORATORY LOG OF BORING

EDP Consultants, Inc.

PROJECT NAME: Kenston Schools - Wind Turbine	LOCATION: Chagrin Falls, Ohio		
CLIENT: Kenston Local Schools	PROJECT NUMBER: 10263G	BORING NUMBER: B-1	BORING DEPTH: 22.0 ft	SHEET: 1 of 1
DRILLING METHOD: Hollow Stem Auger	DRILLER/HELPER/LOGGED BY: RH/CS/DAN			
BORING START & COMPLETION Date/Time: 9/17/10-9:35 am, 9/17/10-11:45 am	SURFACE ELEVATION: 1250.4 ft			

WATER LEVEL	None ▽	None ▼	None ▽	▽
DATE	9/17/10	9/17/10	9/17/10	
TIME	Encount.	W.B.P.A.	Complet.	
BOREHOLE OPEN			20.5 ft	

DEPTH (FT)	SAMPLE	TYPE	SAMPLE RECOVERY, in / CORE RECOVERY %	SYMBOL	SOIL DESCRIPTION	STANDARD PEN. Blows/6in. / RQD %	Qu (tsf)	DRY UNIT WEIGHT (pcf)	PL (%)	WC (%)	LL (%)
					TOPSOIL (4")						
	1	SB	18		FILL: Brown lean CLAY with sand	6-8-9				15	
	2	ST	20								
5	3	SB	18		Medium stiff gray lean CLAY with organics (CL)	3-2-3				22 23	
	4	SB	18		Stiff brown lean CLAY with sand layers and sandstone (CL)	4-6-7				17	
10	5	ST	24		Very stiff to hard brown and dark gray sandy lean CLAY, residual (CL)						
	6	SB	6			50/6"				13 7	
15					Very soft gray with brown SHALE						
					Very soft brown and gray SANDSTONE with sandy lean clay layers						
	7	SB	8			19-50/2"				10	
20					Moderately hard gray SANDSTONE						
	8	SB	1/8		Auger refusal at 22 ft	50/¼"					

SB = SPLIT-BARREL/SPLIT-SPOON
ST = SHELBY TUBE
AS = AUGER SAMPLE
GP = GEOPROBE

REMARKS:

EDP 10263.GPJ EDP-1.GDT 9/27/10

BORING LOG TERMINOLOGY

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

COHESIVE SOILS

N value (blows/ft)	Consistency Term	Unconfined Compressive Strength (tsf)
0–2	very soft	<0.25
2–4	soft	0.25–0.5
4–8	medium stiff	0.5–1.0
8–15	stiff	1.0–2.0
15–30	very stiff	2.0–4.0
>30	hard	>4.0

NON COHESIVE SOILS

N value (blows/ft)	Relative Density Term	Relative Density
0–4	very loose	<0.15
4–10	loose	0.15–0.35
10–30	medium dense	0.35–0.65
30–50	dense	0.65–0.85
>50	very dense	>0.85

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISION			SYMBOLS	DESCRIPTION
COARSE GRAINED SOILS more than 50% of material coarser than #200 sieve	GRAVEL and GRAVELLY SOILS more than 50% of material coarse fraction retained #4 sieve	CLEAN GRAVELS little or no fines	GW	Well-graded GRAVELS, GRAVEL-SAND mixtures, little or no fines
			GP	Poorly-graded GRAVELS, GRAVEL-SAND mixtures, little or no fines
		GRAVELS with appreciable amount of fines	GM	Silty GRAVELS, GRAVEL-SAND-CLAY mixtures
			GC	Clayey GRAVELS, GRAVEL-SAND-CLAY mixtures
	SAND and SANDY SOILS more than 50% of material coarse fraction passing #4 sieve	CLEAN SANDS little or no fines	SW	Well-graded SANDS, gravelly SANDS, little or no fines
			SP	Poorly-graded SANDS, gravelly SANDS, little or no fines
		SANDS with appreciable amount of fines	SM	Silty SANDS, SAND-SILT mixtures
			SC	Clayey SANDS, SAND-CLAY mixtures
FINE GRAINED SOILS more than 50% of material finer than #200 sieve	SILTS and CLAYS	LIQUID LIMIT less than 50	ML	Inorganic SILTS and very fine SANDS, ROCK FLOUR, or CLAYEY SILTS with slight plasticity
			CL	Inorganic CLAYS of low to medium plasticity, gravelly CLAYS, sandy CLAYS, silty CLAYS, lean CLAYS
			OL	Organic SILTS and organic silty CLAYS of low plasticity
	SILTS and CLAYS	LIQUID LIMIT greater than 50	MH	Inorganic SILTS, micaceous or diatomaceous fine sandy or silty SOILS, elastic SILTS
			CH	Inorganic CLAYS of high plasticity, fat CLAYS
			OH	Organic CLAYS of medium to high plasticity, organic SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT and other highly organic SOILS

Dual symbols are used for borderline cases. Symbols may be combined to depict other materials.

OTHER MATERIAL SYMBOLS

TOPSOIL, ASPHALT, BASE, CONCRETE, VOID, GLACIAL TILL, COAL, SHALE, SANDSTONE, CONGLOMERATE, SILTSTONE, LIMESTONE

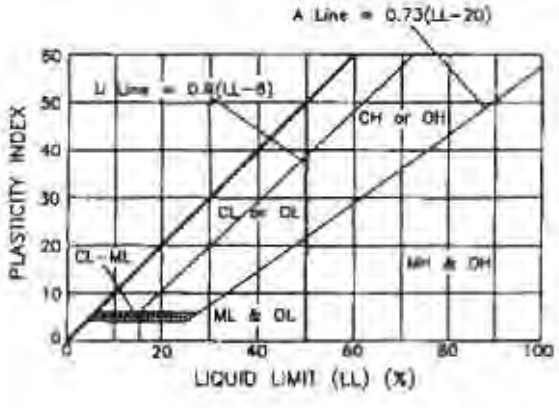
PARTICLE SIZE IDENTIFICATION

BOULDERS	>300	mm
COBBLES	75–300	mm
coarse GRAVEL	19–75	mm
fine GRAVEL	4.75–19	mm
coarse SAND	2–4.75	mm
medium SAND	0.425–2	mm
fine SAND	0.075–0.425	mm
SILT & CLAY	<0.075	mm

SILT: Plastic index less than 4 or below the A-Line
CLAY: Plasticity index equal to or greater than 4 or on or above the A-Line
WELL GRADED GRAVEL: Less than 5% passing no. 200 sieve and $C_u > 4.0$
WELL GRADED SAND: $C_u > 6.0$ and $1.0 < C_c < 3.0$
POORLY GRADED GRAVEL or SAND: if either the C_u or C_c criteria for well graded soils are not satisfied

$C_u = D_{60}/D_{10}$ $\quad C_c = (D_{30}^2)/(D_{10} \times D_{60})$
D_{10}, D_{30} and D_{60} = Particle-size diameters corresponding to 10, 30, & 60% passing 200 sieve

PLASTICITY CHART



SAMPLER AND WATER SYMBOLS

SB=Split-Barrel/Split-Spoon ST=Shelby Tube
AS=Auger Sample NX=Diamond Bit Core

- Water at encounter
- 2nd water level measurement
- 3rd water level measurement
- 4th water level measurement

SPT blow count "N": The number of blows of a 140 pound hammer dropping 30" required to drive a split-barrel sampler through each of three 6" increments of penetration through soil or rock.

EDP Consultants, Inc.
9375 CHILLICOTHE RD., KIRTLAND, OH, 44094
PHONE 440-256-8500 FAX 440-256-8507

Kenston Adjacent Parcels

PIN	LOCATION_A
01-067402	17680 CREEKSIDE DR
01-067403	17650 CREEKSIDE DR
01-067404	17630 CREEKSIDE DR
01-067405	17610 CREEKSIDE DR
01-070100	9685 WASHINGTON ST
01-112353	17528 INDIAN HILLS DR
01-112354	17526 INDIAN HILLS DR
01-112355	17510 INDIAN HILLS DR
01-112356	17485 INDIAN HILLS DR
02-020200	17666 SNYDER RD
02-029700	9551 WASHINGTON ST
02-029800	9575 WASHINGTON ST
02-063570	17650 SNYDER RD
02-083100	9554 BAINBRIDGE RD
02-087600	17620 SNYDER RD
02-093100	17636 SNYDER RD
02-095300	17361 SNYDER RD
02-114220	9388 BAINBRIDGE RD
02-114230	9442 BAINBRIDGE RD
02-118750	17460 SNYDER RD
02-149600	SNYDER RD
02-149700	17520 SNYDER RD
02-167900	9575 BAINBRIDGE RD
02-168100	9574 BAINBRIDGE RD
02-172600	SNYDER RD
02-172700	17430 SNYDER RD
02-200200	17574 SNYDER RD
02-201000	9518 BAINBRIDGE RD
02-201100	BAINBRIDGE RD
02-213200	9536 BAINBRIDGE RD
02-214750	17372 SNYDER RD
02-239600	9655 WASHINGTON ST
02-246400	9639 WASHINGTON ST
02-261460	17446 SNYDER RD
02-267830	17383 SNYDER RD
02-271700	9519 WASHINGTON ST
02-281400	17504 SNYDER RD
02-297320	17688 SNYDER RD
02-308450	17590 SNYDER RD
02-311300	17490 SNYDER RD
02-314100	17476 SNYDER RD
02-329200	17375 SNYDER RD
02-342200	9413 WASHINGTON ST
02-352700	17410 SNYDER RD
02-359200	9315 BAINBRIDGE RD
02-381200	17339 SNYDER RD
02-394100	9451 WASHINGTON ST
02-411550	17406 SNYDER RD
02-419536	SNYDER RD
02-419737	17570 SNYDER RD
02-419758	9480 BEECH TREE LN
02-420064	SNYDER RD
02-712000	9421 BAINBRIDGE RD

KENSTON SCHOOLS

Public Meetings Media Coverage

Exhibit 1

EXHIBIT 1

This project has received media coverage from local newspapers (Chagrin Valley Times, West Geauga Sun, News Herald and Plain Dealer) since 2007. The Kenston Board of Education meets monthly and has discussed this project at its public board meetings. Numerous community groups have requested informational presentations including the Geauga County Department of Development – Renewal Energy Workshops, Bainbridge Civic Club, Cuyahoga Community College regional workshop, Kenston Citizen Advisory Committee and Kenston Business Advisory Council. The general consensus from these public presentations has been positive. Overall, our community is excited about the economical and educational impact of Project K2.

Documented meetings:

Monday, October 17, 2005	Board of Education Meeting, Superintendent's Report
Monday, October 16, 2006	Board of Education Meeting, 2006-129 Wind Study Agreement
Monday, February 12, 2007	Board of Education Meeting, Superintendent's Report
Monday, June 18, 2007	Board of Education Meeting, Superintendent's Report
Monday, September 17, 2007	Board of Education Meeting, Superintendent's Report
Monday, September 17, 2007	Board of Education Meeting, Educational Agreement with CSU
Monday, December 10, 2007	Board of Education Meeting, Superintendent's Report
Monday, February 11, 2008	Board of Education Meeting, Superintendent's Report
Monday, March 17, 2008	Board of Education Meeting, Superintendent's Report
Monday, March 17, 2008	Board of Education Meeting, 2008-30 Notice to Proceed
Thursday, April 17, 2008	Kenston Citizens Advisory Committee
Monday, April 21, 2008	Board of Education Meeting, Renaissance Group
Monday, April 21, 2008	Board of Education Meeting, Superintendent's Report
Monday, May 19, 2008	Board of Education Meeting, Advertise for Bids
Monday, May 19, 2008	Board of Education Meeting, Superintendent's Report
Thursday, May 29, 2008	Geauga County Renewable Energy Meeting
Monday, June 16, 2008	Kenston Board of Education Meeting, Superintendent's Report
Tuesday, June 24, 2008	Kenston Citizens Advisory Committee
Monday, July 14, 2008	Kenston Board of Education Meeting, New Fund Approval
Monday, July 14, 2008	Kenston Board of Education Meeting, Superintendent's Report
Thursday, August 18, 2008	Kenston Board of Education Meeting, Superintendent's Report
Thursday, August 28, 2008	Kenston Citizens Advisory Committee
Monday, September 15, 2008	Kenston Board of Education Meeting, Superintendent's Report
Wednesday, October 15, 2008	Business Advisory
Thursday, October 16, 2008	Kenston Board of Education Meeting, Special, Rejection of Bid
Monday, October 20, 2008	Kenston Board of Education Meeting, Superintendent's Report
Monday, November 17, 2008	Kenston Board of Education Meeting, Superintendent's Report
Thursday, November 20, 2008	Kenston Citizens Advisory Committee
Wednesday, November 05, 2008	Bainbridge Civic Club
Thursday, December 04, 2008	Kenston Citizens Advisory Committee
Wednesday, December 10, 2008	Business Advisory
Monday, December 15, 2008	Kenston Board of Education Meeting, Advertise for Bids
Monday, December 15, 2008	Kenston Board of Education Meeting, Superintendent's Report
Wednesday, January 28, 2009	Kenston Citizens Advisory Committee
Wednesday, February 11, 2009	Business Advisory
Wednesday, March 04, 2009	Kenston Citizens Advisory Committee
Thursday, April 16, 2009	Kenston Citizens Advisory Committee
Wednesday, April 29, 2009	Business Advisory
Tuesday, June 30, 2009	CAFR
Friday, September 25, 2009	PTO Council
Wednesday, October 14, 2009	Business Advisory
Friday, November 13, 2009	PTO Council
Wednesday, December 09, 2009	Business Advisory
Friday, January 29, 2010	PTO Council
Wednesday, February 03, 2010	Business Advisory
Thursday, March 18, 2010	PTO Council

Get rules in place for wind turbines

The future is now. Municipalities had better get ready for alternative energy — wind, solar, clean coal and others — because it's blowing this way.

Elected or appointed officials should watch what Willoughby City Council does in crafting an ordinance to govern wind-energy systems within city limits.

The Willoughby law — which would be the first of its kind in Lake and Geauga counties — would address the construction, operation and regulation of wind turbines in the city. The ordinance will identify the necessary permit applications, a turbine's visual appearance, noise and shadow issues, setbacks from buildings and roads, and liability insurance, among other things.

This discussion in Willoughby stemmed from a request by Willoughby Coal & Supply to construct a 195-foot turbine on its property at 3872 Erie St. The company would use wind energy to reduce the plant's energy costs, and it would sell some.

In addition to this Willoughby business, Kenston School District in Geauga County has expressed interest in utilizing a wind turbine to reduce energy costs.

> Local officials had better not be left struggling to catch up.

Other local governments should have their planning and zoning regulations in place before they receive a request. While unique to Northeast Ohio, Willoughby isn't charting new territory. Numerous communities in other states already have rules for wind turbines.

Anyone who's been paying attention knows that there is abundant public policy talk surrounding alternative energy. It has risen as a key element of talks focused on reshaping electric deregulation in Ohio before year's end.

Meanwhile, Gov. Ted Strickland and others are pushing wind energy as a new industry in Ohio.

The governor wants a $1.7 billion bond issue to stimulate job growth. If approved, as part of his plan, $250 million would be allocated for advanced renewable energy.

The primary focus in Northeast Ohio has been wind turbine farms out on Lake Erie.

The construction of this project could be a few years away, but that could be one of many similar, yet smaller, projects as Northeast Ohioans try to tap the strength of wind energy on Lake Erie.

No one can tell how many other businesses are considering this to improve their bottom line. Local officials had better not be left struggling to catch up.

News Herald 2-26-08

Pressure is on

Wind-turbine project finally gets off the ground

By SUE HOFFMAN

After a year and a half of research and fund-raising, the Kenston School District has begun construction of a wind turbine.

The school board recently signed a contract with the Renaissance Group to provide design services for the turbine at a cost of $80,000. Last week, the company evaluated soil conditions at the construction site near the back entrance to the stadium.

School Superintendent Robert A. Lee said the 500-kilowatt wind turbine will save the school district $80,000 to $100,000 a year in electric costs. The project is expected to cost $700,000 to $800,000, and should be completed by October, he said.

So far, the district has received $500,000 in aid, including an Ohio grant of $300,000 through Cleveland State University, $150,000 from the Ohio Department of Development and $50,000 from the Lake-Geauga branch of the Cleveland Foundation. "We're still working on the funding," Dr. Lee said, and additional money might be forthcoming once the project is under way.

"There needs to be some local matching money." He said the district had budgeted some of its bond-issue funds to help with the project.

Bidding for the project is scheduled for approval at the May 19 school board meeting, with bid opening in June, Dr. Lee said. There will be separate bids for different parts of the project, including the foundation, pole and generator.

"The higher we can go up on the pole, the more wind we can get," Dr. Lee said. A cost-benefit analysis will determine the cost-efficiency of bringing in a special crane to give the turbine greater height, he said.

"There are so many different steps, and one of the challenges will be the delivery of the blades, which are projected to be 100 feet long," Dr. Lee said. "The wind turbine works best at a constant 15 mph wind." An adjustment of the direction of the blades is required in winds above and below that speed, he said.

The district will be building a reconditioned turbine, rather than a new one, he said. "A brand new turbine would take one or two years to construct."

While the school district will need to go through competitive bidding, it

Please turn to next page

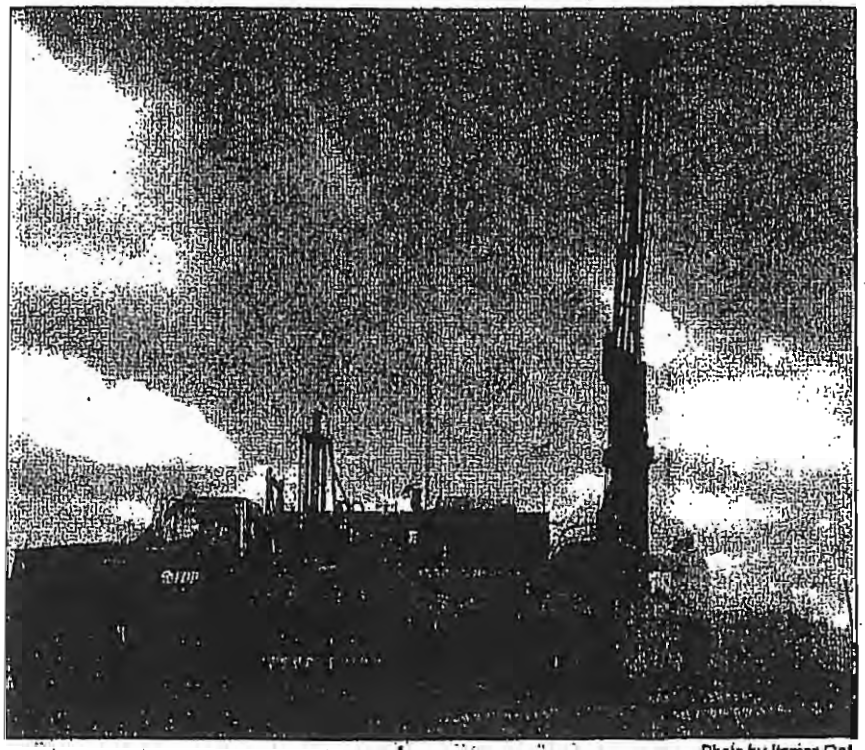


Photo by Itamar Gat

Soil testing got under way at the wind-turbine construction site near the back entrance to the football stadium at Kenston High school in Bainbridge.

CVT 5-8-08

Wind turbine

From previous page

has been listed as a collaborative test site for a new hydraulic system in a proposal for Parker Hannifin Corp. by LNE Group, a government relations firm. Parker Hannifin and its partners were awarded a $1 million grant through Ohio's Third Frontier initiative to commercialize the hydrostatic-wind-turbine-drive-train system it developed. The system uses the company's hydraulic components to improve the overall energy-generating capacity and reliability of wind turbines over their service life, according to LNE Group officials.

The drive-train system "uses hydraulics in lieu of a gear box," said Jason Smith, vice president of LNE Group. "Gear boxes are prone to failure," he said, which leads to high maintenance costs.

"Parker proposes using a hydraulic transmission as a way of connecting the rotor to the generator," according to the abstract submitted by LNE Group. "The technology eliminates the gear box and improves the productivity of the turbine over its service life."

The Kenston School District was one of two sites that completed a year-long wind-study program through Green Energy Ohio, a not-for-profit organization managing the Ohio Anemometer Loan Program. Green Energy Ohio, which worked with the Ohio Department of Development to stimulate development of the state's wind resources, placed several anemometers on the tower for radio station WKHR on top of Kenston Middle School last summer. Iten Industries, a small plastics manufacturer in Ashtabula County, was the other test site.

The Kenston School Board approved a contract in the fall of 2006 to serve as a site sponsor for a wind study. Dr. Lee then had the radio tower analyzed to assure that it would support instrumentation.

The district incurred no cost for the wind study, Dr. Lee said. Students in Kenston High School's Envirothon group helped monitor the instruments during the study.

Dr. Lee said his goal has been to make the new high school, which opened in August 2006, a green building. He said he thought of the potential for using wind power when visiting the site prior to construction. "It seemed it was windy all the time, and I thought of it every time we were on site," he said.

He contacted the Ohio Department of Development after reading about the wind-study grant program. After the department inspected the site, Kenston officials were referred to Green Energy Ohio for the study.


THE WIND TURBINE ATE MY HOMEWORK
KENSTON HIGH SCHOOL
BOB HILL
CVET 5/15/08

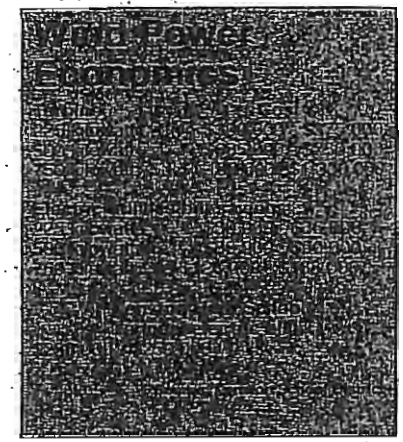
Kenston, Cleveland State plan wind turbine

By SUE HOFFMAN

The Kenston School Board approved an agreement Monday with Cleveland State University to develop an educational partnership for a wind-turbine project.

Working with the university's technical and engineering department, the district "will assess and evaluate the wind turbine and offer reciprocal educational opportunities for our students," School Superintendent Robert A. Lee said. He called the new partnership "a great connection."

The district has received a $300,000 grant from the Ohio Department of Development and U.S. Department of Energy to install a wind turbine on campus, Dr. Lee said. The Lake-Geauga branch of the Cleveland Foundation has agreed to provide $50,000 for the project, he said.



Dr. Lee said he is looking at two other business partnerships and speaking with foundations for funds totaling $1 million to construct a 750-kilowatt turbine. Some of the support "may be a way to save money so that the cost is not as high," he said.

"With a $1 million turbine, we could see savings of more than $100,000 a year," he said. A wind turbine could be constructed by next spring or summer, he said.

The proposed site is between the football stadium and the new high school.

Green Energy Ohio, a not-for-profit organization, is managing the Ohio anemometer loan program. The Kenston School District is one of two sites that Green Energy selected in the first year of the wind-study program. The other is Ilen Industries, a small plastics manufacturer in Ashtabula County.

The anemometer was installed by Green Energy Ohio in the radio tower at Kenston Middle School last March. Green Energy will study six different heights to show the optimal height for the turbine, Dr. Lee said.

The district will incur no cost for the wind study, whose goal is "to make the new high school a green building," he said.

Electricity costs for the new high school are running between $230,000 and $250,000 a year, Dr. Lee said. "The savings would depend on the size of the turbine."

The Kenston School Board approved the wind turbine study last year.

Dr. Lee said he thought of the potential for using wind power when visiting the site prior to construction of the new high school. "It seemed it was windy all the time, and I thought of it every time we were on site," he said.

He checked with the Ohio Department of Development after reading about the wind study grants. "We applied and qualified for the wind study program," Dr. Lee said.

Mayor raises concern about wind turbine plan

GRANT SEGALL
Plain Dealer Reporter

MIDDLEBURG HEIGHTS — High above the Ferris wheel, a wind turbine may someday help to power the Cuyahoga County Fair.

But a local mayor is worried about the turbine, with its 200-foot-tall tower and its blades rising another 50 feet.

"It's going to be located next to a nursing home, a hospital and highly concentrated residential areas," said Middleburg Heights Mayor Gary Starr, who governs the part of the fairgrounds where the turbine would stand. "You have to wait and see how the public will react. You'll be able to see this 250-foot wind turbine for miles around."

The fair board has asked the city for a zoning variance, which such a tall structure would need. Starr expects the city Planning Commission to consider the variance in October.

Last month, the board raised a 164-foot-tall pole holding an instrument called an anemometer to test the wind for a year. So far, said board President David Stephan, the wind seems strong enough to make the turbine worthwhile.

Stephan thinks the 225-kilowatt turbine may cost a little more than $1 million but would pay off by generating most of the fairgrounds' electricity and educating fairgoers about energy.

The board pays about $100,000 for power annually, and the bills always seem to rise.

The fair board received $40,000 from Green Energy Ohio for the anemometer. Stephan hopes for similar grants to cover the turbine.

Because of widespread guy wires, the anemometer could stand only on the Berea side of the fairgrounds, in the middle of the racetrack.

The turbine would rise in the main parking lot off Bagley Road.

But Stephan said the winds should be similar on both sides. So far, he's heard no complaints about the device.

Al Madison, vice president of marketing for the nearby Southwest General Health Center, said, "We are supportive of green activity."

Officials at the nearby Century Oak Care Center could not be reached for comment.

Turbines are spreading across Greater Cleveland. They already stand at the Great Lakes Science Center and at Lake Farmpark.

A public commission is looking at raising five to 10 off Cleveland's shore.

A developer is seeking permission for turbines in Ashtabula. Kenston High School plans to raise one soon, and Perry High School has raised an anemometer to test the idea.

Cleveland has plenty of wind to harness: Average winds are 10.5 mph at Cleveland Hopkins International Airport, compared with 10.3 mph at O'Hare International in Chicago, according to the National Climatic Data Center.

To reach this Plain Dealer reporter: gsegall@plaind.com, 216-999-4187

PHOTOGRAPHS BY CHRIS RUSSELL HEINZ | THE PLAIN DEALER

Alfredo Myers of Cleveland digs for worms among the last of the fresh produce growing in the Kentucky Community Garden in the Ohio City neighborhood of Cleveland. Myers planned to use the worms for bait. He said his garden yielded more produce this year than ever because he introduced more worms to the soil.

PD 9.28.08

Busy getting green

Cleveland is changing its colors, not just for fall

LAURA JOHNSTON | PLAIN DEALER REPORTER

Cleveland's reputation leans more gray than green.

But we're trying. We're changing colors through dozens of programs, real estate developments, grants and ideas.

We're building new green neighborhoods and deconstructing old houses, growing food on vacant inner-city lots and considering "gasifying" our trash to create energy. We've even got a kind of fish-friendly pilot project in the Cuyahoga River's shipping channel that folks in Portland, Ore., the darling of sustainability, have never heard of.

And this month, we were rewarded, moving up 12 spots on SustainLane's annual survey to be ranked the 16th most sustainable city in America. The environmental advocacy Web site lauded Cleveland as "hitting their stride." But, of course, first-place honors went to Portland.

"I think that we really are pioneering and proving a lot of the sustainability concepts," said Andrew Watterson, Cleveland's sustainability director, who moved from Portland to Cleveland in 2002. "We're just not used to talking about what good things we're doing."

Sustainability means meeting the needs of the present without compromising the needs of future generations. The idea is broad, encompassing energy, transportation, air, water, solid waste and vegetation. And here, its projects are overseen by an array of businesses, foundations and governments.

Suburbs, such as Bay Village and Shaker Heights, have created "green teams" to brainstorm sustainable ideas. Others, such as Bedford Heights, are helping businesses retrofit their facilities to save energy and money. Community development corporations are training for months with Entrepreneurs for Sustainability.

Being green saves energy and money, proponents say. Plus, folks are thinking about the threat of climate change; they're ready to be more conscious of their impact on the Earth.

SEE GREEN | B3

Kenston approves fund for wind energy grant

The Kenston Board of Education approved the creation of a fund to house the new Cleveland Foundation Wind Energy Installation Project Grant at Monday's board meeting. The grant, worth $50,000, will go toward the district's $300,000 wind energy project, said Kenston Schools Superintendent Robert A. Lee.

The money was approved a year ago, but the district had to wait on the $50,000 until it proved that it had generated additional funding in the meantime. Once the district started acquiring funding through grants and other sources, then the $50,000 was released to the district, Lee said.

In other news, the district purchased two buses from Power City International — [illegible] bus at respective costs of $80,500 and $78,800.

"Those were low bid," Lee said.

House OKs economic stimulus

News Herald 1-29-09

■ President says plan will create 3 million new jobs

David Espo
Associated Press

WASHINGTON — In a swift victory for President Barack Obama, the Democratic-controlled House approved a historically huge $819 billion stimulus bill Wednesday night with spending increases and tax cuts at the heart of the young administration's plan to revive a badly ailing economy.

The vote was 244-188, with Republicans unanimous in opposition despite Obama's pleas for bipartisan support.

"This recovery plan will save or create more than three million new jobs over the next few years," the president said in a written statement released moments after the House voted.

Earlier, Obama declared, "We don't have a moment to spare" as congressional allies hastened to do his bidding in the face of the worst economic crisis since the Great Depression.

The vote sent the bill to the Senate, where debate could begin as early as Monday on a companion measure already taking shape. Democratic leaders have pledged to have legislation ready for Obama's signature by mid-February.

A mere eight days after Inauguration Day, Speaker Nancy Pelosi said Tuesday's events heralded a new era. "The ship of state is difficult to turn," said the California Democrat. "But that is what we must do. That is what President Obama called us to do in his inaugural address."

With unemployment at its highest level in a quarter-century, the banking industry wobbling despite the infusion of staggering sums of bailout money and states struggling with budget crises, Democrats said the legislation was desperately needed.

"Another week that we delay is another 100,000 or more people unemployed. I don't think we want that on our consciences," said Rep. David Obey, D-Wis., chairman of the House Appropriations Committee and one of the leading architects of the legislation.

See Stimulus, Page A4

Stimulus

From Page A1

Republicans said the bill was ...h tax cuts and contained too much spending, much of it wasteful and unlikely to help laid-off Americans.

Congressman Steven C. LaTourette, R-Bainbridge Township, voted against the stimulus package.

"Everyone wants President Obama to succeed and the economy to be stimulated except the Democratic leadership that wrote the bill. President Obama wants to get money out the door and create jobs, and this bill in its current form doesn't do this. With millions of Americans losing their jobs and homes, this bill is chock full of ill-timed spending during the biggest economic crisis of our lives.

"The infrastructure component could have been the biggest job-creating component of the bill, but those funds account for only about 3 percent of the bill's price tag," LaTourette said.

The party's leader, Rep. John B... of Ohio, said the measure ... create many jobs, but it will create plenty of programs and projects through slow-moving government spending." A GOP alternative, comprised almost entirely of tax cuts, was defeated, 266-170, moments before the final vote.

On the final vote, the legislation drew the support of all but 11 Democrats while all Republicans opposed it.

The White House-backed legislation includes an estimated $544 billion in federal spending and $275 billion in tax cuts for individuals and businesses.

Included is money for traditional job-creating programs such as highway construction and mass transit projects. But the measure tickets far more for unemployment benefits, health care and food stamp increases designed to aid victims of the worst economic downturn since the Great Depression of the 1930s.

Tens of billions of additional dollars would go to the states, which confront the prospect of deep budget cuts of their own.

That money marks an attempt to ease the recession's impact on schools and law enforcement. With funding for housing weatherization and other provisions, the bill also makes a down payment on Obama's campaign promise of creating jobs that can reduce the nation's dependence on foreign oil.

The centerpiece tax cut calls for a $500 break for single workers and $1,000 for couples, including those who don't earn enough to owe federal income taxes.

The House vote marked merely the first of several major milestones a for the legislation, which Democratic leaders have pledged to deliver to the White House for Obama's signature by mid-February.

Already a more bipartisan — and costlier — measure is taking shape in the Senate, and Obama personally pledged to House and Senate Republicans in closed-door meetings on Tuesday that he is ready to accept modifications as the legislation advances.

Rahm Emanuel, a former Illinois congressman who is Obama's chief of staff, invited nearly a dozen House Republicans to the White House late Tuesday for what one participant said was a soft sales job.

This lawmaker quoted Emanuel as telling the group that polling shows roughly 80 percent support for the legislation, and that Republicans oppose it at their political peril.

The lawmaker spoke on condition of anonymity, saying there was no agreement to speak publicly about the session.

In fact, though, many Republicans in the House are virtually immune from Democratic challenges because of the makeup of their districts, and have more to fear from GOP primary challenges in 2010.

As a result, they have relatively little political incentive to break with conservative orthodoxy and support hundreds of billions in new federal spending.

Also, some Republican lawmakers have said in recent days they know they will have a second chance to support a bill when the final House-Senate compromise emerges in a few weeks.

That gave an air of predictability to the proceedings in the House, as Democrats defended the legislation as an appropriate response to the specter of double-digit unemployment in the near future.

Rep. Randy Neugebauer, R-Texas, sought to strip out all the spending from the legislation before final passage, arguing that the entire cost of the bill would merely add to soaring federal deficits. "Where are we going to get the money," he asked, but his attempt failed overwhelmingly, 302-134.

Staff Writer Jacob N. Lammers contributed to this report.

What will area districts get?

Below are the estimated local education allocations under House Appropriations Committee Draft 2009 Stimulus Bill, the "American Recovery and Reinvestment Act of 2009," approved by the House Wednesday night.

Both years' increases are further divided into three categories by the government: boosts for districts with high percentages of low-income students under Title 1-A, special education needs under the Individuals with Disabilities Education Act grants, and major investments in school construction and rehabilitation.

School district	2009	2010
[illegible]	[illegible]	[illegible]
Cardinal	$1,331,700	$664,800
[illegible]	[illegible]	[illegible]
Chardon	$504,200	$447,900
[illegible]	[illegible]	[illegible]
Euclid	$3,843,300	$1,808,300
[illegible]	[illegible]	[illegible]
Kenston	$475,300	$408,000
[illegible]	[illegible]	[illegible]
Ledgemont	$154,800	$112,000
[illegible]	[illegible]	[illegible]
Mayfield	$1,016,900	$709,700
[illegible]	[illegible]	[illegible]
Newbury	$243,200	$163,900
[illegible]	[illegible]	[illegible]
Perry	$343,900	$259,800
[illegible]	[illegible]	[illegible]
Riverside	$2,287,300	$977,400
[illegible]	[illegible]	[illegible]
West Geauga	$399,800	$374,600
[illegible]	[illegible]	[illegible]
Willoughby-Eastlake	$2,441,100	$1,631,500

Wheels turn for Kenston windmill

Jan. 22, 2009
West Geauga Sun

By Joan Cooper Rusek
Jrusek@sunnews.com

BAINBRIDGE — While most residents are coping with wind chill, Kenston Schools Superintendent Bob Lee is trying to get his experimental wind mill project off the ground.

He hopes to iron out some details in the next few weeks that will allow Kenston to award a bid.

Lee hopes to save about $120,000 to $125,000 a year on electricity at the high school by generating it on the school campus.

He said the school received and opened a bid, but could not proceed without additional information.

He said he could not discuss the bid nor the potential supplier at this time.

He did say that if the project goes forward, it could be partly funded through grant money and it could spawn demand for more large electric customers to install windmills.

"This could lead to job creation in Ohio," he said.

The proposed windmill would include a 185-foot tower with either a hydraulic or a gear-box drive system for the 600-kilowatt generator.

Lee said the blades will be larger than those on the windmill at Cleveland's Science Center.

Kenston's mill is anticipated to generate 240,000 kilowatts of electric power a year, providing 40 to 50 percent of the what is needed to run the high school.

Lee started working on his windmill project more than two years ago. He enlisted help from the school's Envirothon Science Club that monitored wind-measuring equipment installed on the school's radio station tower.

He said Green Ohio loaned the equipment to the school for the study.

"We know one thing for sure — we have a very windy location for it on the high school campus," he said.

Contact Rusek at (216) 986-5474.

Geauga County Maple Leaf 2/26/09

County stimulus money requests top $18 million

By Glen Miller and Josh Echt

Geauga County governments are requesting more than $18 million in federal stimulus funding for projects ranging from water and sewer improvements to road paving.

As of now, applicants for 2009 funding include the Geauga County Engineer's Office, the county Department of Water Resources, the City of Chardon, Village of Burton and the Village of Middlefield.

The Village of South Russell discussed the issue at Monday's council meeting, but it does not know what projects or funds would be available as of now, said Councilman Jack Binder.

See Stimulus • Page A6

Stimulus money requests top $18 million

from page A1

...finance committee (which includes Binder and Councilman Bill Koons) will look at this issue this week," Binder said Tuesday. "There are people in the area that claim that they know what projects are going to be funded or not. But it's too early to tell, because it's only been a week since Washington passed the bill."

The funds will be sought from $82 billion in stimulus money from the American Recovery and Reinvestment Act of 2009. Public officials are eyeing an unknown amount of 2010 stimulus money, although no applications will be made until more is known about the money for 2010.

Gov. Ted Strickland's budget calls for using at least $5 billion in federal stimulus money. About $3 billion will be set aside for general revenue fund spending, while $2 billion will be placed in federal accounts for Medicaid. The proposal would free up $2 billion in state funds for other causes, according to Amanda Wurt, the governor's press secretary.

A yet unknown amount of billions of dollars is available nationally for discretionary and competitive uses. Information about those funds is still being gathered, she added.

"We know it's confusing. We're trying to get things resolved," Wurt said.

...unty's largest 2009 stimulus re...6 million, submitted by th... County Department of Wate... Resources to the Ohio Environmental Protection Agency. About $5.5 million of the water and sewer projects are "shovel ready," a term coined by congressman for projects that can be started within 180 days and immediately create jobs.

Those that cannot be started within six months may not be funded, which angers Water Resources Director Gus Saikaly.

Small public agencies and counties like Geauga do not have the money to do the prerequisite planning, engineering and design work necessary to get projects "shovel ready." Public agencies in large cities and counties, such as Cleveland and Cuyahoga County, have their own engineering and planning staffs, he said.

Therefore, they have a huge advantage over small counties and cities that must go through a lengthy bidding process to hire consultants with the same expertise, Saikaly added.

"It is unrealistic to expect small governments to go out and spend money they don't have to begin with to get projects ready so they can get the money to build them," Saikaly said. "The people running this stimulus program didn't factor this into their thinking."

Moreover, the Ohio EPA must approve each of the 14 water and sewer projects submitted for possible stimulus money funding, a process usually requiring lengthy review.

The agency has approved about $500,000 million in improvements to a small wastewater treatment plant in Hambden Township and a $3 million upgrade of a sanitary sewer system and a pump station in Auburn Township.

A few other projects totaling $2 million can be made ready within 180 days, he added.

"The point is, we could have many more ready to go before the end of the year, but right now I don't see that happening," Saikaly said.

Stimulus money will be available in 2010, although the amount and the rules for obtaining it remain unclear, he added.

Chardon's stimulus project submissions total about $2.6 million, Assistant City Manager Randy Sharpe submitted the city's requests. He agreed with Saikaly's assessment of the situation.

"You can't be saying use it or lose it. Small cities like us don't have a whole bunch of projects ready to go," Sharpe said. "We're limited in our scope. We have to be realistic with what we are planning on doing. It's got to be done right. We do not have the money to throw around."

Chardon's biggest proposed stimulus projects are:

- Completion of the delayed Wilson Mills Road sanitary sewer project, $532,500.
- Repaving of Wilson Mills Road, $458,900.
- Improving the intersection of Wilson Mills Road and Park Avenue, about $1.6 million.
- Repaving 10 city streets, a total of more than $1 million. The cost of the individual repaving projects range from $10,100 for Chardon Windsor Road to $260,600 for Washington Street between Center Street and 5th Avenue.

The county hopes to get more than $3.1 million in stimulus funds to repave seven county roads this year, put up a traffic light and do pavement marking. It could spend other $2 million on more three county road resurfacing projects, depending on how stimulus funds are made available in 2010, according to County Engineer Robert Phillips.

Most projects are ready to be built because planning and engineering work was done months before the stimulus package was hammered out by Congress and signed by President Barack Obama. Many are set to receive 80 percent federal funding, even if officials who oversee stimulus funding for Ohio reject them.

If they are approved, the county will save $620,000 because it will not have to pay its 20 percent share of the projects, Phillips said.

"That's a sizable savings that we could use for other projects if we opt to go that route," he added.

The cost of the 2009 resurfacing projects range from $300,000 for Hemlock Road between Music Street and the Village of Chagrin Falls to $540,000 for re-asphalting a portion of Wilson Mills Road between Route 306 and the county line.

The cost of the 2010 projects ranges from $500,000 for the resurfacing of Auburn Road from Mayfield Road to Wilson Mills to $800,000 for the repaving of Wilson Mills from Fairmount to Mayfield roads.

Burton Village Fiscal Officer Chris Paquette said the village will seek funding from the Ohio EPA for the estimated $6 million to $7 million needed for the construction of a new wastewater treatment plant in the village. The funding will be for 2010 stimulus funds, he said.

The village has applied for at least $100,000 in 2009 funding to repave North Cheshire Street and lay new sewer lines along it, a $300,000 project.

Middlefield Village Administrator Dan Weir said the village has applied for $2.5 million in stimulus money for the renovation of a water and sewer pump station near the intersection of routes 608 and 87.

Several township fiscal officers said they would like money to pave township roads. Others said their trustees have not yet discussed applying for stimulus funds.

Munson Township Trustee Todd Ray, president of the county-wide Trustee and Clerks Association, said township officials recently received a lengthy e-mail from the office of U.S. Rep. Steven LaTourette, R-Painesville Township, outlining the various categories under which applications for stimulus money can be made.

"It's rather lengthy, so it's going to take time to go through it and see if there's any category that fits projects a township may have or want to do," Ray said. "I don't think we (Munson Township) or most others have something ready."

The stimulus funding categories to which township governments may apply for money include infrastructure (roads and bridges) and crime and public safety (emergency services), according to the governor's office.

Chardon Schools Superintendent Joe Bergant said county school officials are confused about how education will benefit from the stimulus bill because of conflicting reports from state sources. Chardon schools are supposed to get $110,000, according to an e-mail Bergant received from the Ohio Department of Education (ODE).

"But we've also heard, legislatively, they may be pulling the education money back out," he said. "I don't know what to think, I'm not counting it. Let's put it that way."

The status of $150 billion in federal money earmarked for education remains unclear because of the conflicting reports about how it is to be used. If and when money is available, it will be used to enhance various school security systems, including an upgrade of fire alarms, he said.

ODE spokesman Scott Blake said the agency has not determined how stimulus money will be doled out to each school district in the state, although the U.S. House of Representatives has devised a chart showing "estimates" for each school district in every state.

"There are a lot of unanswered questions," Blake said.

The chart includes funding for Title 1-A and IDEA, special funding for special education programs.

Chardon School District Treasurer Stephanie Swain said the estimated school funding is confusing.

"This appears to have been done hurriedly. We certainly didn't have any input, but, at this point, I guess doing something is better than nothing," she said.

> **"You can't be saying use it or lose it. Small cities like us don't have a whole bunch of projects ready to go."**
> *-Chardon Assistant City Manager Randy Sharpe*

Berkshire	$113,000	$372,000	$485,000
Cardinal	$363,000	$728,000	$1,090,000
Chardon	0	$715,000	$715,000
Kenston	0	$652,000	$652,000
Ledgemont	$33,000	$150,000	$183,000
Newbury	$56,000	$213,000	$269,000
West Geauga	0	$598,000	$598,000
Total	$565,000	$3,578,000	$4,992,000

Geauga County Engineer's Office	$3.1 million
County Dept. of Water Resources	$6.0 million
City of Chardon	$2.6 million
Village of Middlefield	$2.5 million
Village of Burton	$100,000
Village of South Russell	Pending
Village of Aquilla	Pending
All Geauga County Townships	Pending
Total (incl. SD totals of $3.992m)	[illegible]

Estimated stimulus funding for Geauga County school districts.

Is there a wind farm in your future?

by Damon Asbury
director of legislative services

Leaders at all levels of government, including President **Barack Obama**, Gov. **Ted Strickland** and members of the Ohio General Assembly, have repeatedly called for us to "go green" and embrace renewable energy sources for our homes, businesses and communities. The promise of clean, affordable energy, coupled with the potential to spawn new industries and create new jobs, has been a driving force behind these efforts. Schools and school districts have been frequently targeted as the likely beneficiaries from such initiatives.

In Ohio, the General Assembly laid the groundwork in Senate Bill (SB) 221, which required the increased use of advanced and renewable energy technology in the generation of electricity in the state. The bill requires that at least 12.5% of the state's energy supply come from renewable sources by 2025. Among the renewable energy sources identified by the legislation are solar, wind power and wind turbines, geothermal and biomass byproducts.

During the current biennium, several bills have been introduced that seek to encourage even greater use of renewable energy sources. Among these is House Bill (HB)113, sponsored by **Mike Foley** (D-Cleveland) and **Lou Blessing** (R-Cincinnati), which would establish a two-tiered pilot project for school districts with an average daily membership of 5,000 or greater. Districts with 5,000 to 10,000 students would be required to issue requests for proposals (RFPs) to install renewable energy systems capable of generating 250 kilowatts, while larger districts would be required to issue RFPs for projects that could generate up to 500 kilowatts. Under the bill provisions, districts would not be obligated to go forward with the actual installation if they were not convinced that they would gain economic benefits over the cost of energy purchased through traditional sources.

Initially, HB 113 was intended to deal only with solar energy, with an eye toward jump-starting the solar industry in Ohio. However, the legislation was subsequently amended and expanded to include wind energy systems and geothermal sources. The original bill also would have required *all* school districts to participate and to generate up to 25% of their electricity thorough solar means. Efforts of OSBA, Ohio Association of School Business Officials and Buckeye Association of School Administrators lobbying were successful in modifying the requirement to only issue an RFP and to limit the requirement to as few school districts as possible. The bill is currently before the Senate Energy and Public Utilities Committee.

Damon Asbury

A related bill, HB 218, sponsored by **Roland Winburn** (D-Dayton), seeks to reduce the tax valuation of any public utility tangible personal property (TPP) used to generate electricity from renewable resources. The sponsor hopes the measure will be a boon to attract investment in renewable energy development in Ohio.

Wind energy investors have indicated that the public utility tangible personal property tax rate places Ohio at a competitive disadvantage when compared to surrounding states. In order to level the playing field, HB 218 would reduce the tax rate on wind and solar generation machinery and equipment from the current 24% to 12%.

However, following Strickland's State of the State call to phase out the tax on wind and solar facilities to make Ohio more competitive for renewable energy jobs, House Democrats are redrafting the bill so as to eliminate the tangible personal property tax on new wind and solar generation equipment. Taxes on transmission and distribution would remain the same.

Meanwhile, the Senate Republicans have introduced SB 232, sponsored by **Chris Widener** (R-Springfield), as an alternative way to encourage the process. Under Widener's proposal, instead of eliminating the tangible personal property tax, renewable energy companies would instead apply to the Ohio Air Quality Development Authority for an exemption from the tax, and pay an annual fee of $6,000 per megawatt of installed capacity for the life of the facility.

Widener noted that his bill would yield similar results, but would permit local governments and school districts to receive a continued revenue stream, albeit lower than current rates would provide. Some districts currently anticipating major wind or solar projects have expressed support for exempting the facilities from the TPP tax because they expect the installations to create local jobs and bolster the local economy.

Both sides of the aisle agree that fast action is necessary to beat federal stimulus funding deadlines. Both measures call for the facilities to be operational by 2012 and both would require companies to commit to create jobs in Ohio. Based on the level of current legislative and executive office interest in stimulating green energy systems, it is likely that many of the features of HB 113, HB 218 and SB

232 will soon become law.

A number of school districts have already received federal stimulus funds to add wind and solar power generating technologies at their facilities, including wind turbine funds to **Archbold Area Local (Fulton)**, **Kenston Local (Geauga)** and **Pettisville Local (Fulton)**. **Parkway Local (Mercer)** was awarded funds to support a solar thermal project. **Ashtabula Area City** Schools recently authorized staff to prepare and submit to the Ohio School Facilities Commission an application to erect a 750-kilowatt wind-turbine generator.

Once the legislation becomes enacted, districts can expect to be approached by renewable energy companies to purchase or install equipment, or to bless similar initiatives in the local community. District staff should be prepared to carefully consider all aspects of such proposals to make sure that the projects are economically feasible and beneficial to their communities. ❑

Executive outlook, continued from page 3

"Restoring Prosperity."

The National Rural Education Association (NREA), the oldest established national organization of its kind in the United States, conducted a thorough study of school consolidation history and research. The study found that there is no "ideal" size for schools or districts. The larger a district becomes, the more resources are devoted to secondary or non-essential activities.

Further, the NREA study maintained that there is no solid foundation for the belief that eliminating school districts will improve education, enhance cost-effectiveness or promote equality. Consequently, there should not be "forced" consolidation.

In some situations, consolidation may make absolute sense. In others, it may be inevitable. However, school boards and communities must be able to examine all possible variables and make well-informed decisions based on all available data, rather than be subjected to a mandate that "one size is best for all."

School district consolidation is not a new concept in Ohio. In 1915, there were 2,674 school districts in the state. By 1935, the number of school districts fell to 1,986. By 1959 the number was down to 984. Today, as the report notes, there are 613 Ohio public school districts, excluding educational service centers and joint vocational districts.

Ohio schools have always had the option to consolidate or merge. This is a matter that is best determined at the local level, where districts can look in depth at the implications of fiscal, educational, and community advantages and disadvantages. ❑

"Something Good is Happening in Our Schools"
submitted by: Dr. Robert A. Lee, Superintendent
Kenston Local Schools

Kenston Bombers are going green! No, we are not changing the Kenston mascot or the school colors, we are becoming more environmentally conscious. We are using Bio-diesel to fuel our buses, recycling programs are implemented at the high school and middle school and a wind turbine to generate electricity for the high school is planned for installation in 2008.

During site development for the high school, we discovered that the location on the top of a hill to the south of our stadium consistently had stronger winds than the surrounding area. It was at this time in 2005 that Kenston began to explore wind power. Through the Ohio Department of Development, a grant was secured for a wind study. After further study by Aaron Godwin of The Renaissance Group, this site was found to be a micro wind site that experiences more wind than typical areas in our portion of the state.

In the fall of 2006, Kenston Schools were competitively selected to participate as one of only two sites for the "Monitoring Ohio Wind," anemometer loan program managed by Green Energy Ohio. According to Program Coordinator, Steven Watts, Kenston is the first school district in the state of Ohio to participate in the program and the first in the state, known to consider a project of this scale. The program's instrumentation has been installed on our existing campus radio station tower located on top of Kenston Middle School. Information gathered was used to confirm the Ohio Wind Map and support the data originally provided by the Renaissance Group.

In January 2007, Kenston was notified by State Representative Matthew Dolan that Kenston received funding through House Bill 699. The funding amounted to $300,000. The Lake-Geauga branch of the Cleveland Foundation has agreed to provide $50,000 for the project. Currently the district is looking at other business partnerships and is speaking with foundations to reach a goal of $1million to fund the construction of a 750 kilowatt turbine.

With a $1 million turbine, we could see savings of more that $100,000 a year. Electricity costs for the new high school are running between $230,000 and $250,000 per year.

With the wind turbine Kenston plans to save money and while educating students. The high school Science department has incorporated the wind study into our classes and the student Envirothon Club. An educational partnership with Cleveland State University, will allow our students the opportunity to work with the technical and engineering department to assess and evaluate the wind turbine.

Wind power as a renewable source of energy is an excellent alternative for schools. Renewable energy sources are the wave of the future. Kenston has the site and the electrical power need to put a highly visible and effective wind power project in place.

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:08 P.M.

Timmons Elementary School Multi-Purpose Room — June 18, 2007

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Michael and Jean Lanzilotti - Home Education Policy

TREASURER'S REPORT

- News Media Reported
- State Employee Data Theft - No Kenston information was involved.

SUPERINTENDENT'S REPORT

- The Move - One Year Later
- Constitutional Amendment - August is the deadline
- Wind Power - Actively Pursuing Revenue Generation for Project
  1. $50,000 Cleveland Foundation
- Interviews for Assistant Superintendent
- New High School Principal - Nancy Santilli

NEXT REGULAR MEETING

7:00 P.M. July 23, 2007
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:44 P.M., a motion was made by Timmons, seconded by Hastings, to adjourn.

APPROVED: July 23, 2007

SIGNED Joan Hamilton
President

ATTEST Linda M. Hein
Treasurer

2005-87 DONATIONS

Upon the recommendation of the Superintendent a motion was made by Hastings, seconded by Applebaum, to accept the following donations:

- HP Scanjet 4400C from Connie Kramer to KHS Art Department.
- (28) student chairs, library books and a copier/printer from Jim and Katy Donohue to Gardiner Elementary School.

ROLL CALL: Applebaum-Yes, Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes. Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Tom Keck, 17628 Merry Oaks Trail; questions regarding circulation of levy petition

TREASURER'S REPORT

- Update on forecast

SUPERINTENDENT'S REPORT

- Update on move for next summer
- Update on playground equipment for elementary
- January, 2006, design completion for KHS conversion to KMS
- Natural gas prices, checking on wind & solar power grant
- Security grant for present and new high school
- Still reviewing kitchen equipment
- Telephone system - looking to update to new IP phones
- School funding - Alliance for School funding - greater reliance on property taxes. Hope to get a constitutional amendment. Require the state to earmark funds to education
- The Russian trip was too costly ($3,500). They will wait until next year.
- WKHR - Scott McVay passed away. He stepped forward to save WKHR.

NEXT REGULAR BOARD MEETING

November 21, 2005 7:00 P.M.
LOCATION: Timmons Elementary School Multipurpose Room

B. APPROVAL OF DEDUCT CHANGE ORDER - CHAMPION MOVERS

Approve a deduct change order for Champion Movers for crediting the owner the amount of unused dumpster allowance. Total amount of deduction is $(3,000.00).

C. APPROVAL OF DEDUCT CHANGE ORDER - CORPORATE EXPRESS BUSINESS INTERIORS

Approve a deduct change order for Corporate Express Business Interiors for desks received tan in color and were originally specified as oak top writing surface with blue seat and back. Corporate Express offered an additional 20% off of the original purchase price of the chairs. Total amount of the deduction is $(3,955.60).

D. APPROVAL OF CHANGE ORDER - CORPORATE EXPRESS BUSINESS INTERIORS

Approve a change order for Corporate Express Business Interiors for purchasing (60) CPU holders for educational tables. Total amount of the change order is $2,959.80.

E. APPROVAL OF CHANGE ORDER - CORPORATE EXPRESS BUSINESS INTERIORS

Approve a change order for Corporate Express Business Interiors for purchasing the extra (100) tan student stacking chairs at a reduced price of $20.00 per chair. Total amount of the change order is $2,000.00.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2006-129 WIND STUDY AGREEMENT

Upon the recommendation of the Superintendent, a motion was made by Hastings, seconded by Randall, to approve the Wind Study Agreement with Green Energy Ohio.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

First Reading - Textbooks/Materials

High School
Life of Pi, Yan Martel (Freshmen Honors Reading)

Middle School
The Definitive Edition - The Diary of a Young Girl - Anne Frank, Edited by Otto H. Frank and Mirjam Pressler (8th Grade Honors Reading)

2006-130 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Timmons, seconded by Hamilton, to approve the following:

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2007-23 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Hastings, seconded by Hamilton, to accept the following donations:

Keyboard trays to KHS English A110 from Andy Kenen.
Repair to EMAC computer to KHS English A110 from Andy Kenen
Wheelchair to KMS Clinic from KMS PTO.
Hallway painting at KMS from KMS PTO.
$50 from the Fisher family to the KHS website.
Adobe Premier Elements to KHS Room 213 (Mr. Continenza) from Andy Kenen.
ATEC rookie pitching machine and stand from Mrs. Karen Davis to KHS Athletics.
$500 to the KHS Fastpitch team from an anonymous donor.
$100 from the Sabo Family to the KHS website.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Mr. Thomas Keck, 17628 Merry Oaks - Regarding Kenston Citizens Advisory Committee.

TREASURER'S REPORT

- STRS Resolution will be sent to STRS, Legislators, Governor Strickland, OSBA, BASA and the media.

SUPERINTENDENT'S REPORT

- Wind Study
  - Connect to present radio tower, 2-3 weeks.
  - Green Energy will work with our science department. Students will be involved with data.
  - Potential of Kenston Wind Turbine site.
- Lighting
  - KHS Gym Lighting - Increased lumen level.
  - Student Entrance - Still need more light.
- Curriculum - Margaret Searle met with 40 staff members. Align our practices - will have a follow up in March.
- Kindergarten Orientation - GELC
- Even Start Program - GELC, hoping to extend parent involvement.

Y. APPROVAL OF CONTRACTED SERVICE - ESY

Approve a contract with Sue Hogan to provide ESY summer educational services (reading) at an hourly rate of $30, for a maximum of 24 hours, not to exceed $720 from June through August, 2007.

Z. APPROVAL OF WORKERS' COMPENSATION GROUP RATING PROGRAM

Approve the OSBA Workers' Compensation Group Rating Program for the 2007-2008 school year. The projected savings is $63,076. The enrollment fee is $3,858.

AA. APPROVAL OF GRANT AGREEMENT

Approve a Grant Agreement with the Cleveland Foundation to accept a grant in the amount of $50,000 to be used for the wind energy installation project.

BB. APPROVAL OF LEASE

Approve a lease agreement with the Auburn Learning Garden for space at Auburn School for one year beginning August 1, 2007.

CC. APPROVAL OF CONTRACT - CAWRSE AND ASSOCIATES

Approve a contract with Cawrse and Associates to provide construction administration for the parking lot pavement project in the amount of $1,250.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes
Motion carried.

2007-55 DONATIONS

$25 to the KHS Website from the Wandrey Family
$500 to the TES 3rd Grade Challenge Program from Mr. and Mrs. B. G. Pine
$2000 to KIS teachers' classrooms from Mr. James Donohue
Computer monitor to the TES computer lab
from Mr. and Mrs. Theodore Frank

$250 to KIS Principal's Fund from Mr. William Malm.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes
Motion carried.

First Reading

Textbooks/Materials
Biology, A.P. Edition, Campbell/Reece, Pearson, 7th Edition, © 2005 (for A.P. Biology and Biology II - high school)

resource room program at Auburn Career Center for the 2007-2008 school year at an estimated cost of $10,000 per student not to exceed $20,000.

M. APPROVAL OF CONTRACT - BEECH BROOK

Approve a contract with Beech Brook for consultations and therapeutic services for a student attending the Gund School program for behavior disorders at an estimated daily cost of $160 not to exceed $28,800 for the 2007-2008 school year.

N. APPROVAL OF CONTRACT - GEAUGA COUNTY EDUCATIONAL SERVICE CENTER

Approve a contract with the Geauga County Educational Service Center for educational aide services for five Kenston students with multiple disabilities/autism attending MD/AU/PreK satellite classrooms at a cost of $138,717 for the 2007-2008 school year.

O. APPROVAL OF CONTRACT - KORENKO SERVICES, INC.

Approve a contract with Korenko Services, Inc. for physical therapy services (evaluation, therapy and consultation) at an hourly rate of $65 for a maximum of 385 hours at a cost not to exceed $25,000, for the 2007-2008 school year

P. APPROVAL OF CONTRACT - GEAUGA COUNTY EDUCATIONAL SERVICE CENTER

Approve a contract with the Geauga County Educational Service Center for special education services (supervisors, interventionist, audiological and work/study coordinator) at a cost of $61,083.61 for the 2007-2008 school year.

Q. APPROVAL OF CONTRACT - GEAUGA COUNTY EDUCATIONAL SERVICE CENTER

Approve a contract with the Geauga County Educational Service Center for related services to six Kenston students with multiple disabilities attending MD satellite classes at an estimated cost of $54,133 for the 2007-2008 school year.

R. APPROVAL OF CONTRACT - WESTERN RESERVE SPEECH AND LANGUAGE PARTNERS

Approve a contract with Western Reserve Speech and Language Partners, Inc. for a diagnostic evaluation and consultation at a cost of $600 during August, 2008.

S. APPROVAL OF AGREEMENT - CLEVELAND STATE UNIVERSITY

Approve an agreement between Kenston Local Schools and Cleveland State University to develop an educational partnership with the Wind Turbine Project.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Sandy Cipiti, 17819 Chillicothe Road - Ben Cipiti - Kenston Graduate 1996, Ohio University Graduate 2000, PHD 2004 Graduate from University of Wisconsin-Madison in Nuclear Engineering.
  The Energy Construct, book written by Ben Cipiti, was donated to Kenston Schools.

- Joe Drake, 18220 Washington St. - Landscaping Contract, do a bid in the fall. Bid requirement $25,000. Kenston Citizen Advisory Committee had a public records request and got prices.

- Lena Roff, 17615 Indian Hills - KHS parking pass cost, School Pictures Commission, 4th period lunch - not enough food, Principal's Accounts

- Tom Keck, 17628 Merry Oaks Trail - Hiring Practice

TREASURER'S REPORT

- Audit
- Permanent Appropriation
- Records

SUPERINTENDENT'S REPORT

- Suspected Case of Meningitis (ended up not being meningitis) - Health Department Commission
- Agreement with Cleveland State University
  Wind Power Project - working with their tech department
  Grant through Rep. Dolan and Cleveland State - $300,000
- Risk Management Audit - 10% Discount on Insurance Rate
- October 6th - Dedication for the Howard Family
  Marker at Snyder Road Entrance 1 P.M.
- School Start and Open houses went well.

NEXT REGULAR MEETING

7:00 p.m. October 15, 2007
Location: Timmons Elementary School Multipurpose Room

2007-114 APPROVAL TO APPOINT AUBURN CAREER CENTER BOARD REPRESENTATIVE

Approve Ralph Hastings as the Auburn Career Center board representative for the year 2008.

ROLL CALL: Hamilton-Yes, Hastings-Abstain, Moreno-Yes, Randall-Yes
Motion carried.

OATH OF BOARD MEMBER - Joan Hamilton, Ralph Hastings, Anne Randall

OATH OF TREASURER - Linda Hein

2007-115 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Moreno, seconded by Randall, to approve the following

$25 from Laura and James Flaiz to the KMS Performing Arts Club.
$25 from Kathleen Thorn, Alan Thomas and Abra Schweickert to the KMS Performing Arts Club.
$25 from Heather and David Long to the KMS Performing Arts Club.
$500 from Hoehnen Landscaping to the Kenston Community Stadium Fund.
$15 from Tammy Fallon to the KMS Performing Arts Club.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes
Motion carried.

First Reading

Policies
5460 Graduation Requirements

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- None
-

TREASURER'S REPORT

- Preparation of Tax Budget

SUPERINTENDENT'S REPORT

- Stadium Renovation Committee
- Wind Project
- ODE - High School/Timmons Elementary nominated as Schools of Distinction.

$50 from Mr. and Mrs. Jonathan McKnight to the KHS Website.
HP printer to Kenston Middle School from Mr. Mark Ging.
20 pairs of cross country skis to the TES Physical Education Department from TES Student Council and TES PTO.
Saxaphone and trumpet to the KIS Music Department from Mrs. Nancy Olson.
$50 from Jon and Leigh Ann Deeter to the KHS website.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Ralph Hastings - Student Directory
  Snow Plowing

TREASURER'S REPORT

- None

SUPERINTENDENT'S REPORT

- 4th Snow Day - We can have up to 6 days. We may have a 1 hr/2 hr delay.
- Friday was the Wind Power Architect Interviews. August-October target date.
- First Energy called today regarding energy storage projects.
- Governor's State of the Address - comments

NEXT REGULAR MEETING

7:00 p.m. March 17, 2008
Location at Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:38 P.M., a motion was made by Hastings, seconded by Randall to adjourn.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried

APPROVED: March 17, 2008

SIGNED William C. Timmons
President

ATTEST Linda M. Heri
Treasurer

$1,750 from the Kenston Athletic Boosters to the Kenston Community Stadium Fund.
$150 from Mr. and Mrs. Jeff Manis to Kenston Local Schools.
(2) minilites for the sound board in the KHS Auditorium from Andy Kanen.
$1500 from Mr. Richad Tollefson to the KHS Community Stadium Fund.
$351 from an anonymous donor to the KMS 6th grade trip.
$100 from Ms. Charlene Powers to the KMS 6th grade trip.
Recycling bins to the KHS cafeteria from Sodexho Services.
$30 from an anonymous donor to the KMS 6th grade trip.
$25 from Mrs. Brenda Bush to the KMS 8th grade trip.
$100 from Mr. and Mrs. Timothy Miller to the KMS 7th grade camp program.
$75 from an anonymous donor to the KMS 6th grade trip.
$100 from Mr. and Mrs. Thomas Royer to the KMS 7th grade camp program.
$150 to the Science Olympiad from Benku Thomas and Okson Yi.
$50 from The Cardaman family to the KMS 8th grade trip.
$30 from Mr. and Mrs. Phillip Wandry to the KHS Website.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Mr. Thomas Kack, 17628 Merry Oaks - Questions regarding nepotism.
- Bill Timmons - Questions regarding Transportation Department, Potholes and paint booth.

TREASURER'S REPORT

- Tax Rate Resolution will be forwarded to Geauga County Treasurer.

SUPERINTENDENT'S REPORT

- Tracy Jemison did a great job reporting on the shrinking state funding for the county at the Library Forum.
- Snow Days - We are out.
- Jarod's Law - Inspect all school districts on health and safety.
- 13 retirees this year. Many with over 30 years of service.
- Discussed an article regarding Gov. Strickland, who is evaluating the roll of the Superintendant of Public Instruction.
- Wind Power project will allow student involvement.

More Wind Drafts

F. APPROVAL OF CONTRACT - EYERMAN LANDSCAPING

Approve a contract for cutting grass to Eyerman Landscaping for the 2008 season at a price per cut of $1400 for the entire Kenston campus, as well as the breakdown pricing for each individual building.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes

Motion carried.

2008-30 APPROVAL OF NOTICE TO PROCEED

Upon the recommendation of the Superintendent, a motion was made by Moreno, seconded by Hastings, to approve the following:

A notice to proceed, with the Renaissance Group, on the pre-design phase of the wind power project for an amount not to exceed $4000.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Timmons-Yes

Motion carried.

2008-31 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Hamilton, seconded by Hastings, to accept the following:

(2) Velbon 607 camera tripods to the KHS English Dept. from Andy Kenen.
TV with wall mount to the KHS English Department from Andy Kenen.
$150 to the KHS Science Olympiad Team from Marilyn Callaly.
$50 to the 7th grade camp trip from an anonymous donor.
$100 to the 7th grade camp trip from Mr. and Mrs. Jim Gray.
$30 to the 7th grade camp trip from Mr. and Mrs. Doug Heneghan.
$50 to the 7th grade camp trip from Mr. and Mrs. Ted Frank.
$20 to the 7th grade camp trip from Mr. and Mrs. Steve Goldsword.
$1675 for TES Student Programs, $1220 for TES Student Directories and $500 for skis from the TES PTO.
$100 donation from Tate Coverdale to the KMS 6th grade trip.
$50 donation from Patty and Chris Cook to the KMS 6th grade trip.
$468 donation from an anonymous donor to the KMS 6th grade trip.
$50 donation from Lauri Gross to the KMS 6th grade trip.
$50 donation from the Kusner Family to the KMS 6th grade trip.
$25 donation from Leigh Miller to the KMS 6th grade trip.
$25 donation from Julie Navid to the KMS 6th grade trip.
$1000 donation from Tammy and Jeff Fallon to the KMS 6th grade trip.
$50 donation from Pete and Beth Krause to the KMS 6th grade trip.
$10 donation from Dawn Andrews to the KMS 7th grade camp program.
$50 donation from Brian Landsman to the KMS 7th grade camp program.
$40 donation from S. Kwon Lee to the KMS 8th grade trip.
$100 donation from Dr. and Mrs. Scott Shell to the KMS 8th grade trip.
$500 donation from Mr. and Mrs. Kurt Epprecht to the KMS 8th grade trip.
$25 donation from Mr. and Mrs. Jeffrey Bush to the KMS 8th grade trip.
$12,500 from Auburn Twin Oaks to the GELC - LEAP Program.
$500 from the Auburn Bainbridge Joint Rec Board to the Kenston Community Stadium Fund.

E. APPROVAL OF CONTRACT - T. WOLFHOPE

Approve a contract with Tracy Wolfhope for tutoring services in the Wilson Reading Program at a cost not to exceed $800 for the 2007-2008 school year.

F. APPROVAL OF CONTRACT - LEAF

Approve a contract with LEAF (Lake Geauga Educational Assistance Foundation) to provide financial aid advisory services during the 2008-2009 school year at a cost of $3,150.

G. APPROVAL OF LETTER OF COMMITMENT

Approve a letter of commitment with The Cleveland Clinic One Community and LGCA to partner together to deliver health related media to grades K-12.

H. APPROVAL OF FACILITY AGREEMENT - AMERICAN RED CROSS

Approve a facility agreement with the Greater Cleveland Chapter of the American Red Cross for the use of school buildings in the Kenston School District by the American Red Cross in the event of an emergency.

I. APPROVAL OF CONTRACT - CAWRSE & ASSOCIATES, INC.

Approve a contract with Cawrse & Associates, Inc. to provide engineering and planning services to evaluate the paving at the Kenston Middle School and Kenston Intermediate School.

J. APPROVAL OF CONTRACT - RENAISSANCE GROUP

Approve a contract with the Renaissance Group to provide design services for the wind power project at a cost of $80,000.

K. APPROVAL TO ADVERTISE FOR BIDS

Approve the advertisement of bids for the summer 2008 paving project.

L. APPROVAL OF RESOLUTION

Approve a resolution to approve two State Waiver Days for the purpose of Professional Development on October 16, 2008 and February 17, 2009.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-39 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Randall, seconded by Hamilton, to accept the following:

1964 Kenstonian Yearbook from Paul Koballa to the Kenston Community Archives.

- Wind Power - Moving forward with soil borings and design services.
- Legislature passed Jarod's Law - Extensive list of Health Department requirements.

EXECUTIVE SESSION - PERSONNEL CONTRACT NEGOTIATIONS

At 7:45 P.M., a motion was made by Moreno, seconded by Hamilton, to recess into executive session for personnel contract negotiations.

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes, Hastings-abstained and immediately excused himself.
Motion carried.

At 9:18 p.m., the meeting resumed.

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

NEXT REGULAR MEETING

7:00 P.M. May 19, 2008
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 9:18 P.M., a motion was made by Moreno, seconded by Randall, to adjourn.

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

APPROVED: May 19, 2008

SIGNED William C. Timmons
President

ATTEST Linda M. Klein
Treasurer

N. APPROVAL TO ADVERTISE FOR BIDS - WIND POWER

Approve the advertisement of bids for the wind power project.

O. APPROVAL OF AGREEMENT - ODE DIRECT CERTIFICATION

Approve an agreement with the Ohio Department of Education, Office for Safety, Health and Nutrition to implement the direct certification process to certify students as eligible for free school meals under the Food Stamp Program.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-46 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Randall, seconded by Moreno, to accept the following:

Miscellaneous children's storybooks from Mr. and Mrs. Todd Walker to TES teacher, Mrs. Il'Giovine's classroom.
Miscellaneous weight room equipment to the KHS/KMS weight room from Mr. Phil Lowry.
$50 to the Kenston Community Stadium Fund from Dr. Robert A. Lee.
Holton trumpet to the KIS Music Department from Mr. Anthony Hall.
Pencils for testing for KIS from KIS PTO.
$1000 to the KIS Principal's fund, $600 towards the Grade 5 field trip from KIS PTO.
$5000 from the Musical Arts Association of Kenston to the Kenston Community Stadium Fund.
$5000 from Mr. and Mrs. Jim Althans to the Kenston Community Stadium Fund.
$205.75 from KHS Athletics to the Kenston Community Stadium Fund.
$1000 from the Corinne L. Dodero Trust for Arts & Sciences to Mrs. Cathy Zink's 4th grade classroom
Vegetables and dip from Sodexho Food Service to the KIS last day for Students party.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

First Reading - Textbooks/Materials

The Talent Show from the Black Lagoon, Mike Thaler (Grade 2 Challenge)
See You Later, Gladiator, Jon Scieszka (Grade 2 Challenge)
The Magic Finger, Roald Dahl (Grade 2 Challenge)
Skippyjon Jones, Judy Schachner (Grade 2 Challenge)

Workshop Statistics - Discovery with Data and the Graphing Calculator, Edition 3, Rossman, © 2008, Key College Publishing, (Statistics, KHS)

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:05 P.M.

Timmons Elementary School Multi-Purpose Room — May 19, 2008

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- Kaitlin Sirna, 19029 Ravenna Rd. - Football and Basketball Cheerleading Tryouts and Judging.
- Melissa Thomas, 8989 Old Meadow Dr. - Concern of public access to bus routes, web site and mailings.

TREASURER'S REPORT

- Thanks to Joan Redmond for years of service.
- Forecast will be on Web Site at ODE.

SUPERINTENDENT'S REPORT

- Review KEA agreement and settlement.
- Wind Power Project will be on TV tonight.
- Thanks to Joan Redmond for years of service.
- Auburn School - church is still there, childcare is still pending. New developments from fire department came in today. Another church is interested.

NEXT REGULAR MEETING:

7:00 p.m. June 16, 2008
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:15 P.M., a motion was made by Randall, seconded by Hamilton, to adjourn.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

APPROVED: June 16, 2008

SIGNED William C. Timmons
President

ATTEST Linda M. Klein
Treasurer

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:06 P.M.

Timmons Elementary School Multi-Purpose Room — June 16, 2008

TREASURER'S REPORT

- Special Thanks to all retirees.
- Levy Discussion. Thanks to all Principals, Maintenance and Transportation Departments for working on cost saving programs.
- Thanks to Mr. Hastings for work on the Finance Committee Levy Options.

SUPERINTENDENT'S REPORT

- Newbury Annexation - Newbury will not pursue.
- Wind Power
- Paving - Re Bid will push us into an August project.
- Insurance - Savings, Insurance 3% audit reduction.
- Commencement - Great Ceremony, Congratulations.
- Regarding sudden death of Tim Haas - Thanks to KHS Leadership for their counseling and support for the students. Thanks to Mrs. Santilli and her staff.
- Katie Poe and Jack DiCello, new principals at TES and KIS.
- Tim Barrett - Best Wishes, Thanks for years of service at Kenston.

NEXT REGULAR MEETING

7:00 P.M. July 14, 2008
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:25 P.M., a motion was made by Randall, seconded by Hamilton, to adjourn.

APPROVED: July 14, 2008

SIGNED William C. Simmons
President

ATTEST Janet L. Lee
Treasurer

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:09 P.M.

Timmons Elementary School Multi-Purpose Room — July 14, 2008

A. FINANCIAL REPORTS

Approve the financial reports for the month of June 2008 along with warrant nos. 81136 through 81464 in the amount of $3,020,102.74.

B. NEW FUND APPROVAL

Approve the following new fund:

004-9008	$50,000	Cleveland Foundation Wind Energy Installation Project Grant

C. TRANSFERS

Approve the following transfers from general fund:

$20,000	to EMIS
$18,385	to KMS Athletics
$36,500	to Boys Athletics
$41,700	to Girls Athletics

D. AMEND TEMPORARY APPROPRIATION RESOLUTION 2008-2009

Approve the amended temporary appropriation resolution for 2008-2009.

ALL FUNDS TYPES

Kenston Local Schools
Governmental Fund Types

Fund Class/Name	Fund Number/SCC	2008-2009 Temporary Total Appropriation
General Fund	001	34,838,000.00
Special Revenue Class		
	018 Stadium	1,000,000.00
Prin Fund/Camp/Washington	018	350,000.00
Athletic Activities	300	850,000.00
Auxiliary Fund*	401	25,000.00
Teacher Development	416	25,000.00
Lottery	422	0.00
M.I.S.	432	50,000.00
Entry Year	440	0.00
OneNet	451	65,000.00
School Net Prof. Dev	452	15,000.00
State Instr. Materials	455	0.00
IVDL	458	35,000.00
OHIO READS	459	35,000.00
Summer School Subsidy	460	75,000.00
Core	499	5,000.00
Title II	514	16,000.00
Title VI-B	516	655,000.00
Chapter I	572	320,000.00

H. APPROVAL OF COURSE OF STUDY

Approve the following courses of study for the 2008-2009 school year:

K-5 Language Arts Course of Study
K-12 Math Course of Study

I. APPROVAL OF PURCHASE

Approve the purchase of an 84-passenger transit type bus in the amount of $78,800 and a 77-passenger conventional type bus for $80,900 from Power City International.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes

2008-65 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Hamilton, seconded by Hastings, to approve the following:

$5000 from Mrs. Betty Clemens to the Kenston Community Stadium Fund.
$150 United Way from Jeff & Lisa Manis to Kenston Local Schools.
600 various trade books from Sunny Doxey to TES 1st grade classrooms.
1,137 personal storybook/word books from Gail Petruzzi to TES 2nd grade classrooms.
$4000 from the Wachovia Foundation to the Kenston Community Stadium Fund.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

First Reading - Textbooks/Materials

English, Grades 1-5, Houghton Mifflin © 2006
Spelling & Vocabulary, Grades 3-5, Houghton Mifflin © 2006

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- None

TREASURER'S REPORT

- None
-

SUPERINTENDENT'S REPORT

- Linda Hein's medical status
- Wind Power Project update
- Paving Bids
- Chinese Language Program

2008-78 DONATIONS

Upon the recommendation of the Superintendent, a motion was made by Randall, seconded by Moreno, to approve the following:

$150 to Kenston Schools from Jeff and Lisa Manis.
$1000 from the McGinty Family Foundation to KHS Science Olympiad.
$400 from the KHS Boys LaCrosse Team to the KHS Community Stadium Fund.
$4,500 from Auburn Bainbridge Rec Board to the KHS Community Stadium Fund.
$5000 from the Kenston Futbol Club to the KHS Community Stadium Fund.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- None

TREASURER'S REPORT

- Auditors are here for the 2007-08 school year audit.

SUPERINTENDENT'S REPORT

- Wind Project - John May will review special documents.
- Paving is complete.
- Chip and Seal - base planned for behind the bus garage to re-route the traffic to Timmons.
- Wednesday is First Faculty Day, ½ day. Thursday is full day and Friday is a full day. Monday - First Student Day.
- AYP - As of last week we were not meeting this goal. As of 8/18/08 AYP is met on our report card.
- Scott Teaman introduced his new boss, Chris Garbin, from Sodexho Food Service.

NEXT REGULAR MEETING

7:00 p.m. September 15, 2008
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:00 P.M., a motion was made by Randall, seconded by Hamilton, to adjourn.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes
Motion carried.

(2) song digital recorders and extended warranties from Andy Kenon to the KHS English Department.
1994 Volleyball Program and 1994 Volleyball Fan from Bob Hamilton to the Kenston Community Relations Archives.
$200 from John Althans to the KHS Stadium Project.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

HEARING OF PUBLIC ON NON-AGENDA ITEMS

- None

TREASURER'S REPORT

- Preparing forecast for October Adoption.

SUPERINTENDENT'S REPORT

- Wind Turbine = Bid ad in today's paper.

NEXT REGULAR MEETING

7:00 p.m. October 20, 2008
Location: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 8:37 P.M., a motion was made by Hamilton, seconded by Randall, to adjourn.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

APPROVED: October 20, 2008

SIGNED William C. Timmons
President

ATTEST Linda M. Klein
Treasurer

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — SPECIAL Meeting

5:45 P.M.

Kenston High School, Auburn-Bainbridge Room — October 16, 2008

The meeting was called to order by President Timmons.

The following members answered roll call: Joan Hamilton, Ralph Hastings, Jerry Moreno, Anne Randall, Bill Timmons.

2008-86 NEW BUSINESS

Upon the recommendation of the Superintendent, a motion was made by Hastings, seconded by Moreno, to approve the following:

REJECTION OF BIDS – WIND POWER

Reject the bids for the 2008 wind power project.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-87 BIDS FOR WIND POWER

Upon the recommendation of the Superintendent, a motion was made by Hamilton, seconded by Hastings, to approve the following:

APPROVAL TO ADVERTISE FOR BIDS – WIND POWER

Approve the advertisement of bids for the 2008 wind power project.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

ADJOURNMENT

At 6:00 P.M., a motion was made by Moreno, seconded by Hastings, to adjourn.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

APPROVED: November 17, 2008

SIGNED William C. Timmons
President

ATTEST Linda M. Hess
Treasurer

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:05 P.M.

Timmons Elementary School Multi-Purpose Room — November 17, 2008

SUPERINTENDENT'S REPORT

- Wind Power Bid was opened Thursday, November 14th.
- Parker Hannifin - A taller tower could give us a 20-30% increase in power. Will need additional funds for a taller tower. We will explore more funding options.
- Program on Drug and Alcohol Issues was held on November 14th.
- Donations for the Stadium Fund - The committee will follow up with Auburn and Bainbridge Trustees.
- KHS auxiliary gym was a polling site for the recent election. Good process for high school students with the November election.
- New President and new State Superintendent, Dr. Deb Delisle. Discussed how the schools will be affected. Hopeful for things to get better.
- Recycling - Check with Tim Stearns about recycling at each building. Potential savings is a free dumpster per building.
- KHS Play is Friday, Saturday, Sunday "Murder at Coppersmith Inn".
- Paul O'Conner from Kenston Citizens Advisory Committee.

2008-102A SPECIAL MEETING

Upon the recommendation of the Superintendent, a motion was made by Randall, seconded by Hastings, to approve the following:

December 15, 2008 at 6:00 P.M.

Regular Meeting at 7:00 P.M.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-102B JANUARY 2009 ORGANIZATIONAL MEETING AND REGULAR MEETING

Upon the recommendation of the Superintendent, a motion was made by Moreno, seconded by Randall, to approve the following:

January 12, 2009 at 6:30 P.M.

Regular Meeting at 7:00 P.M.

ROLL CALL: Hamilton-Yes, Hastings-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

NEXT REGULAR MEETING:

December 15, 2008
6:00 p.m. Special Meeting
7:00 p.m. Regular Meeting
Location: Timmons Elementary School Multipurpose Room

TES
HP monitor, tag #2036**
NEC monitor, tag #13483**
AOC monitor, tag #11086**

**Not for bid*

B. APPROVAL OF CALENDAR REVISION

Approve the calendar revision to the 2009-2010 school calendar.

C. FIELD SERVICE AGREEMENT - THE UNIVERSITY OF AKRON

Approve a field service agreement with The University of Akron to provide assistance in placing University of Akron student teacher candidates in the Kenston Schools for field and student teaching experiences.

D. APPROVAL TO ADVERTISE FOR BIDS - WIND POWER

Approve the advertisement of bids for the electrical interconnection, foundation and crane erection services for the 2008 wind power project.

E. APPROVAL OF AGREEMENT - WINDSTREAM

Approve an agreement for communication services with Windstream Western Reserve, Inc. beginning July 1, 2009 through June 30, 2012.

F. ELIMINATION OF BUS RUN - PRIVATE SCHOOL

Approve the elimination of the private school morning bus runs to Gilmour, Hawken and University Schools effective January 1, 2009

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-109 APPOINT PRESIDENT PRO TEM FOR JANUARY, 2009 ORGANIZATIONAL MEETING.

Upon the recommendation of the Superintendent, a motion was made by Hamilton, seconded by Randall, to approve the following:

Approve Bill Timmons as the Kenston Board of Education President Pro Tem for the January, 2009 Organizational Meeting.

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes
Motion carried.

2008-110 APPROVAL TO APPOINT AUBURN CAREER CENTER BOARD REPRESENTATIVE

Upon the recommendation of the Superintendent, a motion was made by Timmons, seconded by Moreno, to approve the following:

RECORD OF PROCEEDINGS

Minutes of KENSTON BOARD OF EDUCATION — REGULAR Meeting

7:10 P.M.

Timmons Elementary School Multi-Purpose Room — December 15, 2008

TREASURER'S REPORT

- Tech Garage Sale - Approximately $600. Thanks to Tom Manning and Staff.
- Financial Report Update.

SUPERINTENDENT'S REPORT

- Garage Sale - Obsolete Equipment.
- Wind Project Update.
- School Funding - Kenston Citizen Advisory Committee member, Dennis Lehman, participated in a regional meeting with the governor last week. Concerns about the withdrawal of the Personal Property Tax reimbursement. The loss is equivalent to around 4 mills for Kenston.
- Congress bail out - might be for school construction.
  Happy Holiday Season.

NEXT REGULAR MEETING

ORGANIZATIONAL MEETING: 6:30 p.m. January 12, 2009
NEXT REGULAR MEETING: 7:00 p.m. January 12, 2009

LOCATION: Timmons Elementary School Multipurpose Room

ADJOURNMENT

At 7:55 P.M., a motion was made by Timmons, seconded by Hamilton, to adjourn.

ROLL CALL: Hamilton-Yes, Moreno-Yes, Randall-Yes, Timmons-Yes

Motion carried.

APPROVED: January 12, 2009

SIGNED William C. Timmons
President

ATTEST Linda M. Klein
Treasurer

Superintendent and Treasurer are Council members and, through this Council, maintain school-business communications. The Superintendent is an elected Board of Directors member of the Chagrin Valley Chamber of Commerce. In addition, the trustees of both Auburn and Bainbridge townships are regular participants in the School District's Business Advisory Council.

In 2007, the Board of Education organized the Kenston Citizens Advisory Committee (KCAC) whose overall purpose is to serve as a conduit between the Kenston Board of Education and the Kenston community by communicating, researching and providing education on strategic matters.

The composition of KCAC is nine community members, the School District Treasurer, Superintendent and one Board of Education member. Community members serve for three years (initially, three members for one year, three for two years, and three for three years in order to create staggered terms).

While the School District is primarily residential in nature, there are several areas of commercial and industrial development. The commercial development exists primarily to serve the residents of the area. The industrial development is light manufacturing, but also has a commercial development called Marketplace at Four Corners.

In fiscal year 2008, Geauga Lake Amusement Park announced its decision to close. This amusement park has been one of our community's major individual taxpayers. The impact of the lost personal property taxes has been offset by the state reimbursement with the Commercial Activity Tax revenue. The state reimbursement of $3,235,990 will be phased out by 2018.

The School District is a member of the Alliance for Adequate School Funding. This organization represents high property value/low state aid school districts at the state legislature level. The organization has successfully protected the financial interest of its member districts from major reductions in state support.

House Bill No. 66 (HB66), the State's biennial budget for fiscal years 2006 and 2007 was enacted in June 2005. This legislation adopted sweeping changes in the State's tax structure. The most significant provisions impacting the School District are the elimination of the Cost of Doing Business (CODB) factor portion of the State Formula Aid calculation and the elimination of the tangible personal property tax on business.

Major Initiatives

During the summer of 2008, our major capital project was a continuation of paving replacement/repair. These projects included the TES driveway areas, KIS/KMS parking lot and school bus parking areas.

Future Projects

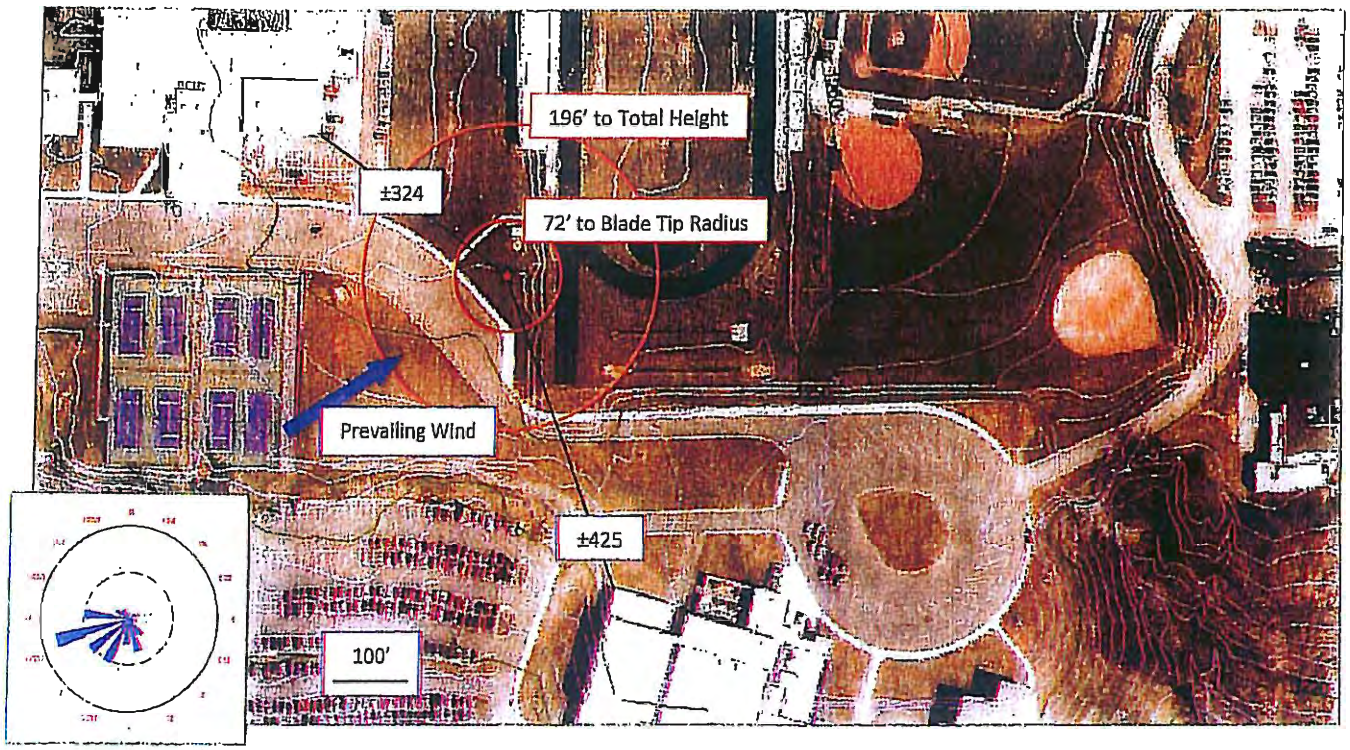
For over two years, the School District has been seeking funding for a wind power project. To date, the School District has received a State grant for $295,000, the Cleveland Foundation has provided $50,000 and the Kenston Board Fund has provided $250,000 towards this project. Also pending is a grant from the Ohio Department of Development for $460,000. In the fall, bids were advertised for a 600 kW turbine and tower. The contract is currently being prepared for Board approval. This project is expected to be in the $800,000 to $1,000,000 range. A 600 kW turbine is projected to produce $110,000 - $130,000 in electric utility cost savings per year. The project is estimated to be completed in the spring of 2010.

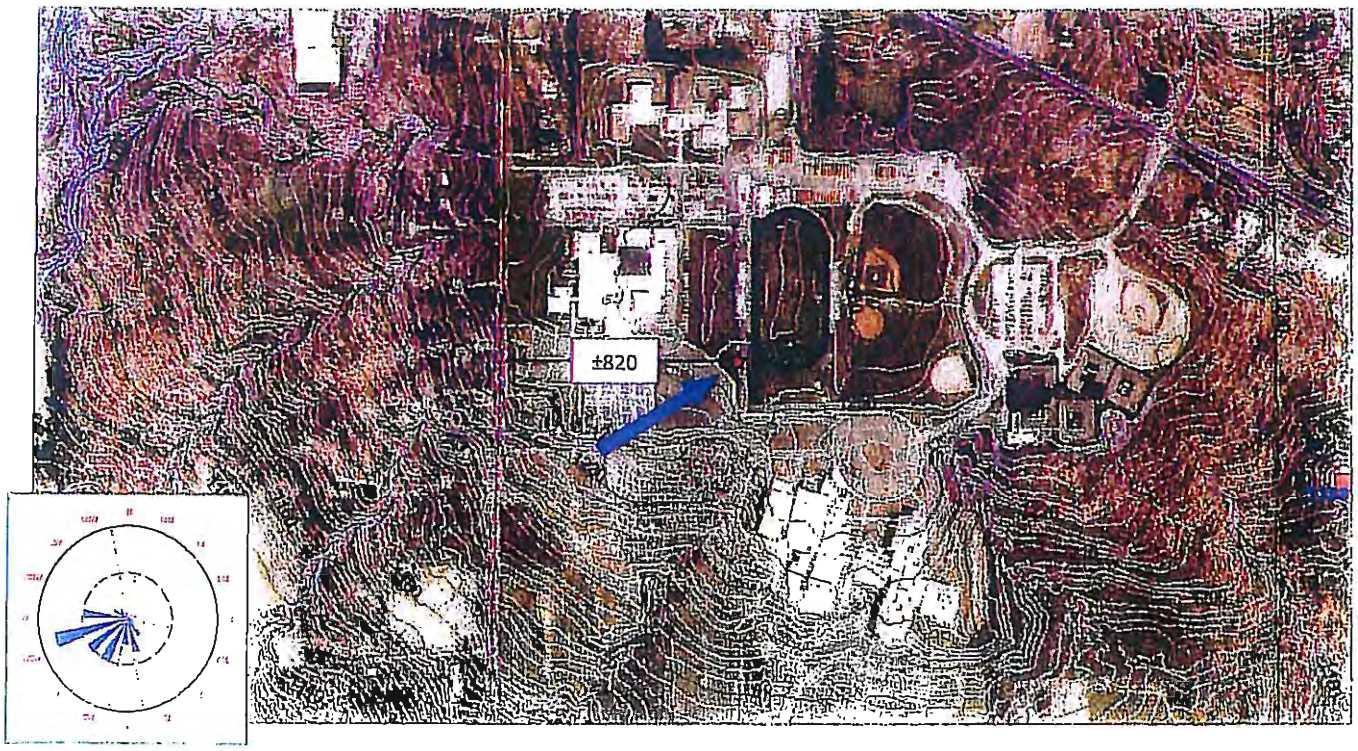
Another project in the revenue development phase is the renovation of the School District's stadium. A group of citizens initiated the idea to fund a $2.4 million renovation through private and corporate contributions. The renovation plans include an all-weather playing field, light replacement, and stadium seating replacement. The project was endorsed by the Kenston Board of Education at its July 2007 meeting. The citizen group's goal is

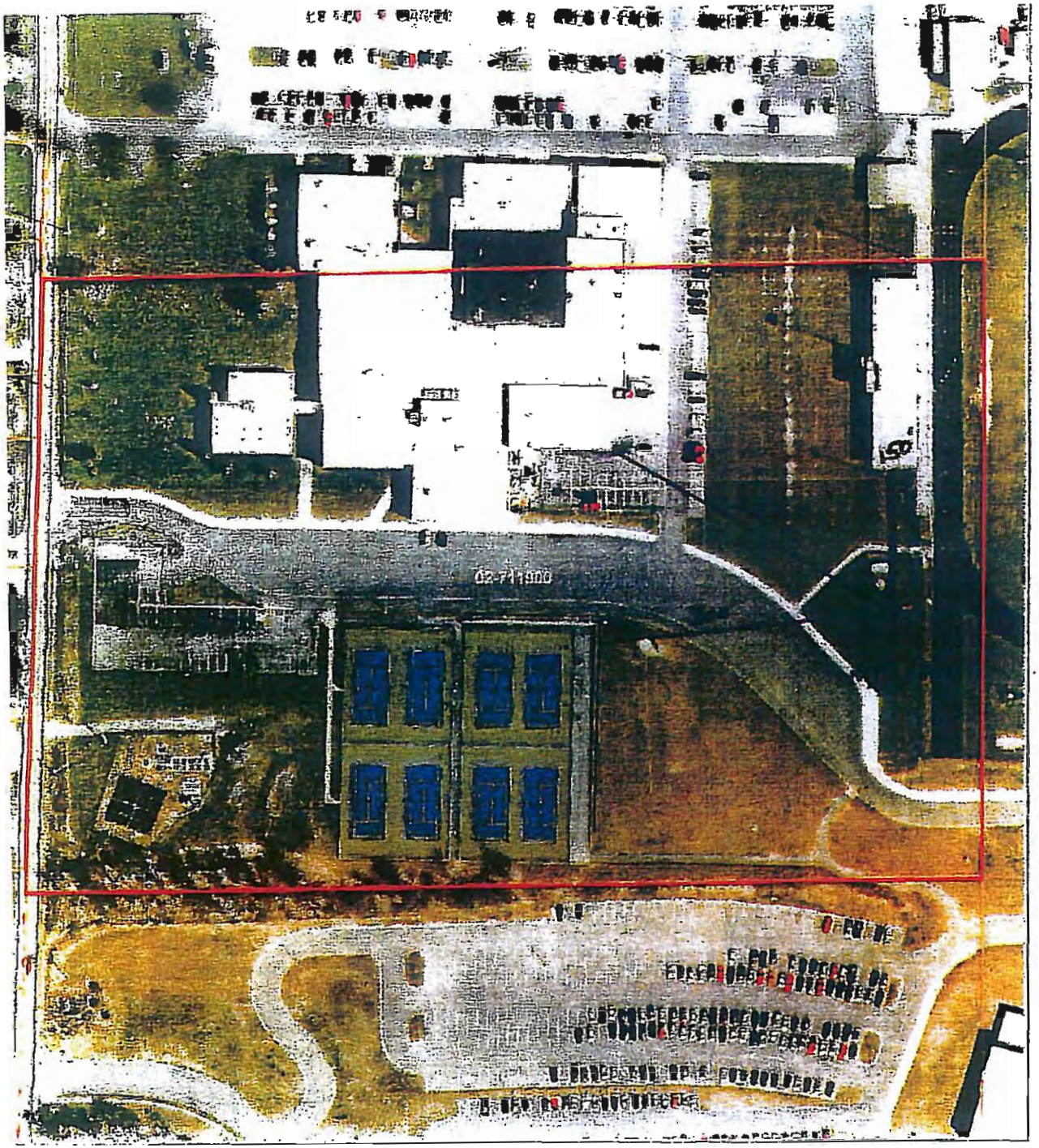
KENSTON SCHOOLS

Project Description
Exhibit 4

Kenston Turbine Proposed Location







Parcel #: 02-711900 Routing #: 02--13-05-00-096-00

Tax District: BAINBRIDGE TWP-KENSTON LSD

Location Add: 17425 SNYDER RD

Owner: KENSTON BOARD OF EDUCATION

Owner Address: 17419 SNYDER RD
CHAGRIN FALLS OH 44022

Mail Name: KENSTON BOARD OF
EDUCATION

Mailing Address: 17419 SNYDER RD
CHAGRIN FALLS OH 44022

Deed Volume/Page: 0272/0058 Class: 650

Sub/Lot/Sect/Tr: SNYDER ROAD SCHOOL

Acreage: 14.00

VALUATION	Tax Year:	2009
	Market	Taxable
Land	$98,000	$34,300
Improvement	$11,330,200	$3,965,570
Total	$11,428,200	$3,999,870
CAUV	$0	$0

Sale Value: $0 Sale Date: 03-15-2000

Yr Blt/Remodel:

Total Living Area: 0 Grade:

N

Frank J. Gliha - County Auditor

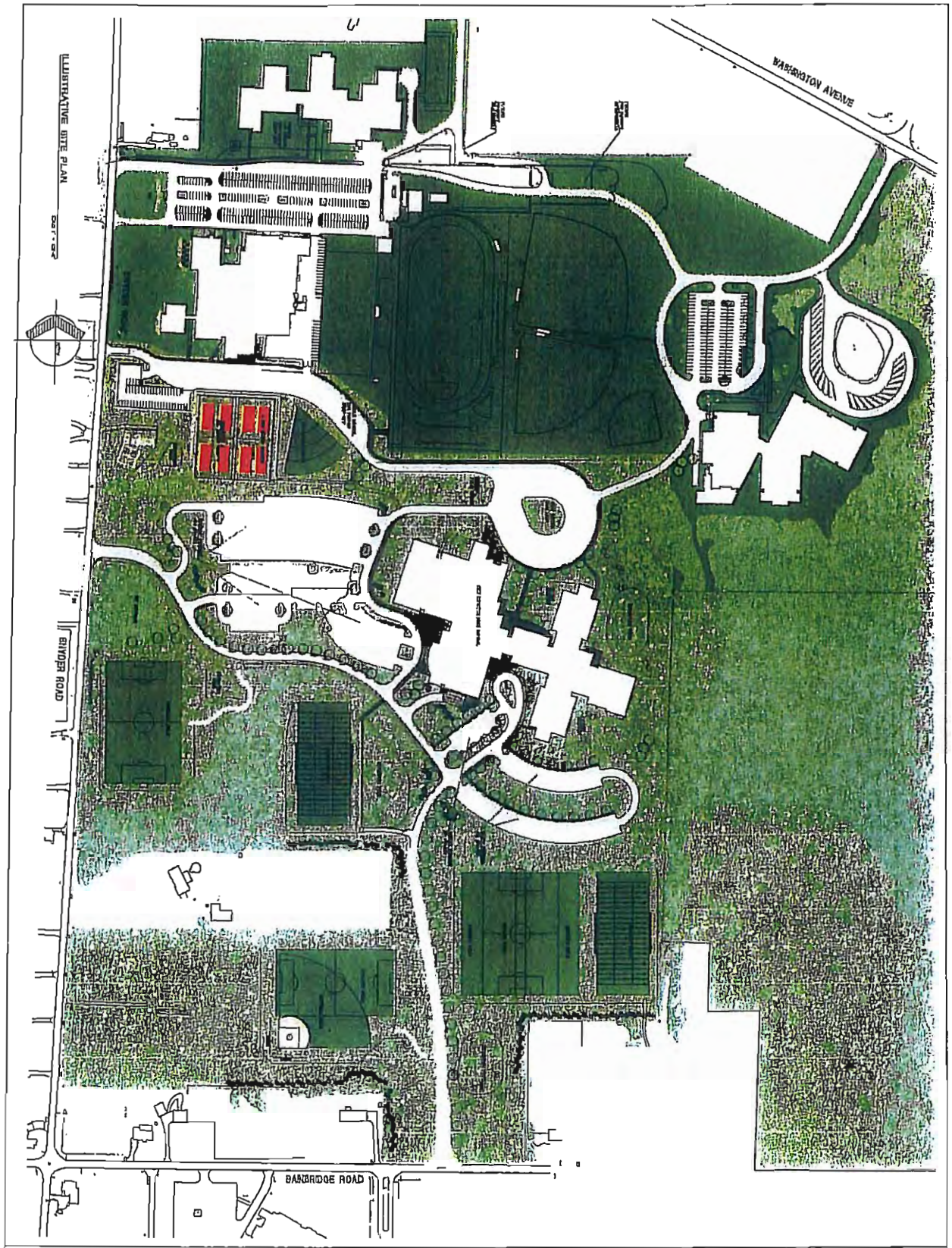
"Inter-agency coordination benefiting the citizens of Geauga County"

Robert L. Phillips, P.E., P.S.
County Engineer

Scale 1:1825

This map was prepared as a Tax Map for Geauga County by the Geauga County Engineer in accordance with Section 5713.09 of the O.R.C. Geauga County digital data is a representation of recorded plats, surveys, deeds, and other collected information for use within the Geographic Information System for purposes of public access and analysis. These and other digital data do not replace or modify land surveys, deeds, and/or other legal instruments defining land ownership or use. Geauga County assumes no legal responsibility for this information and users should contact the GIS or Tax Map Departments with questions or concerns.

http://www.auditor.co.geauga.oh.us/gp/ February 5, 2010



ILLUSTRATIVE MASTER PLAN

G1.0

Fanning/Howey Associates, Inc.
Architects Engineers Consultants

NEW HIGH SCHOOL

KENSTON LOCAL SCHOOLS
BAINBRIDGE TOWNSHIP, OHIO

Kenston Schools Wind Turbine Site

★ 41° 23' 39.612" N, 81° 18' 17.998" W, 1254.9' Elevation

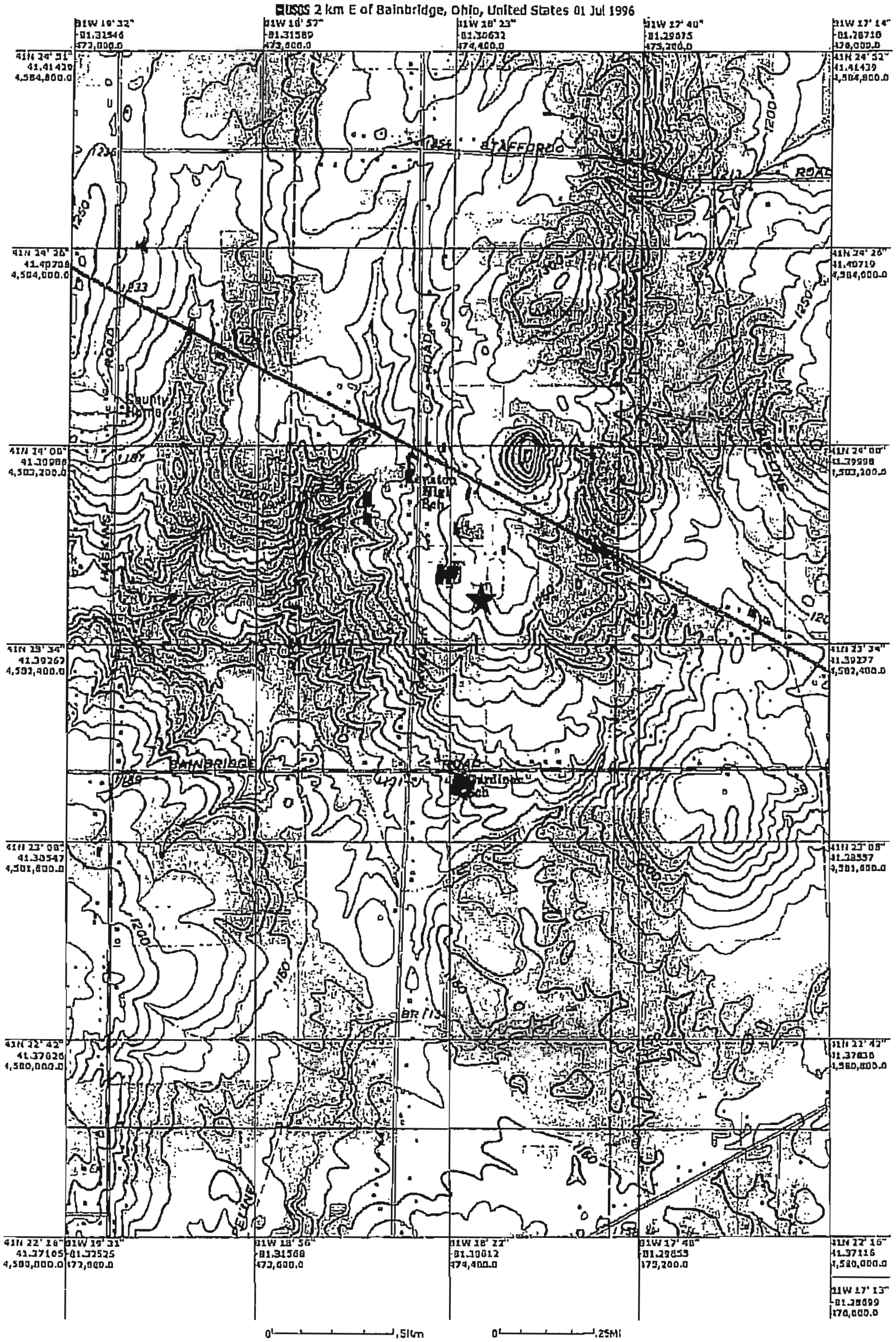
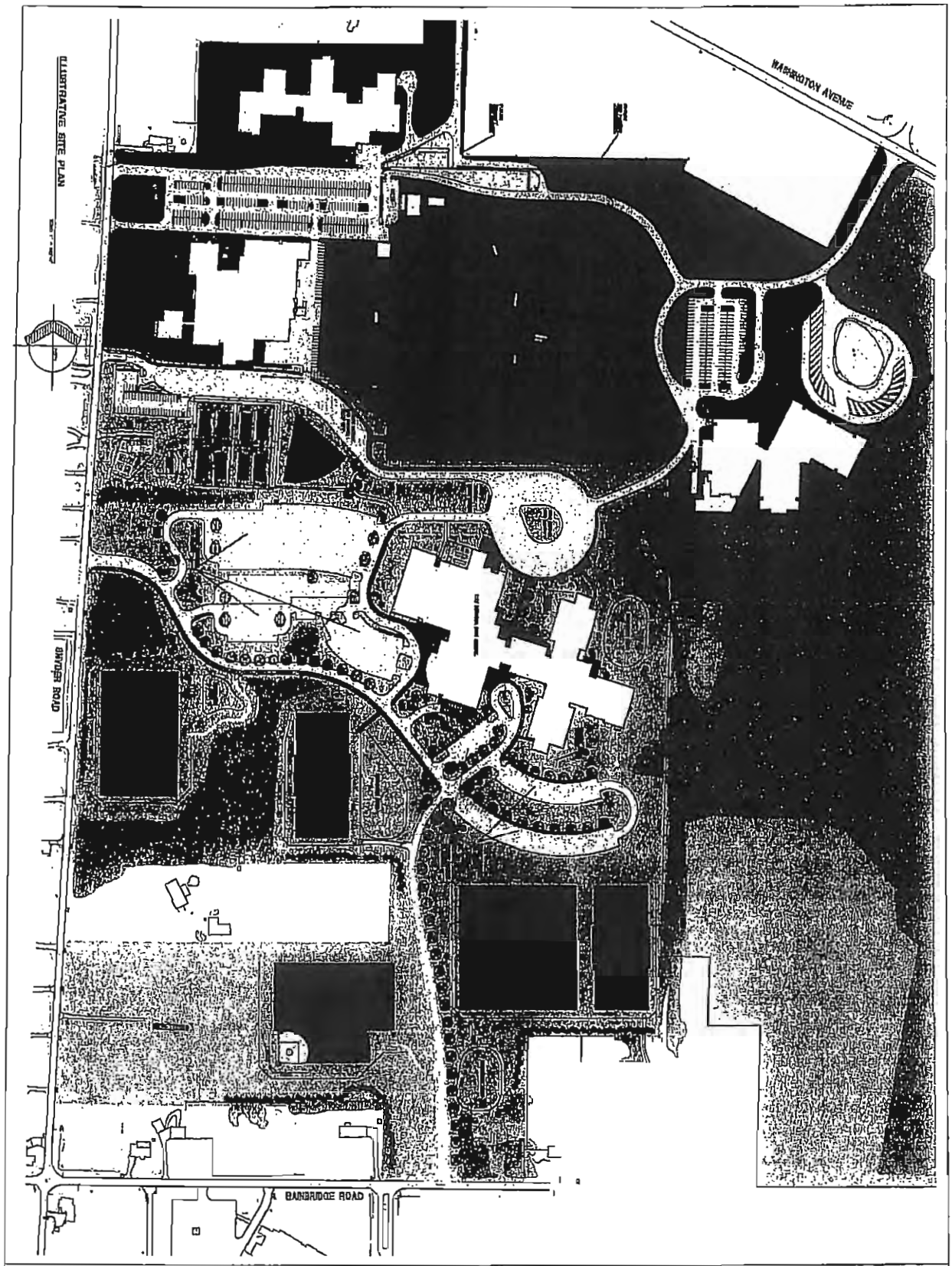


Image courtesy of the U.S. Geological Survey



ILLUSTRATIVE MASTER PLAN

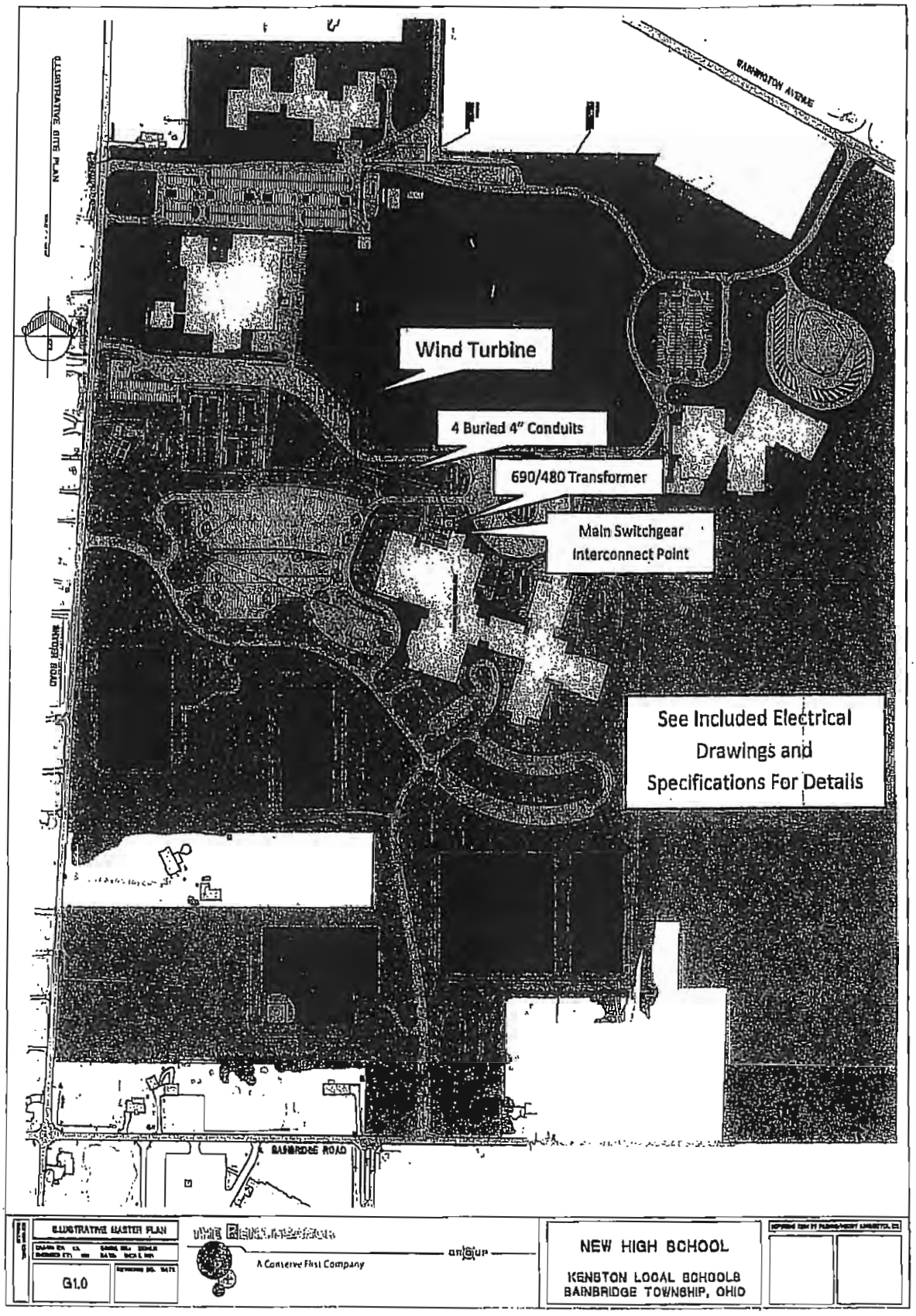
G1.0

Fanning/Howey Associates, Inc.
Architects Engineers Consultants

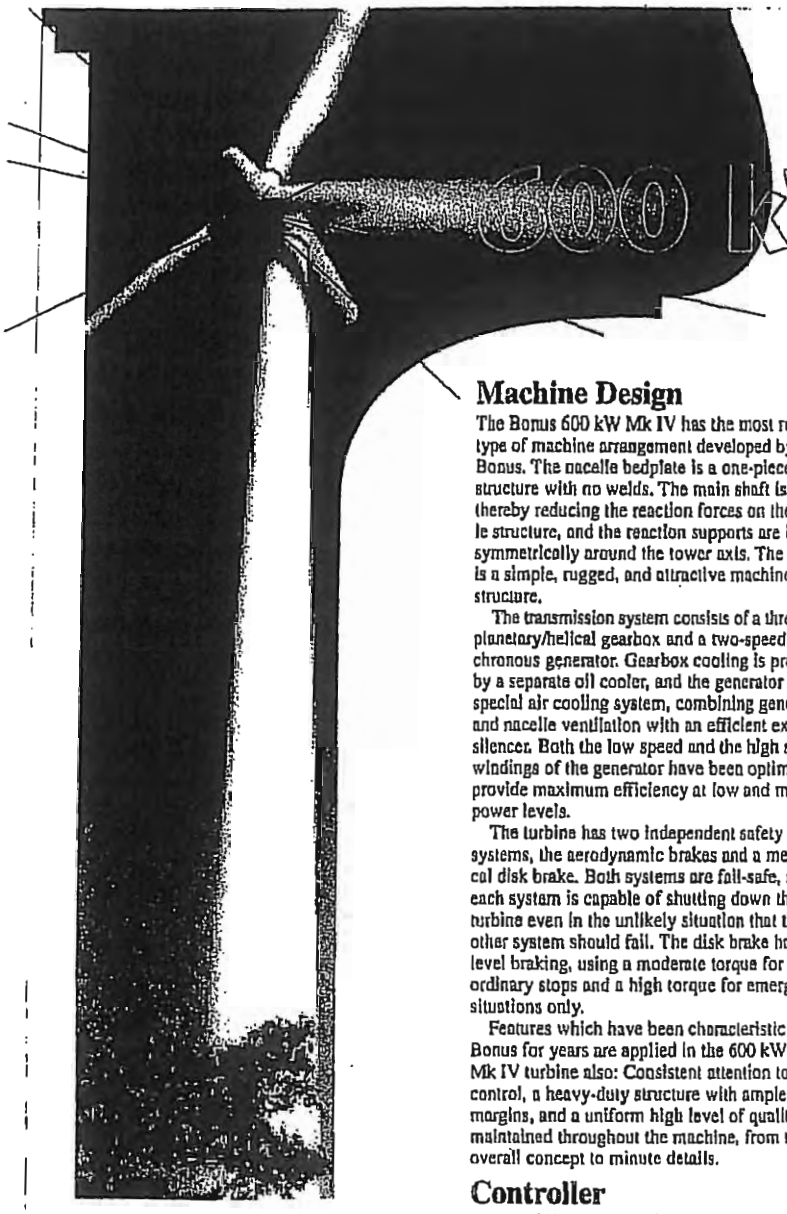
NEW HIGH SCHOOL

KENSTON LOCAL SCHOOLS
BAINBRIDGE TOWNSHIP, OHIO

Kenston Schools Turbine Plan with Turbine and Interconnect Placement
17419 Snyder Road, Chagrin Fall, Ohio 44023



The Renaissance Group, Installer/Project Manager 440-256-2800



600 kW Mk IV

The Bonus 600 kW Mk IV wind turbine is the most recent model in the well-known 600 kW series from Bonus. In the Mk IV version, the nacelle and shaft arrangements have been adapted to the concept, developed for the Bonus 1 MW turbine. The rotor and generator systems are similar to the systems of the earlier Mk III version, thereby providing the same high performance.

Rotor

Like all other turbines from Bonus, the 600 kW Mk IV is a three-bladed, stall regulated machine. This concept is simple, reliable and efficient, and the application of recent, aerodynamic advances offers an attractive combination of low noise and high output.

The blade tips act as aerodynamic brakes and are turned perpendicular to the direction of rotation if the turbine must be switched off.
The blade tips are fitted with lightning protection, substantially reducing the risk of damage in case of a direct hit.

Machine Design

The Bonus 600 kW Mk IV has the most recent type of machine arrangement developed by Bonus. The nacelle bedplate is a one-piece steel structure with no welds. The main shaft is long, thereby reducing the reaction forces on the nacelle structure, and the reaction supports are located symmetrically around the tower axis. The result is a simple, rugged, and attractive machine structure.

The transmission system consists of a three-stage planetary/helical gearbox and a two-speed, asynchronous generator. Gearbox cooling is provided by a separate oil cooler, and the generator has a special air cooling system, combining generator and nacelle ventilation with an efficient exhaust silencer. Both the low speed and the high speed windings of the generator have been optimized to provide maximum efficiency at low and medium power levels.

The turbine has two independent safety systems, the aerodynamic brakes and a mechanical disk brake. Both systems are fail-safe, and each system is capable of shutting down the turbine even in the unlikely situation that the other system should fail. The disk brake has two-level braking, using a moderate torque for ordinary stops and a high torque for emergency situations only.

Features which have been characteristic for Bonus for years are applied in the 600 kW Mk IV turbine also: Consistent attention to noise control, a heavy-duty structure with ample design margins, and a uniform high level of quality maintained throughout the machine, from the overall concept to minute details.

Controller

The 600 kW Mk IV turbine has a microprocessor control with liquid crystal display and a portable hand terminal. All controller activities for operation, service and statistics are provided both at the tower base and in the nacelle.

Optional remote monitoring is Windows-based and offers operational status, statistics and changes of operating parameters from the owner's facilities.

Tower

The 600 kW Mk IV turbine is mounted on a tubular steel tower. Internal tower platforms are spaced sufficiently close to allow ascent without additional safety harness (under typical European safety regulations).

Rotor

Rotor diameter	44 m
Swept area	1520 m²
Rotor speed	18/27 rpm
Power regulation	Stall
Blade length	19 m
Blade type	LM 19.1

Generator

Type	Asynchronous
Nominal power	120/600 kW
Speed	1000/1500 rpm
Voltage	690 V
Protection	IP 54
Supplier	ABB

Transmission

Gearbox type	Planetary/helical
Gearbox supplier	Flender

Brake Systems

Air brakes	Pivoting tips
Mechanical brake	Dual disk brake
Activation	Fail-safe (both)

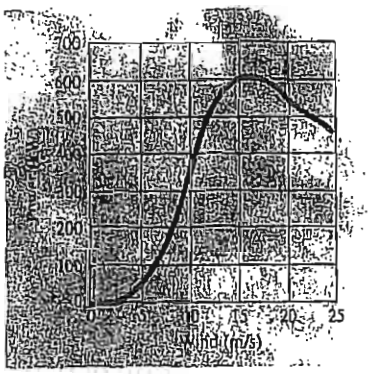
Tower

Type	Conical, tubular
Hub Heights	35 - 60 m
Corrosion protection	Painted

Noise

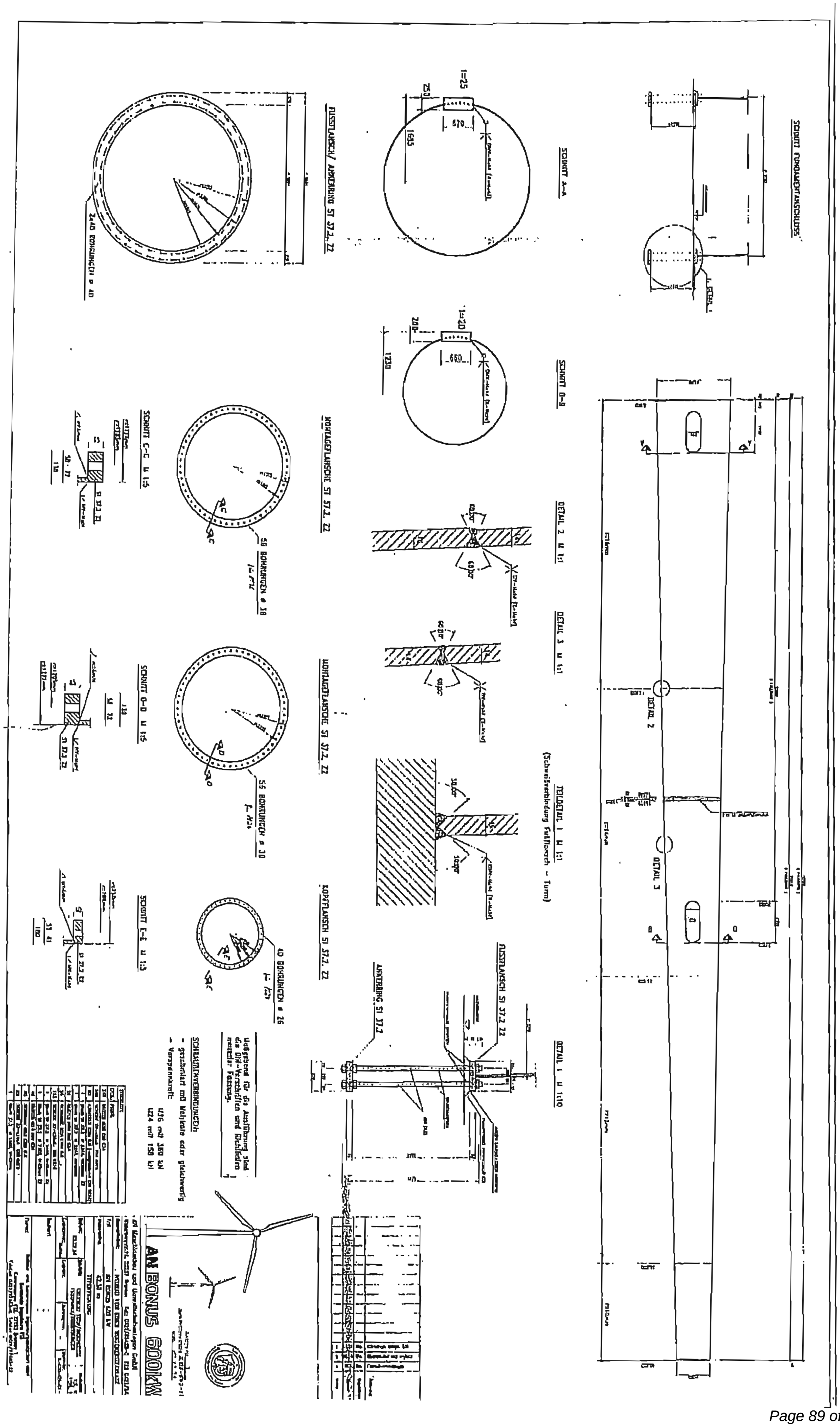
Noise level (8 m/s, 10 m)	<100 dB
Tonal penalty	None (Joint Nordic Method)

Power Curve



BONUS® Energy A/S

Fabriksvej 4 · Box 170
7330 Brande
Tlf. 99 42 22 22
Fax 97 18 30 86
e-mail: bonus@bonus.dk


AN BONUS 600KW
SCHNITT FUNDAMENTANSCHLUSS
SCHNITT A-A
SCHNITT B-B
DETAIL 2 M 1:1
DETAIL 3 M 1:1
TEILDETAIL 1 M 1:1
(Schweißverbindung Fußflansch – Turm)
FUSSFLANSCH/ ANKERRING ST 37.2. Z2
MONTAGEFLANSCHE ST 37.2. Z2
KOPFFLANSCH ST 37.2. Z2
SCHNITT C-C M 1:5
SCHNITT D-D M 1:5
SCHNITT E-E M 1:5
56 BOHRUNGEN ø 38
56 BOHRUNGEN ø 30
40 BOHRUNGEN ø 26
DETAIL 1 M 1:10
DETAIL 2
DETAIL 3
ANKERRING ST 37.2
FUSSFLANSCH ST 37.2 Z2

CONFIDENTIAL

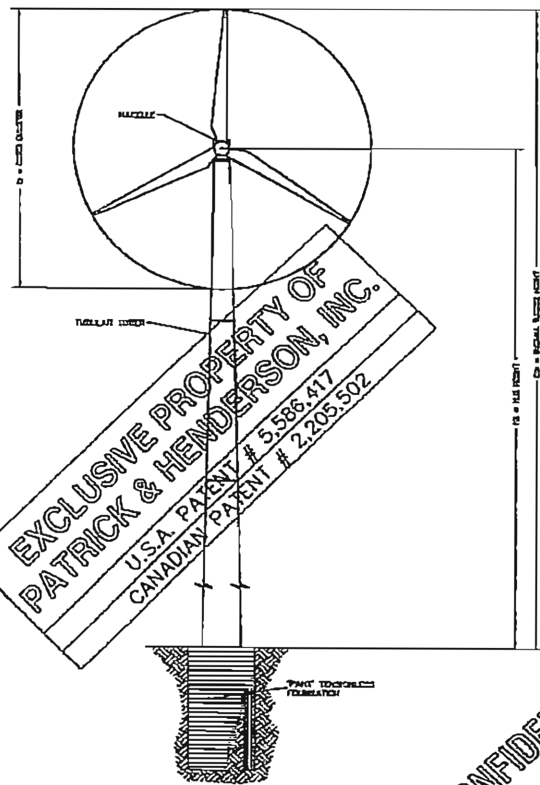
*FOUNDATION DEPTH BASED ON SOIL CONDITIONS PROVIDED ARE SUBJECT TO REVIEW AND MODIFICATION OF DEPTH ON SITE OR IF ADDITIONAL SOIL INFORMATION IS PROVIDED

NOTES:
1. TURBINES SHALL NOT BE CONSTRUCTED IN DEPRESSIONS OR NATURAL STORM RUNOFF CHANNELS.
2. OFF TURBINE PAD STORM RUNOFF WATERS SHALL BE DIRECTED AWAY FROM THE TURBINE PAD.
3. ELECTRICAL TRENCHES SHALL NOT CHANNEL OR PIPE STORM RUNOFF WATERS TO TRANSFORMER OR TURBINE FOUNDATIONS.
4. SEAL TOP OF PVC TUBES AROUND ANCHOR BOLTS WITH SILICON CAULKING OR SILICON TAPE TO PREVENT WATER FROM ENTERING PVC TUBES AFTER TEMPLATE IS REMOVED FROM ATOP FOUNDATION.
5. THE QA/QC SPECIAL INSPECTOR SHALL VERIFY IN WRITING ON THE FOUNDATION CHECKLIST SOILS ENCOUNTERED IN THE FOUNDATION EXCAVATION AND PHOTOGRAPH. CHANGED SOIL CONDITIONS SHALL BE IMMEDIATELY BROUGHT TO THE ENGINEERS ATTENTION FOR RE-ANALYSIS.
6. GEOTECHNICAL INFORMATION FOR FOUNDATION DESIGN PRESENTED IN:
SUBSURFACE EXPLORATION
KENSTON LOCAL SCHOOL DISTRICT
WIND TURBINE FOUNDATION
CHAGRIN FALLS, OHIO
DATED: MAY 14, 2008
BY: EDP CONSULTANTS, INC.
PROJECT NO. 080290

"PAHT" 25 FT FOUNDATION CHART
ONE TURBINE PROJECT

TURBINE ADDRESS:
KENSTON LOCAL SCHOOLS CHAGRIN FALLS CAMPUS
BAINBRIDGE TOWNSHIP, OHIO

NOTE:
FINAL FOUNDATION SIZE SUBJECT TO VERIFICATION OF SOIL / ROCK CONDITIONS EXPOSED BY FOUNDATION EXCAVATION



'PAHT' FOUNDATION FOR WIND TURBINE

SCALE: NONE

AN-BONUS 600 KW 44M ROTOR
WIND TURBINE GENERATOR
ON A
42.3 METER HUB HEIGHT TOWER

ISSUED FOR CONSTRUCTION 09/24/09
25' FOUNDATION
17' SOIL OVER ROCK

CONFIDENTIAL

NOMINAL DIMENSIONS			
"MARK"	VALUE (M)	VALUE (FT)	DESCRIPTION
Hh	42.3	139	HUB HEIGHT
Dr	44	144	DIAMETER OF ROTOR
Oth	64.3	211	OVERALL TURBINE HEIGHT

NOTE:
FLANGE DIMENSIONS PER AN-BONUS 600 KW
TYPE: AN-BONUS 600 KW 42.30 H
DRAWING NO.: D-500-00-01-002
DATED: 05-09-04

DESIGN CRITERIA
WIND
[illegible]

NOTE:
FLANGE DIMENSIONS PER AN BONUS 600 KW
STATIC CALCULATIONS
TYPE: AN-BONUS 600KW/41 and 44 (42.30m)
LOCATION: WINDZONE III, V = 40.3 m/s
ORDER NO.: 780-97
BY: PROF. DELLNER INGENIEURGRUPPE
1. REVISION / SUPPLEMENT OF TYPE CALCULATION
DATE: N/A

NOTE:
WIND LOADS ARE GREATER THAN SEISMIC LOADS AS DETERMINED BY THE 2006 INTERNATIONAL BUILDING CODE.

THIS FOUNDATION WAS DESIGNED FROM EXTREME AND MAXIMUM OPERATION WIND LOADS AND FREQUENCIES AT THE BOTTOM OF THE TOWER PROVIDED BY THE TURBINE AND TOWER MANUFACTURER.
ROTATIONAL STIFFNESS = 77 GN-M/RAD MINIMUM

CONFIDENTIALITY STATEMENT

RESPONSIBILITY STATEMENT

DRAWING INDEX		
FOUNDATION DEPTH-SHEET NUMBER	DRAWING TITLE	REVISION #
S-1	TITLE SHEET & DRAWING INDEX	0
S-2	ASSEMBLY VIEW	0
S-3	FOUNDATION PLAN & SECTION	0
S-4	EMBEDMENT RING, TEMPLATE RING, & FABRICATION DETAILS	0

NOTE:
REFER TO ELECTRICAL ENGINEER'S DRAWINGS FOR COMMUNICATION AND GROUNDING LAYOUT.

9/24/09

STATE OF OHIO
ALLAN P. HENDERSON
E-68439
REGISTERED
PROFESSIONAL ENGINEER

PROPRIETARY WARNING

9/24/09

PATRICK & HENDERSON INC.

09/23/09
AS SHOWN
JK

PHILLIPS GROUP
4128 ST. CLAIR AVENUE
CLEVELAND, OHIO 44103
TELEPHONE: 216-361-4250

APPROVED FOR CONSTRUCTION

TITLE SHEET & DRAWING INDEX

25 FT P&H TENSIONLESS FOUNDATION USA PATENT #5,586,417
AN-BONUS 600KW ON A 42.3 M HH TOWER FOUNDATION PLAN
FOR
KENSTON LOCAL SCHOOL TURBINE PROJECT
CHAGRIN FALLS, OHIO

REV: 0

S-1

09/24/09

EXCLUSIVE PROPERTY OF
PATRICK AND HENDERSON, INC.

CONFIDENTIAL

GENERAL FOUNDATION NOTES:

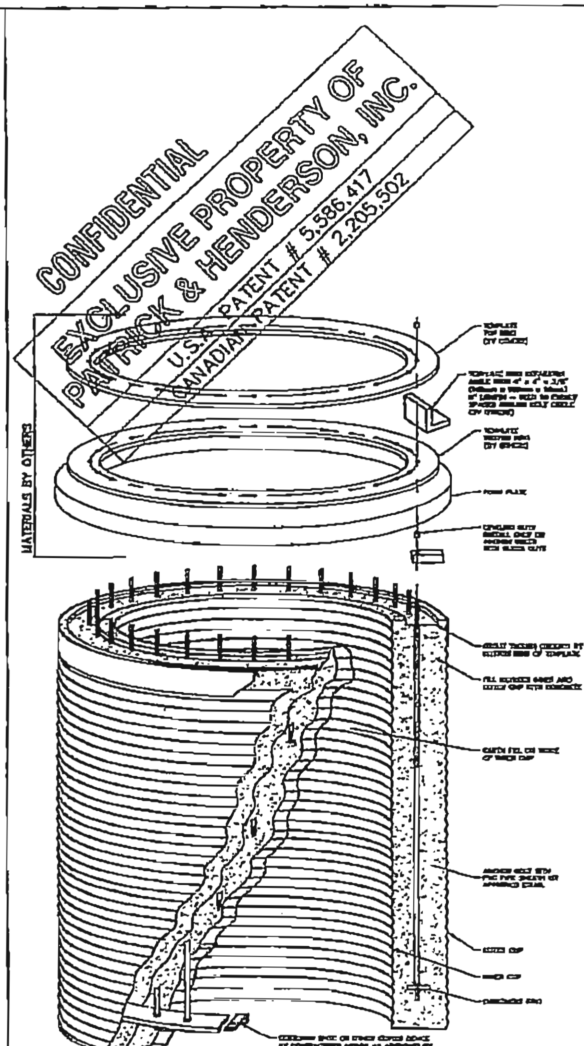
SPECIAL INSPECTION NOTES:

MATERIALS BY SUPPLIERS:

RECOMMENDED CONSTRUCTION SEQUENCE:

TOWER BASE SETTING AND GROUTING PROCEDURE:

EXCLUSIVE PROPERTY OF PATRICK AND HENDERSON, INC.



PROPRIETARY WARNING

ISSUED FOR CONSTRUCTION 09/24/09
25' FOUNDATION
17' SOIL OVER ROCK

STATE OF OHIO
ALLAN P. HENDERSON
E-68439
REGISTERED
PROFESSIONAL ENGINEER

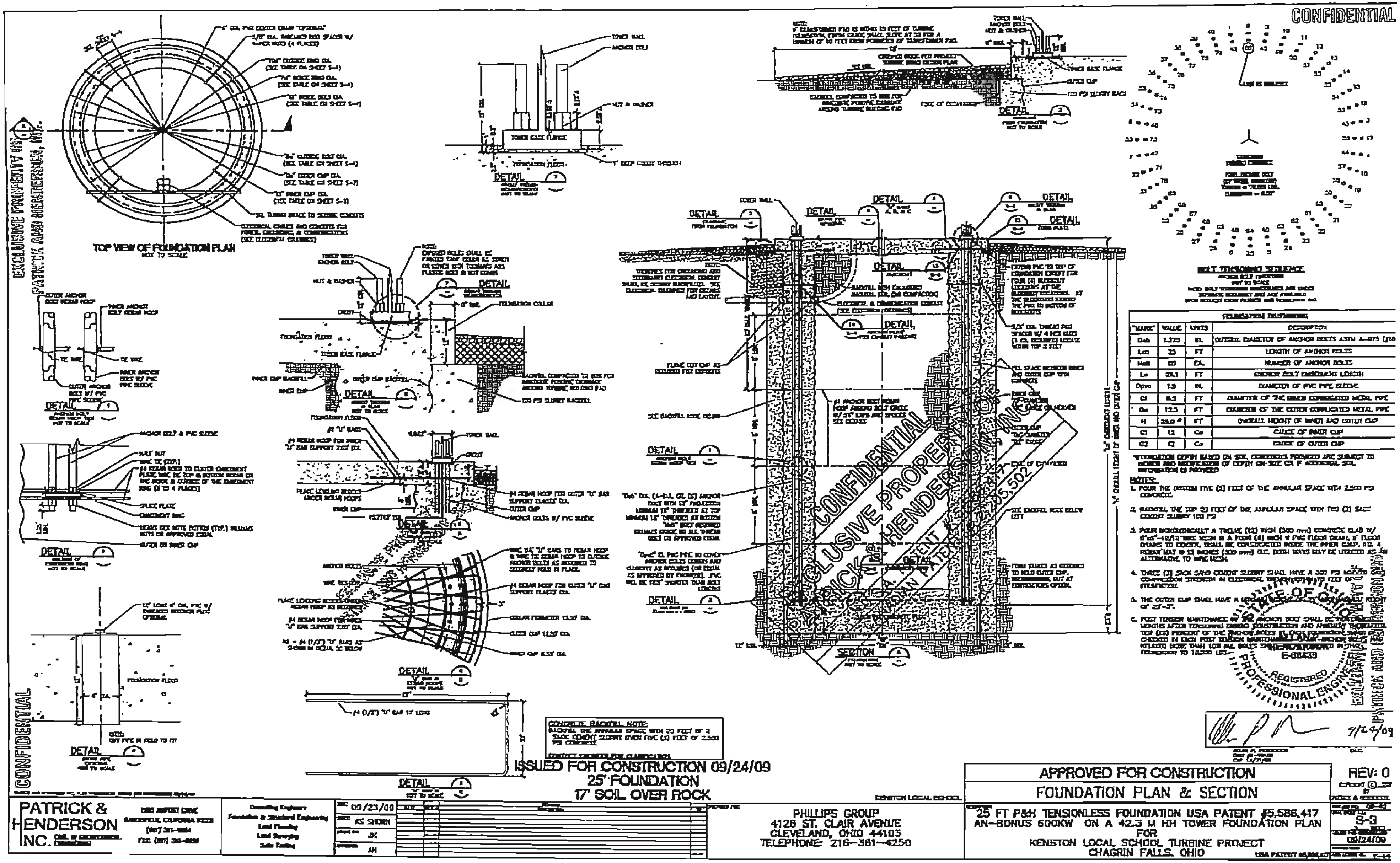
7/24/10

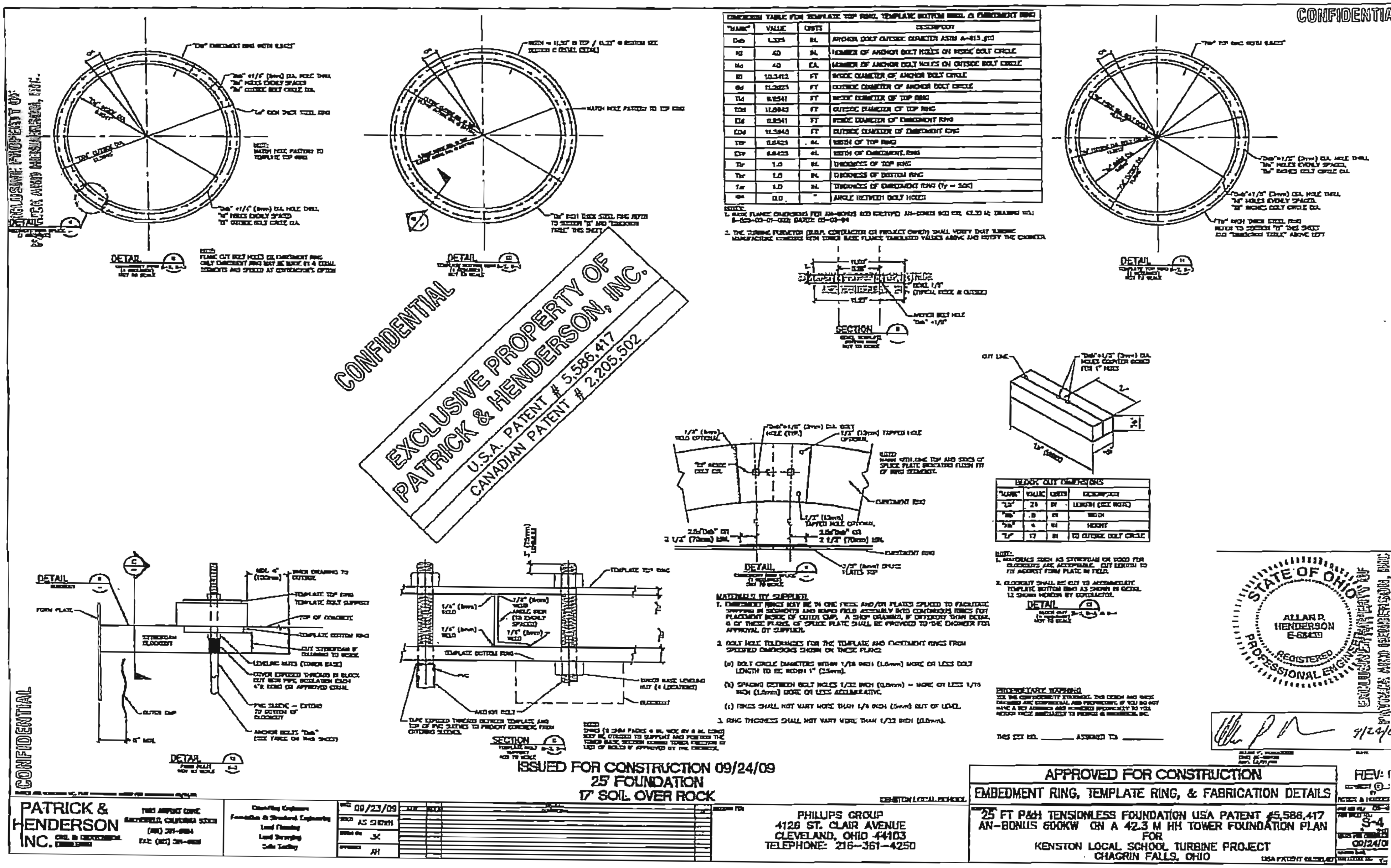
APPROVED FOR CONSTRUCTION

ASSEMBLY VIEW

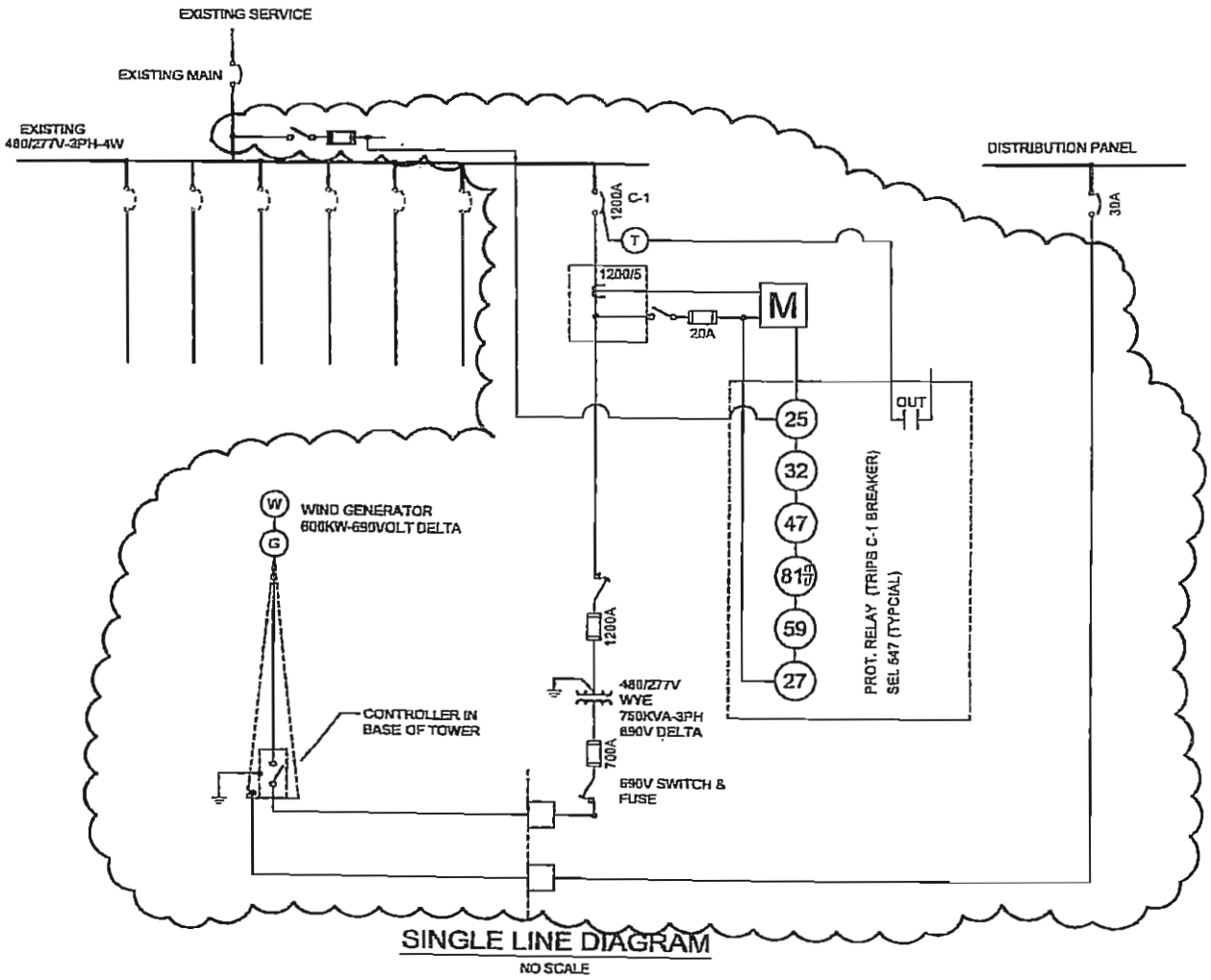
REV: C

PATRICK & HENDERSON INC.		09/23/09	PHILLIPS GROUP 4126 ST. CLAIR AVENUE CLEVELAND, OHIO 44103 TELEPHONE: 216-381-4250
		AS SHOWN	25 FT P&H TENSIONLESS FOUNDATION USA PATENT #5,586,417 AN-BONUS 600KW ON A 42.3 M HH TOWER FOUNDATION PLAN FOR KENSTON LOCAL SCHOOL TURBINE PROJECT CHAGRIN FALLS, OHIO
		JK	S-2
		AH	09/24/09


CONFIDENTIAL
EXCLUSIVE PROPERTY OF PATRICK AND HENDERSON, INC.
TOP VIEW OF FOUNDATION PLAN
BOLT TENSIONING SEQUENCE
FOUNDATION DIMENSIONS
SECTION
DETAIL
ISSUED FOR CONSTRUCTION 09/24/09
25' FOUNDATION
17' SOIL OVER ROCK
APPROVED FOR CONSTRUCTION
FOUNDATION PLAN & SECTION
REV: 0
PATRICK & HENDERSON INC.
PHILLIPS GROUP
4126 ST. CLAIR AVENUE
CLEVELAND, OHIO 44103
TELEPHONE: 216-381-4250
25 FT P&H TENSIONLESS FOUNDATION USA PATENT #5,586,417
AN-BONUS 600KW ON A 42.3 M HH TOWER FOUNDATION PLAN
FOR
KENSTON LOCAL SCHOOL TURBINE PROJECT
CHAGRIN FALLS, OHIO
S-3
09/24/09
STATE OF OHIO
REGISTERED PROFESSIONAL ENGINEER
E-68439
9/24/09

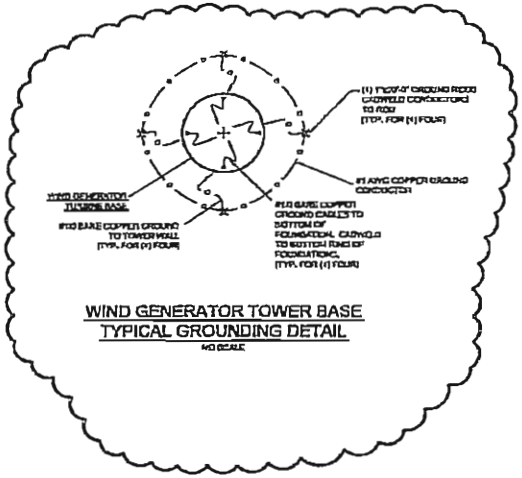


"MARK"	VALUE	UNITS	DESCRIPTION
Dab	1.375	IN.	ANCHOR BOLT OUTSIDE DIAMETER ASTM A-615 #10
Ni	40	EA.	NUMBER OF ANCHOR BOLT HOLES ON INSIDE BOLT CIRCLE
No	40	EA.	NUMBER OF ANCHOR BOLT HOLES ON OUTSIDE BOLT CIRCLE
BI	10.3412	FT	INSIDE DIAMETER OF ANCHOR BOLT CIRCLE
Bd	[illegible]	FT	OUTSIDE DIAMETER OF ANCHOR BOLT CIRCLE
TId	[illegible]	FT	INSIDE DIAMETER OF TOP RING
TOd	[illegible]	FT	OUTSIDE DIAMETER OF TOP RING
EId	[illegible]	FT	INSIDE DIAMETER OF EMBEDMENT RING
EOd	[illegible]	FT	OUTSIDE DIAMETER OF EMBEDMENT RING
[illegible]	[illegible]	IN.	WIDTH OF TOP RING
[illegible]	[illegible]	IN.	WIDTH OF EMBEDMENT RING
Tr	1.0	IN.	THICKNESS OF TOP RING
Tbr	1.0	IN.	THICKNESS OF BOTTOM RING
Ter	1.0	IN.	THICKNESS OF EMBEDMENT RING (Fy = 50K)
[illegible]	9.0	°	ANGLE BETWEEN BOLT HOLES



SINGLE LINE DIAGRAM

NO SCALE



WIND GENERATOR TOWER BASE
TYPICAL GROUNDING DETAIL

NO SCALE

STATE OF OHIO
CASS D. KUHL
E-60263
REGISTERED PROFESSIONAL ENGINEER

09/23/2009

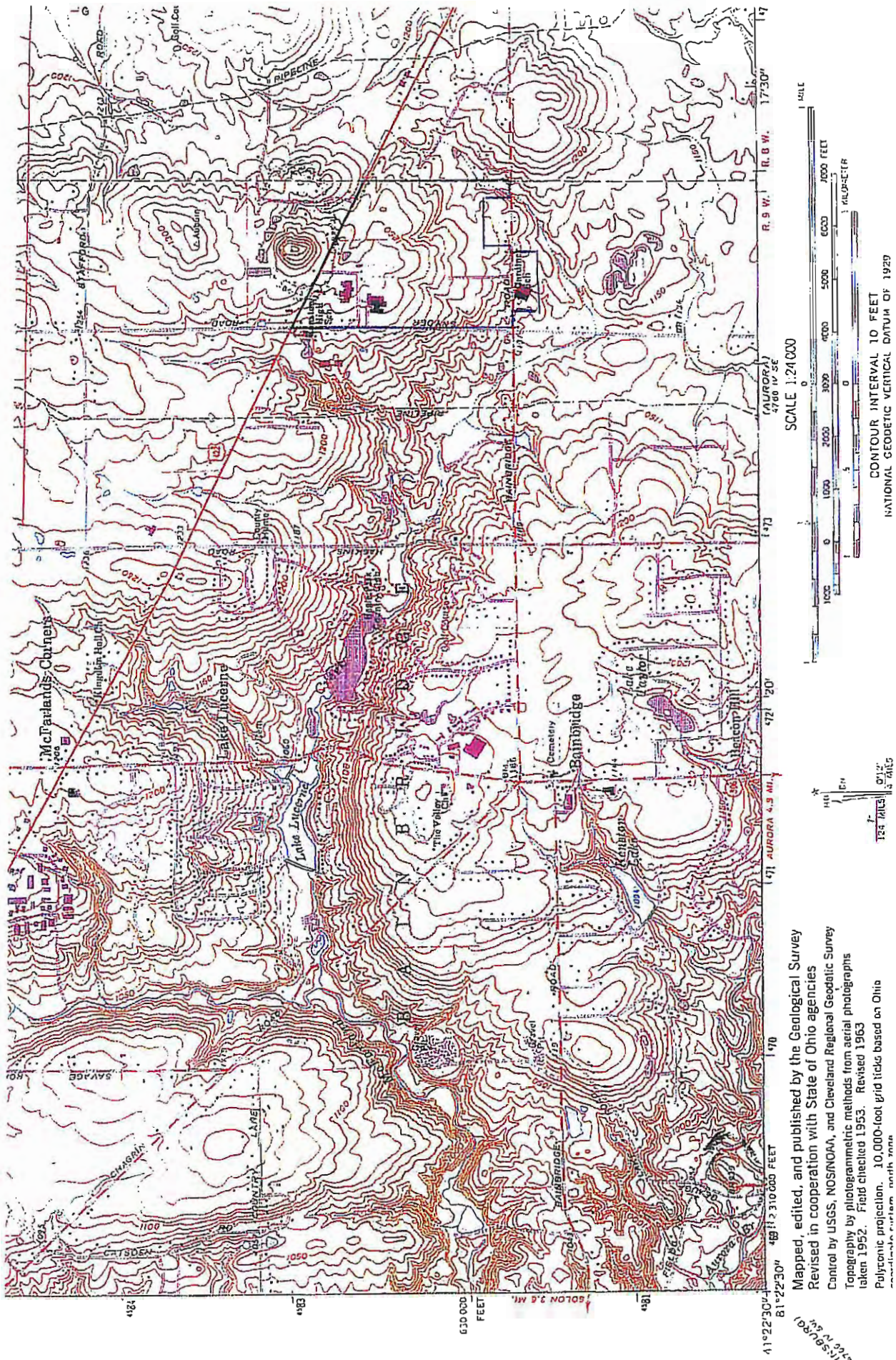
Typical 600kW Wind Turbine Electrical 1L Diagram & Grounding Detail		Philips Group	E-1
		09/23/2009	

KENSTON SCHOOLS

USGS Quad Map

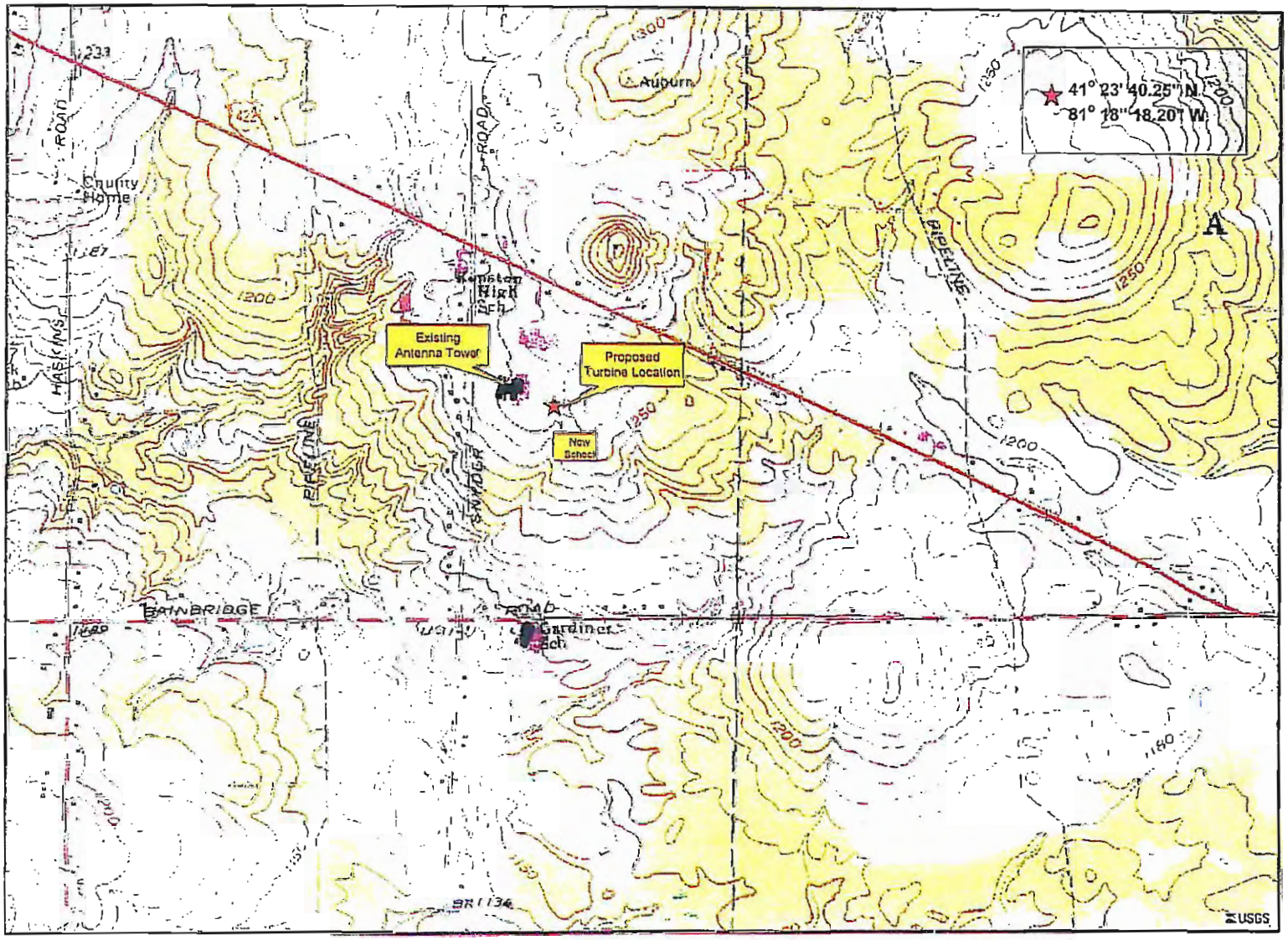
Exhibit 5

Exhibit 5 - USGS Quad Map



Note: Kenston High School identified on map is Kenston Middle School. New Kenton High School was built and dedicated in 2006.

Kenston Schools Proposed Turbine Location



KENSTON SCHOOLS

Street Level Map

Exhibit 6

Exhibit 6


Snyder Road
Snyder Rd
Bainbridge Road
Snyder Road
Leekaida Dr

KENSTON SCHOOLS

Project Inventory
Exhibit 7


34
36
38
35
40
42
44
46
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50
37
39
41
43
45
32
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33
31
28
29
26
27
25
24
C
D
B
Wind Turbine site
23
22
21
20
19
18
17
E
16
15
14
13
12
11
10
9
7
6
4
3
2
1
8
A
5
92-729414
Bainbridge Rd

Year Built: 1893 Remodeled: 1999

Year Built: 1940 Remodeled: na

Year Built: 1900 Remodeled: 1960

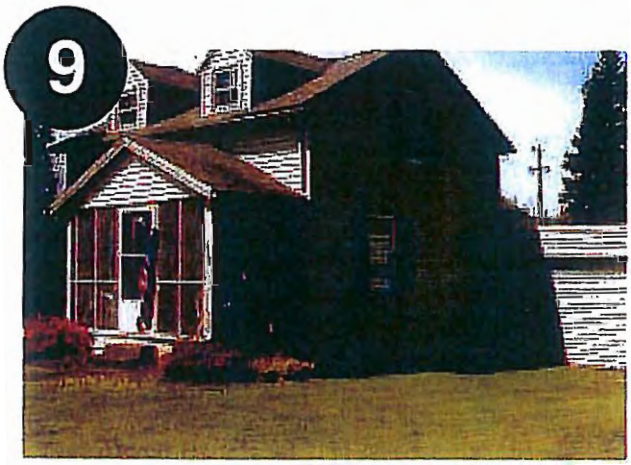
Year Built: 1857 Remodeled: 1989

Year Built: 1990 Remodeled: na

Year Built: 1998 Remodeled: na

Year Built: 1926 Remodeled: 1960

Year Built: 1901 Remodeled: 1996



Year Built: 1930 Remodeled: 1982

Year Built: 1978 Remodeled: na

Year Built: 1950 Remodeled: na

Year Built: 1958 Remodeled: na

Year Built: : 1959 Remodeled: na

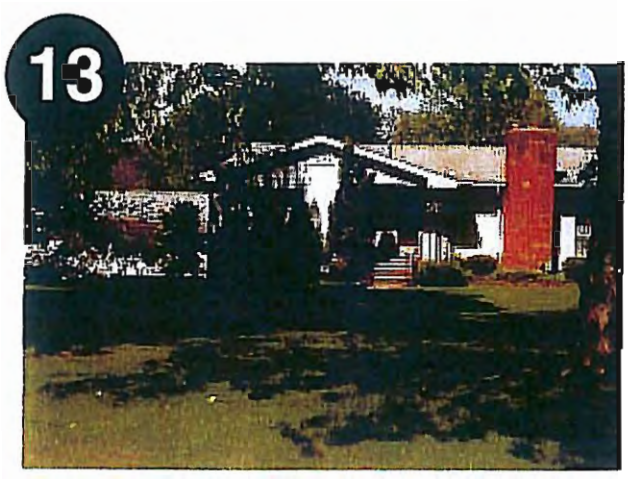
Year Built: 1980 Remodeled: na

Year Built: 1958 Remodeled: 2000

Year Built:: 1955 Remodeled: 2000

Year Built: 1955 Remodeled: 1976

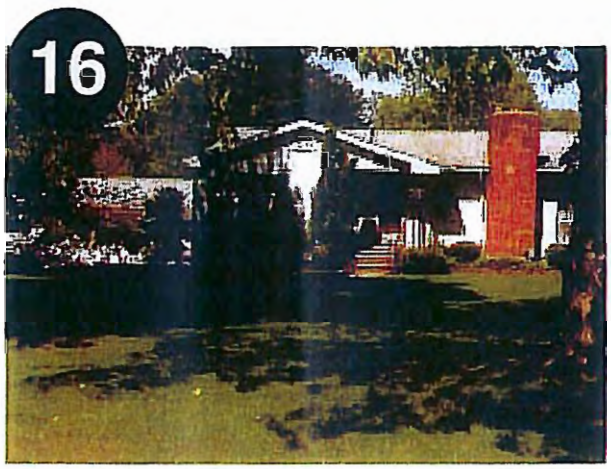
Year Built: : 1961 Remodeled: 1988



Year Built: : 1959 Remodeled: na

Year Built: 1980 Remodeled: na

Year Built: 1958 Remodeled: 2000

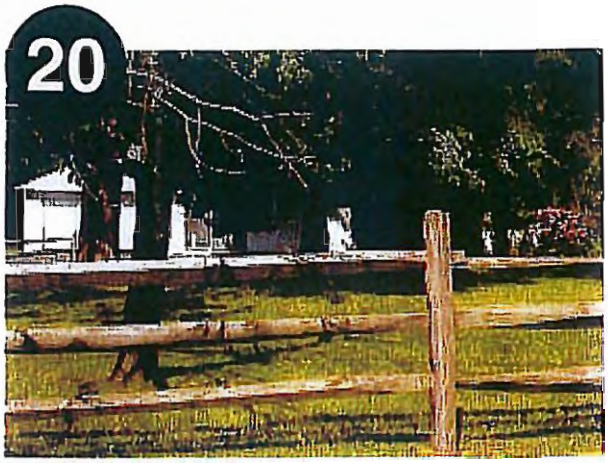


Year Built:: 1955 Remodeled: 2000

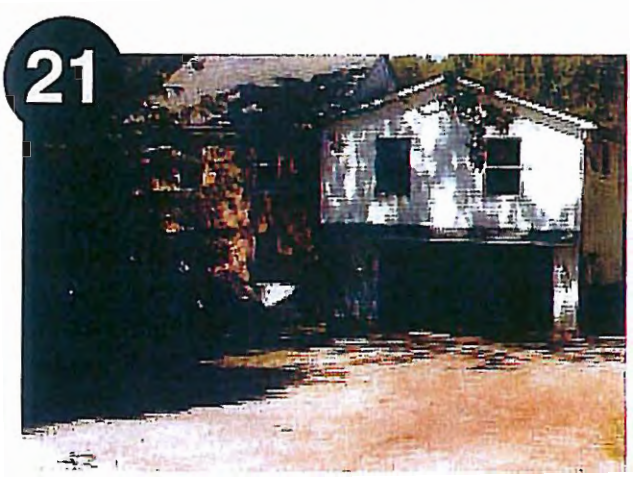
Year Built: 1955 Remodeled: 1976

Year Built: : 1961 Remodeled: 1988

Year Built: 1972 Remodeled: na



Year Built: 1961 Remodeled: 1999



Year Built: 1954 Remodeled: 2003

Year Built: 1956 Remodeled: na

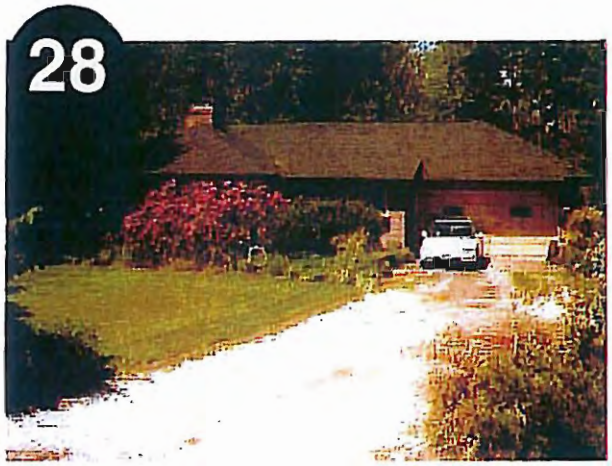
Year Built: 1910 Remodeled: 1950

Year Built: 1900 Remodeled: 2005

Year Build: 1900 Remodeled: 1987

Year Build: 1954 Remodeled: 1989

Year Build: 1943 Remodeled: 1995



Year Build: 1956 Remodeled: na

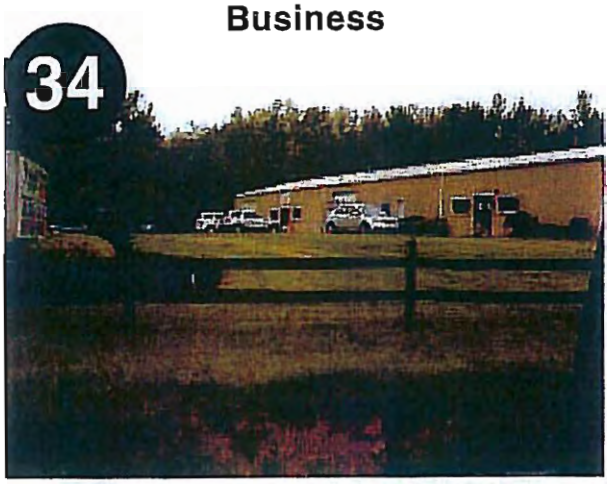
Year Build: 1956 Remodeled: 1991

Year Build: 1955 Remodeled: 1989

Year Build: 1963 Remodeled: 1999

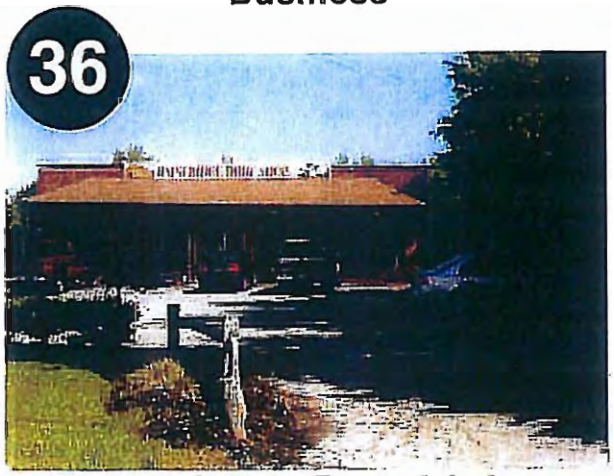
Year Build: na Remodeled: na
Business

Year Build: 1955 Remodeled: na



Year Build: na Remodeled: na
Business

Year Build: 1945 Remodeled: 1975



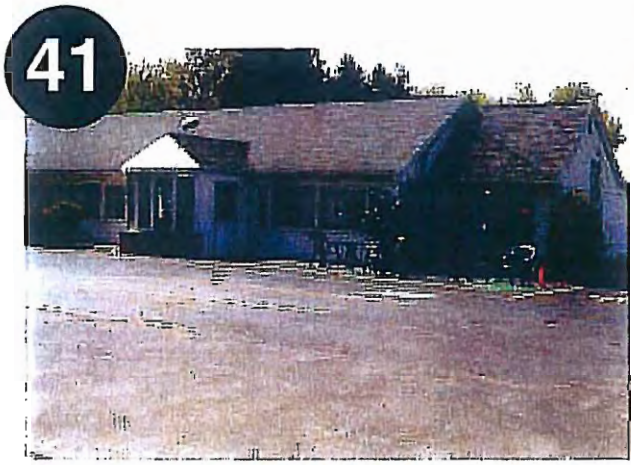
Year Build: na Remodeled: na
Business

Year Built: 1942 Remodeled: 1978

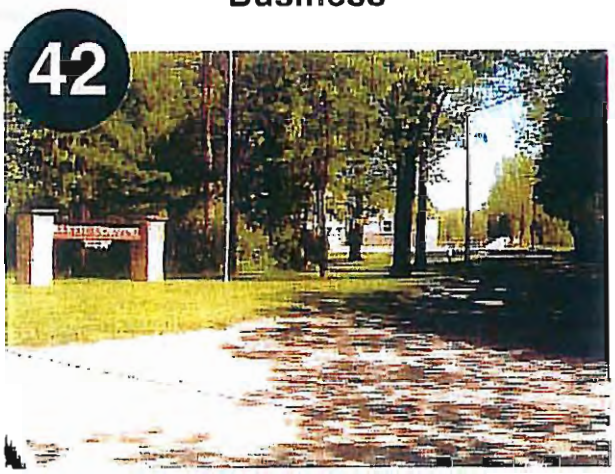
Year Built: 1945 Remodeled: na

Year Built: 1942 Remodeled: na

Year Built: 1932 Remodeled: na
Business



Year Built: 1950 Remodeled: na
Business



Year Built: na Remodeled: na
Business

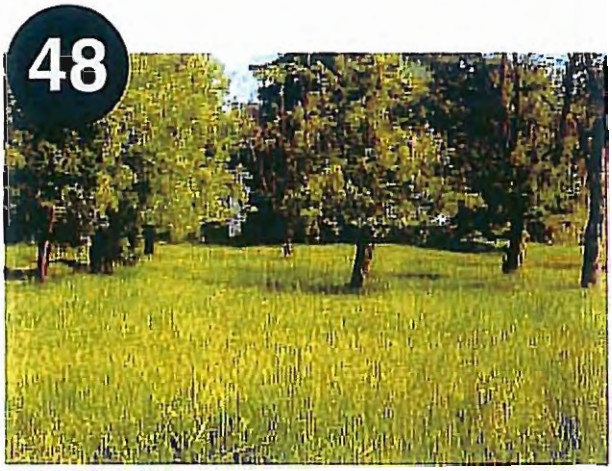
Year Built: 1958 Remodeled: na

Year Built: 1941 Remodeled: 1998

Year Built: 2009 Remodeled: na

Year Built: 1950 Remodeled: 2003

Year Built: 1940 Remodeled: 2003



Year Built: 1956 Remodeled: 1980

Year Built: 1955 Remodeled: 1988

Year Built: 1979 Remodeled: na

Gardiner Early Learning Center
Year Built: 1962 + 2 additions
1964, 1995

Timmons Elementary School
Year Built: 1994 + 1 addition
2006

Kenston Intermediate School
Year Built: 1967 + 3 additions
1969, 1994, 2000

Kenston Middle School
Year Built: 1956 + 5 additions
1958, 1964, 1973, 1974, 1988

Kenston High School
Year Built: 2006

Aerial View

Exhibit 6

Aerial View

Exhibit 6

W - E

Aerial View

Exhibit 6

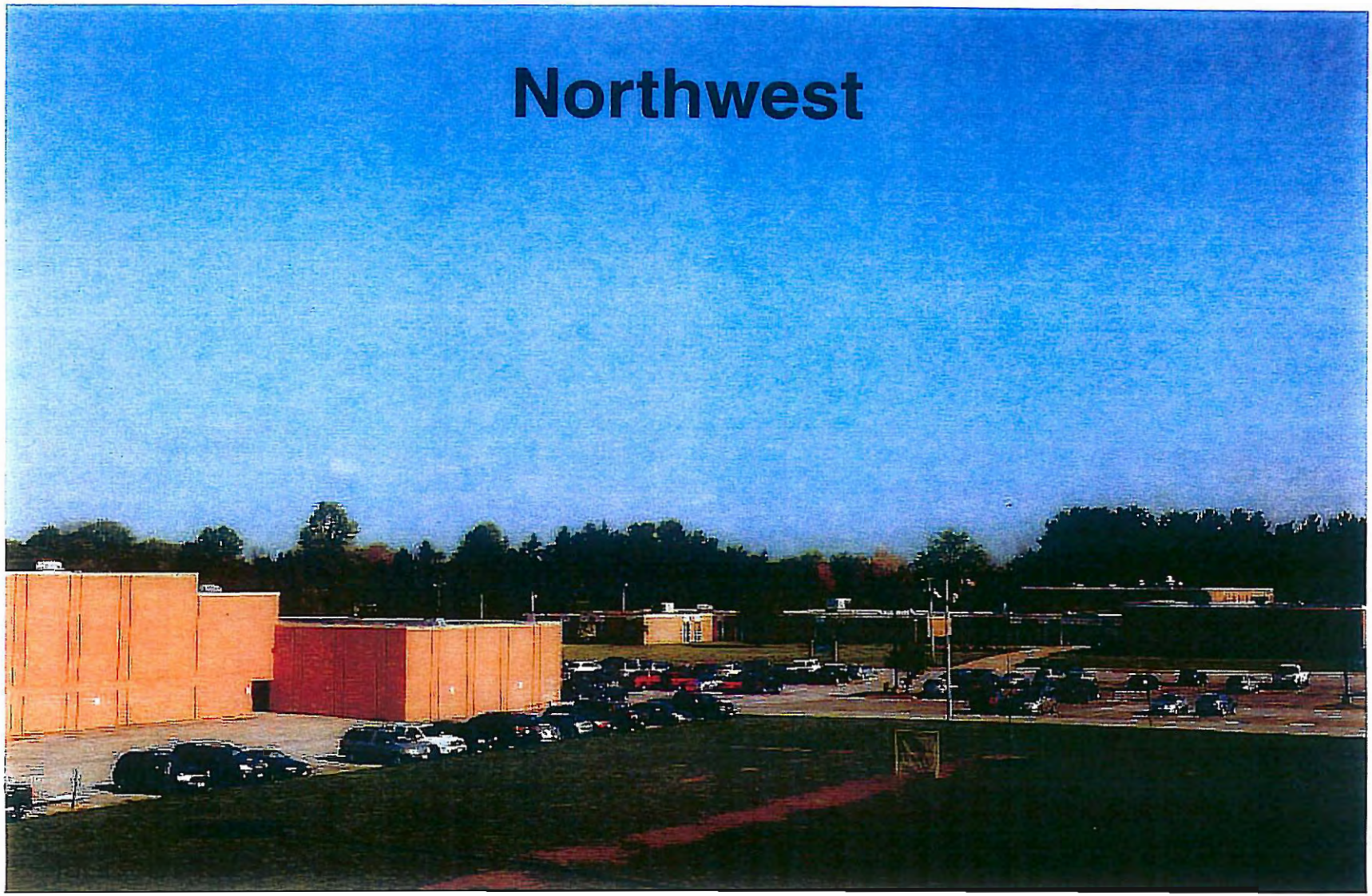


Exhibit 6

East

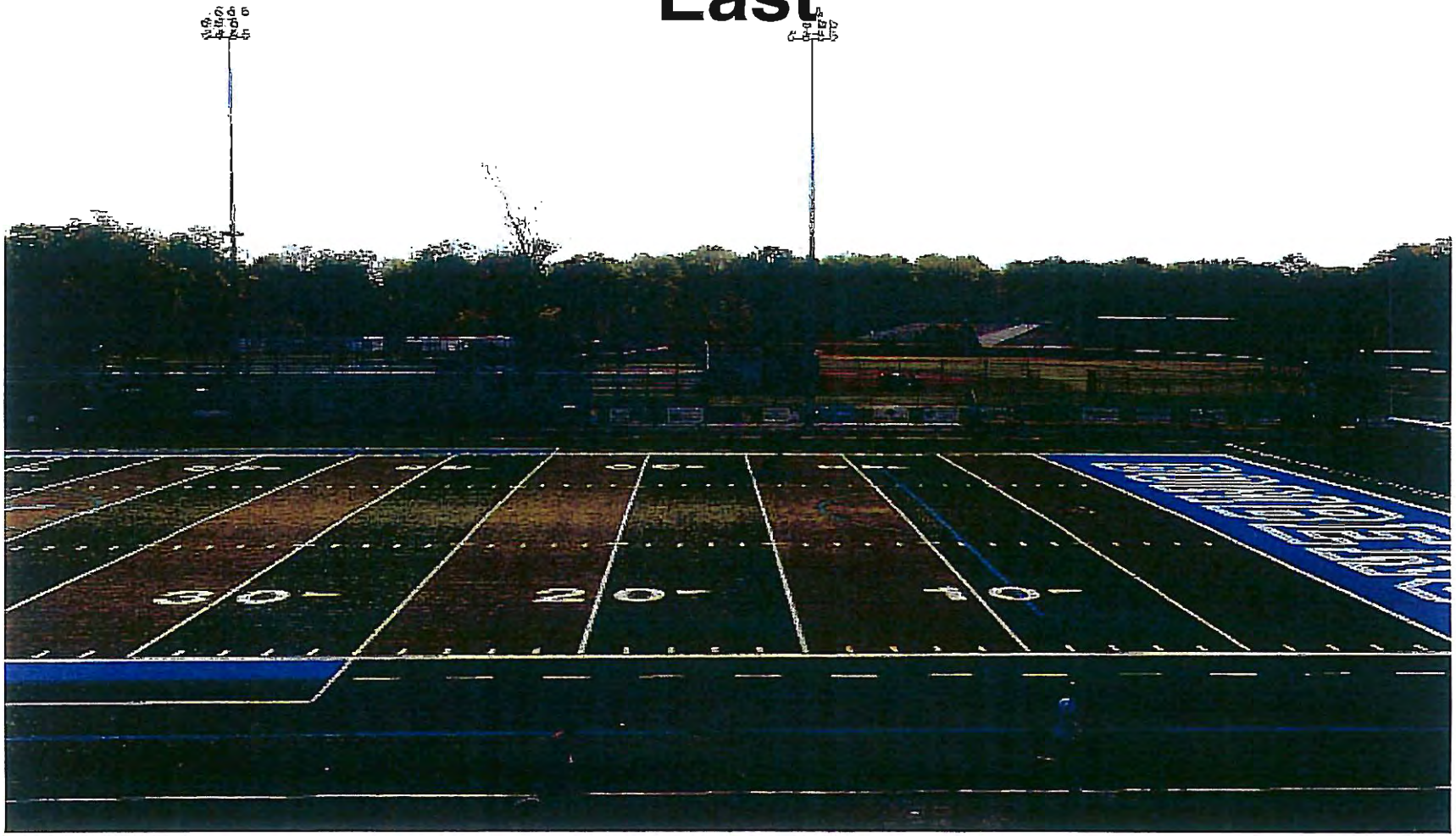


Exhibit 6

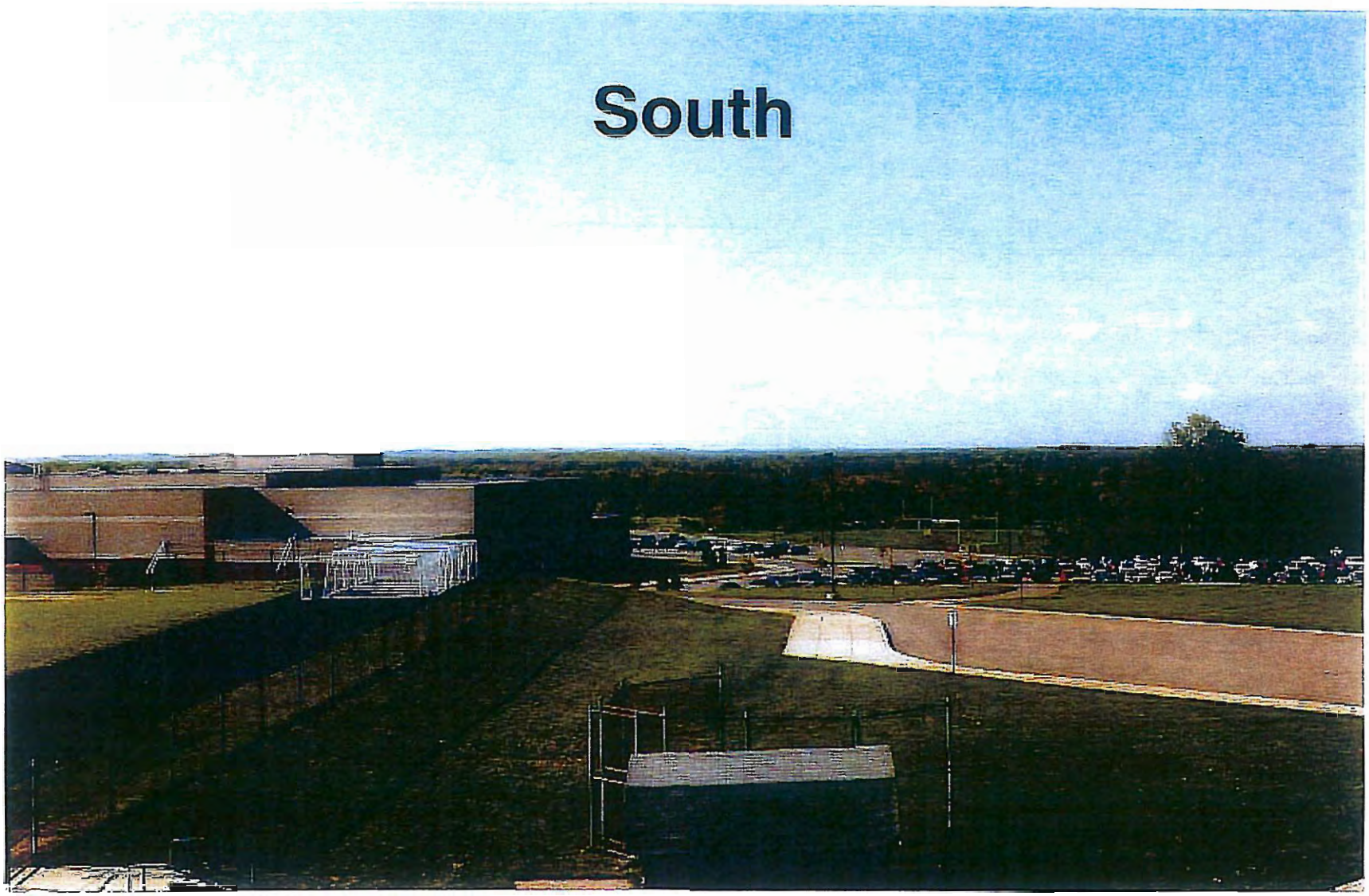
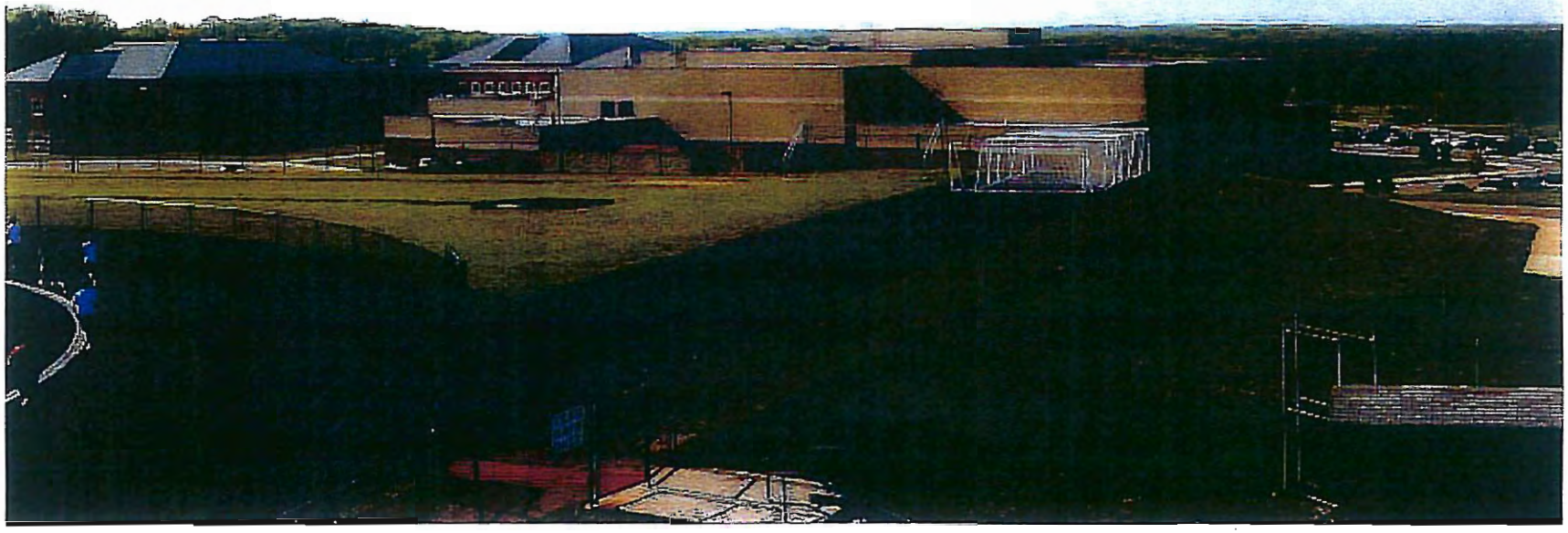


Exhibit 6

Southeast



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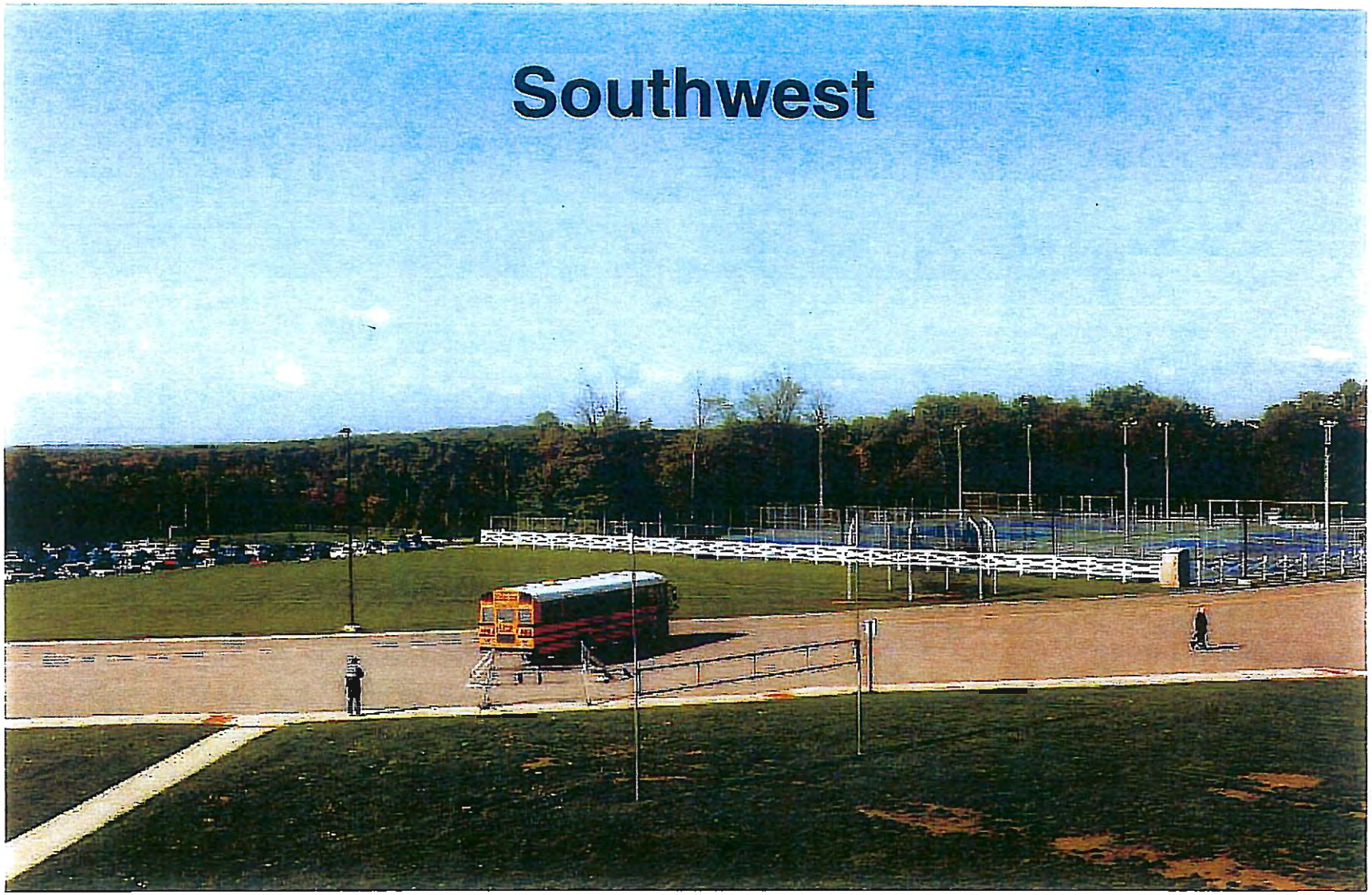

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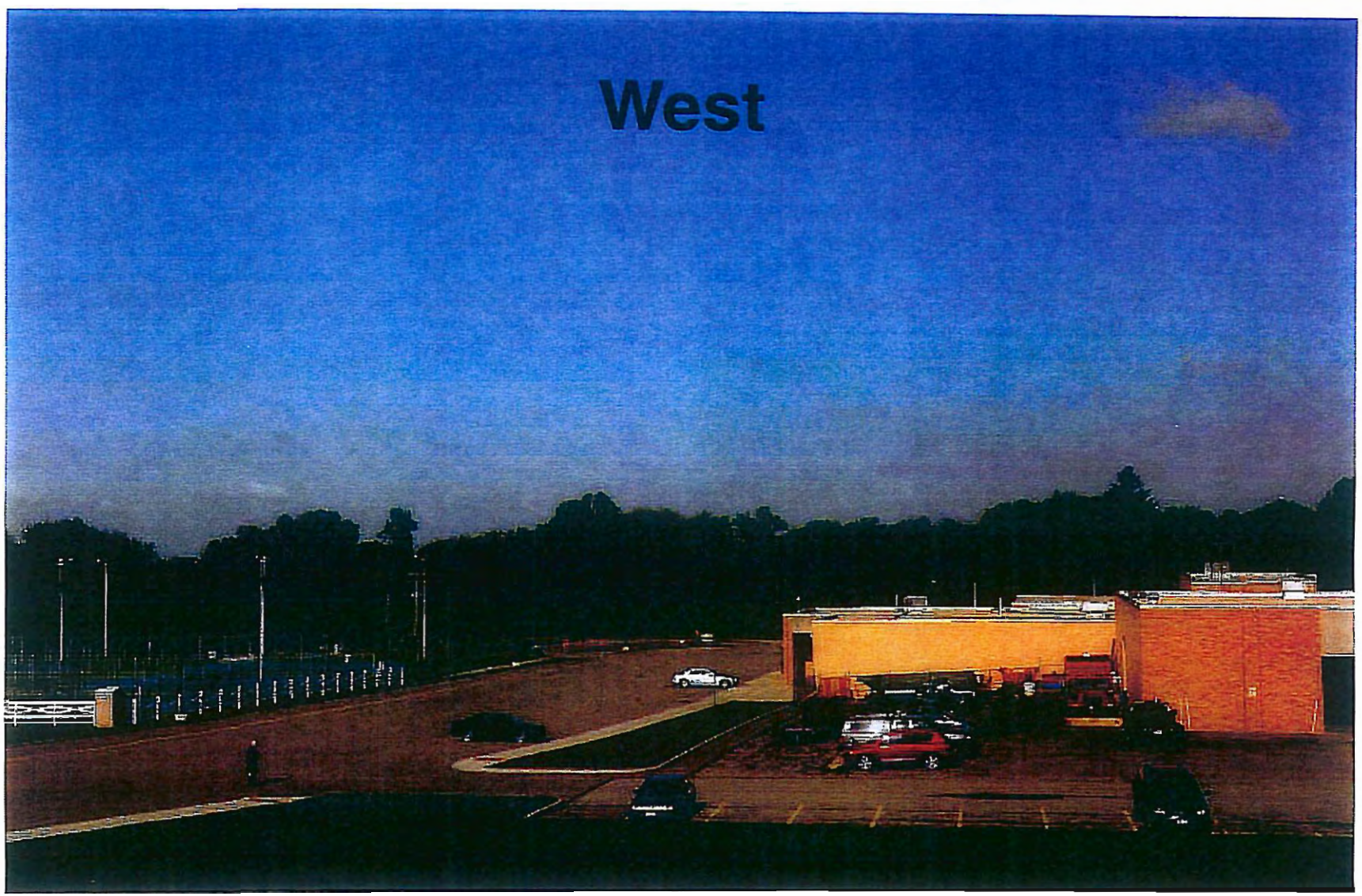

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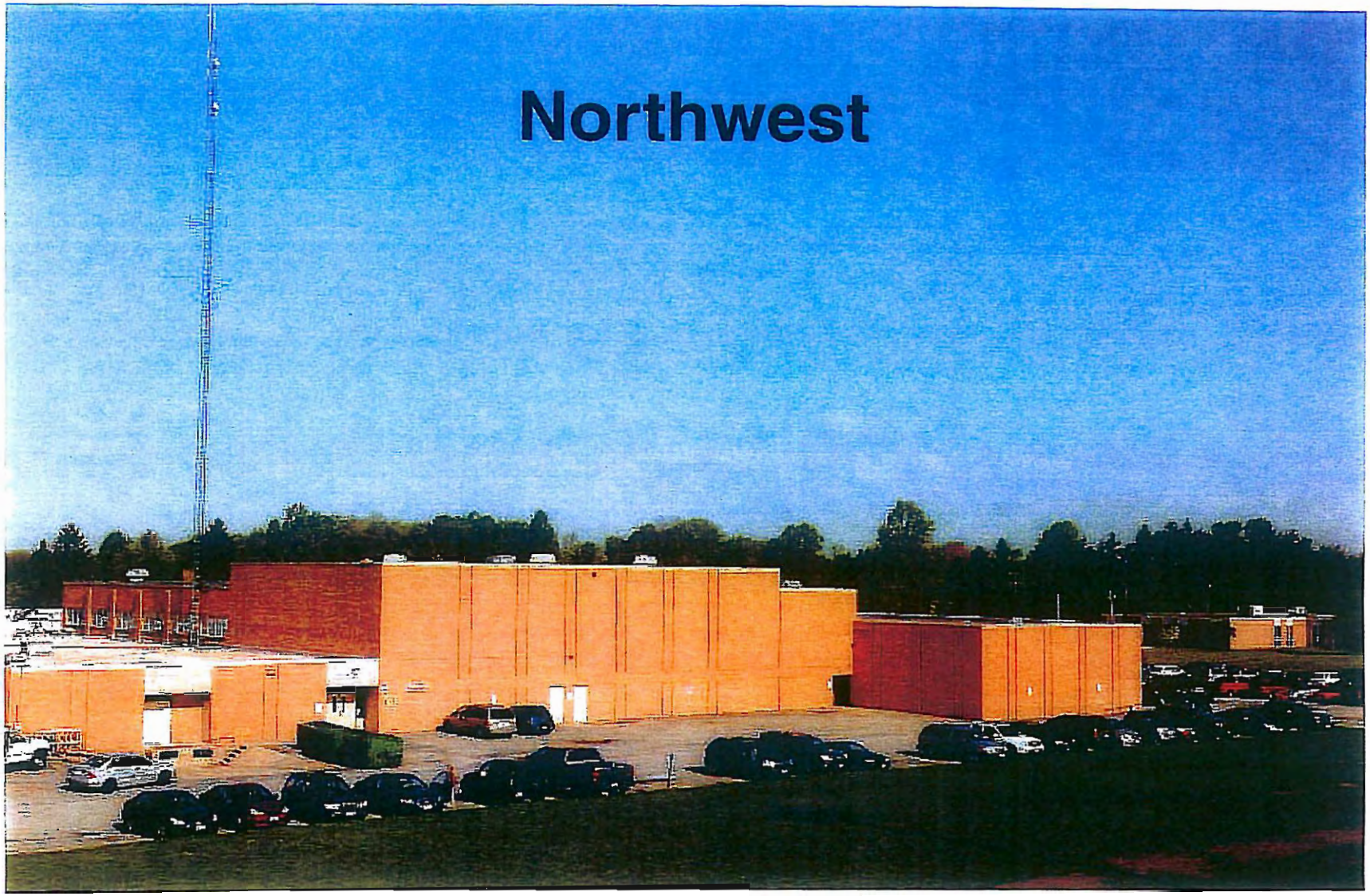

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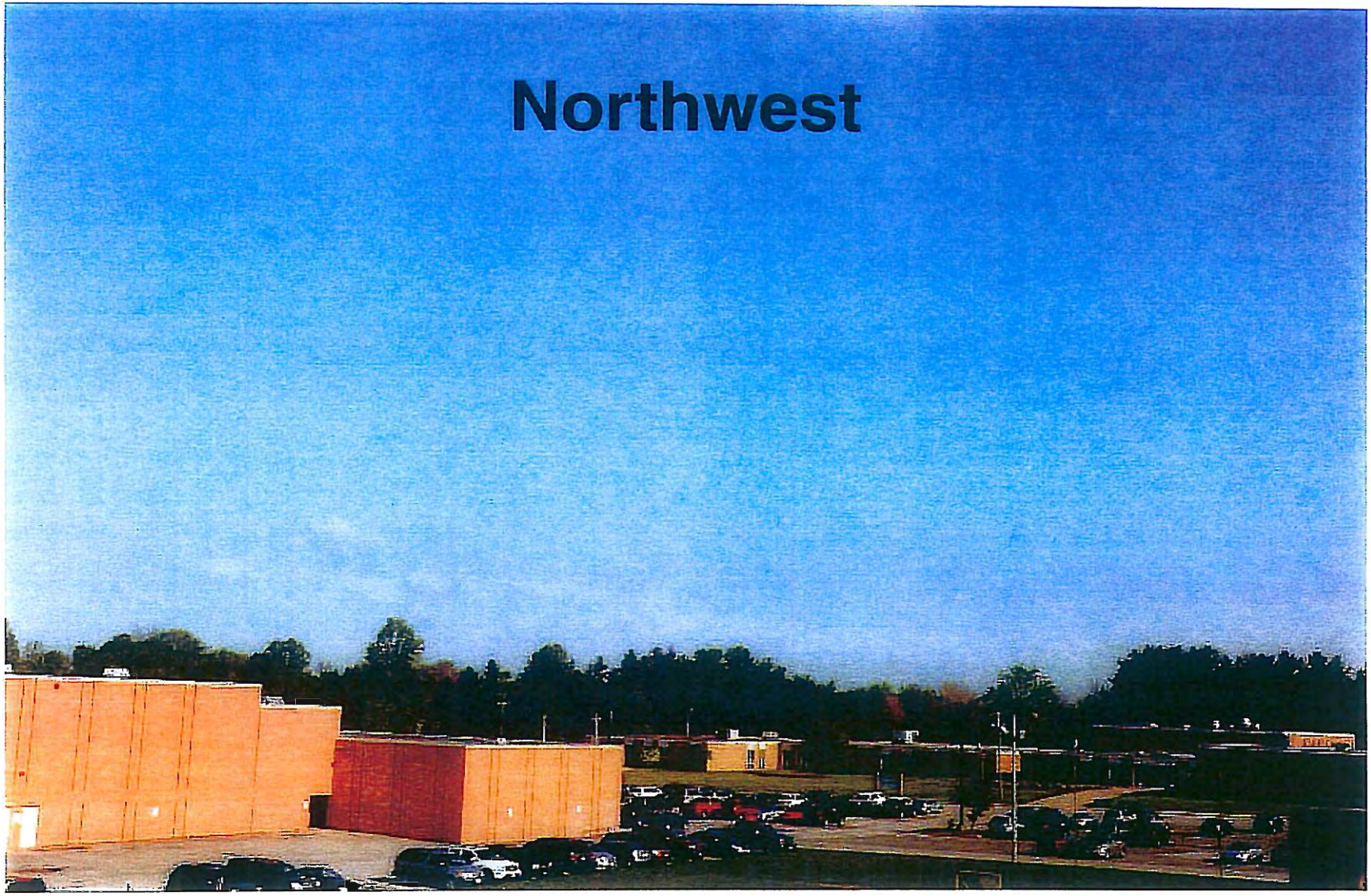


Exhibit 6

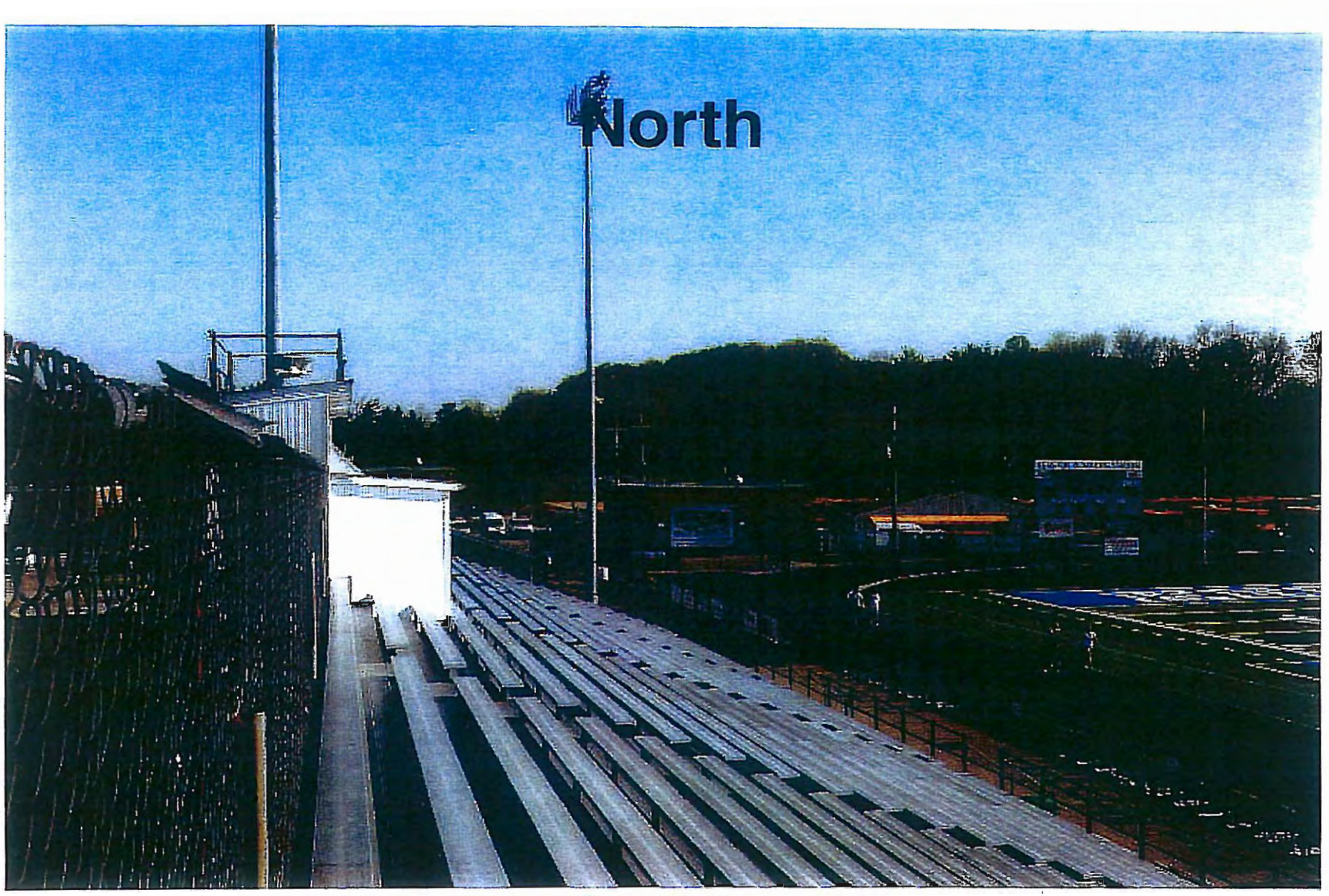
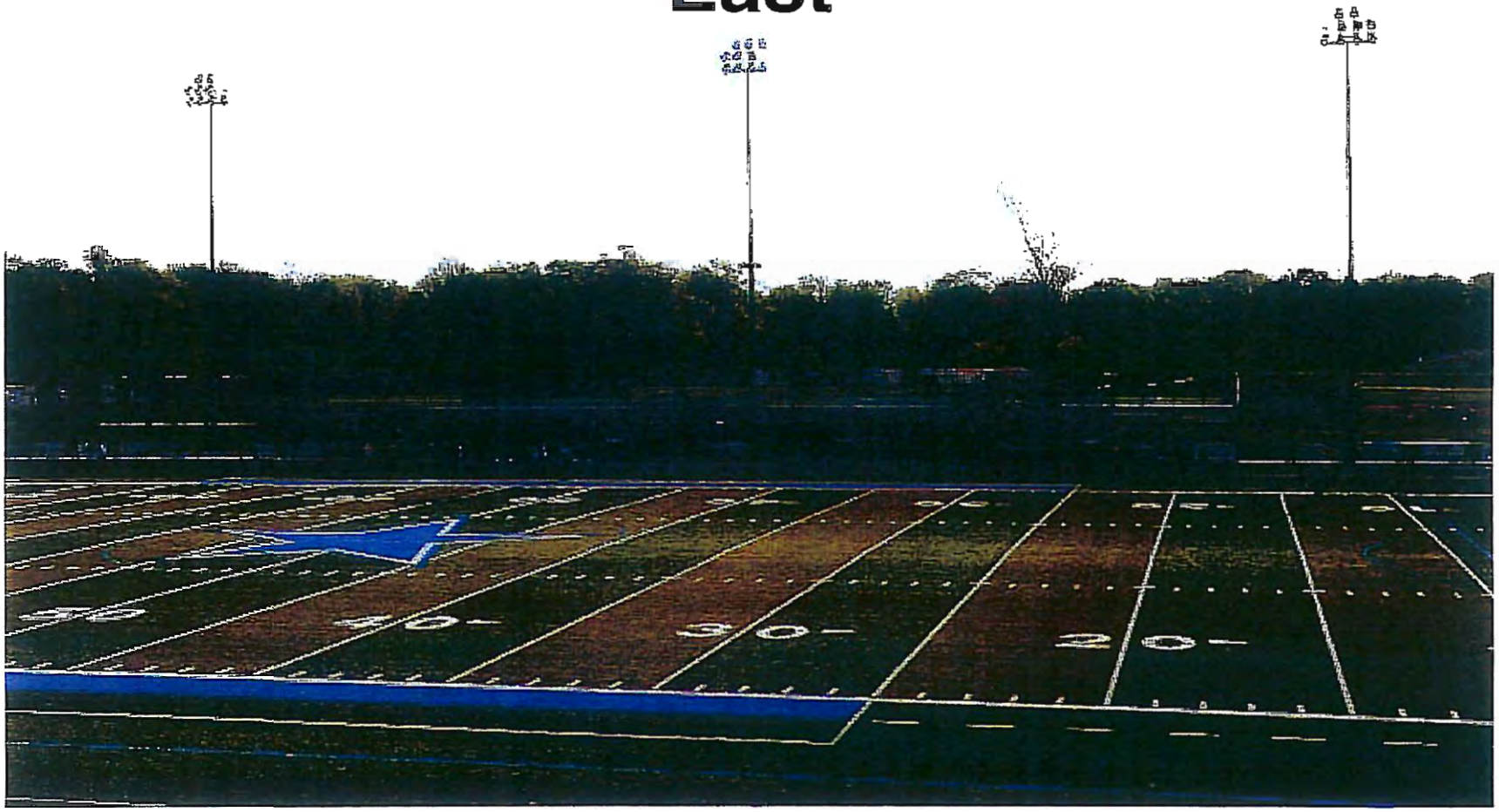


Exhibit 6

Northeast

Exhibit 6

East



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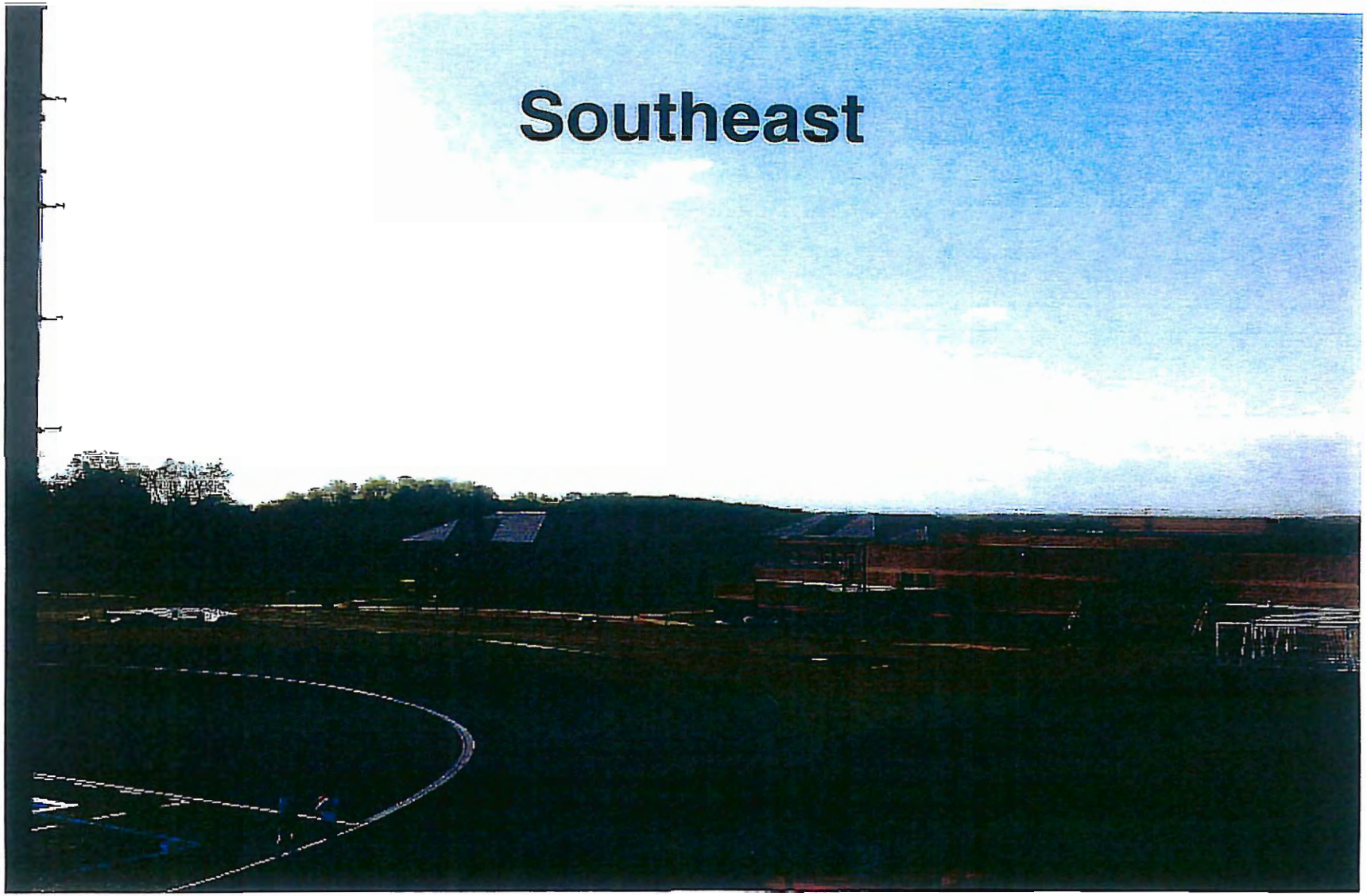

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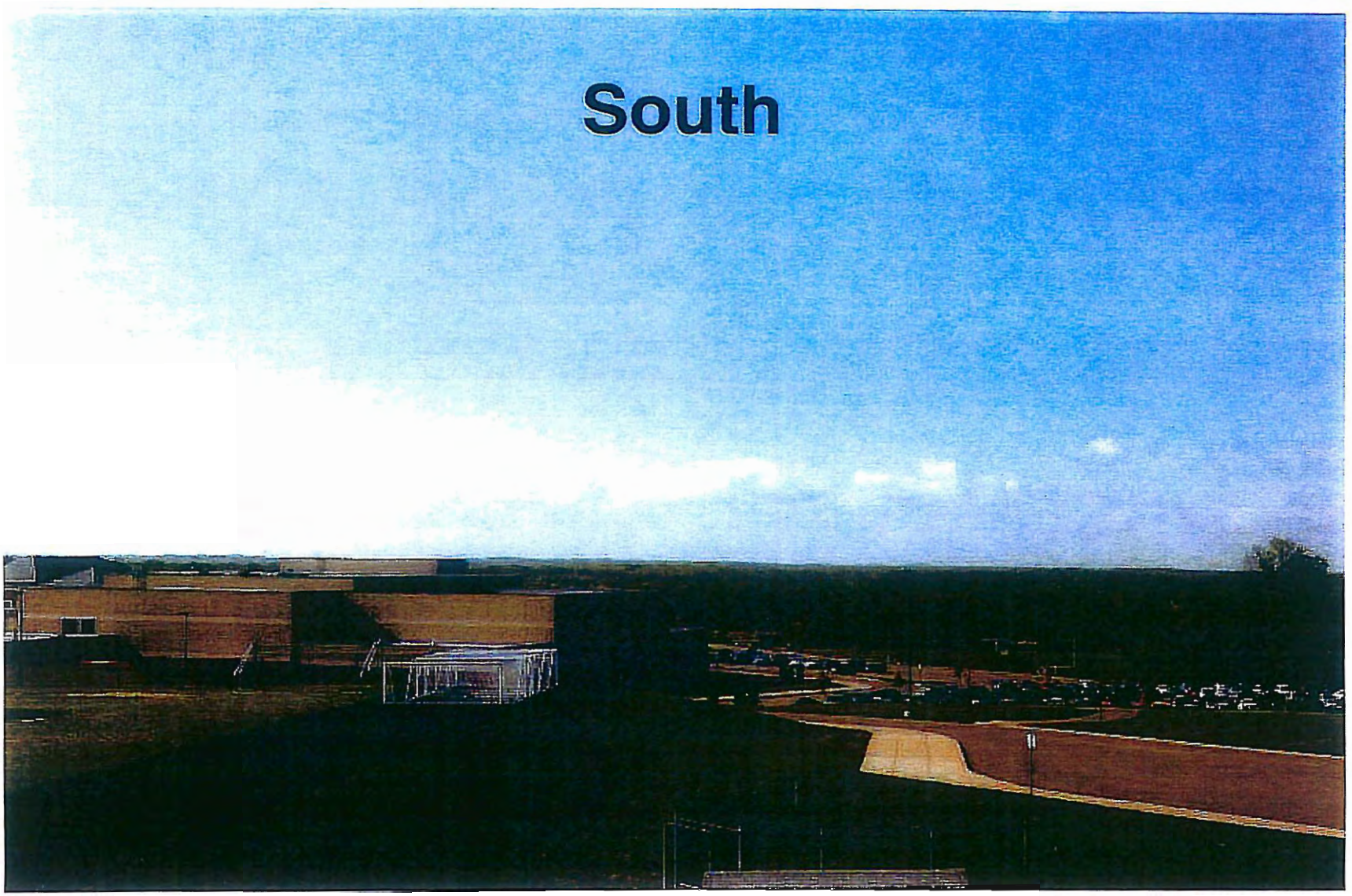

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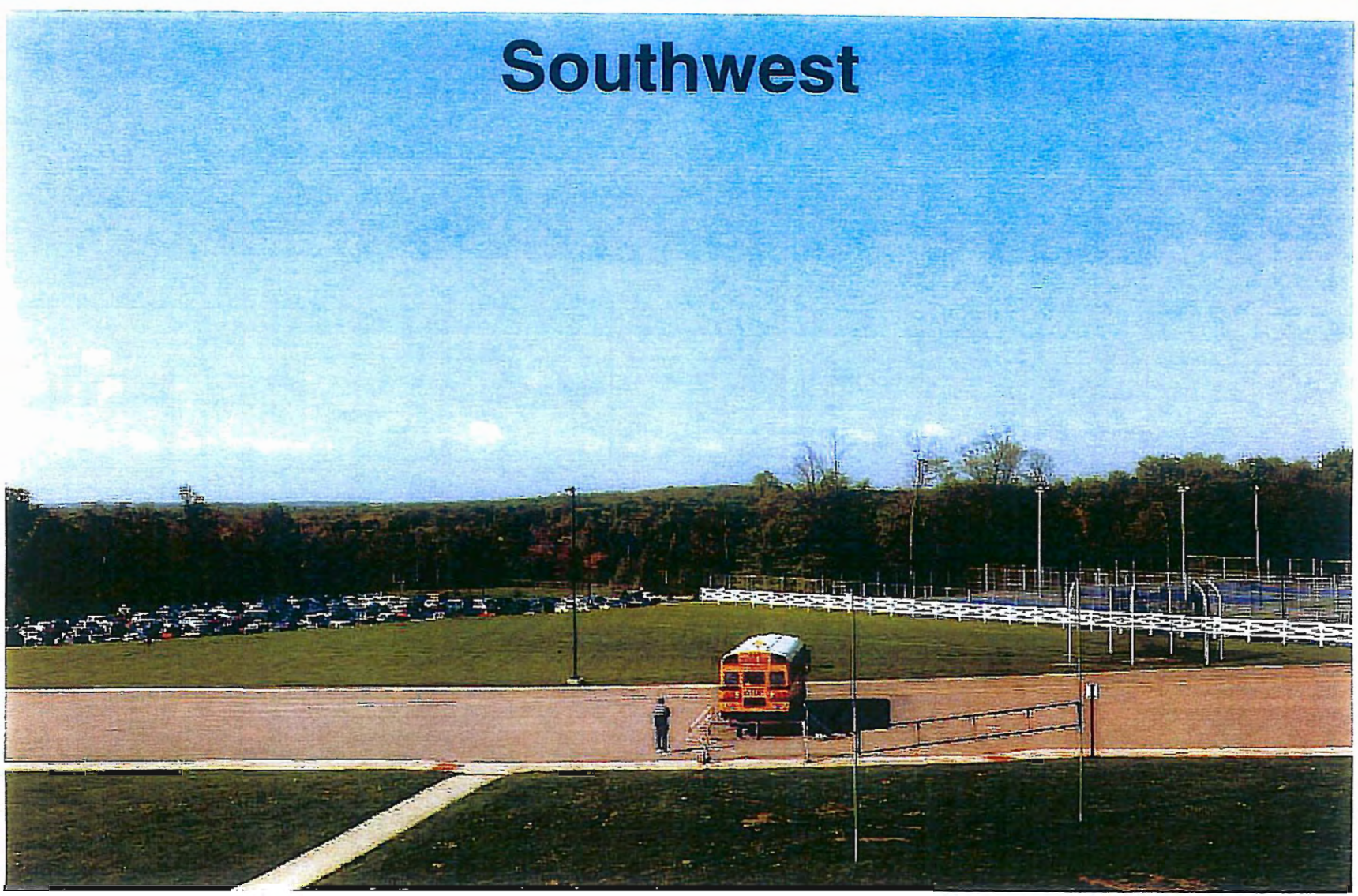


Exhibit 6

APPENDIX E:

HISTORICAL AND CULTURAL DOCUMENTATION

June 21, 2010

Robert A. Lee, Ph. D.
Kenston Board of Education
17419 Snyder Road
Chagrin Falls, OH 44023

Re: K2 – Kilowatts for Kenston – Section 106 Review
17425 Snyder Rd., Bainbridge Township, Geauga County, Ohio

Dear Dr. Lee;

This is in response to your correspondence, received on June 18, 2010 regarding the expenditure of federal funds at this address. My comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

This undertaking involves the installation of a 160'-190' wind turbine on the approximately 189 acres of the Kenston Schools property. The construction of the school and athletic complex entailed a great deal of ground disturbance, making the likelihood of finding any intact archaeological properties very low. Additionally, distance, topography, vegetation, and built landscape features should obscure the view of the proposed turbine from historic properties.

Therefore, based on the information provided, I agree with your determination that no historic properties will be affected by this undertaking,

No further coordination is required unless the project changes or archaeological remains are discovered during the course of the project. In such a situation, this office should be contacted as per 36 CFR 800.13.

As always, if you have any questions, please contact me at (614) 298-2000, or by email at lsegna@ohiohistory.org.

Sincerely,

Laura Segna

Laura Segna, Project Reviews Manager
Resource Protection and Review

CC: Greg Payne, ODOD
James Huth, ODOD

Ser No 1033640

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

KENSTON
SCHOOLS

Kenston Local Schools

17419 Snyder Road
Chagrin Falls, Ohio
44023-2730
Phone: (440) 543-9677
Fax: (440) 543-8634
www.kenstonlocal.com

Robert A. Lee, Ph.D.
Superintendent

Jack K. Thompson, Ed. D.
Assistant Superintendent

Linda M. Hein
Treasurer

June 16, 2010

Laura Segna, project Reviews Manager
Resource Protection and Review
Ohio Historical Society
1982 Velma Avenue
Columbus, OH 43211-2497

Dear Ms. Segna,

In response to your review of our Project K2 submittal, attached is additional information as you requested. You asked that we extend the Area of Potential Effect (APE). On the phone, you were able to provide some suggestions in determining the APE. Per your analysis, we expanded our APE to 1.5 miles, identified the historic structures that pass a "Wow factor," and determined if Project K2 would have any negative effects.

Included in my response is the new APE of 1.5 miles and historic inventory, (Exhibit 9, Expanded Area of Potential Effect). From the inventory analysis, we did not find any visual effects that would negatively effect the historic resources.

The second area of submittal development you requested was that we examine the effects beyond the visual aspects, and evaluate the noise and vibration effects of Project K2. The vibration effect was researched and there is no data to identify vibration. In a field trip to the megawatt versions of our project, I stood next to the tower in a 35mph wind without feeling any vibration sensation. The other variable of noise was evaluated by the Renaissance Group. When calculating the decibel levels at the immediate site and extending out to the property lines, the decibel levels clearly are within the acceptable levels cited in local and county zoning codes (see Exhibit 10 – Noise Analysis). The sounds level not only fall within zoning code requirements, but also would not be noticeable over the typical noises associated with a residential area.

I hope this addendum submittal meets the expectations cited in your phone, e-mail and written communication.

Sincerely,

Robert A. Lee, Ph.D.
Superintendent

RAL/ms
enclosures

Addendum Submittal

Community Background

The Kenston Local School District was formed in 1953 by the merger of the Auburn and Bainbridge Townships' school districts. Both communities were rural with a predominance of farming. Neither townships have a defined town center. The townships' farmland and vacant land began to be developed in the 1980's. In order to maintain the rural atmosphere of our communities, zoning requirements were established for new home construction, which created minimum lot sizes of 3-5 acres. City services like city water and sewer were halted and prevented through defensive zoning and litigation.

Since 1990, our communities (Auburn and Bainbridge Townships) have averaged approximately 150 new housing starts per year until the economic downturn several years ago. The historical properties that remain in existence today are primarily farm house structures. New housing developments continue to consume farmland to the point that only a handful of working farms remain.

In summary, Kenston Schools located in Bainbridge Township continues to watch the surrounding property develop into residential. The large lot zoning has slowed growth and helped maintain a rural/suburban community.

KENSTON SCHOOLS

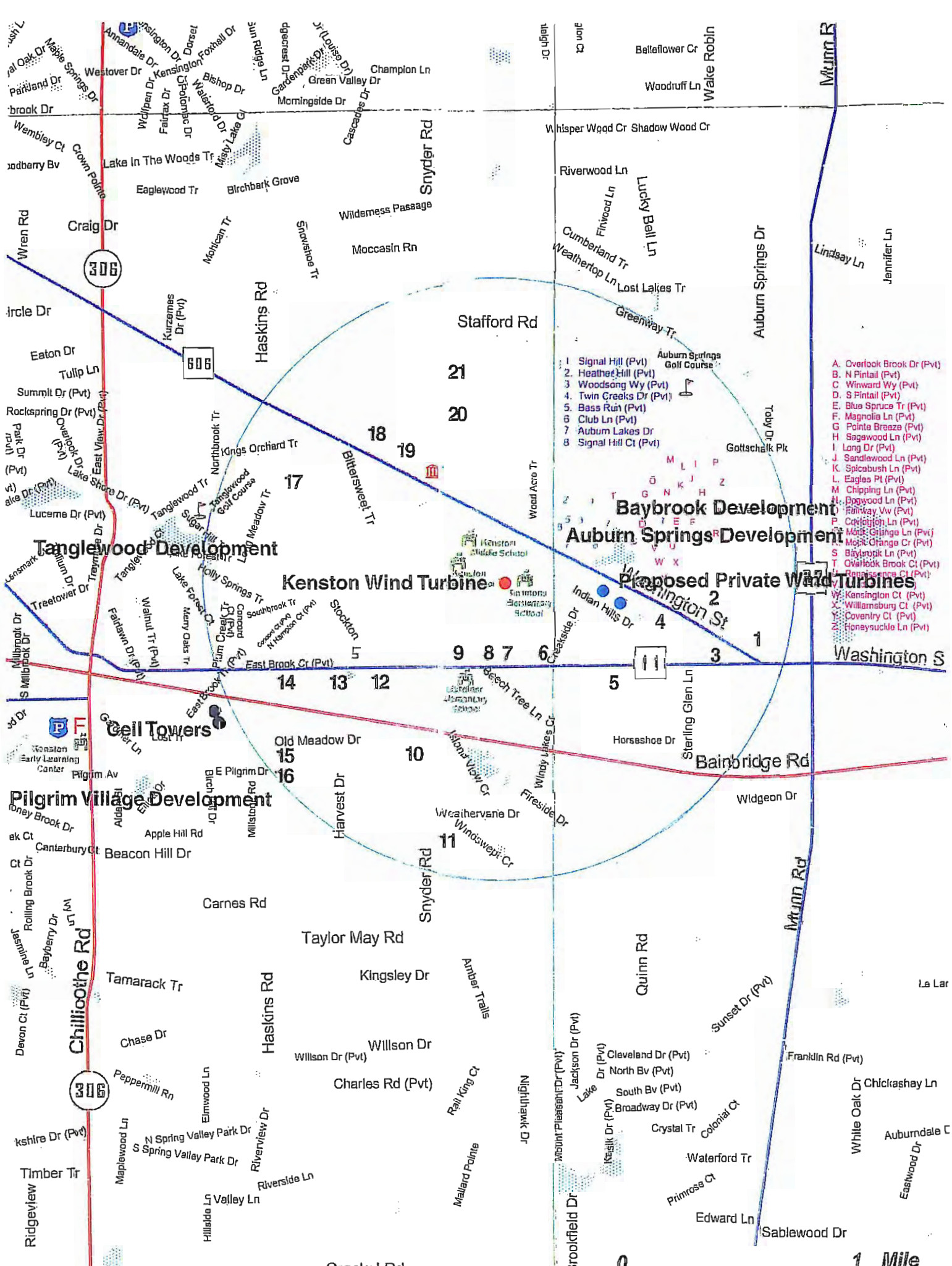
Expanded Area of Potential Effect

Exhibit 9

Expansion of the Area of Potential Effect

Following the review of Kenston School's initial submittal, it was recommended that the Area of Potential Effect be expanded. Enclosed in this addendum is the expansion of the Area of Potential Effect to a 1.5 mile radius of the wind power project's location. The historical properties within this radius were evaluated, and historical properties that have a "Wow factor" were identified to review their impact from the Kenston wind power project. (*Exhibit 9*) As stated in the initial submittal, the impact of noise, vibration or visibility will have minimal effect on the ambiance of the historical structures in the community. The lights and sounds of the community stadium events that occur annually in our stadium and surrounding properties, as well as the physical presence of our school facilities and their related activities, already make our campus a very busy community. In the expanded 1.5 mile range and assessing the historical properties, specifically the properties with a potential "Wow factor", no factors were noted having an adverse effect from Project K2. In addition, the expanded review also re-evaluated the List of Natural Historic Properties. There was one historic farm property listed in Bainbridge without an address. The Ohio Historical Society indicated that the address was confidential, but clearly beyond the 1.5 mile scope of our review.

Over the past 2½ years, the local media has performed an excellent job reporting the status of Project K2. **There have been many conversations with the Bainbridge Township Trustees and the Bainbridge Zoning Department and all have provided approval to proceed**. Consultation with the President of the Bainbridge Historical Society, countless public meetings of the Kenston Board of Education and meetings with local civic groups and citizen advisory committees have clearly met the standard of public impact. In 2½ years, the public discussion of Project K2 has failed to produce one comment concerning the negative effects on historic properties. Kenston Schools, with the test of time, has reached the conclusion that our wind power project has met your standards and we qualify for federal stimulus grant funds.


Kenston Wind Turbine
Proposed Private Wind Turbines
Baybrook Development
Auburn Springs Development
Tanglewood Development
Pilgrim Village Development
Cell Towers
Stafford Rd
Haskins Rd
Snyder Rd
Bainbridge Rd
Washington St
Auburn Springs Dr
Mumn Rd
Chillicothe Rd
Taylor May Rd
Carnes Rd
Crackel Rd
Kenston Middle School
Kenston Early Learning Center
Auburn Springs Golf Course
Tanglewood Golf Course
Kenston Wind Turbine
Proposed Private Wind Turbines
Baybrook Development
Auburn Springs Development
Tanglewood Development
Pilgrim Village Development
Cell Towers
Stafford Rd
Haskins Rd
Snyder Rd
Bainbridge Rd
Washington St
Auburn Springs Dr
Mumn Rd
Chillicothe Rd
Taylor May Rd
Carnes Rd
Crackel Rd
Kenston Middle School
Kenston Early Learning Center
Auburn Springs Golf Course
Tanglewood Golf Course
1. Signal Hill (Pvt)
2. Heather Hill (Pvt)
3 Woodsong Wy (Pvt)
4. Twin Creeks Dr (Pvt)
5. Bass Run (Pvt)
6 Club Ln (Pvt)
7 Auburn Lakes Dr
8 Signal Hill Ct (Pvt)
A. Overlook Brook Dr (Pvt)
B. N Pintail (Pvt)
C Winward Wy (Pvt)
D. S Pintail (Pvt)
E. Blue Spruce Tr (Pvt)
F. Magnolia Ln (Pvt)
G Pointe Breeze (Pvt)
H Sagewood Ln (Pvt)
I Long Dr (Pvt)
J Sandlewood Ln (Pvt)
K. Spicebush Ln (Pvt)
L. Eagles Pt (Pvt)
M Chipping Ln (Pvt)
N. Dogwood Ln (Pvt)
O Fairway Vw (Pvt)
P Coventon Ln (Pvt)
Q Mark Grange Ln (Pvt)
R Mark Grange Cr (Pvt)
S Baybrook Ln (Pvt)
T Overlook Brook Ct (Pvt)
U Renaissance Ct (Pvt)
V Kensington Ct (Pvt)
W Williamsburg Ct (Pvt)
X Coventry Ct (Pvt)
Y Honeysuckle Ln (Pvt)
Z Honeysuckle Ln (Pvt)
0
1 Mile

1

Year Built: 1846
Remodeled: 1867/1976

2

Year Built: 1890
Remodeled: 1977/2004

3

Year Built: 1848 Remodeled: 1997

4

Year Built: 1928 Remodeled: na

5

Year Built: 1900 Remodeled: 1990

6

Year Built: 1900 Remodeled: 1960

Year Built: 1900 Remodeled: 1960

Year Built: 1893 Remodeled: 1999

Year Built: 1900 Remodeled: 1960

Year Built: 1830 Remodeled: 2003

Year Built: 1860 Remodeled: 2003

Year Built: 1854 Remodeled: na

13

Year Built: 1906 Remodeled: na

14

Year Built: 1871 Remodeled: 1996

15

Year Built: 1847 Remodeled: 1978

16

Year Built: 1901 Remodeled: 1992

17

Year Built: 1843 Remodeled: 1976

18

Year Built: 1837 Remodeled: 1950

19

Year Built: 1837 Remodeled: 1950

20

Year Built: 1842 Remodeled: 1947

21

Year Built: 1827 Remodeled: 1991

Parcel	Location Address	Owner Name	yearbuilt	map key #
01-015000	10016 BAINBRIDGE RD	CHILDS VIOLET G	1955	
01-063700	10033 BAINBRIDGE RD	LENART ANDREW J & DARLENE M	1949	
01-034700	10050 BAINBRIDGE RD	PAVLIK JEANNE E TOD	1848	3
01-104400	10051 BAINBRIDGE RD	KLONOWSKI TIMOTHY J	1955	
01-023851	10071 BAINBRIDGE RD	GRAHAM JONATHAN D & GLORY P	1890	
02-291400	8835 BAINBRIDGE RD	AUNGST DEAN W JACQUELYN	1950	
02-173600	8861 BAINBRIDGE RD	TAYLOR OAKS PROPERTIES LLC	1956	
02-198700	8915 BAINBRIDGE RD	CUTLIP GARY D & JANET R	1901	
02-071450	9011 BAINBRIDGE RD	PELANDER CAROL P & NATIONAL CITY BANK T	1871	14
02-318900	9022 BAINBRIDGE RD	MESEC JEFFREY J & SANDRA A	1958	
02-094100	9060 BAINBRIDGE RD	DITTRICH ROBERT	1958	
02-419782	9099 BAINBRIDGE RD	SPRIGGS JAMES M & LINDA M	1906	
02-215100	9188 BAINBRIDGE RD	AL ROUSAN MOUTASEN	1960	
02-139800	9191 BAINBRIDGE RD	GREEN WILLIAM M	1854	12*
02-049010	9228 BAINBRIDGE RD	BUETTNER RICHARD L & BEVERLY A	1950	
02-159000	9238 BAINBRIDGE RD	HEIN WILLIAM H & IRENE M	1950	
02-135000	9298 BAINBRIDGE RD	GLOVA FRANCES T TOD	1900	
02-114220	9388 BAINBRIDGE RD	ZEMLJC FRANK I I	1926	9
02-201000	9518 BAINBRIDGE RD	WHITE ANDREW D & HEATHER J	1857	8
02-213200	9536 BAINBRIDGE RD	SCHMIDT STUART D & LINDA S	1900	
02-083100	9554 BAINBRIDGE RD	HARRIS PAUL E & KROTZER PAMELA S	1940	7
02-168100	9574 BAINBRIDGE RD	CAPITO DINO & JOYCE ANN TRUSTEES	1893	6
01-074800	9768 BAINBRIDGE RD	PIRAINO FRANK J & MARY ELLEN	1846	
01-007900	9799 BAINBRIDGE RD	THROCKMORTON PAUL E & ELAINE N	1900	5
01-117889	9889 BAINBRIDGE RD	BAINBRIDGE EQUESTRIAN CENTER INC	1901	
01-060800	9980 BAINBRIDGE RD	TAYLOR SETH & REBECCA LYNN	1928	
* listed on www.bainbridgememory.org				

Parcel	Location Address	Owner Name	yearbuilt	map key #
01-082100	10089 WASHINGTON ST	REILING LOUISE M	1953	
01-066900	10106 WASHINGTON ST	SKALSKY JOSEPH E	1943	
01-000100	10114 WASHINGTON ST	LARUE ANNE M TRUSTEE	1944	
01-012300	10204 WASHINGTON ST	CATHAN RUTH L TRUSTEE	1846	1
02-288300	9268 WASHINGTON ST	JOSEPH LINDA J	1945	18/19
02-342200	9413 WASHINGTON ST	SPRUTE FRITZ A & KATHERINE C	1942	
02-199800	9416 WASHINGTON ST	KOCH ROBERT TOD	1945	
02-012410	9432 WASHINGTON ST	ALADOR KENNELS INC	1932	
02-394100	9451 WASHINGTON ST	VORTEX LAND DEVELOPMENT LLC	1942	
02-080500	9490 WASHINGTON ST	KOVACH ROBERT M & ELAINE M	1941	
02-271700	9519 WASHINGTON ST	APEL ZEEV & COHEN BRACHA	1950	
02-417500	9536 WASHINGTON ST	FLANAGAN JANET A TRUSTEE	1950	
02-402600	9550 WASHINGTON ST	MOOR JEREMY S & TRISTAN C	1940	
02-029700	9551 WASHINGTON ST	FOLTZ RICHILYN TOD	1958	
02-235600	9564 WASHINGTON ST	MARSEY EDWARD L	1956	
02-187300	9584 WASHINGTON ST	KALEJS ANDRIS GEORGE & ZUIKA MAIJI	1955	
01-084000	9705 WASHINGTON ST	RAMSEY FLOYD E & HELEN L	1857	
01-000050	9809 WASHINGTON ST	RYLYND PROPERTIES LLC	1923	4
01-045850	9911 WASHINGTON ST	FIRST RICHARD C SR CAROL H	1920	
01-118474	9936 WASHINGTON ST	AUBURN PINES LLC	1930	
01-059200	9990 WASHINGTON ST	MANTUSH GAYLE O TOD	1890	2

Parcel	Location Address	Owner Name	yearbuilt	map key #
01-072200	10001 STAFFORD RD	METRO MACHINE & TOOL CO INC	1925	
01-008600	10221 STAFFORD RD	BROCKWAY ALTON L	1932	
01-072600	10235 STAFFORD RD	MILES ROBERT A TRUSTEE	1901	
01-044001	10295 STAFFORD RD	STAFFORD L P AN OHIO LTD PARTNERSHIP	1875	
01-039700	10300 STAFFORD RD	FUGMAN JEAN LENORE AKA JEAN L	1932	
01-109500	10535 STAFFORD RD	VARGO THERESA AKA THERESA A	1885	
01-025400	10546 STAFFORD RD	DREES VICTORIA & KENNETH P	1922	
01-085200	10586 STAFFORD RD	THOMPSON JOCK E & JANET W	1942	
01-002300	10601 STAFFORD RD	PHILLIPS PAUL A	1954	
01-074300	10616 STAFFORD RD	THOMPSON JOCK E & JANET W	1936	
01-109100	10722 STAFFORD RD	RYAN DALE R & BETH L	1860	
01-065200	11181 STAFFORD RD	MULLEN JOHN J JR	1860	
01-083500	11186 STAFFORD RD	PULSFORD & SARGENT CORP	1860	
01-035300	11445 STAFFORD RD	LOSIK RONALD J & MARGARET	1850	
01-109000	11562 STAFFORD RD	GAMBINO JOSEPH N	1900	
01-013000	11970 STAFFORD RD	CAVANAGH RENTALS LTD	1956	
01-029250	12117 STAFFORD RD	HUDDLESTON DAVID A & MILLER AMY J	1957	
01-050105	12231 STAFFORD RD	JACOBS BERNICE C	1948	
01-114900	12284 STAFFORD RD	ZADNIK VALENTINE E & DONNA L TRUSTEES	1850	
01-091600	12394 STAFFORD RD	SIMPSON ROBERT E	1850	
01-061600	12471 STAFFORD RD	HAHN BYRON G	1951	
02-169200	9215 STAFFORD RD	WALTZ KATHLEEN J	1949	
02-085900	9251 STAFFORD RD	CHANNING JEFFREY S &	1948	
02-234700	9262 STAFFORD RD	MAROUS DONALD F & FAZIO LOIS L	1958	
02-118300	9295 STAFFORD RD	IVANEC THOMAS J	1954	
02-259500	9325 STAFFORD RD	MULDOON ELIZABETH W & MARK D	1957	

Parcel	Location Address	Owner Name	yearbuilt	map key #
02-155800	17199 HASKINS RD	HASKINS ROBERT W JANICE J	1843	17*
02-225400	17409 HASKINS RD	SMITH DWIGHT & LAURA	1957	
02-156700	17465 HASKINS RD	BEGAM WILLIAM S & BARBARA L	1957	
02-168500	17525 HASKINS RD	DADDARIO THOMAS A & COLLEEN O	1956	
02-020400	17583 HASKINS RD	BATCHELOR DOROTHY M & JOHN E	1956	
02-236200	17615 HASKINS RD	MARTELL GARY R & VELVA G	1955	
02-236100	17633 HASKINS RD	MARTELL ALAN A TRUSTEE	1955	
02-114400	17649 HASKINS RD	FICK EVERETT S & HULDA M	1959	
02-122810	17665 HASKINS RD	HARTMAN SCOTT C	1954	
02-295200	17675 HASKINS RD	BOLES STEPHANIE REEVE	1925	
02-394140	17790 HASKINS RD	JEFFERSON RUTH E	1948	
02-135930	17805 HASKINS RD	WERNER HENRY & KATHLEEN M	1952	
02-145800	17833 HASKINS RD	RIFFLE ROBERT DYKE	1940	
02-340090	17885 HASKINS RD	GHOLSON LARRY A	1847	15
02-112200	17888 HASKINS RD	FAKADEJ MITCHELL & JEANETTE	1951	
02-363300	17969 HASKINS RD	PIUNNO FAMILY PROPERTIES LLC	1901	16

Parcel	Location Address	Owner Name	yearbuilt	map key #
02-410100	17093 SNYDER RD	WISNIEWSKI MARIE J & EDWARD J	1827	21
02-216200	17151 SNYDER RD	LEONARD DENNIS W	1956	
02-319900	17173 SNYDER RD	MC CABE WINIFRED SCHELL TRUST & SCHELL JOHN	1842	20
02-059200	17215 SNYDER RD	KYLE BRIAN S & DANIELLE D	1901	
02-250200	17279 SNYDER RD	CHAGRIN VALLEY ATHLETIC CLUB INC	1945	
02-033800	17328 SNYDER RD	CHAGRIN VALLEY ATHLETIC CLUB INC	1955	
02-381200	17339 SNYDER RD	VIST ROSEMARIE A	1955	
02-217400	17346 SNYDER RD	BESSETTE CHERYL ANN	1956	
02-214750	17372 SNYDER RD	LAUER CAROL L TRUSTEE	1954	
02-329200	17375 SNYDER RD	DUROSS DEREK S & HOPE M	1956	
02-267830	17383 SNYDER RD	SMITH JAMES H KELLY	1943	
02-411550	17406 SNYDER RD	LEFFLER JAMES M & CAROLYN TRUSTEES	1900	
02-352700	17410 SNYDER RD	KOLTAS GREGORY W & LINDA	1900	
02-172700	17430 SNYDER RD	HUNKAR CLARA TOD	1910	
02-261460	17446 SNYDER RD	NADRATOWSKI NANCY P	1956	
02-118750	17460 SNYDER RD	ECKARD ERIC GLENN & RONI JOYCE	1954	
02-149700	17520 SNYDER RD	BAUER HAROLD S & HAWK BAUER EMILY R	1955	
02-200200	17574 SNYDER RD	KOELKEBECK NICHOLAS H SR SR & SHARLENE G CO TRUST	1955	
02-308450	17590 SNYDER RD	ROTH STEVEN BRUCE TRUSTEE	1958	
02-087600	17620 SNYDER RD	HUMMER JOHN A & GAVELDA PAMELA	1959	
02-093100	17636 SNYDER RD	DICZHAZY RAYMOND B & CAROLYN K	1958	
02-063570	17650 SNYDER RD	CRUM JAMES F	1950	
02-297320	17688 SNYDER RD	RENARD DAVID M & CYNTHIA L	1930	
02-037400	17695 SNYDER RD	REITZ ROBERT W & CAROLE L	1901	
02-337700	17785 SNYDER RD	CAIN JAMES ROGER	1959	
02-272810	17813 SNYDER RD	VELEBA CAROL A	1959	
02-415600	17829 SNYDER RD	SNYDER THOMAS & CHARLEEN M	1956	
02-420765	17888 SNYDER RD	SMITH ROBERT G	1830	10
02-015800	18059 SNYDER RD	RODGERS YOUNG S	1957	
02-102100	18121 SNYDER RD	STREET NANCY S	1958	
02-102123	18157 SNYDER RD	MOREY STEVEN C & LISA M	1860	11
02-318400	18311 SNYDER RD	MAGOVICH DANIEL J	1850	

KENSTON SCHOOLS

Noise Analysis

Exhibit 10

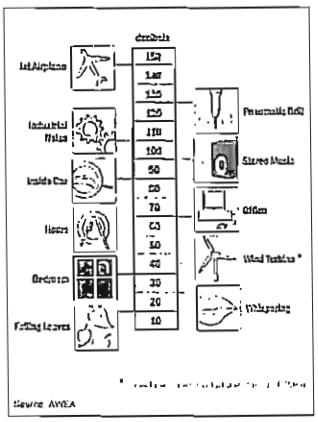
8281 Euclid Chardon Road, Suite E
Kirtland, Ohio 44094
Office: 440-256-2800
Fax: 814-284-2800
Info@ConserveFirst.com

June 14, 2010

RE: Kenston Wind Turbine Project, Sound Levels Over Distance

To Whom It May Concern,

Please accept this letter as confirmation that the planned Kenston Schools Bonus 600kW wind turbine will not have a sound pressure level of more than 45dB under normal operating conditions beyond the school's property limits. This level is below the residential zoning limits of the area, well below typical neighborhood noise levels such as air-conditioning units and well below the ambient noise levels typical of the public roads that surround the school's campus. For reference sound levels and local roads and residence proximities, see the charts below:



Road Name	Alternate Name	Closest Distance to Turbine (@Feet)	Closest Residence on Road to Turbine (@Feet)
Snyder Road	Township Highway 192	788	924
East Washington Street	NA	1280	1198
Indian Hills Drive	Township Highway 592	2243	2098
Bainbridge Road	County Road 11	2267	2107
Creekside Drive	NA	2858	2704

Sound pressure levels drop by approximately 6.02 dB every doubling of distance from the source as illustrated in the chart on the next page.

Distance From Source (Meters)	Distance From Source (Feet)	Sound Pressure Level (dB)
0.30	1	100
0.61	2	93.98
1.22	4	87.96
2.44	8	81.94
4.88	16	75.92
9.76	32	69.9
19.51	64	63.88
39.02	128	57.86
78.05	256	51.84
156.10	512	45.82
312.20	1024	39.8
624.39	2048	33.78
1248.78	4096	27.76
2497.56	8192	21.74
4995.12	16384	15.72
9990.24	32768	9.7
19980.49	65536	3.68

Based on the local proximities and the ambient noise levels typical of the area, it is highly unlikely the turbine will even be audible beyond the school's property limits.

As always, feel free to call with any questions.

Sincerely,

AAron Godwin, Founder
The Renaissance Group
8281 Euclid Chardon Road, Suite E
Kirtland, Ohio 44094
Office: 440-256-2800
Fax: 814-284-2800
Mobile: 216-832-1931
AAron@ConserveFirst.com

OHIO HISTORY

June 7, 2010

Robert A. Lee, Ph. D.
Kenston Board of Education
17419 Snyder Road
Chagrin Falls, OH 44023

Re: K2 – Kilowatts for Kenston – Section 106 Review

Dear Dr. Lee;

This is in response to your correspondence, received on May 27, 2010 regarding the expenditure of EECBG funds at this address. My comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

As stated in my email on June 2, 2010, based on the information provided, we are unable to agree with your determination of No Adverse Effect. At this time, our concerns revolve around the determination of the Area of Potential Effects (APE) for you undertaking.

From what we can tell, your submission considers only the effects of the proposed turbine on properties immediately adjacent to the school complex acreage, about ½ mile away from the installation location. I ran a view shed analysis for an individual of a height of 5' 6" to a range of 3 miles. Your proposed 190 foot turbine could be visible in well over half of the area. Knowing this, it makes sense to extend the APE, for this undertaking as we know it will cause effects well beyond the borders of your school complex.

Another concern we have is that visual effects appear to be the only indirect effects considered to be a product of this undertaking. What about noise? What about vibration? We would like to see these addressed.

Finally, with an expanded APE there will be more properties located within the APE than those you have documented to this point. A historic survey will need to be done for the expanded APE. At your convenience, we can talk about how to complete a survey over a larger APE, or you may wish to hire a consultant. Information is available on our website to help guide you through the process of finding and hiring a consultant at http://www.ohiohistory.org/resource/histpres/services/index.html.

As always, if you have any questions, please contact me at (614) 298-2000, or by email at lsegna@ohiohistory.org.

Sincerely,

Laura Segna

Laura Segna, Project Reviews Manager
Resource Protection and Review

CC: Greg Payne, ODOD

2010-LUC-10094 Seq #3

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office

OHIO HISTORIC PRESERVATION OFFICE: RESOURCE PROTECTION AND REVIEW

Section 106 Review - Project Summary Form

For projects requiring a license from the Federal Communications Commission, please use FCC Forms 620 or 621. DO NOT USE THIS FORM.

SECTION 1: GENERAL PROJECT INFORMATION

All contact information provided must include the name, address and phone number of the person listed. Email addresses should also be included, if available. Please refer to the Instructions or contact an OHPO reviewer (mailto:Section106@ohiohistory.org) if you need help completing this Form. Unless otherwise requested, we will contact the person submitting this Form with questions or comments about this project.

Date: **May 25, 2010**

Name/Affiliation of person submitting form: **Robert A. Lee, Ph.D.**

Mailing Address: **Kenston Local School District, 17419 Snyder Road, Chagrin Falls, OH 44023**

Phone/Fax/Email: **(440) 543-9677 (440) 543-8634**
bob.lee@kenstonlocal.org

A. Project Info:

1. This Form provides information about:
   New Project Submittal:
   YES ☒ NO ☐

   Additional information relating to previously submitted project:
   YES ☐ NO ☒

   OHPO/RPR Serial Number from previous submission:

2. Project Name (if applicable):
   Project K2 (Kilowatts for Kenston)

3. Internal tracking or reference number used by Federal Agency, consultant, and/or applicant to identify this project (if applicable):

B. Project Address or vicinity:
17425 Snyder Road

C. City/Township:
Chagrin Falls (Bainbridge Township)

D. County:
Geauga

E. Federal Agency and Agency Contact. *If you do not know the federal agency involved in your project, please contact the party asking you to apply for Section 106 Review, not OHPO, for this information. HUD Entitlement Communities acting under delegated environmental review authority should list their own contact information.*

Kenston applied to ARRA Stimulus Renewable Energy Grant being administered by the Ohio Department of Development.

F. Type of Federal Assistance. *List all known federal sources of federal funding, approvals, and permits to avoid repeated reviews.*

Kenston is one of 15 finalists for the ARRA Renewable Energy Grant.

G. State Agency and Contact Person (if applicable):
James Huth, Ohio Department of Development

H. Type of State Assistance:

State aid through cooperative partnership with Cleveland State University

I. Is this project being submitted at the direction of a state agency **solely** under Ohio Revised Code 149.53 or at the direction of a State Agency? *Answering yes to this question means that you are sure that no federal funding, permits or approvals will be used for any part of your project, and that you are seeking comments only under ORC 149.53.*

YES ☐ NO ☒

J. Public Involvement- Describe how the public has been/will be informed about this project and its potential to affect historic properties. Please summarize how they will have an opportunity to provide comments about any effects to historic properties. (This step is required for all projects under 36 CFR § 800.2):

Project K2 has been discussed in our community for since October 2005. Exhibit 1 contains a list of public meetings and newspaper articles concerning Project K2.

K. Please list other consulting parties that you have contacted/will contact about this project, such as Indian Tribes, Certified Local Governments, local officials, property owners, or preservation groups. (See 36 CFR § 800.2 for more information about involving other consulting parties). Please summarize how they will have an opportunity to provide comments:

Bainbridge Twp, Geauga Cty Dept. of Development, Congressman LaTourette, Congresswoman Sutton and Senator Brown.

Kenston has also received approval from the Bainbridge Zoning Department (Exhibit 2) and a letter from the President of the Bainbridge Township Historical Society (Exhibit 3).

SECTION 2: PROJECT DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)

Provide a description of your project, its site, and geographical information. You will also describe your project's Area of Potential Effects (APE). Please refer to the Instructions or contact an OHPO reviewer if you need help with developing the APE or completing this form.

Section 2: Project Description and Area of Potential Effects (APE)

The Kenston Local School District is a Kindergarten through Grade 12 public educational school district. The school district boundaries encompass Auburn Township and most of Bainbridge Township. Auburn and Bainbridge Townships are located in the southeast corner of Geauga County, Ohio. The school district was founded in 1953 through the consolidation of the Auburn and Bainbridge schools.

Today, Kenston Schools has an enrollment of 3,137 students. In 2002, a school facility bond issue was passed which created a campus that houses all of our school buildings. The bond issue resulted in the construction of a new high school that opened in 2006. The old high school now houses middle school students (grades 6-8); the middle school was converted into an intermediate school for grades 4 & 5; Timmons Elementary houses grades 1-3 and Gardiner Elementary educates Pre K-Kindergarten students.

During the construction phase of Kenston High School, interest grew in wind power and other renewable energy projects. In 2005, studies were initiated with consultants to assess the feasibility of wind power on our campus. A state grant was secured from Green Energy Ohio to perform a year long wind study during the summer of 2007. The wind study instrumentation was installed on the 140 ft. WKHR radio station tower located on the top of Kenston Middle School. WKHR (91.5 FM) is a community/student radio station that has been in operation for over 30 years. Green Energy Ohio and the Kenston High School Envirothon Club collected the data.

Following the wind study, the wind project was deemed to be beneficial both economically and educationally. Kenston received grants from the Cleveland Foundation and State of Ohio – Cleveland State University. Late in 2009, Kenston also became a finalist in the federal ARRA renewable energy grant program. From these funding sources the wind project became a reality.

Project K2 (Kilowatts for Kenston) involves the construction of a 600kW wind turbine on the Kenston campus. The most viable location is determined to be the football practice field adjacent to the Kenston Community Athletic Stadium. The position also was viewed as favorable due to its distance from school property lines. The 189 acre campus provided the opportunity to use the school facilities that surround the stadium to serve as a buffer to its neighbors. A detailed description of Project K2 that was submitted to the Bainbridge Zoning Department can be found in Exhibit 4, Zoning Department Application.

The Area of Potential Effects was determined to be Kenston 189 acre property plus the properties that are located on Bainbridge Road, Snyder Road and East Washington Street. From an aerial view, the area of potential impact can easily be identified and conservatively encompasses the properties that may have a view of the wind turbine.

For challenging projects, provide as much information as possible in all sections, and then check the box in Section 5.A. to ask OHPO to offer preliminary comments or make recommendations about how to proceed with your project consultation. This is recommended if your project involves effects to significant historic properties or if there may be challenging procedural issues related to your project. Please note that providing information to complete all Sections will still be required and that asking OHPO for preliminary comments may tend to delay completion of the review process for some projects.

A. Does this project involve any Ground-Disturbing activity: YES ☒ NO ☐
(If **Yes**, you must complete all of Section 2.A. If **No**, proceed directly to Section 2. B.)

1. General description of width, length and depth of proposed ground disturbing activity:
Circular hole 30ft. diameter; 30ft. depth

2. Narrative description of previous land use and past ground disturbances, if known:
The wind turbine will be located on a football practice field adjacent to the community athletic stadium.

3. Narrative description of current land use and conditions:
The Kenston Schools has a 189 acre campus which houses the high school, middle school, intermediate school and elementary school. Located in the center of the campus are the Transportation bus yard and stadium.

4. Does the landowner know of any archaeological resources found on the property?
YES ☐ NO ☒ If yes, please describe:

B. Submit the exact project site location on a USGS 7.5-minute topographic quadrangle map for all projects. Map sections, photocopies of map sections, and online versions of USGS maps are acceptable as long as the location is clearly marked. Show the project's Area of Potential Effects (APE). It should be clearly distinguished from other features shown on the map:

1. USGS Quad Map Name:
South Russell, Geauga County, Ohio (Exhibit 5)

2. Township/City/Village Name:
Bainbridge Township, Ohio 44023

C. Provide a street-level map indicating the location of the project site; road names must be identified and legible. Your map must show the exact location of the boundaries for the project site. Show the project's Area of Potential Effects (APE). It should be clearly distinguished from other features shown on the map: **(Exhibit 6)**

D. Provide a verbal description of the APE, including a discussion of how the APE will include areas with the potential for direct and indirect effects from the project. Explain the steps taken to identify the project's APE, and your justification for the specific boundaries chosen:

The Area of Potential Impact was evaluated and determined to be the 189 acre campus plus the residences that directly border the campus. The Kenston campus is framed in by these three roads and property on Bainbridge Road, Snyder Road and East Washington Street. The

strategic location of the wind turbine next to the Kenston Community Athletic Stadium allows our school facilities, stadium lights/stands, tennis courts, WKHR radio tower and bus garage to buffer this project from our neighbors. The impact of this turbine will be consistent with the tower structure of stadium lights and radio station tower that already populate the skyline.

Based on the rationale discussed above and pictures, maps and drawings documentation contained in our documentation, Kenston respectfully submits this delineation for your consideration.

This area was selected because of the turbine location near the center of the school campus. Surrounding the turbine site to the west is the Kenston Middle School, WKHR Radio Station tower, tennis courts, and bus pickup parking lot. Timmons Elementary School, community athletic stadium, baseball fields and bus pickup zones border the eastern part of the turbine site. To the south, Kenston High School, soccer/baseball fields, student/faculty parking and bus pickup zone buffer this area. And lastly, the northern area contains Kenston Intermediate School, bus parking lot, bus maintenance garage and stadium. The 6 light towers at the stadium are approximately 80 ft. in height and WKHR radio station tower is 140 ft.

E. Provide a detailed description of the project. This is a critical part of your submission. Your description should be prepared for a cold reader who may not be an expert in this type of project. The information provided must help support your analysis of effects to historic properties, not other types of project impacts. Do not simply include copies of environmental documents or other types of specialized project reports. If there are multiple project alternatives, you should include information about all alternatives that are still under active consideration:

Kenston's Project K2 is constructing a 600kW wind turbine with a tower height of 160-190 ft. This turbine is designed to provide about 50% of Kenston High School electrical power. In addition, the wind turbine will also be part of an on-site laboratory for Kenston students as well as engineering students from Cleveland State University.

The WKHR radio station tower (located on top of the Kenston Middle School) also has wind study instrumentation that was installed about two years ago. Our high school Envirothon Club has collected the data for Green Energy Ohio. This year, Green Energy Ohio donated the wind study instrumentation to Kenston and it remains in use on the radio station tower. The wind project is part of Kenston's "Going Green" initiatives. Besides energy conservation projects, Kenston has the first hybrid bus in Ohio. We also plan to add solar projects to our campus.

SECTION 3: IDENTIFICATION OF HISTORIC PROPERTIES

Describe whether there are historic properties located within your project APE. To make that determination, use information generated from your own Background Research and Field Survey. Then choose one of the following options to report your findings. Please refer to the Instructions and/or contact an OHPO reviewer if you are unsure about how to identify historic

properties for your project.

If you read the Instructions and you're still confused as to which reporting option best fits your project, or you are not sure if your project needs a survey, you may choose to skip this section, but provide as much supporting documentation as possible in all other Sections, then check the box in Section 5.A. to request preliminary comments from OHPO. After reviewing the information provided, OHPO will then offer comments as to which reporting option is best suited to document historic properties for your project. Please note that providing information to complete this Section will still be required and that asking OHPO for preliminary comments may tend to delay completion of the review process for some projects.

Recording the Results of Background Research and Field Survey:

A. **Summary of discussions and/or consultation with OHPO** about this project that demonstrates how the Agency Official and OHPO have agreed that no Field Survey was necessary for this project (typically due to extreme ground disturbance or other special circumstances). Please **attach copies** of emails/correspondence that document this agreement. You must explain how the project's potential to affect both archaeological and historic resources were considered.

B. **A table that includes the minimum information** listed in the OHPO Section 106 Documentation Table (which is generally equivalent to the information found on an inventory form). This information must be printed and mailed with the Project Summary Form. To provide sufficient information to complete this Section, you must also include summary observations from your field survey, background research and eligibility determinations for each property that was evaluated in the project APE.

C. **OHI (Ohio Historic Inventory) or OAI (Ohio Archaeological Inventory) forms**- New or updated inventory forms may be prepared using the OHI pdf form with data population capabilities, the Internet IForm, or typed on archival quality inventory forms. To provide sufficient information to complete this Section, you must include summary observations from your field survey and background research. You must also include eligibility determinations for each property that was evaluated in the project APE

D. **A historic or archaeological survey report** prepared by a qualified consultant that meets professional standards. The survey report should meet the Secretary of the Interior's Standards and Guidelines for Identification and OHPO Archaeological Guidelines. You may also include new inventory forms with your survey, or update previous inventory forms. To complete this section, your survey report must include summary observations from your field survey, background research and eligibility determinations for each property that was evaluated within the APE.

E. **Project Findings**. Based on the conclusions you reached in completing Section 3, please choose one finding for your project. There are (mark one):
   - ☒ Historic Properties Present in the APE:
   - ☐ No Historic Properties Present in the APE:

SECTION 4: SUPPORTING DOCUMENTATION

This information must be provided for all projects.

A. Photographs must be keyed to a street-level map, and should be included as attachments to this application. Please label all forms, tables and CDs with the

Section 3: Identification of Historic Properties

Recording the Results of Background Research and Field Survey:

A. Summary of Discussions

Since the receipt of the April 19, 2010 letter from the Ohio Historical Society, Kenston Schools have had several phone conversations with Laura Segna, project Review Manager, about our submittal. Per our conversation, there are no areas noted that could be identified as archaeological. However, using the criteria of 50 years or older, there are residential structures and a school building that are identified. The phone conversations did not eliminate the need to inventory the historic resources bordering and/or within the area of potential impact.

B. A table that includes the minimum information...

Under this section, the Kenston Schools will submit the pictures of homes and school building(s) in the area of potential impact. In addition to the photos, there will be geographic locations, ages, topographical maps, architectural site renderings and ages of the structures. It is hoped that the information provided in our research and field study will be sufficient for the Ohio Historical Society to review and process our Project Summary Form.

Exhibit 7 – Area of Impact Property Inventory

date of your submission and project name, as identified in Section 1. You must present enough documentation to clearly show existing conditions at your project site and convey details about the buildings, structures or sites that are described in your submission. Faxed or photocopied photographs are not acceptable. See Instructions for more info about photo submissions or 36 CFR § 800.11 for federal documentation standards.

1. Provide photos of the entire project site and take photos to/from historic properties from/towards your project site to support your determination of effect in Section 5.
2. Provide current photos of all buildings/structures/sites described. **(Exhibit 7)**

B. Project plan, specifications, site drawings and any other media presentation that conveys detailed information about your project and its potential to affect historic properties.

C. Copies or summaries of any comments provided by consulting parties or the public. **(Exhibit 3)**

SECTION 5: DETERMINATION OF EFFECT

A. **Request Preliminary Comments.** For challenging projects, provide as much information as possible in previous sections and ask OHPO to offer preliminary comments or make recommendations about how to proceed with your project consultation. This is recommended if your project involves effects to significant historic properties, if the public has concerns about your project's potential to affect historic properties, or if there may be challenging procedural issues related to your project. Please be aware that providing information in all Sections will still be required and that asking OHPO for preliminary comments may tend to delay completion of the review process for some projects.

1. We request preliminary comments from OHPO about this project:
   YES ☐ NO ☒

2. Please specify as clearly as possible the particular issues that you would like OHPO to examine for your project (for example- help with developing an APE, addressing the concerns of consulting parties, survey methodology, etc.):

B. **Determination of Effect.** If you believe that you have gathered enough information to conclude the Section 106 process, you may be ready to make a determination of effect and ask OHPO for concurrence, while considering public comments. Please select and mark one of the following determinations, then explain the basis for your decision on an attached sheet of paper:

☐ **No historic properties will be affected** based on 36 CFR § 800.4(d) (1). Please explain how you made this determination:

☒ **No Adverse Effect** [36 CFR § 800.5(b)] on historic properties. This finding cannot be used if there are no historic properties present in your project APE. Please explain why the Criteria of Adverse Effect, [36 CFR Part 800.5(a) (1)], were found not to be applicable for your project:
In review of 36 CFR 800.51a, there were no findings of adverse effect. There was no evidence of any Indian tribe or native Hawaiian organizations in our area. The review of the National Register of Historic Places (Exhibit 8) did not identify any properties within the perview of Project K2 and

none identified that may qualify in the future. In respect to the historical properties (more than 50 years old) in and surrounding Kenston School property, Project K2 does not result in destruction, alteration or removal of said properties. The wind turbine site already has numerous athletic and educational facilities and this project only adds to the mission of the Kenston Local Schools. In summary, it is the opinion of the Kenston Local Schools that Project K2 would not create any adverse effects on the historical properties or negatively impact the historical nature of our community.

☐ **Adverse Effect** [36 CFR § 800.5(d) (2)] on historic properties. Please explain why the criteria of adverse effect, [36 CFR Part 800.5(a) (1)], were found to be applicable to your project. You may also include an explanation of how these adverse effects might be avoided, reduced or mitigated:

Please print and mail completed form and supporting documentation to:

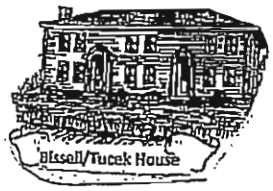
Ohio Historic Preservation Office
Attn: Mark J. Epstein, Department Head
Resource Protection and Review
1982 Velma Avenue
Columbus, OH 43211-2497

KENSTON SCHOOLS

Bainbridge Township Historical Society Letter

Exhibit 3

Exhibit 3



BAINBRIDGE TOWNSHIP HISTORICAL SOCIETY
P.O Box 23363, Chagrin Falls, OH 44023-0363

May 24, 2010

Dr. Robert A. Lee, Superintendent
Kenston Local School District
17419 Snyder Road
Chagrin Falls, Ohio 44023

Dear Dr. Lee,

The Bainbridge Township Historical Society was established in 1990 to educate the future and preserve the past. Our motto *Preserving the Past, Enriching the Future*, defines our mission. In cooperation with Bainbridge Township, we were successful in saving and moving the 175 year old Bissell-Tucek House.

I am writing this letter in support of Kenston's Wind Turbine project. As an interested resident and as president of the Bainbridge Historical Society, I am excited about this project and what it means to our community. As a member of the Bainbridge Historical Society, I am dedicated to the preservation of historical resources within Bainbridge Township. I believe that this will be a positive project for our community without any adverse effects on any historical properties.

I believe the location of the wind turbine next to the varsity football field has been well thought out. The location in the center of the school campus acts as a buffer to surrounding residences. I also believe that over time, as one of the first wind turbine projects of this size in northern Ohio, it will also one day be of historical significance.

If you have any further questions about this issue or the Bainbridge Historical Society please contact me at kkuckelheim@bainbridgememory.org.

Bainbridge Township Historical Society

Karl F. Kuckelheim, President

April 19, 2010

TO: Robert A. Lee, Ph. D.
Kenston Board of Education
17419 Snyder Road
Chagrin Falls, OH 44023

FROM: Laura Segna, Project Reviews Manager

RE: **Project K2 – Kenston, Geauga County, Ohio**

We cannot complete our review of your project at this time. Please provide our office with the following information about the proposed project:

- **List of any potential consulting parties** contacted about this project (such as local governments, property owners, historical societies or any other organizations) and any concerns they have expressed regarding this project, as described in 36 CFR 800.4(a)(3).

- **Full description of the proposed project** and any associated activities, such as excavation, demolition, construction or rehabilitation. This may include preliminary drawings, plans or specifications or a clear verbal description of the project. (Your initial submission does not tell the height of the proposed turbine.)

- **Description of the Area of Potential Effect (APE)** for the proposed project and how this APE was determined, as described in 36 CFR 800.4(a)(1). (This is where you need to address how far the turbine can be seen, heard, how far any vibrations from it may travel, etc.)

- **How you identified historic properties** that may be affected by the project and the sources from which the information was compiled, as described in 36 CFR 800.4(b). Please include a list of any previously identified historic properties that are located within or near the APE, including those you found in the OHPO building and site files.

- **Photographs showing buildings** greater than fifty years old that may be affected by the proposed project, with the address or other identifying number clearly shown on both the photos and the project map.

- **Photographs** taken from historic properties towards the project area, with the location of the proposed project clearly marked on the photograph.

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

- **Map** showing the location of all buildings more than fifty years old within the APE, clearly marked with their addresses or other identifying numbers (such as their Ohio Historic Inventory Numbers).

- **Assessment of National Register eligibility** for any property that may be subjects to effects from the proposed project, as described in 36 CFR 800.4(c).

- **Assessment of effect** for the project, using the language found in 36 CFR 800.4 and 36 CFR 800.5.
    - "No historic properties affected"
      This means that either that there are no historic properties present in the APE, or
      that the historic properties that are present will not be affected by the project.
    - "No adverse effect"
      This means that there are historic properties within the APE, but that the effects of the project on the historic properties are negligible and won't diminish their historic characteristics.
    - "Adverse effect"
      The project will have substantial effects on historic properties that should be avoided, reduced or mitigated.

If you have any questions about this letter or the review of your project, please contact a staff reviewer at 614-298-2000.

Please send the requested information to:

Mark J. Epstein, Department Head
Resource Protection and Review
Ohio Historic Preservation Office
1982 Velma Ave.
Columbus, OH 43211-2497

1030227

ARRA GRANT PROGRAM QUESTIONNAIRE
OHIO STATE HISTORIC PRESERVATION OFFICE (SHPO)

This Section to be Completed by Grantee

Grantee Name: Kenston Local Schools

Contact Person: Robert A. Lee Title: Superintendent

E-Mail Address: bob.lee@kenstonlocal.org

Project Address: 17419 Snyder Road Chagrin Falls, OH 44023

Any Alteration of Structure or Site?: Building Structure/ Site is: (Check One If Applicable)

- ☐ 50 years of age or older?
- ☐ Listed on the National Register of Historic Places?
- ☐ Located in a historic district?

If you answered positively to any of the above questions, complete **Attachment D - Historic Preservation Compliance Form**

Date: May 25, 2010

KENSTON SCHOOLS

National Register of Historic Places

Geauga County, Ohio

Exhibit 8

National Register of Historic Places

OHIO - Geauga County

Batavia House (added 1987 - **Building** - #87001213)
Also known as **James Thompson Inn;Century Inn**
14979 S. State St., Middlefield

Historic Significance: Event
Area of Significance: Exploration/Settlement
Period of Significance: 1800-1824, 1825-1849
Owner: **Local Gov't**
Historic Function: Domestic
Historic Sub-function: Hotel
Current Function: Recreation And Culture
Current Sub-function: Museum

Goodwin House B&B
Geauga County Ohio
Bed & Breakfast

Burton Village Historic District (added 1974 - **District** - #74001501)
Surrounding Public Sq., Burton

Historic Significance: Event, Architecture/Engineering, Person
Architect, builder, or engineer: Et al., Peffers,James
Architectural Style: Italianate, Queen Anne, Second Empire
Historic Person: Hickox,Eleazar
Area of Significance: Social History, Agriculture, Education, Commerce
Period of Significance: 1825-1849, 1850-1874, 1875-1899
Owner: **Private , Local Gov't**
Historic Function: Commerce/Trade, Domestic, Education, Government
Historic Sub-function: City Hall, School, Single Dwelling, Specialty Store
Current Function: Commerce/Trade, Domestic, Education, Government
Current Sub-function: Fire Station, School, Single Dwelling, Specialty Store

The Brownstone Inn
Cleveland, Ohio
Bed & Breakfast Inn

Chardon Courthouse Square District ** (added 1974 - **District** - #74001502)
Public Green, roughly bounded by Main and Center Sts., Chardon

Historic Significance: Event, Architecture/Engineering
Architect, builder, or engineer: Herrick,Rensselaer R., Herricks & Simmons
Architectural Style: Italianate, Gothic Revival
Area of Significance: Social History, Architecture, Commerce
Period of Significance: 1850-1874
Owner: **Private , Local Gov't**
Historic Function: Commerce/Trade, Government, Landscape
Historic Sub-function: Courthouse, Plaza, Specialty Store
Current Function: Commerce/Trade, Government, Landscape
Current Sub-function: Courthouse, Plaza, Specialty Store

Chester Township District School No. 2 (added 1982 - **Building** - #82001463)
Also known as **Scotland School**
7798 Mayfield Rd., Chesterland

Historic Significance: Event
Area of Significance: Education
Period of Significance: 1825-1849
Owner: **Private**
Historic Function: Education
Historic Sub-function: School
Current Function: Recreation And Culture
Current Sub-function: Museum

Hocking Hills Ohio
Millions of Years
of History on Display

Claridon Congregational Church ** (added 1974 - **Building** - #74001503)
U.S. 322, Claridon

Historic Significance: Architecture/Engineering
Architect, builder, or engineer: Unknown
Architectural Style: Greek Revival
Area of Significance: Architecture
Period of Significance: 1825-1849
Owner: **Private**
Historic Function: Religion
Historic Sub-function: Religious Structure
Current Function: Religion
Current Sub-function: Religious Structure

Harrison House
Built by Amos Solomon in
1890.

Domestic Arts Hall And Flower Hall (added 1979 - **Building** - #79001846)
N. Cheshire St, Burton

Historic Significance: Event, Architecture/Engineering
Architect, builder, or engineer: Unknown
Architectural Style: No Style Listed
Area of Significance: Agriculture, Architecture
Period of Significance: 1875-1899
Owner: **Local Gov't**
Historic Function: Recreation And Culture
Historic Sub-function: Museum
Current Function: Recreation And Culture
Current Sub-function: Museum

Fowler's Mills Historic District (added 2002 - **District** - #01001522)
10743-10779, 10750 Mayfield Rd.; 12426-12533 Fowlers Mill Rd., Chardon

Historic Significance: Event, Architecture/Engineering
Architect, builder, or engineer: Huggett, Tryon V.
Architectural Style: Greek Revival, Federal
Area of Significance: Industry, Architecture, Commerce
Period of Significance: 1825-1849, 1850-1874, 1875-1899, 1900-1924, 1925-1949
Owner: **Private , Local Gov't**
Historic Function: Commerce/Trade, Domestic, Education, Industry/Processing/Extraction, Religion
Historic Sub-function: Department Store, Manufacturing Facility, Religious Structure, School, Single Dwelling
Current Function: Commerce/Trade, Domestic, Industry/Processing/Extraction, Religion
Current Sub-function: Manufacturing Facility, Religious Structure, Single

Dwelling, Specialty Store

Fox--Pope Farm (added 1992 - **District** - #92000971)
17767 Rapids Rd., Welshfield

Historic Significance: Event, Architecture/Engineering, Person
Architect, builder, or engineer: Unknown
Architectural Style: Greek Revival
Historic Person: Multiple
Significant Year: 1845, 1865, 1820
Area of Significance: Architecture, Agriculture, Exploration/Settlement
Period of Significance: 1800-1824, 1825-1849, 1850-1874, 1875-1899, 1900-1924, 1925-1949
Owner: **Private**
Historic Function: Agriculture/Subsistence, Domestic, Industry/Processing/Extraction
Historic Sub-function: Agricultural Outbuildings, Animal Facility, Irrigation Facility, Manufacturing Facility, Secondary Structure, Single Dwelling, Storage
Current Function: Agriculture/Subsistence, Domestic
Current Sub-function: Animal Facility, Secondary Structure, Single Dwelling, Storage

Free Will Baptist Church Of Auburn (added 1976 - **Building** - #76001430)
11742 E. Washington St., Auburn Corners

Historic Significance: Event, Architecture/Engineering
Architect, builder, or engineer: Unknown
Architectural Style: Greek Revival
Area of Significance: Religion, Architecture
Period of Significance: 1825-1849
Owner: **Local Gov't**
Historic Function: Religion
Historic Sub-function: Religious Structure
Current Function: Work In Progress

Goodwin, Dr. Erastus, House (added 1975 - **Building** - #75001406)
14485 Main St., Burton

Goodwin House Bed & Breakfast - Built ca. 1828 for Dr. Erastus Goodwin, a prominent physician serving the region. Dr. Goodwin purchased the property in 1811 from William Law of the Connecticut Land Company when the area was first opened to settlers. The brick house reveals an excellent example of mortise and tenon (post and beam) joinery, as framework for the entire 4-course thick brick structure. Wood floors and trim woodwork in the house are original, with historically significant decorative trim in the parlor and master bedroom, as well as the original cherry staircase and banister.

Historic Significance: Architecture/Engineering
Architect, builder, or engineer: Unknown
Architectural Style: No Style Listed
Area of Significance: Architecture
Period of Significance: 1800-1824, 1825-1849
Owner: **Private**
Historic Function: Domestic
Historic Sub-function: Single Dwelling
Current Function: Domestic

Current Sub-function: Single Dwelling

Hathaway, Lot, House ** (added 1974 - **Building** - #74001504)
12236 Old State Rd., East Claridon

Historic Significance: Architecture/Engineering
Architect, builder, or engineer: Unknown
Architectural Style: Greek Revival, Other
Area of Significance: Architecture
Period of Significance: 1825-1849
Owner: **Private**
Historic Function: Domestic
Historic Sub-function: Single Dwelling
Current Function: Domestic
Current Sub-function: Single Dwelling

Lost Lane Farm (added 1984 - **Building** - #84003693)
Address Restricted, Chagrin Falls

Historic Significance: Architecture/Engineering, Person
Architect, builder, or engineer: Rorimer,Louis, Dercum & Beer
Architectural Style: Tudor Revival, Greek Revival
Historic Person: Rorimer,Louis
Significant Year: 1912, 1928, 1851
Area of Significance: Art, Architecture
Period of Significance: 1850-1874, 1875-1899, 1900-1924, 1925-1949
Owner: **Private**
Historic Function: Agriculture/Subsistence, Domestic
Historic Sub-function: Agricultural Outbuildings, Single Dwelling
Current Function: Agriculture/Subsistence, Domestic
Current Sub-function: Agricultural Outbuildings, Single Dwelling

Tambling, Lucius T., House (added 1984 - **Building** - #84003695)
Also known as **Tambling-Clift Home**
14025 Chillicothe Rd., Novelty

Historic Significance: Architecture/Engineering
Architect, builder, or engineer: Tambling,Lucius Tilden
Architectural Style: Greek Revival
Area of Significance: Architecture
Period of Significance: 1825-1849, 1850-1874
Owner: **Private**
Historic Function: Agriculture/Subsistence, Domestic
Historic Sub-function: Agricultural Fields, Single Dwelling
Current Function: Agriculture/Subsistence, Domestic
Current Sub-function: Agricultural Fields, Single Dwelling

White, Walter C., Estate ** (added 1976 - **Building** - #76001431)
Also known as **Circle W Farm;Hawken School**
E of Mayfield Heights at U.S. 322 and County Line Rd., Mayfield Heights

Historic Significance: Architecture/Engineering, Person
Architect, builder, or engineer: Brown,George, Walker & Weeks
Architectural Style: Other
Historic Person: White,Walter C.
Significant Year: 1929, 1917

Area of Significance: Industry, Agriculture, Architecture, Landscape Architecture
Period of Significance: 1900-1924, 1925-1949
Owner: **Private**
Historic Function: Agriculture/Subsistence, Domestic
Historic Sub-function: Agricultural Outbuildings, Animal Facility, Processing, Single Dwelling
Current Function: Education
Current Sub-function: School

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