

**TOWN OF LENOX, MASSACHUSETTS  
WIND FEASIBILITY STUDY**

Prepared for:

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## LIST OF ACRONYMS

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ACEC	Areas of Critical Environmental Concern
agl	above ground level
amsl	above mean sea level
B&V	Black & Veatch
CMR	Code of Massachusetts Regulation
EIR	Environmental Impact Report
ENF	Environmental Notification Form
FAA	Federal Aviation Administration
ft	feet/foot
GE	General Electric
Hz	hertz
I-90	Interstate Highway 90
IEC	International Electrotechnical Commission
ITC	Investment Tax Credit
kg/m <sup>3</sup>	kilograms per cubic meters
km	kilometers
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
m	meters
m/s	meters per second
MassCEC	Massachusetts Clean Energy Center
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information Systems
MEPA	Massachusetts Environmental Policy Act
MW	megawatt
MWh	megawatt-hours
NCDC	National Climatic Data Center
NED	National Elevation Dataset
NHESP	Natural Heritage and Endangered Species Program
NEXRAD	next generation radar
NOI	Notice of Intent
NRCS	National Resources Conservation Service
NWI	National Wetland's Inventory



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## **LIST OF ACRONYMS (Concluded)**

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NWS	National Weather Service
O&M	operation and maintenance
PPA	Power Purchase Agreements
PTC	Production Tax Credit
REC	Renewable Energy Credits
RERL	Renewable Energy Resource Laboratory
rpm	revolutions per minute
Site	Lenox Mountain
SODAR	sound detection and ranging
m <sup>2</sup>	square meter
TI	turbulence intensity
Town	Town of Lenox
U.S.	United States
U.S. FWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WAsP	Wind Atlas Analysis and Application Program
WESTON <sup>®</sup>	Weston Solutions, Inc.
WMECO	Western Massachusetts Electric Company
WPA	Wetlands Protection Act
WQC	Water Quality Certification
WTG	wind turbine generator
ZBA	Zoning Board of Appeals

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## EXECUTIVE SUMMARY

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## **EXECUTIVE SUMMARY**

Weston Solutions, Inc. completed a wind resource feasibility study for wind power development at Lenox Mountain (Site) for the Town of Lenox, Massachusetts (Town). Work was completed in accordance with the Commonwealth Wind Incentive Program and included the following data collection activities and analyses: a 12-month wind data acquisition campaign, concluded in March 2011; wind turbine generator siting and analysis of site physical characteristics and existing electrical infrastructure; environmental impacts and permitting; potential impacts to the community brought on by wind turbine generator (WTG) visibility and noise and shadow flicker during WTG operation; potential wind plant configuration and conceptual design; development of estimated power production; and financial analysis of the development of the Project, including projected savings and revenues for two ownership options.

In summary, based upon the data collected and technical and financial analyses presented in this report, Lenox Mountain appears to have an excellent wind resource at an 80-meter (m) hub height that is promising for either commercial or town-owned development.

### **Wind Resource**

A 1-year sound detection and ranging (SODAR) study was completed. The SODAR unit was placed at the Lenox Reservoir. Although a viable correlation between the Pittsfield National Weather Service data and the site data could not be built, the Pittsfield data were used to estimate variability. Data from the Site were compared to the long-term reference data from the Pittsfield Airport Weather Station, which shows a standard deviation of average annual speeds of 2.59%. This result was used to estimate the P90 wind speed for the Site. Results of this uncertainty assessment show a favorable resource with average annual wind speed (P50) of 8.34 meter per second (m/s) at 80 m and a P90 wind speed of 8.05 m/s, well above the 6.5 m/s standard for a viable wind resource.

### **Site Physical Characteristics**

The primary Project Site is located at approximately elevation 1,815 feet (ft) above sea level, on Lenox Mountain. The Site is owned by the Town and is used occasionally by hikers. The closest

residence to the Site is approximately 2,300 ft away. There is no development or electrical infrastructure in the immediate vicinity of the Site.

To access the Site, significant upgrades to existing roads and new access roads will need to be completed. Several access routes were considered. The most promising route appears to be to utilize West Dugway road off of Route 7 in Lenox, to West Mountain Road, then finally to Reservoir Road, which lead to Dunbar Road and Lenox Mountain. Upgrades to the West Mountain/Reservoir Road intersection will be required.

Dunbar Road, at the base of Lenox Mountain, is an existing road which will require some clearing, grading, and placement of gravel to allow construction equipment and wind turbine components to be brought to the Site. New access roads will need to be installed up Lenox Mountain. These access roads will need to connect Dunbar Road with the turbine locations and the staging area for construction equipment and WTG components. The slope of this road may exceed 15% in some locations, requiring assistance from construction equipment for hauling vehicles.

## **Site Vicinity**

The site vicinity, including nearby visual and noise receptors, airspace impacts, telecommunications impacts, and the level of perceived overall community acceptance was characterized. The area surrounding the Site is largely undeveloped, and is primarily hilly woodlands. Land use around the proposed site is for watershed management and light recreational activities.

Simulations of visual impacts were developed for 11 vantage points ranging in distance from approximately 0.5 mile to 4 miles from the proposed sites. These sites were selected at key locations around the area. For the single turbine option, the turbine would not be visible at all at three locations, only the tips of the blades or the blades only would be visible at three locations, and the turbine would be fully or nearly fully visible at the remaining five locations. For the two turbine scenario, at least the tips of one of the two turbines would be visible at all locations. Both turbines would be fully or nearly fully visible at five locations. At the remaining seven

locations, visibility ranges from both tips only partially visible (almost nothing visible) to one turbine fully visible and one partially visible (mostly visible).

Based on the sparse development around the Site, and the distance to the nearest dwellings from the proposed turbine locations (minimum of 2,300 ft), as well as the vegetative cover surrounding most dwellings in the area of the Site, shadow flicker will likely not be an issue.

Sound levels at the closest residence are expected to be a maximum of 36 decibels for the single turbine configuration and 39 decibels for the two turbine configuration. These levels are similar to the sound levels one would encounter in a library or within a normal residential setting. A detailed acoustic study following the latest protocols established by the Massachusetts Clean Energy Center is to be completed by the summer of 2011.

### **Site Electrical Infrastructure**

The known electrical infrastructure near the Site, including potential interconnection points as well as overall interconnection feasibility, was evaluated. For the two turbine scenario, each turbine would have its own meter and all electrical lines would be placed underground at the Site. Power generated will be “stepped up” in an on-site transformer to a voltage of 13.8 kilovolt (kV) to allow for transmission. Power lines after step up will either be underground or overhead on-site, and will ultimately be overhead at Reservoir Road. The WTG site is known to be within National Grid franchise territory; therefore, to interconnect with National Grid, approximately 3.25 miles of overhead transmission lines will need to be installed along Reservoir Road and National Grid easements. An alternative would be to connect with Western Massachusetts Electric Company (WMECO), which has 23-kV lines serving the water treatment pumping station, which is only 1 mile to the west of the Project Site. To implement this, because the WTG location is within National Grid franchise territory, a “border agreement,” in which National Grid would allow WMECO to serve the customer, would need to be negotiated. This option, if implemented, represents significant cost-saving potential over interconnection with National Grid. In either case, system impact studies would need to be performed and upgrades may be necessary.

## Potential Environmental Concerns

The various environmental concerns associated with the Site, including known habitats of threatened or endangered flora and fauna, areas of critical environmental concern (ACEC), wetlands, and overall environmental impact, were investigated. No known threatened or endangered species have been document at the site and the site is not within an ACEC. No wetlands in the immediate vicinity of the Site are noted on the National Wetland's Inventory or MassGIS maps; however, a site walk will be required by the Town of Lenox Conservation Commission to verify the presence of wetlands and vernal pools. No major concerns for birds and bats have been identified through the initial bird and bat risk screening; however, additional research and studies will likely be required, including understanding the migration patterns of bats in the area, determining the breeding presence of birds, and the possible presence of the mourning warbler, which has been sighted in the region.

## Permitting and Interconnection Requirements

The various permitting issues, including zoning and the possible impact of the town's bylaws related to windmills and other issues, were investigated. A list of permits likely to be required for project development and general timeframes has been developed. In addition, the requirements and process for interconnection have been investigated. The Project will need to comply with local requirements, including the Scenic Mountain Act, Wetlands Protection, and Building and Fire Codes. A special permit will be required for the Project as there is no wind zoning ordinance in the Town; however, construction of a utility is permitted. A wetlands permit (order of conditions) may be necessary due to the possible presence of wetlands in the immediate project vicinity. Although no Massachusetts Environmental Policy Act (MEPA) thresholds are likely to be exceeded, the Project may need to file for MEPA review, since action of state agencies will be required for the Project to move forward. Pre-screening evaluations of three separate types of radar, long range, next generation, and weather surveillance were completed. The Project will require a formal determination from Federal Aviation Administration (FAA) to address the pre-screening results of possible adverse effect for long-range radar. An obstruction analysis has also been filed with FAA.

## **Conceptual Design**

A conceptual project design, including turbine choices, potential wind plant configurations, and a more detailed assessment of shadow flicker and noise impacts were developed. Two wind turbine configurations were analyzed in this study: a single Fuhrländer FL 1500/77 WTG with a capacity of 1.5 megawatt (MW) and a two turbine scenario using two General Electric (GE) 1.6-100 WTG units with a total capacity of 3.2 MW (1.6 MW each). The first configuration places the Fuhrländer unit at the more accessible of the two locations, to minimize the infrastructure that would be needed. The second configuration places one GE unit at this same location, and the second unit is placed at a location that is optimized for generation and constructability, within the Project Site. The two turbine configuration would place the units a minimum of 3 rotor diameters, or 300 m apart.

Based upon these proposed locations, setbacks appear not to be an issue as there are no on-site or nearby facilities of any kind. The nearest occupied structure is 2,900 ft away from the southern turbine location and 2,300 ft away from the northern turbine location. The closest airport is 3.75 miles away, and the closest communications tower is a microwave tower 1.5 miles away. The operator of the microwave tower should be contacted to confirm no interference. Based upon these site characteristics, the Site appears to be suitable for wind energy development.

Community impacts and communications were assessed. The Town is committed to maintaining open communication with the community, and while the Town is a “Green Community,” some concerns are likely to arise regarding noise, views, and property values. It is recommended that a series of public forums be held to discuss the Project with community stakeholder groups.

## **Project Development Considerations**

Ownership options, financing sources, operations, and management of the Project, and other development considerations were evaluated. Advantages and disadvantages of two types of ownership options, town ownership and private developer ownership, were evaluated. A significant advantage for private ownership is that a corporation can take advantage of many of the incentives for wind energy, such as the Investment Tax Credit (ITC), accelerated depreciated, and/or Production Tax Credit, while a municipal owner cannot. Under the private ownership scenario, the Town would gain significant benefits for little risk. Under the town-ownership

scenario, greater economic benefits would likely flow to the Town; however, all risk would be borne by the Town. In addition, a town-owned project may benefit from the ability of the Town to obtain debt financing at a lower cost of money than a private developer. Under both scenarios, project owners would be able to take advantage of selling Renewable Energy Credits (REC).

## **Estimated Energy Production**

Estimates of net energy production from the chosen wind project designs and the wind resource at the Site were developed using WindFarmer software. Several key factors were modeled including manufacturers' power and thrust curves, the wind resource and estimated losses, which include topographic, wake, turbine availability, grid availability, electrical losses, blade contamination, icing, and high wind shutdown. For the single turbine (Fuhrländer) configuration, a net capacity factor of 33% was estimated (equivalent to  $33\% \times 8,760$  hours per year = 2,891 hours at peak capacity of 1.5 MW). For the two turbine configuration (GE), a net capacity factor of 44% was estimated (3,854 hours at peak capacity of 3.2 MW).

Uncertainty analysis was performed on a number of factors, including long-term wind speed variability, correlation standard error, anemometer calibration, topographic and wake modeling, and wind variability. These factors were used to determine P50 and P90 wind speeds and power generation for the two scenarios. The P50 and P90 wind speeds at a hub height of 80 m are 8.34 and 8.06 m/s, respectively. The P50 and P90 power generation for the single Fuhrländer and two GE scenarios are, respectively, 4,300 megawatt-hours (MWh) per year, 3,130 MWh per year, 12,200 MWh per year, and 10,900 MWh per year.

An analysis of energy use by the Town was completed. This analysis shows that the Town used a total of approximately 2,742 MWh. Approximate two thirds of this amount is on National Grid meters and the remaining one third is on WMECO meters. Although the entire Town is within National Grid franchise territory, over the years a number of "border agreements" between the two utilities have been drawn up to address cases (typically water and wastewater infrastructure) where it is more economical to connect to WMECO than National Grid. It is important to note that even the total amount of electricity used by the Town is well below the amount that is estimated to be generated by the single turbine scenario. Under current neighborhood net



metering rules, this excess generation can be sold to other credit worthy customers served by the same utility in the same load zone.

## **Cost Estimate**

A general cost estimate with rough order of magnitude costs to develop the proposed designs was developed. Costs for the two wind plant configurations were developed based on vendor quotes, experience with other similar projects, site specific requirements, and general knowledge of construction. Total installed costs are estimated at \$5.3M for the single Fuhrländer option [\$3,500 per kilowatt (kw)] and \$8.3M for the two GE turbine configuration (\$2,600/kw). The Site will require significant civil upgrades for either option, due to the need to install access roads up the mountain and to improve existing public access roads near the Site. Approximately \$300k to \$400k has been included for access roads, staging areas, and road improvements. Interconnection costs are likely to be quite significant due to the need to install more than 3 miles of new overhead three-phase power lines (over \$700k), to reach National Grid power lines. If a border agreement between National Grid and WMECO can be developed, the cost to interconnect with new overhead lines will be reduced by two thirds.

## **Project Revenues**

The anticipated revenue streams from the proposed wind plant configurations include energy savings, energy sales, and REC sales. There would be additional revenues in the form of the ITC and tax savings from accelerated depreciation for a private developer. Project revenues were estimated for two ownership options: town-owned and developer-owned. For the town-owned scenario, electricity revenues would include avoided cost of electricity for 1,821 MWh (current total National Grid usage annually) at \$0.13/kWh (total Year 1 revenue of \$237,000) and net excess generated electricity at \$0.08/kWh for the remaining 2,487 MWh (Year 1 revenue of \$199,000), to be sold to other local credit worthy businesses or municipalities who are National Grid customers in the same Load Zone. Sales of RECS are estimated at \$86,000 per year.

For the developer-owned option, it has been assumed that all electricity would be sold at \$0.08/kWh, which equates to Year 1 revenue of \$979,800. In addition, the developer would have REC revenue of \$245,000. The developer would be able to take advantage of the ITC of 30%,

which in this case would be valued at \$2,484,000. The accelerated 5-year depreciation results in additional revenue in the form of tax savings over a period of 5 years. Finally, the Town would likely benefit from a lease payment from the private developer to the Town for the use of the land for the wind turbines.

## Financial Analysis

A simplified financial analysis via a financial proforma for the proposed designs was completed. For the town-owned scenario, it was assumed that the Town would finance the Project through a 20-year municipal bond, carrying an interest rate of 4.5% on the full amount of \$5,254,000 plus \$50,000 closing costs for the single turbine configuration. This amount could be reduced by \$400,000 if a Commonwealth Wind Grant can be obtained. Annual operation and maintenance (O&M) costs are estimated at \$50,000, plus an annual amount of \$5,000 is assumed for a long-term escrow fund to address major equipment repairs in the future. Based on these assumptions, the Year 1 cash flow is \$64,000, with a total 20-year positive cash flow of \$3,072,000.

For the developer-owned scenario, the full capital cost of the Project (\$8,300,000 minus the 30% ITC) would be financed by the developer and possibly investor equity. An additional \$50,000 in closing costs has been assumed. Annual costs for O&M of \$130,000, lease payment to Town of \$25,000, and an escrow fund of \$5,000 have also been assumed. Based on these assumptions, the Project will have an Return on Investment/Internal Rate of Return (ROI/IRR) of approximately 16%, which likely exceeds the hurdle rate required by a developer. Should a Commonwealth Grant be obtained, the ROI/IRR will likely climb closer to 17%.

## Summary of Recommendations

- Complete a detailed acoustic study in the summer of 2011
- Further investigate the possibility of developing a “border agreement” between National Grid and WMECO to save interconnection costs.
- Complete a site walk to determine the presence of wetlands and vernal pools at the site. Begin the permitting process for wetlands, if necessary.

- Implement biological studies to determine species present at the Site and their behavior, including the migration patterns of bats, the breeding presence of birds, and the possible presence of the mourning warbler.
- Investigate whether wildlife studies have been completed for the microwave tower located 1.5 miles to the north of the Project Site.
- Maintain communications throughout the development process with Mass Audubon, and other key wildlife agencies and programs, such as Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species and the New England office the U.S. Fish and Wildlife Service.
- Follow permitting plan and begin discussions with appropriate agencies as early in the process as possible.
- Obtain formal determination from FAA regarding long-range radar interference.
- Contact the owner of the microwave tower located 1.5 miles to the north of the Site to determine the possibility of interference from the WTG(s).
- Begin communications with project stakeholders and understand their concerns as early in the process as possible.

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## **SECTION 1**

### **INTRODUCTION**

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## 1. INTRODUCTION

Weston Solutions, Inc. (WESTON®) has prepared this Wind Feasibility Study for the Town of Lenox, Massachusetts (Town) to evaluate the feasibility of installing and operating a wind turbine generator(s) (WTG) at the proposed development site on Lenox Mountain (Site). The Town selected WESTON through a competitive selection process that complied with the commonwealth's procurement laws. WESTON assisted the Town in obtaining funding for the study via the Commonwealth Wind Incentive Program - Community-Scale Wind Initiative. This grant program is administered by the Massachusetts Clean Energy Center (MassCEC).

WESTON completed several key evaluations as part of the feasibility study including:

- A 12-month wind data acquisition campaign, concluding in March of 2011, including the evaluation of nearby long-term wind datasets for correlation.
- Wind turbine generator siting including an analysis of the Site physical characteristics and existing electrical infrastructure for interconnection.
- Environmental impacts and permitting issues.
- Potential impacts to the community brought on by noise and shadow flicker during WTG operation.
- Potential wind plant configuration and conceptual design, including estimated power production.
- Financial analysis of the development of the Project, including projected savings and revenues.

The results of the study are more specifically described below.

### 1.1 BACKGROUND INFORMATION

The Town is committed to sustainability and has been designated as a Massachusetts Green Community. As part of that commitment, the Town has initiated several programs evaluating the potential for development of renewable energy resources, including solar and wind, to offset its current electricity demand.

Previous wind studies were completed evaluating the preliminary feasibility for wind power project development within the Town to generate enough electricity to offset a majority of the Town's Municipal Water Treatment Plant electricity demand. In 2005, Black & Veatch (B&V), an engineering consulting firm, prepared a Site Screening and Development Options Report for the Town, which evaluated three potential locations for a wind turbine, estimated local wind resource conditions, and prepared a preliminary power production and economic analysis (see Appendix A for the full text of this report). Some of the findings in the report were based on a Siting Report prepared by The University of Massachusetts Renewable Energy Research Lab (RERL) (RERL is now known as the Wind Energy Center) in 2004 (see Appendix B). The B&V report found that there was a potentially developable wind resource at the Site, and recommended implementation of on-site wind data gathering via installation of a 40 or 50 meter meteorological tower. The RERL report had previously included some analysis of construction and site issues for installing such a meteorological tower at the Site. The Town did not proceed with the meteorological tower installation.

To the extent possible, WESTON utilized the information and data collection from these previous studies to develop the study presented in this report.

## **1.2 OBJECTIVE**

The objective of this report is to assess the feasibility of building a community scale wind project in the Town, on town-owned land, in attempt to offset the electricity demand of operations at town facilities including water and wastewater treatment plants, schools, and other facilities. To that end, this report describes the results of the evaluation of the wind resource at the Site, site physical characteristics, financial analysis, and the various environmental and community issues that were completed as part of this study.

## **1.3 REPORT ORGANIZATION**

This report is organized into the following sections:

- **Wind Resource:** This section looks at the wind resource data collected in Lenox, as well as long-term reference data from the Pittsfield Airport Weather Station.

- **Site Physical Characteristics:** This section contains a general description of the potential Project Site, its current use, existing infrastructure, site access, and the overall suitability of the potential site for wind project development.
- **Site Vicinity:** This section describes the general vicinity of the proposed site, including nearby visual and noise receptors, airspace impacts, telecommunications impacts, and the level of perceived overall community acceptance.
- **Site Electrical Infrastructure:** This section explores the known electrical infrastructure near the Site, including potential interconnection points as well as overall interconnection feasibility.
- **Potential Environmental Concerns:** This section outlines the various environmental concerns associated with the Site, including known habitats of threatened or endangered flora and fauna, areas of critical environmental concern (ACEC), wetlands, and overall environmental impact.
- **Permitting and Interconnection Requirements:** This section is an outline of the various permitting issues, including zoning and the possible impact of the town's bylaws related to windmills. It includes a list of permits likely to be required for project development and a general timeline. This section also outlines the requirements and process for interconnection.
- **Project Development Considerations:** This section is an overview of ownership options, financing sources, operations and management of the Project, and other development considerations.
- **Conceptual Design:** This section lays out a conceptual project design, including turbine choices, potential wind plant configurations, and a more detailed assessment of shadow flicker and noise impacts.
- **Estimated Energy Production:** This section estimates net energy production from the chosen wind project designs and wind resource at the Site.
- **Cost Estimate:** This section contains a general cost estimate with rough order of magnitude costs to develop the proposed designs.
- **Project Revenues:** This section attempts to quantify the revenue streams from the proposed wind plant configurations, including energy savings, energy sales, and Renewable Energy Credits (REC) sales.
- **Financial Analysis:** This section shows the results of a simplified financial analysis via a financial pro forma for the proposed designs presented.

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## **SECTION 2**

### **WIND RESOURCE**

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## **2. WIND RESOURCE**

The wind energy resource of a site is the most critical single aspect to understand, and is one of the few that cannot be overcome with technical solutions. Prior to the development of any wind energy project, it is highly advisable to perform at least a year of wind data collection at the Project Site as was completed as part of this study. Figure 2-1 depicts the location of the study area on Lenox Mountain relative to the Town and the surrounding areas.

### **2.1 SITE LOCATION**

The Site selected for the wind measurements was at the Lenox Reservoir, located northwest of Lenox. The Site represents the nearest practical location for performing wind monitoring for the proposed turbine location. The location was proposed by WESTON and agreed to by representatives of MassCEC in consultation with the Wind Energy Center. Sound detection and ranging (SODAR) was selected for wind measurements as a way of minimizing land disturbance at this point in the wind development process. Appendix C includes the Massachusetts wind resource map generated by NREL and AWS Truepower. The scale of this map is too large to determine where exactly Lenox Mountain falls within it; however, there is an area of 5.0 to 5.5 meters per second (m/s) shown on the map which is likely near the Site. To gain a finer control on this information, a map was generated using the Massachusetts Geographic Information System (MassGIS) wind siting tool, <http://www.mass.gov/mgis/mapping.htm#Wind>. This map is also provided in Appendix C.

A 7.5-minute United States (U.S.) Geological Survey (USGS) topographic map showing the monitoring site location is shown in Figure 2-2. The map shows the location of the wind measurement station along with the area where turbine construction is feasible.

The candidate turbine area is approximately 28 hectares (70 acres) total area, and is approximately 1.4 kilometers (km) in length. Elevations in the candidate turbine area gradually increase from southwest to northeast from approximately 550 meters (m) above mean sea level (amsl) to 580 m amsl. The center of the area is approximately 2.1 km northeast of the monitoring station.

The reservoir is situated in a clearing in a small valley of Lenox Mountain. The valley is oriented along a southwest to northeast axis and is approximately 1 km long. The approximate range of elevations along the valley is from 430 m amsl at the southwest end of the valley to 460 m amsl at the upper reservoir. The ridge to the north rises to approximately 500 m amsl.

The monitoring station is located at the southwest side of the lower reservoir. The geographic coordinates (North American Datum of 1983, or NAD83) of the station location are:

Latitude 42° 22' 00.73" N 42.366870° N  
Longitude 73° 19' 43.02" W 73.328617° W  
Elevation 435 m amsl

The Universal Transverse Mercator coordinates (Zone 18, NAD83) are:

Easting 637,624 m  
Northing 4,691,864 m

## **2.2 INSTRUMENTATION**

### **2.2.1 Tripod Weather Station**

A small tripod-mounted meteorological station was placed near the SODAR to provide additional information on station conditions. The tripod was equipped with sensors for wind speed, wind direction, temperature, barometric pressure, and precipitation. Wind and precipitation sensors were equipped with heaters to prevent icing. The wind sensors were mounted atop the tripod mast at a height of 20 feet (ft) above ground level (agl). Temperature was measured 2 m agl in a solar radiation shield. Precipitation was measured with a tipping bucket rain gauge mounted at ground level adjacent to the tripod. The sensors' specifications conform to the U.S. Environmental Protection Agency guidance for meteorological monitoring for regulatory dispersion modeling applications.

Data from the tripod sensors were collected using a Campbell Scientific, Inc. CR850 datalogger. Readings were scanned every second, with average data (or totals, for precipitation) reported at 10- and 60-minute intervals. Data were retrieved daily via cellular modem.

The tripod was located adjacent to the dam for the lower reservoir. This placement was required in order to keep the tripod away from the SODAR and allow access to existing AC power to run heaters for the wind sensors. The exposure of the tripod wind instruments is significantly influenced by the dike of the reservoir. Therefore, the wind data from the tripod were only used in qualitative reviews of daily data. The main use of the tripod data for the wind resource assessment was to provide local air density data.

### **2.2.2 Sound Detection and Ranging**

The wind resource assessment was conducted using a REMTECH Model PA2 Doppler SODAR remote sensing unit. The PA2 uses an array of 196 small elements to transmit sound pulses along directional beams at specific frequencies. The atmosphere scatters sound back to the unit with wind-induced Doppler frequency shifts that the PA2 processes to determine wind speed and direction. The PA2 is designed to filter fixed echoes, and utilizes a unique pulse coding technology that enables it to automatically compensate for ambient noise or echoes. The PA2 is capable of profiling winds and turbulence to heights approaching 1,500 m (4,921 ft) agl in ideal conditions.

The PA2 produces measurements of both horizontal and vertical wind speeds at multiple vertical levels. The system uses three antenna beams, two tilted 30° from vertical and turned 90° from each other for the horizontal components of the wind and the third pointed vertically. The PA2 SODAR used at Lenox produces the following outputs:

- Mean vector horizontal wind speed and direction
- Standard deviation of horizontal wind direction
- Mean vertical wind speed
- Standard deviation of vertical wind speed

The vertical range and height intervals of the PA2 at Lenox were configured to provide coverage of the height range that will be spanned by the wind turbines. Wind data were collected at 30 contiguous heights at 10-m intervals ranging from 50 to 340 m agl. The averaging period used was 10 minutes.

## 2.3 WIND CLIMATOLOGY

### 2.3.1 Sound Detection and Ranging Data

The 12-month monitoring period began on 1 March 2010, and concluded on 28 February 2011. The PA2 unit operated continuously during the entire period, with no equipment malfunctions. The only raw data losses were due to routine automatic invalidations done internally by the PA2 algorithms. Sound detection and ranging technology typically has reduced data recovery during periods of calm periods, gusty winds, and precipitation events. Also, because sound intensity decays with distance, SODAR technology generally tends to have lower data recovery rates at higher levels above ground.

#### 2.3.1.1 Altitude Selection

The choice of SODAR levels to use in the wind resource assessment was guided by the general elevation range of the turbine blade span. The turbines being considered have a hub height of 80 m, and rotor diameters from 72 - 80 m. The average terrain base elevation in the candidate turbine area is approximately 570 m amsl, and the SODAR base elevation is 435 m amsl. This would make the approximate design hub elevation relative to the SODAR base elevation:

$$(Z_{\text{base}} + 80) - Z_{\text{sodar}} = (570 + 80) - 435 = 215 \text{ m}$$

The target SODAR level for hub height wind data was chosen by rounding up to 220 m. In order to define wind shear exponents, the 180 m and 260 m SODAR heights were chosen to span the maximum design rotor span of 80 m.

#### 2.3.1.2 Validation

The PA2 performs a significant amount of internal validation of data as it is collected. If the returned data do not meet internal criteria for any specific output parameter, after any automatic noise and echo corrections, then a missing data value is output. Each individual parameter is validated independently at each level. Therefore, not all parameters will have reported values at all levels (e.g., a vertical wind speed may be reported, but the standard deviation of vertical wind speed would be missing).

The incoming daily SODAR data were also reviewed during the monitoring program to ensure that the SODAR was operating, that the wind profiles with height appeared consistent, and that the data were representative of the general meteorological patterns in the area. This is referred to as “Level 0” data review. A more detailed, “Level 1”, review of the SODAR data was done on the entire data set, examining statistical patterns in the data to identify anomalous data.

The Level 0 review of the daily data had showed potentially unusual behavior of the vertical wind profiles at higher wind speeds. In the Level 1 data analysis, a discontinuity in the wind speed distributions was identified under high wind conditions. The unusual speed readings were attributed to excessive noise interference with the SODAR measurements. The Level 1 analysis indicated that the interference pattern occurred when wind speeds at the 50 m level (the lowest SODAR altitude) reached 11.5 m/s and above. All SODAR data for measurement periods with 50 m level wind speeds of 11.5 m/s or above were invalidated for the resource assessment.

The data recovery rates for the SODAR at the three levels of interest are broken down in Table 2-1.

**Table 2-1**  
**Sound Detection and Ranging Data Recovery**

Level	50 m	180 m	220 m	260 m
Total Periods	52,560	52,560	52,560	52,560
Valid Raw Data	45,874	46,433	47,723	48,257
Valid Level 1 Data	40,837	40,837	40,837	40,837
Recovery (%)	77.7	77.7	77.7	77.7

For the targeted levels, the SODAR achieved from 87% - 92% recovery at specific levels for the raw data (passing the PA2 internal validations). Because the Level 1 filter invalidated all levels during a specific period, and all profiles with missing 50 m wind speeds were treated as invalid, the final number of recovered periods for all levels was identical.

### 2.3.1.3 Calculations

The SODAR data were used to calculate turbulence intensity (TI) at hub height and wind shear exponents across the blade span. The SODAR levels used were relative to the nominal hub height of 220 m above SODAR base elevation, and a nominal blade span of 80 m.

Wind shear exponent ( $\alpha$ ) was calculated from the wind speeds at 180 m and 260 m levels. The equation used was for a constant power-law wind profile:

$$\alpha = \frac{\ln(u_{260}/u_{180})}{\ln(260/180)}, \text{ where}$$

$u_{180}$  = wind speed at 180 m level  
 $u_{260}$  = wind speed at 260 m level

Turbulence intensity for wind resource assessments are typically calculated using the standard deviation of horizontal wind speed ( $\sigma_u$ ). The PA2 software does not output  $\sigma_u$  data. Therefore, as a surrogate, the standard deviation of vertical velocity ( $\sigma_w$ ) output by the PA2 was used. Turbulence intensity based on the vertical wind ( $TI_w$ ) was calculated as:

$TI_w = \sigma_w / u_{220}$ , where  
 $\sigma_w$  = standard deviation of vertical wind speed at 220 m level  
 $u_{220}$  = horizontal wind speed at 220 m level

## 2.3.2 Data Distributions

The presentations in this section are based on the validated 10-minute SODAR data from the 220 m agl hub height, which is equivalent to an approximate 80 m hub height as discussed in the above sections.

### 2.3.2.1 Wind Direction

The joint frequency of wind speed and direction are shown in tabular form on Table 2-2, and graphically as a wind rose in Figure 2-3. The presentations show the prevailing winds are from the northwest quadrant, with a secondary peak in frequency from the south and southwest. The most frequent higher wind speeds were also recorded from the prevailing direction sectors.

**Table 2-2**

**Joint Distribution of Observed Wind Speed and Direction**

Monitoring Period Frequency (per mille)													
Wind Direction Sector (wind from)													
Wind Speed													
Bin (m/s)	000°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	Total
1	0.4	0.3	0.4	0.5	0.3	0.4	0.5	0.3	0.4	0.3	0.3	0.3	4.5
2	1.0	1.0	1.1	1.1	0.6	0.8	1.4	0.9	0.7	1.0	1.2	1.5	12.2
3	3.2	1.4	1.0	1.4	0.6	1.6	3.4	2.0	1.6	2.8	4.3	3.8	27.2
4	4.7	2.7	1.4	3.0	2.4	3.2	7.0	3.8	4.3	6.2	10.6	10.5	59.7
5	8.0	3.6	2.9	3.8	3.0	4.3	12.1	6.1	5.7	12.2	12.3	15.7	89.5
6	10.3	2.1	2.4	4.2	3.1	5.3	13.9	7.7	8.2	12.7	13.0	16.3	99.1
7	9.0	1.5	1.9	3.5	2.9	6.7	13.9	8.5	8.8	11.5	15.2	21.1	104.5
8	9.5	1.9	2.3	3.1	2.8	6.4	15.9	9.8	6.3	9.0	19.6	26.2	112.6
9	8.1	1.2	2.9	3.5	3.0	7.5	15.9	12.0	6.5	8.1	24.4	30.2	123.3
10	6.8	1.1	3.1	2.8	2.8	6.9	15.4	11.9	6.3	6.8	27.8	32.3	123.9
11	5.0	1.1	3.7	2.3	1.7	4.8	12.1	13.8	4.2	6.0	20.7	21.7	97.1
12	4.3	0.4	3.3	2.1	1.4	3.4	6.9	9.3	2.6	3.1	13.0	14.9	64.7
13	1.9	0.3	2.2	1.6	1.5	1.2	3.8	7.9	1.2	1.8	9.4	7.8	40.6
14	0.8	0.2	1.1	0.9	0.8	1.0	1.8	4.6	0.6	1.2	5.1	5.3	23.5
15	0.5	0.0	0.5	0.6	0.2	0.3	0.7	2.8	0.3	0.5	2.2	2.6	11.3
>15	0.2	0.1	0.4	0.3	0.1	0.3	0.5	1.3	0.2	0.3	1.1	1.1	5.9
Total	73.8	19.0	30.4	34.5	27.2	54.1	125.2	102.9	57.8	83.5	180.1	211.2	999.6
Calm (< 0.5 m/s)													0.4

### 2.3.2.2 Wind Speed

The annual and seasonal frequency distributions of wind speeds are shown in Figure 2-4. Seasons were defined in 3-month blocks beginning with December through February as winter. The monthly distributions within each seasonal block were similar. The annual average wind speed was 8.34 m/s.

Each season is slightly different, with winter and spring being most similar. Summer and autumn have the most distinctive distributions. The summer pattern is more evenly distributed over speeds from 7 - 10 m/s, with fewer speeds over 10 m/s. The autumn pattern has fewer speeds in the 7- 10 m/s range, with a sharper frequency peak in the 11 - 13 m/s range. The annual pattern is similar to the spring and winter pattern.

Figure 2-5 shows the average diurnal variation of wind speeds. The monitoring site shows a pattern of nocturnal maximum winds, with lower wind speeds during the midday period. Wind speeds within the hourly bins range from just under 7.5 m/s around 1000 EST to roughly 9.0 m/s during hours around midnight.

### **2.3.2.3 Turbulence Intensity and Wind Shear**

The diurnal patterns of wind shear exponents ( $\alpha$ ) and TIs are shown in Figure 2-6. The overall mean TI was 0.056. The overall mean wind profile exponent was 0.361.

The two parameters are inversely related, with higher shear exponents occurring along with lower TI. The peak  $\alpha$  values occur during nighttime hours, and the peak TI values occur during the day. This behavior is expected, since stable nighttime conditions produce higher wind speeds and less turbulence. Daytime heating produces less stable conditions that result in lower wind speeds and more turbulence.

## **2.3.3 Reference Stations**

### **2.3.3.1 Pittsfield Municipal Airport**

The nearest source of long-term meteorological data is the National Weather Service (NWS) station located at Pittsfield Municipal Airport (KPSF, WBAN Station Number 14763), located approximately 7.4 km north-northeast of the monitoring station. The terrain elevation at KPSF is 364 m amsl.

The hourly observation data from KPSF were obtained from National Climatic Data Center (NCDC) International Surface Hourly DVDs for years 2003 through 2009. The data from 2010 through the close of the SODAR monitoring program were purchased directly from NCDC



on-line. These data sets were used to generate wind roses to qualitatively compare the SODAR monitoring period to historical patterns.

Figure 2-7 compares wind roses for KPSF for the years 2003 - 2008, and for the 12-month SODAR monitoring period from March 2010 through January 2011. The wind rose for the monitoring period is representative of the general long-term wind patterns at the NWS station.

A correlation approach is typically used for a wind resource analysis to build a synthetic long-term on-site data set from a shorter period of monitored data. The use of correlation for this purpose requires a reasonably strong degree of correlation between the reference and on-site stations.

A correlation analysis was attempted between the KPSF data and the SODAR data. Unfortunately, no strong correlation could be derived. The correlation coefficient was roughly 0.4, and the preferred range of useful correlation coefficients are generally 0.7 and above. The NWS station reported speeds to the nearest knot (1 knot = 0.5 m/s), and the speeds reported are short-term (1-minute) averages. These differences make comparisons difficult between on-site data recorded to 0.1 m/s resolution, and averaged over 10 minutes. The elevation of the SODAR hub-height measurements was 655 m amsl above a roughly 60 m deep valley, while the NWS station anemometer was located at 374 m amsl in a relatively flat region north of the mountain. This almost 300 m differential in complex terrain also makes correlation difficult, particularly when the SODAR is in a location where streamlines would be expected to be accelerated by the terrain regardless of wind direction.

Because of the lack of a useful correlation with the reference site, the 1-year validated SODAR data set was used as the frequency distribution input to Wind Atlas Analysis and Application Program (WAsP) and WindFarmer. Due to the slightly less than 80% recovery rate, WindFarmer was used to generate a frequency distribution adjusted to compensate for seasonal bias.

### **2.3.3.2 Jiminy Peak**

Reference data from the operating wind turbine, Zephyr, located at the Jiminy Peak Mountain Resort in Hancock, Massachusetts, approximately 20 miles to the north of the Site, was obtained and compared to the SODAR data collected at the outset of the wind monitoring campaign.

Zephyr is a 1.5-MW WTG and has a 77-m hub height, so it is comparable to the WTGs being considered for the Lenox wind project.

Figure 2-8 shows the average monthly wind speeds observed from the SODAR monitoring site at both a 50-m and 80-m hub height for the months of March, April, and May of 2010. Also plotted on Figure 2-8 are the average recorded wind speeds for the months of April and May of 2010 from Zephyr at Jiminy Peak. Figure 2-8 also shows the approximate threshold for mean wind speeds for viable commercial scale wind turbine projects.

Figure 2-8 illustrates there is a good correlation between the two datasets as both show similar trends moving from April to May. Additional wind speed data could not be obtained from the Jiminy Peak wind turbine project for further comparison, however, it is recommended that further correlation studies be conducted during project pre-development.

## **2.4 DATA EXTRAPOLATION**

### **2.4.1 Model Used**

In order to extrapolate the SODAR wind speeds from the measurement location to the turbine area, the WAsP model (Version 10) was used. WAsP was used to generate resource grids of wind speed and wind power density at hub height for use in WindFarmer. The following subsections present brief descriptions of the data inputs used in WAsP and maps of the resource grids.

### **2.4.2 Model Inputs**

#### **2.4.2.1 Geographic Domain**

The domain for WAsP modeling was defined as a 14 km x 14 km rectangular region centered on the central portion of Lenox Mountain. The domain includes most of the Lenox Mountain terrain feature plus the region within a 5 km buffer around the ridge. Figure 2-9 shows a USGS 1:100,000 scale topographic map of the domain area.

#### **2.4.2.2 Topography**

The topography within the domain was represented using digital elevation data from the USGS National Elevation Dataset (NED). The NED data were downloaded from the USGS Seamless Data Distribution System website.

The NED is a seamless dataset composed of the best available raster elevation data of the contiguous U.S., Alaska, Hawaii, and territorial islands. The NED is derived from diverse source data that are processed to a common coordinate system and unit of vertical measure. NED data are available nationally (except for Alaska) at resolutions of 1 arc-second (approx. 30 m) and 1/3 arc-second (approx. 10 m), and in limited areas at 1/9 arc-second (approx. 3 m).

The 1/3 arc-second resolution data were used for the Lenox wind assessment. The Surfer (Version 9) software package was used to generate contours of the NED elevations at 10-m vertical intervals for input into WAsP. The raw gridded NED elevations were used as the Digital Terrain Model input to WindFarmer. The contour map is presented in Figure 2-10.

#### **2.4.2.3 Roughness**

A map of surface roughness lengths is required as input to WAsP. Surface roughness helps determine the shape of the vertical wind speed profile over varying types of obstacles. Wind speed increases more rapidly with height over a smooth surface such as water than over a rough surface such as an urbanized area or a forest canopy. WAsP needs information on variations in surface roughness to account for changes in roughness by direction sector as part of its calculations.

Roughness length is a function of land use. Digital land use map data for Berkshire County (2005) were downloaded from the MassGIS website. The data for the domain area were extracted, manually processed into clusters of similar roughness areas, and then manually digitized to produce a set of roughness length boundaries for input to WAsP.

The main roughness feature of the domain area is forest, which covers roughly 60% of the domain area. Numerous lower roughness areas are interspersed with the forested areas. Detailed representations of all the areas would have resulted in an excessively detailed roughness map.

Instead, these areas of water, agricultural fields, and other areas were grouped together where possible and assigned intermediate roughness lengths to simplify the roughness map. More detailed representations were used closer to the turbine siting area, with lesser detail towards the edges of the domain.

## 2.5 UNCERTAINTY ASSESSMENT

### 2.5.1 Annual Mean Wind Speeds

Two wind distribution statistics of interest are the annual mean wind speeds that are expected to be exceeded 50% of the time and 90% of the time. These are referred to as P50 and P90 speeds, respectively. Using several years of data, these statistics can be estimated using the mean and standard deviation of the annual averages. Assuming a normal distribution, the P50 speed is the arithmetic mean of the annual averages, and the P90 speed is the mean annual wind speed minus 1.28 times time standard deviation of the annual averages.

Even though no viable correlation with the on-site data could be built with the Pittsfield NWS data, the Pittsfield data were used to estimate the long-term variability of mean wind speeds. Table 2-3 presents the annual mean wind speeds calculated from the hourly Pittsfield data for the years 2003 through 2008, along with the summary statistics. The standard deviation of the annual speeds was 2.59% of the mean (also referred to as the standard error).

**Table 2-3**

#### **KPSF Annual Wind Speeds**

<b>Year</b>	<b>Speed (m/s)</b>
2003	3.66
2004	3.63
2005	3.49
2006	3.56
2007	3.64
2008	3.43
<i>Mean</i>	<i>3.57</i>
<i>Standard Deviation</i>	<i>0.0924</i>
<i>Standard Error</i>	<i>2.59%</i>

The 2.59% long-term variability of the Pittsfield annual mean speeds was used to estimate the P90 wind speed at the measurement site. The long-term standard deviation for the measurement site was calculated as 2.59% of the mean wind speed of 8.34 m/s, or 0.215 m/s. The P50 wind speed is the mean wind speed of 8.34 m/s, and the P90 wind speed was calculated as 1.282 standard deviations below the mean at 8.06 m/s.

For calculations in WindFarmer, the number of years of data used for the long-term estimate was entered as 6. This results in an assumed uncertainty of 2.45%, which is very near the directly calculated uncertainty of 2.59%.

### **2.5.2 Anemometry**

The performance specifications for the PA2 SODAR list its accuracy as 3%. This figure was used to represent the anemometry uncertainty for calculations in WindFarmer.

## **2.6 SUMMARY ASSESSMENT OF WIND RESOURCE**

Based on the results of the wind resource assessment campaign conducted at the Site, as presented above, it has been determined there is a viable, investment grade wind resource available at the Site. However, all risks associated with the development of a wind power project should be assessed in conjunction with the outcome of the wind resource assessment in order to complete a comprehensive investment grade analysis.

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## **SECTION 3**

### **SITE PHYSICAL CHARACTERISTICS**

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### **3. SITE PHYSICAL CHARACTERISTICS**

#### **3.1 GENERAL DESCRIPTION**

The primary Project Site is located about 1.5 miles northwest of the Town, and is at the top of an approximately 1,815-foot (ft) peak on the Lenox Mountain range called Yokun Ridge. Lenox Mountain is an approximately 9 mile ridgeline oriented SSW to NNE surrounded by valleys on three sides. The southern portion of Lenox Mountain is crossed by the Massachusetts Turnpike (US Interstate 90). The proposed location of the WTG is at the mid-point of Lenox Mountain. The Site is just north of Reservoir Road and is shown in Figure 3-1 and is approximately 180 ft higher than Reservoir Road. At the highest point along the ridgeline considered just north of Reservoir Road, the hilltop has a flat crest which is approximately 150 ft by 350 ft (45 m by 106 m). Just to the north of this crest, the ridgeline lowers slightly in elevation into a broader plateau.

The vegetation in the area of the Site consists mainly of dense woodlands and is comprised of both deciduous and coniferous trees. Tree heights range from approximately 50 to 60 ft (15 to 20 m). The Lenox Reservoirs are approximately ½ mile southwest of the Site as shown in Figure 3-1.

#### **3.2 SITE USAGE**

The Site is located on Yokun Ridge and has several hiking trails that are nearby including Dunbar Road to the west and the Trail of Ledges to the north. Reservoir Road borders the proposed site to the south and acts as the main access way to the town reservoirs and drinking water treatment plant. The Project Site is located on town-owned land and is zoned residential (R-3A) per town zoning maps.

#### **3.3 SITE INFRASTRUCTURE**

The existing infrastructure at the Site is limited due to its remote location. Reservoir Road borders the Site to the east and south and Dunbar Road borders the Site to the west. Both Western Massachusetts Electric Company (WMECO) and National Grid service the area with electricity and have distribution lines near the Site. Additional details regarding these distribution

lines and interconnection points are provided in Section 5 of this report. There are no dwellings or other structures located at the proposed site, and there are no adjacent buildings and no known underground infrastructure.

### **3.4 POTENTIAL TURBINE LOCATION SUITABILITY**

As stated previously, the Town owns the area of land considered for proposed WTG development. The parcel is undeveloped and offers sufficient land in this area to install several WTGs while maintaining necessary setbacks from adjacent land and homes. The approximate boundaries of the town-owned land are shown in Figure 3-1.

Other than Reservoir Road, there is no development on or adjacent to the proposed site. Roadway access during development and operation would be mainly via existing roads and site access roads built specifically for the purpose of constructing the WTG and operation and maintenance (O&M) activities. It is expected some improvements would be necessary to existing roadways to allow for construction and delivery vehicles to approach the Site. Because the proposed location is in a remote wooded area, clearing of existing trees and shrubs would be necessary.

Because there are active hiking trails in the area of the Site, public safety would be a concern during development. However, appropriate use of institutional and engineering controls during construction would minimize the potential for public safety issues.

The primary areas of concern with the development of a wind project at the proposed site are the potential visual and noise impacts on nearby residents, businesses, and organizations. There are no residences within 1,200 ft of the proposed site. The closest residence is approximately 2,300 ft to the southeast from the Site, and there are 13 residences within three-quarters of a mile of the Site. Visual simulations were completed from various vantage points around the Site to evaluate the extent of the visual impact imparted by a WTG. Details regarding the results of this analysis are presented in Section 4 of this report. Noise and shadow flicker are discussed in more detail in Section 4 and Section 8.



### 3.5 TURBINE SEPARATION AND SETBACKS

There are three general guidelines for locating wind turbines on a specified parcel of land:

- Setbacks required per zoning laws.
- Setbacks recommended for public safety.
- Minimum spacing between wind turbines so they do not interfere with each other's operation.

Each of these areas of concern is explored in more detail in the following sections.

#### 3.5.1 Town of Lenox Zoning Bylaw and the Massachusetts's Model Wind ByLaw

The Town does not currently have a zoning bylaw concerning the permitting and requirements for installing a wind turbine ("windmill"). However, municipal uses, including utilities, are allowed throughout the Town. The Town would have to file for a special permit for the WTG installation with the Special Permit Granting Authority, which in this case is the Town Zoning Board of Appeals (ZBA). The ZBA may grant a special permit after concluding a public hearing process and ensuring that the proposed project complies with the general provisions contained in the bylaw. It is anticipated that the wind turbine project can successfully be permitted at the local level.

A good point of reference; however, can be found in the Massachusetts's Model Wind By-law (Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit prepared by Massachusetts's Division of Energy Resources attached as Appendix D). This document provides general guidance as to the appropriate requirements of a windmill by-law including setback requirements from residences and property lines.

Utilizing the recommendations set forth in the state bylaw the following setback requirements are recommended:

- The minimum setback distance from occupied buildings should be 1.5 times the total turbine height.

- The minimum setback distance from property lines or public right of ways should be a minimum of 100 ft.

In addition, the state guidelines on maximum total height (base to tip of blade) requirement and excessive noise could also be adopted.

### **3.5.2 Public Safety**

To evaluate safety issues to the general public as it relates to the operation of a wind turbine, usually the most catastrophic (and highly unlikely) scenario of complete turbine collapse is considered. To ensure public safety in this event, a safety zone around the turbine base equal to the maximum height of the turbine should be defined, or approximately 400 ft in all directions from the WTG base (see Section 8 and related figures). The WTG should then be located such that no public areas fall within this zone.

The WTG will be a minimum of 1,500 ft from Reservoir Road and should not pose a risk to drivers. The Town may wish to re-route nearby hiking trails such that this safety zone setback is met. It is recommended the public not have access to the Site such that one can stand directly beneath the operating wind turbine without the appropriate personal protective equipment and without supervision. The most likely source of any safety concerns if the public were to have access to the WTG would be falling ice from the wind turbine blades after a winter storm.

### **3.5.3 Typical Wind Turbine Spacing**

Wind turbines generate electricity by transferring energy from the wind to the turbine's drive-train. Because they take energy from the wind, and because they are large structures, wind turbines create an area around them in which the wind flow is disturbed. Placing wind turbines too close together would result in one turbine being within the disturbed area of another, causing one turbine to reduce the wind energy available to another. To avoid this, there are two general rules about placement of wind turbines. The first is to place turbine towers at least three times the turbine rotor diameter (3D) from each other in the direction perpendicular to prevailing winds. The second is to place turbines at least 8D from each other in the direction parallel to prevailing winds. The reason for the different spacing is that the wake effects of turbines are much greater

downwind than they are cross-wind. The following figure, Figure 3-2 illustrates this spacing concept.

The prevailing wind direction for the Site is expected to be generally from the northwest (315°). It should be noted that these guidelines are not absolute requirements. Spacing may be tighter when land use conditions require it. If closer spacing is required, an increase in the corresponding turbine's losses would also be included in the performance projection to account for the efficiency losses. However, due to the nature of the site physical characteristics, it is expected the minimum spacing requirements should be easily attained for a multiple turbine plant configuration.

### **3.6 SITE ACCESS**

With blades up to 130 ft long, modern wind turbines require transportation on roads with a fairly large turning radius and only small changes in slope. Figure 3-3 illustrates turning radii (in millimeters) requirements for transporting the blades of a Vestas V80 wind turbine.

Careful route planning and on-site road improvement and/or construction may be necessary along roadways leading to the Site. Construction of access roads up Lenox Mountain to access the Site will be necessary. Once a specific turbine model is chosen during development planning, a detailed route survey and access plan should be developed and discussed with the manufacturer.

Commercial scale wind projects have been recently constructed in the nearby towns (e.g., Jiminy Peak and Brodie Mountain in Hancock, Massachusetts). It is assumed route planning and lessons learned thereafter for these Projects will be utilized for the Town wind project.

#### **3.6.1 Modes of Long Distance Transport**

The mode by which the wind turbine components will be transported to the Site will depend upon which manufacturer of turbine is installed and whether it is coming from a domestic source or from overseas. It is expected that all wind turbine components coming from a domestic U.S. source will be transported to the Site using one or multiple over-the-road trucks, as rail transport for the small turbine project considered will likely not be cost effective. Any

components coming from Europe will be transported by ocean cargo carriers to a U.S. port (likely Boston or Quonset, Rhode Island for this Project), then loaded onto over-the-road trucks for transport to the Site. It is possible that some components could be sourced from foreign suppliers that would use a Pacific port. In that case, it is expected the most cost effective transport manner would be by ocean to a port such as Los Angeles, and then long-distance over-the-road truck to the Project Site.

### **3.6.2 Local Access Routes**

In all cases, it is expected U.S. Interstate Highway 90 (I-90) would provide the major access way to approach western Massachusetts and the Town. From I-90, the most likely transport route would be via Route 20 North to Route 7/20 North. Multiple routes from these major thoroughfares were considered as part of this feasibility study. Figure 3-4 illustrates this route into the Town area.

Once turbine components reach the Lenox area, there are several potential routes transport vehicles could take to access the Site including the following four options:

- Route #1 – From Route 7/20 in Lenox, left on Walker Street (Route 183), right onto Main Street onto Cliffwood Street, and right onto Reservoir Road to Dunbar Road.
- Route #2 - From Route 7/20 in Pittsfield, left onto Dan Fox Drive to Tamarack Road, left onto Barker Road to Swamp Road, left onto East Road; left onto Reservoir Road to Dunbar Road.
- Route #3 – From Route 7/20 in Pittsfield, left onto Dan Fox Drive to Tamarack Road, left onto Barker Road to Swamp Road, left onto Osceola Road to Dunbar Road.
- Route #4 – From Route 7/20 in Lenox, left onto West Dugway Road to West Mountain Road, left onto Reservoir Road to Dunbar Road.

Route #4 described above and shown on Figure 3-5 is the expected local transport route as the other three routes described each have horizontal or vertical curves or both that would need significant modifications to allow transport vehicles to pass loaded with the wind turbine components. Many of these improvements or modifications could potentially have an impact on nearby residents and property and require interaction with utility and town infrastructure.

The preferred route, Route #4, would still require improvements prior to the transport of wind turbine components along this route. Along sections of the route, it will be necessary to increase the load bearing capacity of the existing road surface by installing additional aggregate on top of the existing road surface. In addition, potential widening or straightening of horizontal curves and the reduction of vertical curves may be necessary. At a minimum, the intersection of West Mountain Road and Reservoir Road would need to be bypassed by installing an approximately 530-ft long haul road connecting the two roads more directly and eliminating the sharp turn at the intersection. Some clearing would be necessary to allow for the construction of this bypass. Because this intersection occurs on town-owned land, no access agreement would be necessary to construct and utilize this improvement.

Clearing along the entire road length will most likely be necessary. Low hanging tree branches will need to be cut back as some wind turbine components may require as much as 15 ft of vertical clearance to allow transport vehicles to pass unencumbered. It may also be necessary to remove some trees along the route to allow for enough road width (minimum 15 ft) for transport vehicles to pass.

The final leg of the access route to the Site on top of Lenox Mountain will require significant improvement. This includes the section of Dunbar Road at the base of the hilltop leading to the construction access road up to the Site. The construction access road will need to be cleared of trees and shrubs, graded, and specified materials placed and compacted on top of the ground surface. The slope along this construction access road was approximated to be 15 degrees. It is expected this slope will allow for transport vehicles to pass without the need for additional equipment.

A staging or lay-down area will also need to be established at the top of the access road at the final point of installation to support construction activities. This area will also act as a turnaround for construction vehicles. This area will be a minimum of approximately 2 to 3 acres and will need to be cleared and grubbed and covered with an appropriate gravel matrix to support construction vehicles, including a crane. This area along with the construction access road is shown above on Figure 3-5.

The total length of access road needing improvement has been estimated to be 4,000 linear feet. A total area of approximately 6 acres will need to be cleared or improved to allow for the development of the proposed project.

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## **SECTION 4**

### **SITE VICINITY**

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## **4. SITE VICINITY**

As the area of the proposed site for wind development is largely undeveloped, the impact to uses of the area is expected to be minimal. However, due to the size of the WTG and the proposed siting along Yokun Ridge in the Lenox Mountains, the visual impact to the surrounding areas has been evaluated in detail.

### **4.1 DESCRIPTION OF SITE VICINITY**

The Town is located in Berkshire County, Massachusetts. Set in Western Massachusetts, it is part of the Pittsfield, Massachusetts Metropolitan Statistical Area. The Town is bordered by Pittsfield to the north, Washington to the east, Lee to the southeast, Stockbridge to the southwest, and Richmond to the west. The town center is 8 miles south of downtown Pittsfield, 45 miles west-northwest of Springfield, 125 miles west of Boston, and 6 miles east of the Massachusetts-New York border. The Town includes the commercial area of New Lenox and the hamlet of Lenoxdale. The Town has a population of 5,025 (2010 census). Of the Town's many attractions is Tanglewood (situated just over the town's border in Stockbridge), the summer home of the Boston Symphony Orchestra. The Town also has many hiking and recreational trails including those in Kennedy Park and in the Pleasant Valley Wildlife Sanctuary which is owned and managed by the Massachusetts Audubon Society. The Project Site is located approximately 2 miles northwest of downtown Lenox as shown on Figure 4-1.

The region around the Project Site is primarily woodlands with scattered homes in the hills and more dense population in the valleys. The area directly around the Project Site is owned by the local government for watershed and conservation. South of the Project Site, large portions of land are owned by Berkshire Natural Resources Council. At present, the land use around the Project Site is for watershed and light recreational use. Due to its classification as a watershed, the Site will not be open to home development. The installation of a wind turbine at the Project Site would not impact the watershed, and should cause only minimal impact to the recreational hiking and existing trails may need to be rerouted to meet safety setback requirements.



There are no known historic sites directly adjacent to the Project Site. During the permitting process, this topic will be explored in more detail. Several potentially sensitive locations from which the WTG would be visible were identified around the Site. Visual simulations of the WTG from these locations were developed and are discussed in greater detail in Subsection 4.2 below.

## **4.2 VISUAL AND NOISE IMPACT**

Any wind turbine installation is likely to have some adverse impacts on residential or commercial areas, though careful siting can often minimize these impacts. Some of the most common concerns are the potential noise impacts, the potential for shadow flicker impacts, and the potential for visual impacts on vistas that include the ridgeline where the WTG has been proposed for installation.

The homes closest to the Site are located along Under Mountain Road and West Mountain Road to the east of the Site. There is a small ridgeline and dense tree cover between the homes and the potential wind turbine site. To the southwest of the Project, the closest home is located approximately 1 mile from the Site. The high amount of observed woodlands around this home should mitigate some or all of the visual and noise impact of the Project. Two residences are within one-half mile of the proposed site and approximately 11 residences are located within three-quarters of a mile of the Site. The closest residence is located to the southeast of the Site and is approximately 2,300 ft away.

Table 4-1 presents a list of potential nearby receptors to noise and visual impacts imparted by the proposed wind development project at the Site. Figure 4-2 provides the location of each one of these potential receptors. A detailed acoustic study following the latest protocols established by the MassCEC is to be completed by the summer of 2011.

**Table 4-1**  
**Potential Visual and Noise Receptors**

<b>Receptor Number<sup>1</sup></b>	<b>Distance to Closest WTG (ft)<sup>2</sup></b>	<b>Closest Proposed WTG Site (North/South)<sup>3</sup></b>
No. 1	3,160	South
No. 2	3,070	South
No. 3	3,180	South
No. 4	2,790	South
No. 5	2,650	South
No. 6	2,930	South
No. 7	3,090	South
No. 8	3,210	South
No. 9	3,220	South
No. 10	2,300	North
No. 11	2,390	North
No. 12 <sup>4</sup>	2,700	North

Notes:

ft = feet

1. Includes receptors within 1000-meters of the proposed WTG sites

2. All distances are approximate

3. North WTG includes only the two turbine configuration

4. Receptor No. 12 is the main building of the Pleasant Valley Wildlife Sanctuary

#### **4.2.1 Visual Impacts**

Visual simulations of a WTG situated at the proposed site were completed from various vantage points around the surrounding area. Figures 4-3a and 4-3b show the location of each of these vantage points. The vantage points included in this analysis were chosen based on input from the Town regarding the sensitivity of the views from these locations and/or because there is enough open area not blocked by obstacles to allow for a clear view in the direction of the proposed Site. Figure 4-3a illustrates the results of the simulation for the single turbine configuration and Figure 4-3b shows the results for the two turbine configuration scenario.

Additional details regarding these different configurations are provided in subsequent sections of this report.

A model of the proposed WTG(s) along with the surrounding topography was developed for this analysis. The model represents the topography as a green wire frame such that the location of the WTG can be seen even if the WTG is actually behind obstructing topography. A snapshot view looking towards the WTG from each vantage point was generated showing the visual impact the WTG would have on the landscape from each viewpoint. It is important to note the simulations do not account for vegetation or other obstructions along view horizons that may obscure or even completely block the view of the WTG(s) from each of these vantage points. These simulations are presented in Appendix E.

Because each of the potential receptors listed in Table 4-1 are in heavily forested areas and the view of the proposed site will be obscured or blocked by vegetation, visual simulations were not completed for most of these viewpoints [a visual simulation was completed for the Pleasant Valley Wildlife Sanctuary (Receptor No. 12)].

#### **4.2.2 Shadow Flicker**

Shadow flicker is caused by sunlight passing through the swept area of the blades of a wind turbine. As sunlight passes through the spinning blades, it is possible to have a stroboscopic effect. The most typical effect is the visibility of an intermittent light reduction in rooms of dwellings facing the wind turbines and subject to shadow flicker. In general, these conditions require varying light intensity at frequencies of 2.5-3 hertz (Hz). Large commercial turbines are typically limited to a frequency of less than 1.75 Hz. Furthermore, the impacts of shadow flicker diminish rapidly with distance as the low-angle light necessary to produce shadow flicker bends around objects and becomes diffuse. For instance, at a distance of a mile, even if the conditions, like sun-angle, are ideal for producing shadow flicker, the intensity will be extremely low and hardly noticeable. As a general rule of thumb, the effects of shadow-flicker should be greatly diminished or nonexistent at 10 or more rotor diameters, which is not expected to exceed 1,000 m.

The effects of shadow flicker are also a seasonal and/or diurnal impact, requiring that the sun be at the right position in the sky to generate a line of sight with the affected receptor and the wind

turbine rotor. As such, the impacts of shadow flicker will generally only be felt for a few hours per year and limited to impacted areas. Also, it is much more likely to be a concern for residents in the surrounding area than for those using the area recreationally. Lastly, no flicker shadow will be cast when the sun is obscured by clouds/fog or when the turbine is not rotating.

Based on the sparse development around the Site, and the distance to the nearest dwellings from the proposed turbine locations (discussed in subsequent sections), as well as the vegetative cover surrounding most dwellings in the area of the Site, it is expected that shadow flicker will not be an issue.

### **4.2.3 Noise Impacts**

Noise considerations generally take two forms, state regulatory compliance and nuisance levels at nearby residences.

Massachusetts state regulations do not allow a rise of 10 decibels or greater above background levels at a property boundary [Massachusetts Air Pollution Control Regulations, Regulation 310 Code of Massachusetts Regulation (CMR) 7.10]. An increase in sound level of this magnitude is very unlikely to be reached along property boundaries that border developed areas at the Site.

Aside from Massachusetts regulations, the impact to nearby residences must also be taken into consideration. Any eventual turbine would be sited such that it would be inaudible or minimally audible at the nearest residences. However, the proposed turbine site and its proximity to nearby residences was evaluated as part of this analysis. As a general rule, to minimize possible noise impacts, wind turbines should be sited at least three times the blade-tip height from residences. The blade-tip height is not expected to exceed 430 ft. Applying the rule described above, turbines should be sited at least 1,300 ft away, approximately, from residences. The closest home to the proposed site is approximately 2,300 ft away; therefore, noise impacts to the community are expected to be limited to individuals hiking near the proposed site.

An additional analysis was completed simulating the noise impacts imparted by WTG operation on the surrounding area for both the single and two turbine configurations. The results of this

analysis for the single and two turbine configurations are shown on Figure 4-4a and Figure 4-4b, respectively. These figures show the anticipated sound level propagation around the Site during operation at 2 m above the ground surface. This model takes into account the topography of the surrounding area but does not take into account background noise levels, like wind, nor does it account for the sound dampening effects of vegetation. Table 4-2 presents the anticipated noise level at each potential receptor listed in Table 4-1 and shown on Figure 4-2 for the single and two turbine configuration scenarios. The highest calculated noise level among the receptors adjacent to the Site is 35.82 decibels for the single turbine configuration and 39.01 decibels for the two turbine scenario. These levels equate to approximately the same noise level one would encounter at a library. Normal residential background noise levels range in the mid 30-decibel level, therefore, it is anticipated the noise level imparted by both turbine configurations will not negatively impact the surrounding area.

**Table 4-2**  
**Noise Levels**

<b>Receptor Number<sup>1</sup></b>	<b>Noise Level Single Turbine [dB(A)]<sup>2</sup></b>	<b>Noise Level Two Turbines [dB(A)]<sup>2</sup></b>
No. 1	34.02	35.68
No. 2	34.36	36.05
No. 3	33.97	36.05
No. 4	35.25	37.16
No. 5	35.82	37.83
No. 6	34.93	37.48
No. 7	34.49	37.19
No. 8	34.06	36.86
No. 9	34.15	36.54
No. 10	34.32	39.01
No. 11	34.20	38.69
No. 12 <sup>3</sup>	32.43	37.30

Notes:

1. Includes receptors within 1000-meters of the proposed WTG sites
2. dB(A) = decibels (A-weighting curve)
3. Receptor No. 12 is the Pleasant Valley Wildlife Sanctuary

A detailed acoustic study following the latest protocols established by the MassCEC is to be completed by the summer of 2011.

### **4.3 AIRSPACE IMPACT**

The Site is approximately 3.5 miles south of the Pittsfield Airport as shown on Figure 4-5. However, the Pittsfield Airport and other public and military airports in the region are far enough away that they do not impose a siting restriction. According to Federal Aviation Administration (FAA) Advisory Circular 70/7460-2J, a Notice of Proposed Construction must be filed with FAA for the construction of any structure over 200 ft (61 m) tall (to blade-tip) or within a certain distance-height zone from commercial or military airports. Prior to installation, Form 7460-1 (Notice Of Proposed Construction or Alteration) must be sent to FAA for any proposed wind turbine installation exceeding this threshold. Any concerns of airport personnel and other air safety regulators would be considered as part of the turbine siting process. For instance, FAA requires that any structure over 200 ft be lit. Any commercial-scale turbine installed at the Site will be lit and marked per aviation safety requirements.

It is recommended the marking plan for the turbine include two aviation warning lights positioned on both sides of the nacelle so that visibility of at least one light will not be blocked by a stopped wind turbine blade. The lights should blink in unison, and be of a dual-light design that will use a white light during daylight hours and red during nighttime hours. This approach achieves aviation safety and limits the visual impact of the lights to nearby residents. The proposed wind turbine project is not expected to impact the operations of the Pittsfield Airport.

A pre-screening analysis was completed to evaluate the impact that siting WTGs at the Site would have on radar operated in the area and military operations. To complete this analysis, the pre-screening assessment tools located on the FAA's Obstruction Evaluation/Airport Airspace Analysis portal were utilized.

Three separate pre-screening evaluations were completed including long range radar (air defense and Homeland Security), next generation radar (NEXRAD) used for weather surveillance, and military operations. A report was generated for each evaluation and all three have been included as Appendix F. The long range radar analysis yielded a result indicating a wind turbine located at

the proposed site would likely impact radar. However, pre-screening for impact to military operations and NEXRAD radar indicated there would be minimal or no impact.

In addition to the pre-screening analyses described above, an aeronautical study or obstruction analysis has been filed with FAA. The results of this determination were not available at the time this document was completed; however, a formal assessment from FAA on any adverse impact will be required as part of permitting. Section 7 discussing permitting requirements for the Project.

#### **4.4 COMMUNICATIONS IMPACT**

A microwave tower is located approximately 1.5 miles north of the Project Site, near the location of the abandoned fire watch tower (see Figure 4-5). While no microwave antennas were observed to be oriented toward the Site, it is recommended the operator of this tower be contacted to confirm no beam path interference would be likely from a wind turbine at the Project Site.

#### **4.5 COMMUNITY IMPACT AND COMMUNICATION**

##### **4.5.1 Types of Impacts**

For this type of project there are three potential impacts that include the following:

##### **Community Statement**

By embarking on this Project, the Town is embracing the concept of *local control and responsibility* for energy production. This reinforces the idea of making the Town a more sustainable community that is thinking long term and is self dependent. In addition, it “brands” the Town as a responsible and Green community, making it a more desirable place to live.

##### **Economic Savings**

Should the Town move forward with this Project, it will realize a reduction in energy costs based on the current cost of electrical power, and the incentives and net metering options currently available. This reduction in cost will translate directly as a benefit to the tax payers in the Town.

## Physical Presence

Instead of obtaining all its power from a remote large power generation station, the Town will install its own wind turbine, and this turbine will be visible and will create noise. The negative aspects of these impacts can be detailed and can be minimized to benign or (at least) acceptable levels. Information on these impacts is detailed in this report.

### 4.5.2 Proactive Communication to Discuss Impacts

The Town of Lenox Board of Selectmen and its various committees have been working on this Project for several years, and it appears that the town residents are relatively enthusiastic about the Project and recognize the community benefits.

However, Lenox is a seasonal community appreciated for its scenery and recreational activities, and the presence of large wind turbines may be viewed as intrusive. As discussed previously, the majority of the homes in the direct area of the Project Site should have little to no visual impact and no noise impact brought on by the installation of a WTG.

Still, some residents have expressed concern about the noise and effects on views, which are concerns common to wind projects of this size. The Town is committed to maintaining open communication about project plans with the community and also with adjacent towns like Richmond, by both direct presentations and discussions with community groups (i.e., Lenox High School, Town Employees, Lenox Environmental Committee, Richmond Selectboard, Audubon staff and members) as well as hosting open forums to the community at large.

Direct physical impacts to the community that will be included in these presentations include:

- Construction activity
- Biological –flora and fauna of site work and operations
- Visual
- Noise

This study details the limited and various environmental effects of the Project. These will be conveyed to the public in multiple gatherings and presentations. In addition, the Town should have a plan already devised for the possibility of future negative biological findings in required studies and during construction and mitigation procedures. As an example, if a rare animal is



spotted during site clearing, a means and method for capture and relocation to a suitable site needs to be included in project plans and procedures detailed before the event happens (i.e., working out details with Audubon group). Another example is if, contrary to current understanding, significant bat mortality occurs during wind turbine operation, procedures already in place for curtailing wind turbine operations during bat activity periods can be implemented.

To understand the Project (and its impact), the community members need to see what the Project will look like from various locations in town. Visual simulations of the Project will be presented. Photomontages (actual photographs with wind turbines superimposed) will be fair in their accuracy and coloration (i.e., the towers in shade or directly reflecting sunlight to the viewer) and include a point of reference regarding overall size to put the Project in perspective.

The description of visual impacts transitions well into a review of “flicker”, the resulting effect of sunlight on and through the revolving wind turbine blades. Details of the flicker analysis are included in this report.

A noise impact study from a neutral and experienced firm will be implemented (as per this report) and the results presented in language that is clear to the layperson (i.e., not technical jargon). Examples of existing wind turbine noise impacts (site visits to Jiminy Peak or Berkshire East) and comparisons to recognizable sound levels (ambient noise levels, lawnmower, refrigerator, and highway) are both equally important.

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## **SECTION 5**

### **SITE ELECTRICAL INFRASTRUCTURE**

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## 5. SITE ELECTRICAL INFRASTRUCTURE

At present there are no overhead or known underground electrical lines at the Site or along Reservoir Road near the Site. The closest overhead electrical lines are to the east of the Project Site approximately 1 mile away, and are single phase distribution voltage lines [10 kilovolt (kV) or below] operated by National Grid. The Lenox Pumping Station is located approximately 4,000 ft west of the Reservoir Road-Dunbar Road intersection, and is connected to a WMECO overhead line. WMECO has confirmed this line to be a 23-kV line, which is sufficient for the interconnection of a commercial wind turbine. Although the distribution lines were not physically traced, based on information provided by National Grid, these single phase lines to the east of the Site ultimately connect with a National Grid at a substation in Lenox approximately 4 miles east of the Project Site. The WMECO distribution line at the Lenox Pumping Station likely connects with the same 115-kV transmission line at the Oswald Substation approximately 4.5 miles north of the Project Site.

It has been confirmed with both National Grid and WMECO that the proposed site is in National Grid territory. Therefore, per the net metering provisions in Massachusetts, in order for an entity to take advantage of electricity and the value of the electricity generated by the system (known as net metering credits), the end user must be serviced by the same utility and in the same load zone as the generating facility. In this case, the proposed project must be connected to National Grid distribution lines and therefore, any electricity usage the Town has through National Grid could be offset. Also per the net metering provision in Massachusetts, the type of system proposed for this Project would fall under a Class III system. A Class III Net Metering Facility includes wind net metering facilities with a generating capacity of more than 1 megawatt (MW) but less than or equal to 2 MW.

The Town is serviced by both WMECO and National Grid. A summary of the majority of the town's electricity usage in 2010 by facility is provided in Table 5-1. As illustrated in Table 5-1, approximately 1,821 megawatt-hours (MWh) of electricity was serviced through National Grid while 921 MWh was serviced by WMECO. Because the potential wind turbine site is within National Grid territory, the Town should be able to offset approximately two-thirds (i.e., all of the National Grid usage) of its electricity usage if a large enough project is developed.

Based on the size of the WTGs (1.5 MW) considered for this Project, it is expected generation will far exceed the annual consumption by the Town serviced through National Grid. Therefore, Lenox would need additional contracts with the host utility other parties to make use of the additional wind power generated. One arrangement would be to negotiate a Power Purchase Agreement (PPA) with other National Grid municipalities or credit-worthy businesses within the same load zone to purchase the additional electricity. This would be the simplest arrangement to fully capture all the potential economic value of the energy. This evaluated and discussed in greater detail in subsequent sections of this report.

**Table 5-1**

**Municipal Energy Usage Data**

Location	2010 Consumption by Provider (kWh)		2010 Cost by Provider (kWh)	
	National Grid	WMECO	National Grid	WMECO
Lenox Memorial Middle and High School	687,000	0	\$94,647.00	\$-
Lenox Morris Elementary School	440,640	0	\$60,260.00	\$-
Waste Water Treatment Plant	0	389,760	\$-	\$50,644.00
Waste Water Pump Stations	165,068	86,041	\$26,238.00	\$13,676.00
Water Treatment Plant	5,090	413,714	\$962.00	\$52,245.00
Street Lights	120,838	17,276	\$43,093.00	\$4,614.00
Town Hall	157,285	0	\$21,705.00	\$-
Community Center	44,000	0	\$6,879.00	\$-
Fire Stations	30,976	14,616	\$4,895.00	\$2,330.00
Library	131,680	0	\$20,396.00	\$-
Department of Public Works	36,077	0	\$5,738.00	\$-
Athletic Fields	2,399	0	\$522.00	\$-
<b>Totals</b>	<b>1,821,053</b>	<b>921,407</b>	<b>\$285,335.00</b>	<b>\$123,509.00</b>

## 5.1 POTENTIAL INTERCONNECTION POINTS

Figure 5-1 illustrates the closest distribution lines managed by National Grid. As shown on this Figure, the nearest distribution line is a single-phase line that intersects with Reservoir Road between the intersections of Under Mountain Road and West Mountain Road. It would not be feasible to interconnect to this line, however. Instead, it would be necessary to run approximately 3 miles of conductors to the three-phase distribution line (labeled 1103W2) running along Main Street or Route 7A to the east of the Project Site. This length of run for interconnection will increase development costs. It has been approximated that installation and equipment costs for this type of interconnection would cost \$75,000 per mile (assuming above ground installation). This does not include potential costs for the development of substations at either end of the connection which could increase costs significantly. An interconnection impact study would need to be completed by the utility during the interconnection application process to confirm such requirements.

At Dunbar Road, the electrical line could be transitioned to an underground cable, and routed to the wind turbine. One route would be along the site access road which would take advantage of economies of scale during construction; however, if a direct path can be made the cable length would shorten considerably. The cable would then terminate into the pad mounted transformer next to the base of the wind turbine. Figure 5-2 shows a typical arrangement for a wind turbine and base transformer.

It is believed all of the land along this route is owned by the Town. Reservoir Road should be the only active public right-of-way that would need to be crossed, given that Dunbar Road is closed to public access. Other possible routing solutions can be determined during the initial design phase of the Project.

Communications from the wind turbine can be done using radio link, telephone line, or cellular telephone. For a telephone line, such a line would likely need to be run along with the electrical cables and overhead lines, and possibly extended further west to the closest existing telephone junction.

## **5.2 INTERCONNECTION FEASIBILITY**

The interconnection options discussed would require a detailed interconnection study be performed by National Grid that would also entail performing a system impact study. It is expected that the nearby distribution and transmission lines in this area are not heavily loaded. Therefore, it is expected a project of this size should be able to interconnect to the lines on National Grid's system without needing major system upgrades. However, a detailed study performed by National Grid will ultimately decide the feasibility of interconnecting the Project.

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## **SECTION 6**

### **POTENTIAL ENVIRONMENTAL CONCERNS**

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## 6. POTENTIAL ENVIRONMENTAL CONCERNS

To determine which environmental concerns are likely to exist for a wind turbine project at the Lenox site, WESTON and its consultant, Stantec, Inc., reviewed information obtained from the New England office of the U.S. Fish and Wildlife Service (U.S. FWS), Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (NHESP) ([www.nhesp.org](http://www.nhesp.org)), National Wetland's Inventory (NWI) maps, U.S. Department of Agriculture, National Resources Conservation Service (NRCS) soil maps, and MassGIS. We have obtained information on the locations of ACECs, Open Space, BioMap Core Habitats, certified vernal pools, Living Waters Critical Supporting Watersheds, and Living Waters Core Habitats. This information helps to identify areas of the state that are of particular concern for endangered plant and animal life and to identify important habitats such as wetlands and vernal pools. WESTON and Stantec also reviewed information from the Massachusetts Audubon Society, the Nature Conservancy, and other public sources regarding sensitive areas near the Project Site. While this information is a good resource for an initial feasibility study, WESTON would not consider the information below an exhaustive list, and would recommend a specific environmental review be completed for the Project Site in future phases of project development.

### 6.1 SITE FLORA AND FAUNA

#### 6.1.1 Natural Heritage and Endangered Species Program

The Massachusetts Division of Fisheries and Wildlife's NHESP maintains a website ([www.nhesp.org](http://www.nhesp.org)) that identifies vulnerable and protected plant and animal species, as well as sensitive core habitats broken down by town. The NHESP area designations reviewed and mapped for this Site include:

**Areas of Critical Environmental Concern:** These are areas in Massachusetts that are considered special and highly significant due to their natural and cultural resources. Nominations for areas to receive ACEC designation are made by communities to the state Secretary of Environmental Affairs. Administration of the ACEC program is done by the Department of Conservation and Recreation. Figure 6-1 shows the location of ACECs near the Project. It is important to note that the Site does not fall within an ACEC.



**Priority Habitat for Rare Species:** These areas are NHESP estimates of habitats for rare species. The boundaries of these habitats are considered approximate. Based upon information obtained from NHESP, the Site does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat. NHESP noted that the Jefferson Salamander, *Ambystoma jeffersonianum*, a state-listed rare species, has been observed in the vicinity of the Site. In addition, the New England Field office of the U.S. FWS indicated that “no federally-listed or proposed, threatened or endangered species or critical habitat under jurisdiction of the U.S. FWS are known to occur in the project area.” Figure 6-2 (Priority Habitats for Rare Species) confirms that the Site does not fall within a Priority Habitat.

**Protected and Recreational Open Space:** These are areas that have been designated at the state or community level as areas for limited or no development. The MassGIS, the service from where the data was obtained, shows the site area to be within a “limited” open space (see Figure 6-3). Limited is defined as:

*Protected by legal mechanisms other than those above (for temporary or In Perpetuity Open Space), or protected through functional or traditional use. These lands might be protected by a requirement of a majority municipal vote for any change in status. This designation also includes lands that are likely to remain open space for other reasons (e.g., cemeteries and municipal golf courses).*

The “limited” designation by MassGIS may simply be a reflection of the fact that this is a watershed area that is protected under the Town of Lenox’s Scenic Mountains Act. The purpose of the act is to protect watershed resources and preserve the natural scenic qualities of the mountain region. The construction of a municipal utility on the Site is permitted.

Open space designated as “In Perpetuity” is located in several areas surrounding the Site, but none of these area intersect with the Site. “In Perpetuity” is defined as

*“Legally protected in perpetuity and recorded as such in a deed or other official document. Land is considered protected in perpetuity if it is owned by the town’s conservation commission or, sometimes, by the water department; if a town has a conservation restriction on the property in perpetuity; if it is owned by one of the state’s conservation agencies (thereby covered by article 97); if it is owned by a non-profit land trust; or if the Town received federal or state assistance for the purchase or improvement of the property.)”*

**BioMap Core Habitats:** The BioMap program was completed in 2001 by NHESP, and identified areas considered to represent habitats for the state's most viable rare plant and animal populations. BioMap Core Habitats and Living Water Core Habitats encompass almost 1.4 million acres, or about 28% of the land area of Massachusetts. Figure 6-4 shows the Site to be within a Core Habitat, known as BM677, which includes Lenox Mountain. In addition, BM492, located in Pittsfield, includes a bat hibernaculum which may warrant more investigation (see Subsection 6.1.2 below). The NHESP BioMap and Living Waters report is included in the Black and Veatch 2005 wind study (see Appendix B of that report, for the 2004 *Core Habitats of Lenox* document produced by NHESP, which is included in this report as Appendix A to this report), and includes discussions on the species identified in these core habitats.

**Certified Vernal Pools:** NHESP defines vernal pools as small, shallow ponds characterized by lack of fish and by periods of dryness. These pools are deemed critical to some wildlife, and are protected under a variety of state programs including the Massachusetts Wetlands Protection Act (WPA). No vernal pools are identified within the immediate project vicinity based upon maps obtained from MassGIS; however, at least one vernal pool is located further to the north of the Site, and a site walk with the Lenox Conservation Commission should be conducted to identify vernal pools. Figure 6-5 depicts the locations of vernal pools in the Lenox area, including those that are proximate to the Site. The Core Habitats of Lenox document (NHESP 2004) notes that "another conservation priority should be areas of mature deciduous or mixed forest with clusters of vernal pools that provide breeding habitat for Jefferson or Marbled Salamanders."

**Living Waters Critical Supporting Watersheds:** These watersheds are identified as being critical for supporting Living Waters Core Habitats. They were identified in the Living Waters project completed in 2003 by NHESP. Figure 6-6 shows that the Site falls within a Critical Supporting Watershed.

**Living Waters Core Habitats:** Similar to the BioMap Core Habitats, the Living Waters Core Habitats are those rivers, streams, lakes, and ponds critical to the biological diversity of Massachusetts. Figure 6-7 shows that the Site does not fall within a Living Water Core Habitat.

These maps show that the Project Site is within a BioMap Core Habitat (BM677), a Protected and Recreational Open Space, and a Living Waters Critical Supporting Watershed (LW359). The

Site is not within a Priority Habitat for Rare Species. Should this Project move forward, a detailed environmental review of the Site should further investigate the requirements of the “limited” level of protection for the open space designation, better define habitat boundaries, and which species are located at or near the Site.

### 6.1.2 Avian and Bat Impacts

The largest biological concern for this Project may be potential or perceived risk to avian and bat species. To begin addressing these potential concerns, WESTON’s bird and bat study subcontractor, Stantec, completed an initial bird and bat risk identification report. This report (see Appendix G) presents the likelihood for rare, threatened or endangered bird and bat species to occur at the Site, and provides an initial assessment of the likelihood for the proposed project to significantly impact bird and bat species.

The initial bird and bat risk identification process included three primary steps: 1) request natural resource information from state and federal agencies and perform desktop analysis of site photographs; 2) conduct an information review of avian and bat resources in the vicinity of the Site; and 3) conduct a review of publicly available pre- and post-construction data from other proposed and operational wind projects in Massachusetts and the Northeast. Results are as follows:

- No federally-listed or proposed threatened or endangered bird or bat species or critical habitats were identified at the Site by U.S. FWS.
- NHESP identified no Estimated Habitat of Rare Wildlife or Priority Habitat for bird or bat species at the Site.
- The information review step performed for this Project identified two potential issues which may require agency follow-up. These are the potential breeding presence of mourning warbler (*Oporornis philadelphia*), and the species composition and foraging behavior of bats in the hibernaculum identified in Core Habitat BM492 (Pittsfield). Consulting with agencies at this stage of project development is suggested to determine whether or not these are issues that warrant further investigation.

Results of this initial avian and bat risk identification do not suggest that avian and bat issues at the Site are unique or greater than those at other projects in the Northeast for which data are publicly available, particularly in regard to risk to passerine, raptor and bat migrant species;

however, the data provided are qualitative and should not be used in lieu of on-site ecological surveys. Without the existence of state guidelines regarding wind power projects and wildlife to identify the requirements necessary for permitting a Massachusetts wind project, the best site-specific and regionally-specific biological information available should be used to inform the Project as it is reviewed by multiple entities. Consultation with agencies would help ensure this.

The Massachusetts Audubon Society owns land for conservation to the north of the Project Site. This society also designated a region to the east of the Project Site as the Upper Housatonic Valley Important Bird Area. Development of the Project will require dialog and coordination with this Mass Audubon, who has been conducting breeding bird surveys at Pleasant Valley bird sanctuary immediately to the northeast of the Project Site (see Appendix G).

An additional resource that may be beneficial for review is the results of any wildlife studies performed for the microwave tower located 1.5 miles north of the Project Site. Research done during the permitting stage should ascertain if any studies were done, and if those studies are available for review.

## **6.2 STREAMS AND WETLANDS**

The potential stream and wetland impacts of the Project, primarily due to the construction of the access road to the wind tower site and associated staging area, will need to be evaluated. This evaluation is of particular importance due to information obtained from Commonwealth of Massachusetts NHESP, which identified the Jefferson Salamander (*Ambystoma jeffersonianum*), a species of “special concern” and a species dependant on wetlands, particularly vernal pools, as the only listed species within the terrestrial impact area. This evaluation requires a review of applicable state and federal laws, as well as the locations and sizes of streams and wetlands in the impact area.

### **Site-Specific Information**

A review of available information has been conducted to determine the likelihood that stream or wetland impacts may occur as part of the Project. WESTON has reviewed NWI maps of the project area (see Figure 6-8) and the Massachusetts Department of Environmental Protection

(MassDEP) wetlands from the MassGIS server (see Figure 6-9), and no streams or wetlands are mapped within the proposed project area; however, there are streams located downslope of the project area that could potentially be affected by the Project. However, it should be noted that NWI and MassGIS mapping only includes larger-scale streams and wetlands, and can only be considered a screening tool. WESTON recommends a ground survey of the proposed project area to identify potential streams, wetlands, and vernal pools.

WESTON has also reviewed U.S. Department of Agriculture, NRCS soil maps of the project area, to identify soil units which may include hydric soils, a requisite condition for wetlands. The two soil units mapped over the majority of the project area are the Peru-Marlow association, rolling, extremely stony (905C), which occurs on the lower hillsides, and the Lyman-Tunbridge association, steep, very stony (904E) near the summit of Lenox Mountain. Both of these soil units are characterized as well drained to moderately well drained, and thus, neither of these soil units constitute hydric soils. However, as noted in the NRCS Soil Survey Report, the mapped soil units typically include “some minor components that belong to taxonomic classes other than those of the major soils.” Thus, the shallow depth to bedrock (10 to 20 inches) in the Lyman soils, and shallow depth to water table in the Peru soils (18 to 30 inches), provide potential for localized water tables shallower than 12 inches that would result in inliers of hydric soils. These findings further support the recommendation for a ground survey of streams and wetlands in the proposed project area.

WESTON recommends a ground survey for streams and wetlands of the proposed project area, to be limited to 50 ft along the upslope side and 100 ft to the downslope side of the proposed access road(s), as well as within a 500-ft radius of the proposed tower location(s). This should be accomplished by the Project proponent along with the Town of Lenox Conservation Commission.

### **6.3 ENVIRONMENTAL IMPACT**

WESTON feels that the likelihood of a small wind energy project having unacceptable environmental impacts is small. However, some avian and other species may be present at the Site that warrant further ecological study and surveys (Jefferson Salamander, mourning warbler, and bat hibernaculum). While most wind energy projects have little or no recorded bird strikes, it

can be a significant problem at a few sites and it is therefore, important to determine if species known to be susceptible to wind turbine strikes can be found at the Site.

There are multiple development strategies for lessening impacts to a range of species of birds and bats based on the U.S. FWS interim guidelines and Massachusetts Environmental Policy Act (MEPA). These include the use of tubular wind towers in lieu of lattice structures, curtailment during times of heavy migration events and low visibility, reduction in blade rotation speed, avoiding guy wires on met towers, placing electrical lines underground, reducing and modifying lighting, and minimizing habitat disturbance/alteration during and after project development.

Although no wetlands are mapped within the immediate footprint of the Project, a site walk should be performed to evaluate the presence of wetlands, streams, and vernal pools in the immediate site vicinity so that proper permitting and mitigation measures can be implemented.

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## **SECTION 7**

### **PERMITTING AND INTERCONNECTION REQUIREMENTS**

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## **7. PERMITTING AND INTERCONNECTION REQUIREMENTS**

WESTON has investigated the general permitting requirements for energy projects in Massachusetts and an initial list of those requirements along with expected timeframes has been developed. There are numerous state, local, and federal permits which will be required (see Table 7-1) for a construction project of this size. In addition to a summary level presentation in Table 7-1, this section discusses in more detail some of the more likely or more relevant permitting issues for wind projects.

### **7.1 SITE ZONING**

Based on documents provided by the Town and discussions with town officials, the proposed location of the wind turbine at the Site lies within residential zoning and is designated by R-3A. As shown in the attached Town of Lenox Zoning Map (Figure 7-1 March 2009), this zone is bordered to the east by R-1A zoned property, to the south by Town of Stockbridge, to the west by the Town of Richmond, and to the north by the Town of Pittsfield (see H for the Town of Lenox Zoning Bylaw).

While the RS-3 zone is designated as residential, few if any homes exist in this area as the zone is moderately to heavily vegetated. The current land use designation for the area is as a watershed and several ponds and wetlands exist to the west of the proposed site. The assessment card lists the property as a municipal district as it is exempt for tax purposes even though the property is zoned as residential.

The project limits lie within Tax Map Lots numbered 15, 16, 20, and 21 based on The Town of Lenox Property Index Map (see Appendix H). A total of 587.2 acres Owned by the Town make up the property.

#### **7.1.1 Wind Development Bylaws**

As discussed in Section 3 of this report, the Town does not currently have a wind bylaw. However, the zoning bylaw allows municipal utilities in the residential zone. The Town would have to file for a special permit for the WTG installation with the Town ZBA and is not expected to curb the development of the Project (see Appendix D for the Massachusetts Model Wind Facility Bylaws for an example).



### **7.1.2 Scenic Mountain Act**

The entire R-3A area as designated in the Town Zoning Map falls under the Scenic Mountain Act based on Conservation Commission and General Law Chapter 131, Section 39A authority as the Site (or any part therein) is less than 1,400 ft in elevation and is located adjacent to steep slopes (15% or greater over a horizontal distance of 200 ft). The purpose of the act is to protect the watershed resources and preserve the natural scenic qualities of the mountain region. While electric facilities are exempt from the Scenic Mountain Act (Appendix H includes the text of the Scenic Mountain Act, see Section 12), the Project will be designed to minimize adverse impacts.

## **7.2 REQUIRED PERMITS AND TIMELINE**

The primary permits needed to construct most community-scale wind power projects will include the local permits such as building, zoning special permit, wetlands (through Conservation Commission and Order of Conditions), and fire code approval. The Project will need to be filed with FAA. If electricity is to be sold directly to the grid, approvals will be needed from ISO New England, EFSB, and Mass DPU. An interconnection permit and system impact study will be required by National Grid. For this Project, other permits or reviews may be required such as MEPA review, Massachusetts Department of Fish and Game NHESP compliance, wide load permits, general access permits, and the Massachusetts Department of Highway if alterations to state roads are needed.

At this phase of project development, limited contacts with state and federal agencies were made to explore the permit requirements for this Project. Local officials were contacted regarding the zoning status of the Site and the likely permits required, including compliance with the Scenic Mountains Act. The above list represents a collection of permits that may be required, and identifies which permits are likely to be needed for the Project. It is recommended that additional contacts with the appropriate local, state, or federal agencies be made to obtain a more refined understanding of permitting requirements as the Project moves forward.

To prepare for these permits, it may be advisable to have informal meetings with each agency to discuss the Project and that agency's study expectations. The majority of the permits listed in this section are expected to require approximately 3 to 4 months to obtain, following completion of

appropriate study work. In some cases, lead time may be longer depending on the complexity of the Project (system impact study and interconnection may require 6 months or even more).

If project development moves forward, the Town should begin some permitting and related activities in the near term including the following:

- Avian and other wildlife studies generally require seasonal observations and should be planned accordingly.
- A wetlands survey should be conducted, and the wetlands mapped by the Conservation Commission.
- A review should be conducted to determine if there are any areas of historic or archaeological interest at the Site.
- If noise concerns are expected to be an issue for residents, an acoustic study should be performed.
- Although flicker impacts are expected to be minimal given the distance of the nearest resident, a more detailed study on the potential shadow flicker impacts, taking land cover and weather patterns into consideration, may be warranted.
- Discussion with National Grid about interconnecting the Project should also begin as early as possible to help determine the best interconnection option, and then an interconnection request should be filed.
- Because one or more thresholds under MEPA could be exceeded, and a wind project will most likely require state agency action (a permit from a state agency), WESTON recommends that the Town obtain an advisory opinion as to whether or not the Project will require MEPA filing.

Additional details on wetlands and MEPA permits and regulations are included below.

### **7.2.1 Wetlands**

Activities in waters of the U.S. that have minimal individual and cumulative adverse effects on the aquatic environment within the Commonwealth of Massachusetts are regulated under a General Permit issued to the Commonwealth by the New England District of the U.S. Army Corps of Engineers effective 21 January 2010. Permit applications are made to the local Conservation Commission using MassDEP WPA forms.

Under the Massachusetts WPA (MGL c. 131 Section 40), a Final Order of Conditions must be obtained for construction activities in or affecting wetlands subject to jurisdiction as defined in 310 CMR 10.02. As noted above, this permitting is performed via applications made to the local Conservation Commission using MassDEP WPA forms.

Because the wind turbine project is not anticipated to have any unacceptable or significant adverse effects on the watershed resources or natural scenic qualities, a Request for Determination of Applicability will be submitted to the Conservation Commission via submittal of Form A. The purpose of this submission is to determine if the activity is regulated or not. Information in the form will include a description of the scope, design (if available), plans showing all phases of site work, erosion and sedimentation controls to protect the watershed in accordance with Best Management Practices, and engineering drawings. Following review of this form, it is anticipated that the Conservation Commission will issue a Preliminary Determination of Applicability and require a Notice of Intent (NOI).

The NOI submittal shall include at a minimum project plans, locus map, USGS map, zoning map, drawings stamped by a professional engineer, and vegetation profile maps. Hydrologic calculations and plans of storm water mitigation designed by a registered professional engineer for 2-year, 10-year, 25-year, and 100-year intervals shall also be included. Following submittal of the NOI, a public hearing will be scheduled with the Town. It is anticipated that following the public hearing, an Order of Conditions (Form D) will be signed by the Conservation Commission, a general public notice will be made by the Town, and the order will be recorded with the Berkshire Middle District Registry of Deeds.

Under MGL c. 91, a waterways license or permit MassDEP must be obtained for activities within streams subject to its jurisdiction, defined in 310 CMR 9.05. All stream crossings or improvements to existing crossings must comply with the standards set forth in *Massachusetts River and Stream Crossing Standards*, developed by the River and Stream Continuity Partnership, revised 1 March 2011.

Work in Corps jurisdictions involving a discharge of dredged or fill materials to waters of the U.S., including wetlands requires Water Quality Certification (WQC). Some projects require an individual WQC issued by MassDEP under Section 401 of the Clean Water Act and

314 CMR 9.00, before work can proceed (see Appendix B for 401 WQC requirements). This requirement is not expected to be invoked for the proposed project as no discharge of dredged or fill materials is expected.

### **7.2.2 Massachusetts Environmental Policy Act**

The MEPA requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. It also requires them to take all feasible measures to avoid, minimize, and mitigate damage to the environment.

MEPA applies to projects that exceed MEPA review thresholds and that require a state agency action, specifically that they are either proposed by a state agency or are proposed by municipal, nonprofit or private parties and require a permit, financial assistance, or land transfer from state agencies.

MEPA review is not a permitting process, but requires public study, disclosure, and development of feasible mitigation for a proposed project. It does not pass judgment on whether a project is environmentally beneficial, or whether a project can or should receive a particular permit. Those decisions are left to the permitting agencies. MEPA review occurs before permitting agencies act, to ensure that they are fully cognizant of environmental consequences of their actions.

MEPA review provides the mechanism through which this information collection and mitigation mandate is executed. MEPA empowers the Secretary of Energy & Environmental Affairs to oversee the review process. The process is public and encourages comments from citizens and from state, regional, and local agencies.

There are a number of threshold categories that are used to determine whether or not a project would require MEPA review. These categories include: Land; State Listed Species; Wetlands, Waterways and Tidelands; Water; Wastewater; Transportation; Energy; Air; Solid and Hazardous Waste; Historical and Archaeological Resources; ACEC; and Regulations.

Based upon the currently available information regarding the potential project, none of the thresholds requiring submittal of an Environmental Notification Form (ENF) and Environmental

Impact Report (EIR) will likely be exceeded. However, thresholds for one category, wetlands, waterways, and tidelands, could potentially be exceeded by the Project. Although no mapped wetlands are shown in the immediate vicinity of the proposed site, potential exists for wetlands to be present and affected by the Project, either directly on the Site or as part of transmission line and substation installation. If the Project requires a variance in accordance with the WPA, then an ENF and EIR will be required. If the Secretary of Energy and Environmental Affairs requires failsafe review, and more than ½ acre of wetlands will be altered, submittal of an ENF and further MEPA review will be required.

Additionally, the requirements for land should be investigated further as the Project moves forward and becomes better defined, particularly with respect to the total land area affected (threshold is 25 acres and currently the footprint is estimated at 5 acres), creation of impervious area, and watershed preservation.

The Project would not exceed the Energy category thresholds, which include a project of 25 or more MW and construction of transmission lines with a capacity of 69 kV or more along new, unused, or abandoned right-of-way for a distance of at least 1 mile.

The Site is not within a designated priority habitat or an ACEC; therefore, thresholds related to these categories would not be exceeded.

Additional review of the State Register of Historic Places and the Inventory of Historic and Archaeological Assets of the Commonwealth should be conducted to determine if any of these features are within the project area. If these features are present and the Secretary requires failsafe review, additional MEPA review and submittal of an ENF would be required.

### **7.2.3 Federal Aviation Administration**

Subsection 4.3 of this report includes details of FAA notification.

### 7.3 INTERCONNECTION REQUIREMENTS

In order to interconnect the proposed project to the distribution grid, an application process must be followed. National Grid has a standard process for submitting the interconnection application and granting approval. More information can be found at the following worldwide web address:

[https://www.nationalgridus.com/masselectric/home/energyeff/4\\_standard-interconnection.asp](https://www.nationalgridus.com/masselectric/home/energyeff/4_standard-interconnection.asp).

Based on the size of the potential Lenox Wind project, an expedited or standard interconnection process will be followed. Common elements for any interconnection application include the application form itself, single line diagrams showing the key elements of the plant, a site plan, specification sheets for generation and other electrical equipment, proposed interconnection methodology, and payment of the application fee. Once all the initial documents are approved, the application is considered complete and forwarded to National Grid's Engineers for initial screening and technical review. Additional detailed impact studies may be required depending upon the size and type of generating system (non UL-1741 listed) and the outcome of the initial screening before final approval to interconnect is granted.

Approval timing is dependent on the necessary breadth and depth of the interconnection impact study to be completed by the utility and any required system modifications that result from the impact studies.

**Table 7-1**  
**List of Permits**

Agency	Permit	Regulated Activity	Required Project Phase	Applicable to Project	Minimum Review Time	Comments/Issues
<b>FEDERAL</b>						
COE	Section 404 Nationwide Permit	Discharge of dredge or fill material into US waters, including jurisdictional wetlands	Construction	MAYBE	3 - 4 months for nationwide; 2 -3 months for individual	Required only if wetlands will be filled on site or along off-site utility right-of-way. Site reconnaissance needed to determine applicability.
FAA	Notice of Proposed Construction or Alteration	Construction of an object which has the potential to affect navigable airspace (height in excess of 200 feet or within 20,000 feet of an airport)	Construction	YES	3 - 4 months	Pittsfield Municipal Airport is approximately 3.5 miles from the nearest candidate site. FAA will require lighting or marking of turbines or temporary construction crane. Notices for the site have already been filed and no height restrictions are expected. The tallest estimated turbine blade height is about 2,300 feet above sea level. May be concerns about height if close to existing flight paths. Refer also to MAC/MPA review.
EPA	NPDES Stormwater Construction General Permit	Discharge of stormwater from construction sites disturbing 1 acre or more	Construction	YES	9 - 12 months	Requires joint approval with MDEP. Dependent on candidate site selected. Project will disturb more than 1 acre.

**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
USFWS	Migratory Bird Treaty Act Compliance	Activity with potential to harm migratory bird species	Construction	MAYBE	1 - 2 months	Design turbines to avoid avian impacts. Studies needed to determine if migratory species inhabit the project area. ESA compliance review may also incorporate this Migratory Bird Treaty Act review.
<b>FEDERAL</b>						
USFWS	Endangered Species Act Compliance	Confirmation of no impacts to threatened and endangered species	Construction	NO	1 - 2 months	Consultation recommended if species and/or habitat on-site or along utility interconnection right-of-way may be impacted. May be concerns about avian and other impacts from turbines. No endangered species present per USFWS.
<b>STATE</b>						
MDPU/EFSB	Site Certification	Construction of an energy generating facility	Construction	MAYBE	10 - 12 months	Project size below review threshold; however, need for transmission lines could potentially require review.



**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
DOER	Application for Statement of Qualification pursuant to Massachusetts Renewable Portfolio Standard	Construction and operation of a new renewable energy facility proposing to sell energy to the grid	Construction	YES	2 - 3 months	Project would be considered a Small Power Production Qualifying Facility with respect to selling power to utilities that are required under Massachusetts law to purchase electricity from certain classes of renewable energy and distributed generation facilities.
EOEA	MEPA Determination: Environmental Notification Form (or expanded form)	Alteration of more than 25 acres of land	Construction	MAYBE	2 - 3 months	Must be filed if more than 25 acres of land will be directly altered or certain other EOEA criteria met such as creating impervious areas or alterations of wetlands.
EOEA	MEPA Review: Environmental Impact Report	Alteration of more than 50 acres of land	Construction	NO	6 - 9 months	Evaluation of effects of state agency permitting action on the environment based on review of the Environmental Notification Form by the Secretary of Environmental Affairs. Environmental Impact Report required if more than 50 acres of land will be altered or other criteria met. Project will not meet 50 acre threshold.

**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
MDEP	Notice of Intent	Wetland alteration	Construction	MAYBE	3 - 4 months	Site reconnaissance necessary to determine any wetland impacts from the project. GIS resources show no direct impact. Local clarification of potential wetland issues would be a logical next step.
MDEP	Noise Control Policy Compliance	Noise from wind turbine	Operation	MAYBE	1 - 2 months	Policy discourages a broadband noise level greater than 10 dB(A) above ambient, or pure tone noise. Noise is not expected to be an issue as long as the project is properly evaluated and any necessary mitigation requirements are implemented.
MDEP	Massachusetts Clean Waters Act, Section 401 Water Quality Certification	Required for federal activities affecting state land	Construction	MAYBE	3 months	Necessary if Section 404 permit is required. Permit required if wetlands will be altered in any way. The permit application is a Notice of Intent and is sent to the Town of Lenox Conservation Commission. If an area less than 5,000 square feet of wetland is altered, the Order of Conditions also serves as the project's Section 401 Water Quality Certificate. The project may affect wetlands.

**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
MDF&G Natural Heritage and Endangered Species Program	Notice of Intent	Wetland alteration	Construction	MAYBE	3 - 4 months	Same as form submitted to MDEP. Project is not within an "estimated habitat" of rare wildlife; however, Jefferson salamander may be in area.
MDF&G Natural Heritage and Endangered Species	Endangered Species Act Consultation Compliance	Activities that could potentially affect threatened or endangered species	Construction	MAYBE	3 - 4 months	Conservation and Management Permit required for any take of a state endangered species. Jefferson salamander maybe in area.
MDOH	General Access Permit	Alteration of state roads	Construction	MAYBE	2 - 3 months	May be needed if project involves alterations to state roads to access site.
MDOH	Wide Load Permit	Movement of oversize project equipment	Construction	MAYBE	2 - 3 months	May be necessary for transport of oversized equipment like turbine components or certain construction equipment.

**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
ISO New England (and transmission line owner at interconnection point)	NEPOOL Interconnection System Impact Study and Facility Study	Transmission interconnection	Construction	MAYBE	9 - 12 months	Electricity may or may not be sold to the grid. Project owner determine participation in NEPOOL.
EFSB	Transmission line approval	Transmission interconnection	Construction	MAYBE	2 - 3 months	Electricity may or may not be sold to the grid.
Mass DPU	Section 72 Approval of Transmission Line	Transmission interconnection	Construction	MAYBE	2 - 3 months	New 13 kV transmission line needed to interconnect.
MAC	Request for Airspace Review courtesy notice	Structures over 200 feet tall	Construction	YES	3 - 4 months	Provide courtesy notification of any projects over 200 feet tall (similar to FAA review, but not a permit per se).

**Table 7-1**  
**List of Permits**

Agency	Permit	Regulated Activity	Required Project Phase	Applicable to Project	Minimum Review Time	Comments/Issues
MPA	Request for Airspace Review	Structures over 200 feet tall near airports	Construction	YES	3 - 4 months	Pittsfield Municipal Airport is in fairly close proximity, approximately 3.5 miles from the nearest candidate site. May be concerns about the -400 foot turbine blade height if close to existing flight paths. This review may be done concurrent with the FAA review.
MHC	Archaeological and Historical Review	Activities that could potentially affect archaeological or historical resources	Construction	MAYBE	3 - 4 months	Need to determine potential for historic or archaeological sites within the area.
<b>LOCAL</b>						
Town of Lenox Conservation Commission	Order of Conditions/ Wetlands Bylaw compliance review	Alteration of wetlands	Construction	MAYBE	3 - 4 months	Permit required if wetlands will be altered in any way. The permit application is a Notice of Intent and is also sent to the Massachusetts Department of Environmental Protection. If an area less than 5,000 square feet of wetland is altered, the Order of Conditions also serves as the project's Section 401 Water Quality Certificate. Site reconnaissance necessary to determine wetland impacts.

**Table 7-1**  
**List of Permits**

<b>Agency</b>	<b>Permit</b>	<b>Regulated Activity</b>	<b>Required Project Phase</b>	<b>Applicable to Project</b>	<b>Minimum Review Time</b>	<b>Comments/Issues</b>
Town of Lenox-Building Department	Building permit	New construction activity in Lenox	Construction	YES	2 - 3 months	
Town of Lenox-Planning and Zoning Department	Zoning/Site Plan Approval-Special Permit	Wind project construction outside the scope of current zoning designations	Construction	MAYBE	3 - 4 months	Reviews project for compliance with zoning code. Contact with Department needed to determine specific requirements.
Town of Lenox-Zoning Board of Appeals	Variances from code	Project exceeding height limit	Construction	MAYBE	3 - 4 months	Height or setback restrictions may require a variance. Contact with Board needed to determine specific requirements.
Fire Marshal	Fire Code Approval	New development	Construction	MAYBE	NA	Possible substation inclusion in project may trigger need for this approval. Contact with Fire Marshal needed to determine specific requirements.

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## **SECTION 8**

### **CONCEPTUAL DESIGN**

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## 8. CONCEPTUAL DESIGN

The Project Site is suitable for a one or two wind turbine installation. A second wind turbine could be added to the Project without significant additional cost in establishing an access road and staging area to support the construction of both WTGs. For instance, one WTG could be constructed along the south end of the proposed staging area and a second WTG could be installed at the north end of the staging area. The location of any turbine at this Site should be along the ridgeline at the highest elevations possible as the wind resource appears to be best in these areas and subsequently will allow for the greatest generation capacity.

### 8.1 WIND TURBINE GENERATOR MODELS

For the purposes of this analysis, wind turbines from two manufacturers were considered. Table 8-1 presents the make and model of each, capacity, rotor diameter, and hub height.

**Table 8-1**

**General Wind Turbine Information**

<b>Turbine Manufacturer</b>	<b>Model</b>	<b>Capacity (MW)</b>	<b>Rotor Diameter (m)</b>	<b>Hub Height (m)</b>
General Electric	GE-1.6-100	1.6	100	80
Fuhrländer	FL 1500/77	1.5	77	80

Notes:

1. MW = megawatt
2. m = meter
3. m/s = meters per second

Both of these WTGs are classified by the International Electrotechnical Commission (IEC) as Class II machines. IEC develops and publishes standards for WTGs including International Standard IEC 61400 which deals with design requirements and classifications of WTGs. Per the IEC standard, a Class-II wind regime has an average wind speed at hub-height of 8.5 m/s. Therefore, the selected WTGs are appropriate for the Site given the measured wind resource. Additional information for each WTG is provided below.



### 8.1.1 General Electric

The General Electric (GE) model reviewed as part of this analysis is the GE 1.6-100, a 1,600-kilowatt (kW) machine with a rotor diameter of 100 m. The GE 1.6-100 falls into the 1.5-MW class of GE machines and is one of GE's latest models in the 1.5-MW class. This model of WTG has been considered for its larger swept area due to the increased rotor diameter potentially allowing for greater output.

This turbine is placed on either an 80 or 100-m tower. Because of its variable-speed ability, this GE WTG has a rotational speed range between 9.75 and 16.18 revolutions per minute (rpm) (or one revolution approximately every 4 to 6 seconds). The GE 1.5-MW class turbine is one of the most popular designs for U.S. wind farms and GE turbines are manufactured in the U.S.

Table 8-2 below lists the specifications for GE 1.6-100 considered for this Project:

**Table 8-2**

**GE 1.6-100 Specifications**

Specification	Value/Description
Rated power	1,600 kW
Rated wind speed	11 m/s
Cut-in wind speed	3.0 m/s
Cut-out wind speed <sup>1</sup>	25 m/s
Rotor diameter	100.0 m
Rotor swept area	7,853.98 square meter (m <sup>2</sup> )
Number of blades	3
Rotor speed	9.75 - 16.2rpm
Rotor material	glass-fiber reinforced plastic
Generator type	asynchronous, double fed induction
Voltage	690 V
Hub height	80.0 m
Tower type	tubular steel
Tower shape	conical
Safety Zone	130 m (426 ft)

Notes:

1. At air density of 1.225 kilograms per cubic meters (kg/m<sup>3</sup>)

In addition, a specification cut sheet has been attached as Appendix I of this report.

### 8.1.2 Fuhrländer

The FL 1500/77 is produced by Fuhrländer, a German based wind turbine designer and manufacturer. The FL 1500 was originally introduced as an expansion to Fuhrländer's megawatt class of WTGs. The FL 1500 offers a compact, pitch controlled turbine easily adapted to various locations due to its availability at different hub heights and rotor sizes.

Table 8-3 below lists the specifications for Fuhrländer FL 1500/77:

**Table 8-3**  
**FL 1500/77 Specifications**

Specification	Value/Description
Rated power	1,500 kW
Rated wind speed	13 m/s
Cut-in wind speed	3.0 m/s
Cut-out wind speed <sup>1</sup>	20.0 m/s
Rotor diameter	77.0 m
Rotor swept area	4,656.63 m <sup>2</sup>
Number of blades	3
Rotor speed	9.7 - 18.3 rpm
Rotor material	glass-fiber reinforced plastic, epoxy resin
Generator type	asynchronous, double fed induction
Voltage	690 V
Hub height	80.0 m
Tower type	tubular steel
Tower shape	Conical
Safety Zone	118.5 m (389 ft)

Notes:

1. At air density of 1.225 kg/m<sup>3</sup>

In addition, a specification cut sheet has been attached as Appendix I of this report.

## 8.2 POTENTIAL CONFIGURATIONS

Two configurations were considered as part of this analysis. The first configuration included one WTG, the FL 1500/77 at a location that offered the greatest annual generation within the area of the proposed site. Figure 8-1 illustrates the proposed location for the FL 1500/77.

The second configuration included two WTGs. For this configuration two GE 1.6-100 WTGs were placed at optimal locations for generation and constructability within the area of the proposed site. The two turbine scenario is shown on Figure 8-2.

For both the single and double turbine configurations, setbacks from areas of concern are not expected to be an issue since there are no on-site or nearby facilities of any kind in the area of the proposed site. Therefore, the separation between the two turbines proposed in the two turbine configuration will be the main concern for locating the turbines. With the orientation of the ridgeline to the prevailing wind direction, siting of the two wind turbines should allow for a separation of at least 3 rotor diameters. This distance is 300 m or approximately 984 ft for the GE 1.6-100 WTGs.

Beyond the WTGs themselves and the foundation they will be constructed on, other necessary appurtenances or balance of system equipment will most likely include the following:

- Lockout mechanism at the base of the turbine tower to allow for generated power to be cut off from feeding to the interconnection point.
- Underground electrical conduit and conductors leading from the base of the turbine tower to a location an appropriate distance away where a connection to an above ground or “pop-up” transformer will be made (it may make sense from a constructability standpoint to establish this run down the access road proposed to Dunbar Road).
- Transformer to step-up voltage to the voltage of the distribution lines at the location of the interconnection point for parity (in this case, it will be necessary to step up to 13.8 kV to match the voltage of the distribution line proposed for interconnection as discussed earlier in this report).
- FAA-approved lighting and markings for aviation safety in the area of the WTG(s).

- Metering systems to track generation and to monitor the WTG for O&M and warranty purposes (two meters will be necessary for the two-turbine scenario).
- Security fencing to keep the area protected from vandalism, theft, and for public safety purposes.

### 8.3 DISTANCE FROM KEY LOCATIONS

As discussed previously, the nearest residence to the Site is estimated to be 2,300 ft. The Site is approximately 3 miles from the potential interconnection point along the three-phase line running along Main Street close to downtown Lenox and approximately 1 mile from three-phase power lines owned by WMECO at the water treatment plant to the west of the Project Site. Table 8-4 presents the distances from key locations:

**Table 8-4**

#### **Distances to Nearby Structures and Areas of Concern**

<b>Structure or Area of Concern</b>	<b>Distance (feet or miles)</b>
Closest Occupied Structure	2,300 ft (nearest residence)
Closest Airport	3.5 miles (Pittsfield Airport)
Closest publicly accessible space (ex., schools, roads, bike paths, parks)	0 ft (hiking trail)
Closest off-site neighboring residential structure	2,300 ft (homes to the east)
Closest property line	350 ft
Closest wetlands (if within 1,000 ft)	350 ft (wetlands exist on the property)
Communication towers/microwave towers (if within 3 miles)	1.5 miles (microwave tower to north)

### 8.4 APPROPRIATENESS AND IMPACT

Based on the available land, current land use, proximity of roads and highways, and proximity of transmission, the proposed site appears to be suitable for development of a small wind energy project consisting of one to a few commercial wind turbines. It exceeds all recommended setbacks from roads, homes, and property lines. It should not directly interfere with recreational uses of the area or the primary views from homes in the area. Noise impacts are also not expected to be significant as discussed earlier in this report.

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## **SECTION 9**

### **PROJECT DEVELOPMENT CONSIDERATIONS**

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## 9. PROJECT DEVELOPMENT CONSIDERATIONS

### 9.1 DEVELOPMENT AND OWNERSHIP OPTIONS

There are typically two ownership options explored for Massachusetts communities looking to host community scale wind projects on municipal lands: municipal ownership and third-party (commercial or developer) ownership. The potential for shared-ownership of the Project has not been explored as part of this study but it is recommended this option be investigated further. Both ownership options were modeled in the financial analysis of the Project.

Under either ownership option there is significant risk that a project could be slowed by local opposition or permitting problems. However, delays like this could prove fatal to a private developer. Table 9-1 summarizes the advantages and disadvantages of each ownership option and additional details regarding these advantages and disadvantages are provided in the sections that follow.

**Table 9-1**

#### **Ownership Options – Advantages and Disadvantages**

<b>Ownership Option</b>	<b>Advantages</b>	<b>Disadvantages</b>
Private Developer	Eligible for Federal based incentives (PTC, accelerated depreciation)	Higher cost of debt (uncertain)
	Takes on risk of project	May not have access to state funding programs
	Experience in developing wind projects	May be difficult to attract developer interest for such a small project
Municipal	Lower cost of debt (uncertain)	Not eligible for Federal based incentives (PTC, accelerated depreciation)
	Potential for greater economic benefit	Business risk, little experience developing wind projects
	Access to municipal state funding programs	

Notes:

PTC = Production Tax Credit

### **9.1.1 Municipal Ownership**

Under the municipal ownership scenario, the Town could potentially realize greater economic gains over the third-party ownership scenario, but it would also bear the risks associated with the ownership of an income earning enterprise. A few issues to consider with the municipal ownership option include the fact the Town will most likely be able to finance the procurement and installation of the Project at a lower cost via its bonding capacity. However, this may limit the Town's ability to finance other projects during at least a portion of the lifespan of the Project. In addition, the Town cannot take advantage of the credits associated with development of wind energy projects like a commercial developer could, thereby negatively affecting the fiscal performance of the Project when compared to the third-party ownership structure. However, there may be state run assistance programs that are only available to municipalities at the time of project development that could potentially enhance the economics of the Project.

### **9.1.2 Commercial Ownership**

With the commercial ownership option, the risks associated with developing the Project rest wholly on the developer selected. However, commercial developers have experience with developing wind projects and could more readily develop the Project reducing the overall risk. Private owners are also eligible for federal tax incentives, such as the Production Tax Credit (PTC) and accelerated depreciation, which may make the Project more financially viable. The Town's primary benefits from private ownership are likely to be cost savings for electricity generated by the Project and used by the Town and potentially either property tax or payment in lieu of tax, as well as lease payments for the use of municipal land. Lastly, it may prove difficult for the Town to interest a private developer in a wind project this size.

## **9.2 PROJECT FINANCING**

It has been assumed that the Town would finance the wind energy project with 100% debt in the form of 20-year municipal bonds. This would allow a lower interest rate than financing from other sources, resulting in a lower overall cost of debt and higher return.

Private development would most likely have a higher cost of debt, as financing would be through a private institution. It was assumed that a private developer would finance the Project using 100% equity sources as is the standard in evaluating the financial viability of a project like this.

### **9.3 DEVELOPMENT CONSIDERATIONS**

A wind energy project in Lenox will generate RECs equivalent to the number of megawatt-hours of energy it produces. The RECs are an attempt to capture the “green” aspects of renewable energy and incentivize development and steer utilities away from the use of fossil fuels for electricity generation. Massachusetts has an operating REC market where these credits can be bought and sold. Purchasing these credits may help a utility meet the requirements of the state Renewable Portfolio Standard; a policy that seeks to increase the proportion of renewable electricity generated, without purchasing a project or its energy directly. For the purposes of this analysis, it has been assumed the Town would sell all RECs generated by the Project.

Project management and procurement would likely be handled by a third party contractor who will actually complete the project engineering and install the turbines. Alternatively, the Town could buy the turbines themselves and hire a contractor to perform the remaining engineering, construction, and installation. Often with large projects the Project owner procures the turbines directly, because the long lead time to obtain turbines means they are often bought before a construction contractor is selected, though there are several aggregators in Massachusetts that are able to provide a full service installation including turbine procurement for small projects such as this.

### **9.4 OPERATION AND MAINTENANCE**

The proposed wind project is not likely to be large enough for a turbine manufacturer to have dedicated service personnel in the area. Since the manufacturer would likely perform routine maintenance and repair on the turbines for the first 5 years of operations, it is likely that personnel from other wind projects in New England would be dispatched to Lenox as necessary. This may introduce delays in servicing faults that require on-site repair, though many faults could be reset remotely.



After the turbine warranty period ends, the Town would have the option of hiring a third party firm that would operate and maintain the turbines similarly to the manufacturer, or could have local residents trained in the O&M of the turbines.

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**SECTION 10**

**ESTIMATED ENERGY PRODUCTION**

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## 10. ESTIMATED ENERGY PRODUCTION

Estimates for annual energy production for both single turbine and two turbine project scenarios using the two wind turbine models considered, the Fuhrländer FL 1500/77 and GE 1.6-100, have been calculated. The production estimates are based on data collected from the SODAR unit only, as discussed in previous sections. The methods and assumptions for this estimate are discussed below.

### 10.1 ANNUAL ENERGY PRODUCTION

#### 10.1.1 Wind Turbine Power Curves and Thrust Coefficients

Wind turbine power curves and associated thrust coefficients provide a schedule of measured or calculated values representing the amount of energy a particular make and model of wind turbine will generate at a given wind speed and air density. Typically, power curves are supplied as a table of wind speeds versus air densities by the manufacturer. At lower air densities, the power generated by a wind turbine at wind speeds below the turbine's rated speed is less than at higher densities. For the purposes of this evaluation, calculated power curves were utilized with an associated air density of 1.225 kilograms per cubic meter ( $\text{kg/m}^3$ )<sup>1</sup> when estimating production for both WTGs considered. The power curves and associated thrust coefficients are shown in Table 10-1 for the Fuhrländer FL 1500/77 and Table 10-2 for the GE 1.6-100.

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<sup>1</sup> Density of air at 1 atmosphere pressure (sea level) and 60 °F

**Table 10-1**

**FL 1500/77 Power Curve and Thrust Coefficients**

Wind Speed at Hub Height (m/s)	Power Curve (kW)	Thrust Coefficient (ct)
1	0	0.1
2	0	0.1
3	5	0.1
4	52	0.8
5	114	0.82
6	223	0.84
7	387	0.79
8	605	0.72
9	864	0.66
10	1113	0.59
11	1352	0.53
12	1462	0.46
13	1505	0.4
14	1510	0.33
15	1502	0.28
16	1500	0.23
17	1500	0.2
18	1500	0.16
19	1500	0.13
20	1500	0.12

Notes:

1. Air Density of 1.225 kg/m<sup>3</sup>
2. Cutout wind speed 20.0 m/s. The cutout wind speed is the wind speed at which the turbine shuts down to protect components from failure and damage.

**Table 10-2**

**GE 1.6-100 Power Curve and Thrust Coefficients**

Wind Speed at Hub Height (m/s)	Power Curve (kW)	Thrust Coefficient (ct)
3.0	1	1.293
3.5	16	1.199
4.0	81	1.091
4.5	163	1.002
5.0	259	0.928
5.5	378	0.864
6.0	504	0.817
6.5	643	0.793
7.0	808	0.783
7.5	984	0.772
8.0	1159	0.744
8.5	1312	0.688
9.0	1426	0.615
9.5	1519	0.538
10.0	1571	0.462
10.5	1594	0.402
11.0	1609	0.347
11.5	1619	0.302
12.0	1620	0.263

Notes:

1. Air Density of 1.225 kg/m<sup>3</sup>
2. Cutout wind speed 25 m/s. The cutout wind speed is the wind speed at which the turbine shuts down to protect components from failure and damage.

### 10.1.2 Estimated Losses

Prior to estimating the generation for each of the configurations considered, potential production losses that might impact wind turbines were examined. Each loss factor is discussed below, and summarized in Table 10-3:

- **Topographic Effect:** This is the loss or gain due to wind speed reductions or increases between the wind data collection point (in this case, the location of the SODAR unit) and turbine caused by the site's topography. Even though there is a very large topographic difference between the location of the wind data collection point and the proposed installation site, the topographic effect is assumed to be zero. This is due to the fact that SODAR was utilized instead of a traditional meteorological tower and the wind resource could be measured at the approximate hub height of the proposed WTG, well above any obstructions in the area of the SODAR that could impact the measured data.
- **Wake Effect:** This is the energy loss due to the effect one turbine will have on another, or the wake caused by any structure on the wind turbines. By definition, this is zero for a single turbine project. It has been assumed that there will be minor wake losses for the two turbine configuration.
- **Turbine Availability:** Wind turbine manufacturers will specify an availability level to be covered in a warranty (this may be difficult to obtain for single turbine installations). This value has been assumed based on industry standard.

**Table 10-3**

#### Summary of Loss Factors

Loss Type	Single Turbine		Two Turbines	
	Loss Percent	Adjustment Factor	Loss Percent	Adjustment Factor
Topographic Effect	0.00%	1	0.00%	1
Wake Effect	0.00%	1	1.50%	0.99
Turbine Availability	3.00%	0.97	3.00%	0.97
Turbine Power Curve	0.00%	1	0.00%	1
Grid Availability	0.50%	1	0.50%	1
Electrical Losses	1.00%	0.99	1.00%	0.99
Columnar Losses	0.00%	1	0.00%	1
Blade Contamination	1.50%	0.99	1.50%	0.99
Icing	1.50%	0.99	1.50%	0.99
High Wind Hysteresis	0.00%	1	0.00%	1

- **Turbine Power Curve:** The wind turbine manufacturer will warranty a performance level from the turbine at a percentage of the power curve values (this may also be difficult to obtain for a single turbine installation.) Typical warranty levels are approximately 95 to 97% of published power curve values. However, industry practice is usually not to consider this as a potential loss, given most wind turbines operate at or slightly above their published power curves, therefore, no loss was considered.
- **Grid Availability:** An estimate is made as to the amount of time the utility will be available to receive power from the Project. All grid systems are off-line periodically for maintenance, and projects in more remote locations will be connected to weaker grid systems that are more prone to failure. Losses for grid availability vary between 0.1% for very strong grid system to as high as 5% for weak systems (and even larger for systems outside the U.S.). No specific information on grid reliability in the project area was examined, therefore, an estimated conservative loss of 0.5% was assumed.
- **Electrical Losses:** Losses in the lines and electrical equipment prior to reaching the plant's metering devices are covered by this factor. Points of significant electrical losses in a wind energy project usually include the underground and overhead distribution lines connecting the turbines to a substation, and the substation's primary transformer. Typical electrical loss values range from as low as 1% to 10% or more, depending on the layout and equipment used. Since the overall project area is compact with one to two turbines considered, electrical losses were assumed to be 1%.
- **Columnar Losses:** If a project of many wind turbines is arranged in rows, turbine manufacturers may require the shutdown of some turbines when the winds are coming from a direction parallel to the rows due to wake turbulence. These losses will not apply to the options defined in this report.
- **Blade Contamination:** Wind turbine performance is sensitive to the cleanliness of the turbine's blades. In areas of high dust or insects, contamination can build on the wind turbine blades that will limit the turbine's performance (causing losses up to 5% or more). Often the blades are cleaned by occasional rainfall, but in some areas periodic blade washing is required. A general loss of 1.5% due to contamination was assumed.
- **Icing:** During winter storms, snow and ice will build up on the wind turbine blades causing a similar degradation in performance to that caused by dust and insects. While this contamination will build much faster than contamination occurring during summer operation, it is often cleared after a few hours of direct sunlight (even at continued subzero temperatures). Given the anticipated likelihood of several significant storms per winter, a loss of 1.5% was assumed for the lost energy due to icing.
- **High Wind Hysteresis:** When wind speeds exceed the operational range of a wind turbine, the turbine shuts down to protect itself. Shut-downs normally require the turbine to remain offline for several minutes, regardless if the wind speed returns to

the operational range. Sites with a significant number of these high wind events suffer lost energy due to this hysteresis effect (this is in addition to the amount of time the average wind speeds remain above the cut-out wind speed). As the Project Site does not have a significant number of high wind events on record, no losses due to this hysteresis effect were applied. For the two turbines considered in this report, the Fuhrländer FL 1500/77 and the GE 1.6-100, the cut-out speeds are 20 m/s and 25 m/s, respectively.

### 10.1.3 Production Estimates and Comparisons

The annual energy production was estimated for both wind turbines considered as part of this analysis, including the single Fuhrländer WTG scenario and the two GE WTG configuration. To complete this analysis two wind modeling application packages were utilized including WAsP along with WindFarmer. WindFarmer utilizes project specific inputs from the project location to calculate estimated energy generation as well as other parameters. Inputs include the predicted wind resource, topography, and turbine specifications. WindFarmer also has the capability of applying wake models to multiple turbine layouts to estimate potential impacts on adjacent turbines due to wake propagation brought on by turbine operation.

Utilizing the observed wind resource data presented in Section 2 of this report, the power curves and thrust coefficients for each turbine model, and the estimated losses presented above, energy production estimates were calculated within WindFarmer. The losses were applied to the gross or ideal energy estimate to determine the net energy estimate. Finally, a net capacity factor was calculated which represents the net annual generation compared to maximum possible generation from the wind turbine (a value of 100% would mean the turbine would operate at rated power every hour of the year; a typical capacity factor for a project in the Northeast U.S. is about 30%).

The resulting energy and capacity factor estimates are shown in Table 10-4 for the single Fuhrländer turbine and for the two GE turbine scenario.



**Table 10-4**

**Estimated Annual Generation and Net Capacity Factors**

Single Turbine Fuhrländer FL 1500/77		Two Turbines GE 1.6-100	
Generation (MWh)	Net Capacity Factor	Generation (MWh)	Net Capacity Factor
4,300	33%	12,200	44%

Notes:

1. MWh = Megawatt-hour

There are a number of parameters that cause the net capacity factors to be different, including those factors shown above in Table 10-3. For a two-turbine scenario, 1.5% is assumed to be lost due to wake effect while in the single-turbine, by definition, there is no loss due to wake effect. However, this is compensated by the fact the second location for the GE two-turbine scenario is expected to have a wind resource that is better than the location at which the single Fuhrländer unit would be situated. Aside from those factors, the most significant reason why the two-turbine GE option has a significantly higher capacity factor is the power curve. The GE units have a larger blade diameter at 100 m, while the Fuhrländer is at 77 m. This equates to rotor swept areas of 7,854 square meter (m<sup>2</sup>) and 4,657 m<sup>2</sup> for the GE and Fuhrländer units, respectively, giving the GE a 69% advantage. The GE units will generate more power along the power curve, and even with a slightly higher cut-in speed, the GE reaches its maximum capacity of 1.6 MW at a wind speed of approximately 10.5 m/s, while the Fuhrländer reaches its maximum of 1.5 MW at a speed of 13 m/s. The GE WTG is a new unit when compared to the Fuhrländer, and as a result of recent innovations, has a power curve that better aligns with the wind resource in Lenox. In addition, the GE can operate in speeds of up to 25 m/s before shutting down, while the Fuhrländer cuts out at 20 m/s.

## Uncertainty Analysis

To determine the sensitivity of energy generation to variations in wind speed, and to estimate the magnitude of variations possible, the following parameters were considered as part of the uncertainty analysis for this study:

- Long-term wind speed variability: this is a measure for how well understood the long-term wind resource is, and is determined by the length of the long-term data set analyzed. Because no long-term data set was utilized for this analysis the standard error of 6% for extrapolating a single year of monitoring data was used.
- Correlation standard error: this value is a measure of how well the on-site data correlates to the long-term data source. Since no long-term data were utilized, no error was applied.
- Anemometer calibration: This is the stated calibration of the primary anemometer used to measure the on-site wind resource. For uncalibrated instruments, the standard accuracy of the anemometer published by its manufacturer is used. For instruments left installed past their calibration periods or for longer than 1 year for uncalibrated sensors, an increase in the calibration uncertainty may be applied for expected sensor degradation. For the SODAR instrumentation used for the wind monitoring study, the manufacturer calculated error of 3% was applied.
- Topographic and wake modeling: the models used to estimate the effects of topography and turbine wakes have uncertainty associated with them. As explained earlier under the subsection on estimated losses, the SODAR instrumentation utilized to conduct the wind monitoring study eliminates any error associated with topographic modeling. The error associated with wake modeling is calculated by the modeling software used to measure the wake effects between WTGs and has been set at 15% (this only applies to the two-turbine configuration).
- Wind variability: this is a single year estimate of the long-term variability, signifying the uncertainty of estimating the “next year’s” power production. The error for wind variability has been set at 5%.

Table 10-5 shows the value used for each of these uncertainty components for each configuration considered. The combined standard error is calculated as the square root of the sum of the squares of each error component, and represents the combined standard deviation from the mean or P50 estimated generation. As described in Section 2 of this report, the P50 variable is a confidence value and equivalent to the arithmetic mean of the annual averages (meaning that there is a 50% chance that the true long-term average wind speed is higher, and a 50% chance it is lower). The P50 value is used to calculate the P90 annual energy, based on a normal

distribution. The P90 statistic represents that there is a 90% probability the true long-term annual average energy is greater than the P90 estimate shown. The P50 and P90 values can be used for sensitivity evaluations in a project proforma or payback analysis.

## 10.2 ENERGY USE

As shown in Table 5-1, the total annual usage for the Town via National Grid in 2010 was approximately 1,821 MWh. Therefore, when compared to the estimated annual generation for both the single turbine and two turbine scenario illustrated in Table 10-4 above, there will be excess generation beyond the expected town usage.

**Table 10-5**

### Generation Sensitivity and Uncertainty Analysis

Generation and Sensitivity			
Description	Units	Single Turbine	Two Turbines
		Fuhrlander FL 1500/77	GE 1.6-100
Project Rating	MW	1.5	3.2
P50 Estimated Generation	MWh/yr	4,300	12,200
P50 Wind Speed	m/s	8.34	8.34
P90 Estimated Generation	MWh/yr	3,130	10,900
P90 Wind Speed	m/s	8.06	8.06
Uncertainty			
Factor	Percent		Percent
Long-Term Wind Variability	6		6
Correlation	0		0
Anemometer Calibration	3		3
Topo/Wake Model	0		15
Wind Variability	5		5

## 10.3 PERFORMANCE DEGRADATION

Generally in a study such as this, performance degradation over time is not considered in the production estimates. It is assumed that over the 20-year projected operating life of a wind

project, O&M are sufficient to keep the turbines operating nominally at the warranted availability. What is expected to change over time is the cost of maintaining the turbines. This is accounted for in the financial analysis by increasing the operations and maintenance costs over time.

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**SECTION 11**

**COST ESTIMATE**

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## 11. COST ESTIMATE

WESTON prepared preliminary cost estimates for the two WTG configurations selected for analysis in this Feasibility Study. The two configurations include a single-turbine project using a Fuhrländer FL1500/77 WTG and a two-turbine project using GE 1.6 -100 WTGs.

The cost estimates shown in Table 11-1 are based on general and specific pricing data from wind turbine vendors, cost breakdowns from recent small and large wind turbine projects, and general experience with wind projects. A detailed cost estimate has not been developed at this stage of project development, nor has WESTON requested cost proposals from local construction contractors. These estimates are for study purposes only and do not represent offers to install the proposed scenarios at the estimate prices. These estimates do not attempt to capture any internal town costs for necessary project oversight, approvals, legal, or other internal costs.

The general total capital cost estimate for the installation of the Fuhrländer FL1500/77 is \$5.3 million, or about \$3,503 per kW. The general total capital cost estimate for the installation of the two GE 1.6 -100 1.6 MW WTGs is \$8.3 million, or about \$2,588 per kW. Readers may note the costs per kW are much higher than the average industry installed cost of approximately \$1,700 per kW for wind projects<sup>2</sup>. The cost per kW is higher for a single turbine project than for two turbines, because similar costs of study, engineering, mobilization, and permitting work is required for each scenario. In addition, these costs include significant interconnection costs for installation of three-phase 13.8 kV power lines and poles a distance of approximately 3.25 miles from the Site to National Grid transmission lines. If connection to the WMECO power lines at the pumping station to the west of the Site is possible using a “border agreement” between National Grid and WMECO, these costs would roughly be cut by two thirds. For this connection, we have assumed an approximate cost of \$717,500 (or \$205,000 per mile). If interconnection with WMECO occurs, this cost would likely be approximately \$205,000, a savings of over \$500,000.

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<sup>2</sup> This value is the 2007 cost per kW published in “Annual Report on U.S. Power Installation, cost, and Performance Trends: 2007,” by the U.S. Department of Energy, Energy Efficiency and Renewable Energy, May 2008.

Also, the site preparation and road development work for the Lenox site will cost more than a site in simpler terrain with less vegetation. Dunbar Road will require some clearing and upgrading; however, the access road up Lenox Mountain will require clearing, grading, and gravel installation. Significant improvements are required for the access route along West Dugway Road to West Mountain Road to Reservoir Road. Of particular note is the intersection between West Mountain Road and Reservoir Road, which will require construction of a new “cut through” due to the orientation of that intersection. Additional improvements along this route may be required such as tree clearing and road grading to accommodate the large turbine and installation equipment such as cranes which must be brought to the Site. A detailed assessment of the access route will need to be conducted as part of design.

WESTON assumed that the first 5 years of O&M would be performed by the turbine manufacturer and included in the wind turbine supply and warranty agreements. From years 6 to year 20 (not reflected in Table 11-1 or the total capital cost), WESTON assumed a total O&M cost of \$40,000 per turbine per year, escalated at the inflation rate.

Table 11-1

**Development, Engineering, and Construction Cost Estimate  
Lenox Wind Feasibility Study  
Lenox, Massachusetts**

Item Description	Single Turbine	Two Turbine
Turbine Manufacturer	<b>Fuhrlaender</b>	<b>General Electric</b>
Model	<b>FL 1500/77</b>	<b>GE -1.6-100</b>
Turbine Rating (MW)	1.5	1.6
Project Rating (MW)	1.5	3.2
Hub Height	80 m	80 m
<b>Development and Project Management</b>		
<b>Development Costs (pre-engineering)</b>		
Feasibility Studies, Consulting	\$150,000	\$150,000
Interconnection Study	\$100,000	\$100,000
<b>Project Management</b>		
Owner's Costs, Permitting	\$100,000	\$100,000
<b>Total Development &amp; Project Management</b>	<b>\$350,000</b>	<b>\$350,000</b>
<b>Wind Turbines and Balance of Plant</b>		
<b>Engineering (BOP Only)</b>		
Surveying	\$10,000	\$15,000
Geotechnical Investigation	\$10,000	\$20,000
Civil Engineering	\$15,000	\$25,000
Structural/Foundation Engineering	\$35,000	\$55,000
Electrical Engineering	\$30,000	\$40,000
Engineering Management	\$15,000	\$20,000
<b>Subtotal</b>	<b>\$115,000</b>	<b>\$175,000</b>
<b>Procurement: Wind Turbines</b>		
Wind Turbine FOB Lenox/2 yr service/warranty	\$2,570,000	\$4,730,000
Extended Service (Years 3-5)	\$69,000	\$138,000
Communications/SCADA	\$130,000	\$240,000
Training	\$10,000	\$10,000
<b>Subtotal</b>	<b>\$2,779,000</b>	<b>\$5,118,000</b>
<b>Procurement: Balance of Plant Equipment</b>		
Switchgear/Transformer/Cables	\$75,000	\$150,000
FAA Lights	\$2,500	\$5,000
<b>Subtotal</b>	<b>\$77,500</b>	<b>\$155,000</b>
<b>Construction</b>		
<u>Site Preparation</u>		
Contractor Mob/Demob	\$50,000	\$50,000
Laydown/Trailer Complex Prep/crane pads	\$200,000	\$300,000
Improve Dunbar Road	\$25,000	\$25,000
Access Road up Lenox Mtn	\$75,000	\$75,000
Improve West Mountain to Reservoir Rd Connection	\$20,000	\$20,000
Stormwater/Erosion Control	\$10,000	\$15,000
WTG/Crane Pad Clearing and Prep	\$15,000	\$30,000
<u>Structural Construction</u>		
WTG Foundation Excavation	\$50,000	\$100,000
WTG Foundation Construction	\$100,000	\$200,000
Electrical Construction (Collection, SCADA)	\$35,000	\$70,000
WTG Erection	\$350,000	\$500,000
Construction Management/Indirects	\$50,000	\$75,000
<b>Subtotal</b>	<b>\$980,000</b>	<b>\$1,460,000</b>
<b>Total Wind Turbines and Balance of Plant</b>	<b>\$3,951,500</b>	<b>\$6,908,000</b>



Table 11-1

**Development, Engineering, and Construction Cost Estimate  
Lenox Wind Feasibility Study  
Lenox, Massachusetts**

Item Description	Single Turbine	Two Turbine
<b><i>Substation and Transmission</i></b>		
Facility Interconnection	\$135,000	\$155,000
System Upgrades/3-phase Power Lines	\$717,500	\$717,500
<b>Total Substation and Transmission</b>	<b>\$852,500</b>	<b>\$872,500</b>
<b><i>Other Costs</i></b>		
Construction Contingency		
<b>Total Other Costs</b>	<b>\$100,000</b>	<b>\$150,000</b>
<b><i>Project Totals</i></b>		
Development and Project Management	\$350,000	\$350,000
Balance of Plant	\$1,172,500	\$1,790,000
Substation and Transmission	\$852,500	\$872,500
Other Costs	\$100,000	\$150,000
SUBTOTAL	\$2,475,000	\$3,162,500
Wind Turbine Procurement	\$2,779,000	\$5,118,000
<b>TOTAL PROJECT</b>	<b>\$5,254,000</b>	<b>\$8,280,500</b>
<b><i>Project Cost per kW</i></b>		
Development and Project Management	\$233	\$109
Balance of Plant	\$782	\$559
Substation and Transmission	\$568	\$273
Other Costs	\$67	\$47
SUBTOTAL	\$1,650	\$988
Wind Turbine Procurement	\$1,853	\$1,599
<b>TOTAL PROJECT</b>	<b>\$3,503</b>	<b>\$2,588</b>

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**SECTION 12**

**PROJECT REVENUES**

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## 12. PROJECT REVENUES

### 12.1 POTENTIAL VALUE OF WIND GENERATED ELECTRICITY

The proposed project location has no actual on-site loads. However, as discussed earlier in this report, per the net metering provisions in Massachusetts, an entity can take advantage of electricity and the value of the electricity generated by the system (known as net metering credits), as long as the end user is serviced by the same utility and in the same load zone as the generating facility. In this case, because the proposed project is located within National Grid territory, it must be connected to National Grid distribution lines and therefore, only the electricity usage the Town has through National Grid could be offset and any excess generation could be sold to an off-taker within the same load zone on National Grid's distribution system.<sup>3</sup>

Under the net metering provision, a net metering credit is not valued at full retail rate. Instead, the credit is valued as the sum of the default service charge, transmission and transition charges. This credit value would apply if a third-party owned the system. For hosts that are a municipality, as in the town-owned scenario, the value also includes the distribution charge, yielding a slightly higher value for each credit than if the system was owned by a third-party developer. It has been assumed the credit value would be \$0.13 per kilowatt-hour (kWh) for the town-owned scenario and \$0.10 per kWh for the developer-owned scenario. The components and expected values for a net metering credit are shown in Table 12-1. These values are only approximations and subject to change over time.

In both the single turbine and two turbine scenarios there will be excess generation that will need to be allocated and sold to an end user or "off-taker" in the same load zone serviced by National

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<sup>3</sup> Another scenario may be possible through what is known as a "border agreement." In cases where a customer is within the territory of a particular provider, but it is much closer and/or more economical to interconnect with another provider, a "border agreement" can be drawn up to allow interconnection with the closer provider. In this case, the border agreement would need to be between WMECO and National Grid, and interconnection would be through WMECO at the pumping station. The ability to execute a border agreement will need to be investigated further.

**Table 12-1**

**Schedule of Net Metering Credit Values by Ownership Scenario**

Charge	Town Ownership	Private Developer
	Value (\$/kWh)	Value (\$/kWh)
Default service	\$0.0940	\$0.0940
Distribution	\$0.0187	\$0.0000
Transmission	\$0.0135	\$0.0135
Transition	\$0.0003	\$0.0003
<b>Total</b>	<b>\$0.1265</b>	<b>\$0.1077</b>

Notes:

Source: National Grid schedule of rates

kWh = kilowatt-hour

Grid. As discussed previously, under both ownership scenarios, purchase agreements will need to be established with off-takers to buy this excess generation in the form of the net metering credits. The actual value of the credits sold via these agreements will most likely be less than the assumed rates discussed above to allow for savings to be passed on to each off-taker. For the purposes of the financial analysis included in this study, it has been assumed the credit value would be \$0.08 per kWh for the town-owned scenario and \$0.08 per kWh for the developer owned scenario. For both scenarios, it has been assumed a 3% annual escalation on the net metering credit rate to off-takers will apply.

Based on the ownership advantages and disadvantages discussed in Section 9 and because the Town would not get full retail value of any excess electricity generated, financial analyses presented in this report included only the single turbine configuration for the town-ownership scenario. For the financial analysis of the two turbine scenario, it has been assumed a third-party would own the wind plant as this presents a more likely financeable option for outside development.

For the purposes of modeling the savings to the Town under both ownership scenarios, all electricity generated by the system and utilized by the Town has been valued at the average 2010 retail rate as provided by the Town. In addition, this rate has been escalated at 5.5% annually

over the life of the project. An annual rate increase of 5.5% by National Grid is the anticipated likely scenario. An annual rate increase of 8.95% by National Grid is the anticipated worst-case scenario. [According to the U.S. Energy Information Administration's Electric Power Annual 2008-State Data Tables (EIA-861), the average annual increase in commercial sector electricity prices in Massachusetts from 2003 through 2008 was 8.95% for the total electric industry.]

## **12.2 RENEWABLE ENERGY CREDITS**

As discussed earlier, Massachusetts has an operating REC market where these credits can be bought and sold. For financial modeling purposes it has been assumed that both the Town and a third party developer would sign a REC sales contract valued at \$20 per MWh for the first 10 years of project operation.

## **12.3 OTHER SOURCES OF REVENUE**

In the case of developer ownership, several federal based economic incentives are available and applicable. For the purposes of this analysis, it has been assumed the Business Energy Investment Tax Credit (ITC) can be utilized. The ITC value is equivalent to 30% of the project expenditures and is available through 31 December 2012 in lieu of the PTC. The PTC is valued at \$0.022 per kWh of electricity generated and is available through 31 December 2012. In addition, a private developer can take advantage of the “Modified Accelerated Cost Recovery System,” which allows taxable entities to rapidly depreciate the cost of capital equipment, resulting in tax savings early in the project lifecycle. None of these incentives are available to the Town in the case of a town-owned project.

Also in the case of third party developer ownership scenario, it has been assumed a land lease payment would be paid to the Town. The value of the land has been estimated and a reasonable lease payment calculated. It has been assumed the third-party developer would provide a land lease to the Town at \$5,000 per acre per year or approximately \$25,000 per year.

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## **SECTION 13**

### **FINANCIAL ANALYSIS**

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## 13. FINANCIAL ANALYSIS

The following information provides a preliminary financial analysis based on the generation estimates, cost estimates, and revenue estimates detailed in the preceding sections.

### 13.1 MAJOR ASSUMPTIONS

Several major assumptions were made in order to perform this financial analysis. These assumptions include debt and equity sources and amounts, debt interest rate, hurdle rates<sup>4</sup> for return on equity (internal rate of return or IRR), and the applicability of tax credits and incentives (for third-party ownership only). The assumptions used for town ownership of projects are shown in Table 13-1. The assumptions used for developer ownership of projects are shown in Table 13-2. It was assumed that the Town would be able to finance a project over a 20-year term<sup>5</sup>. All financial projections presented in this section have been prepared assuming no Commonwealth Wind Grants.

Additional project expenses may include insurance and management fees for monitoring power generation and managing invoicing and other administrative responsibilities related to holding PPAs with end users. These potential costs have not been included in this analysis. It has been assumed for the town-owned scenario, the Project would be covered under current insurance policies held by the Town and the administrative costs for managing PPA invoicing and monitoring generation would be completed by town employees.

Also for the town-ownership option, no cost for decommissioning or repowering the WTG at the end of the project term has been assumed. The most likely scenario would be for the Town to repower the WTG by replacing the generator and blades and any other necessary balance of system components with up-to-date equipment. Because this cost cannot realistically be quantified and because it would be greatly discounted, no cost has been assumed for repowering the Project.

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<sup>4</sup> The hurdle rate for a private developer has been assumed to be 15%.

<sup>5</sup> The 20-year term of the debt is less than the estimated useful life of a WTG, which is approximately 25 years.

**Table 13-1**

**Economic Assumptions for Town Ownership**

<b>Assumption Category</b>	<b>Assumption Description</b>	<b>Value</b>
<b>Project Information &amp; Costing</b>	Turbine Quantity/Manufacturer	(1) - Fuhrländer FL 1500
	Aggregate Nameplate Capacity (kW)	1,500
	Estimated Annual Generation (kWh)	4,308,000
	Fully Installed System Cost	\$5,254,000
	Transactional/Closing Costs	\$50,000
	Date to Begin Operation	12/31/2012
<b>Revenues</b>	Net Metering Credit Value for Town Usage via National Grid (\$/kWh)	\$0.13
	Net Metering Credit for Town Usage Annual Escalator	3%
	Annual Town Usage Offset by WTG (kWh)	1,821,053 <sup>6</sup>
	Net Metering Credit Value for Excess Generation (\$/kWh)	\$0.08
	Net Metering Credit PPA Term (Yrs)	20
	Net Metering Credit PPA Annual Escalator	3%
	REC Sales, Years 1-10 (\$/MWh)	\$20.00
<b>Expenses</b>	Annual Operation and Maintenance	\$50,000
	Operation and Maintenance Annual Escalator	3%
	Annual Long-Term Maintenance Escrow Fund	\$5,000
<b>Financing</b>	Debt to Equity Ratio	All Debt
	Municipal Bond Term (Yrs)	20
	Municipal Bond Interest Rate	4.50%

<sup>6</sup> Based upon current annual usage on National Grid accounts (see Table 5-1).



**Table 13-2**

**Economic Assumptions for Third-Party Ownership**

<b>Assumption Category</b>	<b>Assumption Description</b>	<b>Value</b>
<b>Project Information &amp; Costing</b>	Turbine Quantity/Manufacturer	(2) - GE 1.6-100
	Aggregate Nameplate Capacity (kW)	3,200
	Estimated Annual Generation (kWh)	12,248,000
	Fully Installed System Cost	\$8,280,500
	Transactional/Closing Costs	\$50,000
	Date to Begin Operation	12/31/2012
<b>Revenues</b>	Net Metering Credit PPA Term (Yrs)	20
	Net Metering Credit Value (\$/kWh)	\$0.08
	Net Metering Credit PPA Annual Escalator	3%
	REC Sales, Years 1-10 (\$/MWh)	\$20.00
<b>Expenses</b>	Annual Operation and Maintenance	\$130,000 <sup>7</sup>
	Operation and Maintenance Annual Escalator	3%
	Annual Long-Term Maintenance Escrow Fund	\$5,000
	Annual Land Lease Payment to Town	\$25,000
	Land Lease Annual Escalator	3%
<b>Financing &amp; Incentives</b>	Debt to Equity Ratio	All Equity
	Investment Tax Credit	30%
	Depreciation	5-Yr MACRS

## 13.2 ESTIMATED FINANCIAL RESULTS

### 13.2.1 Town-Ownership Scenario

Table 13-3 presents a summary of the financial modeling results including expected revenues and expenses along with the total anticipated benefit to the Town by year if it were to develop

<sup>7</sup> Operations and Maintenance costs have been based upon data recently published by the U.S. Department of Energy, Energy Efficiency and Renewable Energy division in a report titled "2009 Wind Technologies Market Report." Figure 35 shows that average annual O&M for wind projects is approximately \$10 per MWh generated. O&M estimates for the two scenarios are based upon this average; therefore, the difference in the annual O&M is a function of the number of MWh estimated to be produced for each option.

the proposed project utilizing the assumptions detailed in Table 13-1. Note that no REC sales are forecast beyond 10 years due to long range uncertainty in the marketplace.

**Table 13-3**

**Summary of Financial Modeling Results for Town-Owned Option**

Year	Electricity Savings	Energy Sales	REC Sales	Operating Expenses	Bond Repayment	Net Total Benefits
1	\$236,737	\$198,956	\$86,160	\$55,000	\$402,669	\$64,184
2	\$243,839	\$204,924	\$86,160	\$56,500	\$402,669	\$75,755
3	\$251,154	\$211,072	\$86,160	\$58,045	\$402,669	\$87,673
4	\$258,689	\$217,404	\$86,160	\$59,636	\$402,669	\$99,948
5	\$266,449	\$223,926	\$86,160	\$61,275	\$402,669	\$112,592
6	\$274,443	\$230,644	\$86,160	\$62,964	\$402,669	\$125,615
7	\$282,676	\$237,564	\$86,160	\$64,703	\$402,669	\$139,029
8	\$291,157	\$244,690	\$86,160	\$66,494	\$402,669	\$152,845
9	\$299,891	\$252,031	\$86,160	\$68,339	\$402,669	\$167,075
10	\$308,888	\$259,592	\$86,160	\$70,239	\$402,669	\$181,733
11	\$318,155	\$267,380		\$72,196	\$402,669	\$110,670
12	\$327,699	\$275,401		\$74,212	\$402,669	\$126,220
13	\$337,530	\$283,663		\$76,288	\$402,669	\$142,237
14	\$347,656	\$292,173		\$78,427	\$402,669	\$158,734
15	\$358,086	\$300,938		\$80,629	\$402,669	\$175,726
16	\$368,828	\$309,967		\$82,898	\$402,669	\$193,228
17	\$379,893	\$319,266		\$85,235	\$402,669	\$211,255
18	\$391,290	\$328,844		\$87,642	\$402,669	\$229,823
19	\$403,029	\$338,709		\$90,122	\$402,669	\$248,947
20	\$415,120	\$348,870		\$92,675	\$402,669	\$268,646
Totals	\$6,361,209	\$5,346,016	\$861,600	\$1,443,519	\$8,053,373	\$3,071,932

A simplified annual cash flow statement illustrating the results of the financial analysis for the town-ownership scenario including the values presented in Table 13-3 and the assumptions shown in Table 13-1 has been included as Appendix J of this report.

As discussed in previous sections, a two-turbine configuration was not analyzed for the town-ownership scenario for several reasons. To reiterate, the Town would take on additional risk in developing a larger project and would need to take on a larger debt sum to service the Project, potentially reducing the town's capacity to bond other necessary capital improvements over at least a portion of the project term. In addition, the Town would most likely need to establish additional PPA contracts to sell the additional generation to third parties, which would entail a significant marketing and administrative effort.

### **13.2.2 Third-Party Ownership Scenario**

Table 13-4 presents the savings to the Town under a third-party owned scenario by comparing the anticipated cost of electricity supplied by the utility, National Grid, against the assumed PPA rate a third-party developer would offer the Town utilizing the assumptions detailed above. Figure 13-1 illustrates these calculated values across the 20-year term of the Project.

Table 13-5 shows the total benefit to the Town under the third-party developer-owned project scenario including the anticipated savings to be realized via a PPA and the estimated land lease value by year.

## **13.3 FINANCIAL VIABILITY**

The estimated financial results presented indicate that a town-owned wind project may be financially viable and would be cash-flow positive during each year of the 20-year project. The project would be even more viable assuming a \$400,000 Commonwealth Wind grant. In addition, a third-party developer-owned project appears to exceed current return hurdle rates<sup>8</sup> for similar projects and would most likely be financeable given current market conditions.

This analysis was prepared using a financial proforma, and does not capture all the costs associated with the development, ownership, and operation of a wind turbine project. It is

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<sup>8</sup> Return on investment is estimated at 16% without a Grant and nearly 17% with a Commonwealth Grant of \$260,000.

recommended a detailed financial analysis be completed as part of the pre-development and business planning phase of the Project, after completion of this feasibility study.

**Table 13-4**

**Anticipated Costs and Savings to the Town of Lenox  
Under the Third-Party Ownership Scenario**

Year	PPA Rate (\$/kWh) <sup>1</sup>	Annual Cost at PPA Rate (\$)	Utility Rate (\$/kWh) <sup>2</sup>	Annual Cost at Utility Rate (\$)	Projected Savings (\$)
1	0.080	\$145,684	0.130	\$236,737	\$91,053
2	0.082	\$150,055	0.134	\$243,839	\$93,784
3	0.085	\$154,556	0.138	\$251,154	\$96,598
4	0.087	\$159,193	0.142	\$258,689	\$99,496
5	0.090	\$163,969	0.146	\$266,449	\$102,481
6	0.093	\$168,888	0.151	\$274,443	\$105,555
7	0.096	\$173,955	0.155	\$282,676	\$108,722
8	0.098	\$179,173	0.160	\$291,157	\$111,983
9	0.101	\$184,548	0.165	\$299,891	\$115,343
10	0.104	\$190,085	0.170	\$308,888	\$118,803
11	0.108	\$195,787	0.175	\$318,155	\$122,367
12	0.111	\$201,661	0.180	\$327,699	\$126,038
13	0.114	\$207,711	0.185	\$337,530	\$129,819
14	0.117	\$213,942	0.191	\$347,656	\$133,714
15	0.121	\$220,360	0.197	\$358,086	\$137,725
16	0.125	\$226,971	0.203	\$368,828	\$141,857
17	0.128	\$233,780	0.209	\$379,893	\$146,113
18	0.132	\$240,794	0.215	\$391,290	\$150,496
19	0.136	\$248,018	0.221	\$403,029	\$155,011
20	0.140	\$255,458	0.228	\$415,120	\$159,661
<b>Totals</b>	-	<b>\$3,914,590</b>	-	<b>\$6,361,209</b>	<b>\$2,446,619</b>

Notes:

1. PPA rate escalates at 3% annually
2. Utility rate escalation estimated at 3% annually

**Table 13-5**

**Anticipated Total Benefit to the Town of Lenox  
Under the Third-Party Ownership Scenario**

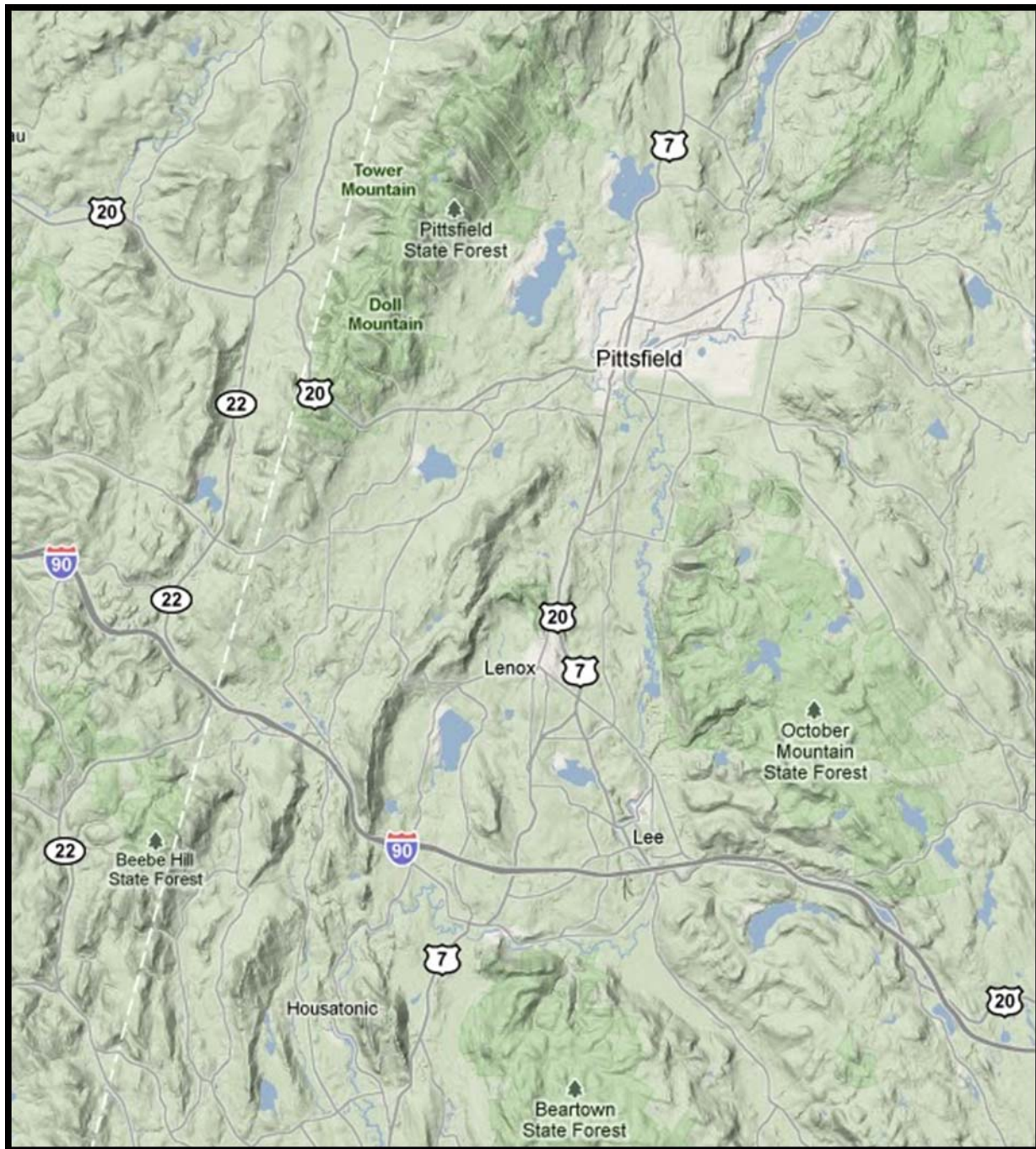
Year	Electricity Savings	Land Lease	Total Benefit
1	\$91,053	\$25,000	\$116,053
2	\$93,784	\$25,750	\$119,534
3	\$96,598	\$26,523	\$123,120
4	\$99,496	\$27,318	\$126,814
5	\$102,481	\$28,138	\$130,618
6	\$105,555	\$28,982	\$134,537
7	\$108,722	\$29,851	\$138,573
8	\$111,983	\$30,747	\$142,730
9	\$115,343	\$31,669	\$147,012
10	\$118,803	\$32,619	\$151,422
11	\$122,367	\$33,598	\$155,965
12	\$126,038	\$34,606	\$160,644
13	\$129,819	\$35,644	\$165,463
14	\$133,714	\$36,713	\$170,427
15	\$137,725	\$37,815	\$175,540
16	\$141,857	\$38,949	\$180,806
17	\$146,113	\$40,118	\$186,230
18	\$150,496	\$41,321	\$191,817
19	\$155,011	\$42,561	\$197,572
20	\$159,661	\$43,838	\$203,499
<b>Totals</b>	<b>\$2,446,619</b>	<b>\$671,759</b>	<b>\$3,118,378</b>

---

## FIGURES

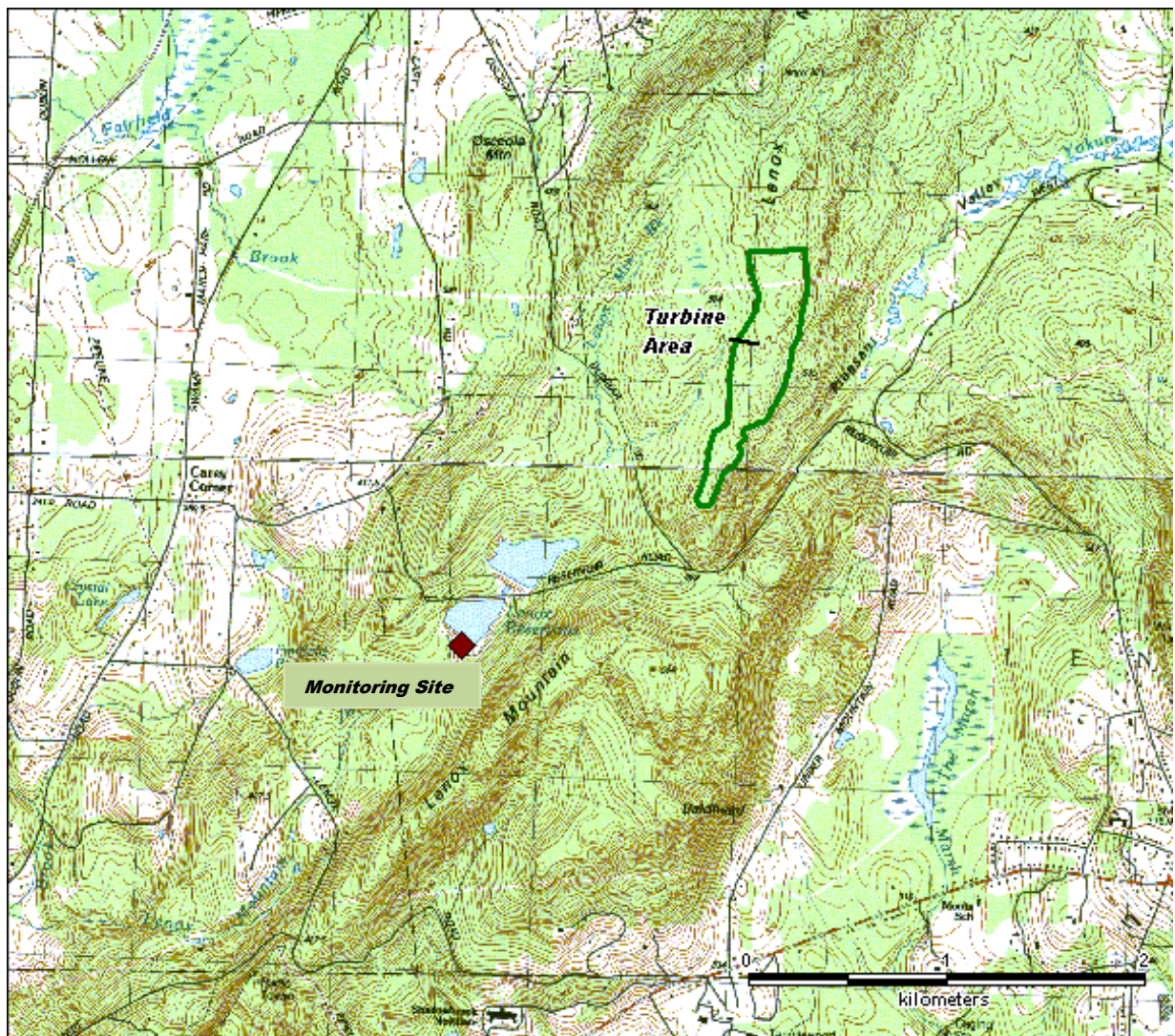
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**Figure 2-1**  
**Site Location Map**



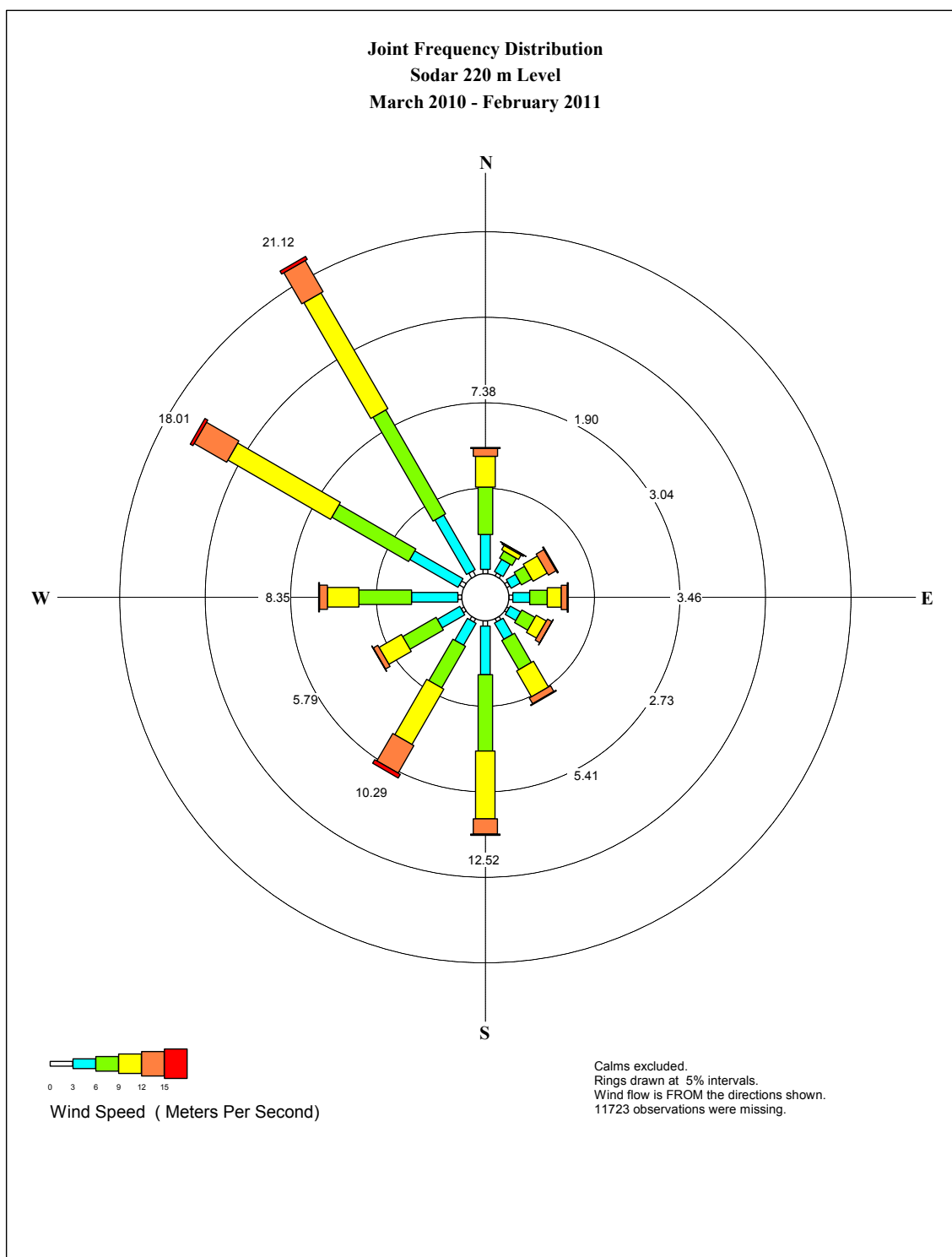


**Figure 2-2**  
**Site Location Map**

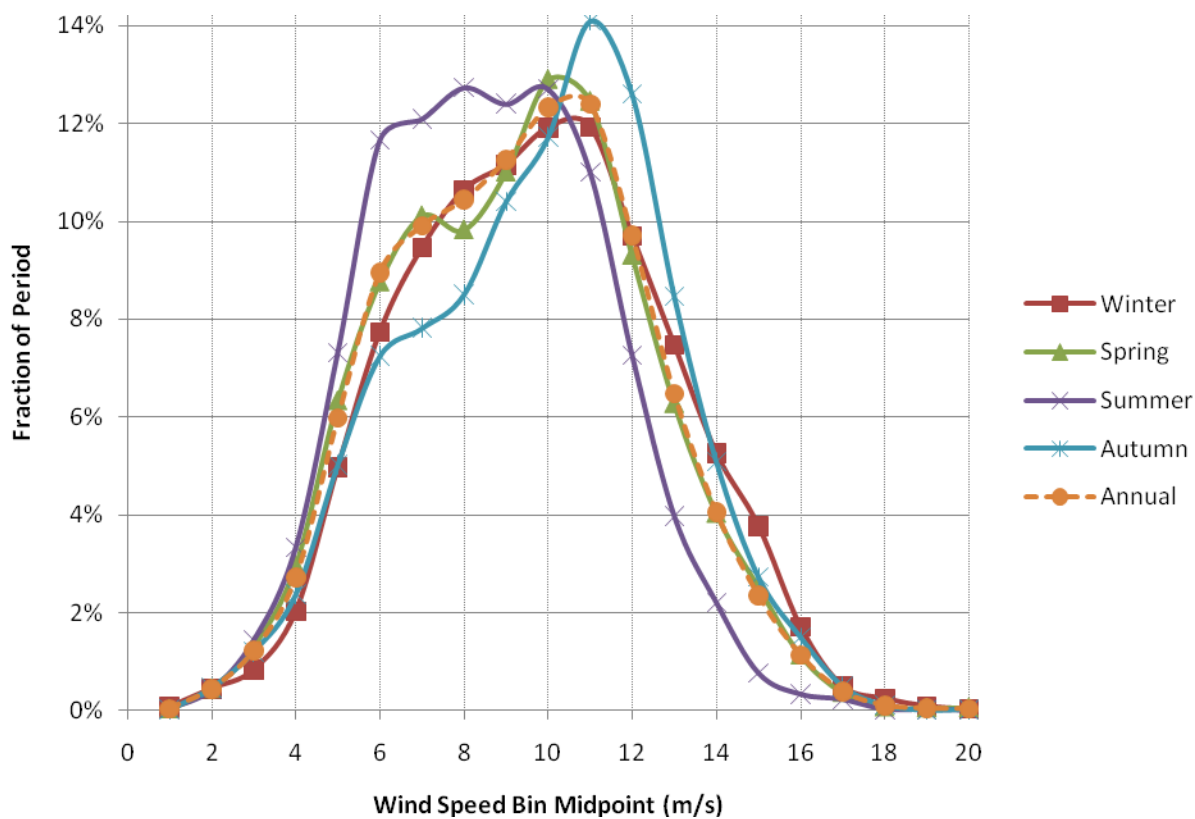




**Figure 2-3  
Wind Rose**



**Figure 2-4**  
**Annual and Seasonal Wind Speed Frequency Distribution**



**Figure 2-5**  
**Diurnal Wind Speed Pattern**

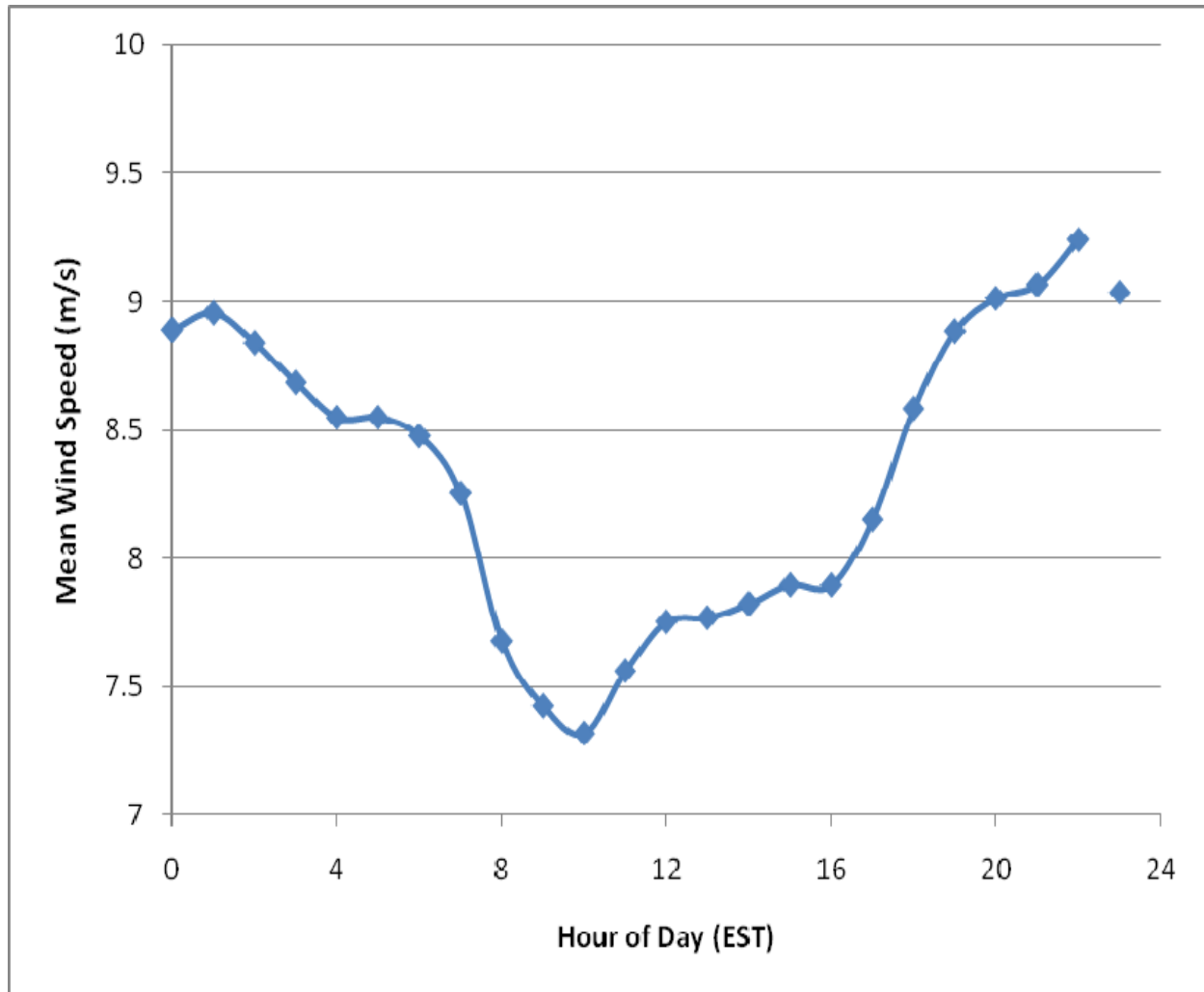
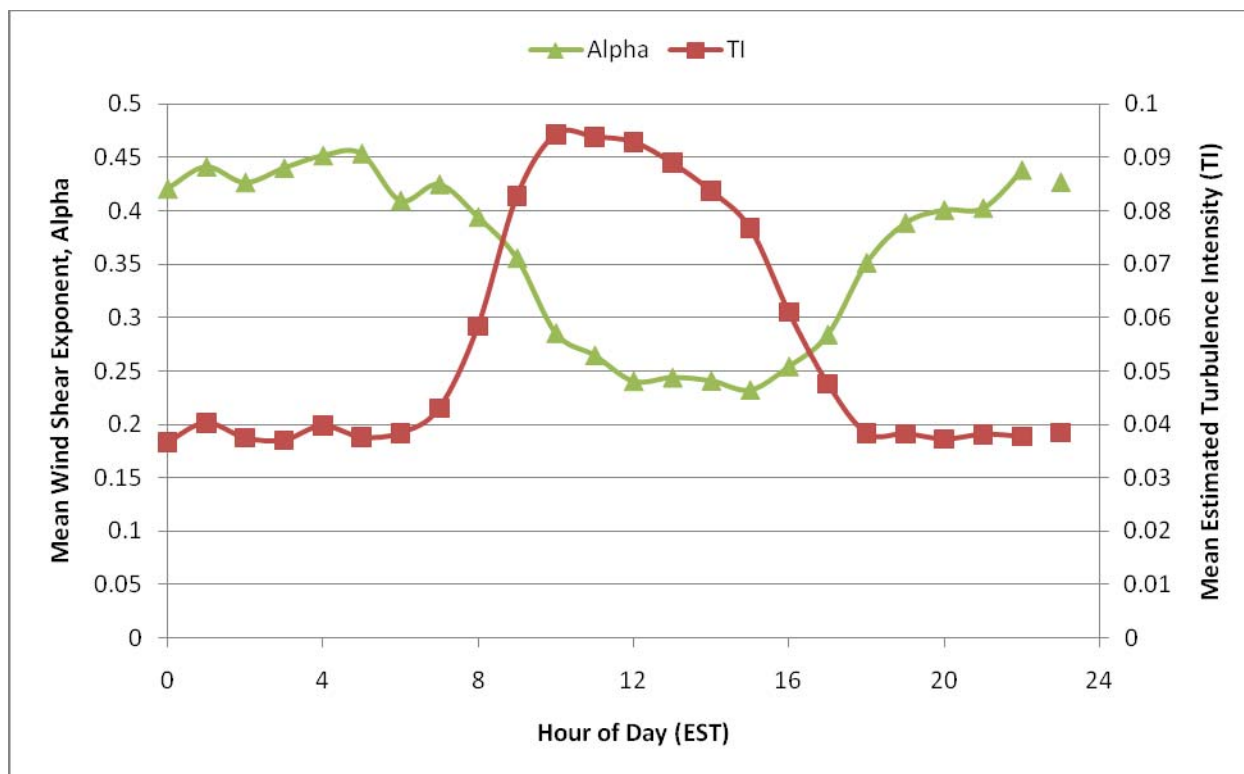
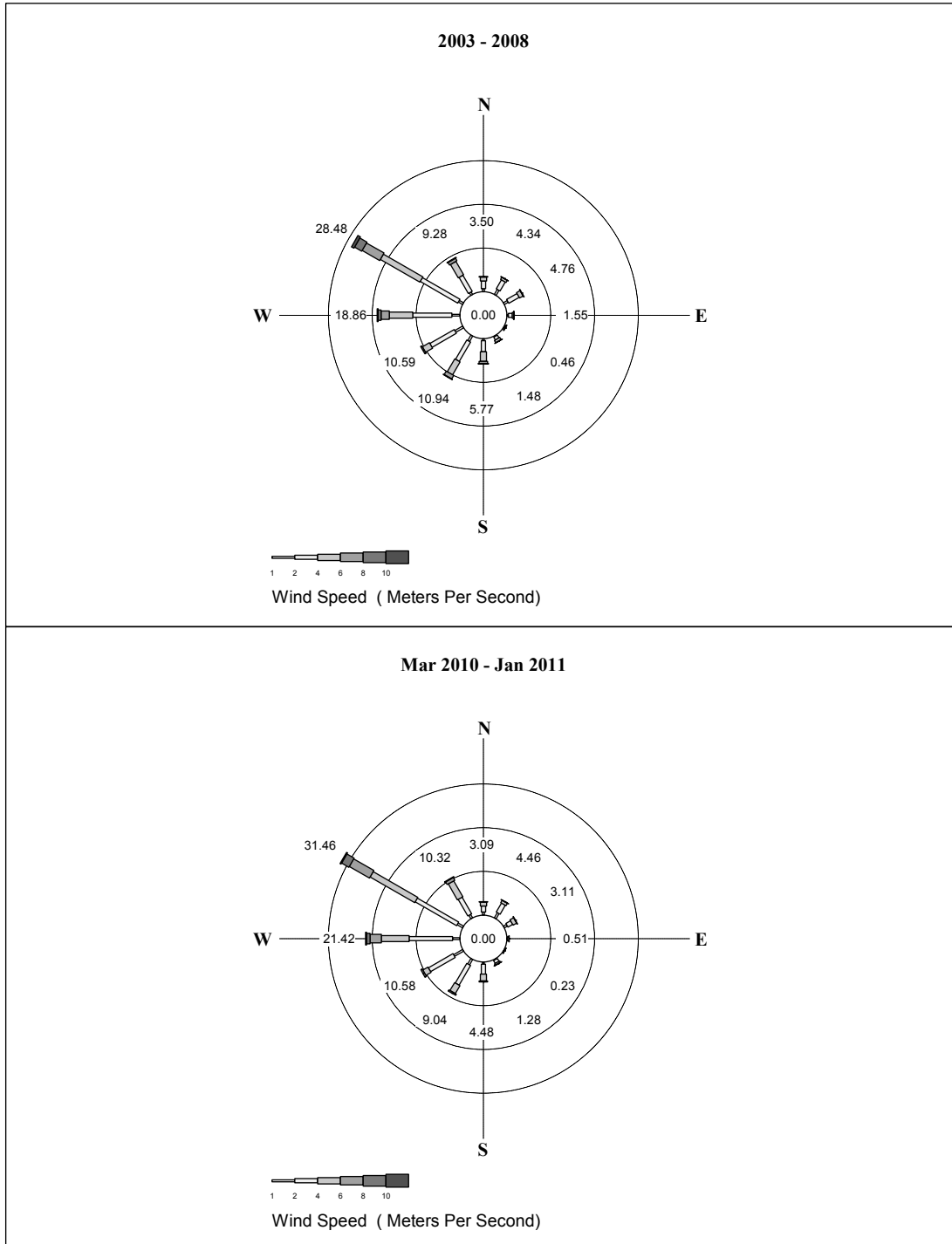


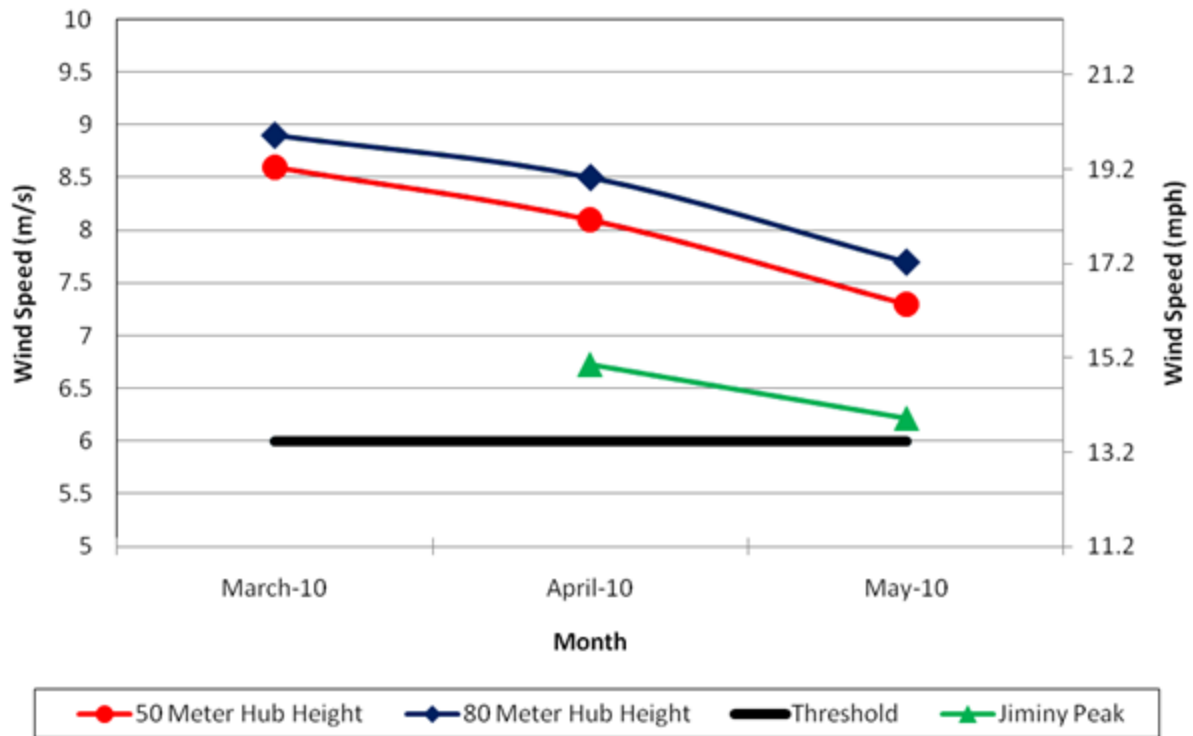
Figure 2-6  
Diurnal Wind Speed Pattern



**Figure 2-7**  
**KPSF Wind Rose Comparison**



**Figure 2-8**  
**Lenox Wind and Jiminy Peak - Average Monthly**  
**Wind Speeds**

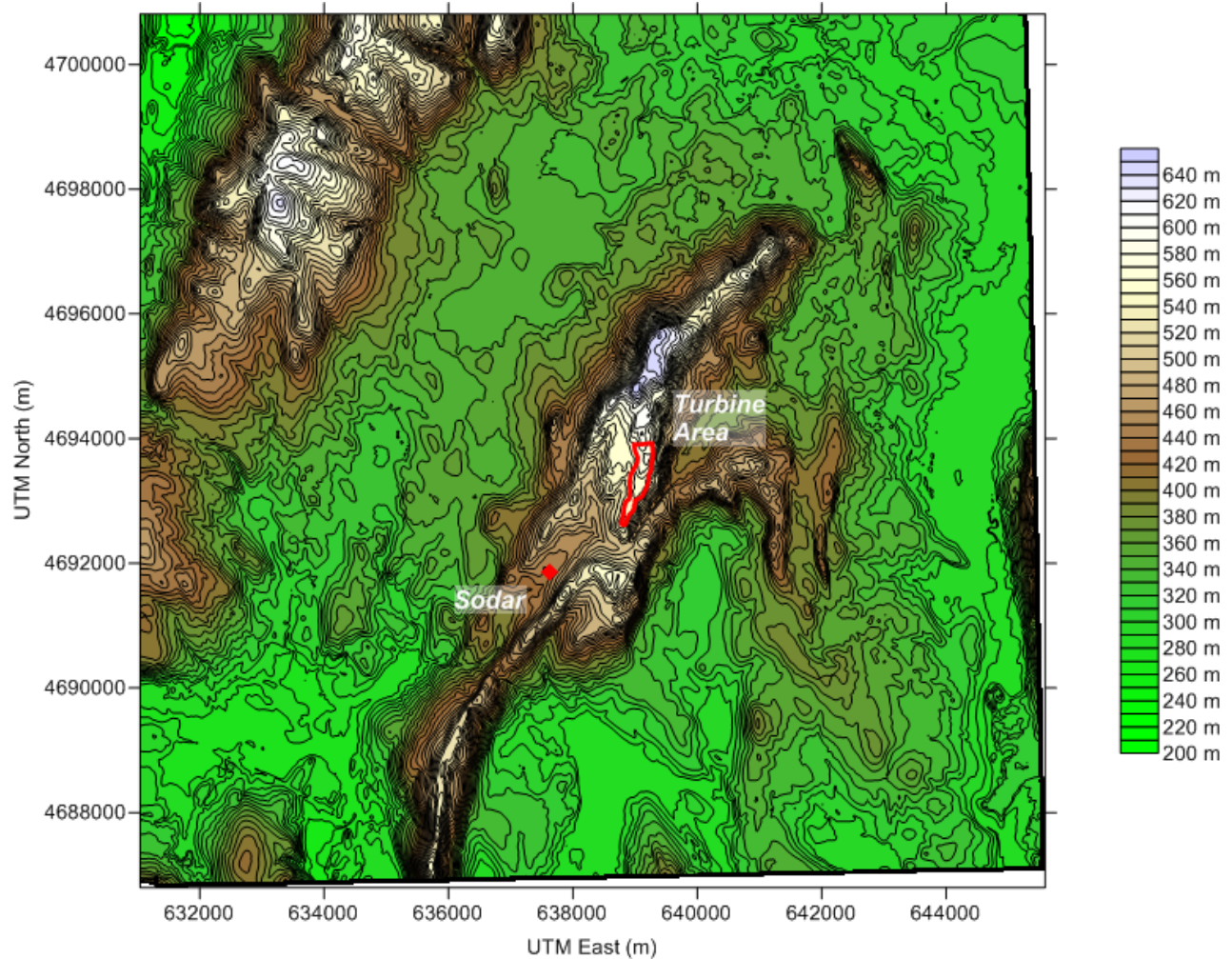


**Figure 2-9**  
**Domain Regional Map**



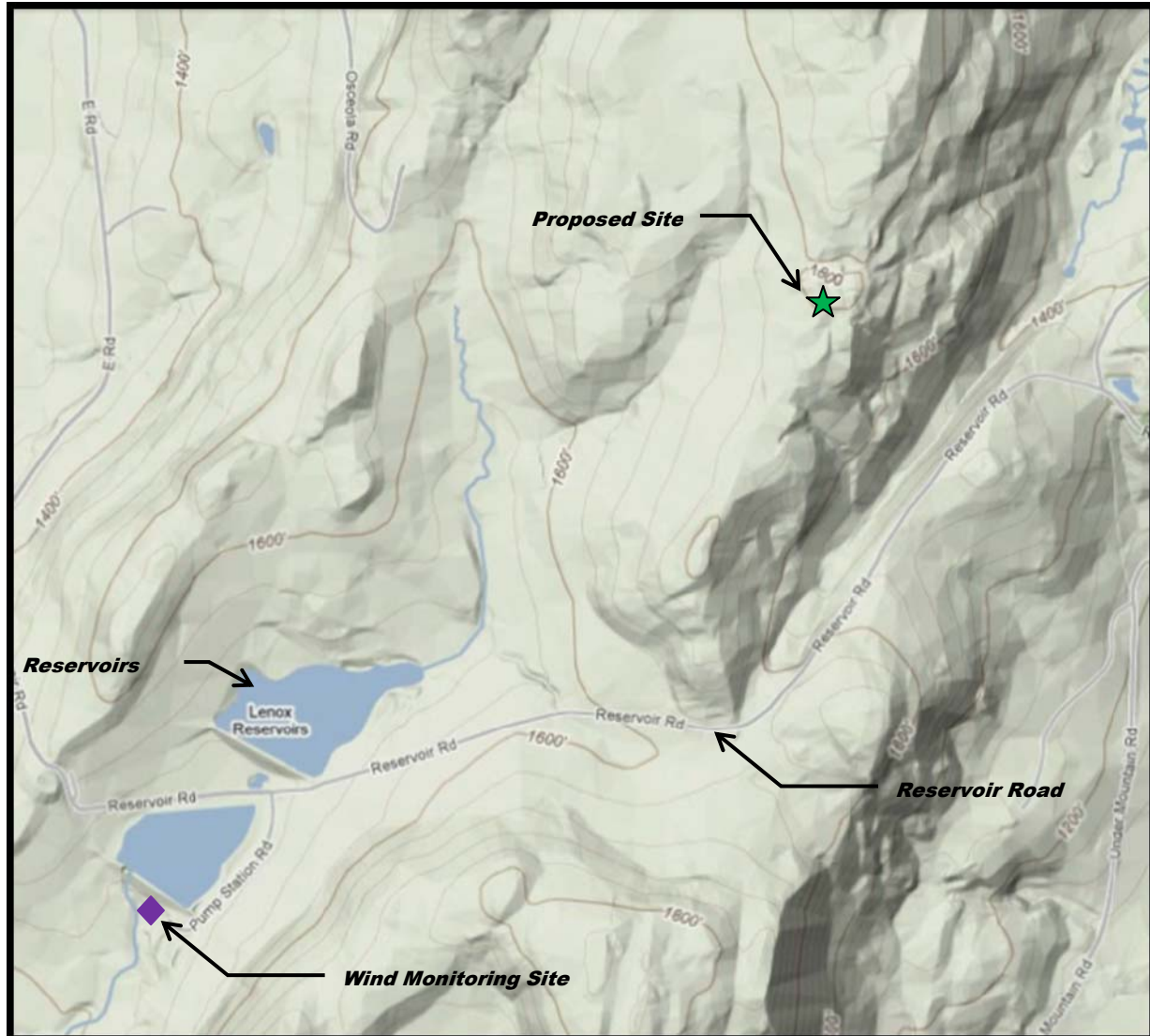


**Figure 2-10**  
**Domain Elevation Contour Map**

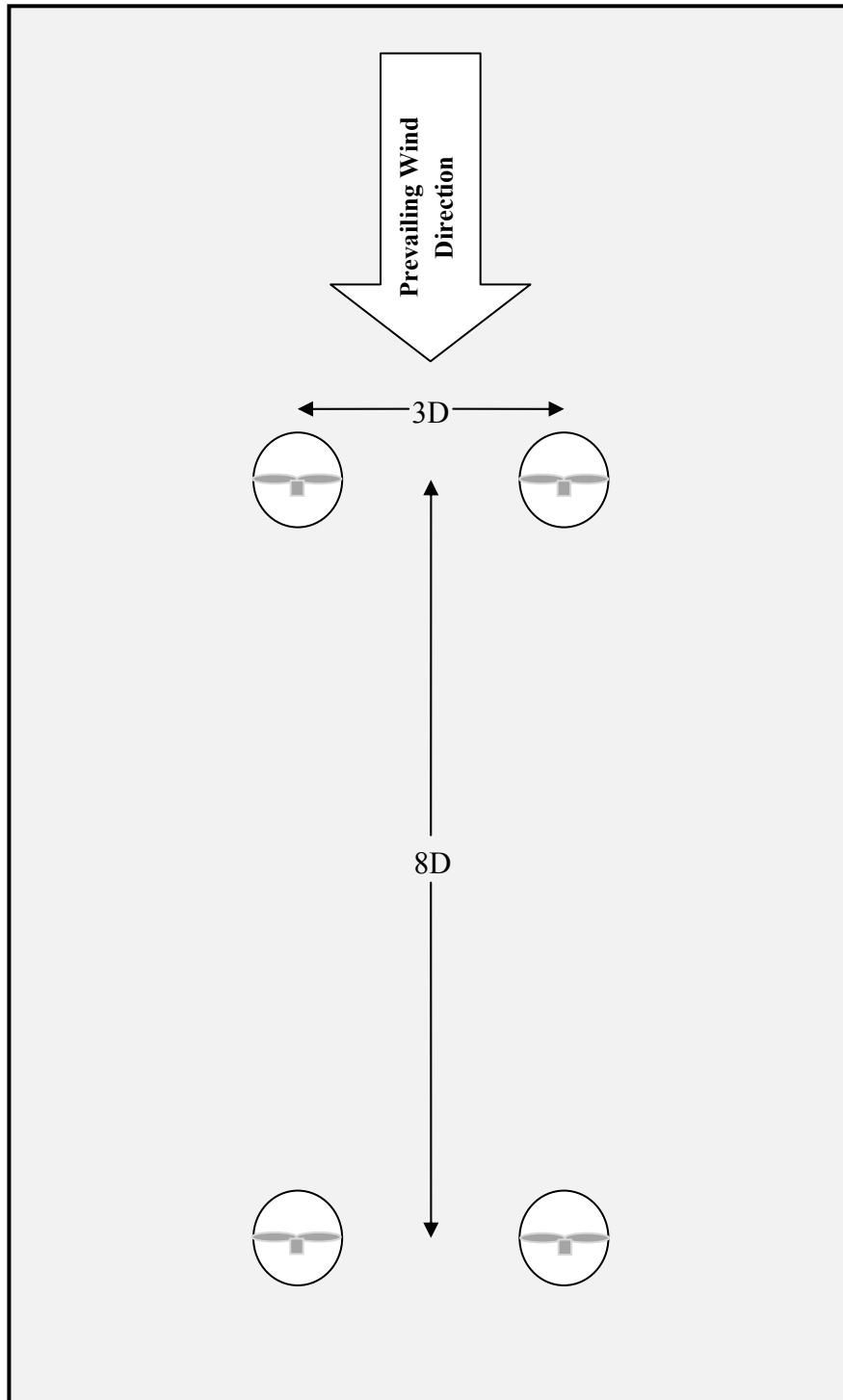




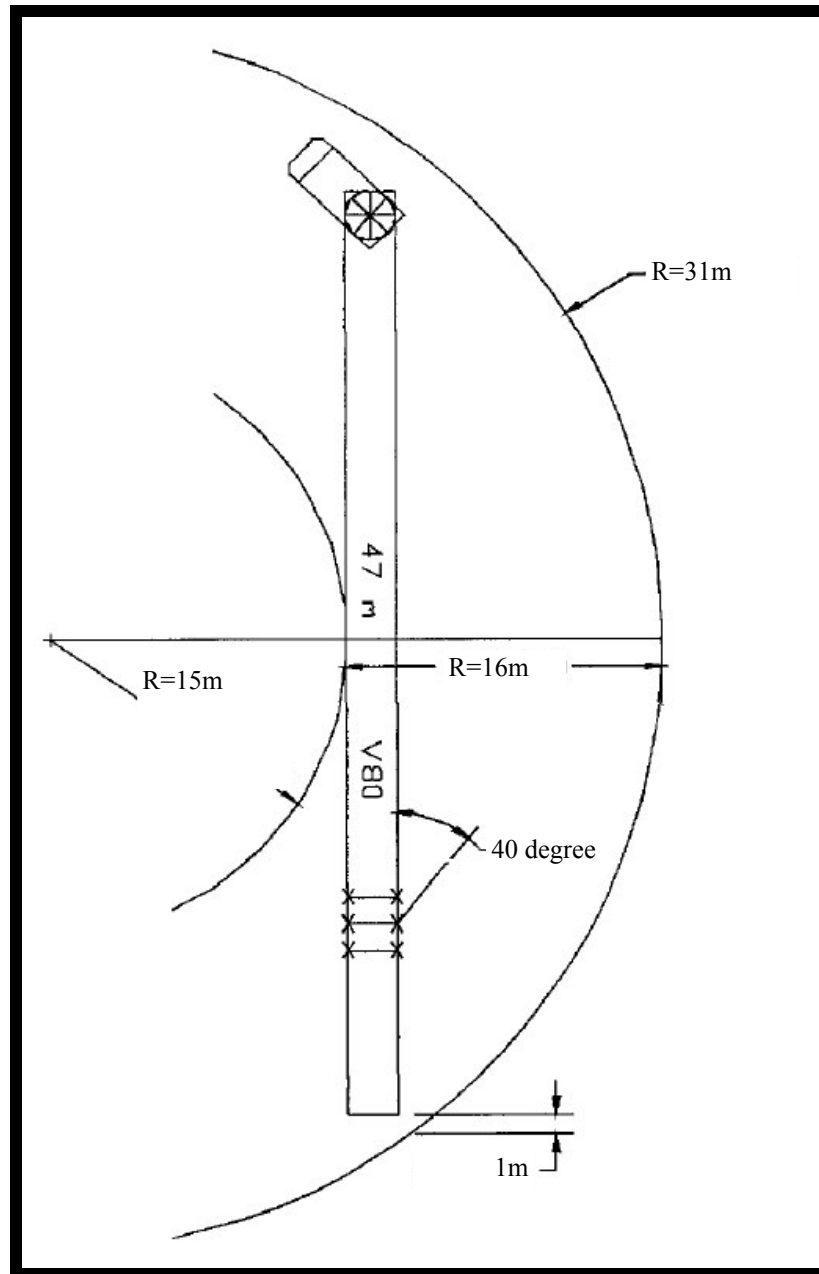
**Figure 3-1**  
**Nearby Site Features**



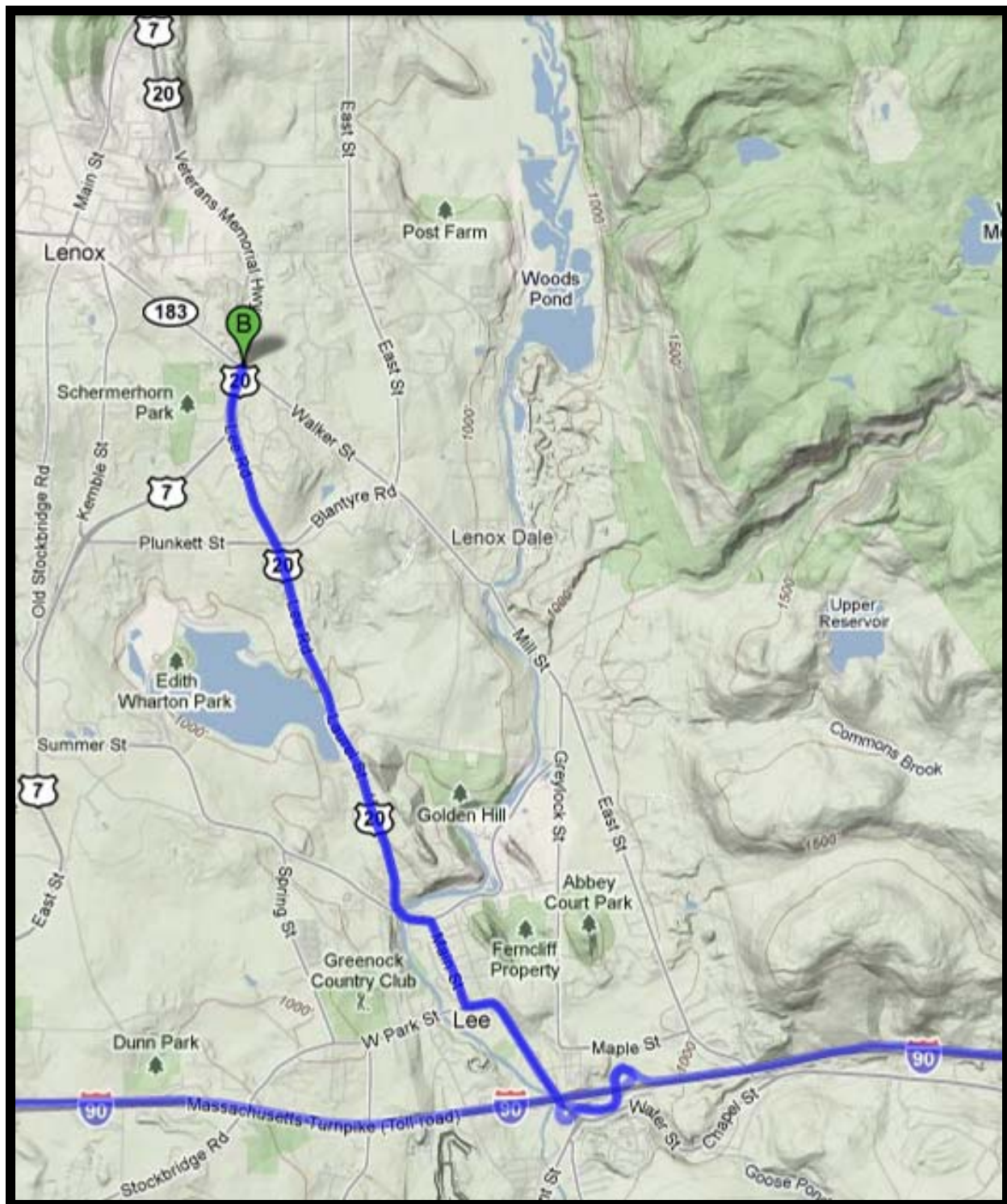
**Figure 3-2**  
**Turbine Spacing Schematic**



**Figure 3-3**  
**Turning Radius Requirements for a**  
**Vestas V80 Wind Turbine Blade**

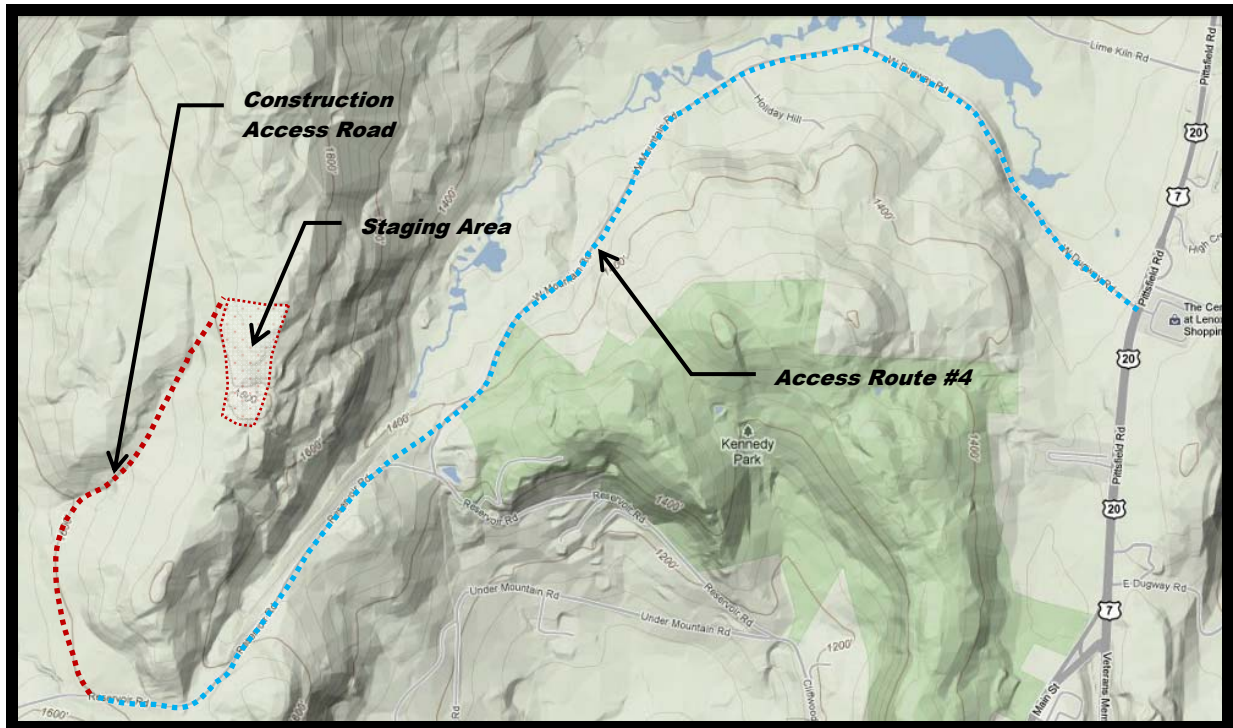


**Figure 3-4**  
**Access Route from Interstate Highway 90**





**Figure 3-5**  
**Local Access Route #4**  
**Construction Access Road and Staging Area**



**Figure 4-1**  
**Site Vicinity Map**

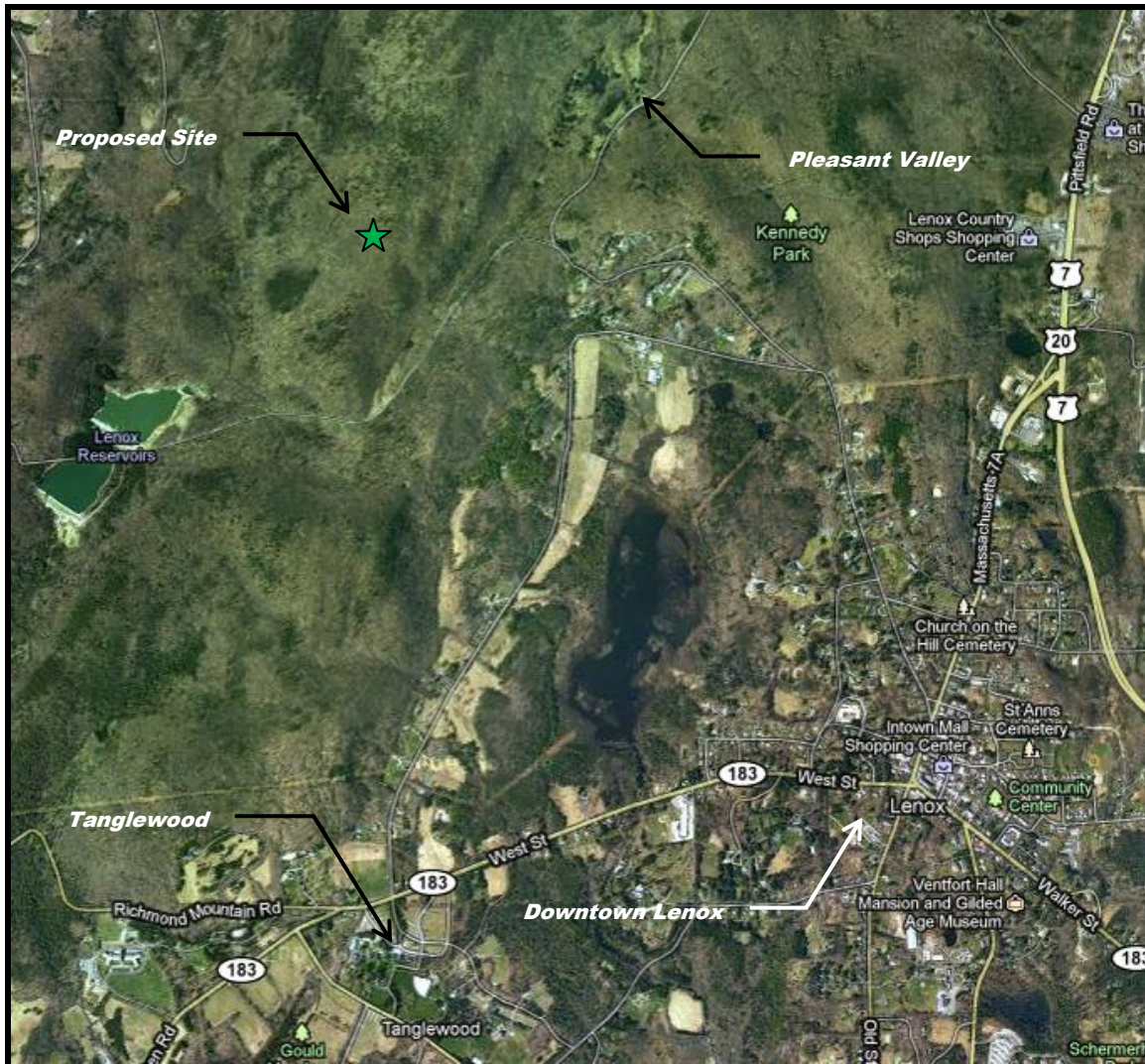
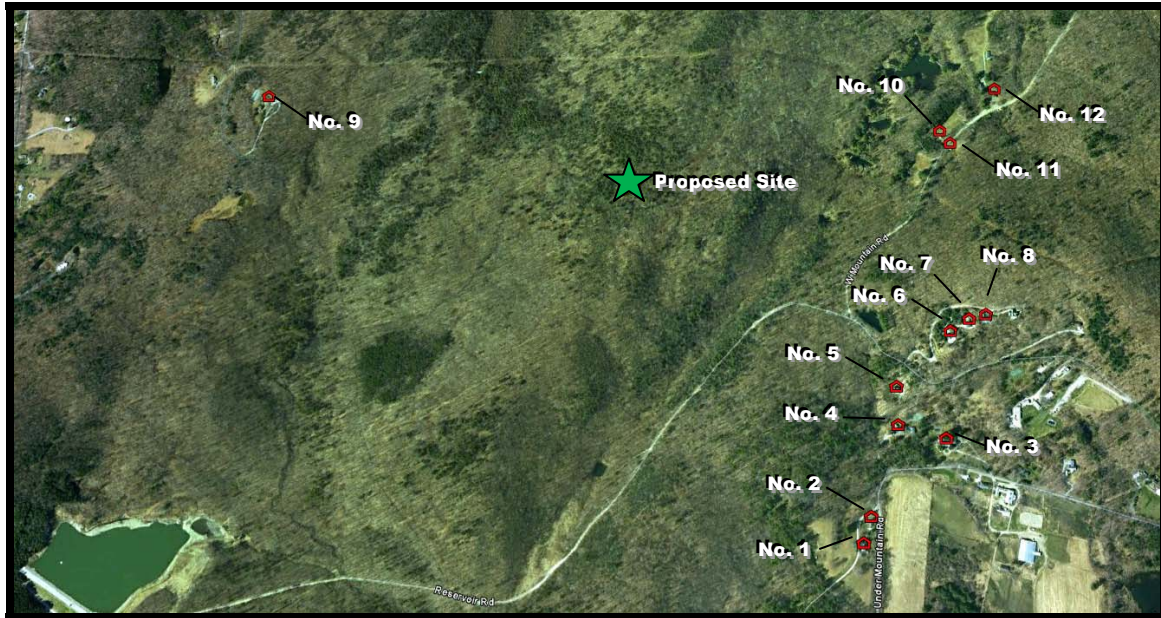
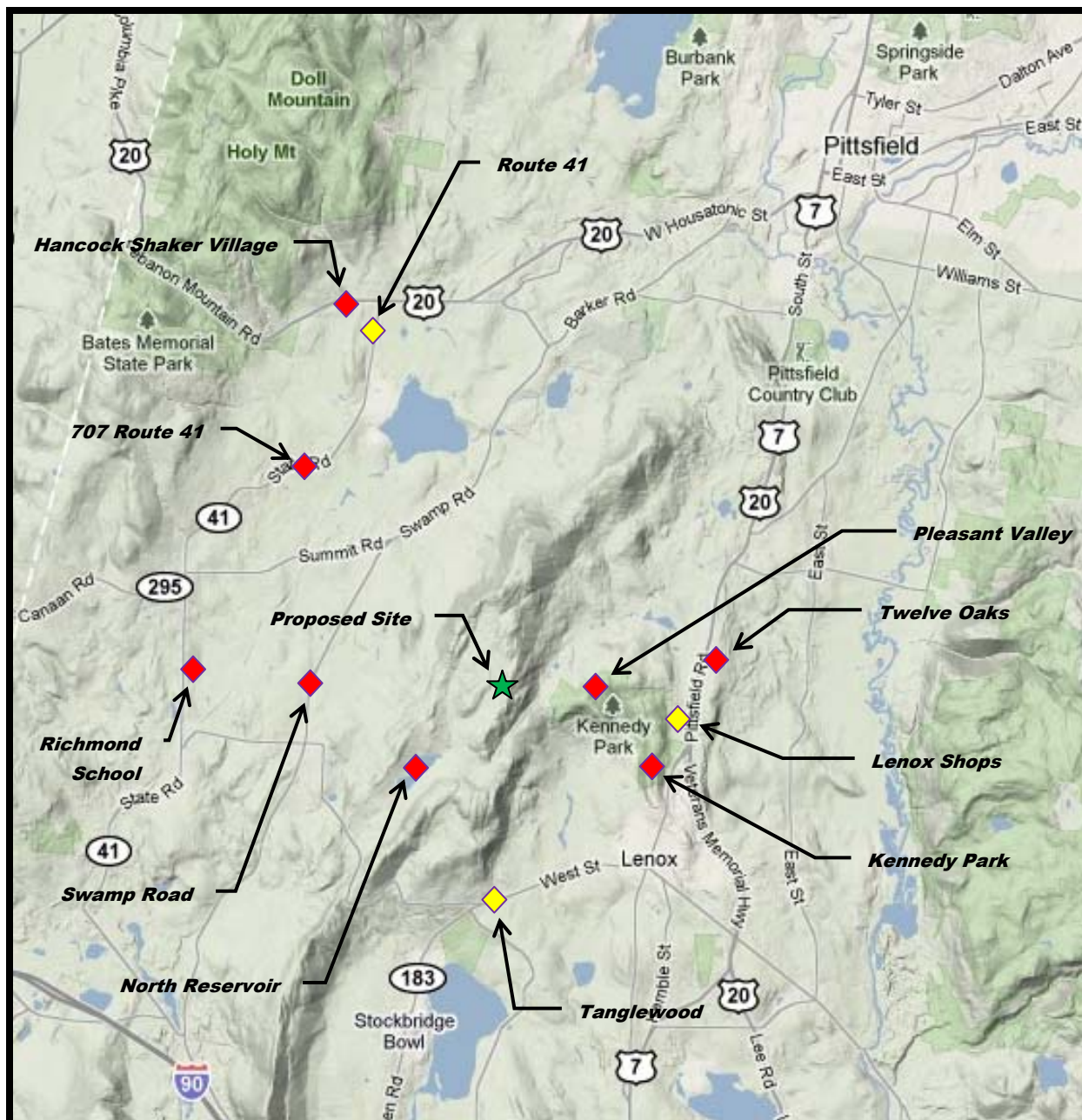




Figure 4-2  
Potential Visual and Noise Receptors



**Figure 4-3a**  
**Visual Simulation Vantage Points**  
**Single Turbine Configuration**



Notes: Red vantage point icons indicate at least a portion of the wind turbine can be seen. Yellow vantage point icons indicate the wind turbine cannot be seen from the viewpoint.

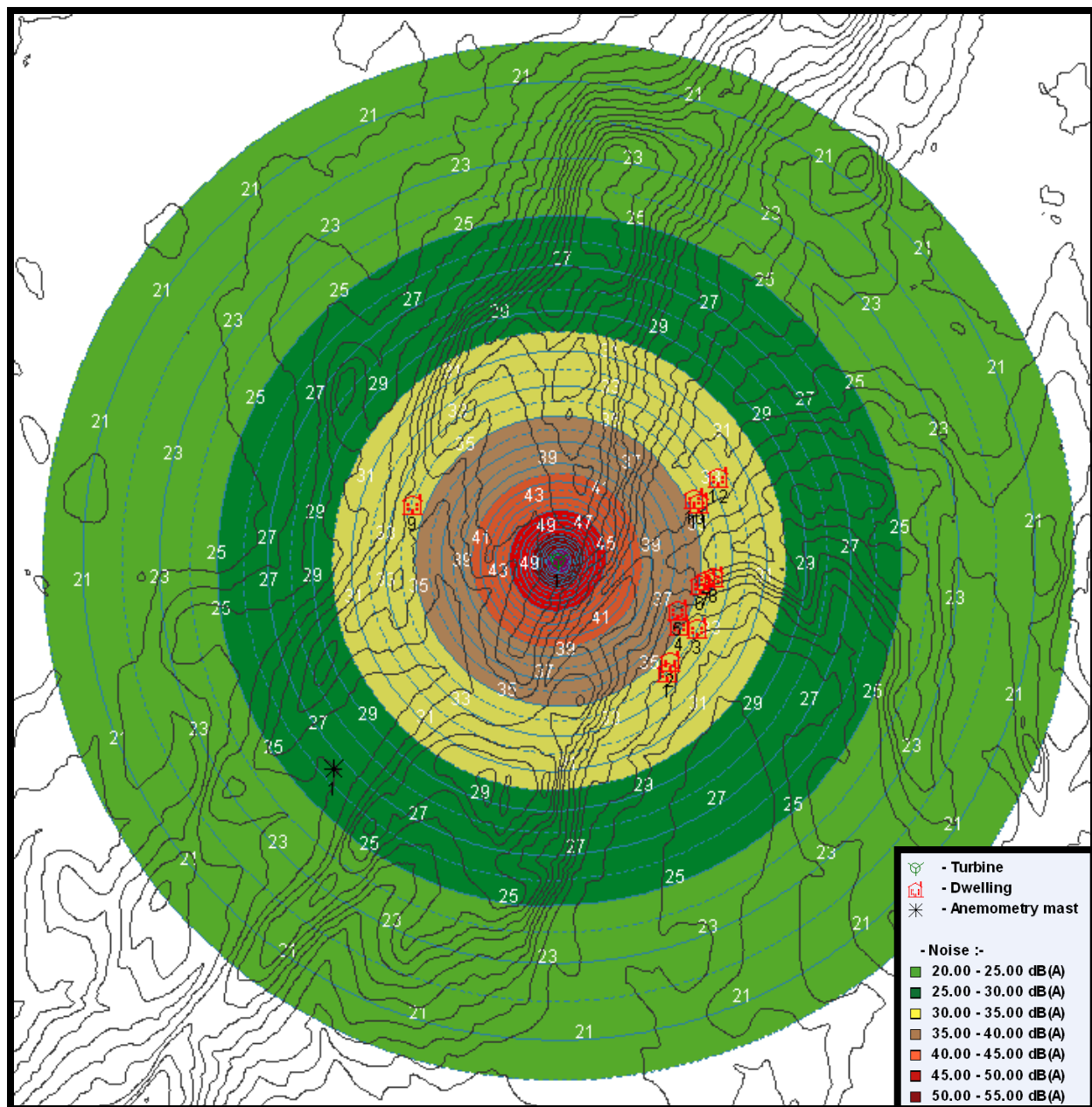


The map displays the Lenox area with various roads and landmarks. Key features include:

- Roads:** Route 41, Route 20, Route 7, Route 295, and Route 183.
- Landmarks:** Doll Mountain, Holy Mt, Bates Memorial State Park, North Reservoir, Stockbridge Bowl, Tanglewood, Pleasant Valley, Twelve Oaks, Lenox Shops, Kennedy Park, and Hancock Shaker Village.
- Proposed Sites:** Indicated by red diamonds along Route 41 and Route 20.
- Other Locations:** Richmond School, Swamp Road, and the 'Proposed Site' marked with a green star near the North Reservoir.

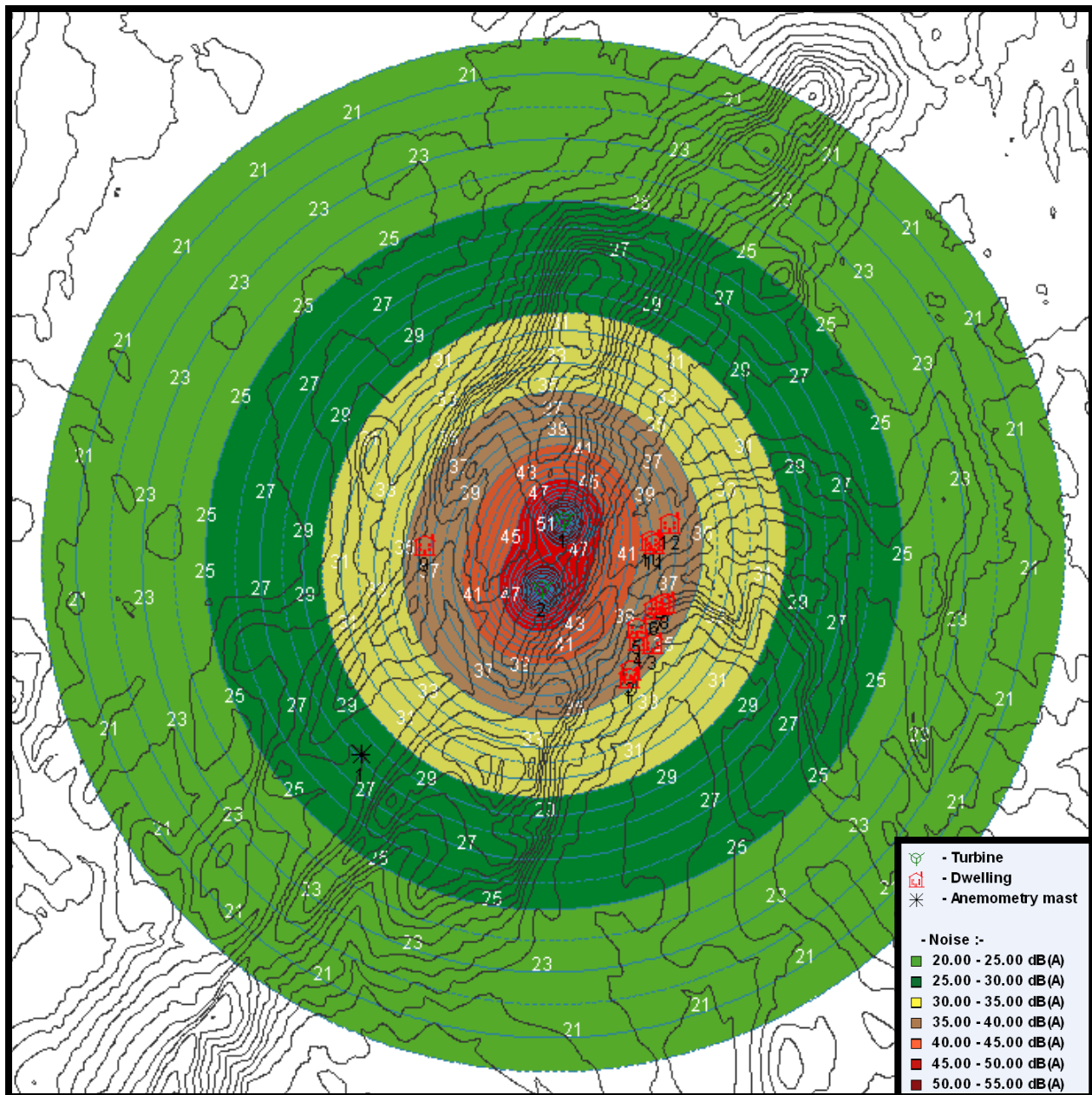
Notes: Under the two turbine configuration scenario, at least a portion of one wind turbine can be seen from all vantage points.

**Figure 4-4a**  
**Simple Noise Propagation Simulation**  
**Single Turbine Configuration**



Notes: This simple noise propagation simulation accounts for effects of topography but does not account for background noise levels or the effects of vegetation. Noise levels are calculated at 2-meters above the ground surface are in decibels (A-Weighting curve).

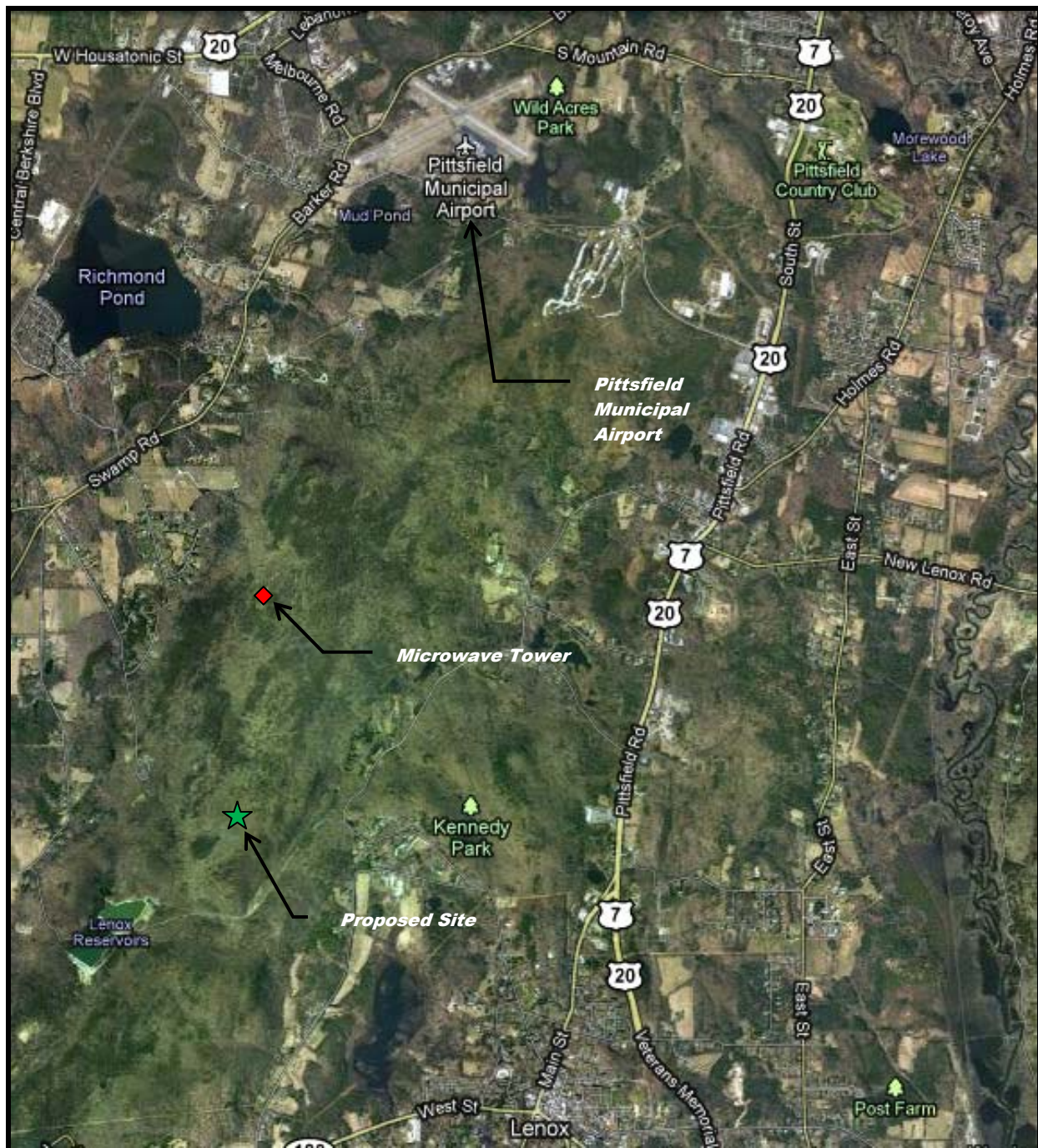
**Figure 4-4b**  
**Simple Noise Propagation Simulation**  
**Two Turbine Configuration**



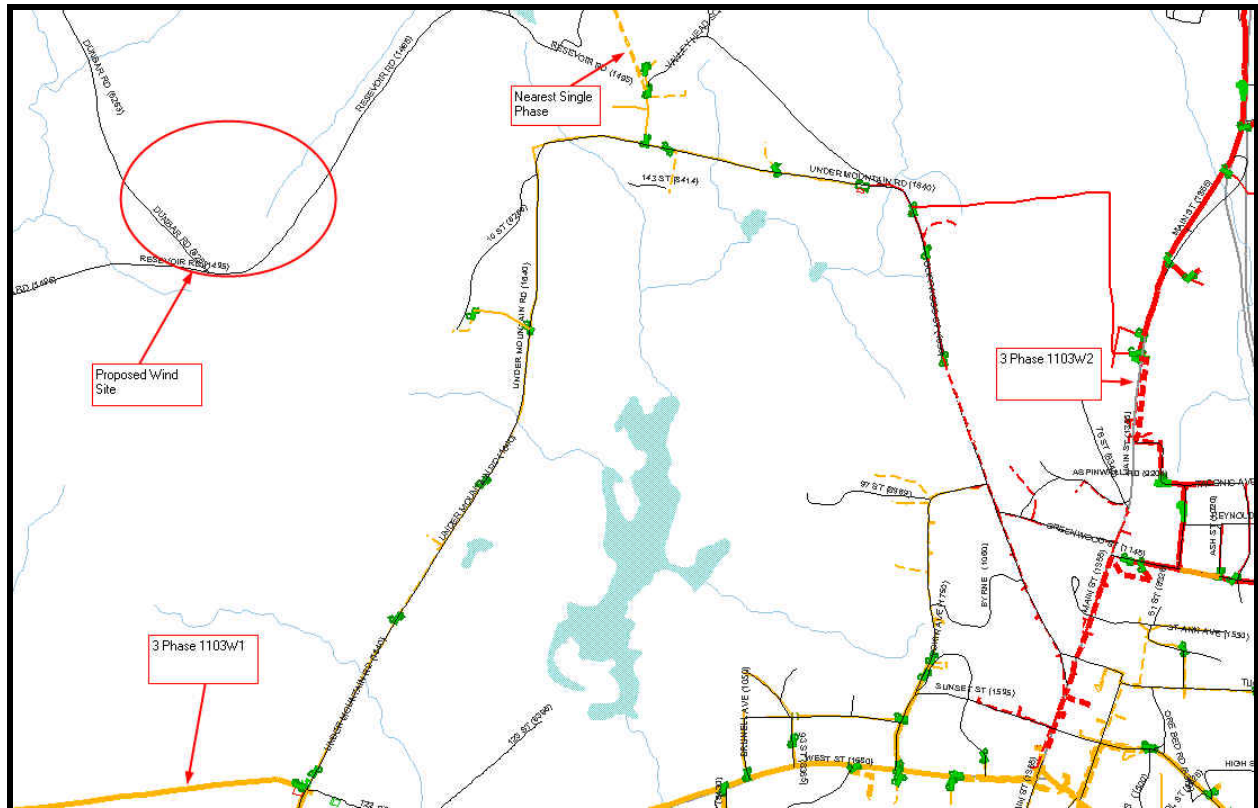
Notes: This simple noise propagation simulation accounts for effects of topography but does not account for background noise levels or the effects of vegetation. Noise levels are calculated at 2-meters above the ground surface are in decibels (A-Weighting curve).



**Figure 4-5**  
**Nearby Communication Tower and Airport**



**Figure 5-1**  
**National Grid Distribution Lines**

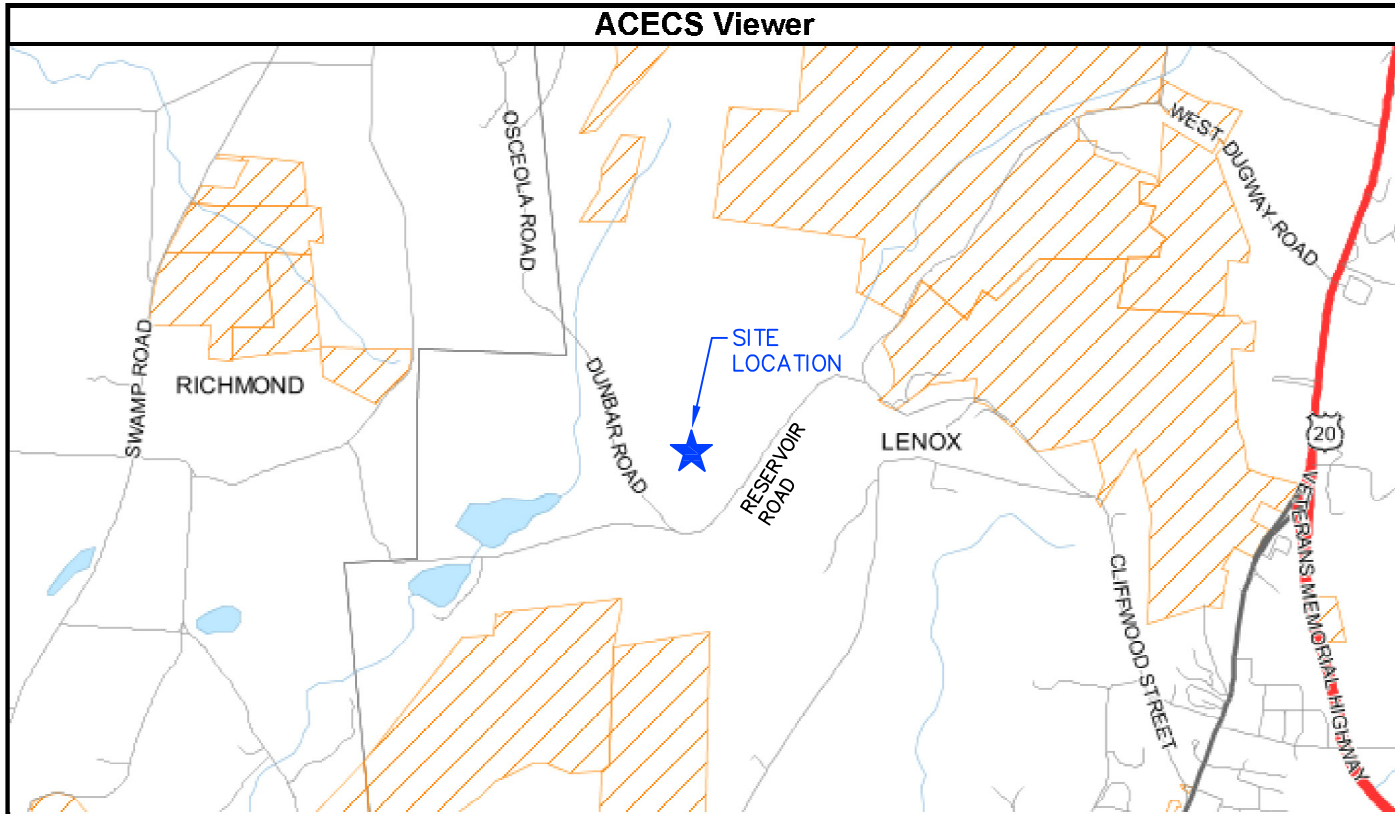




**Figure 5-2**  
**Typical Transformer Arrangement**



M:\Design\DWG\WIND\Lenox MA\FIG 6-1.dwg, Layout1, 4/5/2011 3:05:16 PM, GIRARDEB, 1:1



Note: some data appears only at certain zoom levels



**SOURCE:**  
STATE OF MASSACHUSETTS GIS  
WEBSITE, ACECS VIEWER.

## AREAS OF CRITICAL ENVIRONMENTAL CONCERN

CONCORD



NEW HAMPSHIRE

LENOX, MASSACHUSETTS

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APR 2011

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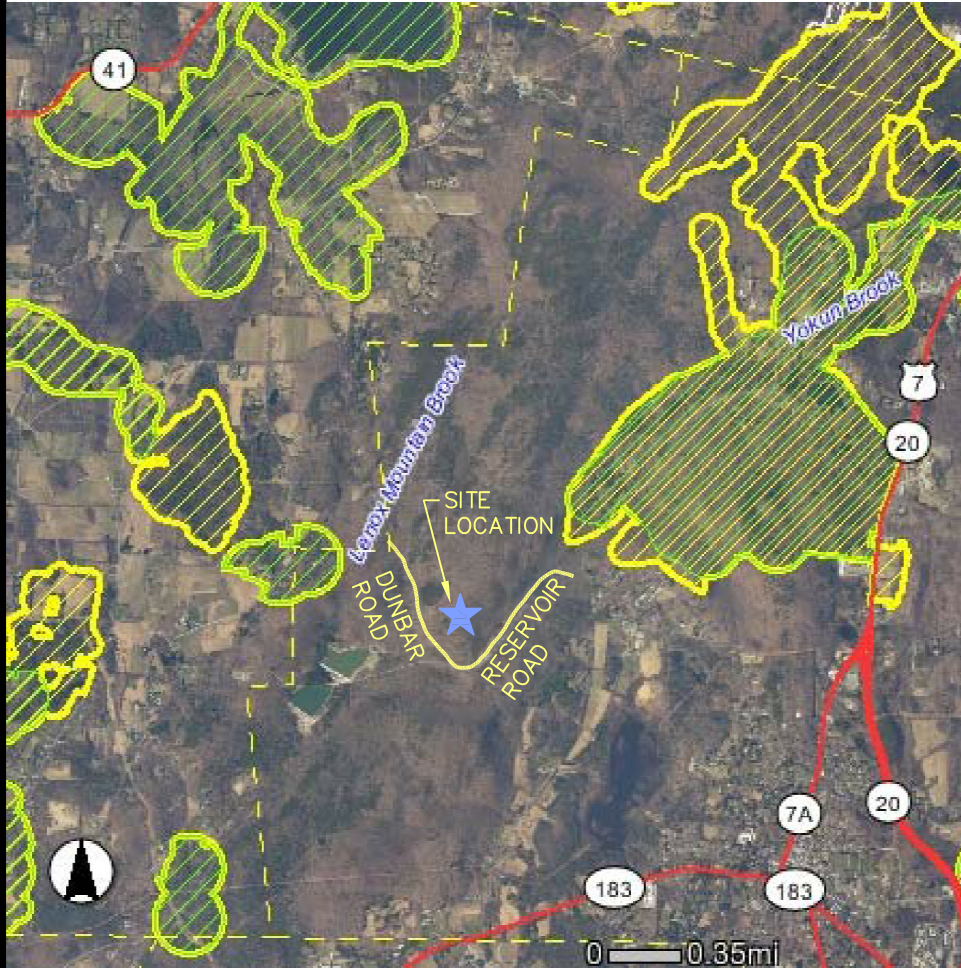
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REVISION

FIGURE NO.

6-1

# Priority Habitat for Endangered Species



## Legend

Land Feature Names  
Major EOT-OTP Roads  
Alternate Route Numbers

### Major EOT-OTP Roads

- Limited Access Highway
- Multi-lane Hwy, Not Limited Access
- Other Numbered Hwy

### Place Names

Surrounding States  
Labels

- Surrounding States
- NHESP 2008 Priority Habitats of Rare Species and also Estimated Habitats of Rare Wildlife
- NHESP 2008 MA Priority Habitats of Rare Species

Color Orthos 2005

SOURCE:  
STATE OF MASSACHUSETTS GIS  
WEBSITE.

PRIORITY HABITAT  
FOR RARE SPECIES

CONCORD



NEW HAMPSHIRE

LENOX, MASSACHUSETTS

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FIGURE NO.

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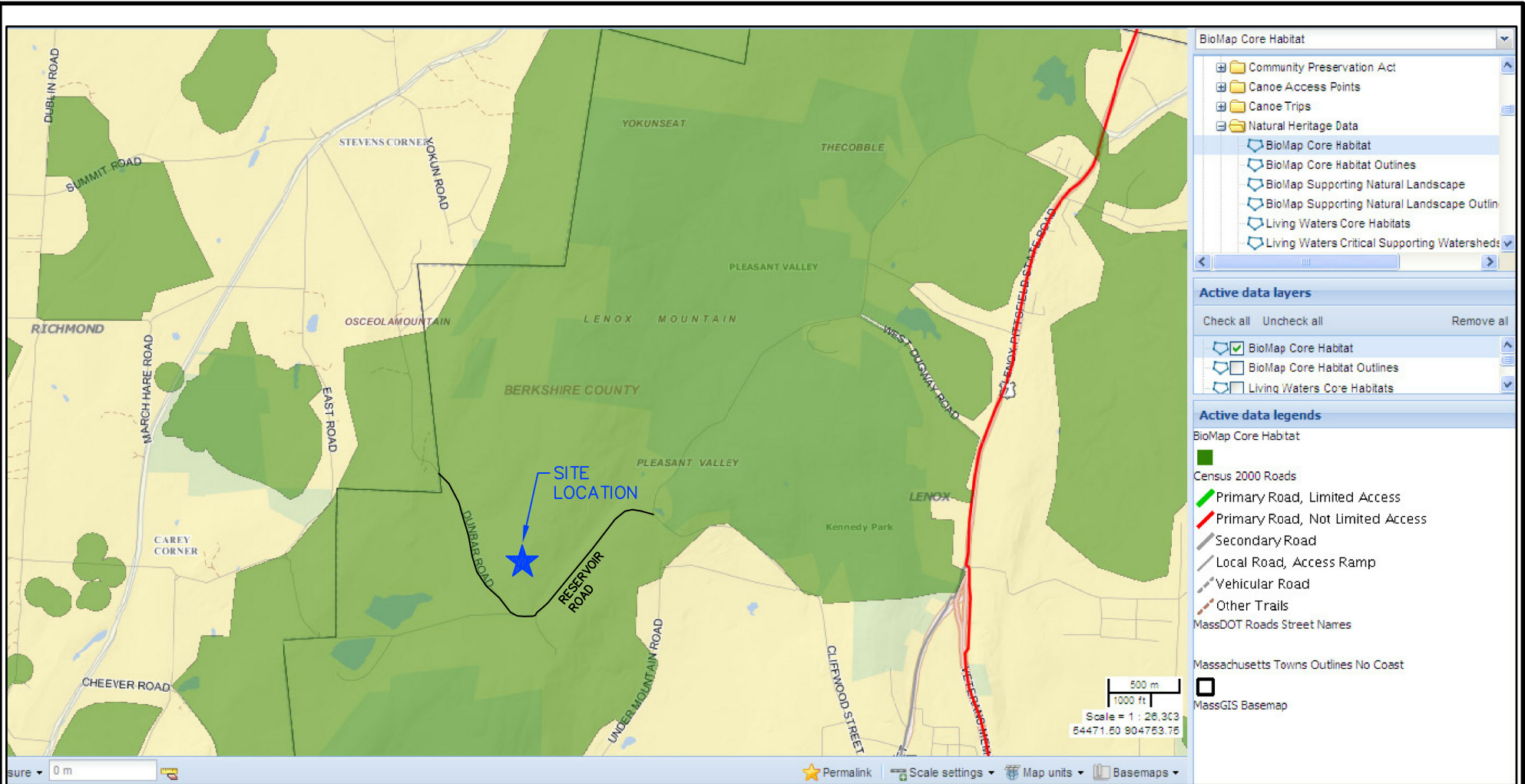
## PROTECTED AND RECREATIONAL OPEN SPACE




**WESTON**  
SOLUTIONS

NEW HAMPSHIRE

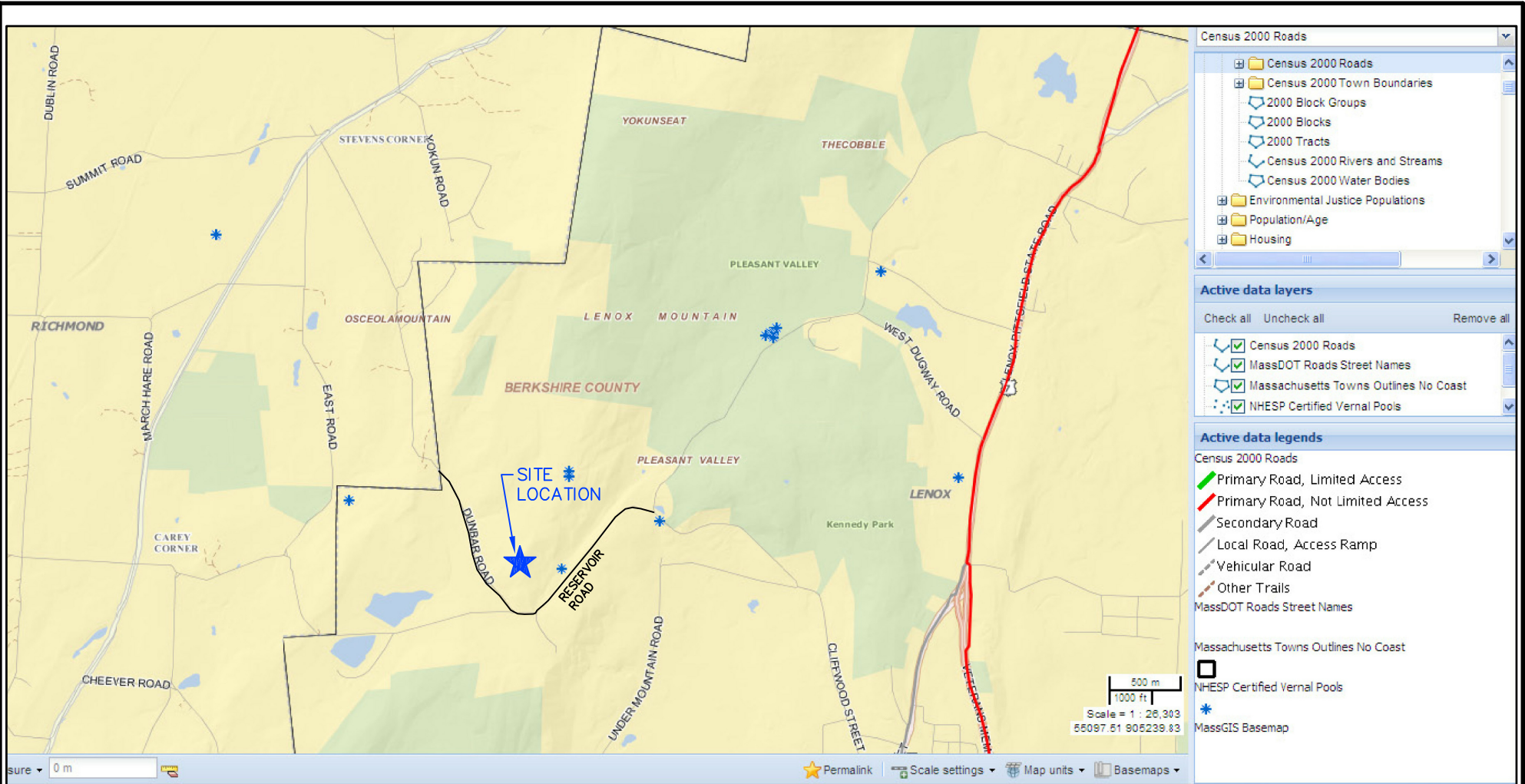
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SOURCE:  
STATE OF MASSACHUSETTS GIS  
WEBSITE.

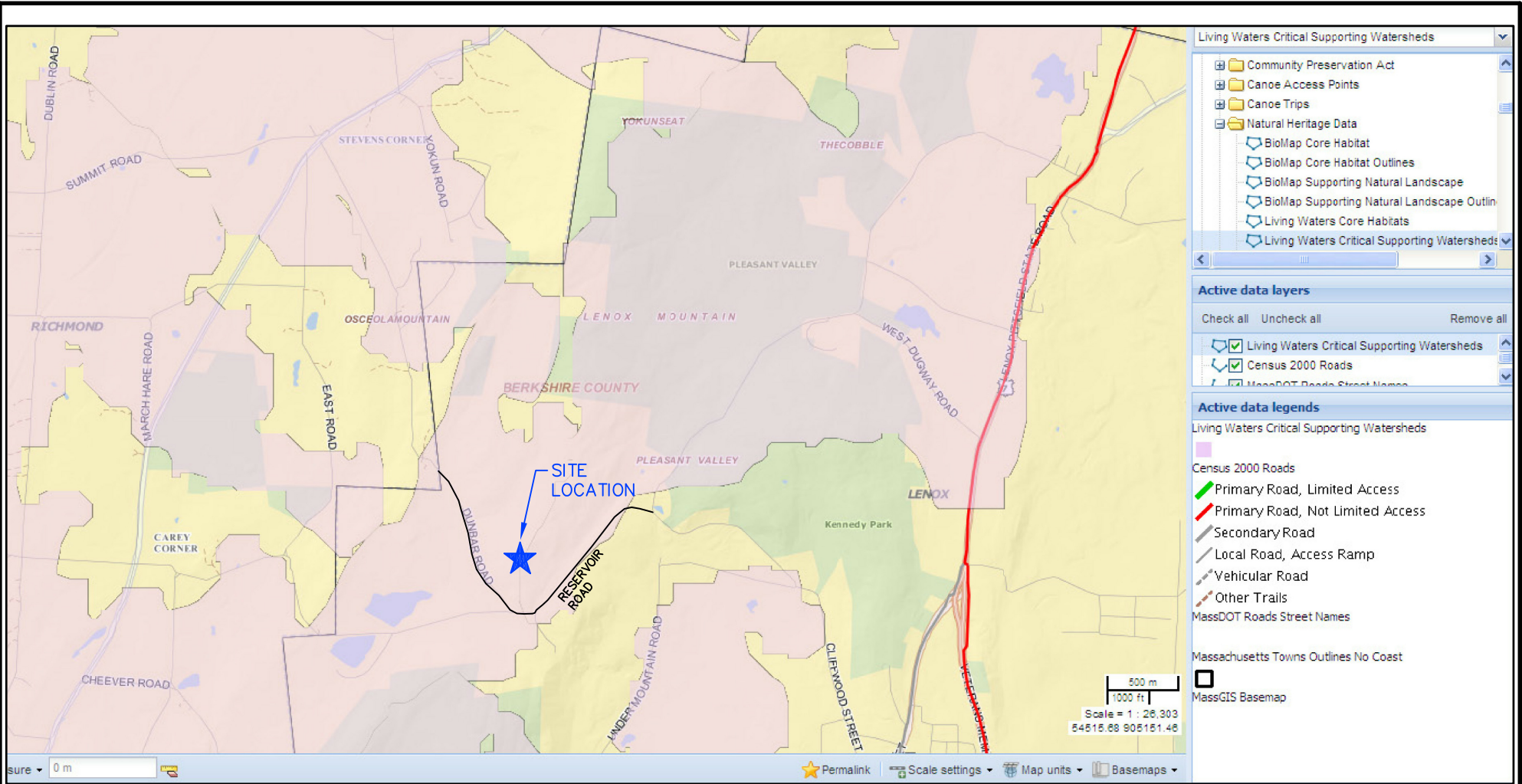
BIOMAP CORE HABITATS					
LENOX, MASSACHUSETTS		CONCORD	NEW HAMPSHIRE		
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	CHECKED	DATE	SCALE	REVISION	FIGURE NO.
			AS SHOWN		6-4





SOURCE:  
STATE OF MASSACHUSETTS GIS  
WEBSITE.

CERTIFIED VERNAL POOLS					
LENOX, MASSACHUSETTS		CONCORD	NEW HAMPSHIRE		
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SOURCE:  
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LIVING WATERS CRITICAL SUPPORTING WATERSHEDS

LENOX, MASSACHUSETTS

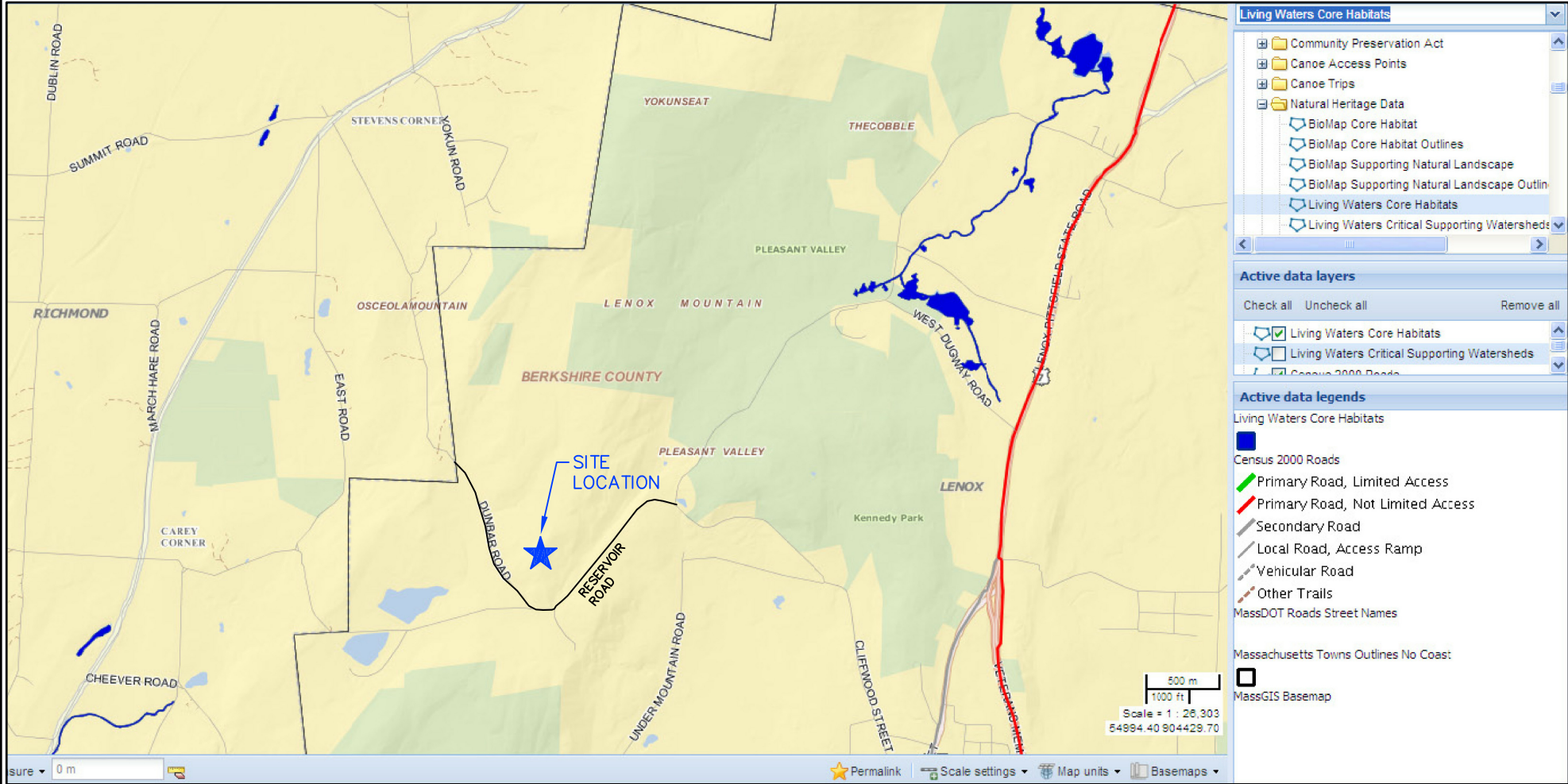


CONCORD


NEW HAMPSHIRE

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CHECKED		DATE		SCALE	AS SHOWN	REVISION	FIGURE NO.
							6-6





SOURCE:  
STATE OF MASSACHUSETTS GIS  
WEBSITE.

LIVING WATERS CORE HABITATS		<div>CONCORD</div> <div></div> <div>NEW HAMPSHIRE</div>			
LENOX, MASSACHUSETTS	DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
	BEG	APR 2011			14662.001.001
	CHECKED	DATE	SCALE	REVISION	FIGURE NO.
			AS SHOWN		6-7



U.S. Fish and Wildlife Service  
National Wetlands Inventory

NWI Map Lenox,  
MA

Apr 4, 2011



Wetlands

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

User Remarks:

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

SOURCE:  
U.S. FISH AND WILDLIFE  
SERVICE WETLANDS MAPPER  
WEBSITE.

NATIONAL WETLANDS INVENTORY MAP



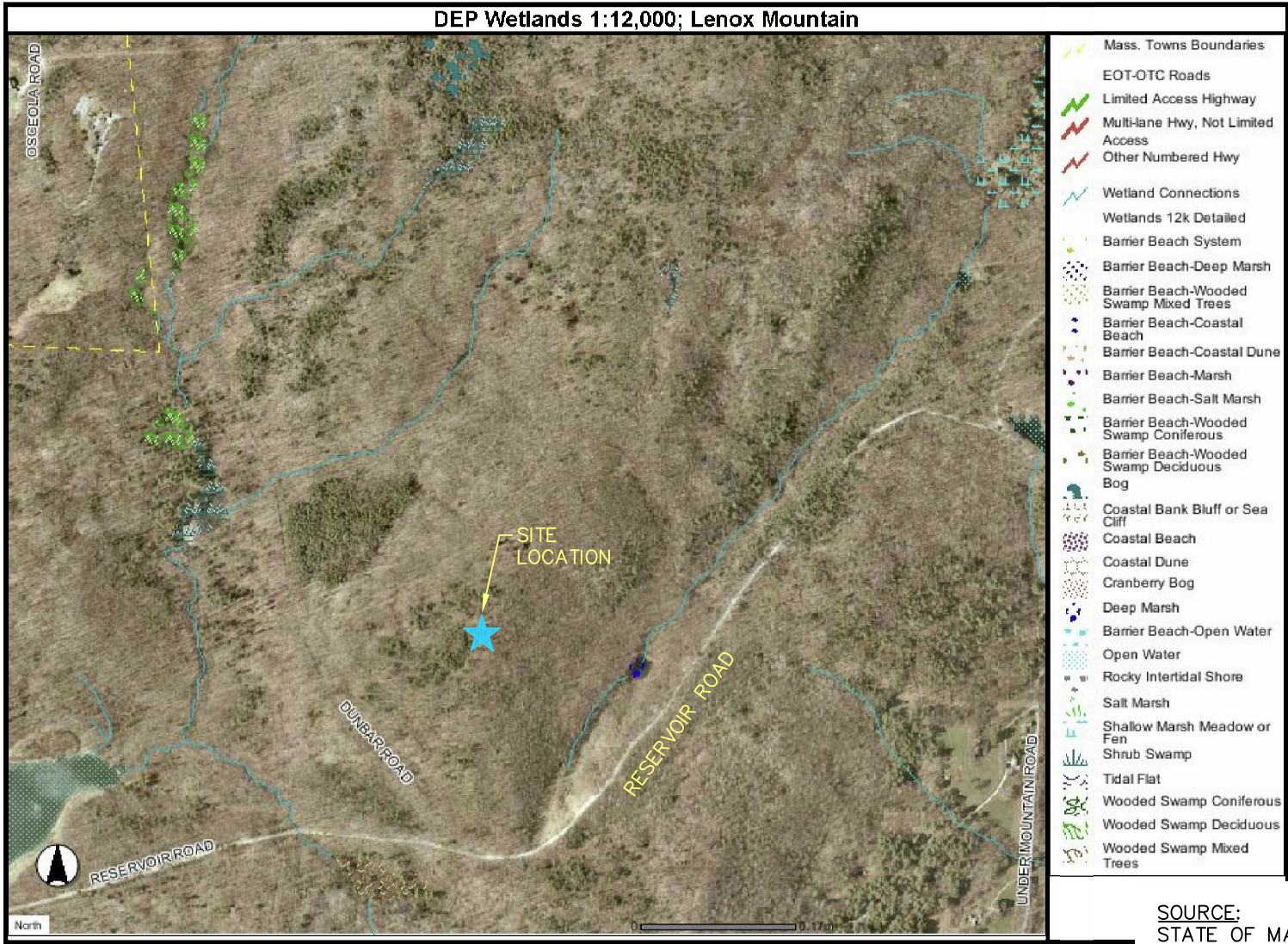
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NEW HAMPSHIRE

LENOX, MASSACHUSETTS

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LENOX MOUNTAIN WETLANDS

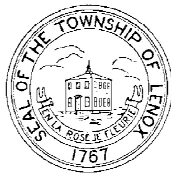
LENOX, MASSACHUSETTS



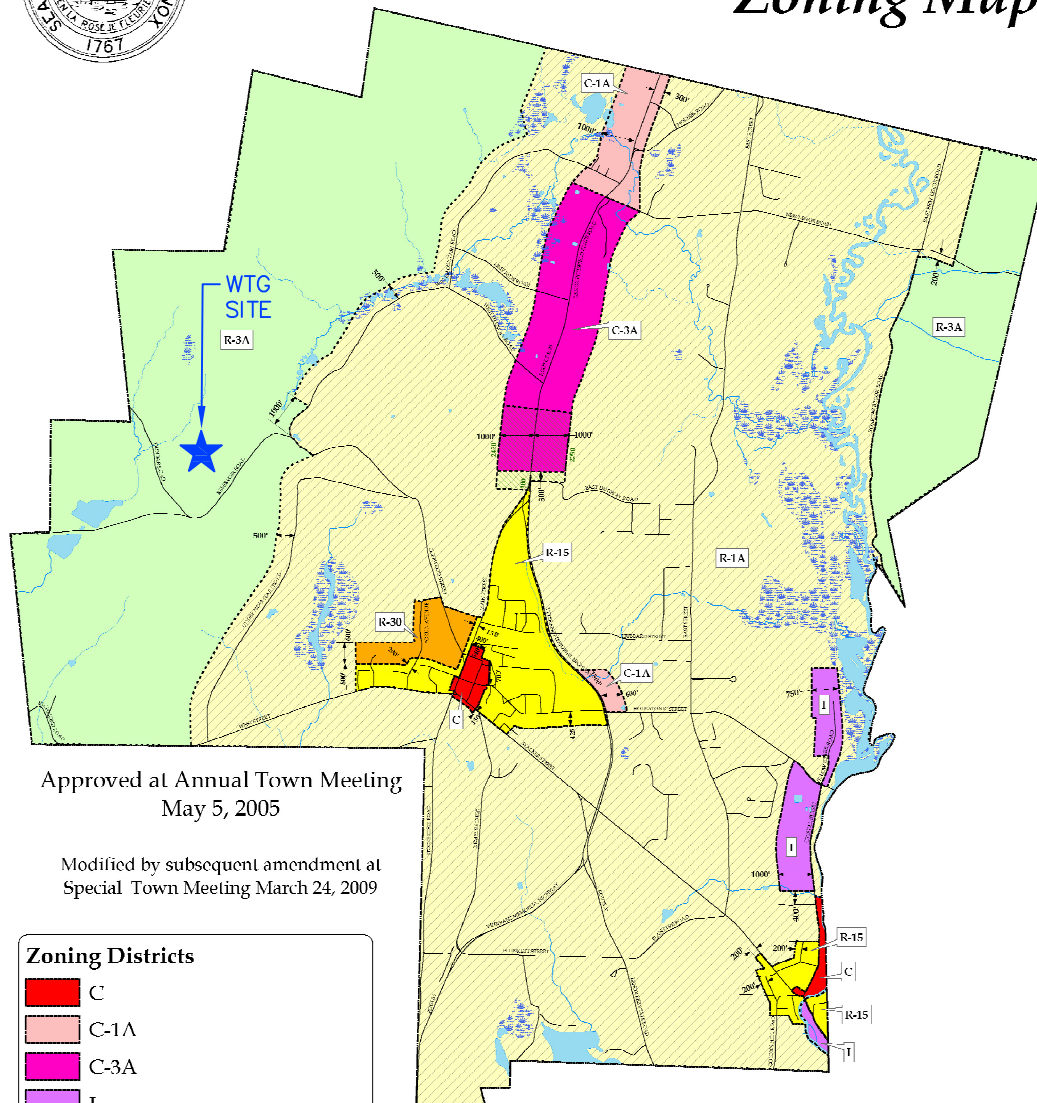
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NEW HAMPSHIRE

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				AS SHOWN			



# Town of Lenox Zoning Map



Approved at Annual Town Meeting  
May 5, 2005

Modified by subsequent amendment at  
Special Town Meeting March 24, 2009

## Zoning Districts

- C
- C-1A
- C-3A
- I
- R-15
- R-1A
- R-30
- R-3A
- Open Space Flexible  
Development Overlay District
- Gateway Mixed Use  
Development Overlay District

For the Flood Plain District see the Town of Lenox  
Flood Insurance Rate Map (FIRM), dated July 5,  
1982 and Flood Boundary Floodway Map (FBFM),  
dated July 5, 1982.



0 3,000 6,000 9,000  
Feet

1:18,000

1 inch = 1,500 feet  
Massachusetts State Plane Meters  
North American Datum 1983



- Town Boundary
- Lake / Pond
- Wetland / Marsh
- Perennial Stream
- Intermittent Stream
- Roads

## ZONING MAP

CONCORD



NEW HAMPSHIRE

LENOX, MASSACHUSETTS

DRAWN

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APR 2011

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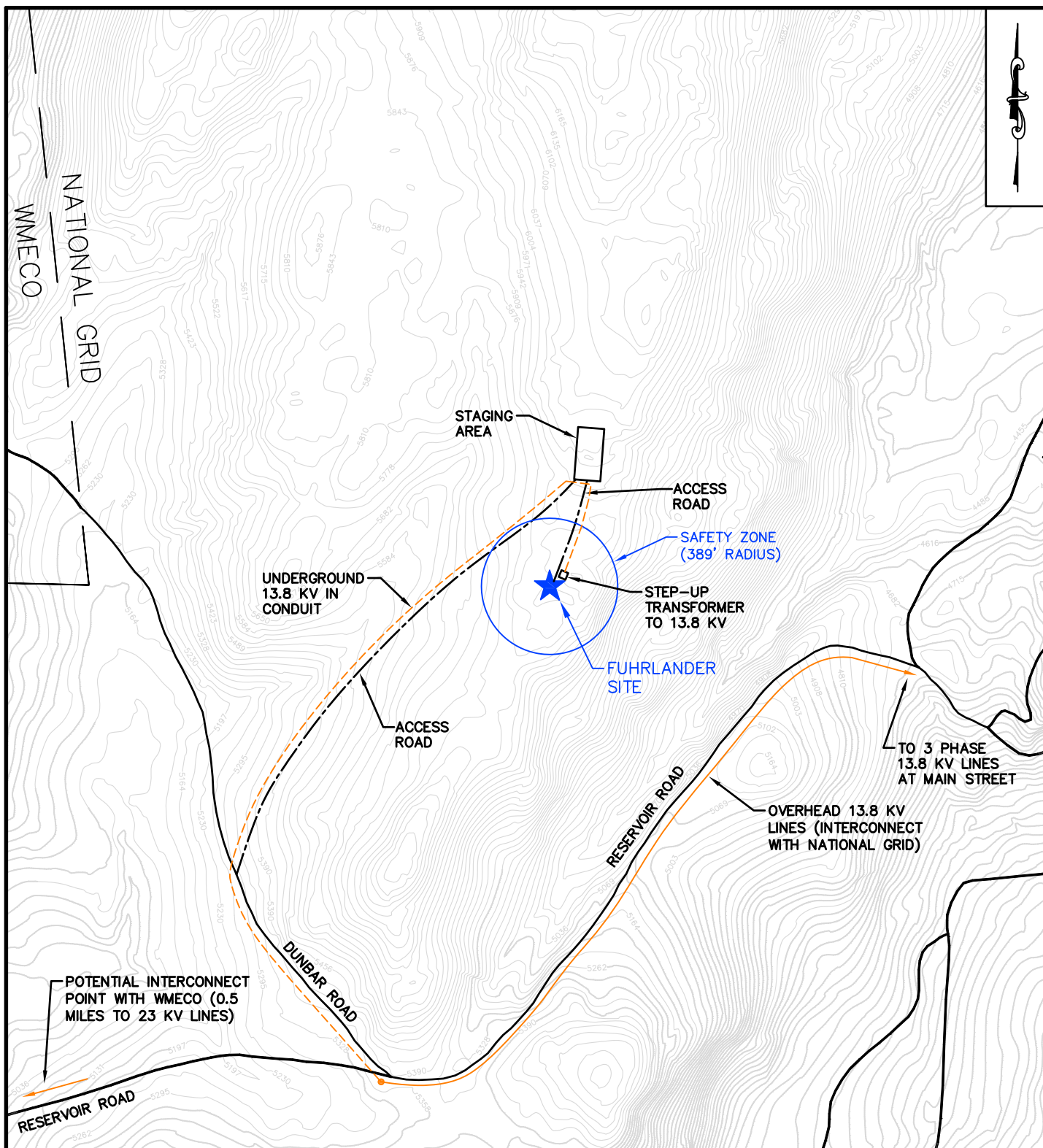
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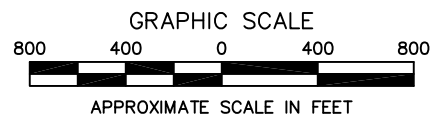
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**NOTE:**  
SINGLE TURBINE IS A  
FUHLRLANDER FL1500/77



## SINGLE TURBINE WIND PLANT CONFIGURATION

CONCORD



NEW HAMPSHIRE

LENOX, MASSACHUSETTS

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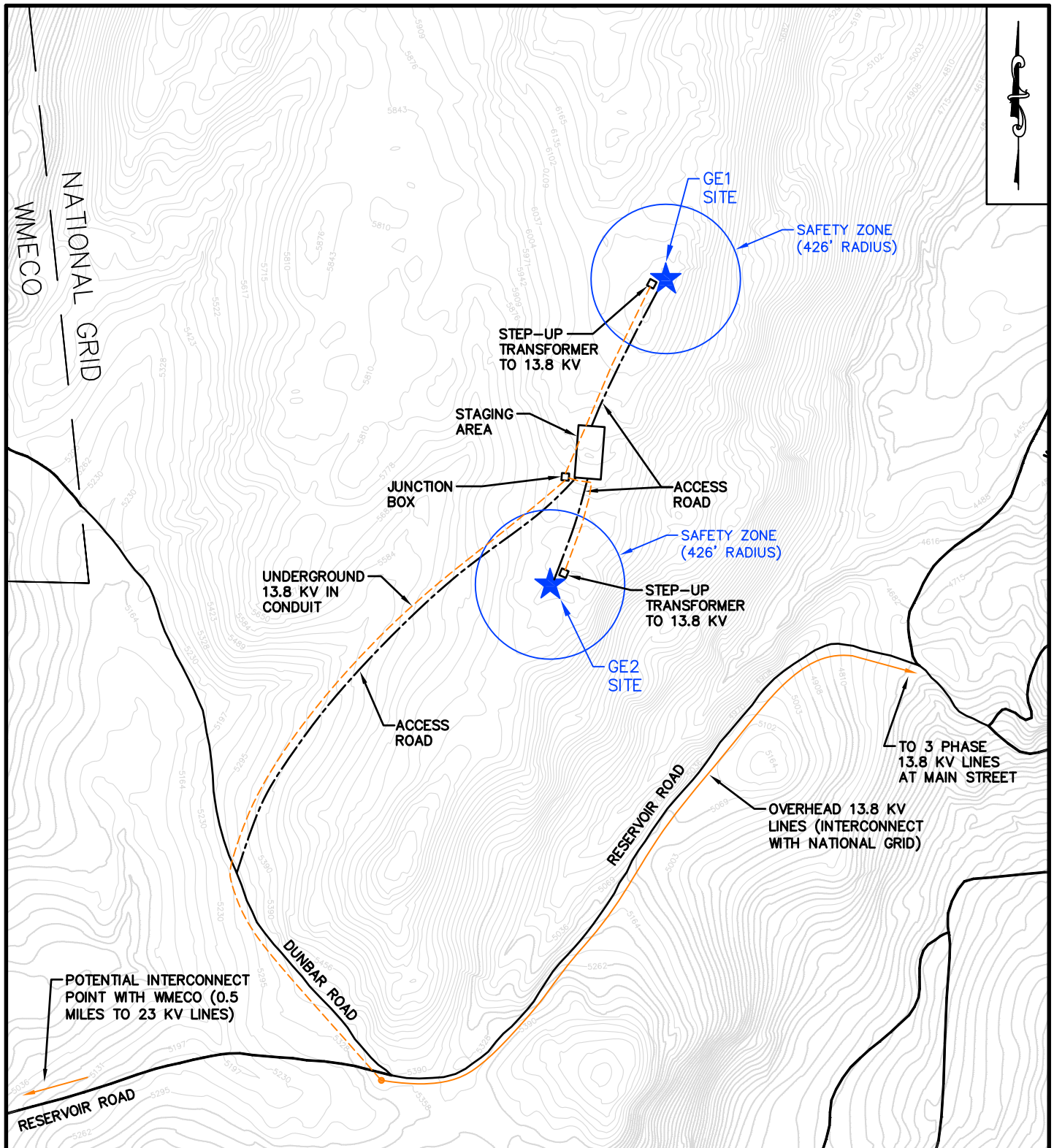
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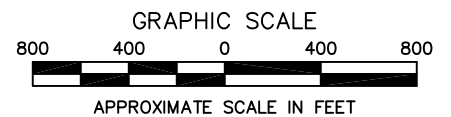
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FIGURE NO.

8-1



NOTE:  
TURBINES ARE GE-1.6-100



## TWO-TURBINE WIND PLANT CONFIGURATION

CONCORD



NEW HAMPSHIRE

LENOX, MASSACHUSETTS

DRAWN

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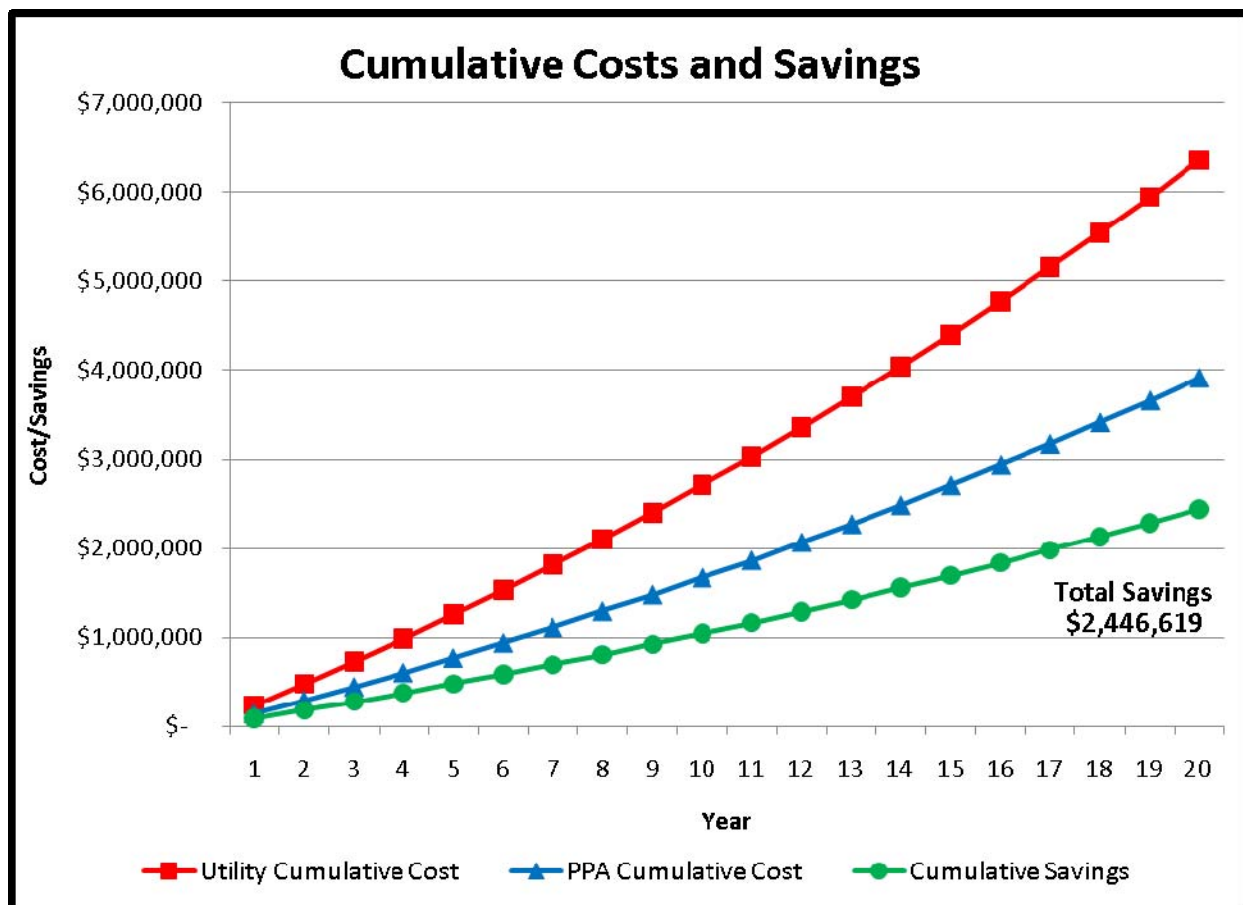
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8-2

**Figure 13-1**  
**Anticipated Costs and Savings to the Town of Lenox**  
**Under the Third-Party Ownership Scenario**



---

## **APPENDIX A**

### **SITE SCREENING AND DEVELOPMENT OPTIONS ANALYSIS REPORT, BLACK AND VEATCH**

---

## **Town of Lenox**

### Site Screening and Development Options Analysis Report

March 9, 2005



**BLACK & VEATCH**  
building a **world** of difference™

ENERGY • WATER • INFORMATION • GOVERNMENT

Prepared by:

Black & Veatch  
230 Congress Street  
Suite 802  
Boston, Massachusetts 02110  
(617) 451-6900

Black & Veatch Project Number 137450.0200

Funded by the Community Wind Collaborative  
of the Renewable Energy Trust



MASSACHUSETTS  
TECHNOLOGY  
COLLABORATIVE

**Principal Investigators:**

Ryan Jacobson, Project Manager, Wind Energy Specialist

Jeff Stillman, Environmental Specialist

Terry Meyer, Wind Energy Specialist

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## **Notice**

This report was prepared by Black & Veatch in the course of performing work sponsored by the Renewable Energy Trust (RET), as administered by the Massachusetts Technology Collaborative (MTC), pursuant to work order number 05-01. The opinions expressed in this report do not necessarily reflect those of MTC or the Commonwealth of Massachusetts, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it.

## **Acknowledgements**

Black & Veatch would like to acknowledge the Massachusetts Technology Collaborative, specifically Nils Bolgen and Kristen Burke, for their sponsorship and leadership during this study. Black & Veatch would also like to acknowledge Mr. Gergory Federspiel, Town Manager of the Town of Lenox, for his assistance and guidance in understanding the study process.

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## **Abstract**

Black & Veatch reviewed the feasibility of installing a community wind energy project on Lenox Mountain for the Town of Lenox. The wind resource of the project site was estimated using wind data from nearby sources, as well as the state wind resource map. Land use and terrain issues were reviewed, specifically addressing the difficulty in delivering wind turbine components to the site. The nearby electrical infrastructure was also reviewed, as was the potential of the nearby pumping station to use the generated electricity. Likely permitting requirements were also listed. The cost for two turbine size options were estimated, and the cash flow of the project was reviewed. Black & Veatch found no obvious fatal flaws for the project, and recommended that a meteorological tower be installed at the project site as soon as possible. Also, Black & Veatch recommends that the Town of Lenox continue to discuss the project with the public and local landowners.

## **Keywords**

Renewable Energy Trust  
Massachusetts Technology Collaborative  
Community Wind Collaborative  
Town of Lenox  
Berkshire County  
Lenox Mountain  
Wind Energy  
Wind Power  
Black & Veatch  
Site Screening and Development Options  
Feasibility Study

## **1.0 Conclusions and Recommendations**

The Massachusetts Technology Collaborative (MTC) has entered into a Work Order (WO05-01) with Black & Veatch to perform an initial evaluation of a potential wind energy site near the town of Lenox, Massachusetts. This report provides the results from this initial review, and provides recommendations regarding further review of this project site. A summary of the results and recommendations are:

- The annual average wind resource at the project site is approximately 6.6 m/s at 50 meters above ground level. A high degree of accuracy was not possible due to difficulties in data collection at reference met towers. (Section 3.1)
- Black & Veatch recommends a 50 meter met tower be installed at the project site if possible, or a 40 meter tower if necessary. This tower should be installed as soon as possible to verify the site's wind resource. (Section 3.1)
- The slopes of local roads should not be too steep to make turbine installation very difficult or expensive. The site access road will be a significant line item in the project's overall development costs (Section 3.2)
- The most likely point for interconnection is at the Pumping Station west of the project site. Since the wind turbine project will generate more power than the Pumping Station can use, a Power Purchase Agreement will be needed with either Western Massachusetts Electric or another party. (Section 3.3)
- Current land use should be conducive for a wind energy project. (Section 3.4)
- The largest environmental concern may be potential impacts to avian species. Early coordination with the Massachusetts Audubon Society is recommended. (Section 3.5)
- The site on Lenox Mountain is well suited for a single wind turbine, and can accommodate more by placing them further north along the ridgeline (Section 3.6)
- A Vestas V47 is estimated to have a potential annual energy production of 1,412 MWh, or a 24.4 percent capacity factor. A GE 1.5MW would have potential annual energy production of 3,916 MWh, or a 29.8 percent capacity factor. Black & Veatch would classify these capacity factors as "good". The accuracy of these estimates will improve as on-site data is collected. (Section 3.7.1)
- The initial cost estimate for a single V47 project is \$1.42 million, or \$2,152 per kW. The initial cost estimate for a single GE 1.5MW project is \$2.52 million, or \$1,680 per kW. (Section 3.7.2)

## **2.0 Review of On-Site and Community Wind Energy**

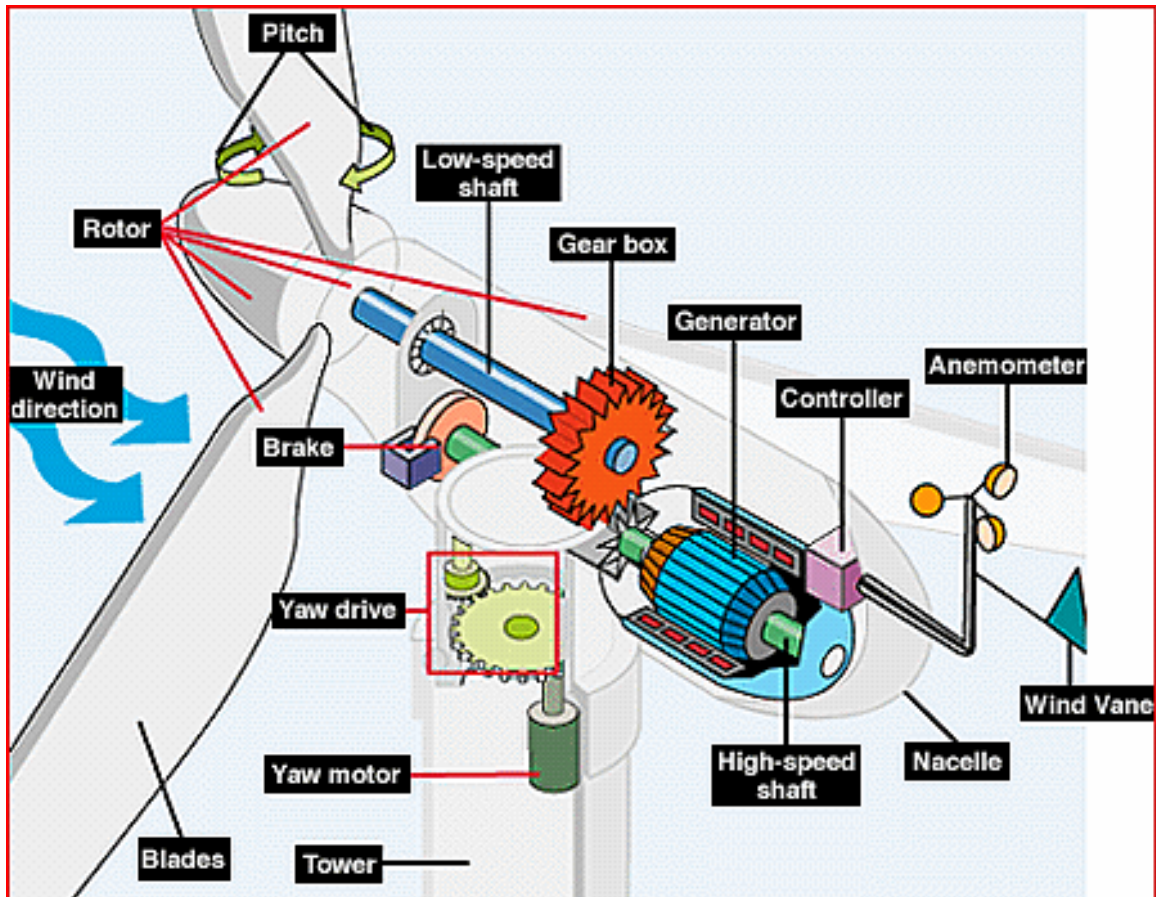
Black & Veatch has included the following section to help readers better understand the technology being evaluated in this study, as well as the feasibility of installing wind turbines near or within facilities and cities.

### **2.1 Wind Energy Technology**

The design of the typical wind turbine has changed greatly over the past twenty years. While many types of wind turbine designs were initially developed, the “Danish” design of a three-bladed, up-wind horizontal axis turbine has emerged as the standard of the industry.

While the size and complexity of wind turbines has increased, their basic operating principles have remained virtually unchanged. Figure 2-1 from the U.S. Department of Energy shows the typical layout of equipment in a turbine’s nacelle, which is the “pod” of equipment at the top of the tower to which the turbine’s blades are connected. Wind energy is captured by the wind turbine blades, and cause the rotor to rotate the turbine’s low-speed shaft. This shaft will rotate at a speed of about 15 to 20 revolutions per minute (RPM). The low speed shaft is then connected to a gearbox, which transfers the energy to the high-speed shaft connected to the generator. The speed of the high-speed shaft depends on the generator type and electrical frequency of the site, but for the U.S. typical speeds are 1,800 and 3,600 RPM. The electrical output of the generator is then transferred to the base of the wind turbine via electrical droop cables. At the base, these cables connect to a transformer, which increases the voltage of the power from the low voltage of the generator (480 or 600 VAC) to the distribution voltage of the plant (anywhere from 12 kV to 46 kV). The orientation of the wind turbine is kept into the wind by a yaw drive, with the wind direction determined by a wind vane located on top of the nacelle. The turbine’s controller has independent control of the wind turbine’s operation, without requiring commands from a user or central control center. If the turbine senses a problem, the wind speed increases beyond the turbine’s operational range, or a shut-down command is given manually, the turbine will come to a stop by means of electrical, mechanical, and aerodynamic brakes (the design of which depend on the turbine).





**Figure 2-1 Wind Turbine Components (from US Dept. of Energy)**

Obviously, the output of the wind turbine is dependent upon wind speed. The relationship of a wind turbine's electrical output as a function of wind speed is given in its power curve. A typical curve will show power production beginning when the wind speed increases beyond the turbine's minimum (cut-in) wind speed. As wind speed increases, the output power also increases in a roughly linear manner until the turbine's rated power is reached. The minimum wind speed at which a wind turbine delivers this nameplate output power is called its rated wind speed. For most modern wind turbines, winds higher than the rated wind speed will not produce any additional power, and turbine will continue to output its rated power. If the wind speed increases beyond the safe operating limits of the turbine (cut-out), the turbine will automatically shut-down and wait for the wind speeds to decrease. The wind speeds and power amounts for the above values depend mostly on the size of the wind turbine and the design of the blade airfoils. On average, larger wind turbines have lower cut-in wind speeds, have higher rated power and reach that power at lower winds.

Two representative wind turbine designs are considered in this study. The Vestas V47 is one of the smallest commercial wind turbines currently available, and is being considered due to the potential difficulties with transport of large equipment to the project site. The General Electric 1.5MW wind turbine is also being considered as it is currently the most popular turbine for new wind farms in the U.S. and has been chosen by MTC as the standard design for study purposes. Wind turbines from other manufacturers may be equally appropriate for the site.

### **2.1.1 Vestas V47**

Vestas is one of the world's largest manufacturer of wind turbines. Based on Denmark, Vestas has about one-third of the market for wind turbine sales. They recently merged with the wind turbine manufacturer NEG Micon, and together represent a major vendor and installer for wind turbines in the United States.

The V47 is one of the smallest commercial wind turbines still available in the U.S. Rated at 660kW, the V47 has a 47 meter rotor diameter, and is commonly installed on 50 meter towers (although Vestas offers tower options between 40 and 80 meters). For a smaller on-site wind project, or for a larger project where multiple machines are desired, the V47 is a good option. The closest development of V47 to the Lenox site is likely the project in Hull, Massachusetts.



**Figure 2-2 Vestas V47 in Hull, Massachusetts**

### **2.1.2 GE 1.5MW**

General Electric (GE) purchased Enron Wind Energy in 2002, and has integrated the company into GE's Power Systems company. GE has applied their efforts since this acquisition to improving the design and production of their only commercial on-shore wind turbine, the GE 1.5MW. This turbine is a 1,500kW machine with a rotor diameter of 65, 70.5 or 77 meters. The turbine is commonly placed on either 65 or 80 meter towers, with 65 meters assumed for this study. Projects with this design wind turbine include the Somerset, Mill Run, and Waymart projects in Pennsylvania and Fenner in New York.



**Figure 2-3 GE 1.5MW turbines at Desert Sky Project, Texas**

## **2.2 Examples of On-Site and Community Wind Energy Projects**

Black & Veatch has included an example each of wind energy projects installed on a community power level or directly on-site of major power consumers.

### **2.2.1 Palmdale, California**

Black & Veatch was the engineer for the Palmdale Water District in Palmdale, California, for the design and installation a single 950kW wind turbine at their water treatment facility. The wind turbine is a Micon (now Vestas) NM54, and is connected directly to the 12kV system of the treatment plant. This project was completed in July 2004.

This project was able to make use of two programs unique to California: the Self-Generation Incentive Program and a large Net Energy Metering allowance. The Self-Generation Incentive essentially requires the local utility (Southern California Edison) to pay for half of the costs of the project. The Net Energy Metering program in California allows for wind turbines up to 1MW to qualify for net metering, which is a requirement that the utility purchase of energy produced by the wind turbine at the same rate the customer who owns it buys power, up to the point where the wind turbine offsets the total annual consumption of their site. The Net Energy Metering allows the Palmdale project to have a turbine that will generate power at times greater than the site's consumption. Neither of these programs are presently available in Massachusetts.



**Figure 2-4 Palmdale Water District On-Site Wind Turbine**



### 2.2.2 Toronto, Ontario

As part of a community wind power effort, the people of Toronto developed a single 750kW Lagerway wind turbine project for installation at the city's Exhibition Place. This turbine was installed in 1999, and is used to provide the power for the exhibition complex in downtown Toronto. While intended for a grassroots beginning for wind power in Ontario, this project has proven that urban wind power can work well in North America, as it does in much of Northern Europe.



Figure 2-5 Wind Turbine at Toronto's Exhibition Place

### 3.0 Site Screening and Development Options Analysis

Black & Veatch is supporting the Massachusetts Technology Collaborative (MTC) in technical aspects of the Community Wind Collaborative. The goal of the Community Wind Collaborative is to support communities in determining the feasibility of developing small to moderate wind energy projects, and aiding in the development of those projects found to be feasible. This report is result of an initial site screening review and development feasibility analysis for the Lenox Mountain site near Lenox, Massachusetts. Issues of general development feasibility and obvious fatal flaws were reviewed, and Black & Veatch has prepared recommendations for future activities toward development of a project at the site.

The primary project site is located about 1.5 miles northwest of the Town of Lenox, and is a 1815 foot peak on the Lenox Mountain range. The site is just north of Reservoir Road and is shown in Figure 3-2 as “Lenox Site 1”. For construction reasons an alternative to this site was identified approximately 650 feet north east, and is labeled “Lenox Site 1 Alt”. Another potential site was identified south of Reservoir Road on a 1850 foot peak (shown as “Lenox Site 2”), but this site was disqualified due to land use issues.

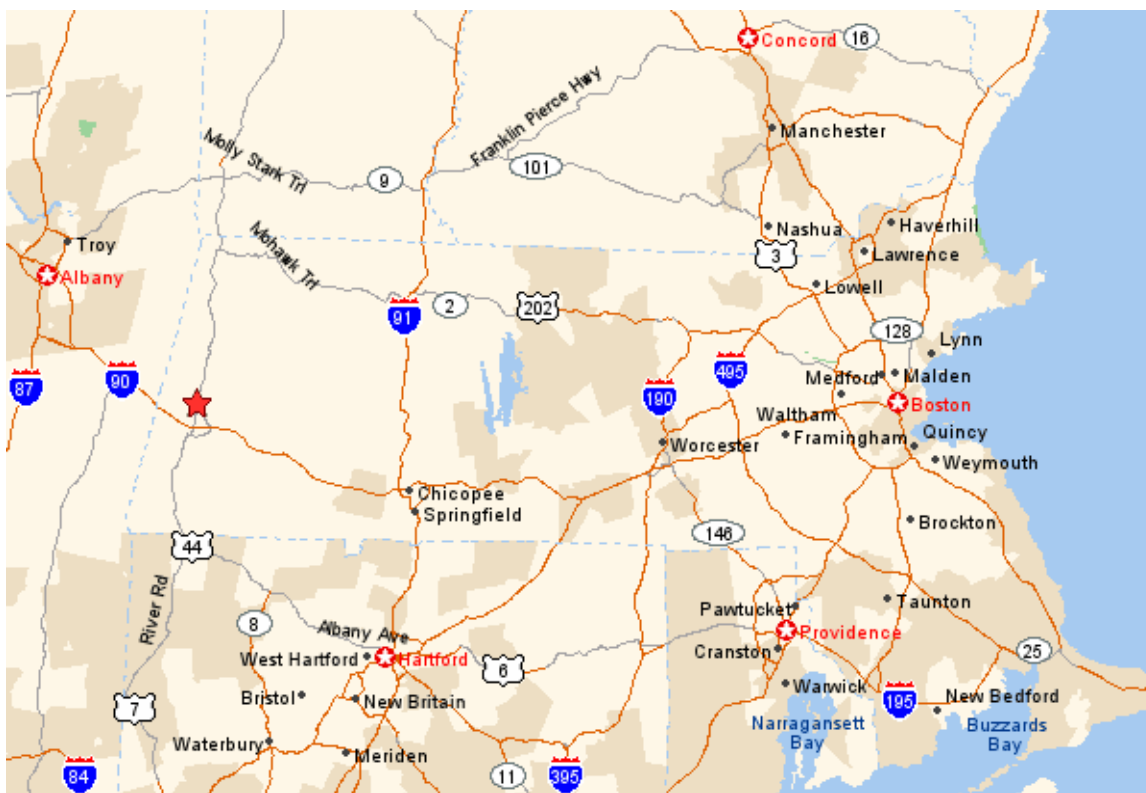


Figure 3-1 Town of Lenox Location

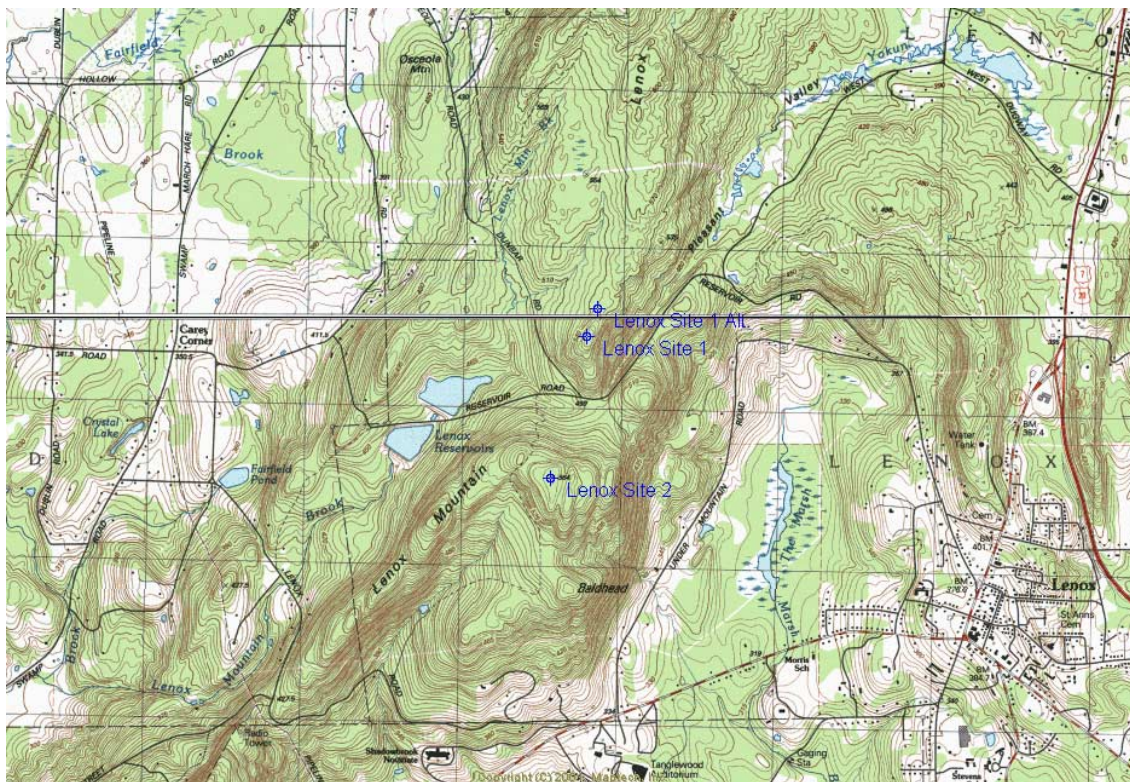


Figure 3-2 Lenox Site Location

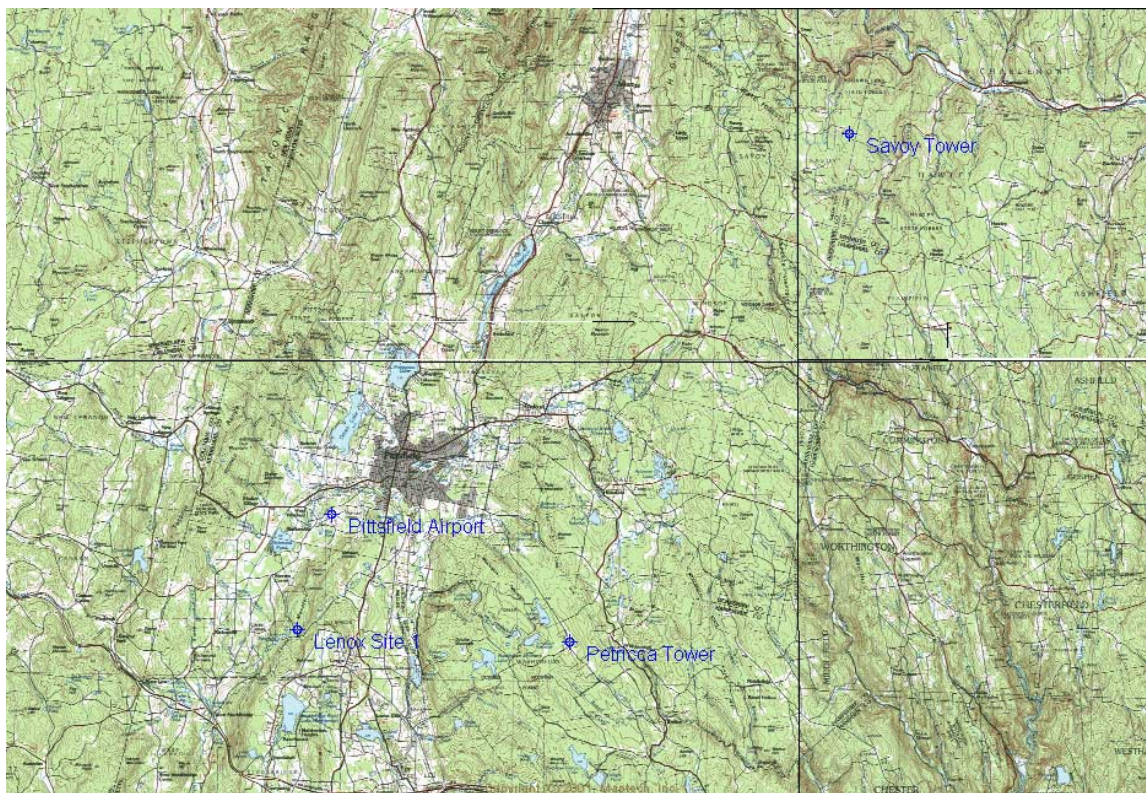
### 3.1 Site Wind Resource

The wind energy resource of a site is the most critical single aspect to understand, and is one of the few that cannot be overcome with technical solutions. Prior to the development of any wind energy project it is highly advisable to perform at least a year of wind data collection at the project site. However, for preliminary feasibility studies such as this, regional data is usually used to approximate the wind resource and ascertain if additional study is warranted.

For the Lenox project site, Black & Veatch reviewed five data sources, three of which were generated by the University of Massachusetts Renewable Energy Research Lab (RERL). These sources were:

- *Town of Lenox Preliminary Assessment of Wind Resource and Appropriateness of Anemometry* Report, RERL, August, 2004
- The New England Wind Map web site operated by TrueWind Solutions (<http://truewind.teamcamelot.com/ne/>)
- Wind data collected by RERL at Savoy site
- Wind data collected by RERL at Patricca site
- Wind data recorded at Pittsfield Airport



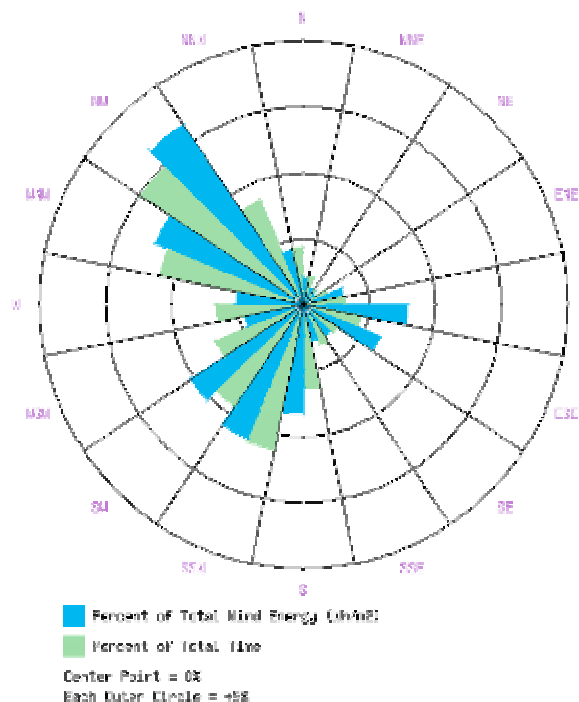


**Figure 3-3 Met Tower Locations**

The first data source was a report generated by RERL after reviewing the project site in August 2004. This report gave a very preliminary estimate of the general wind resource based on the wind resource map of Massachusetts developed by TrueWind Solutions and the feasibility of installing a meteorological tower (met tower) at the project site. RERL predicted this site would have a annual average wind speed between 6.5 and 7.0 meters per second at 70 meters above ground level. Also, it was predicted a 50 meter met tower could not be installed due to steep terrain, but a 40 meter met tower was feasible. To install the 40 meter met tower, RERL recommended that the site be cleared in a 150 meter (500 feet) diameter circle around the tower so nearby trees to not interfere with instrumentation. As such a wide clearing is more than is required for construction, Black & Veatch recommends the height of nearby trees be confirmed and the required clearing area be confirmed.

Black & Veatch also referenced the TrueWind Solutions New England Wind Resource Map web site for general information on the wind resource for the area around the project site. By entering the project site's coordinates, the web service estimated the project site's annual average wind speed to be 6.9 m/s at 50 meters above ground level. A wind rose for the site was also downloaded from the web site and shown below in

Figure 3-4. These results should be considered to be a general estimate, and on-site data collection is still strongly recommended.

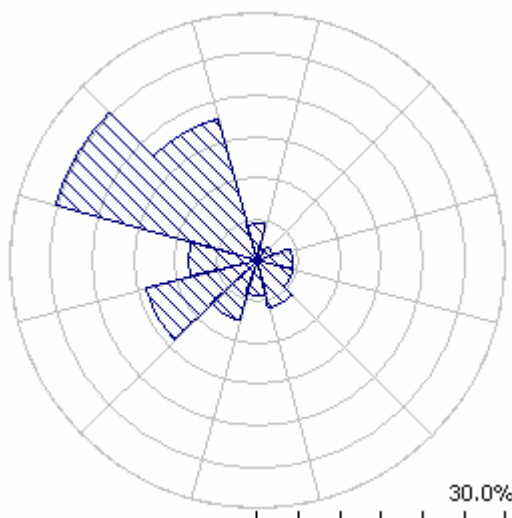


**Figure 3-4 TrueWind Wind Rose**

RERL also operated a 50 meter met tower at Savoy, Massachusetts approximately 24 miles north of the project site. This tower collected data from November 2003 through September 2004. Black & Veatch evaluated this data, and determined the average over the total data set to be 6.4 m/s at 50 meters above ground level. While it is good to have such recent data collected from a proper met station for wind energy resource estimation, the data set is only 10 months long and therefore cannot produce an annual wind speed estimate. Still, the monthly averages are good comparison points to the other data sources examined.

RERL operated a 60 meter met tower at the Patricca site on October Mountain approximately 8 miles east of the project site. The tower operated for three years between 1997 and 1999, and observed wind speed at 25, 40, and 60 meters above ground level. When Black & Veatch examined the data, it was discovered that a significant amount of the wind speed data in 1998 and 1999 were “0” wind speed, far more than in 1997. As this radical change in wind conditions between years is not typical, it was determined that there were problems with the instruments starting in 1998. Therefore, only the 1997 data was examined for this study. Using the 60 meter data to estimate the

wind speed at 50 meters above ground level, the average wind speed for 1997 was 5.5 m/s. The wind energy rose for the 1997 data is shown below in Figure 3-5.



**Figure 3-5 Patricca 1997 Wind Rose**

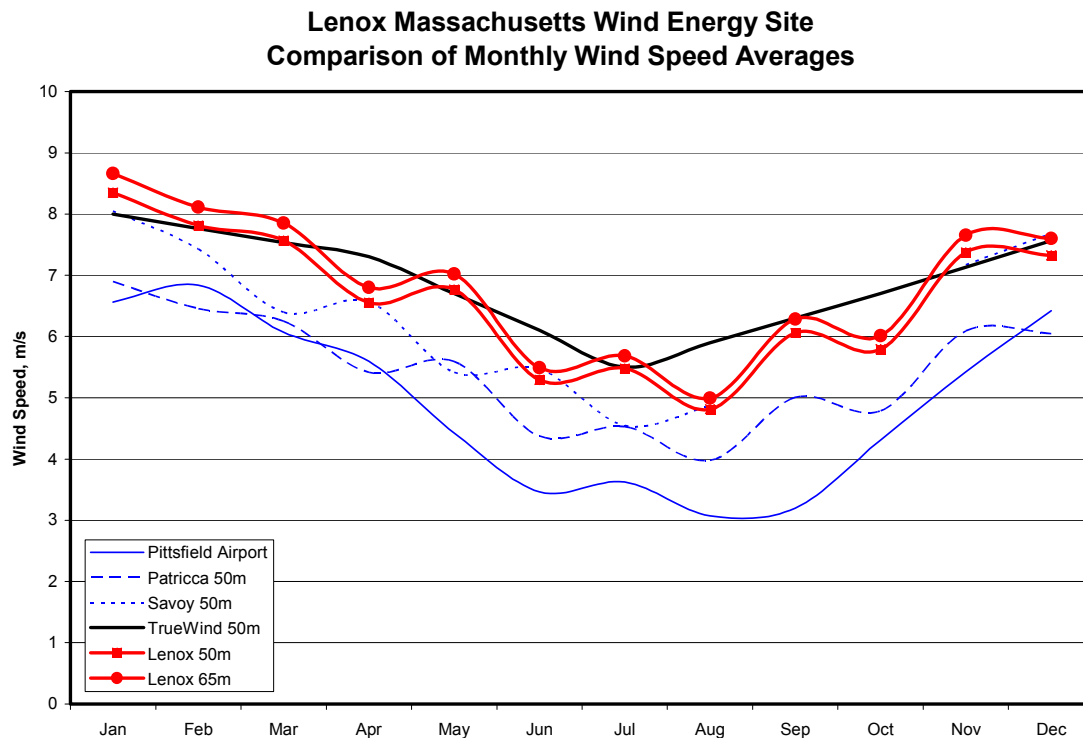
Black & Veatch also reviewed the wind speed data available from the Pittsfield Airport, approximately 3.5 miles north of the project site. Data collected from January 1, 2000 through December 19, 2004 was reviewed. This data was collected at only 10 meters above ground level, and the airport is located in a valley rather than on a ridgeline as the Savoy and Patricca towers were. Therefore, Black & Veatch only used this data to compare the averaged monthly wind speed shape to those from the RERL met towers. As shown in Figure 3-6, the comparison between the RERL towers and the airport tower show a similar relationship over the year.

Based on all the data reviewed, Black & Veatch would expect the average wind speed conditions at the Lenox project site to be similar to the results from the Savoy met tower and the TrueWind wind map estimate. The shape of the Patricca met tower data from 1997 is similar to the other data sources but the values are lower than expected, possible due to vegetation effects and different topography at that site. The data from the Pittsfield Airport was not collected at a sufficient height above ground for accurate wind energy resource estimation. Therefore, Black & Veatch is currently of the opinion that the annual wind speed at the Lenox project site is between the Savoy average of 6.4 m/s and the TrueWind average of 6.9 m/s at 50 meters above ground level, which is the hub height for the Vestas V47 wind turbine. For study purposes, Black & Veatch chose an annual average wind speed of 6.6 m/s at 50 meters, which is equivalent to 6.8 m/s at the GE 1.5MW wind turbine tower height of 65 meters above ground level. These levels are

sufficient for a wind energy to possibly be successful, and therefore additional production estimation and cost analysis was done in Section 3-7.

To generate the data necessary for a monthly wind speed estimate and production estimate for the Lenox project site, Black & Veatch needs a complete annual data set to work from. While the Savoy data set appears to be of higher quality than the Patricca set, Savoy has only 10 months of data and would not allow for estimates for September and October. Therefore, Black & Veatch built an estimate for the Lenox site from the Patricca 1997 data. Each 1997 Patricca data point was multiplied by the same factor (1.211) to create the desired annual average wind speed value. The resulting monthly averages are presented in Table 3-1 below. The production estimates are detailed in Section 3-7.

<b>Table 3-1 Reference Sites Monthly Averages</b>						
<b>Month</b>	<b>TrueWind</b>	<b>Savoy, 2003/2004</b>	<b>Patricca, 1997</b>	<b>Pittsfield, 2000-2004</b>	<b>Lenox, 50m</b>	<b>Lenox, 65m</b>
January	8.0	8.0	6.9	6.6	8.3	8.7
February	7.8	7.4	6.5	6.8	7.8	8.1
March	7.5	6.4	6.2	6.1	7.6	7.9
April	7.3	6.6	5.4	5.6	6.6	6.8
May	6.7	5.4	5.6	4.4	6.8	7.0
June	6.1	5.5	4.4	3.5	5.3	5.5
July	5.5	4.5	4.5	3.6	5.5	5.7
August	5.9	4.9	4.0	3.1	4.8	5.0
September	6.3	N/A	5.0	3.2	6.1	6.3
October	6.7	N/A	4.8	4.3	5.8	6.0
November	7.1	7.2	6.1	5.4	7.4	7.7
December	7.6	7.7	6.0	6.4	7.3	7.6
<b>Annual</b>	<b>6.9</b>	<b>N/A</b>	<b>5.5</b>	<b>4.9</b>	<b>6.6</b>	<b>6.8</b>
<p>Notes: <b>All values in meters per second.</b></p> <p>All wind speed averages at 50 meters except Pittsfield Airport, which is 10 meters above ground level.</p> <p>TrueWind only provided seasonal and annual averages; Black &amp; Veatch linearly scaled between seasonal values to provide estimates in italics</p>						



**Figure 3-6 Monthly Wind Speed Averages**

The above approach does provide an approximate result, but Black & Veatch recommends an on-site met tower be installed and at least one year of data collection be obtained so a more accurate estimate of the wind resource can be determined. The actual height of trees at the project site should be determined so sufficient but not excessive tree clearing can be done to insure the wind speed readings are accurate. Black & Veatch recommends frequent data collection, review, and comparison to independent sources be done to avoid any excessive data loss due to instrumentation or datalogger problems. The RERL report indicates the position of the met tower compared to the Pittsfield Airport may require a Notice of Intent to Construct be filed with the Federal Aviation Administration. While Black & Veatch presently believes the project site location will not require such a notice, it is recommended the notification be submitted anyway so that local air navigation charts can be updated. Black & Veatch also recommends at least one heated anemometer and one heated wind vane be installed on the met tower so that periods of icing do not lead to data loss.

## 3.2 Site Physical Characteristics

The project site is a 1815 foot hilltop in the Lenox Mountain formation, located just north of Reservoir Road approximately 1.5 miles from the Town of Lenox. Lenox



Mountain is an approximately 9 mile ridgeline oriented SSW to NNE surrounded by valleys on three sides. The southern portion of Lenox Mountain is crossed by the Massachusetts Turnpike (US Interstate 90). The proposed location of the wind turbine is at a mid-point of Lenox Mountain, and is 180 feet higher than Reservoir Road. The hilltop has a roughly flat crest which is approximately 150 feet by 350 feet (45 meters by 106 meters). The NAD27 coordinates of the site are 42° 22' 25.8" North, 73° 18' 51.6" West. Black & Veatch performed a visual inspection and tour of the site on December 15, 2004 with Lenox Town Manager Greg Rederspeil and MTC Project Manager Kristen Burke. Figure 3-7 is a photo taken at the center of the hilltop looking south.



**Figure 3-7 Project Site**

The vegetation surrounding the project site is relatively dense woodlands consisting of trees estimated to be 50 to 60 feet (15 to 20 meters) high. No large clearing are located near the site, with some small clearings along the proposed site access route from past logging activities. The Lenox Reservoirs are approximately ½ mile southwest of the project site.

The manner by which the wind turbine components will be transported to the site will depend upon which turbine is installed. If a GE 1.5MW wind turbine is used, the nacelle and rotor hub for the wind turbine will likely come from the GE Wind Energy

plant in Tehachapi, California. The turbine's tower may come from the DMI factory in North Dakota or another U.S. supplier, but not likely from a foreign source. The blades may come from the GE Wind Energy plant in Florida, another U.S. source, or from an overseas manufacturer. For the Vestas V47, the nacelle and rotor hub will likely come from the Vestas factory in Denmark. The tower will likely come from a domestic U.S. source similar to those for the GE wind turbine. The blades may come from Denmark with the nacelle, or from the LM Glasfiber plant in North Dakota. It is expected that all wind turbine components coming from a domestic U.S. source will be transported to the site using one or multiple over-the-road trucks, as rail transport for a single turbine project will likely not be cost effective. The components from Europe will be transported by ocean cargo carriers to a U.S. port (likely Boston for this project), then loaded onto over-the-road trucks for transport to the site. It is possible that some components could be sourced from foreign suppliers that would use a Pacific port (such as if a Mitsubishi or Suzlon wind turbine is used). In that case, it is expected the most cost effective transport manner would be by ocean to a port such as Los Angeles, and then long-distance over-the-road truck to the project site. The details of transport of components at the project site itself is discussed in Section 3.2.1.

The primary project site labeled Lenox Site 1 in Figure 3-8 is large enough for only one wind turbine. If a second wind turbine is desired, it would need to be installed further north on the Lenox Mountain formation. For two V47's, it would be possible to utilize both Lenox Site 1 and Lenox Site 1 Alt shown in Figure 3-8. For two GE 1.5MW turbines, these sites are too close together and the wind turbines could interfere with each other. As such, one turbine could be located at Lenox Site 1 and the other at a site further north from Lenox Site 1 Alt. The topography, vegetation, and road conditions north of the project site are not expected to be different from the primary site, other than the elevation is somewhat lower and the wind resource would be expected to be slightly less.

### **3.2.1 Site Access Road**

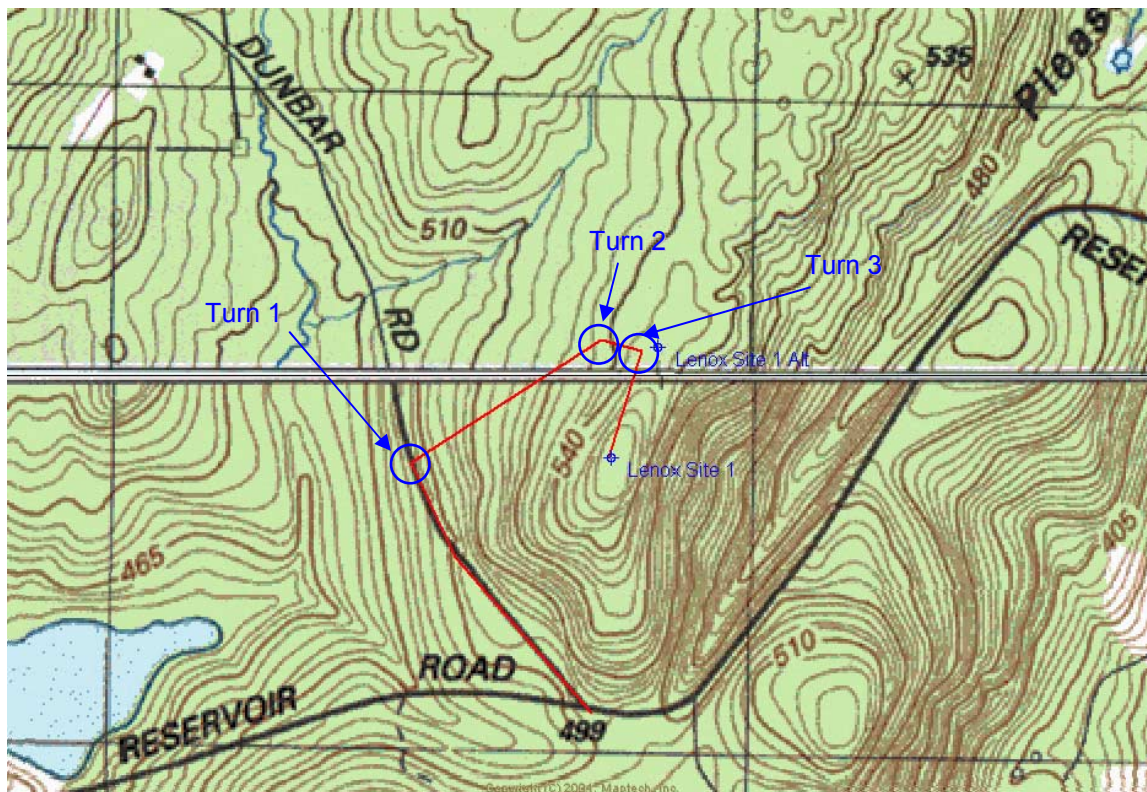
Black & Veatch understands that there is significant concern regarding the ability to cost effectively establish an access road to the site. As such, this issue is explored in detail in this section.

The most difficult aspect of construction at this site is likely to be the slope of the terrain. Transport of turbine components to project sites using typical semi tractor-trailers loaded to handle significant slopes mandate a maximum slope of 14 degrees (or about 25 percent). The Reservoir Road between Lenox and the project site has areas with slopes exceeding 26 percent (just under 15 degrees). Initial discussions with



transportation experts at Vestas indicate exceeding the maximum can be done over this short length without the need for extensive equipment or cost.

Once the site access road is reached, the slope of the access road is no longer the point of concern (the maximum slope is 22 percent or just less than 13 percent). Indeed the restoration of an abandoned town road and old logging roads, widening to a minimum of 15 feet, and creating sufficient turn radius clearances will be the main points of concern. The site access road route from Reservoir Road is shown in Figure 3-8.



**Figure 3-8 Site Access Route**

The first section of the project site access road will involve the restoration of Dunbar Road. This road was previously a town road maintained by the Town of Lenox, but was abandoned several years ago. Dunbar Road is in relatively good condition, but would likely require some grading and resurfacing. The length of Dunbar Road that will require restoration is approximately 1,500 feet, from Reservoir Road to the old logging road at Turn 1. Both Dunbar Road and the old logging road are shown at Turn 1 in Figures 3-9 and 3-10.





**Figure 3-9 Turn 1 Toward Reservoir Road**



**Figure 3-10 Turn 1 Toward Site**



The next section of the project site access road will use the old main logging road for Lenox Mountain. This road is well established, approximately 1.5 miles long, and connects Dunbar Road to an abandoned fire watch tower north of the project site. The section of this road between Turn 1 and Turn 2 will require a moderate amount of road upgrading, as well as clearing to reach the required road width of 15 feet. Approximately 1,100 feet of this road will require upgrading, plus some additional clearing and grading at Turn 2. This old main logging road at Turn 2 is shown in Figure 3-11.



**Figure 3-11 Old Main Logging Road near Turn 2**

The section of road between Turn 2 and Turn 3 is was established as a small spur road for logging near the project site. As such, little clearing or grading work was done to establish this road. Black & Veatch expects significant clearing and grading will be required along this road, although the road already being established will lessen the cost of such activities, as will the relatively short length (200 feet) of this road section.

Between Turn 3 and the primary turbine location there currently exists only a footpath. To establish a road from Turn 3 to the site would require clearing and grading about 600 feet relatively thick woodland. A section of this footpath is shown in Figure 3-12. If the establishment of this new road is deemed too expensive or the amount of

clearing too great, the turbine could be located near Turn 3. The overall energy capture of this site would be somewhat lower than the primary site.



**Figure 3-12 Footpath between Turn 3 and Project Site**

### **3.3 Site Electrical Infrastructure**

At present there are no overhead or known underground electrical lines at the site or along Reservoir Road near the site. The closest overhead electrical lines to the east of the project site was approximately 1 mile away, and are likely low distribution voltage lines (10kV or below) operated by Massachusetts Electric. The Lenox Pumping Station is located approximately 4,000 feet west of the Reservoir Road-Dunbar Road intersection, and is connected to a Western Massachusetts Electric (WMECO) overhead line. WMECO has confirmed this line to be a 23kV line, which is sufficient for the interconnection of a commercial wind turbine. Although the distribution lines were not physically traced, it is believed the Massachusetts Electric distribution line ultimately connects with a WMECO 115kV transmission line at a substation in Lenox approximately 4 miles east of the project site. The WMECO distribution line at the Lenox Pumping Station likely connects with the same 115kV transmission line at the Oswald Substation approximately 4.5 miles north of the project site. Given the



comparative voltages, distances from the site, and intention to use the wind generation in part to offset the electrical load of the facility, connecting the wind turbine to the Lenox Pumping Station appears to be the most feasible.



**Figure 3-13 Lenox Pumping Station**



**Figure 3-14 Distribution Lines at Pumping Station**



**Figure 3-15 Substation Locations Near Project Site**

To bring a sufficient electrical connection to the wind turbine, it is estimated that about 1 mile of new overhead three-phase 23kV line would cross to the north side of, then run along, Reservoir Road between the Lenox Pumping Station and Dunbar Road. At this point, the electrical line could be transitioned to an underground cable, and routed to the wind turbine. One route would be along the site access road, but if a direct path can be made the cable length would shorten considerably. The cable would terminate into the pad mounted transformer next to the base of the wind turbine. Figure 3-16 shows a typical arrangement for a wind turbine and base transformer.

It is believed all of the land along this route is owned by the Town of Lenox. Reservoir Road should be the only active public right-of-way that would need to be crossed, given that Dunbar Road is closed to public access. If approval for crossing over Reservoir Road appears to be difficult to obtain, an alternative could be to route an underground cable through the water conduits that link the upper and lower reservoirs. Other possible routing solutions can be determined during the initial design phase of the project.





**Figure 3-16 Typical Wind Turbine Transformer Arrangement**

Communications from the wind turbine can be done using radio link or telephone line. For a telephone line, such a line would likely need to be run along with the electrical cables and overhead lines, and possibly extended further west to the closest existing telephone junction. Black & Veatch has been informed that the Pumping Station has a radio link to the Department of Public Works garage in Lenox, but that this link is not reliable. The best solution may be to establish a radio transmitter and repeater at the project site, and transmit both the wind turbine and pumping station information to the garage together. Further work on this topic would be performed in the engineering phase of this project, but a cost effective communication solution should be achievable.

With the wind turbine making an electrical connection with WMECO at the Lenox Pumping Station site, the metering connection can be made so that the wind turbine's generation is first used to offset any load at the pumping facility. Based on invoice data from the facility between June 12, 2003 and December 8, 2004, the annual load of the facility appears to be approximately 452 MWh, which is equivalent to a 7.8 percent capacity factor from a V47 at the project site. As is shown in Section 3.7.1, the capacity factor from the wind turbine is expected to significantly exceed this amount. Therefore, Lenox would need additional contracts with the host utility or another party to make use of the additional wind power generated. One arrangement would be to



negotiate a power purchase agreement with WMECO or another party to purchase the additional electricity. This would be the simplest arrangement, although it may not fully capture all the potential value of the energy. An alternative arrangement would be a wheeling agreement. Electrical wheeling refers to the injection of power at one point on an electrical grid and the extraction of that power from another point. In general, the owner of the wind turbine could make an agreement with the host utility to pay for the transfer the power to the owner's other facilities. Utilities are not under the same requirements to allow such wheeling agreements as they are for self-generation, so obtaining a wheeling agreement can be difficult. What may be more difficult for Lenox is that the remainder of their loads may all be served by another utility, meaning a two-party wheeling agreement may be required. It is also important to note that, given the intermittent nature of wind energy and the unmanned status of the pumping facility, coordinating the timing of the facility's electrical load to the wind turbine's generation will likely not be practical with existing control systems. Therefore, only a portion of the facility's annual load will be offset by the wind turbine. Additional study into the load shape and wind resource shape would need to be done to approximate the fraction of the site load offset by the wind turbine.

Table 3-2 shows an estimate of the monthly electrical consumption and demand from the Pumping Station, as well as the energy and demand portions of the station's electric bill (assuming present tariff levels for the WMECO G-2 rate).

<b>Table 3-2</b> <b>Lenox Pumping Station Electrical Load Estimate</b>					
Month	Consumption (kWh)	Demand (kW)	Energy Cost	Demand Cost	Total Cost
January	40,590	78.3	\$2,658	\$715	\$3,374
February	39,481	77.6	\$2,585	\$711	\$3,296
March	36,562	72.0	\$2,394	\$666	\$3,060
April	35,117	69.2	\$2,299	\$643	\$2,943
May	35,614	57.5	\$2,332	\$547	\$2,879
June	41,198	79.8	\$2,698	\$733	\$3,431
July	46,743	93.6	\$3,061	\$849	\$3,910
August	45,144	77.7	\$2,956	\$718	\$3,674
September	35,333	68.9	\$2,313	\$646	\$2,959
October	34,302	71.9	\$2,246	\$672	\$2,918
November	30,883	68.7	\$2,022	\$646	\$2,668
December	31,401	67.8	\$2,056	\$639	\$2,696
<b>Annual</b>	<b>452,368</b>	<b>93.6</b>	<b>\$29,625</b>	<b>\$8,189</b>	<b>\$37,815</b>

One unique feature of this project site is that it is feasible to deliver power to two different utilities. If one utility proves especially resistant to the wind turbine project, Lenox can explore connecting with the other.

### **3.4 Characteristics of the Site Vicinity**

The region around the project site is primarily woodlands with scattered homes in the hills and more dense population in the valleys. The area directly around the project site is mostly owned by the local governments for watershed and conservation. South of the project site, large portions of land are owned by Berkshire Natural Resources Council. At present, the land use around the project site is for watershed and light recreational use. Due to its classification as a watershed, the site will not be open to home development. The installation of a wind turbine at the project site will not impact the watershed, and should cause only minimal impact to the recreational hiking (the existing foot trail might need to be slightly rerouted).

The closest homes to the project site are located along Under Mountain Road to the east of the project site. The view of and any noise generated by the wind turbine would likely be blocked by the small ridgeline between the homes and project site. To the southwest of the project, the closest home located is approximately 1 mile from the site. The high amount of observed woodlands around this home should mitigate some or all of the visual and noise impact of the project.

A microwave tower is located approximately 1.5 miles north of the project site, near the location of the abandoned fire watch tower. While no microwave antennas were observed to be oriented toward the site, Black & Veatch recommends the operator of this tower be contacted to confirm to beam path interference would be likely from a wind turbine at the project site.

No significant safety issues should exist from locating the turbine at this site. The turbine will be a minimum of 1,000 feet from Reservoir Road and should not pose a risk to drivers. Lenox may wish to route the nearby hiking trail away from the turbine itself. Black & Veatch recommends the public be discouraged from being directly beneath an operating wind turbine without a hard hat, although it is acknowledged that there are project sites where the public is allowed to approach the turbines (such as in Hull, MA and Moorehead, MN). The most likely source of any safety concerns would be falling ice from the wind turbine blades after a winter storm.

The project site is approximately 3.5 miles south of the Pittsfield Airport. According to Federal Aviation Administration (FAA) Advisory Circular 70/7460-2J, a Notice of Proposed Construction must be filed with the FAA for the construction of any

structure over 200 feet (61 meters) tall or within a certain distance-height zone from commercial or military airports. Given the size of the Pittsfield Airport and the distance of the project site, a notice must be filed for any structure taller than 185 feet (56 meters). Both wind turbine options will have a blade path that far exceeds this limit, and therefore a notice will be required. Black & Veatch would recommend the marking plan for the turbine to include two aviation warning lights positioned on both sides of the nacelle so that visibility of at least one light will not be blocked by a stopped wind turbine blade. The lights should blink in unison, and be of a dual-light design that will use a white light during daylight hours and red during nighttime hours. This approach achieves aviation safety and limits the visual impact of the lights to nearby residents. The existence of the wind turbine project is not expected to impact the operations of the Pittsfield Airport.

There are no known historic sites directly at the project site. During the permitting process, this topic will be explored in more detail. One potentially sensitive location from which the project would be visible is the Kennedy Park in Lenox. A visual simulation of the project from this site would be valuable for public information and discussion purposes.

### 3.5 Environmental Concerns

To determine which environmental concerns are likely to exist for a wind turbine at the Lenox site, Black & Veatch reviewed information obtained from the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (NHESP) web site ([www.nhesp.org](http://www.nhesp.org)). This web site identifies areas of the state that are of particular concern for endangered wildlife and plant life. Black & Veatch also reviewed information from the Massachusetts Audubon Society, and Nature Conservancy, and other public sources regarding sensitive areas near the project site. While this information is a good resource for an initial feasibility study, Black & Veatch would not consider the information below an exhaustive list, and would recommend a specific environmental review be done at the project site in future phases of project development.

The NHESP area designations reviewed and mapped for this site include:

- **Areas of Critical Environmental Concern (ACEC):** These are areas in Massachusetts that are considered special and highly significant due to their natural and cultural resources. Nominations for areas to receive ACEC designation are made by communities to the state Secretary of Environmental Affairs. Administration of the ACEC program is done by the Department of Conservation and Recreation.

- **Priority Habitat for Rare Species:** These areas are NHESP estimates of habitats for rare species. The boundaries of these habitats are considered approximate.
- **Protected and Recreational Open Space:** These are areas that have been designated at the state or community level as areas for limited or no development. The Massachusetts Geographic Information System (MassGIS), the service from where the data was obtained, indicated the accuracy of the identified open space locations was limited.
- **BioMap Core Habitats:** The BioMap program was completed in 2001 by NHESP, and identified areas considered to represent “habitats for the state’s most viable rare plant and animal populations”<sup>1</sup>. BioMap Core Habitats and Living Water Core Habitats encompass almost 1.4 million acres, or about 28 percent of the land area of Massachusetts.
- **Certified Vernal Pools:** NHESP define vernal pools as “small, shallow ponds characterized by lack of fish and by periods of dryness.” These pools are deemed critical to some wildlife, and are protected under a variety of state programs including the Massachusetts Wetlands Protection Act.
- **Living Waters Critical Supporting Watersheds:** These watersheds are identified as being critical for supporting Living Waters Core Habitats. They were identified in the Living Waters project completed in 2003 by NHESP.
- **Living Waters Core Habitats:** Similar to the BioMap Core Habitats, the Living Waters Core Habitats are those rivers, streams, lakes, and ponds critical to the biological diversity of Massachusetts.

Figures 3-17 and 3-18 are maps showing these identified areas near the Lenox Site. These maps show that the project site is within a BioMap Core Habitat (BM677), a Protected and Recreational Open Space, and a Living Waters Core Supporting Watershed (LW359). The site is also near a Priority Habitat for Rare Species. Based on discussions with the Town of Lenox, Black & Veatch understands the project site to not be located within a designated open space, and therefore questions the accuracy of the open space boundary data obtained from MassGIS for this site. Should this project move forward, a detailed environmental review of the site should determine the accuracy of the open space and habitat boundaries, and which species are located at or near the site. The

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<sup>1</sup> From *BioMap and Living Waters, Core Habitats of Lenox*, Natural Heritage & Endangered Species Program, 2004

NHEPS BioMap and Living Waters report is included in Appendix ??, and includes discussions on the species identified in these core habitats.

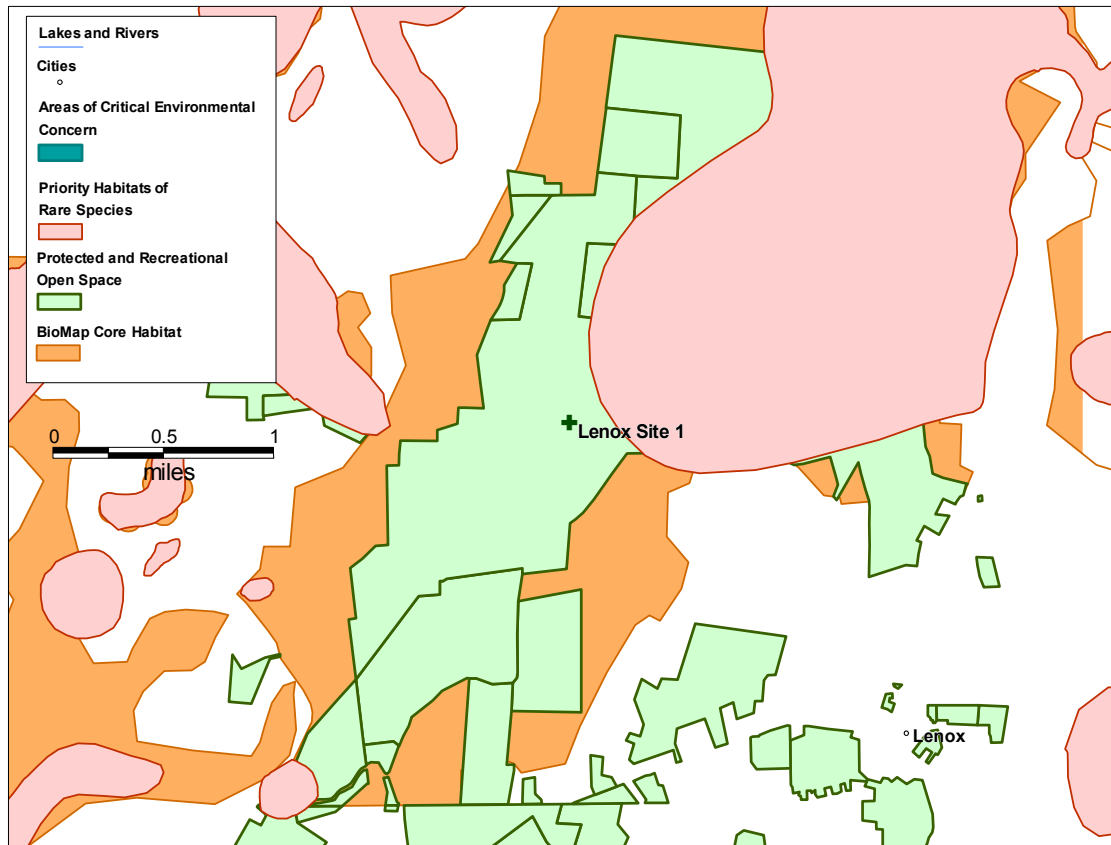
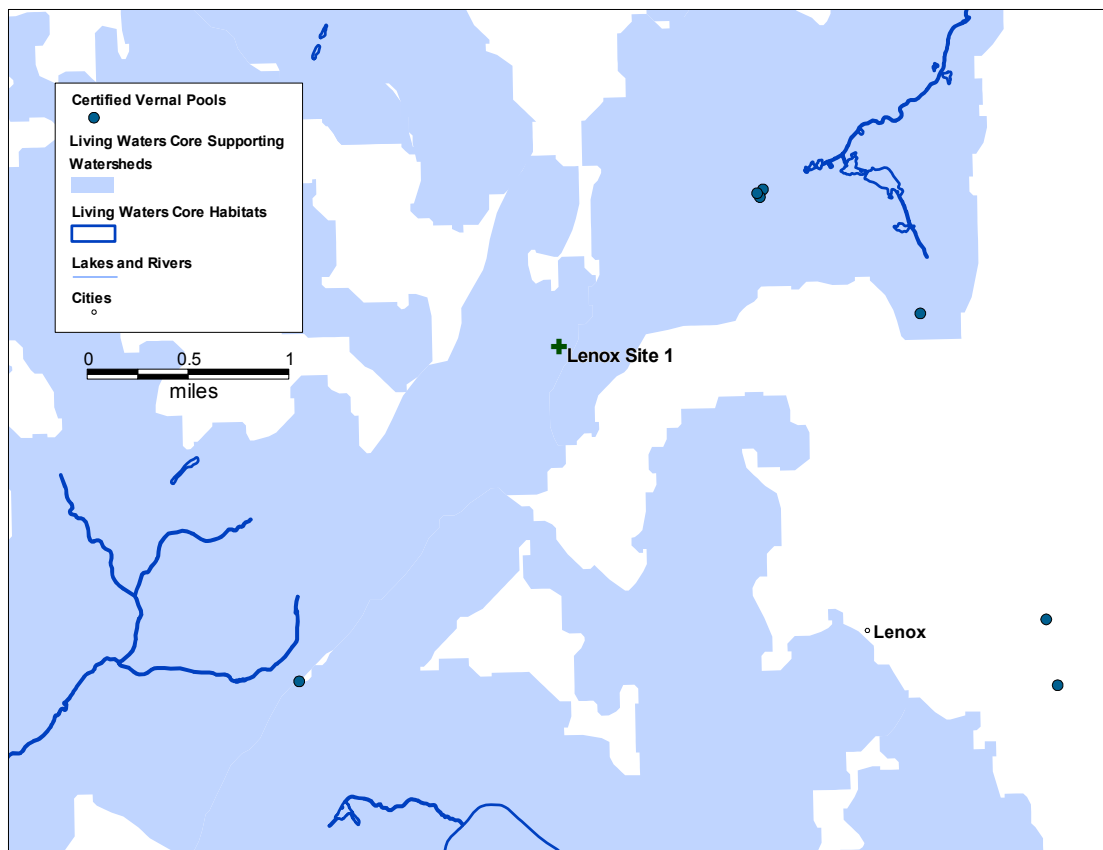


Figure 3-17 Environmental Protected Areas Near Site



**Figure 3-18 Protected Waters and Wetlands Near Site**

The largest biological concern for this project's development may be potential or perceived risk to avian species. During the permitting phase of project development, a wildlife impact study should be performed and specifically look at any potential avian species that would be at risk. Modern wind turbines include slow rotating blades, and tower and nacelle designs that provide almost no perching or nesting points for birds. While most wind energy projects have little or no recorded bird strikes, it can be a significant problem at a few sites (such as Altamont, California or the Mountaineer Wind Energy project in West Virginia). It is therefore important to determine if species known to be susceptible to wind turbine strikes can be found at the site. It is not clear at this time if any of the species identified in the BioMap Core Habitat are particularly susceptible to wind turbine strikes.

The Massachusetts Audubon Society owns land for conservation to the north of the project site. This society also designated a region to the east of the project site as the Upper Housatonic Valley Important Bird Area. While no specifics about this area were found on the society's web site ([www.massaudubon.org](http://www.massaudubon.org)), Black & Veatch believes it may be a wetland area in the valley 2 miles east of the project site. It is expected that



development of the project will require dialog and coordination with this society, who may have a detailed database of avian species known to exist in the vicinity of the project site.

An additional resource that may be beneficial for review is the results of any wildlife studies performed for the microwave tower located 1.5 miles north of the project site. Black & Veatch did not inspect this tower, but believes it to be likely it is supported by a series of guy wires. These wires can be difficult to see, and since the tower presents numerous perching points the wires could be far more dangerous to avian species than a wind turbine. Research done during the permitting stage should ascertain if any studies were done, and if those studies are available for review.

The Nature Conservancy's Berkshire Taconic Landscape region is located approximately 20 miles southwest of the project site. It is very unlikely the project would be visible from this landscape area, and therefore should not impact that area's conservation efforts.

Some public concern is likely regarding the visual impact of the project. Black & Veatch recommends that visual simulations of project options be presented to the public at the first hearing of the project, including animations showing the rotational speed of the turbine. Experience shows that sharing this information early in the process can avoid unnecessary concerns regarding what the project might look like. Lenox should work with their owner's engineer or permitting consultant to identify those locations of likely concern, and prepare simulations from these sites.

While the project site is a watershed, there are no known wetlands at the site or along the project access road route. Some small runoff formations might require culverts to avoid any changes to runoff patterns, even though no culverts were observed on Dunbar Road or the old main logging road.

Another issue often faced by community wind energy projects, or any project close to cities or landowners, is the project's potential to impact nearby property values. Some study work has been done which was unable to determine an impact, but this issue should be explored further for the most up-to-date information from locations similar to this project site. Black & Veatch cannot estimate if there will be an impact at this site, but has not yet been involved with a project where such an impact occurred.

### **3.6 Potential Wind Plant Options**

The project site is conducive to a single wind turbine installation, although Lenox Mountain appears able to support the installation of several more wind turbines to the north. By the current development plan for the access road, a second wind turbine can be added to the project without significant cost addition for the access road. The location of

any turbine at this site should be along the ridgeline, and the closer to Reservoir Road the less cost for creating a site access road. Also, higher elevations will have better exposure and therefore higher overall energy capture.

There are no on-site facilities that the turbines will be adjacent to, so only the separation between multiple wind turbines at the project site would be of concern. With the orientation of the ridgeline to the prevailing wind direction, neighboring wind turbines should be at least 3 rotor diameters apart (141 meters or 460 feet for the V47, 231 meters or 760 feet for the GE 1.5MW). Given the closest homes are almost a mile away from the project and the area is covered with dense vegetation, noise emissions from the wind turbine are not expected to bother local residents. During the project's permitting, site background noise readings and noise simulations can be made to better quantify the exact emission levels.

From a wind exposure and land use standpoint, the project site appears to be a good location for the installation of a small wind energy project consisting of one to a few commercial wind turbines. There does not appear to be any apparent significant impacts to the economic base of Lenox likely from the project, nor any limitations to the further development of the town. Given the land is already owned by the Town of Lenox for watershed, the installation of a wind project at the site seems to be a good proposal to gain additional benefit from the land without loss of its primary function.

### **3.7 Preliminary Energy Production and Plant Cost**

With the wind resource and general site conditions understood, Black & Veatch prepared a preliminary energy and cost estimate for a single turbine project at the Lenox site. Some general assumptions were made as to the value of the energy from the project, and general predictions made as to the economic potential of the project. Black & Veatch provided the general cost assumptions so that interested parties can utilize a variety of development structures and examine the economic impacts to the project. As this is a preliminary study, only a general cost estimate and financial evaluation was performed

#### **3.7.1 Preliminary Energy Estimate**

As indicated earlier, both the Vestas V47 and GE 1.5MW turbines were evaluated for this report. The standard tower height for the V47 is 50 meters and for the GE 1.5MW is 65 meters, although both turbines have other height options available. When Black & Veatch toured the project site, the height of the surrounding trees was estimated at 15 to 20 meters (50 to 60 feet). In the RERL report, they estimated the tree height at 50 meters (165 feet). If the shorter estimate for the tree height is accurate, then the standard tower heights would be appropriate as the blade path would be completely

above the tree canopy. If, however, the taller tree height estimate is correct, then the turbine would need to be mounted on a much taller tower, which would increase project cost and the visual impact of the project (and also increase energy capture). Black & Veatch recommends the height of these trees be determined during follow-up project reviews and discussed with wind turbine vendors so that the proper wind turbine tower option can be chosen.

Based on site elevation (550 meters or 1815 feet) and annual average temperature data collected at the Pittsfield Airport (between 7°C and 10°C), Black & Veatch determined the site's average air density was between 1.24 and 1.26 kg/m<sup>3</sup>. The sea level air density power curves from wind turbine manufacturers reference 1.225 kg/m<sup>3</sup>, so Black & Veatch used sea level power curves for the Vestas V47 and GE 1.5MW. A comparison of the power curves is shown in Table 3-3.

By utilizing the modified 1997 Patricca met tower discussed in Section 3.1, Black & Veatch estimated the production for both the V47 and GE 1.5MW at the Lenox project site. The data was "binned" by hub height wind speed for each turbine to determine the number of hours per year the winds would be within 1 m/s bin (for instance, the 5 m/s bin represents all wind speed data points between 4.5 m/s and 5.5 m/s). With the hours per bin known, the total energy produced each year from winds within each bin was estimated and summed to determine the total annual gross production from the turbine. Each wind turbine installation is subject to losses caused by topographic effects, nearby obstacles, electrical line distances, and many other factors. Due to the preliminary nature of this study, Black & Veatch used a general estimate of 10 percent losses for this project site, and subtracted 10 percent from the gross energy estimate to determine the project's net energy estimate. Finally, a capacity factor was calculated which represents the net annual generation compared to maximum possible generation from the wind turbine (a value of 100% would mean the turbine would operate at rated power every hour of the year; a typical capacity factor for a project in the Northeast U.S. is about 30 percent).

Black & Veatch estimates the Lenox site could produce approximately 1,400 MWh per year from a Vestas V47, or a capacity factor of 24.4 percent. The estimate for the GE 1.5MW turbine is 3,900 MWh per year, or a capacity factor of 29.8 percent. For wind energy projects located in the eastern US, Black & Veatch considers this a moderately good production level, making the site worthy of further study. Table 3-3 shows the breakdown of the estimate by wind speed, and Figures 3-19 and 3-20 represent the frequency distributions and power curves for each turbine. Table 3-4 shows the estimated energy production by month, which is presented graphically in Figure 3-21.

**Table 3-3**  
**Lenox Site Performance Estimate by Wind Speed**

Wind Speed, m/s	V47			GE 1.5		
	Power Curve, kW	50m Hours	Production, MWh	Power Curve, kW	65m Hours	Production, MWh
0	0	39.3	0	0	39.3	0
1	0	149.9	0	0	149.9	0
2	0	339.1	0	0	296.9	0
3	0	659.4	0	0	630.9	0
4	2.9	1,027.4	3	43	1,000.2	43
5	43.8	1,361.8	60	131	1,114.0	146
6	96.7	1,231.9	119	250	1,257.6	314
7	166	1,050.5	174	416	1,107.0	461
8	252	850.1	214	640	830.3	531
9	350	653.0	229	924	703.6	650
10	450	442.0	199	1,181	532.8	629
11	538	335.9	181	1,359	340.0	462
12	600	221.3	133	1,436	270.2	388
13	635	146.8	93	1,481	178.1	264
14	651	97.1	63	1,494	111.4	166
15	657	64.5	42	1,500	77.4	116
16	659	47.3	31	1,500	53.6	80
17	660	21.3	14	1,500	32.9	49
18	660	10.4	7	1,500	16.3	24
19	660	6.4	4	1,500	8.3	12
20	660	3.0	2	1,500	5.7	9
21	660	1.3	1	1,500	3.0	4
22	660	0.2	0	1,500	0.7	1
23	660	0.0	0	1,500	0.0	0
24	660	0.0	0	1,500	0.0	0
25	660	0.0	0	1,500	0.0	0
Total Gross Generation, MWh:			1,569			4,352
Losses, MWh:			157			435
Total Net Generation, MWh:			1,412			3,916
Capacity Factor:			24.4%			29.8%

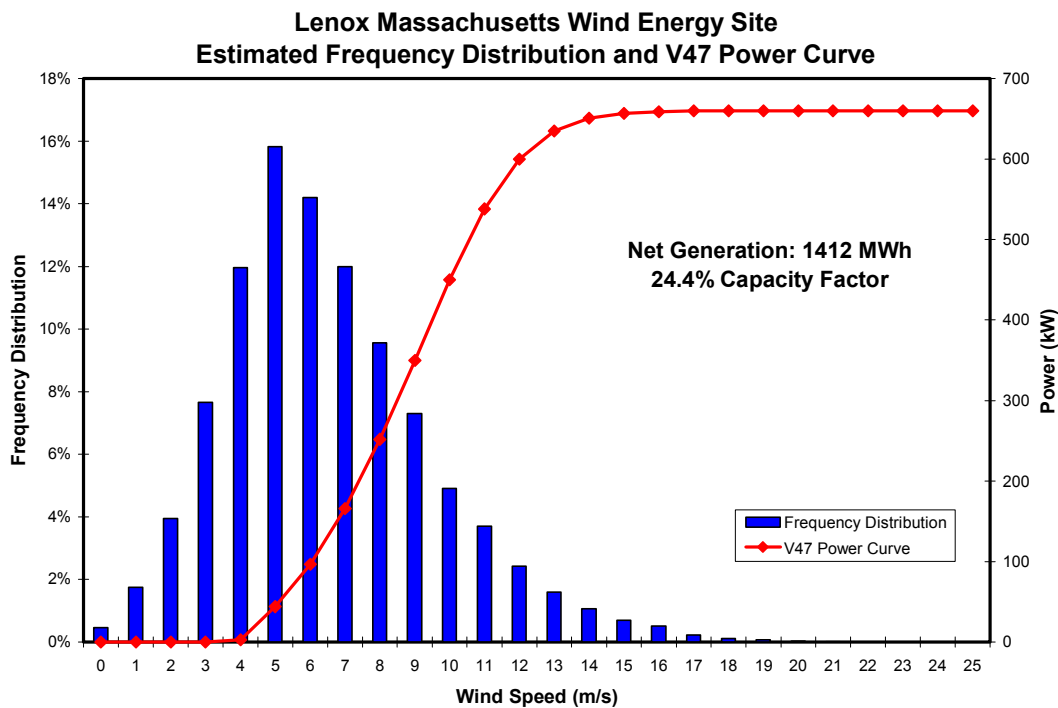


Figure 3-19 Vestas V47 Production Estimate

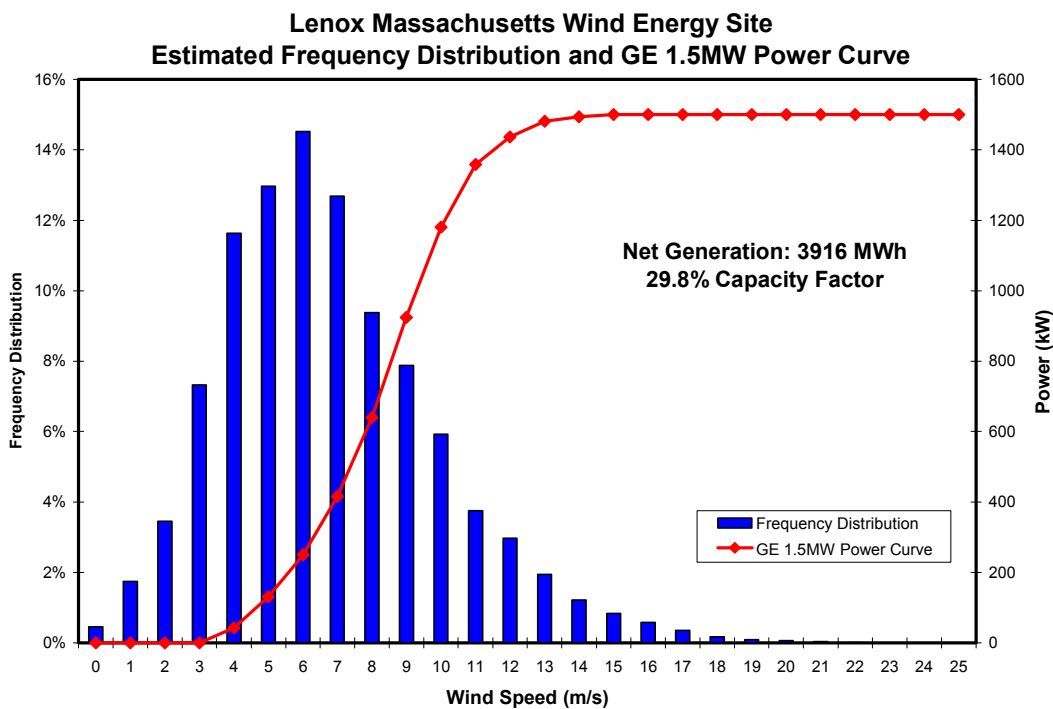
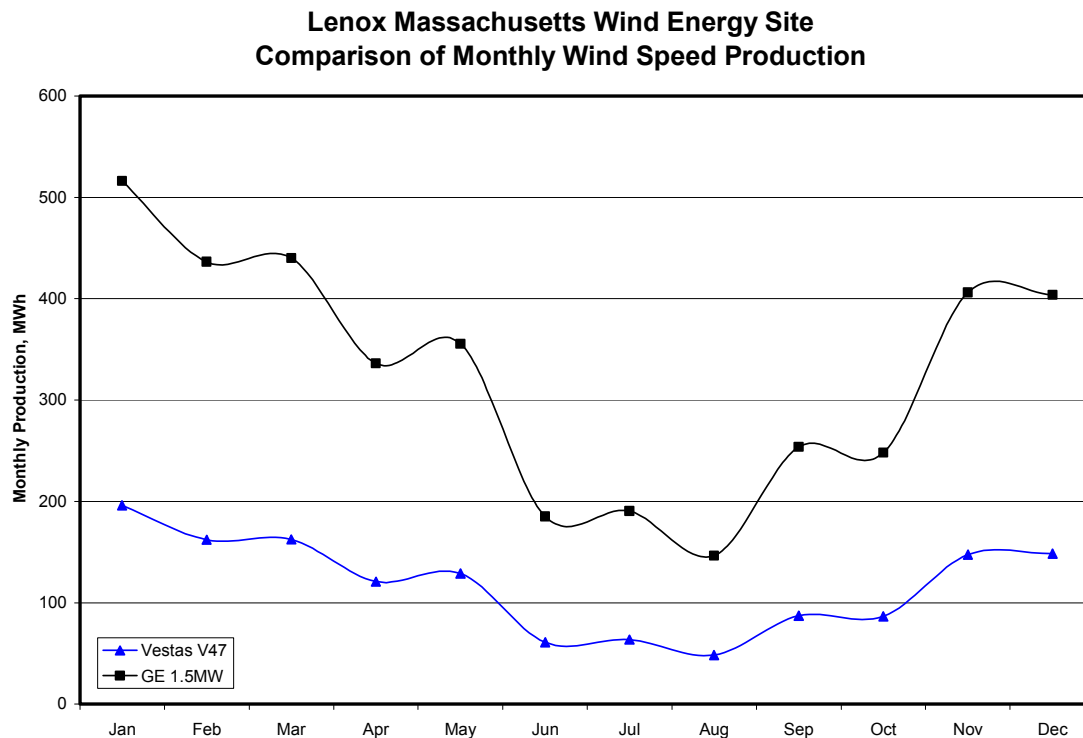


Figure 3-20 GE 1.5MW Production Estimate

**Table 3-4  
Lenox Site Performance Estimate by Month**

<b>Month</b>	<b>V-47</b>		<b>GE 1.5</b>	
	<b>Capacity Factor</b>	<b>Production, MWh</b>	<b>Capacity Factor</b>	<b>Production, MWh</b>
January	39.9%	196	46.2%	516
February	36.5%	162	43.3%	436
March	33.1%	162	39.4%	440
April	25.4%	121	31.1%	336
May	26.2%	129	31.8%	355
June	12.8%	61	17.1%	185
July	12.9%	64	17.1%	190
August	9.8%	48	13.1%	146
September	18.3%	87	23.5%	254
October	17.7%	87	22.2%	248
November	31.0%	148	37.6%	406
December	30.2%	148	36.2%	404
<b>Annual</b>	<b>24.4%</b>	<b>1,412</b>	<b>29.8%</b>	<b>3,916</b>





**Figure 3-21 Monthly Production Estimates**

### 3.7.2 General Project Cost Estimate

Black & Veatch prepared a budgetary estimate for the installation of either a single Vestas V47 or GE 1.5MW turbine at the Lenox project site. These estimates are based on general pricing data from wind turbine vendors and the cost breakdown of a recent single wind turbine project. A detailed estimate has not been generated for this study, nor has Black & Veatch requested cost proposals from local construction contractors. This estimate is also not a bid from Black & Veatch to install this project for this price, but rather intended for study purposes only.

The general total estimate for the installation of the V47 is \$1.42 million, or about \$2,150 per kW. The general total estimate for the installation of the GE 1.5MW is \$2.52 million, or about \$1,680 per kW. Readers may note the costs per kW are much higher than the often quoted industry model of \$1,000 per kW for wind farms. The reason for the higher cost is that all the study, engineering, construction mobilization, and permitting work must be done for only one turbine, while these costs are spread across many turbines for a wind farm. Also, the site preparation and road development work for the Lenox site will require more cost than a site in simpler terrain with less vegetation might.

<b>Table 3-5 Project Cost Estimate Breakdown</b>		
	<b>V-47</b>	<b>GE 1.5</b>
Rating, MW	0.66	1.50
Number	1	1
Nameplate, MW	0.66	1.50
<b>Direct Project Costs</b>		
Road/Site Grading and Prep	\$200,000	\$250,000
Foundation	\$25,000	\$50,000
Wind Turbine w/ shipping	\$600,000	\$1,400,000
Wind Turbine Install	\$100,000	\$150,000
Electrical Equipment, installed	\$250,000	\$350,000
2-Year Warranty/Service	\$0	\$60,000
Extended Warranty/Service	\$65,000	\$80,000
Communications	\$25,000	\$25,000
Training	\$5,000	\$5,000
<b>Total Direct Costs</b>	<b>\$1,270,000</b>	<b>\$2,370,000</b>
Permitting	\$50,000	\$50,000
Pre-Development Consulting	\$50,000	\$50,000
Owner's Engineer/Project Mgmt	\$50,000	\$50,000
<b>Total Project Costs</b>	<b>\$1,420,000</b>	<b>\$2,520,000</b>
<b>Cost per kW</b>	<b>\$2,152</b>	<b>\$1,680</b>

### 3.7.3 Preliminary Cash Flow Analysis

By placing the electrical connection for the wind turbine behind the utility meters at the Pumping Station, Lenox can use much of the wind turbine's energy to offset that station's power consumption. As stated earlier, since both the station and the wind project will not be manned, it has been assumed that no coordination of the electrical load of the station will be done to correspond to peak production times of the wind turbine. Therefore, Black & Veatch assumed that only half of the energy from the station will be offset by the wind turbine, and the remainder of the load will continue to come from the

utility when the turbine is not running. Likewise, the excess energy generated by the wind turbine will be sold to the utility at rate similar to other Qualifying Facilities.

Black & Veatch reviewed potential cash flows of both turbine options using economic criteria established by MTC, which include:

- 20 year project life
- Power sold to utility at \$40/MWh in Year 1
- RECs sold at \$35/MWh in Year 1
- RECs value decreases to \$25/MWh in Year 6
- O&M for Years 1-5 paid for in project's capital cost
- Annual operations and scheduled maintenance at \$20,000 in Year 6
- Annual unscheduled maintenance at \$10,000 in Year 6
- General escalation of sale rates and O&M at 2.5% per year

It is noted that MTC is evaluating several ownership and financing options for Community Wind projects. These include: municipal ownership and financing, private ownership and financing (perhaps with a portion of the power sold to the municipality), and private/public partnerships. Options that include private ownership of the turbine be financially advantageous because they allow the project to use the federal wind energy Production Tax Credit.

The pro forma cash flows for both turbine options are included in Appendix C.

### **3.8 Project Management Considerations**

This project will not require an on-site operations or maintenance building. It is expected that any spare parts for the wind turbine can be stored either at the Pumping Station near the site, or at the Department of Public Works garage in Lenox. During the turbine's warranty period, turbine performance will be monitored remotely by the manufacturer who will be responsible for dispatching repair personnel as needed. It is likely the manufacturer will request Lenox to perform periodic visual inspections of the wind turbine, but maintenance and repair work will be performed by qualified technicians from the nearest large project. For the Vestas, this could be Meyersdale Wind Energy Project near Somerset, Pennsylvania or Buffalo Mountain Wind Energy Project near Oak Ridge, Tennessee. For the GE Wind Energy, this could be the Fenner Wind Energy Project near Syracuse, New York or the Waymart Wind Energy Project near Scranton, Pennsylvania. Operations and maintenance arrangements will be determined with manufacturers during the turbine purchase negotiation.

Once the warranty and service contract period expires, Lenox will have the option to continue to work with the turbine manufacturer, contract with a third party provider, or

train local personnel to perform these services. The best solution will depend somewhat on how many wind energy projects are installed in the region over the next few years. If an independent service provider or vendor service center is sited near Lenox, obtaining a contract with that entity will likely be the most cost effective solution. Money for this contract was included in the pro forma analysis provided in Section 3.7.3.

## Appendix A. Wind Resource Maps

Wind resource map of Massachusetts was downloaded from the New England Wind Map web site (<http://truewind.teamcamelot.com/ne/>).

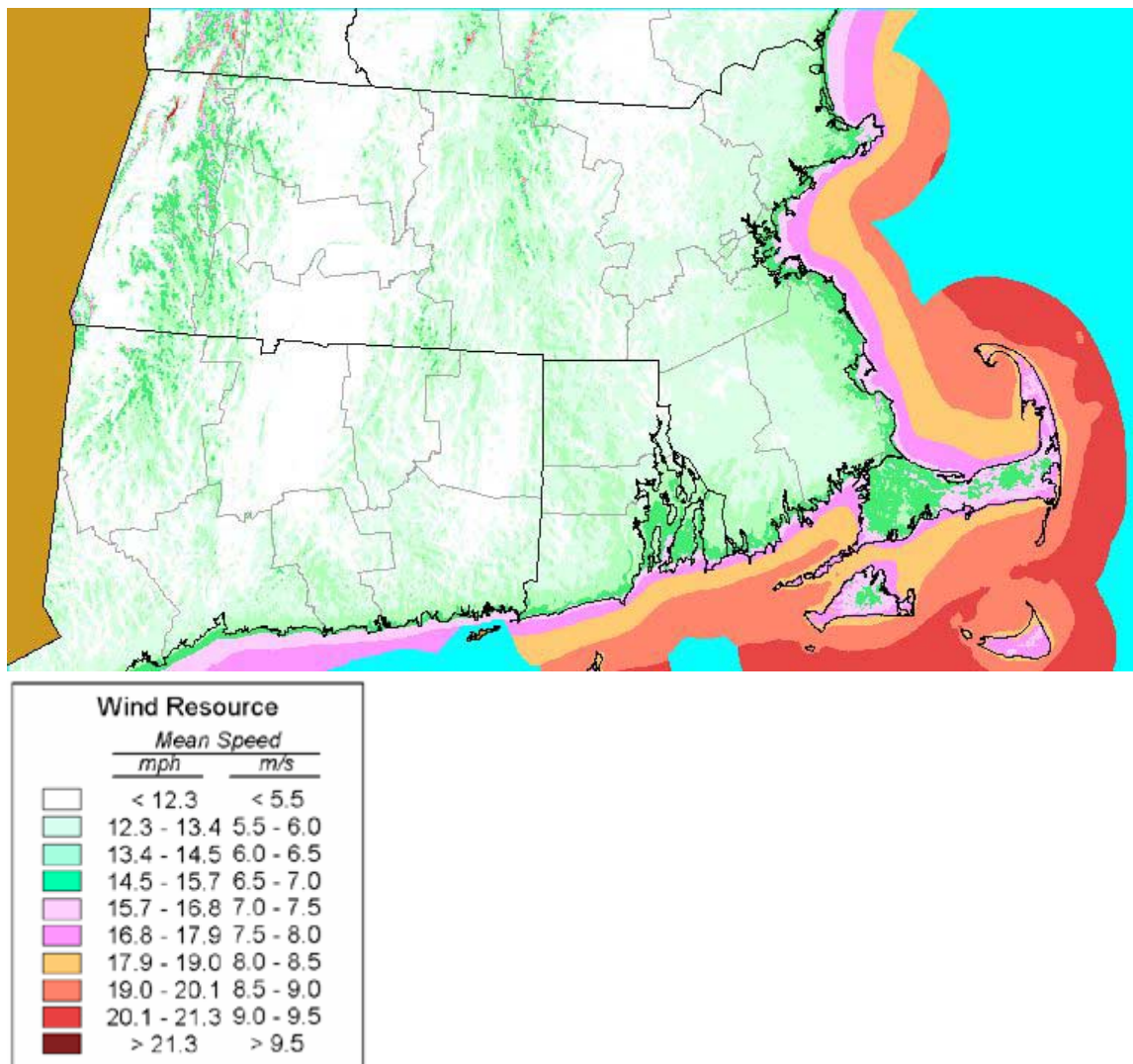


Figure A-1 Massachusetts Wind Resource Map

## Appendix B. Environmental Maps and Documents

Figure B-1 shows the locations of the Massachusetts Audubon Society Important Bird Areas (IBAs) in Berkshires County. This map was downloaded from the society's web site ([www.massaudubon.org](http://www.massaudubon.org)) on January 23, 2005. Also, the NHEPS BioMap and Living Waters report for Lenox is included in this Appendix.



Figure B-1 Mass Audubon Society IBAs





# BioMap and Living Waters

## Guiding Land Conservation for Biodiversity in Massachusetts

### Core Habitats of Lenox

This report and associated map provide information about important sites for biodiversity conservation in your area.

This information is intended for conservation planning, and is not intended for use in state regulations.

Produced by:  
**Natural Heritage & Endangered Species Program**  
**Massachusetts Division of Fisheries and Wildlife**  
**Executive Office of Environmental Affairs**  
**Commonwealth of Massachusetts**

Produced in 2004



# BioMap and Living Waters:

## Guiding Land Conservation for Biodiversity in Massachusetts

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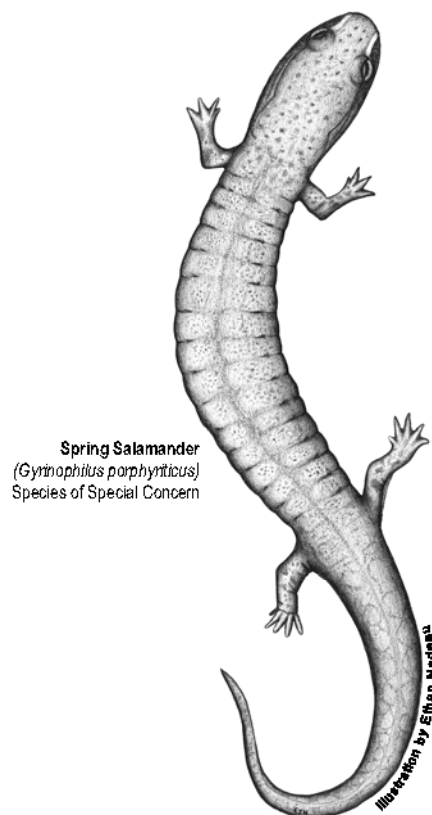
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\* Depending on the location of Core Habitats, your city or town may not have all of these sections.



Spring Salamander  
(*Gyrinophilus porphyriticus*)  
Species of Special Concern

*Funding for this project was made available by the Executive Office of Environmental Affairs, contributions to the Natural Heritage & Endangered Species Fund, and through the State Wildlife Grants Program of the US Fish & Wildlife Service.*



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# BioMap and Living Waters:

## Guiding Land Conservation for Biodiversity in Massachusetts

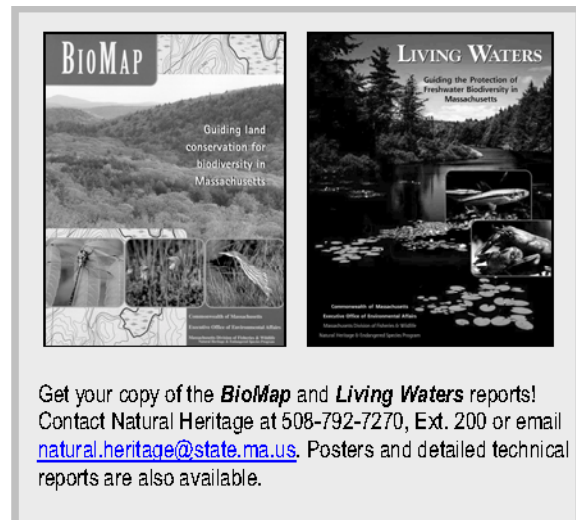
### Introduction

In this report, the Natural Heritage & Endangered Species Program provides you with site-specific biodiversity information for your area. Protecting our biodiversity today will help ensure the full variety of species and natural communities that comprise our native flora and fauna will persist for generations to come.

The information in this report is the result of two statewide biodiversity conservation planning projects, **BioMap** and **Living Waters**. The goal of the BioMap project, completed in 2001, was to identify and delineate the most important areas for the long-term viability of terrestrial, wetland, and estuarine elements of biodiversity in Massachusetts. The goal of the Living Waters project, completed in 2003, was to identify and delineate the rivers, streams, lakes, and ponds that are important for freshwater biodiversity in the Commonwealth. These two conservation plans are based on documented observations of rare species, natural communities, and exemplary habitats.

### What is a Core Habitat?

Both BioMap and Living Waters delineate **Core Habitats** that identify the most critical sites for biodiversity conservation across the state. Core Habitats represent habitat for the state's most viable rare plant and animal populations and include exemplary natural communities and aquatic habitats. Core Habitats represent a wide diversity of rare species and natural communities (see Table 1), and these areas are also thought to contain virtually all of the other described species in Massachusetts. Statewide, BioMap Core Habitats encompass 1,380,000 acres of uplands and wetlands, and Living Waters identifies 429 Core Habitats in rivers, streams, lakes, and ponds.



### Core Habitats and Land Conservation

One of the most effective ways to protect biodiversity for future generations is to protect Core Habitats from adverse human impacts through land conservation. For Living Waters Core Habitats, protection efforts should focus on the **riparian areas**, the areas of land adjacent to water bodies. A naturally vegetated buffer that extends 330 feet (100 meters) from the water's edge helps to maintain cooler water temperature and to maintain the nutrients, energy, and natural flow of water needed by freshwater species.

### In Support of Core Habitats

To further ensure the protection of Core Habitats and Massachusetts' biodiversity in the long-term, the BioMap and Living Waters projects identify two additional areas that help support Core Habitats.

In BioMap, areas shown as **Supporting Natural Landscape** provide buffers around the Core Habitats, connectivity between Core Habitats, sufficient space for ecosystems to function, and contiguous undeveloped habitat for common species. Supporting Natural Landscape was



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# BioMap and Living Waters:

## Guiding Land Conservation for Biodiversity in Massachusetts

generated using a Geographic Information Systems (GIS) model, and its exact boundaries are less important than the general areas that it identifies. Supporting Natural Landscape represents potential land protection priorities once Core Habitat protection has been addressed.

In Living Waters, *Critical Supporting Watersheds* highlight the immediate portion of the watershed that sustains, or possibly degrades, each freshwater Core Habitat. These areas were also identified using a GIS model. Critical Supporting Watersheds represent developed and undeveloped lands, and can be quite large. Critical Supporting Watersheds can be helpful in land-use planning, and while they are not shown on these maps, they can be viewed in the Living Waters report or downloaded from [www.mass.gov/mgis](http://www.mass.gov/mgis).

## Understanding Core Habitat Species, Community, and Habitat Lists

### What's in the List?

Included in this report is a list of the species, natural communities, and/or aquatic habitats for each Core Habitat in your city or town. The lists are organized by Core Habitat number.

For the larger Core Habitats that span more than one town, the species and community lists refer to the entire Core Habitat, not just the portion that falls within your city or town. For a list of all the state-listed rare species within your city or town's boundary, whether or not they are in Core Habitat, please see the town rare species lists available at [www.nhesp.org](http://www.nhesp.org).

The list of species and communities within a Core Habitat contains only the species and

**Table 1.** The number of rare species and types of natural communities explicitly included in the BioMap and Living Waters conservation plans, relative to the total number of native species statewide.

<b>BioMap</b>		
Biodiversity Group	Species and Verified Natural Community Types	
	Included in BioMap	Total Statewide
Vascular Plants	246	1,538
Birds	21	221 breeding species
Reptiles	11	25
Amphibians	6	21
Mammals	4	85
Moths and Butterflies	52	An estimated 2,500 to 3,000
Damselflies and Dragonflies	25	An estimated 165
Beetles	10	An estimated 2,500 to 4,000
Natural Communities	92	> 105 community types
<b>Living Waters</b>		
Biodiversity Group	Species	
	Included in Living Waters	Total Statewide
Aquatic Vascular Plants	23	114
Fishes	11	57
Mussels	7	12
Aquatic Invertebrates	23	An estimated > 2500

natural communities that were explicitly included in a given BioMap or Living Waters Core Habitat. Other rare species or examples of other natural communities may fall within the Core Habitat, but for various reasons are not included in the list. For instance, there are a few rare species that are omitted from the list or summary because of their particular sensitivity to the threat of collection. Likewise, the content of many very small Core Habitats are not described in this report or list, often because they contain a single location of a rare plant



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# BioMap and Living Waters:

## Guiding Land Conservation for Biodiversity in Massachusetts

species. Some Core Habitats were created for suites of common species, such as forest birds, which are particularly threatened by habitat fragmentation. In these cases, the individual common species are not listed.

### What does 'Status' mean?

The Division of Fisheries and Wildlife determines a status category for each rare species listed under the Massachusetts Endangered Species Act, M.G.L. c.131A, and its implementing regulations, 321 CMR 10.00. Rare species are categorized as Endangered, Threatened, or of Special Concern according to the following:

- **Endangered** species are in danger of extinction throughout all or a significant portion of their range or are in danger of extirpation from Massachusetts.
- **Threatened** species are likely to become Endangered in Massachusetts in the foreseeable future throughout all or a significant portion of their range.
- **Special Concern** species have suffered a decline that could threaten the species if allowed to continue unchecked or occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become Threatened in Massachusetts.

In addition, the Natural Heritage & Endangered Species Program maintains an unofficial **watch list** of plants that are tracked due to potential conservation interest or concern, but are not regulated under the Massachusetts Endangered Species Act or other laws or regulations. Likewise, described natural communities are not regulated any laws or regulations, but they can help to identify ecologically important areas that are worthy of protection. The status of natural

### Legal Protection of Biodiversity

BioMap and Living Waters present a powerful vision of what Massachusetts would look like with full protection of the land that supports most of our biodiversity. To create this vision, some populations of state-listed rare species were deemed more likely to survive over the long-term than others.

Regardless of their potential viability, all sites of state-listed species have full legal protection under the Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (321 CMR 10.00). Habitat of state-listed wildlife is also protected under the Wetlands Protection Act Regulations (310 CMR 10.37 and 10.59). The **Massachusetts Natural Heritage Atlas** shows **Priority Habitats**, which are used for regulation under the Massachusetts Endangered Species Act and Massachusetts Environmental Policy Act (M.G.L. c.30) and **Estimated Habitats**, which are used for regulation of rare wildlife habitat under the Wetlands Protection Act. For more information on rare species regulations, see the *Massachusetts Natural Heritage Atlas*, available from the Natural Heritage & Endangered Species Program in book and CD formats.

BioMap and Living Waters are conservation planning tools and do not, in any way, supplant the Estimated and Priority Habitat Maps which have regulatory significance. Unless and until the combined BioMap and Living Waters vision is fully realized, we must continue to protect all populations of our state-listed species and their habitats through environmental regulation.

communities reflects the documented number and acreages of each community type in the state:

- **Critically Imperiled** communities typically have 5 or fewer documented sites or have very few remaining acres in the state.
- **Imperiled** communities typically have 6-20 sites or few remaining acres in the state.
- **Vulnerable** communities typically have 21-100 sites or limited acreage across the state.
- **Secure** communities typically have over 100 sites or abundant acreage across the state; however excellent examples are identified as Core Habitat to ensure continued protection.



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# BioMap and Living Waters:

## Guiding Land Conservation for Biodiversity in Massachusetts

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### Understanding Core Habitat Summaries

Following the BioMap and Living Waters Core Habitat species and community lists, there is a descriptive summary of each Core Habitat that occurs in your city or town. This summary highlights some of the outstanding characteristics of each Core Habitat, and will help you learn more about your city or town's biodiversity. You can find out more information about many of these species and natural communities by looking at specific *fact sheets* at [www.nhesp.org](http://www.nhesp.org).

### Next Steps

BioMap and Living Waters were created in part to help cities and towns prioritize their land protection efforts. While there are many reasons to conserve land—drinking water protection, recreation, agriculture, aesthetics, and others—BioMap and Living Waters Core Habitats are especially helpful to municipalities seeking to protect the rare species, natural communities, and overall biodiversity within their boundaries. Please use this report and map along with the rare species and community fact sheets to appreciate and understand the biological treasures in your city or town.

### Protecting Larger Core Habitats

Core Habitats vary considerably in size. For example, the average BioMap Core Habitat is 800 acres, but Core Habitats can range from less than 10 acres to greater than 100,000 acres. These larger areas reflect the amount of land needed by some animal species for breeding, feeding, nesting, overwintering, and long-term survival. Protecting areas of this size can be

very challenging, and requires developing partnerships with neighboring towns.

Prioritizing the protection of certain areas within larger Core Habitats can be accomplished through further consultation with Natural Heritage Program biologists, and through additional field research to identify the most important areas of the Core Habitat.

### Additional Information

If you have any questions about this report, or if you need help protecting land for biodiversity in your community, the Natural Heritage & Endangered Species Program staff looks forward to working with you.

Contact the Natural Heritage & Endangered Species Program:

*by Phone* 508-792-7270, Ext. 200

*by Fax:* 508-792-7821

*by Email:* [natural.heritage@state.ma.us](mailto:natural.heritage@state.ma.us)

*by Mail:* North Drive  
Westborough, MA 01581

The GIS datalayers of BioMap and Living Waters Core Habitats are available for download from MassGIS: [www.mass.gov/mgis](http://www.mass.gov/mgis)

Check out [www.nhesp.org](http://www.nhesp.org) for information on:

- Rare species in your town
- Rare species fact sheets
- BioMap and Living Waters projects
- Natural Heritage publications, including:
  - \* Field guides
  - \* Natural Heritage Atlas, and more!



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# BioMap: Species and Natural Communities

## Lenox

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### Core Habitat BM677

#### Natural Communities

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp		Imperiled
Calcareous Sloping Fen		Imperiled
Red Oak - Sugar Maple Transition Forest		Secure
Rich, Mesic Forest Community		Vulnerable

#### Plants

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Adder's-Tongue Fern	<i>Ophioglossum pusillum</i>	Threatened
Bristly Buttercup	<i>Ranunculus pensylvanicus</i>	Threatened
Bush's Sedge	<i>Carex bushii</i>	Endangered
Capillary Beak-Sedge	<i>Rhynchospora capillacea</i>	Endangered
Chestnut-Colored Sedge	<i>Carex castanea</i>	Endangered
Crooked-Stem Aster	<i>Symphotrichum prenanthoides</i>	Threatened
Dioecious Sedge	<i>Carex sterilis</i>	Threatened
Fen Sedge	<i>Carex tetanica</i>	Special Concern
Foxtail Sedge	<i>Carex alopecoidea</i>	Threatened
Gray's Sedge	<i>Carex grayi</i>	Threatened
Hairy Wild Rye	<i>Elymus villosus</i>	Endangered
Handsome Sedge	<i>Carex formosa</i>	Threatened
Hemlock Parsley	<i>Conioselinum chinense</i>	Special Concern
Intermediate Spike-Sedge	<i>Eleocharis intermedia</i>	Threatened
Mossy-Cup Oak	<i>Quercus macrocarpa</i>	Special Concern
Northern Bedstraw	<i>Galium boreale</i>	Endangered
Pale Green Orchis	<i>Platanthera flava var herbiola</i>	Threatened
Pink Pyrola	<i>Pyrola asarifolia var purpurea</i>	Endangered



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# BioMap: Species and Natural Communities

## Lenox

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### Sensitive Rare Plant

Smooth Rock-Cress	<i>Arabis laevigata</i>	Threatened
Stiff Gentian	<i>Gentianella quinquefolia</i>	Watch Listed
Wapato	<i>Sagittaria cuneata</i>	Threatened
White Adder's-Mouth	<i>Malaxis monophyllos var brachypoda</i>	Endangered

### Invertebrates

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Early Hairstreak	<i>Erora laeta</i>	Threatened
Eastern Veined White	<i>Pieris oleracea</i>	Threatened

### Vertebrates

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
American Bittern	<i>Botaurus lentiginosus</i>	Endangered
Common Moorhen	<i>Gallinula chloropus</i>	Special Concern
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Special Concern
Jefferson Salamander	<i>Ambystoma jeffersonianum</i>	Special Concern
Least Bittern	<i>Ixobrychus exilis</i>	Endangered
Marbled Salamander	<i>Ambystoma opacum</i>	Threatened
Spring Salamander	<i>Gyrinophilus porphyriticus</i>	Special Concern
Wood Turtle	<i>Clemmys insculpta</i>	Special Concern

## Core Habitat BM761

### Natural Communities

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp		Imperiled

### Plants

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Hemlock Parsley	<i>Conioselinum chinense</i>	Special Concern
Labrador Bedstraw	<i>Galium labradoricum</i>	Threatened



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# BioMap: Core Habitat Summaries

## Lenox

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### Core Habitat BM677

This Core Habitat includes portions of the Housatonic River, Sackett Brook, Yokun Brook, Pleasant Valley and Lenox Mountain. From riparian habitats and calcareous wetlands to large areas of Northern Hardwoods, the diversity of this Core Habitat supports rare species of salamanders, turtles, marsh birds, and butterflies. The calcareous bedrock here supports many high-quality natural communities that contain a wealth of biodiversity, most notably several important rare plant populations. Large portions of this Core Habitat are protected as conservation land and additional protection priorities include areas along the Housatonic River, the lower and middle reaches of Yokun Brook, and around Mud Pond.

#### Natural Communities

This Core Habitat contains a good diversity of exemplary natural communities that are associated with the porous calcareous bedrock commonly found in this area of the Berkshires. An excellent Calcareous Sloping Fen occurs near Mud Pond. Calcareous Sloping Fens are open, sedge-dominated wetlands occurring on slight to moderate slopes where there is calcareous groundwater seepage. They are rare species "hot spots" with many associated rare plant and animal species. Two good-quality Black Ash-Red Maple-Tamarack Calcareous Seepage Swamps occur in basins below Mahanna Cobble. Black Ash-Red Maple-Tamarack Calcareous Seepage Swamps are mixed deciduous-coniferous forested swamps occurring in areas where there is calcium-rich groundwater seepage. This nutrient enrichment results in many rare calcium-loving plant species.

#### Plants

A tremendous diversity of rare plant species that are adapted to calcareous fens, swamps, meadows and forests live within this large Core Habitat. For example, a vigorous population of Fen Sedge and one of the state's two known populations of the Capillary Beaked-Sedge inhabit open calcareous peatlands in this area. The state's most outstanding population of Wapato, a rare relative of the Common Arrowhead, makes its home here in a floodplain community. Wet meadow species such as Stiff Gentian and Pale Green Orchis are also present in this Core Habitat.

#### Invertebrates

This Core Habitat includes undeveloped and unfragmented areas of Northern Hardwoods Forest in northwestern Lenox and southeastern Pittsfield that are habitat for rare butterflies including the Early Hairstreak and the Eastern Veined White. While both of these butterflies may be found within sunny openings in the forest, the most critical areas are those with their larval host plants - Beech trees for the Early Hairstreak and Toothwort and other mustard family plants for the Eastern Veined White. The part of this Core Habitat in southeastern Pittsfield is located less than 10 km from other habitat for the Eastern Veined White in northeastern Pittsfield and Washington, which probably allows for dispersal of individual butterflies between all of these areas.



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# BioMap: Core Habitat Summaries

## Lenox

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### Vertebrates

Significant habitat for Wood Turtles is present along the Housatonic River, Sackett Brook, and in Pleasant Valley where mosaics of riparian habitats include miles of meandering river and streams, old river oxbows, wet meadows, shrub and wooded swamps, and adjacent upland forests and fields. Along the Housatonic River and the lower reaches of Sackett Brook, shallow freshwater marshes and wet meadows, including beaver-impounded wetlands and old oxbows, provide habitat for the American Bittern, a rare marsh bird. Riverine marshes that have a good interspersed of cattails, aquatic bed vegetation, and open water provide habitat for American and Least Bitterns, Common Moorhens, and other marsh birds. Also in this Core Habitat, mixed upland forests with clusters of vernal pools support populations of Jefferson and Marbled Salamanders, while forested and shrub wetlands and seeps with abundant sphagnum moss provide significant habitat for Four-toed Salamanders. In portions of the Core Habitat that are at higher elevations, the cold, high-gradient brooks and seeps provide habitat for Spring Salamanders.

Land protection within this Core Habitat should focus on protecting large areas of connected riparian habitat, especially between Yokun Brook and the Housatonic River, and expanding areas of existing conservation land. Wood Turtles will benefit from the protection of undeveloped riparian corridors that extend out at least 600 yards along both sides of the Housatonic River and its tributaries. Another conservation priority should be areas of mature deciduous or mixed forest with clusters of vernal pools that provide breeding habitat for Jefferson or Marbled Salamanders. Mature, rich mesic or floodplain forests at lower elevations are especially important habitat for a variety of songbirds, including Wood Thrush.

### Core Habitat BM761

#### Natural Communities

This Core Habitat contains a good example of a Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp, an unusual community type. Black Ash-Red Maple-Tamarack Calcareous Seepage Swamps are mixed deciduous-coniferous forested swamps occurring in areas where there is calcium-rich groundwater seepage. This nutrient enrichment results in many rare calcium-loving plant species.

#### Plants

Two wetland-adapted rare plant species are located within a calcareous peatland here: Labrador Bedstraw and Hemlock Parsley.



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# Living Waters: Species and Habitats

## Lenox

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### Core Habitat LW236

#### Invertebrates

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
--------------------	------------------------	---------------

Pilsbry's Spire Snail	<i>Pyrgulopsis lustrica</i>	Endangered
-----------------------	-----------------------------	------------

### Core Habitat LW359

#### Plants

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
--------------------	------------------------	---------------

Hill's Pondweed	<i>Potamogeton hillii</i>	Special Concern
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Water Star-grass	<i>Heteranthera dubia</i>	Watch Listed
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# Living Waters: Core Habitat Summaries

## Lenox

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### Core Habitat LW236

Laurel Lake is one of only two sites in Massachusetts where the Endangered Pilsbry's Spire Snail is currently known. This snail has been found around the perimeter of the lake, but deeper portions likely provide critical overwintering habitat. Without conservation attention, this species is in danger of disappearing from the state's landscape.

### Core Habitat LW359

This freshwater complex of ponds and wetlands along Yokum Brook supports an extensive population of the globally rare Hill's Pondweed, a plant exclusively of hard waters. Native freshwater plants like Hill's Pondweed are an important component of aquatic ecosystems, providing habitat and nutrition for fishes and invertebrates, and adding oxygen to the water through photosynthesis.



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## Help Save Endangered Wildlife!

Please contribute on your Massachusetts income tax form or directly to the



Natural Heritage &  
Endangered Species Fund

To learn more about the Natural Heritage & Endangered Species Program and the Commonwealth's rare species, visit our web site at: [www.nhesp.org](http://www.nhesp.org).



## Appendix C. Operating Cash Flows

MTC Community Wind Collaborative  
Operating Cash Flow Estimate

Configuration Information		Value	Revenue Stream Variables	Value
Client	Town of Lenox		On-Site Energy Use (MWh)	226
Site	Lenox 1		On-Site Energy Savings	\$14,800
Wind Turbine Type	Vestas V47		Energy Sales Rate (\$/MWh)	\$40
WTG Rating (MW)	0.66		REC Sales Rate Year 1-5 (\$/MWh)	\$35
Number of Turbines	1		REC Sales Rate Year 6+ (\$/MWh)	\$25
Project Rating (MW)	0.66		General Escalation	2.50%
Annual Energy (MWh)	1,416		Other Project Variables	
Project Capacity Factor	24.49%		Year 6 Sched O&M	\$20,000
Project Capital Cost	\$1,420,000		Year 6 Unsched O&M	\$10,000

All input values are in 2007\$

Cash Flow Analysis			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Lenox 1	Units	Escalation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
OPERATING REVENUES																						
Existing Plant Impacts -- Savings																						
Pumping Station Energy Savings	\$/yr	2.5%	14,800	15,170	15,549	15,938	16,336	16,745	17,163	17,593	18,032	18,483	18,945	19,419	19,904	20,402	20,912	21,435	21,971	22,520	23,083	23,660
Energy Sales	\$/yr	2.5%	47,600	48,790	50,010	51,260	52,541	53,855	55,201	56,581	57,996	59,446	60,932	62,455	64,017	65,617	67,258	68,939	70,662	72,429	74,240	76,096
REC Sales	\$/yr	2.5%	41,650	42,691	43,759	44,852	45,975	47,128	48,311	49,524	50,767	52,040	53,343	54,676	56,039	57,432	58,865	60,328	61,821	63,344	64,897	66,480
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	\$/yr	N/A	104,050	106,651	109,318	112,050	98,628	101,094	103,621	106,211	108,867	111,588	114,378	117,238	120,169	123,173	126,252	129,408	132,644	135,960	139,359	142,843
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Operating Revenues	\$/yr	N/A	104,050	106,651	109,318	112,050	98,628	101,094	103,621	106,211	108,867	111,588	114,378	117,238	120,169	123,173	126,252	129,408	132,644	135,960	139,359	142,843
OPERATING EXPENSES																						
Scheduled O&M	\$/yr	2.5%	0	0	0	0	0	20,000	20,500	21,013	21,538	22,076	22,628	23,194	23,774	24,368	24,977	25,602	26,242	26,898	27,570	28,259
Unscheduled O&M	\$/yr	2.5%	0	0	0	0	0	10,000	10,250	10,506	10,769	11,038	11,314	11,597	11,887	12,184	12,489	12,801	13,121	13,449	13,785	14,130
Total Operating Expenses	\$/yr	N/A	0	0	0	0	0	30,000	30,750	31,519	32,307	33,114	33,942	34,791	35,661	36,552	37,466	38,403	39,363	40,347	41,355	42,389
CASH AVAILABLE FOR FINANCING	\$/yr	N/A	104,050	106,651	109,318	112,050	98,628	71,094	72,871	74,693	76,560	78,474	80,436	82,447	84,508	86,621	88,786	91,006	93,281	95,613	98,003	100,453

MTC Community Wind Collaborative  
Operating Cash Flow Estimate

Configuration Information		Value	Revenue Stream Variables	Value
Client	Town of Lenox		On-Site Energy Use (MWh)	226
Site	Lenox 1		On-Site Energy Savings	\$14,800
Wind Turbine Type	GE 1.5MW		Energy Sales Rate (\$/MWh)	\$40
WTG Rating (MW)	1.50		REC Sales Rate Year 1-5 (\$/MWh)	\$35
Number of Turbines	1		REC Sales Rate Year 6+ (\$/MWh)	\$25
Project Rating (MW)	1.50		General Escalation	2.50%
Annual Energy (MWh)	3,916		Other Project Variables	
Project Capacity Factor	29.80%		Year 6 Sched O&M	\$20,000
Project Capital Cost	\$2,520,000		Year 6 Unsched O&M	\$10,000

All input values are in 2007\$

Cash Flow Analysis			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Lenox 1	Units	Escalation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
OPERATING REVENUES																						
Existing Plant Impacts -- Savings																						
Pumping Station Energy Savings	\$/yr	2.5%	14,800	15,170	15,549	15,938	16,336	16,745	17,163	17,593	18,032	18,483	18,945	19,419	19,904	20,402	20,912	21,435	21,971	22,520	23,083	23,660
Energy Sales	\$/yr	2.5%	147,600	151,290	155,072	158,949	162,923	166,996	171,171	175,450	179,836	184,332	188,940	193,664	198,506	203,468	208,555	213,769	219,113	224,591	230,206	235,961
REC Sales	\$/yr	2.5%	129,150	132,379	135,688	139,080	92,250	94,556	96,920	99,343	101,827	104,372	106,982	109,656	112,398	115,208	118,088	121,040	124,066	127,168	130,347	133,606
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	\$/yr	N/A	291,550	298,839	306,310	313,967	271,509	278,297	285,254	292,386	299,695	307,188	314,867	322,739	330,808	339,078	347,555	356,244	365,150	374,278	383,635	393,226
	\$/yr	2.5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Operating Revenues	\$/yr	N/A	291,550	298,839	306,310	313,967	271,509	278,297	285,254	292,386	299,695	307,188	314,867	322,739	330,808	339,078	347,555	356,244	365,150	374,278	383,635	393,226
OPERATING EXPENSES																						
Scheduled O&M	\$/yr	2.5%	0	0	0	0	0	20,000	20,500	21,013	21,538	22,076	22,628	23,194	23,774	24,368	24,977	25,602	26,242	26,898	27,570	28,259
Unscheduled O&M	\$/yr	2.5%	0	0	0	0	0	10,000	10,250	10,506	10,769	11,038	11,314	11,597	11,887	12,184	12,489	12,801	13,121	13,449	13,785	14,130
Total Operating Expenses	\$/yr	N/A	0	0	0	0	0	30,000	30,750	31,519	32,307	33,114	33,942	34,791	35,661	36,552	37,466	38,403	39,363	40,347	41,355	42,389
CASH AVAILABLE FOR FINANCING	\$/yr	N/A	291,550	298,839	306,310	313,967	271,509	248,297	254,504	260,867	267,389	274,073	280,925	287,948	295,147	302,526	310,089	317,841	325,787	333,932	342,280	350,837

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## **APPENDIX B**

**WIND POWER IN LENOX: SITING CONSIDERATIONS FOR  
A MET TOWER AND FOR A WIND TURBINE,  
UNIVERSITY OF MASSACHUSETTS,  
RENEWABLE ENERGY RESEARCH LABORATORY**

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# Renewable Energy Research Laboratory

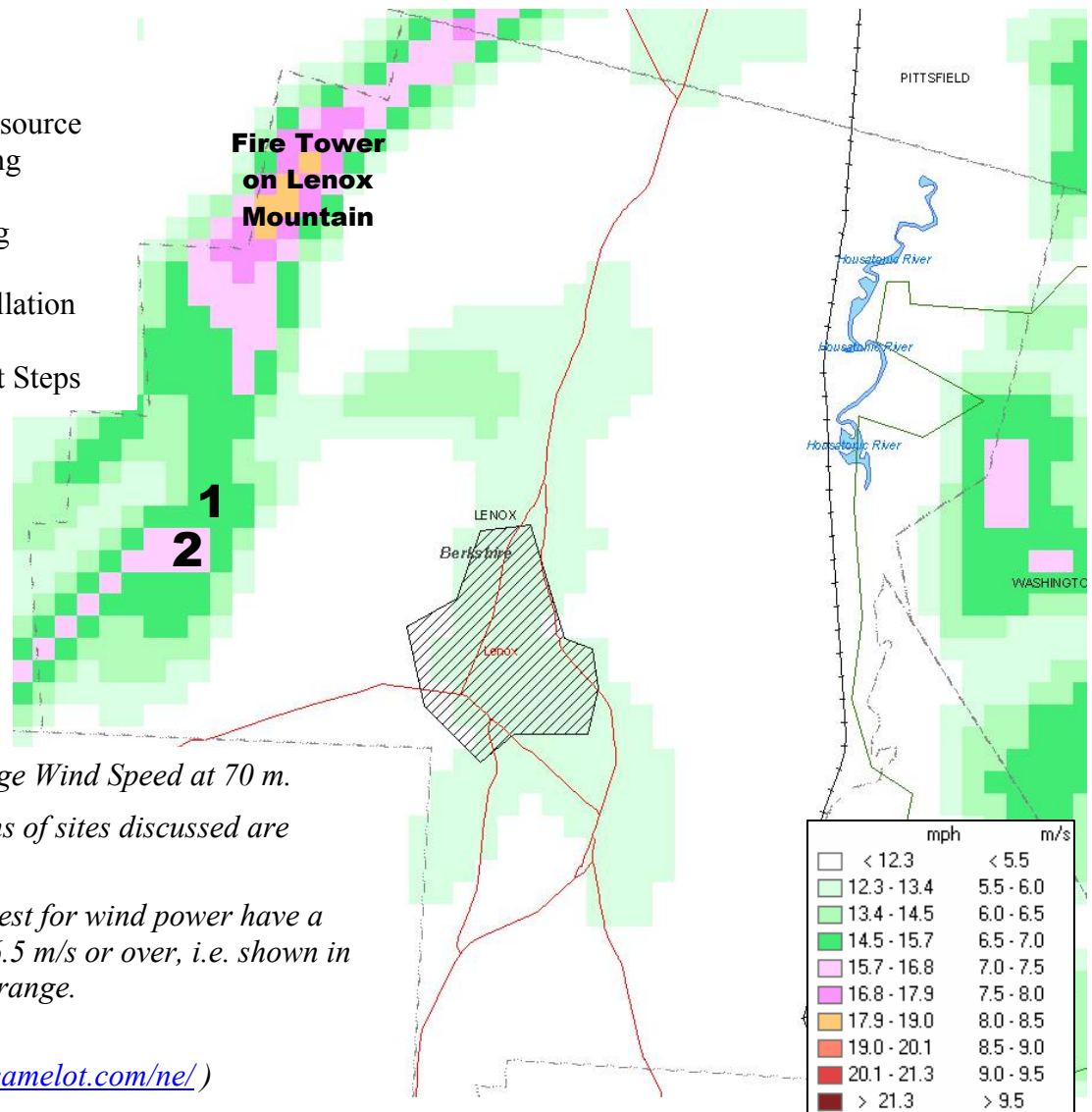
Department of Mechanical and Industrial Engineering  
University of Massachusetts  
160 Governor's Drive  
Amherst, MA 01003-9265  
Phone: 413-545-4359  
[www.ceere.org/rerl](http://www.ceere.org/rerl)  
[rerl@rerl.org](mailto:rerl@rerl.org)

## Wind Power in Lenox: Siting considerations for a Met Tower and for a Wind Turbine

This report was paid for by the Massachusetts Technology Collaborative Community Wind Collaborative on behalf of the town of Lenox. It was prepared by Sally Wright, RERL.

### Table of contents

1. Introduction
2. Sites Considered
3. Predicted Wind Resource
4. Wind Turbine Siting Considerations
5. Anemometry Siting Considerations
6. Anemometry Installation Logistics
7. Conclusion & Next Steps



*Lenox, Annual Average Wind Speed at 70 m.*

*Approximate locations of sites discussed are shown in bold.*

*Sites of primary interest for wind power have a mean wind speed of 6.5 m/s or over, i.e. shown in dark green, pink or orange.*

(TrueWind Solutions,  
<http://truewind.teamcamelot.com/ne/>)

# 1. Introduction

At the request of the Massachusetts Technology Collaborative's Renewable Energy Trust, Sally Wright of the UMass Renewable Energy Research Lab (RERL) visited two potential wind turbine / wind monitoring sites in Lenox in August 2004, along with town manager Greg Federspiel. This report focuses on the siting considerations for wind-monitoring towers (met towers) as well as some of the logistics for installing a met tower. Additionally, it takes into consideration a few logistical considerations in a broad "fatal flaw" analysis for potential wind turbine installations. This report is not intended to and should not be considered a wind turbine siting study.

## Note

- This document assumes some familiarity with wind power technology on a community scale, as well as wind resource assessment. For an introduction to these areas, please refer to RERL's Community Wind Fact Sheets, which are available on the web at: [http://www.ceere.org/rerl/about\\_wind/](http://www.ceere.org/rerl/about_wind/). These sheets include information on the following subjects:
- [Wind Technology Today](#)
- [Performance, Integration, & Economics](#)
- [Capacity Factor, Intermittency, and what happens when the wind doesn't blow?](#)
- [Impacts & Issues](#)
- [Siting in Communities](#)
- [Resource Assessment](#)
- [Interpreting Your Wind Resource Data](#)
- [Permitting in Your Community](#)

## 2. Sites considered

This report focuses on two local peaks of the Lenox Mountain ridge, lying on either side of Reservoir Road, in the Lenox watershed. These two locations were chosen by the Lenox Renewable Energy Committee.

Below is a listing of site characteristics. The following pages show photographs and ortho-photos for each site.

### Site characteristics

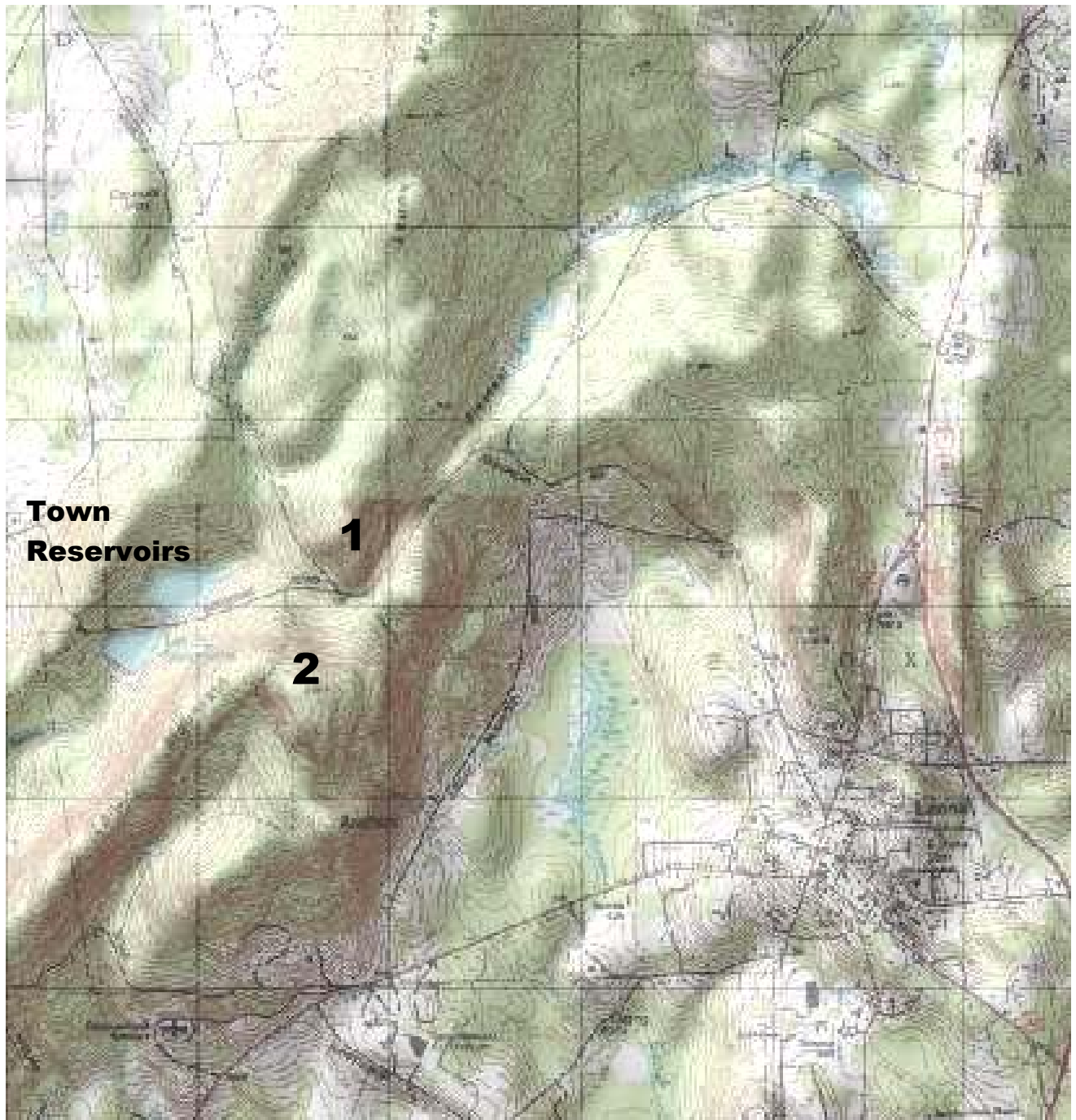
Site:	1. North of Reservoir Road	2. South of Reservoir Road
Owner	Town of Lenox	Town of Lenox, at the border of land owned by Berkshire Natural Resources Council (BNRC)
Approximate elevation	1,800 feet	1,790 feet
Clearing, terrain	Oak & brush will need to be cleared	Mature trees would have to be cleared.
Road Access:	From Reservoir Road, take a gated, dirt road in relatively good condition. Then turn onto about 900 feet of old logging road (that would have to be cleared), which takes you to within about 200 feet of the peak. This last, steep stretch is currently reached by hiking trails or bushwhacking.	From Reservoir Road, drive or hike up a dirt road about 1000 feet. Turn off the road and hike about another 200 feet to the highest point on Lenox Watershed land, next to the BNRC border.
Soil quality:	Rough granite ledge	Presumably rough granite ledge
Security:	Hiking trails pass over this peak	Hiking trails nearby
Distance to Distribution/Transmission lines	About 0.8 miles to the town pump station.	About 0.5 miles to the town pump station.
On-site electrical loads	Pump station	Pump station
Electric costs	TBD	TBD
Nearby residential areas:	About ½ mile away in Richmond and Lenox	About ½ mile away in Richmond and Lenox
Nearby cell & radio towers	Unknown. Fire tower 1.3 miles to the north at the ridge's high point.	Unknown

The fire tower to the north of these sites was also mentioned by the town but was not visited and is not discussed in this report. This site can be expected to have the highest winds in Lenox, with predicted mean speeds of 8-8.5 m/s. Also, the existing road to the top would improve access.



## Maps:

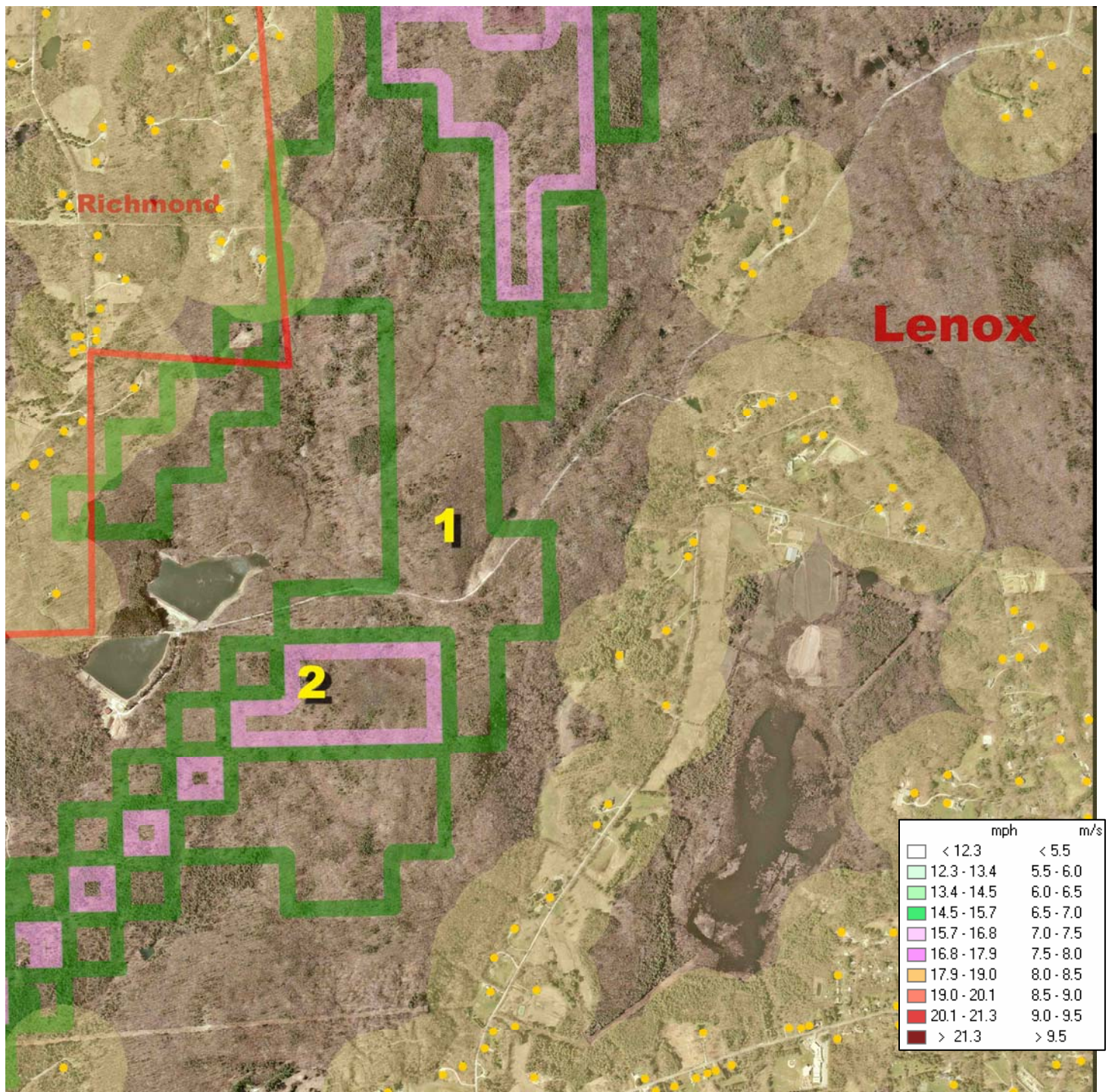
The topographic map offered by the town manager:



## Ortho-photograph with wind map

Key:

- Red: Approximate town boundary
- Yellow: Nearby residences, and a 241-meter (791 feet, or 0.15 mile) buffer
- Pink & green: Outlines of areas in TrueWind map (70-meter mean wind speeds. See page 1 for the full map)





## Photos

### Site 1:

Left: the top of the hill.

Below: the view east from the upper reservoir's dam



### Site 2:

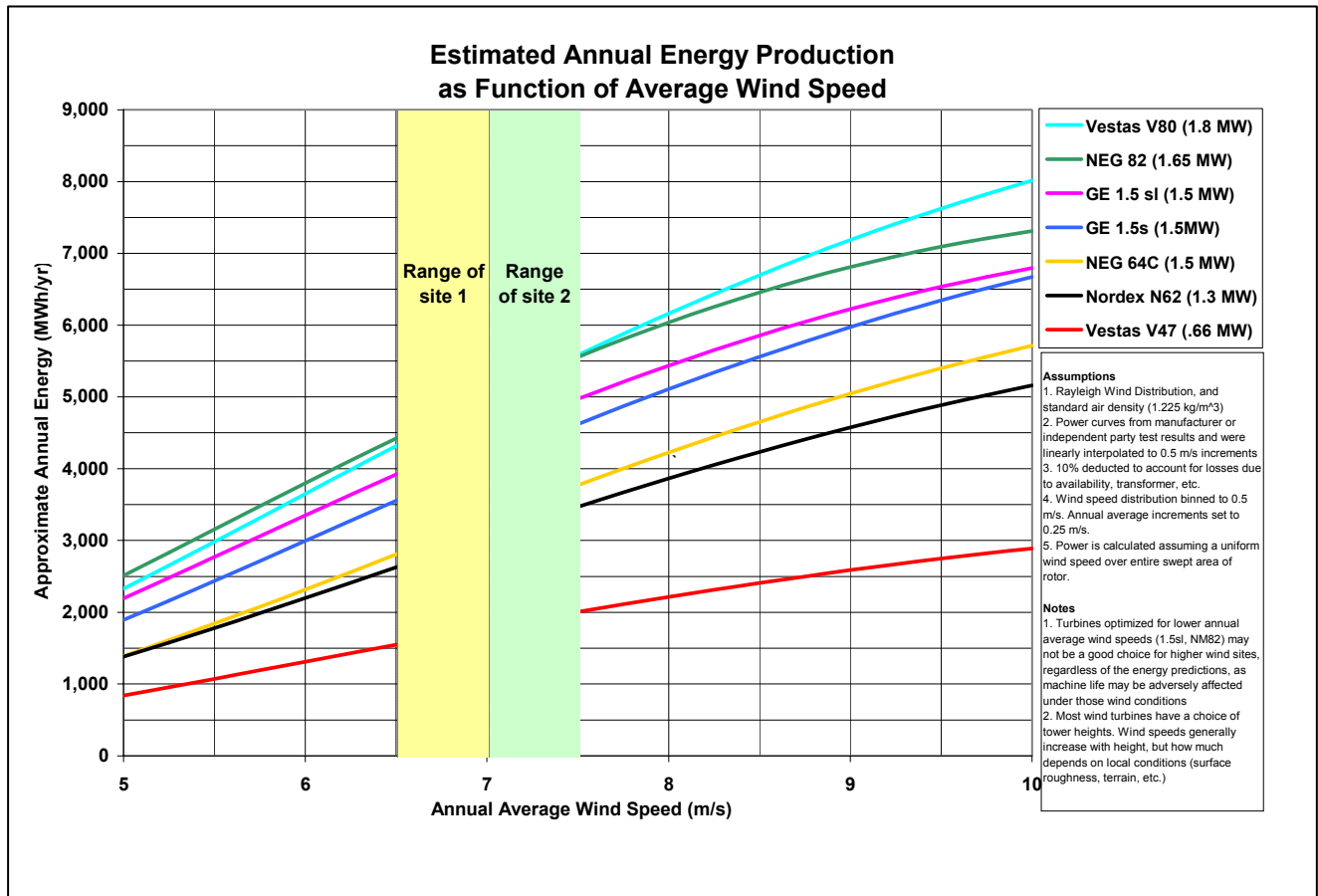
Left: the slope at the property boundary (marked with a blue “Public Watershed Property” tag). The water shed is down to the right of the photo.

Below: the view east from the far side



### 3. Predicted Wind Resource

The feasibility of wind power depends on many factors. One of the most important factors is wind speed. The power in wind varies with the cube of its speed, so small changes or inaccuracies in wind speed will mean big changes in annual energy production. The chart below demonstrates the impact of mean wind speed on wind turbine output at the two sites. Note that both the axes of this graph, wind speeds and the annual energy, are estimates.



#### TrueWind Estimates:

According to the modeled wind speeds in the TrueWind map included on the first page of this report, predicted annual average wind speeds are as follows:

Estimated annual average wind speeds	1. North of Reservoir Road	2. South of Reservoir Road
At a height of 70 m	6.5-7 m/s (14.5-15.7 mph)	7-7.5 m/s (15.7-16.8 mph)

These TrueWind estimates are used for screening and do not eliminate the need for site-specific anemometry.

## **Other available wind data**

Various groups have monitored wind in the Berkshires for many years, though to our knowledge not in Lenox itself. Other data from the Berkshires includes:

- Eight miles to the east in October Mountain (Petricca Tower), available at: [ftp://ftp.ecs.umass.edu/pub/rerl/outgoing/Wind\\_Resource\\_Data/WesternMass/](ftp://ftp.ecs.umass.edu/pub/rerl/outgoing/Wind_Resource_Data/WesternMass/)
- RERL's met tower at Savoy is 24 miles to the north: [http://www.ceere.org/rerl/publications/resource\\_data/Savoy/](http://www.ceere.org/rerl/publications/resource_data/Savoy/)

## **Obstacles to wind flow**

Both sites have mature trees about 30-50 tall that will cause turbulence and slowing of the wind. Both sites have reasonably good exposure to the west, the prevailing wind direction. These are important factors in site selection for a wind turbine because they effect the power production.

## **Appropriateness of anemometry**

The expected wind resource is good enough that wind resource assessment in the area is appropriate. The remainder of this report will look at preliminary siting logistics for wind turbines and met towers at and around these sites.

Note that while wind resource assessment directly on the proposed wind turbine site is preferred, it is not required. If wind data are gathered in one spot, but a site for a wind turbine is chosen in another nearby location a computer model that considers the wind data and terrain can be used to extrapolate the data from one location to the other. However, as the two sites become farther apart, the level of certainty in the data goes down, and thus the amount of risk in the investment goes up. It is difficult to predict the rate at which the certainty changes with distance, and can only be estimated on a site-specific basis.

## **4. Wind Turbine Siting Considerations**

As discussed in the previous section, it is important to try to measure the wind as close to a potential wind turbine site as possible. We stress that a site for a wind turbine has not yet been considered in any depth and siting of a wind turbine is not the intended purpose of this report. The purpose of this section is to consider whether there are any “fatal flaws” to siting a wind turbine in the general areas under discussion. This information is helpful in the decision of where to measure the wind.

Furthermore, a scale of wind turbine has not been chosen. For the purposes of this discussion, it is assumed that a commercial-scale (660 – 1800 kW) wind turbine will be chosen for the shore sites, but medium-scale turbines may also be feasible.

### **Transportation accessibility for turbine installation**

With blades up to 130 feet long, modern wind turbines require transportation on roads with a fairly large turning radius and only small changes in slope.

Local roads are somewhat narrow and winding and may present transportation challenges. In particular, however, building an acceptable access road for the final approach will be difficult. For instance, the final 400 feet along which we hiked had an average slope of about 25%, whereas, for example, the maximum acceptable slope for Vestas V47 blades is 5%. This route would need to be carefully planned.

While this does not make wind power impossible in Lenox, it will make installation more difficult and more expensive than a location with a gentler slope.

### **Distance to distribution or transmission lines for distribution:**

One mile from site #1 to the power lines that come into the lower reservoir pump house.

### **Noise**

Noise considerations generally take two forms, State noise regulations, and nuisance levels at nearby residences:

A. Massachusetts state law does not allow a rise of 10 dB or greater above background levels at a property boundary (Massachusetts Air Pollution Control Regulations, Regulation 310 CMR 7.10). This sound level is very unlikely to be reached in any case at the sites we examined

B. Aside from Massachusetts’s regulations, residences must also be taken into consideration. Any eventual turbine would be sited such that it would be inaudible or minimally audible at the nearest residences. At this stage, to check for “fatal flaws,” a rule of thumb can be used: wind turbines should be sited at least three times the blade tip height from residences. Distances from mixed-use areas may be slightly shorter.

Noise is unlikely to be an issue in siting wind power at either of these locations in Lenox.

### **Nearby Airports**

Distances from nearby airports to the nearest proposed met tower/wind turbine site are:

- Pittsfield: 3.5 miles

Small airports, etc. in the area:



- Blueberry Hill, in Washington, 8 miles to the east

The FAA requires that any structure over 200' be lit. A Form 7460-1 (Notice Of Proposed Construction Or Alteration) would be sent to the FAA for any proposed wind turbine installation. Any concerns of airport personnel and other air safety regulators would be considered as part of the turbine siting process.

### Other environmental issues

The Massachusetts Audubon Society owns land to the north of the sites. They have also designated an Important Bird Area (or I.B.A., see

[http://www.massaudubon.org/Birds\\_&\\_Beyond/IBAs/index.php](http://www.massaudubon.org/Birds_&_Beyond/IBAs/index.php)) to the east, called Upper Housatonic Valley.

While a nearby IBA alone does not eliminate the possibility of siting a wind turbine nearby, it does suggest a study of bird habitats and potential avian impact. A Phase One Avian Impact study could be part of the decision process.



*Map of Berkshire IBA's, from  
www.massaudubon.org/*

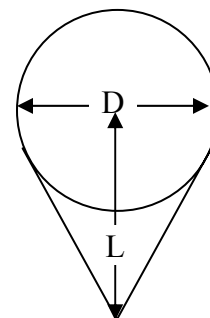


## 5. Anemometry Siting Considerations

### Space required for a met tower in general

Clearing is necessary both for met tower installation and to reduce ground effect disturbance during data collection. The cleared area is shaped like a circle for the guy wires, with an additional “wedge” in which the tower is assembled before raising. The *minimum* cleared areas for guyed towers are:

Tower Height	Minimum D (Guy diam.)	Minimum L (Space to lay the tower down)	Total Envelope
40 meter (131')	160 feet	135 feet	215 x 160 feet
50 meter (164')	240 feet	165 feet	285 x 240 feet



To get a feel for the amount of space needed for a guyed met tower, compare these sizes to a football field, which is 300' x 160'.

In general, a larger cleared area reduces the disturbances seen by the instruments, and improves data quality. Therefore, a cleared area larger than the minimum size is preferred. While it is not necessary to pull stumps, removing as much obstruction and underbrush as possible will facilitate the raising of the tower. Guy-wires will be pulled across this field, and any obstacles that entangle the wires make the job more difficult.

It is also essential that there not be any electric or telephone wires within 1.5 times the height of the tower, i.e. 200 feet of a 40m tower, or 250 feet of a 50m tower.

Trees must be cleared at least the height of the trees away from the anchors to eliminate the danger of a falling tree hitting the guys. For example, a 50-foot-tall tree within less than 50 feet of an anchor must be cut down.

### Space availability at the Lenox sites

	1. North of Reservoir Road	2. South of Reservoir Road
Space availability	There is a fairly level area at the top about 150 feet across. The hill drops off steeply on three sides beyond that. There is room for anchors and lay-down area for a 40-meter tower.	The land on the town side of the border is too steep for a guyed met tower of the type that RERL uses.  The BNRC land just to the south is level & large enough but is not town-owned.

Because of its steepness, site 2 will not be considered further in this report, unless and until the town requests that we explore other nearby options.

A 50-meter met tower would be preferred at site 1 because of the height of the mature trees, but there is only room for 40-meter tower. Because the tower will be shorter than recommended for the site, a larger than typical area should be cleared. This would reduce the impact of the trees on the wind data. A five-hundred-foot diameter would be preferred, in order to bring the treetops about to the level of the base of the tower.

### **Nearby Airports & FAA restrictions for met towers**

The Pittsfield Airport lies 3.5 miles to the north of site 1, at about 600 feet lower altitude than the hilltops. Refer to the map on the next page.

	<b>1. North of Reservoir Road</b>	<b>2. South of Reservoir Road</b>
Location	42 22 26.2 north 73 18 50.9 west Approx. Elevation: 552 m/ 1812'	42 22 03.9 north 73 19 07.4 west Approx. Elevation: 547 m /1793'
Approx. distance from Pittsfield runway	3.5 miles	3.9 miles
FAA restrictions	The FAA would require notification of a 40-meter tower at site 1, due to the height of the land.  Because the hill itself does not meet slope requirement for the Pittsfield Airport, any structure there requires the filing of a Form 7460-1 (Notice Of Proposed Construction Or Alteration).	Notification is not required. This site appears to be just outside the edge of the restricted zone that limits site number 1.  A slight change in location may change this; the new site should be rechecked.

### **Lighting**

Met tower lighting may be required by the FAA. This would be determined after the filing of a Form 7460-1. If lighting is required either a source of 120 VAC power or sufficient photovoltaic panels and batteries will be needed as an energy source for the light.

The Trust recommends FAA lighting of met towers even if not required by the FAA. This would be left to the discretion of the town and MTC.

Both sites are too far from power lines to warrant bringing 120 VAC power to the site just for lighting the met tower. Therefore photovoltaic panels and batteries would be supplied to meet the energy needs of a light on the top of a met tower..

Due to limited roads, the sites would be difficult to access for met tower installation. RERL's four-wheel-drive pick-up truck should be able to traverse the logging road, but equipment will have to be hauled or carried up the last 200 feet.

Five to ten holes would need to be drilled into the granite ledge. Rock anchors will be engaged into the holes and

This topographic map of the Lenox area in Massachusetts shows the following features:

- Landmarks and Locations:** Lenox Mountain (1830), Lenox Fire tower, Lenox Site 1, Lenox Site 2, Lenox House, The Center at Lenox, Pleasant Valley, The Cobble (1538), Osoeda Mountain (1772), Mahanna Cobble (1858), Bousquet Ski Area, Howard Brook Pond, Mud Pond, Camp Marion White, Camp Russell, Northeast Cemetery, Stevens Corner, and Pittsfield.
- Water Bodies:** Shaker Brook, Richmond Pond, Lenox Mountain Brook, Reservoir, and various smaller ponds and brooks like Yokun Brook and Pleasant Valley Brook.
- Topography:** Contour lines indicating elevations such as 1115, 1181, 1378, 1509, 1575, 1640, 1706, 1772, and 1830.
- Roads:** Major roads like Route 7 (Dugway) and Route 1A (Pittsfield) are shown.
- Other Features:** Lenox Mountain Brook, Under Mountain, Cirtwood, and various smaller settlements and landmarks like Chapel, Barkerville, Tamarack, and Pittsfield Mun.

A scale bar indicates 0.5 miles, and the map is labeled "GPS Map Detail".

Renewable Energy Research Laboratory, University of Massachusetts

## **6. Anemometry Installation Logistics**

### **Site Owner Responsibilities**

RERL is pleased to offer wind-monitoring services to the town through MTC's Community Wind Collaborative. The town's in-kind assistance will be needed in several aspects of installing a met tower. The town of Lenox would be responsible for security, some maintenance, insurance, and permitting. They are described as follows:

### **Security**

The security of the loaned monitoring equipment is the responsibility of the town. The town is expected to protect the site to its satisfaction – e.g. by installing a fence around the tower base if this seems necessary. If the site manager prefers, RERL can place the logger high enough up the pole that a ladder is required to reach it. Additionally, if PV panels are needed for FAA lighting, these would be located near the base of the met tower.

### **Maintenance**

Met towers have data loggers attached to them to collect the wind data.. The data loggers require that a memory card be periodically swapped and mailed back to RERL. Additionally, the person replacing the card would look at the tower and report anything unusual to RERL. A designated town representative (or representatives) will be trained in these simple operations at the time of installation.

### **Liability and Insurance**

The RERL loans industry-standard wind-monitoring equipment under a standard loan agreement. The form can be found at <http://www.ceere.org/rerl/projects/support/weps/agreement.pdf> or contact RERL for a copy.

The Trust requires that the site owner carry liability insurance for the met tower and name the Trust as an insured party. This requirement is described in the loan agreement.

### **Permitting: Local approval process**

RERL will support the site owner in obtaining any necessary local permits for the temporary monitoring tower (e.g. building permits or zoning variances.)

### **In-kind labor**

This is discussed in the above sections. Additionally, the town would need to clear the area where a met tower would be installed..

### **Weather**

The met tower cannot be installed in strong winds, rain, or snow. Additionally, the anchors must be installed before the ground is frozen.

Note that weather-dependence can make the planning of the project somewhat difficult. Typically RERL sets aside a one- to two-week period ahead of time, then chooses the exact days within this window, just a few days in advance.

## **Timing & sequence of events**

Met tower installation can proceed when:

1. The town chooses a location that is acceptable to RERL and MTC.
2. The site owner secures required permits, if any,
3. A loan agreement is signed and returned to the RERL, and insurance coverage is confirmed,
4. Anchoring systems have been designed, installed and tested, and
5. The RERL can schedule a work-crew, equipment – and of course good weather!

## 7. Conclusions & Next Steps

Preliminary inspection indicates that Lenox has sufficient wind speeds to warrant consideration of wind power. To understand this with more certainty requires the installation of a temporary wind-monitoring tower (“met tower”).

### Most important issues for Lenox

Lenox should discuss site selection with residents and MTC. These discussions should include both wind resource and accessibility. Site number 1, the town’s current preferred site, is not predicted to have the town’s best wind resource, and has access difficulties. The moderate wind resource at site 1 will limit its income potential, while the difficult access will increase the costs. On the other hand, site 2 is adjacent to protected land that may prove difficult for permitting.

### Next Steps

The following are recommendations for installation of a met tower:

- Understand your needs: It will be important to discuss and understand what the town would like to and can achieve as a decision is made on which site to monitor.
- Choose a site: Although site 1 has difficult access and probably lower wind, a met tower could be installed there. Site 2 will need the cooperation of the neighboring landowner. If the town is willing to consider the fire tower location, this site could be preferable from a wind development perspective because of its higher winds and better access.
- Cooperation with neighbors: Discussions with the Berkshire Natural Resources Council and the Audubon Society is recommended.
- Met tower size recommendation: If site 1 is chosen a 40-meter tower would be installed. If site 2 is chosen a 50-meter will most likely fit, but the exact site would have to be re-examined to accommodate this tower.
- Clearing for the met tower: Sufficient area will need to be cleared at either site. If site 1 is chosen, the use of a 40-meter met tower will necessitate additional clearing.
- FAA & Lighting: The FAA will have to be consulted to determine the lighting requirements. This can take 6 weeks to 3 months, and should start as soon as the town decides on a site. Because of the distance to power lines, any required lights would be powered by photovoltaic panels, batteries, and a charger system.



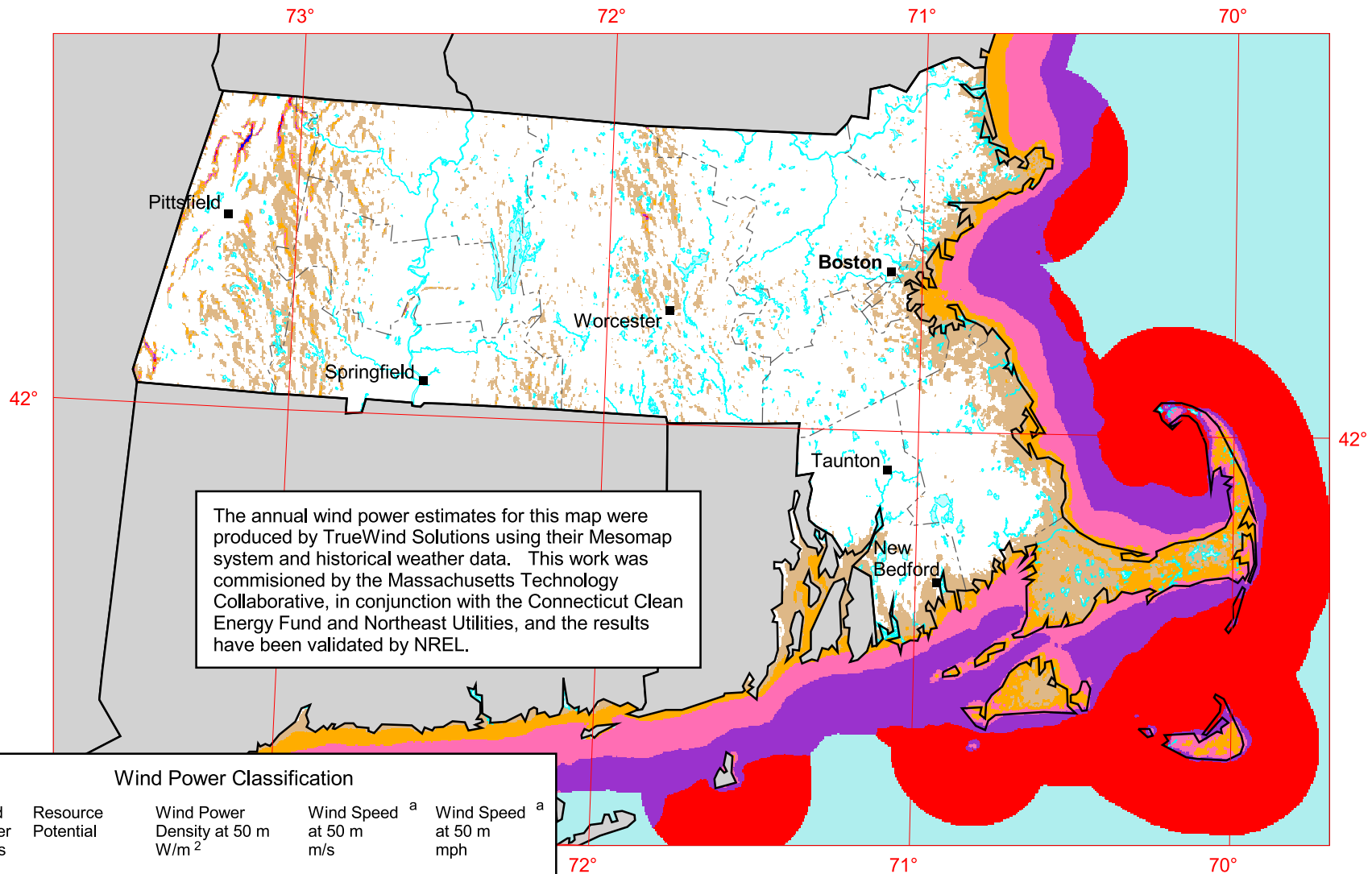
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## **APPENDIX C**

### **NREL/AWS TRUEPOWER WIND RESOURCE MAP AND MASSGIS WIND SITING TOOL MAP**

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# Massachusetts - 50 m Wind Power



## Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m $W/m^2$	Wind Speed <sup>a</sup> at 50 m m/s	Wind Speed <sup>a</sup> at 50 m mph
1	Poor	0 - 200	0.0 - 5.6	0.0 - 12.5
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	> 800	> 8.8	> 19.7

<sup>a</sup> Wind speeds are based on a Weibull k value of 2.0

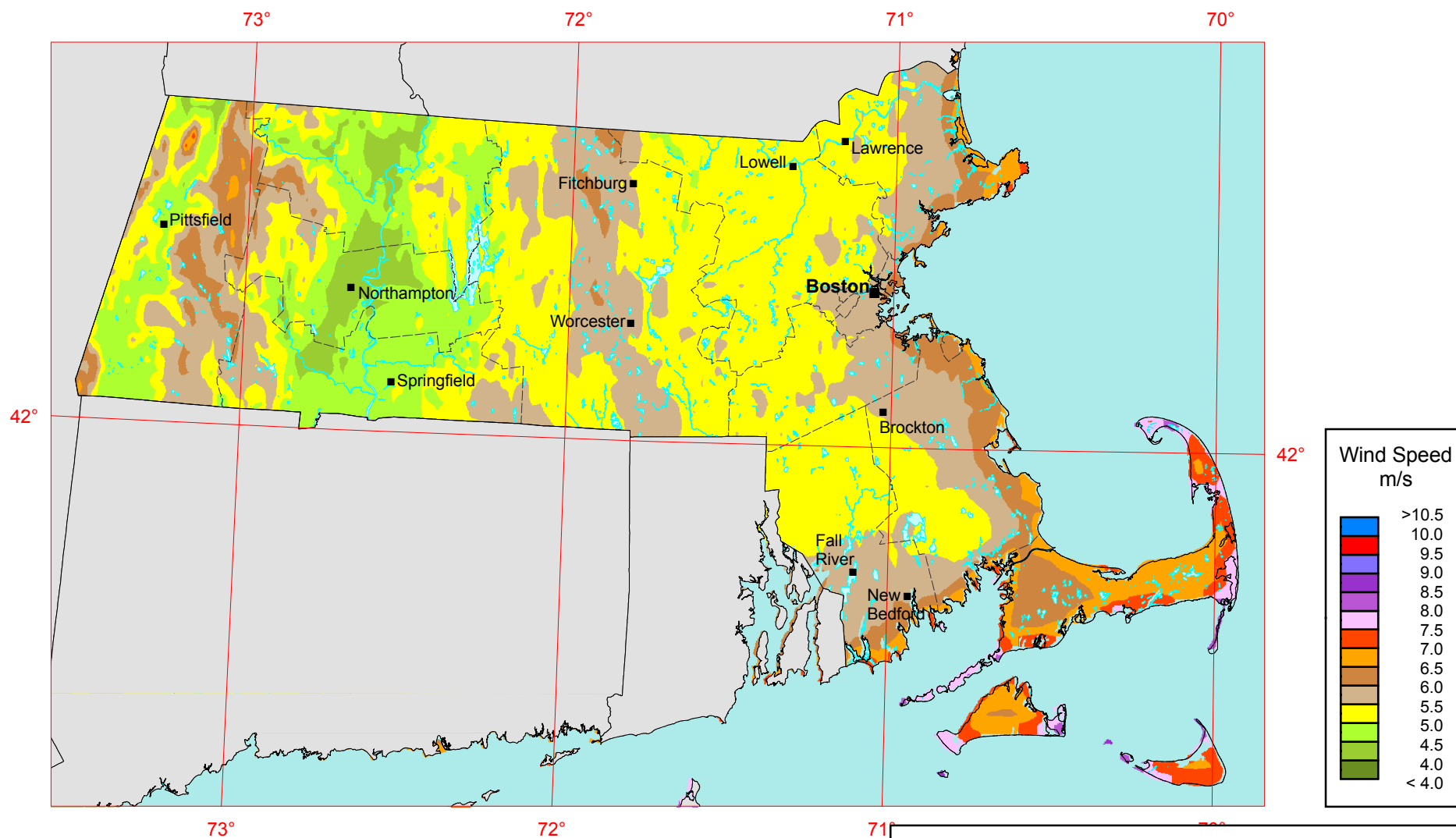


U.S. Department of Energy  
National Renewable Energy Laboratory

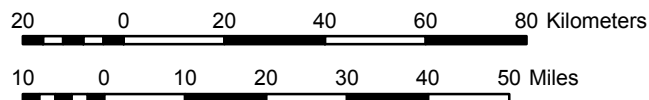


06-FEB-2007 2.1.3

# Massachusetts - Average Annual Wind Speed at 80 m



Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: <http://www.windnavigator.com> | <http://www.awstruepower.com>. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 19 WGS84.



**AWS Truepower™**  
Where science delivers performance.



**NREL**  
NATIONAL RENEWABLE ENERGY LABORATORY

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## **APPENDIX D**

### **MASSACHUSETTS MODEL WIND FACILITY BYLAWS**

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# Model As-of-Right Zoning Ordinance or Bylaw: Allowing Use of Wind Energy Facilities

Prepared by:  
Department of Energy Resources  
Massachusetts Executive Office of Environmental Affairs

March 2009

*This Model By-Law was prepared to assist cities and towns in establishing reasonable standards for wind power development. The by-law is developed as a model and not intended for adoption without specific review by municipal counsel.*

## 1.0 Purpose

The purpose of this bylaw is to provide standards for the placement, design, construction, operation, monitoring, modification and removal of wind facilities that address public safety, minimize impacts on scenic, natural and historic resources and to provide adequate financial assurance for the eventual decommissioning of such facilities.

The provisions set forth in this bylaw shall take precedence over all other bylaws when considering applications related to the construction, operation, and/or repair of land-based wind energy facilities.

### 1.1 Applicability

This section applies to all utility-scale and on-site wind facilities proposed to be constructed after the effective date of this section. This section also pertains to physical modifications to existing wind facilities that materially alter the type, configuration, or size of such facilities or related equipment.

This section does not apply to off-shore wind systems.

## 2.0 Definitions

**As-of-Right Siting:** As-of-Right Siting shall mean that development may proceed without the need for a special permit, variance, amendment, waiver, or other discretionary approval. As-of-right development may be subject to non-discretionary site plan review to determine conformance with local zoning bylaws as well as state and federal law. As-of-right development projects that are consistent with zoning bylaws and with state and federal law cannot be prohibited.

**Building Inspector:** the inspector of buildings, building commissioner, or local inspector charged with the enforcement of the state building code.

**Building Permit:** The permit issued in accordance with all applicable requirements of the Massachusetts State Building Code (780 CMR).

**Designated Location:** The location[s] designated by [the community's local legislative body] in accordance with M.G.L. c. 40A, section 5, where wind energy facilities may be sited as-of right. Said location[s] [is/are] shown on a Zoning Map [insert title of map]. This map is hereby made a part of this Zoning Bylaw and is on file in the Office of the [Town/City] Clerk.

*Note: The "designated location" refers to the location within a community where wind power generation is permitted as-of-right. Establishment of a designated location for wind power generation is an integral part of the process of adopting an As-of-Right Wind Energy Facility Bylaw.*

*Legal Requirements: The process of designating the location must comport with the requirements of Section 5 of Chapter 40A of the Massachusetts General Laws which sets out the requirements for adopting and amending zoning bylaws.*

*Communities should keep in mind the requirements of the Green Communities Program. To qualify for designation as a Green Community, the designated area must provide a realistic and practical opportunity for development of wind power generation. An average wind speed of six meters per second at 50 meters elevation is considered the minimum wind speed for commercial scale wind generation, however, the potential for power generation increases exponentially with increased average wind speeds.*

*To satisfy the as-of-right zoning requirement contained in the Green Communities Act, the as-of-right bylaw must allow for wind energy facilities that utilize at least one turbine with a rated nameplate capacity of 600 kW or more.*

*Methods of Designating a Location: Communities may designate locations by reference to geographically specific zoning districts. In the alternative, communities may create an overlay district consisting of all or portions of multiple preexisting zoning districts, where wind power generation is permitted by right. In designating a location, it is important for the community implementing the zoning bylaw to consider the availability of wind and particular characteristics of the local community.*

**Height:** The height of a wind turbine measured from natural grade to the tip of the rotor blade at its highest point, or blade-tip height.



*Note: The height of the wind energy facility will have a direct impact on the amount of power it generates. While actual outputs vary, a wind turbine that is 250 feet tall will have an average nameplate capacity of roughly 660 kW, whereas a turbine that is 450 feet will have an average nameplate capacity of roughly 1.5 to 2.0 MW.*

*As previously mentioned, to satisfy the as-of-right zoning requirement contained in the Green Communities Act, the as-of-right bylaw must allow for the construction and operation of wind generation facilities that utilize at least one turbine with a rated nameplate capacity of 600 kW or more.*

*Actual generating capacity must be considered not only in terms of tower height, but also in light of average wind speeds at a given location.*

**Rated Nameplate Capacity:** The maximum rated output of electric power production equipment. This output is typically specified by the manufacturer with a “nameplate” on the equipment.

**Site Plan Review Authority:** Refers to the body of local government designated by the municipality to review site plans.

**Utility-Scale Wind Energy Facility:** A commercial wind energy facility, where the primary use of the facility is electrical generation to be sold to the wholesale electricity markets.

**Wind Energy Facility:** All of the equipment, machinery and structures together utilized to convert wind to electricity. This includes, but is not limited to, transmission, storage, collection and supply equipment, substations, transformers, service and access roads, and one or more wind turbines.

**Wind Monitoring or Meteorological Tower:** A temporary tower equipped with devices to measure wind speed and direction, to determine how much electricity a wind energy facility can be expected to generate.

**Wind Turbine:** A device that converts kinetic wind energy into rotational energy to drive an electrical generator. A wind turbine typically consists of a tower, nacelle body, and a rotor with two or more blades.

**Zoning Enforcement Authority:** The person or board charged with enforcing the zoning bylaws.

*Note: By state statute, this may be the “inspector of buildings, building commissioner or local inspector, or if there are none, in a town, the board of selectmen, or person or board designated by local ordinance or by-law”. MGL 40A § 7. In many communities, the building inspector is the person charged with enforcing both the state’s building code and local zoning bylaws.*

### 3.0 General Requirements for all Wind Energy Facilities

The following requirements are common to all wind energy facilities to be sited in designated locations.

#### 3.1 Compliance with Laws, Ordinances and Regulations

The construction and operation of all such proposed wind energy facilities shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, environmental, electrical, communications and aviation requirements.

#### 3.2 Building Permit and Building Inspection

No wind energy system shall be erected, constructed, installed or modified as provided in this section without first obtaining a building permit.

*Note: Under the state building code, work must commence within six (6) months from the date a building permit is issued, however, a project proponent may request an extension of the permit and more than one extension may be granted.*

#### 3.3 Fees

The application for a building permit for a wind energy system must be accompanied by the fee required for a building permit.

#### 3.4 Site Plan Review

No wind energy facility shall be erected, constructed, installed or modified as provided in this section without first undergoing site plan review by the Site Plan Review Authority.

*Purpose: The purpose of the site plan review is to determine that the use complies with all requirements set forth in this zoning by-law and that the site design conforms to established standards regarding landscaping, access, noise and other zoning provisions.*

*Additional Considerations: As part of the implementation of an as-of-right wind energy bylaw, communities should consider amending their existing site plan review provisions in order to incorporate site plan review conditions that apply specifically to wind energy facilities.*

##### 3.4.1 General

All plans and maps shall be prepared, stamped and signed by a professional engineer licensed to practice in Massachusetts.

##### 3.4.2 Required Documents

Pursuant to the site plan review process, the project proponent shall provide the following documents:

(a) A site plan showing:

- i. Property lines and physical dimensions of the site parcel and adjacent parcels within 300 feet of the site parcel;

- ii. Outline of all existing buildings, including purpose (e.g. residence, garage, etc.) on site parcel and all adjacent parcels within 500 feet of the site parcel, including distances from the wind facility to each building shown;
  - iii. Location of the proposed tower, foundations, guy anchors, access roads, and associated equipment;
  - iv. Location of all existing and proposed roads, both public and private, and including temporary roads or driveways, on the site parcel and adjacent parcels within 500 feet of the site parcel;
  - v. Any existing overhead utility lines;
  - vi. Existing areas of tree cover, including average height of trees, on the site parcel and any adjacent parcels within a distance, measured from the wind turbine foundation, of 1.2 times the height of the wind turbine;
  - vii. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting (other than FAA lights), screening vegetation or structures;
  - viii. Tower foundation blueprints or drawings signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts;
  - ix. Tower blueprints or drawings signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts;
  - x. One or three line electrical diagram detailing wind turbine, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;
  - xi. Documentation of the wind energy facility's manufacturer and model, rotor diameter, tower height, tower type (freestanding or guyed), and foundation type/dimensions;
  - xii. Name, address, phone number and signature of the applicant, as well as all co- applicants or property owners, if any;
  - xiii. The name, contact information and signature of any agents representing the applicant; and
  - xiv. A maintenance plan for the wind energy facility;
- (b) Documentation of actual or prospective access and control of the project site (see also Section 3.5);
- (c) An operation and maintenance plan (see also Section 3.6);
- (d) A location map consisting of a copy of a portion of the most recent USGS Quadrangle Map, at a scale of 1:25,000, showing the proposed facility site, including turbine sites, and the area within at least two miles from the facility. Zoning district designation for the subject parcel should be included; submission of a copy of a zoning map with the parcel identified is suitable for this purpose;
- (e) Proof of liability insurance;
- (f) Certification of height approval from the FAA;
- (g) A statement that evidences the wind energy facility's conformance with Section 3.10.6, listing existing ambient sound levels at the site and maximum projected sound levels from the wind energy facility; and
- (h) Description of financial surety that satisfies Section 3.12.3.

The Site Plan Review Authority may waive documentary requirements as it deems appropriate.

*Additional Consideration (expedited site plan review for smaller wind energy facilities): The extensive site plan review documentation set forth in Section 3.3.2 of this model bylaw may not be appropriate for smaller wind energy facilities, such as those utilizing turbines under 150 feet in height. Accordingly, communities should consider incorporating a provision in their bylaw that allows smaller wind energy projects to undergo a site plan review with fewer required documents. One of the key goals underpinning the Green Communities Program is the development of renewable and alternative energy capacity. Communities should shape their bylaws to enable both large and small wind energy projects to proceed without undue delay.*

### 3.5 Site Control

The applicant shall submit documentation of actual or prospective access and control of the project site sufficient to allow for installation and operation of the proposed wind energy facility. Control shall include the legal authority to prevent the use or construction of any structure for human habitation within the setback areas.

### 3.6 Operation & Maintenance Plan

The applicant shall submit a plan for maintenance of access roads and storm water controls, as well as general procedures for operational maintenance of the wind facility.

### 3.7 Utility Notification

No wind energy facility shall be installed until evidence has been given that the utility company that operates the electrical grid where the facility is to be located has been informed of the customer's intent to install an interconnected customer-owned generator. Off-grid systems shall be exempt from this requirement.

### 3.8 Temporary Meteorological Towers (Met Towers)

A building permit shall be required for stand-alone temporary met towers. No site plan review shall be required for met towers.

*Note: Under the state building code, work must commence within six (6) months from the date a building permit is issued, however, a project proponent may request an extension of the permit and more than one extension may be granted.*

### 3.9 Design Standards

#### 3.9.1 Appearance, Color and Finish

Color and appearance shall comply with Federal Aviation Administration (FAA) safety requirements.

#### 3.9.2 Lighting

Wind turbines shall be lighted only if required by the FAA. Lighting of other parts of the wind energy facility, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Except as required by the FAA, lighting of the wind energy facility shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

### 3.9.3 Signage

Signs on wind energy facilities shall comply with the Town's sign by-law. The following signs shall be required:

- (a) Those necessary to identify the owner, provide a 24-hour emergency contact phone number, and warn of any danger.
- (b) Educational signs providing information about the facility and the benefits of renewable energy.

Wind turbines shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the wind energy facility.

### 3.9.4 Utility Connections

Reasonable efforts, as determined by the Site Plan Review Authority, shall be made to place all utility connections from the wind energy facility underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

### 3.9.5 Appurtenant Structures

All appurtenant structures to wind energy facilities shall be subject to reasonable regulations concerning the bulk and height of structures, lot area, setbacks, open space, parking and building coverage requirements. All such appurtenant structures, including but not limited to, equipment shelters, storage facilities, transformers, and substations, shall be architecturally compatible with each other and contained within the turbine tower whenever technically and economically feasible. Whenever reasonable, structures should be shaded from view by vegetation and/or located in an underground vault and joined or clustered to avoid adverse visual impacts.

*Note: Regulations governing appurtenant structures are typically contained in a town's zoning bylaw.*

### 3.9.6 Height

The height of wind energy facilities shall not exceed 450 feet in height.

*Note: A turbine height of 450 feet is used for illustration purposes only. Communities may set a height limit that is less than 450 feet, provided that the limit selected allows for the as-of-right construction and operation of turbines with a rated nameplate capacity of 600 kW or more.*

*Currently, a land-based turbine that is 450 feet in height is considered a large turbine. Periodically, communities may wish to revisit their siting criteria to ensure that they reflect industry standards as well as Green Communities Act requirements.*

## 3.10 Safety and Environmental Standards

### 3.10.1 Emergency Services

The applicant shall provide a copy of the project summary, electrical schematic, and site plan to the police and fire departments, and/or the local emergency services entity designated by the local government. Upon request the applicant shall cooperate with local emergency services in developing an emergency response plan. All means of disconnecting the wind energy facility shall be clearly marked. The applicant or facility owner shall identify a responsible person for public inquiries or complaints throughout the life of the project.

### 3.10.2 Unauthorized Access

Wind energy facilities shall be designed to prevent unauthorized access. For instance, the towers of wind turbines shall be designed and installed so that step bolts or other climbing features are not readily accessible to the public and so that step bolts or other climbing features are not installed below the level of 8 feet above the ground. Electrical equipment shall be locked where possible.

### 3.10.3 Setbacks

A wind turbine may not be sited within:

- (a) a distance equal to the height of the wind turbine from buildings, critical infrastructure, or private or public ways that are not part of the wind energy facility;
- (b) three times (3x) the height of the turbine from the nearest existing residential structure; or
- (c) one point five times (1.5x) the height of the turbine from the nearest property line.

### 3.10.4 Setback Waiver

The Site Plan Review Authority may reduce the minimum setback distance as appropriate based on site-specific considerations, or written consent of the affected abutter(s), if the project satisfies all other criteria for the granting of a building permit under the provisions of this section.

### 3.10.5 Shadow/Flicker

Wind energy facilities shall be sited in a manner that minimizes shadowing or flicker impacts. The applicant has the burden of proving that this effect does not have significant adverse impact on neighboring or adjacent uses.

**Educational Note:** Shadow flicker is caused by sunlight passing through the swept area of the wind turbine's blades. As sunlight passes through the spinning blades, it is possible to have a stroboscopic effect that can, under the right conditions, affect persons prone to epilepsy. In general, these conditions require varying light intensity at frequencies of 2.5-3 Hz. Large commercial turbines are typically limited to a frequency of less than 1.75 Hz. Furthermore, the impacts of shadow flicker diminish rapidly with distance and should be minimal at 10 or more rotor diameters. Though the RPM for smaller turbines is generally higher (up to 350 RPM, for some turbines), the small size of the rotor swept area, combined with the shorter tower heights, support a negligible shadow flicker impact from these types of facilities. In any case, the effects of shadow flicker are a seasonal and/or diurnal impact, requiring that the sun be at the right position in the sky to generate a line of sight with the affected building and the wind turbine rotor. As such, the impacts of shadow flicker will generally only be felt for a few hours per year.

### 3.10.6 Sound

The operation of the wind energy facility shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10).

**Educational Note:** According to the Division of Air Quality Control Policy, a source of sound will be considered to be violating 310 CMR 7.10 if the source:

- (a) Increases the broadband sound level by more than 10 dB(A) above ambient, or
- (b) Produces a "pure tone" condition – when an octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited structure. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment hours. The ambient may also be established by other means with consent from the DEP.

### 3.10.7 Land Clearing, Soil Erosion and Habitat Impacts

Clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the wind energy facility or otherwise prescribed by applicable laws, regulations, and bylaws.

## 3.11 Monitoring and Maintenance

### 3.11.1 Wind Energy Facility Conditions

The applicant shall maintain the wind energy facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures. Site access shall be maintained to a level acceptable to the local Fire Chief and Emergency Medical Services. The project owner shall be responsible for the cost of maintaining the wind energy facility and any access road(s), unless accepted as a public way.



### 3.11.2 Modifications

All material modifications to a wind energy facility made after issuance of the required building permit shall require approval by the Site Plan Review Authority.

## 3.12 Abandonment or Decommissioning

### 3.12.1 Removal Requirements

Any wind energy facility which has reached the end of its useful life or has been abandoned shall be removed. The owner/operator shall physically remove the facility no more than 150 days after the date of discontinued operations. The applicant shall notify the Site Plan Review Authority by certified mail of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of:

- (a) Physical removal of all wind turbines, structures, equipment, security barriers and transmission lines from the site.
- (b) Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
- (c) Stabilization or re-vegetation of the site as necessary to minimize erosion. The Site Plan Review Authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

### 3.12.2 Abandonment

Absent notice of a proposed date of decommissioning or written note of extenuating circumstances, the wind energy facility shall be considered abandoned when the facility fails to operate for more than one year without the written consent of the Site Plan Review Authority. If the applicant fails to remove the facility in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town may enter the property and physically remove the facility

### 3.12.3 Financial Surety

Applicants for utility-scale wind energy facilities shall provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the town must remove the facility and remediate the landscape, in an amount and form determined to be reasonable by the Site Plan Review Authority, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the applicant. Such surety will not be required for municipally or state-owned facilities. The applicant shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.

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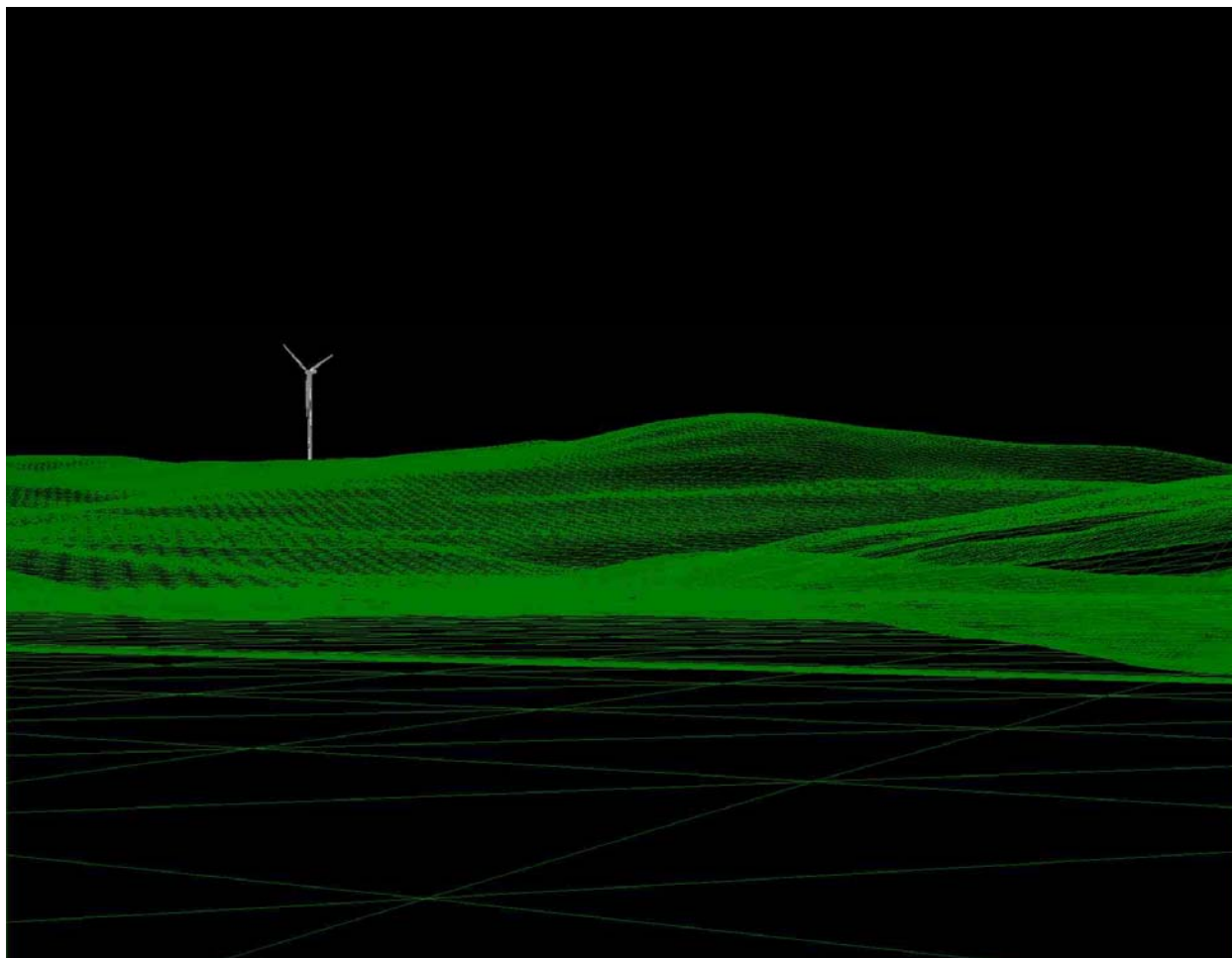
## **APPENDIX E**

### **PHOTOMONTAGE AND VISUALIZATIONS**

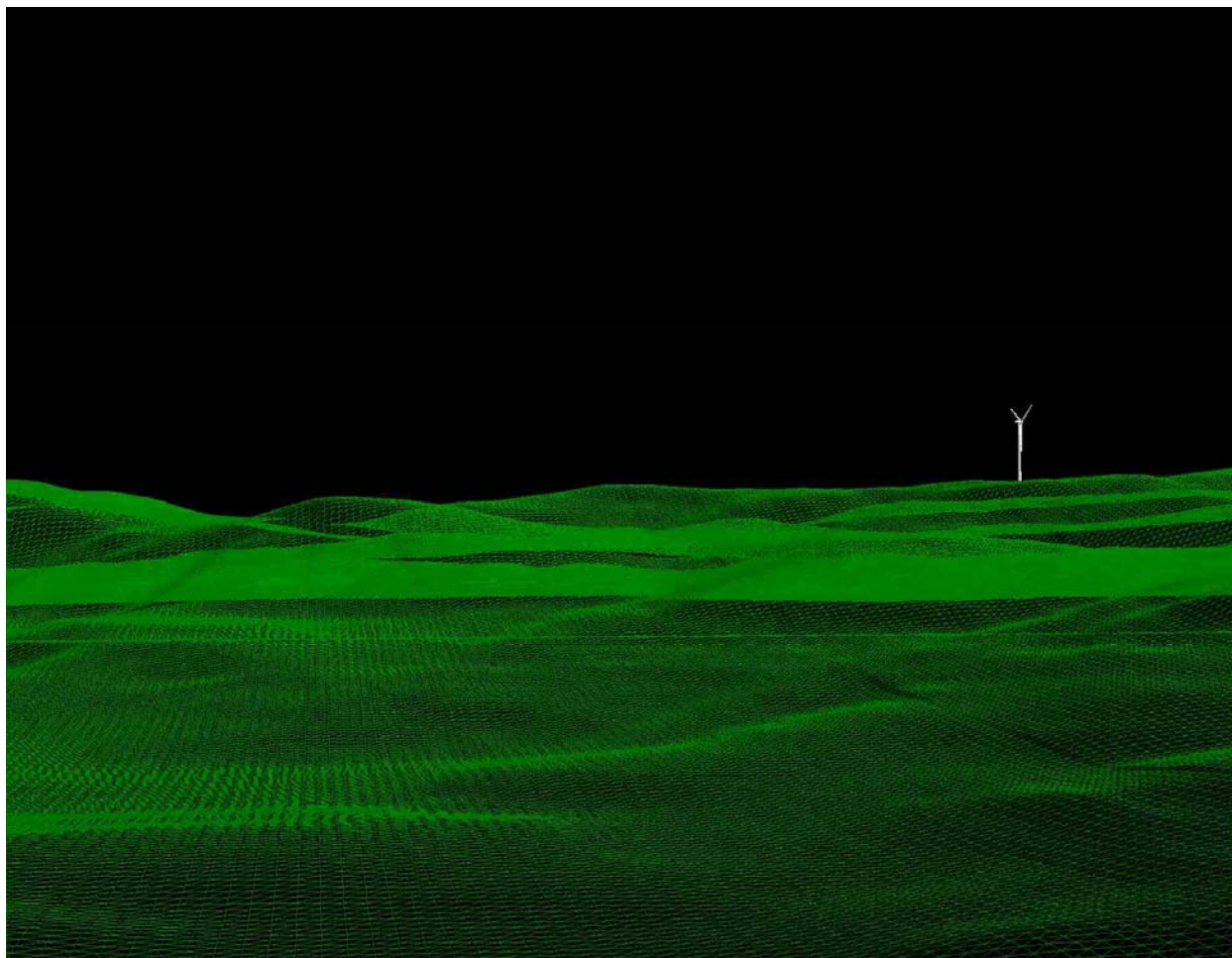
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Appendix E presents the results of the visualization analysis for both wind plant configurations considered, including the single Fuhrlander FL 1500/77 as well as the two GE 1.6-100 WTGs. Each figure presented simulates what the turbine(s) would look like situated in the existing landscape and topography from each of the viewpoints presented in Figure 4-2 of this report.

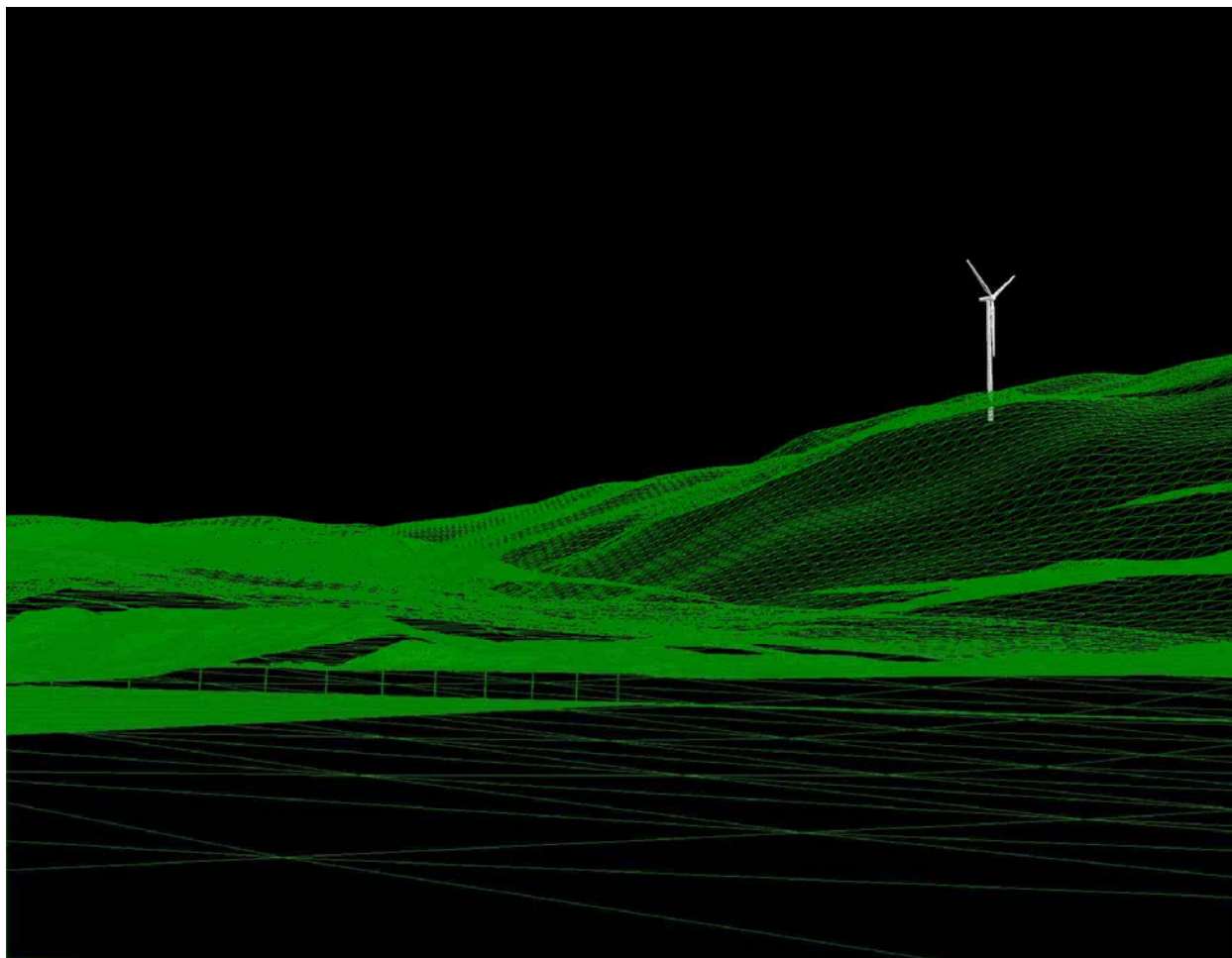
**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Northern Reservoir**



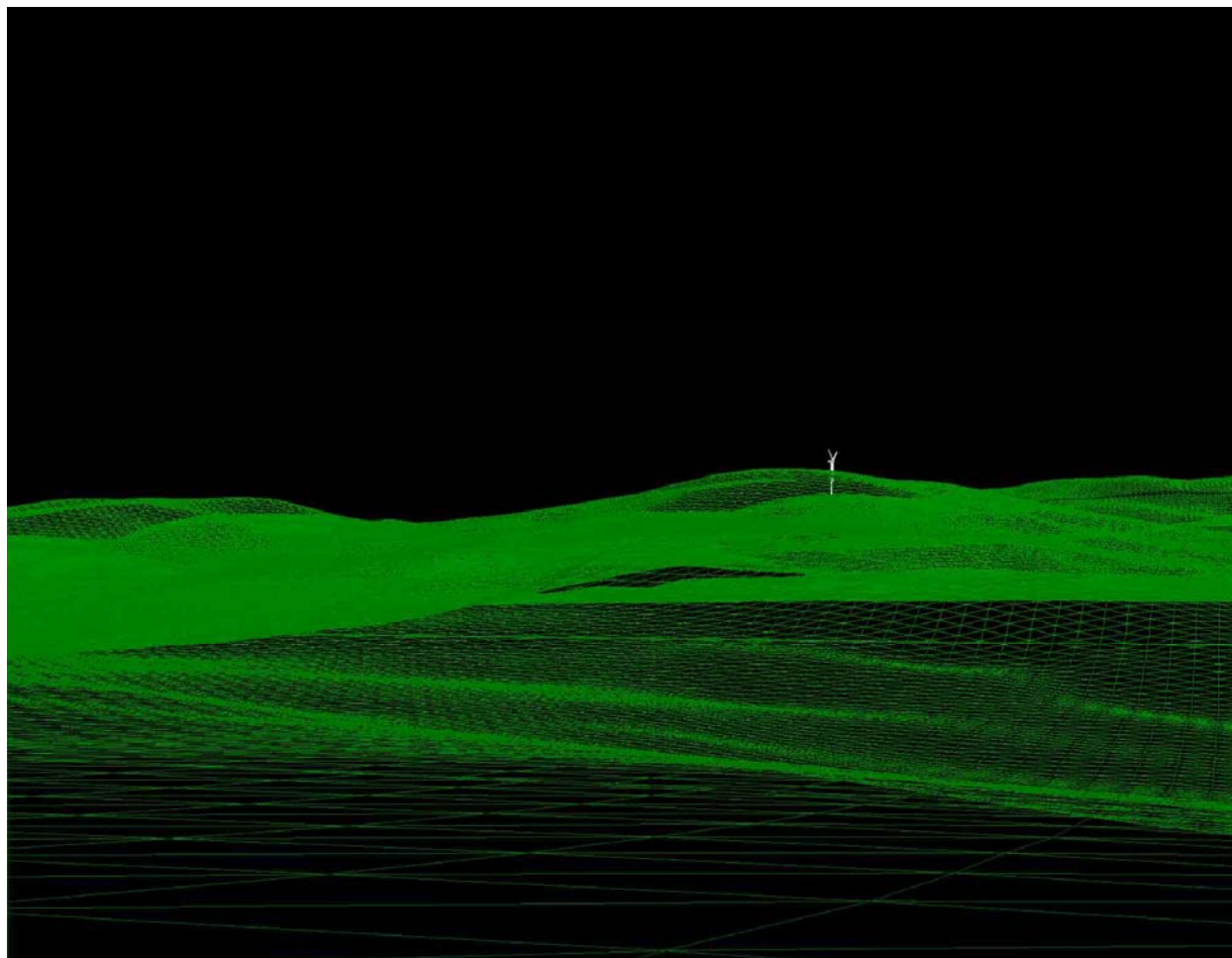
**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Kennedy Park Outlook**



**Figure E-2**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Pleasant Valley Parking Lot**

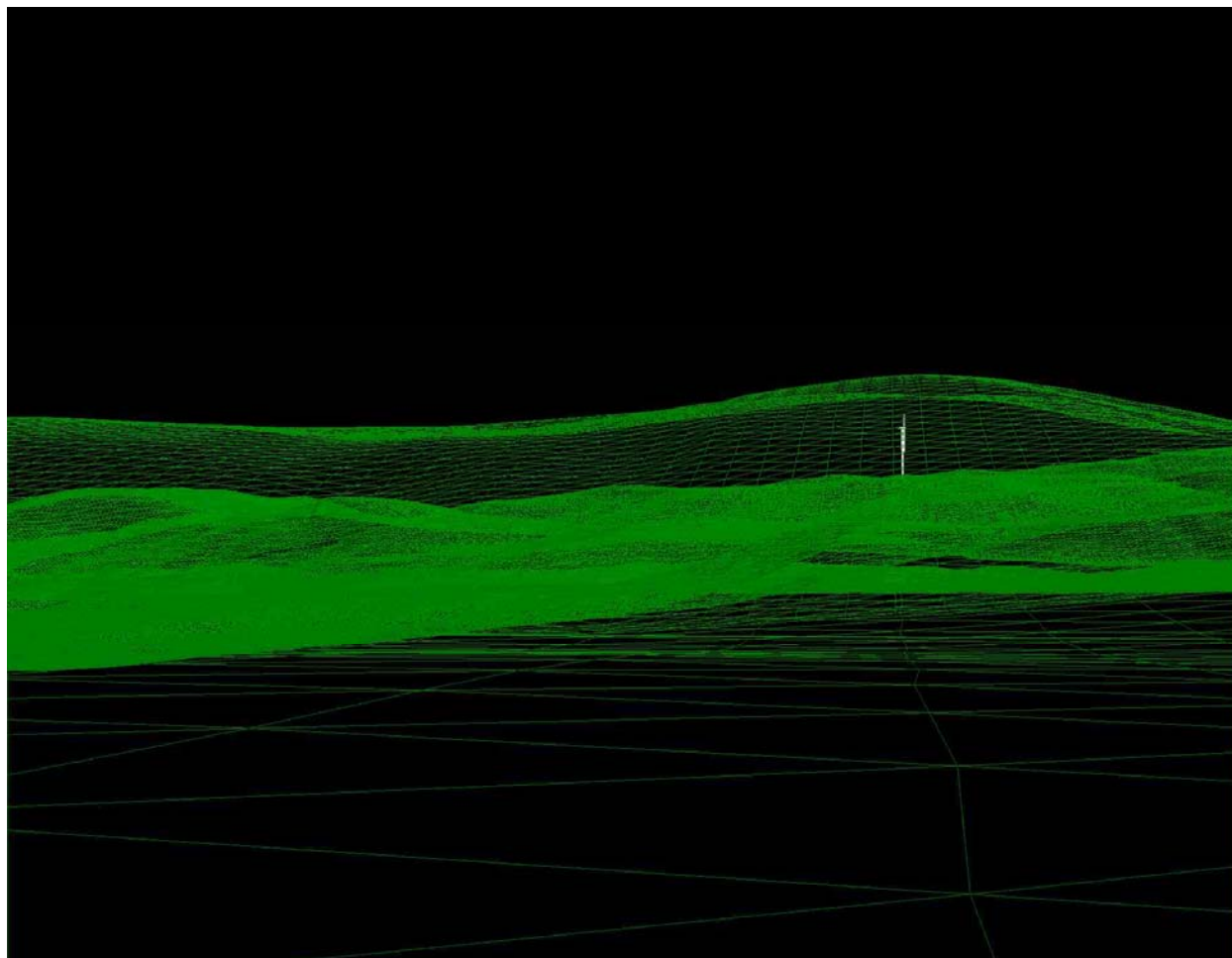


**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from 12 Oaks Condominiums**



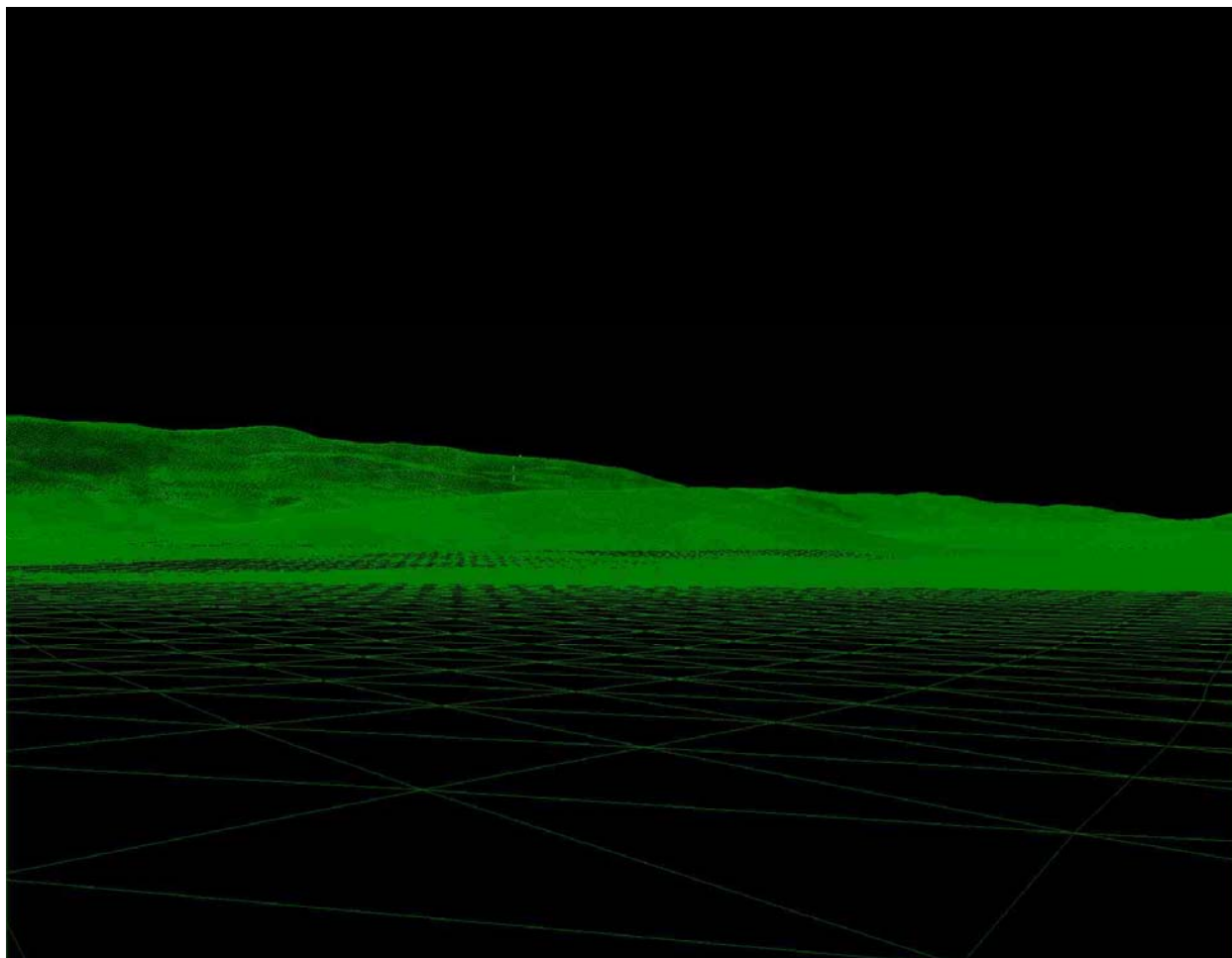


**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Lenox Shops Parking Lot**



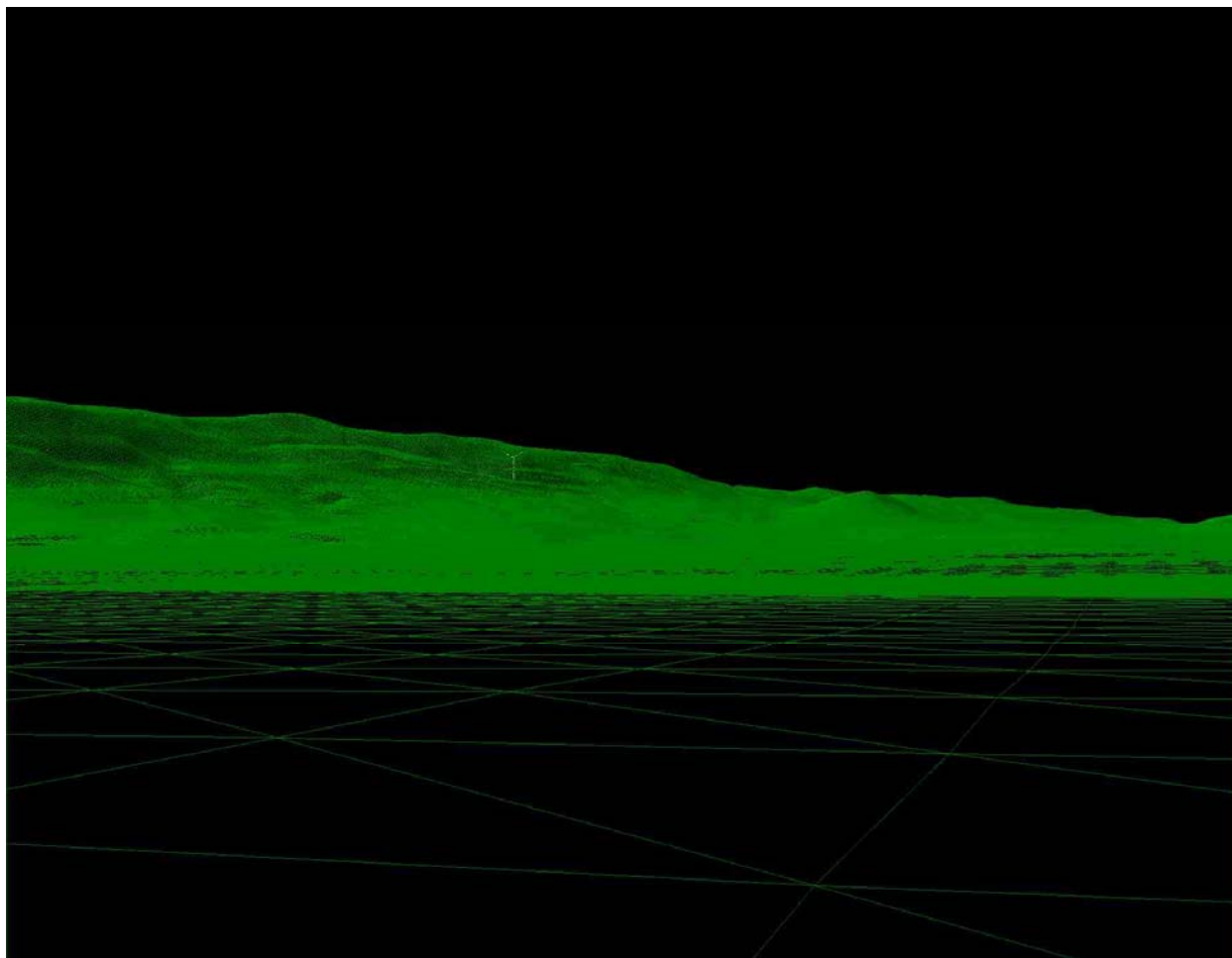
Note: Wind turbine not visible from this viewpoint.

**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Hancock Shaker Village Parking Lot**



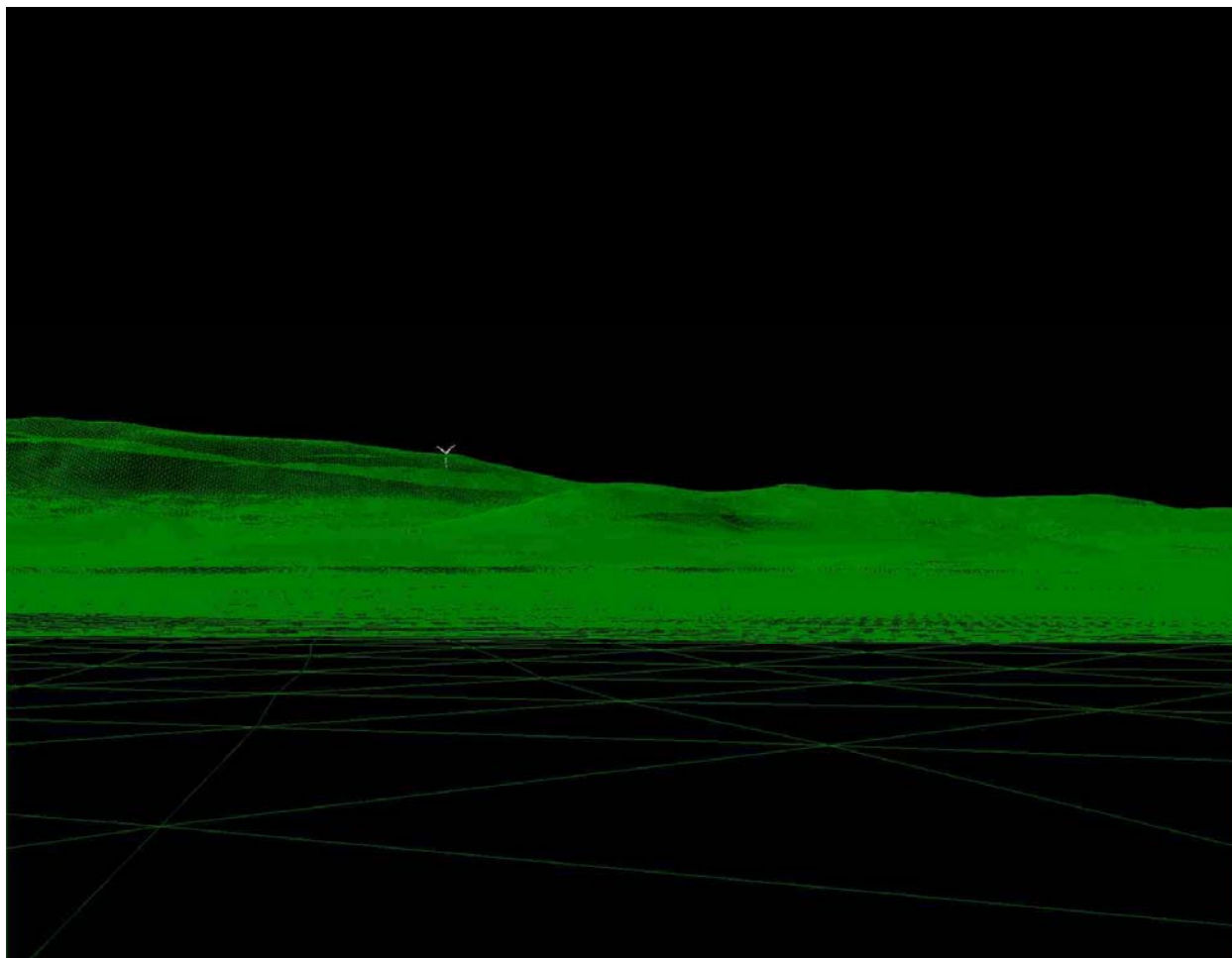
Note: Only the blades of the wind turbine are visible from this viewpoint (partial blade only).

**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from Route 41**

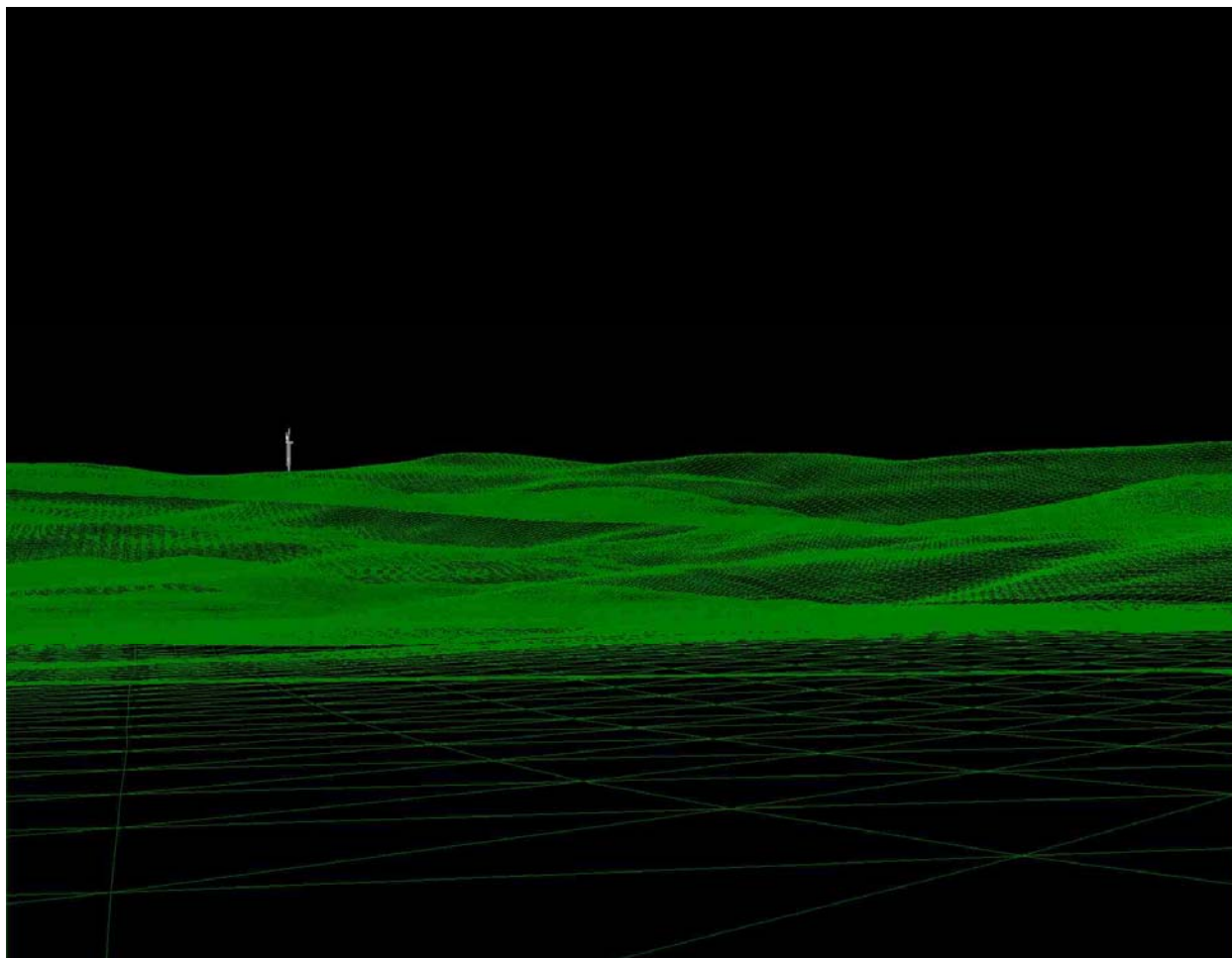


Note: Wind turbine not visible from this viewpoint.

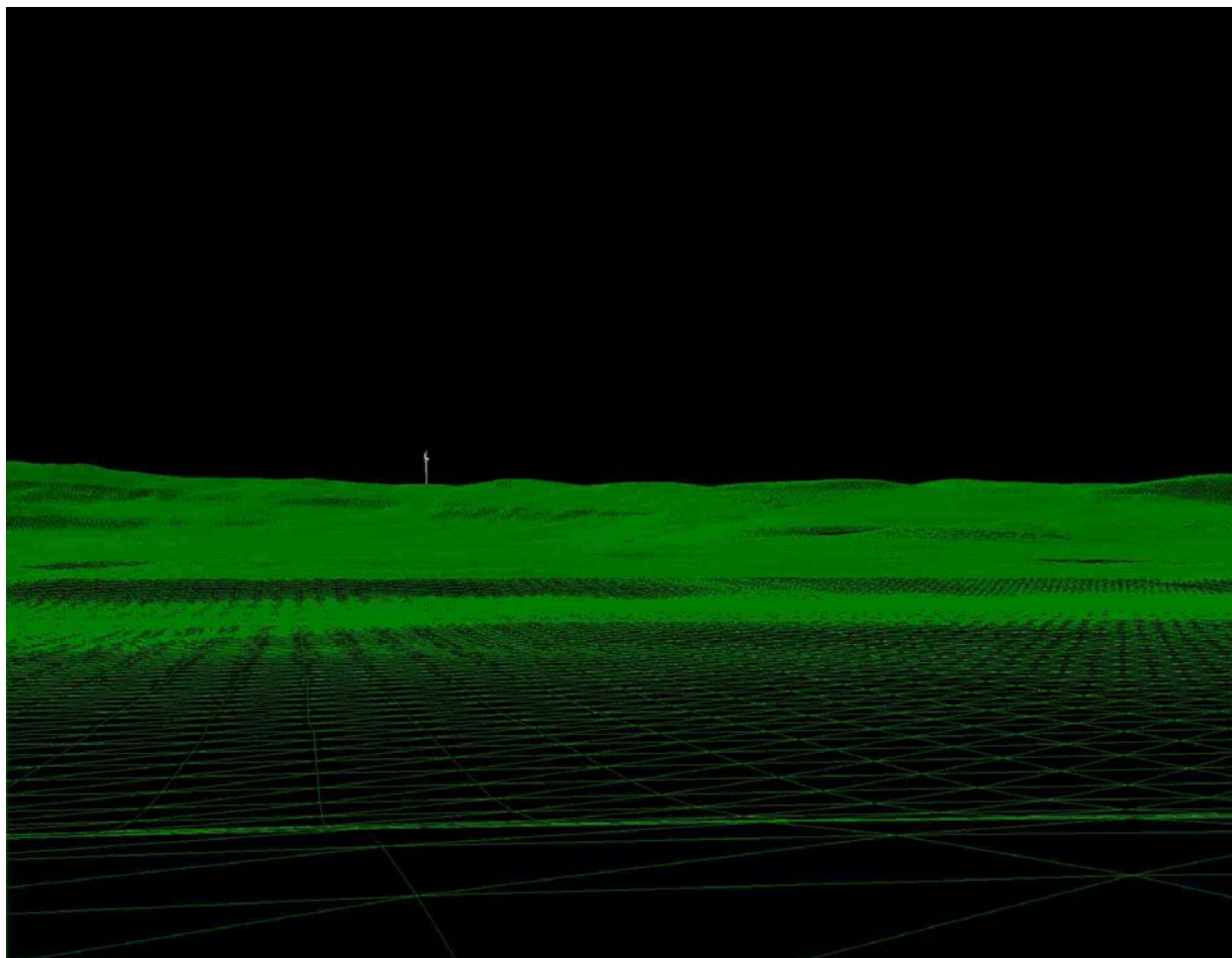
**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from 707 Route 41 (State Road)**



**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from Swamp Road**

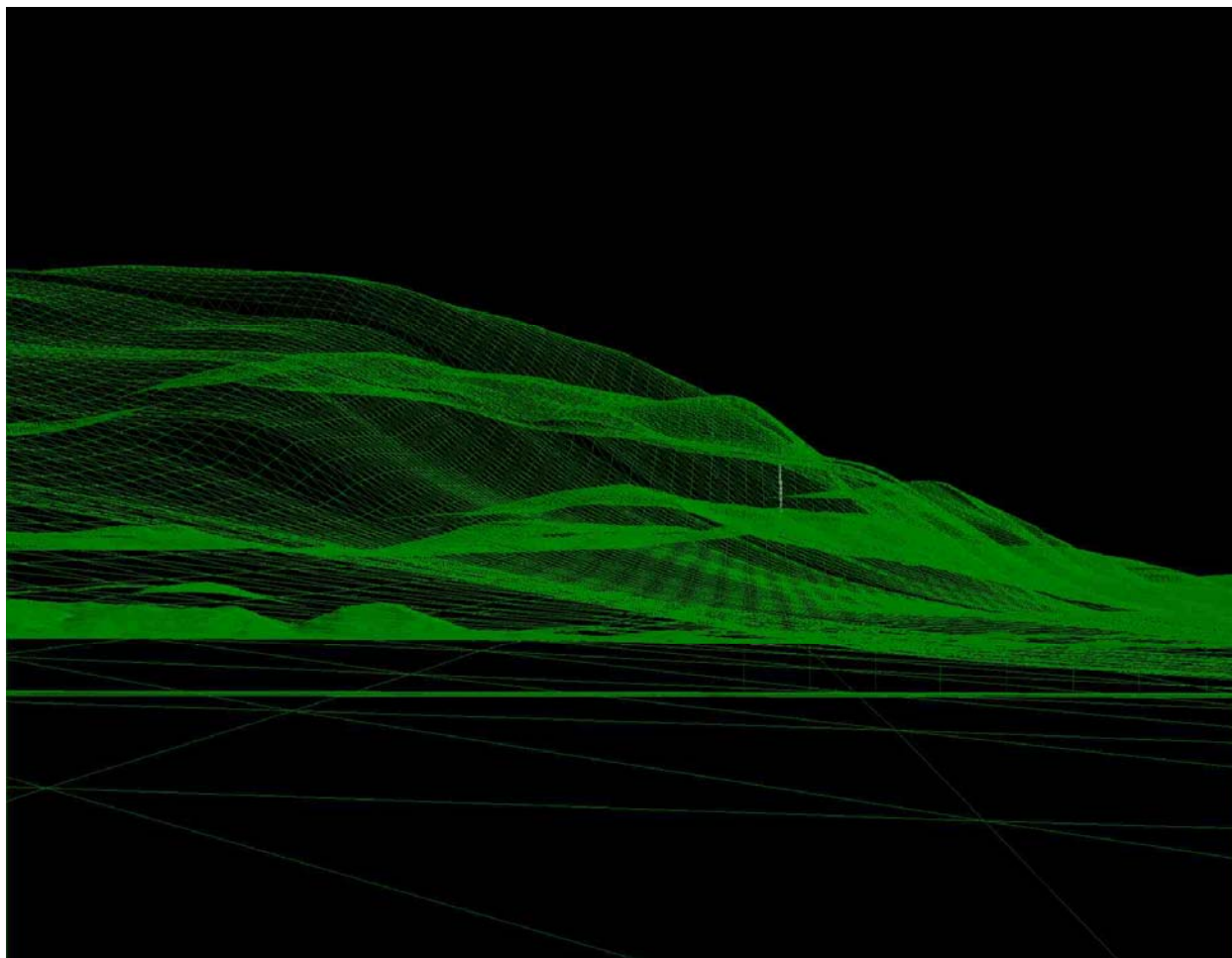


**Figure E-11**  
**(1) - Fuhrländer FL 1500/77**  
**View from the Richmond Consolidated School Parking Lot**





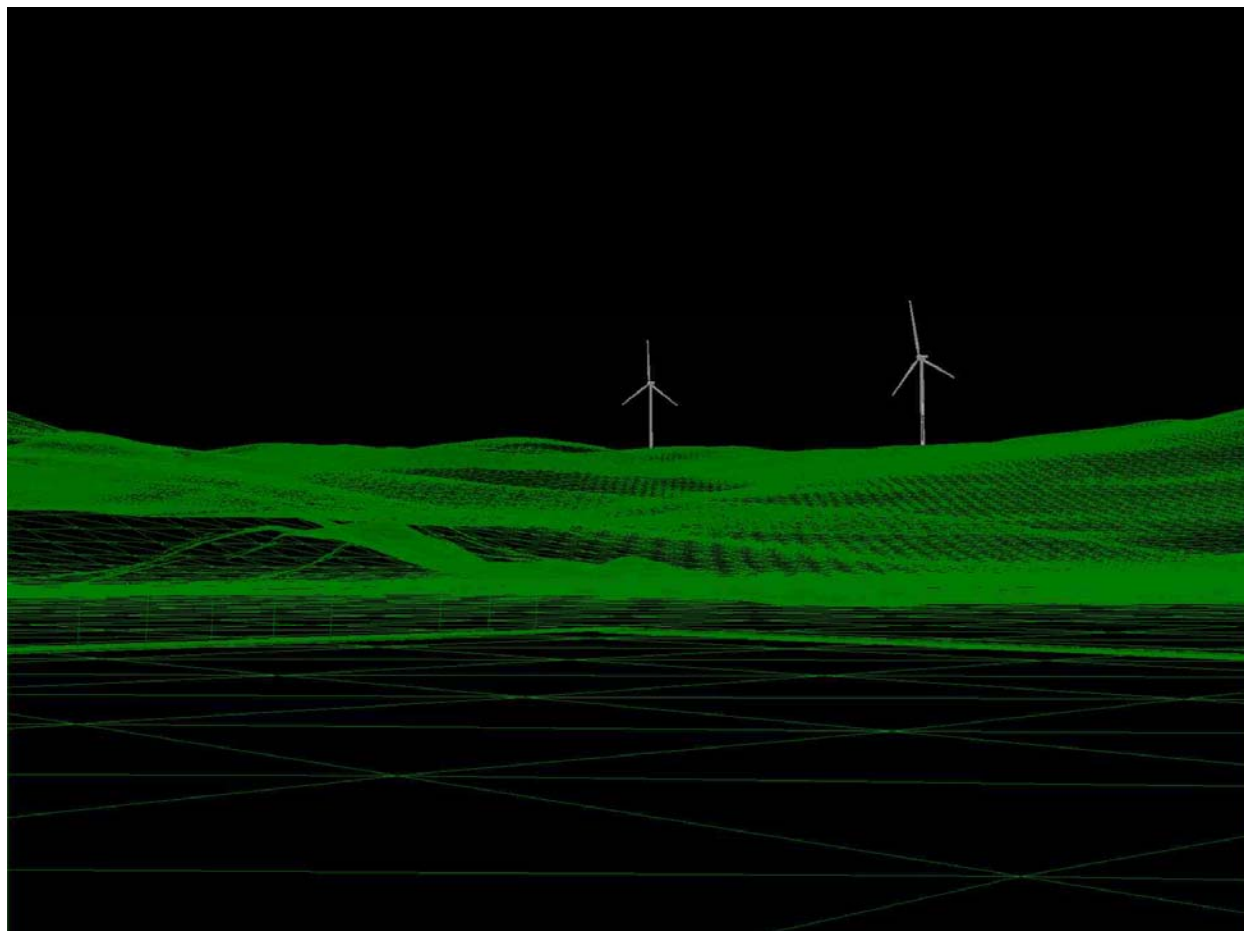
**Figure E-1**  
**(1) - Fuhrländer FL 1500/77**  
**View from Tanglewood**



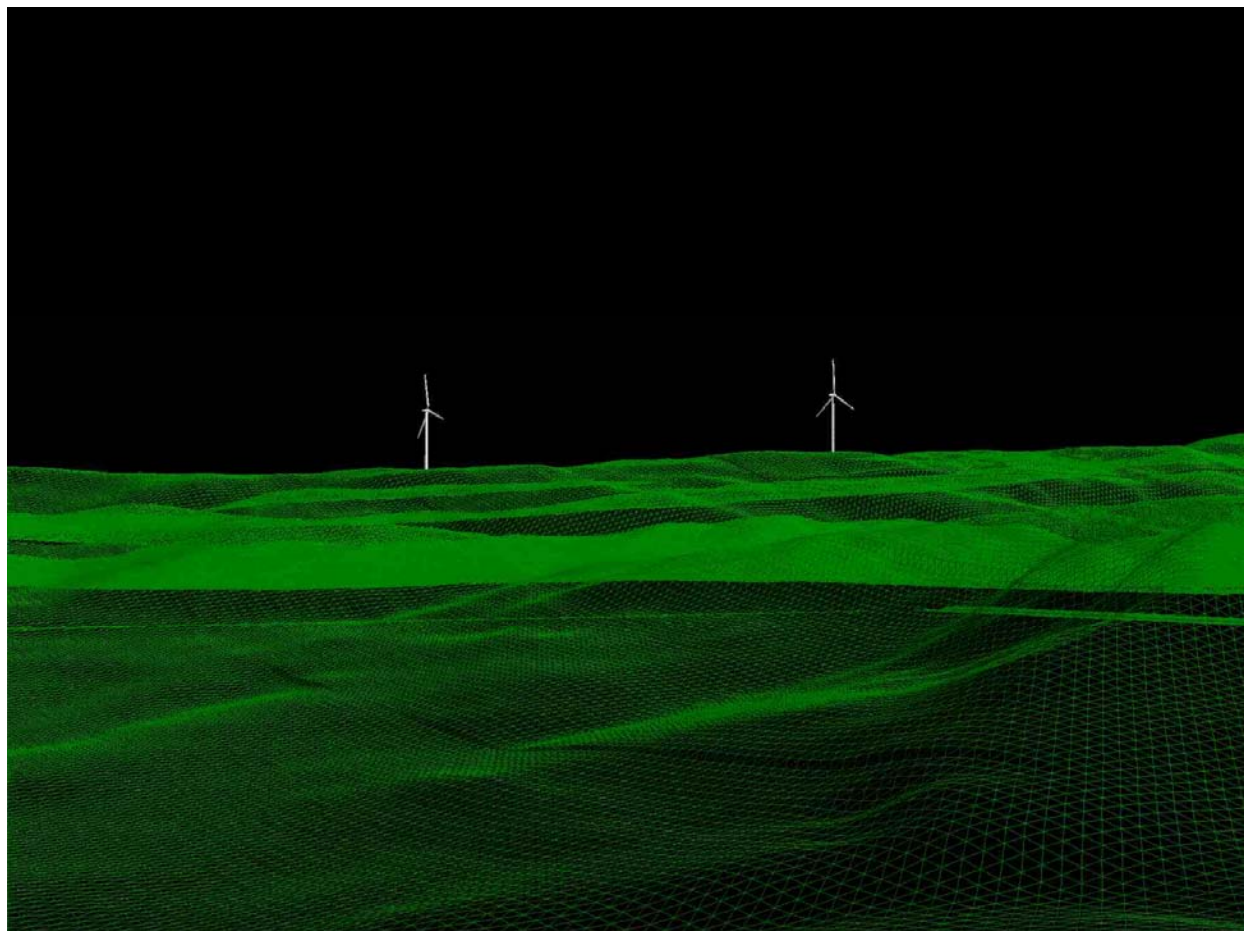
Note: Wind turbine not visible from this viewpoint.



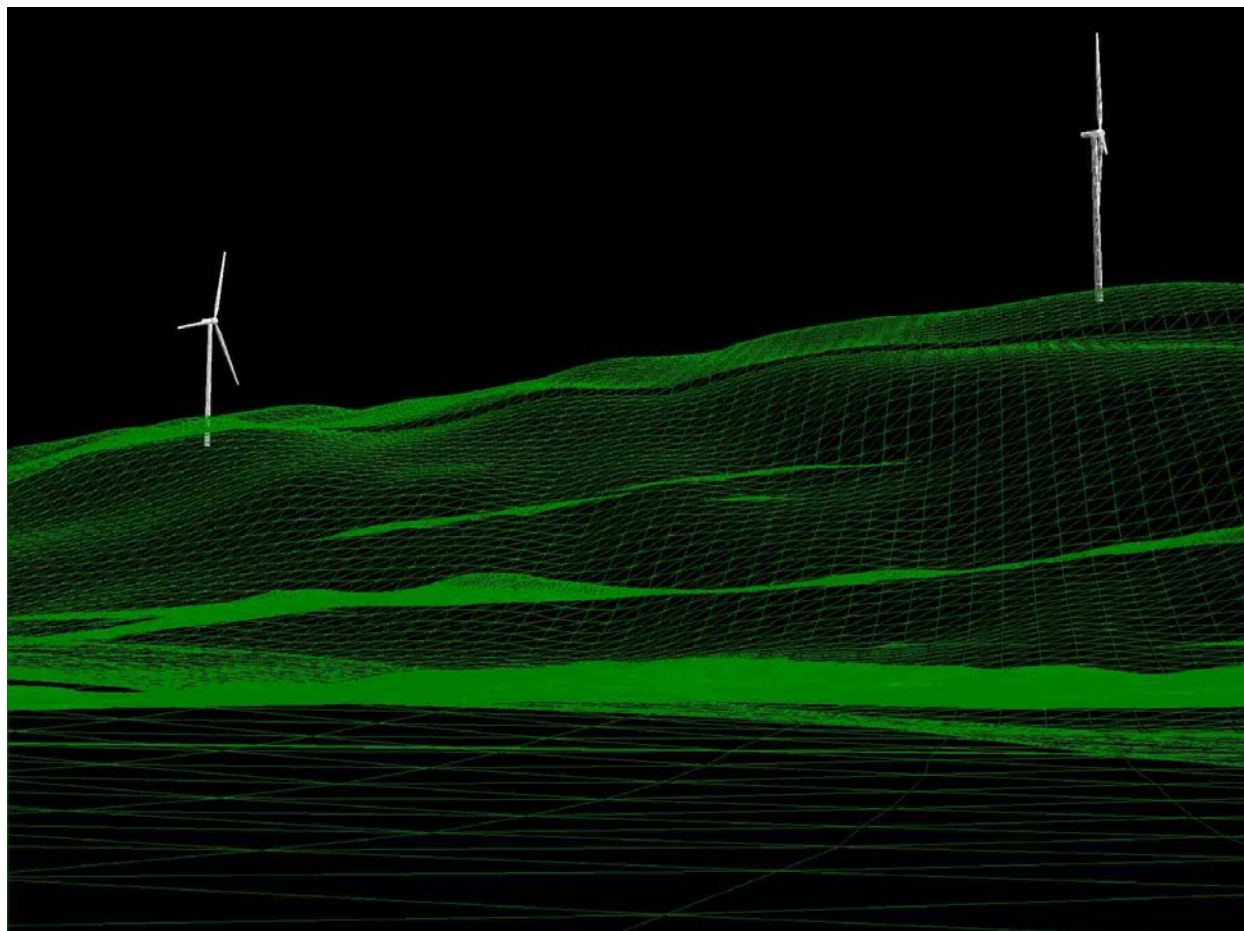
**Figure E-1  
(2) - GE 1.6-100  
View from the Northern Reservoir**



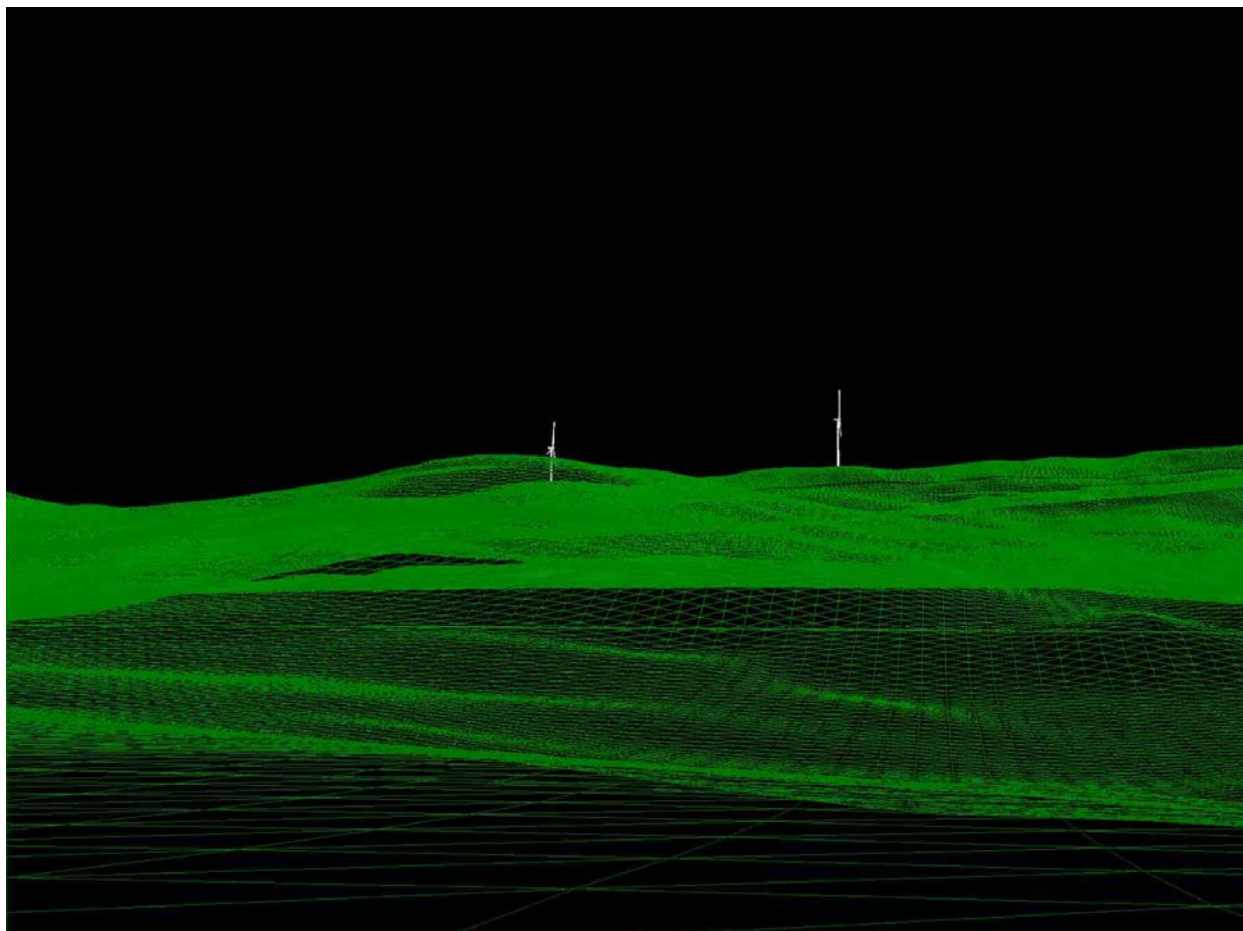
**Figure E-1  
(2) - GE 1.6-100  
View from the Kennedy Park Outlook**



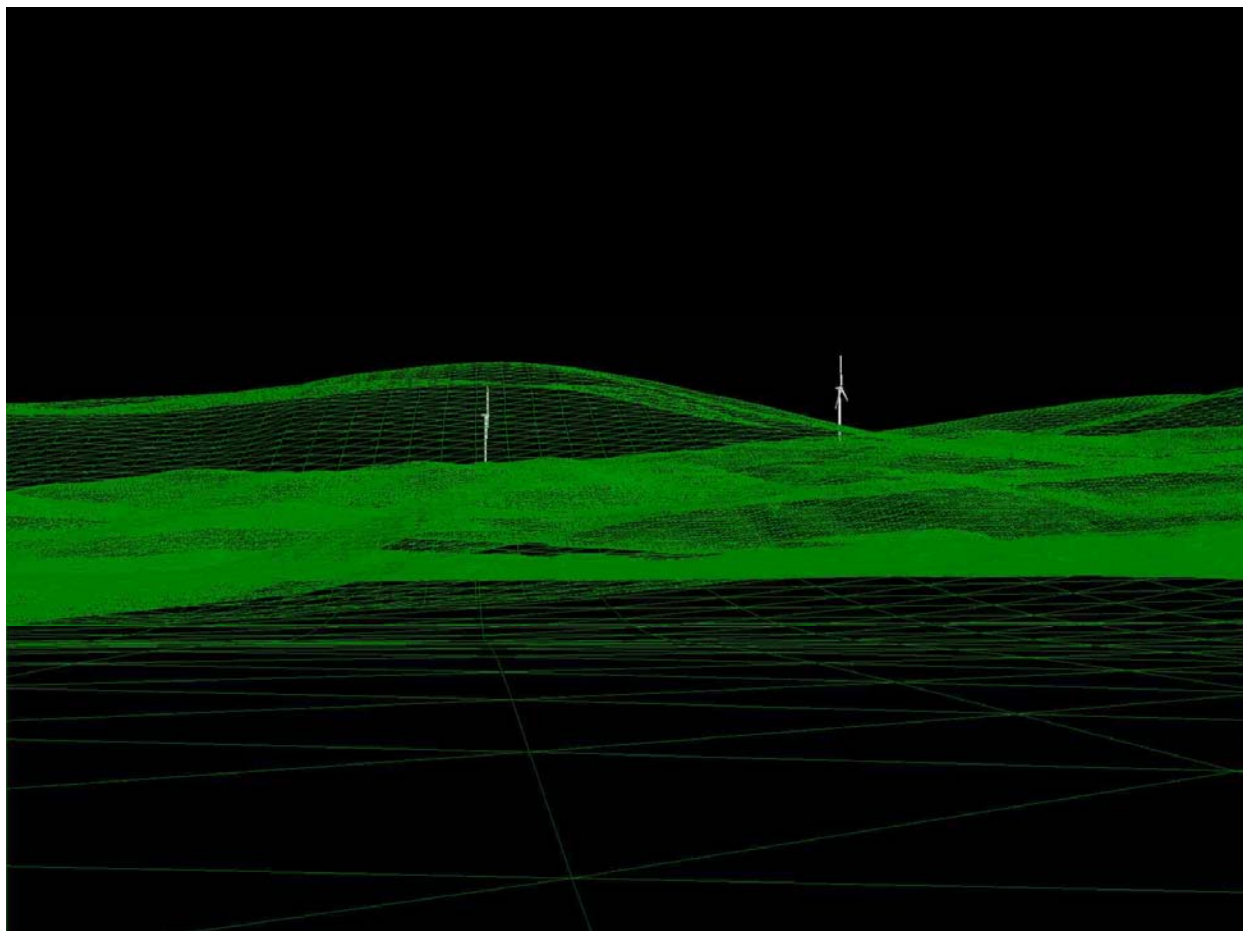
**Figure E-2**  
**(2) - GE 1.6-100**  
**View from the Pleasant Valley Parking Lot**



**Figure E-1  
(2) - GE 1.6-100  
View from 12 Oaks Condominiums**



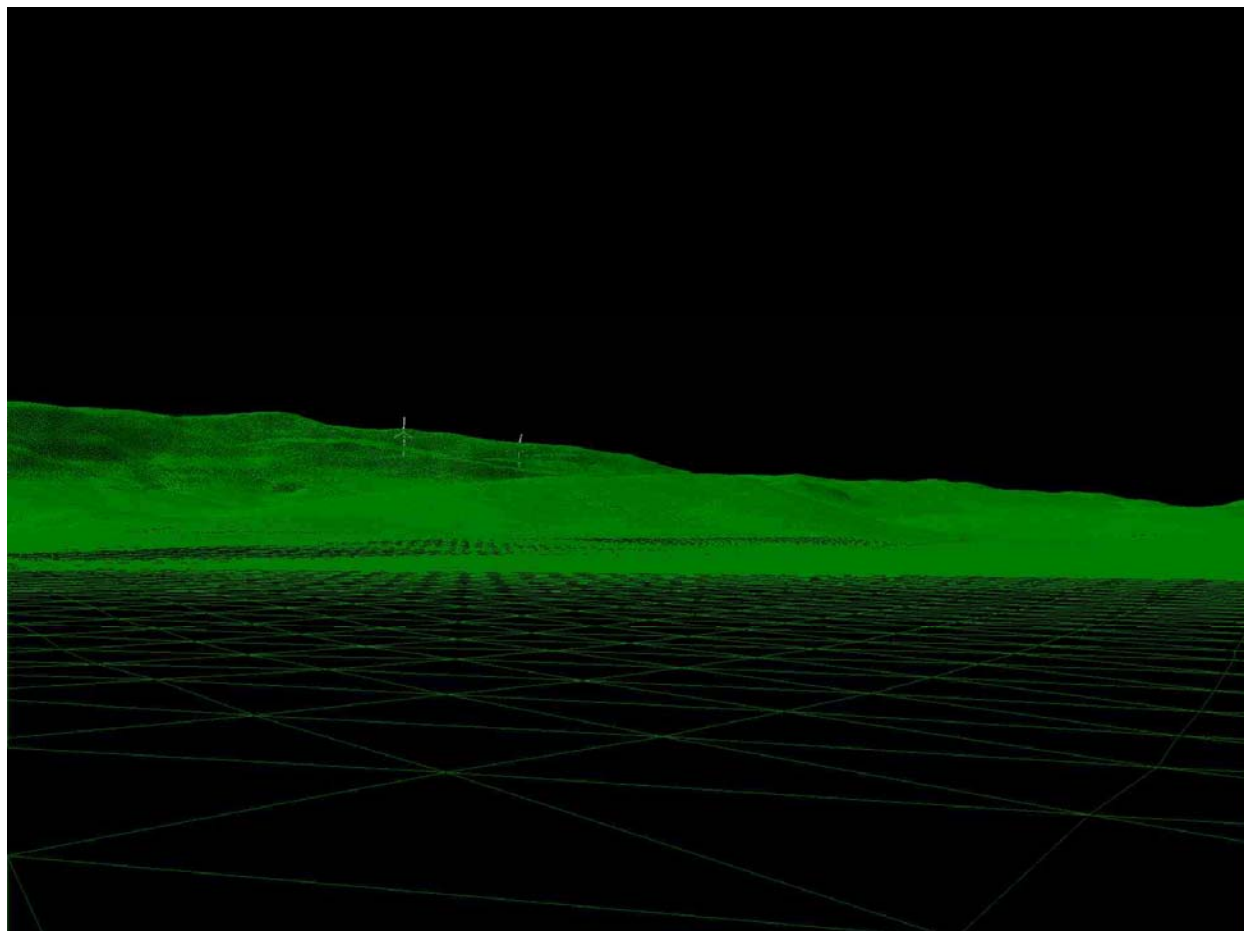
**Figure E-1  
(2) - GE 1.6-100  
View from the Lenox Shops Parking Lot**



Note: Only one wind turbine is visible from this viewpoint.

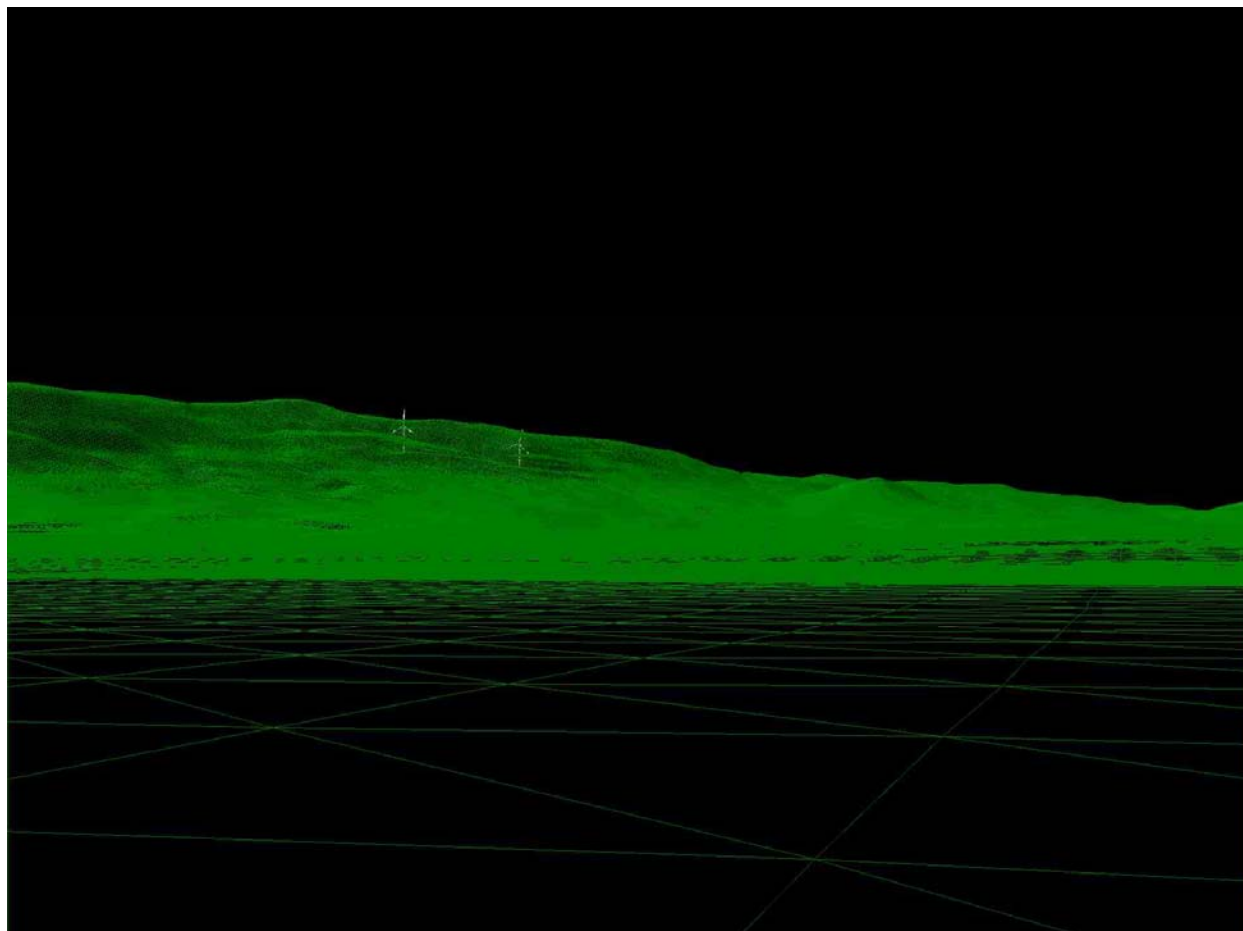


**Figure E-1  
(2) - GE 1.6-100  
View from the Hancock Shaker Village Parking Lot**



Note: Only the blades of both wind turbines are visible from this viewpoint (partial blades only).

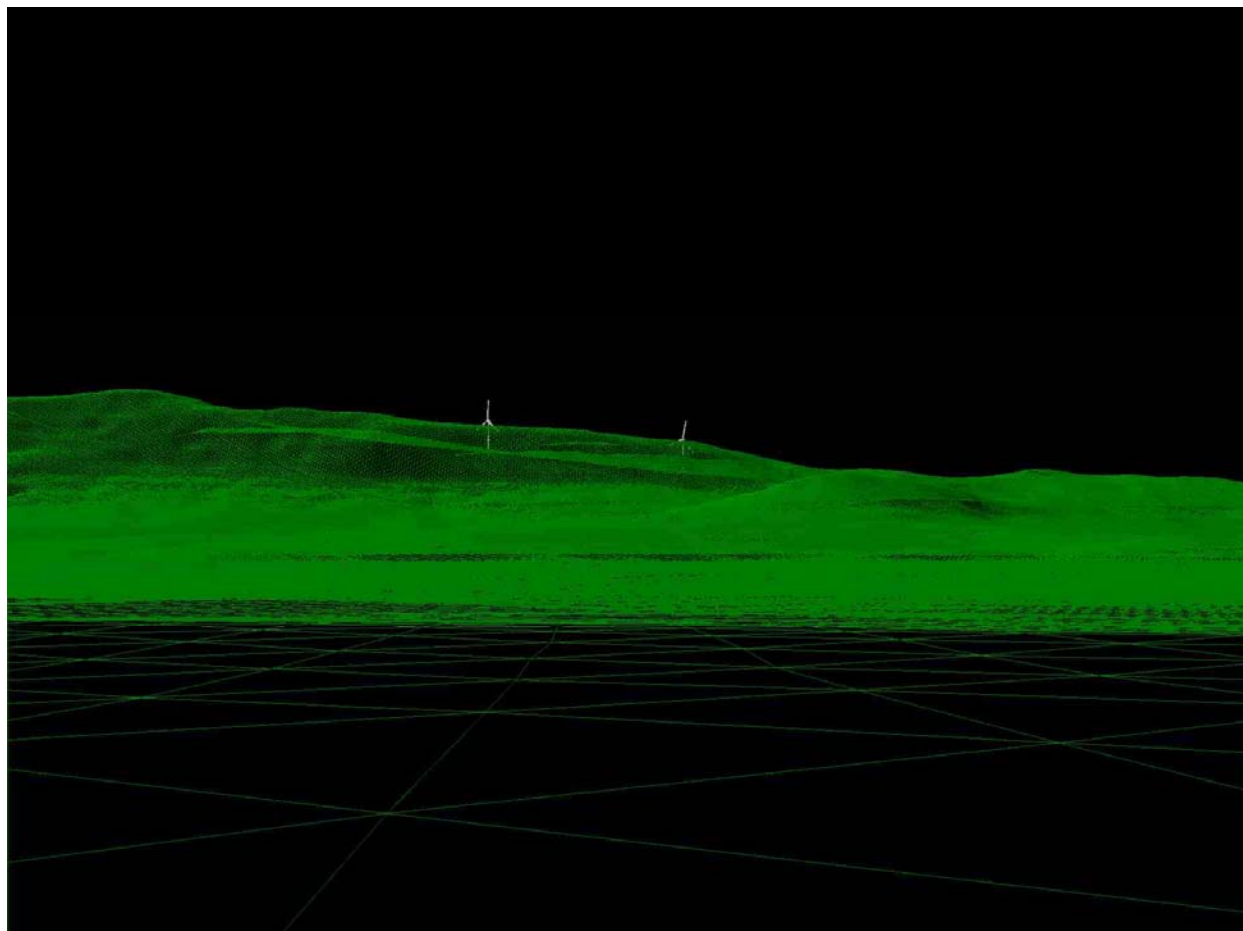
**Figure E-1  
(2) - GE 1.6-100  
View from Route 41**



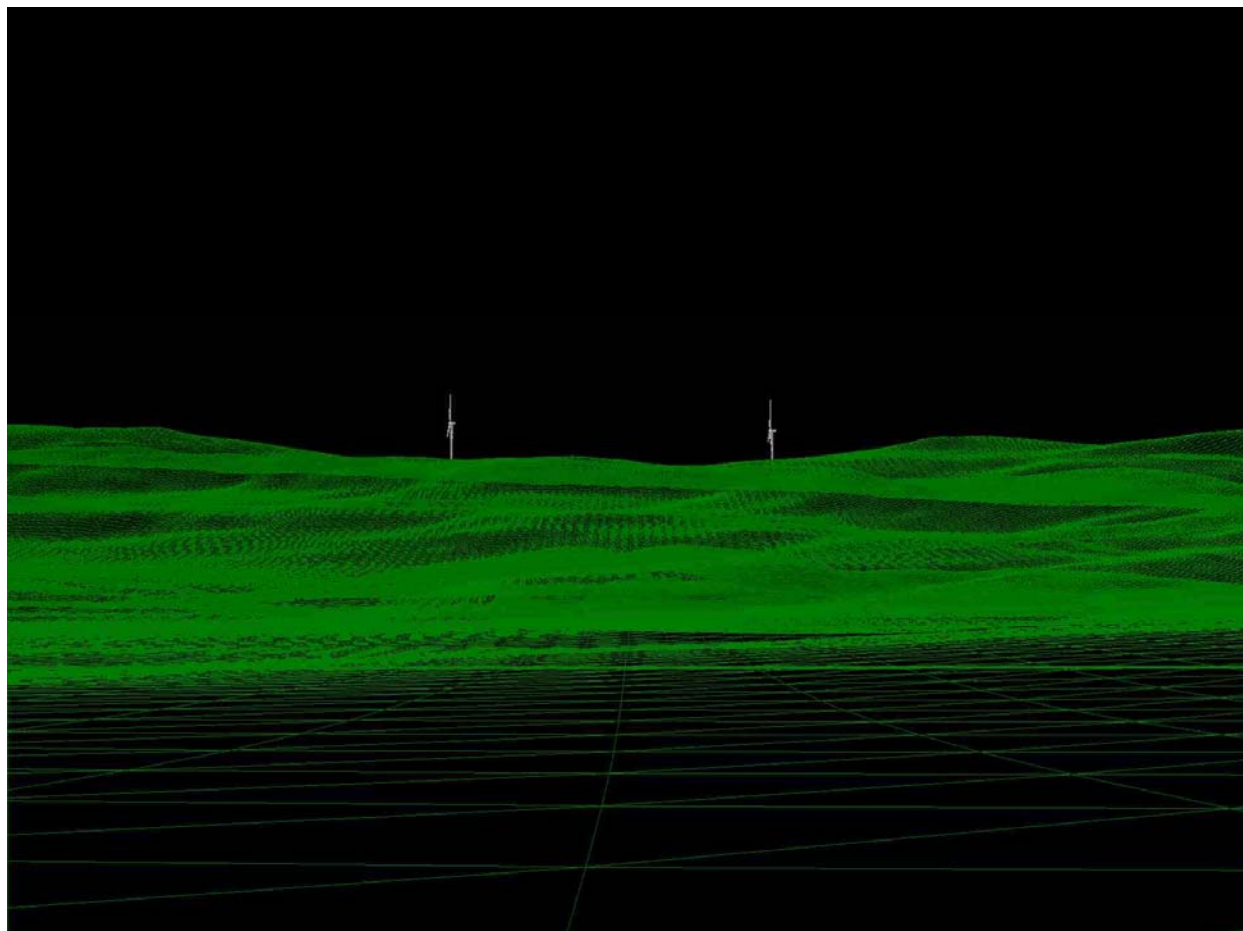
Note: Only the blades of both wind turbines are visible from this viewpoint (partial blades only).



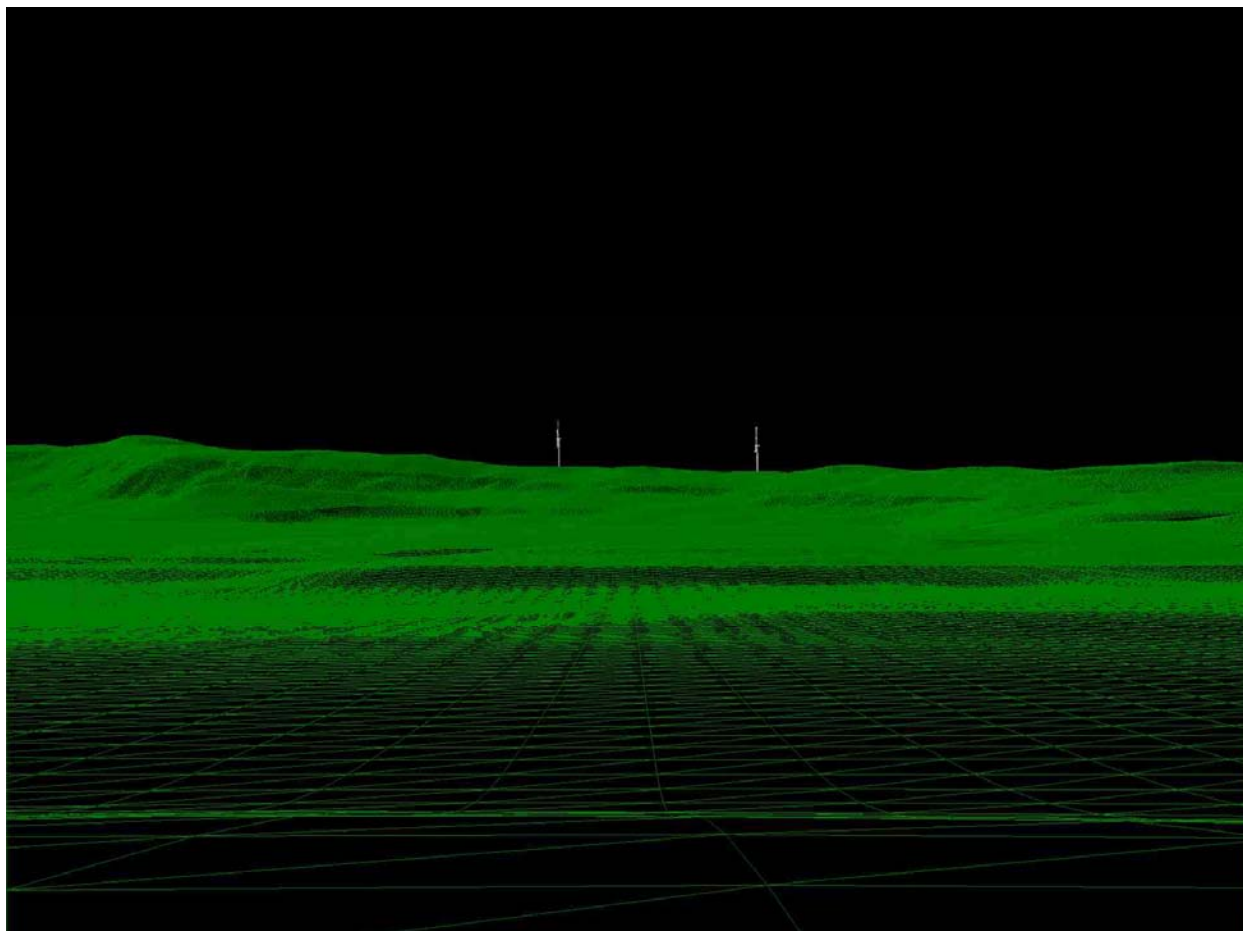
**Figure E-1  
(2) - GE 1.6-100  
View from 707 Route 41 (State Road)**



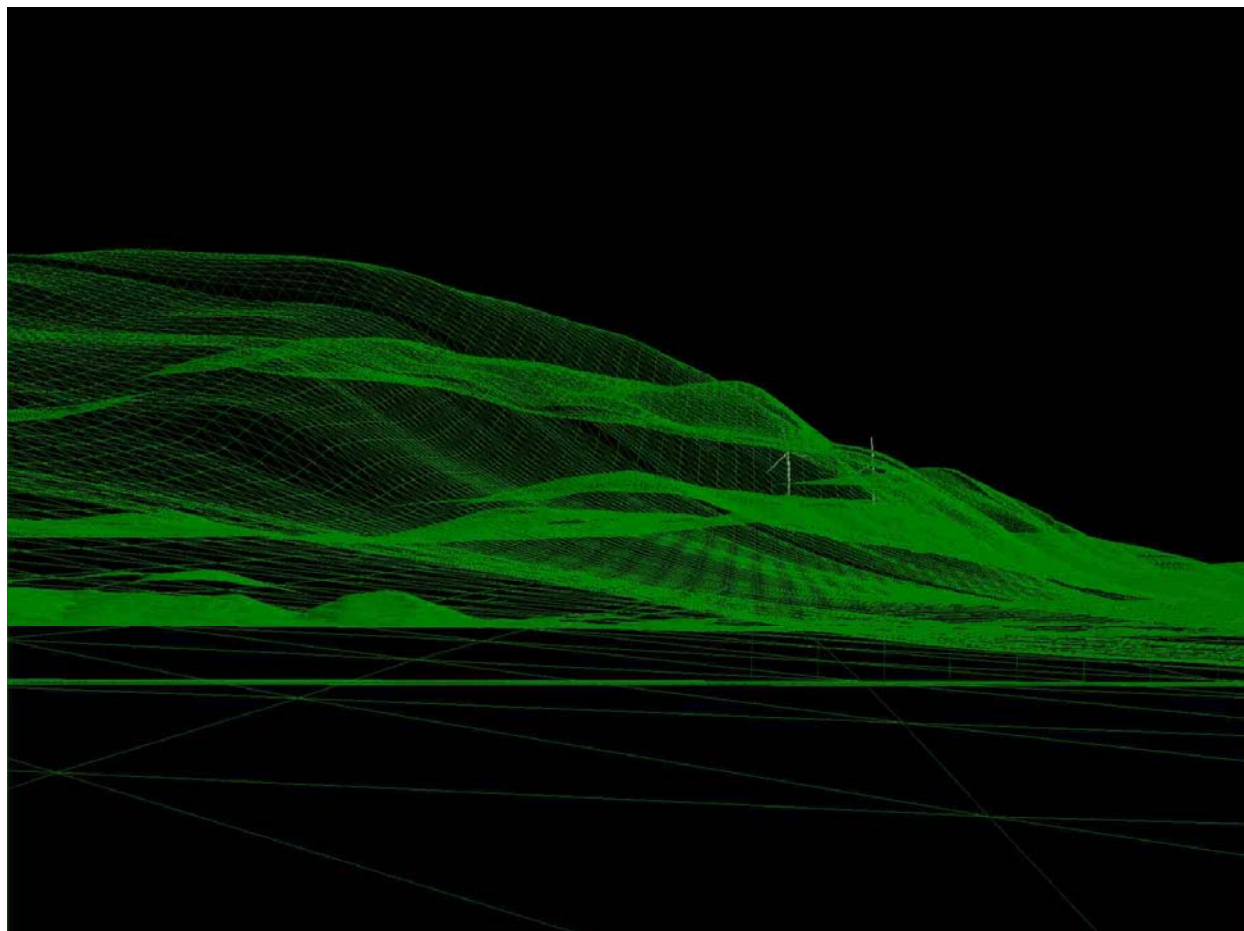
**Figure E-1  
(2) - GE 1.6-100  
View from Swamp Road**



**Figure E-11**  
**(2) - GE 1.6-100**  
**View from the Richmond Consolidated School Parking Lot**



**Figure E-1  
(2) - GE 1.6-100  
View from Tanglewood**



Note: Only one wind turbine is visible from this viewpoint (partial blade only).

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## **APPENDIX F**

### **FAA OE/AAA OBSTRUCTION ANALYSIS REPORTS**

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## DoD Preliminary Screening Tool

**Disclaimer:**

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

**Instructions:**

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  - Air Defense and Homeland Security radars(Long Range Radar)
  - Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  - Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

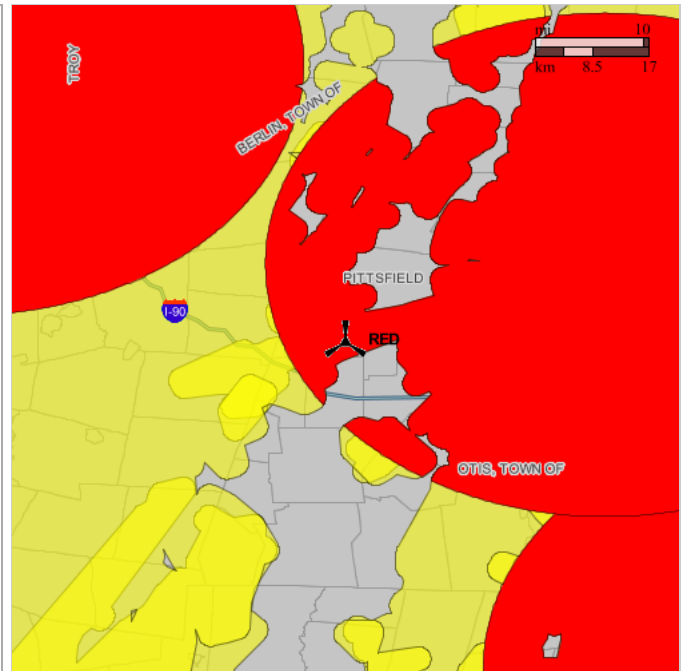
Screening Type:  Geometry Type:

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	<input type="text" value="42"/>	<input type="text" value="22"/>	<input type="text" value="35.2"/>	<input type="text" value="N"/>	<input type="text" value="73"/>	<input type="text" value="18"/>	<input type="text" value="44.5"/>	<input type="text" value="W"/>

Horizontal Datum:

**Map Legend:**

- Green:** No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.
- Yellow:** Impact likely to Air Defense and Homeland Security radars. Aeronautical study required.
- Red:** Impact highly likely to Air Defense and Homeland Security radars. Aeronautical study required.







## DoD Preliminary Screening Tool

**Disclaimer:**

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

**Instructions:**

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  - Air Defense and Homeland Security radars(Long Range Radar)
  - Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  - Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

Screening Type:  Geometry Type:

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	42	22	35.2	N	73	18	44.5	W

Horizontal Datum:

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact David Brentzel at the USAF Regional Environmental Coordinator at (404)562-4211 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact the US Navy Representative, FAA Eastern Service Area at the USN Regional Environmental Coordinator at (404) 305-6908 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact LTC Jeff Mowery at the USA Regional Environmental Coordinator at (404)305-6915 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact the US Marine Corps Representative, FAA Eastern Service Area at the USMC Regional Environmental Coordinator at (404) 305-6907 for confirmation and documentation.

**This is a preliminary review of your proposal and does not preclude official FAA processes.**

Your search data is not retained and the privacy of all your searches is assured.



Any questions interpreting the map, please email Steve Sample with your question/s and phone number at [steven.sample@pentagon.af.mil](mailto:steven.sample@pentagon.af.mil)







## DoD Preliminary Screening Tool

**Disclaimer:**

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

**Instructions:**

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  - Air Defense and Homeland Security radars(Long Range Radar)
  - Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  - Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

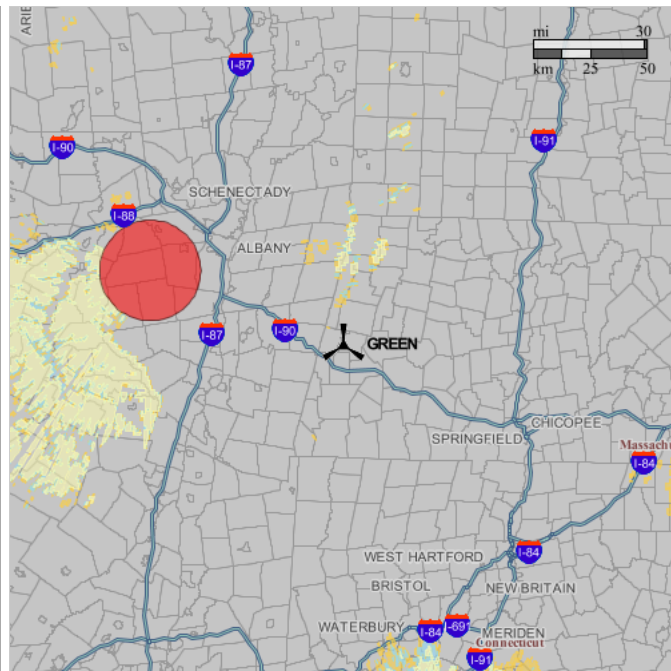
Screening Type:  Geometry Type:

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	<input type="text" value="42"/>	<input type="text" value="22"/>	<input type="text" value="35.2"/>	<input type="text" value="N"/>	<input type="text" value="73"/>	<input type="text" value="18"/>	<input type="text" value="44.5"/>	<input type="text" value="W"/>

Horizontal Datum:

**Map Legend:**

- Green:** Minimal to no impact to Weather Surveillance Radar-1988 Doppler (WSR-88D) weather radar operations. National Telecommunications & Information Administration (NTIA) notification advised.
  - Yellow:** RLOS Coverage At or Below 130m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
  - Blue:** RLOS Coverage At or Below 160m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
  - Gold:** RLOS Coverage At or Below 200m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- Red:** Impact highly likely to WSR-88D weather radar operations and wind turbine electronics. Turbines likely in radar line of sight. Aeronautical study required. NTIA notification strongly advised.



For more information, or to discuss the screening results, please contact NOAA at [wind.energy.matters@noaa.gov](mailto:wind.energy.matters@noaa.gov)

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## **APPENDIX G**

**INITIAL BIRD AND BAT RISK IDENTIFICATION REPORT,  
PREPARED BY STANTEC, AND BREEDING BIRD  
SURVEY DATA FROM PLEASANT VALLEY BIRD SANCTUARY**

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## LENOX BIRD BAT REPORT

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# Initial Bird and Bat Risk Identification Report for the Town of Lenox Wind Project In Berkshire County, Massachusetts

Prepared for

WESTON Solutions, Inc.  
10 Lyman Street, Suite 2  
Pittsfield, MA 01201

Prepared by

Stantec Consulting Services Inc.  
30 Park Drive  
Topsham, ME 04086



Rev. December 2010

## Executive Summary

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Stantec Consulting Services Inc. (Stantec) prepared an initial bird and bat risk identification report for a proposed wind project (Project) for the Town of Lenox in Berkshire County, Massachusetts. The Project is currently in the initial stages of planning. This report is a guidance document that synthesizes what is known about the avian and bat resources present in the region, and examines available data regarding the Project footprint and known habitats occurring in the Project vicinity. This report discusses the likelihood for rare, threatened or endangered bird and bat species to occur in the Project area, and provides an initial assessment of the likelihood for the proposed Project to significantly impact bird and bat species.

The initial bird and bat risk identification report includes three primary steps: 1) request for natural resource information from state and federal agencies and desktop analysis of site photographs; 2) an information review of avian and bat resources in the vicinity of the Project area; and 3) a review of publicly available pre- and post-construction data from other proposed and operational wind projects in Massachusetts and the Northeast. Results are as follows:

- No federally-listed or proposed threatened or endangered bird or bat species or critical habitat were identified in the Project area by USFWS during the information-gathering step of this report. Similarly, the NHESP identified no Estimated Habitat of Rare Wildlife or Priority Habitat for bird or bat species in the Project area.
- The information review step performed for this Project identified two potential issues which may require agency follow-up. These are the potential breeding presence of mourning warbler (*Oporornis philadelphia*), and the species composition and foraging behavior of bats in the hibernaculum identified in Core Habitat BM492 (Pittsfield). Consulting with agencies at this stage of project development is suggested to determine whether or not these are issues that warrant further investigation.

Results of this initial avian and bat risk identification report do not suggest that avian and bat issues at the Project are unique or greater than those at other projects in the Northeast for which data are publicly available, particularly in regard to risk to passerine, raptor and bat migrant species; however, the data provided in this report are qualitative and should not be used in lieu of on-site ecological surveys.

Without the existence of state guidelines regarding wind power projects and wildlife to identify the requirements necessary for permitting a Massachusetts wind project, one must use the best site-specific and regionally-specific biological information available to inform the project as it is reviewed by multiple entities; consultation with agencies would help ensure this.

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## 1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) prepared an initial bird and bat risk identification report for a proposed wind project (Project) for the Town of Lenox in Berkshire County, Massachusetts. This report is a guidance document that synthesizes what is known about the avian and bat resources present in the region, and examines available data regarding the Project footprint and known habitats occurring in the Project vicinity. This report discusses the likelihood for rare, threatened or endangered bird and bat species to occur in the Project area, and provides an initial assessment of the likelihood for the proposed Project to significantly impact bird and bat species. This report makes recommendations for further investigation or regulatory coordination as necessary to ensure project compliance with applicable environmental regulations. This report does not include potential impacts to other natural resources (i.e. wetlands, rare plants, rare plant communities), impacts to historic, cultural or visual resources or potential impacts from noise. Additionally, it does not evaluate the ecological impacts of any conceptual transmission line corridors.

The Project is currently in the initial stages of planning. The information presented in this report may be used during the project planning and permitting phases to inform the potential need for additional data collection or agency coordination and to assist in the design of Project elements in ways that may minimize potential impacts to avian and bat resources present.

### 1.1 Project Area Description

The Project area is located in Berkshire County in western Massachusetts near the border with New York, and occurs within the Western New England Marble Valley ecoregion (Griffith *et al.* 2009).

The Western New England Marble Valley ecoregion is drained by the Hoosic and Housatonic Rivers. This ecoregion is characterized by steep-sided valleys with floodplains, terraces, and rolling or hilly terrain. This area includes cropland, pasture, urban, suburban and residential areas, rock quarries, coniferous, mixed and northern hardwood forest, and calcareous fens. Stream substrates include bedrock, boulder, cobble, or sand. This ecoregion contains numerous springs, seeps and wetlands and a few lakes. Underlying bedrock of limestone and marble in the river valleys create alkaline lakes and streams and contribute to calcareous wetlands, which are unique to Massachusetts. Most elevations in this region range from 61 m (200 ft) and 122 m (400 ft). The region's climate is mild in spring, summer and fall and cold in winter. Rainfall amounts average between 91 centimeters (cm; 36 inches [in]) and 117 cm (46 in), and temperatures range from -11.7 to -0.6 degrees Celsius (°C; 11 to 31°F Fahrenheit [F]) in January and 14.4 to 27.8°C (58 to 82°F) in July. Dominant mesic forest species include sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), bitternut hickory (*Carya cordiformis*), hophornbeam (*Ostrya virginiana*), alternate-leaved dogwood (*Cornus alternifolia*), maidenhair fern (*Adiantum pedatum*), blue cohosh (*Caulophyllum thalictroides*) and wild leek (*Allium tricoccum*). Well-drained calcareous slopes or low ridges include sugar maple, chinkapin oak (*Quercus muehlenbergii*), white ash, shagbark hickory (*Carya ovata*), hophornbeam and hackberry (*Celtis occidentalis*). Ledges and abandoned pastureland support eastern red cedar (*Juniperus virginiana*), hophornbeam and hickories. Lowlands support calcareous red-

maple (*Acer rubrum*)-tamarack (*Larix laricina*) swamps with red maple, tamarack, black ash (*Fraxinus nigra*) and eastern hemlock (*Tsuga canadensis*) (Griffith *et al.* 2009).

More specifically, the proposed Project area is located on the Lenox Mountain ridge, which is situated between the Lenox Reservoirs and the marshlands (Figure 1). Lenox Mountain is approximately nine miles long and is oriented south-southwest (SSW) to north-northeast (NNE). Its elevation is approximately 610 m (2,000 ft) above sea level, and the proposed Project site will be situated on a peak approximately 553 m (1,815 ft) high. For the purposes of this report, the “Project area” will refer to Lenox Mountain.

## **2.0 METHODOLOGY**

The initial bird and bat risk identification report includes three primary steps: 1) request for natural resource information from state and federal agencies and desktop analysis of site photographs; 2) an information review of avian and bat resources in the vicinity of the Project area; and 3) a review of publicly available pre- and post-construction data from other proposed and operational wind projects in Massachusetts and the Northeast.

### **2.1 Requests for Information from Federal and State Agencies and Other Sources**

Stantec contacted natural resource agencies to request information on known resources in the Project area. Requests were made to the Massachusetts Department of Fish and Game (MA DFG) and the Natural Heritage and Endangered Species Program (NHESP) in the Commonwealth of Massachusetts’ Division of Fisheries and Wildlife, and to the New England Field Office of the United States Fish and Wildlife Service (USFWS). The NHESP facilitates conservation of Massachusetts’ biodiversity by maintaining information on the status and location of rare plant and animal species and natural communities.

### **2.2 Site Photos and Potential Presence of State-Listed Species**

Stantec obtained photos taken by WESTON on September 29, 2010 of the Project area. The forest cover types represented in the photos were determined by a Stantec botanist, which were used to help assess the likelihood for some state-listed species to occur on the site<sup>1</sup>.

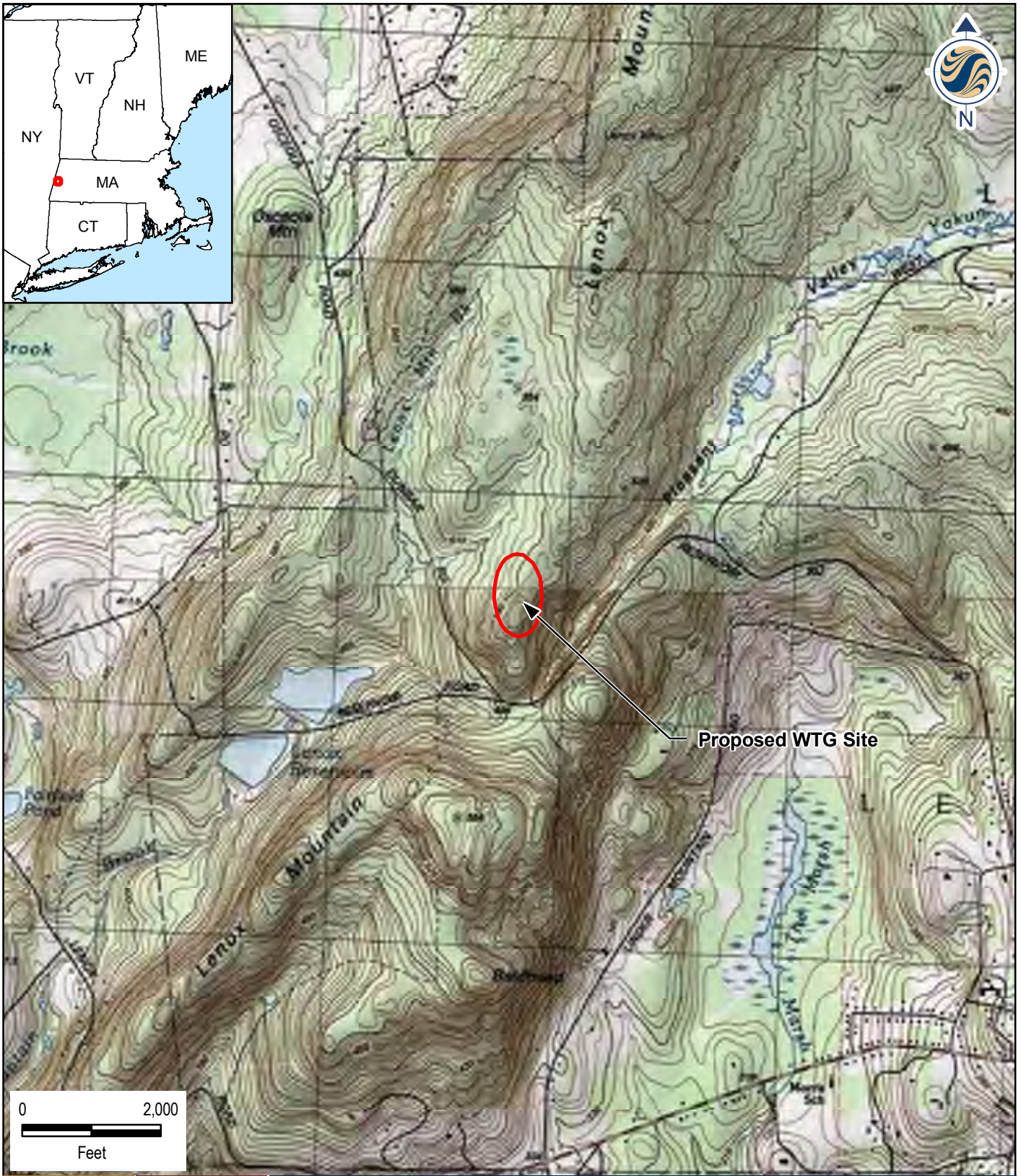
### **2.3 Information Review of Avian and Bat Resources**

Since avian and bat mortality has been documented at modern wind energy projects, potential impacts to these species groups warrants assessment. The presence of birds and bats does not directly translate to collision risk; however determining which species or species groups are present may aid in understanding potential risk. Potential impact to avian and bat species that may result from wind energy projects can be either direct or indirect. Direct impacts result from the collision of an individual with a turbine or associated structures (i.e. met towers and guy wires, transmission structures, buildings), or barotrauma, in bats. Indirect impacts include alteration of habitat that results in fragmentation or loss due to development, or displacement as a result of increased

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<sup>1</sup> It should be noted that habitats depicted in the photos provided to Stantec may not be representative of all habitats present in the Project area.





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**Client/Project**  
**WESTON Solutions, Inc.**  
**Town of Lenox Wind Project**  
**Lenox, Massachusetts**

**Figure No.**

**1**

**Title**

**Project Location Map**

September 8, 2010

human activity. State and federal laws and guidelines detailing the protection of avian and bat species that are applicable to this Project, as well as potential permit requirements of this Project, are summarized and attached as Appendix A. Agency responses, available literature, and United States Geological Survey (USGS) topographic maps were reviewed to identify potential resources in the vicinity of the Project area that could encourage high use by birds and bats. This review included the entire Project area, as well as potentially ecologically significant areas in the vicinity of the Project area. Additionally, a literature review of publicly available pre- and post-construction data collected from other proposed and operational wind developments in the East was conducted. The review of pre-construction data included other sites in Massachusetts and New York, and the review of post-construction data included other sites in the eastern United States. Resources used to identify potential avian and bat species that may occur within the Project area are discussed below.

### 2.3.1 Breeding Bird Atlas Data

The Breeding Bird Atlas is sponsored by Massachusetts Audubon and was created to document and collect data on all birds that breed in a particular area each year. The State of Massachusetts has been subdivided into over 1,000, 10-mile square blocks and each block is surveyed for 20 hours during each breeding season. Surveyors include ornithologists, field researchers and amateur birders. Once all blocks are surveyed, data are compiled into a searchable database.

This atlas used for this report is the second version of the Breeding Bird Atlas for Massachusetts. The Breeding Bird Atlas II includes data up to 2010.

### 2.3.2 National Audubon Society Data

#### *Christmas Bird Counts*

The Christmas Bird Count is performed in the United States every year from December 14 to January 5. Volunteer birders record all birds seen or heard at a given location. The National Audubon Society maintains a database that lists all species observed at a given location in all years sampled. The database includes the species scientific name, location, and the number of species found per party per hour.



### *Important Bird Area Data*

Important Bird Areas (IBAs) are designated areas that provide habitats for one or more breeding, wintering or migrating bird species. Sites may be public or privately held, and may be protected or unprotected. They vary in size and boundaries may be human-made or natural. The criteria of an IBA in Massachusetts are as follows: 1) regularly holding significant numbers of endangered, threatened, vulnerable or declining species; 2) regularly holding significant numbers of species of high conservation priority in Massachusetts; 3) birds concentrating in significant numbers during the breeding, winter or migrating season; 4) sites containing groups of species characteristic of rare, threatened or unique habitat within the state or region; or 5) sites important for long-term research.

#### 2.3.3 Hawk Migration Association of North America (HMANA) Hawk Watch Data

HMANA is a membership-based organization that collects and maintains hawk watch data from nearly 200 affiliated raptor monitoring sites throughout the United States, Canada and Mexico. The HMANA database includes general site information, site coordinates, site contacts, season counts, daily counts, timing of counts, species observed, and directions to the sites.

#### 2.3.4 Bat Data

Data were obtained from the MA DFG website regarding bat hibernacula and species present in the State.

#### 2.3.5 BioMap Core Habitats

Specific to Massachusetts, the NHESP's BioMap program identifies areas considered to represent habitats for rare plant and animal populations. BioMap Core Habitat in the vicinity of the Project area was identified, as were species thought to be present within the mapped habitat.

#### 2.3.6 Department of Conservation and Recreation's Areas of Critical Environmental Concern (ACEC) Program Data

Specific to Massachusetts, ACECs are identified and nominated at the community level and are reviewed and designated by the State's Secretary of Environmental Affairs. ACECs in the vicinity of the Project area were identified.

## **2.4 Information Review of Publicly Available Data**

#### 2.4.1 Publicly available pre-construction data from Massachusetts wind energy projects

Publicly available pre-construction data has been compiled for numerous surveys conducted at proposed wind energy projects in the eastern United States. Data compiled are the results of marine radar studies targeting nocturnal migrants (birds and bats), diurnal raptor surveys of migrating raptors, and acoustic bat surveys, which use ultrasonic detectors to characterize bat activity and species groups. Publicly available pre-construction data are limited for Massachusetts wind projects, likely because standards for such work are not well defined in state guidelines. However, the results of two recent pre-construction reports from Massachusetts wind energy projects and one

restoration project report conducted in close proximity to the Project area will be summarized in this report.

#### 2.4.2 Publicly available post-construction data from wind energy projects in the eastern United States

Publicly available results of avian and bat mortality surveys conducted at operational wind projects have been compiled for sites in the eastern United States, and are included in this document. Since there is limited publicly available post-construction for Massachusetts, the literature review extended beyond Massachusetts and covered the eastern United States. Avian and bat mortality surveys generally involve daily or weekly searches of defined plots located under operational turbines during which the number of bird and bat carcasses are recorded and when possible, identified to species.

### 3.0 RESULTS

#### 3.1 Requests for Information from Federal and State Agencies and Other Sources – Rare, Threatened and Endangered Species

There are currently 12 bird and 1 bat species state-listed as endangered under MESA, (Table 1). Six bird species meet the criteria for threatened status in Massachusetts, and 10 bird species and 1 bat species meet the criteria for special concern status in Massachusetts. Of these state-listed species, two are federally listed as endangered under the ESA (piping plover [*Charadrius melodus*] and Indiana bat [*Myotis sodalis*]), and one is federally listed as threatened (piping plover) (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq.).

The New England Field Office of the USFWS replied to the information request on August 31, 2010 and stated that “no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the [USFWS] are known to occur in the project area(s).” (Appendix B). The NHESP replied on September 1, 2010 and stated that the Project does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the *Massachusetts Natural Heritage Atlas* (13<sup>th</sup> Edition) (Appendix B). No state-listed avian or bat species observations have been documented in the vicinity of the Project area; however one state-listed amphibian species of special concern, Jefferson salamander (*Ambystoma jeffersonianum*), was identified.

Although not listed, the State of Massachusetts recognizes four bird species of “conservation interest.” These include green heron (*Butorides virescens*), marsh wren (*Cistothorus palustris*), sora (*Porzana carolina*) and Virginia rail (*Rallus limicola*) (NHESP 2010). These species primarily occur in wetlands including swamps or marshland environments, which are of conservation concern in the State. These species are not expected to occur in the Project area, however may occur in the vicinity of the Project area.



**Table 1. Massachusetts Listed Species**

Species Common Name	Species Scientific Name	Breeding Habitat*	Federally Listed as Endangered	Federally Listed as Threatened
<b>Endangered</b>				
Pied-Billed Grebe	<i>Podilymbus podiceps</i>	fresh marshes, ponds > 12.5 acres		
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	remote oceanic islands		
American Bittern	<i>Botaurus lentiginosus</i>	marshes, dry meadows or floating islands of vegetation		
Least Bittern	<i>Ixobrychus exilis</i>	cattail and sedge marshes and salt marshes		
Bald Eagle	<i>Haliaeetus leucocephalus</i>	large bodies of water with abundant fish and tall trees for nesting		
Peregrine Falcon	<i>Falco peregrinus</i>	cliffs and other suitable nest sites near water		
Upland Sandpiper	<i>Bartramia longicauda</i>	open habitats with low vegetation		
Roseate Tern	<i>Sterna dougallii</i>	dense vegetation on coastal beaches	Y	
Short-Eared Owl	<i>Asio flammeus</i>	extensive open marshes or grasslands		
Sedge Wren	<i>Cistothorus platensis</i>	wet meadows or drier margins of marshes		
Golden-Winged Warbler	<i>Vermivora chrysoptera</i>	overgrown pastures, briery woodland borders		
Henslow's Sparrow	<i>Ammodramus henslowii</i>	wet, shrubby fields or weedy meadows		
Indiana Myotis	<i>Myotis sodalis</i>	tree cavities, loose bark for roosting	Y	
<b>Threatened</b>				
Northern Harrier	<i>Circus cyaneus</i>	open country		
King Rail	<i>Fallus elegans</i>	wetlands with abundant vegetation		
Piping Plover	<i>Charadrius melodus</i>	along sandy or pebbly beaches or dredge spoils		Y
Northern Parula	<i>Parula americana</i>	open forests, woodlands, and swamps		
Vesper Sparrow	<i>Poocetes gramineus</i>	dry, upland areas with short sparse vegetation		
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	dry grassy areas with conspicuous song perches		
<b>Special Concern</b>				
Common Loon	<i>Gavia immer</i>	undisturbed bodies of water with stable water levels		
Sharp-Shinned Hawk	<i>Accipiter striatus</i>	extensive, undisturbed open mixed woodlands		
Common Moorhen	<i>Gallinula chloropus</i>	shallow water bodies with emergent vegetation		
Common Tern	<i>Sterna hirundo</i>	open areas near water including beaches, marshy islands, rocky island in lakes or rivers		
Arctic Tern	<i>Sterna paradisaea</i>	coastal treeless islands with low vegetation		
Least Tern	<i>Sternula antillarum</i>	beaches, dredge spoils, open shoreline		
Barn Owl	<i>Tyto alba</i>	open country		
Long-Eared Owl	<i>Asio otus</i>	dense forests or groves		
Blackpoll Warbler	<i>Dendroica striata</i>	low, northern coniferous forests, spruce		
Mourning Warbler	<i>Oporornis philadelphia</i>	stands of dense saplings, shrubs		
Small-Footed Myotis	<i>Myotis leibii</i>	dry, drafty, cool hibernacula near mines and caves		
*habitat descriptions were obtained from DeGraaf and Yamasaki (2001) and Andrie and Carroll (eds.) (1988)				

### 3.2 Site Photos and Potential Presence of State-Listed Species

Photos were taken of the Project area by WESTON on September 29, 2010 (Photos 1-4 Appendix C). Photos revealed cover types indicative of past harvesting, with mixed hardwood/softwood appearing to be the dominant cover type. Other cover types identified in the photos include beech-birch-maple, eastern hemlock, white pine-red oak-red maple and northern hardwood forest.

Despite the fact that the USFWS response letter did not identify federally-listed or proposed, threatened or endangered species or critical habitat in the Project area, the letter states such species or habitat are not “known to occur” in the Project area; this does not imply that such species or habitats absolutely do not occur in the Project area. Based on the habitat types represented in the site photographs and upon general habitat requirements of state-listed bird species, one state species of special concern, mourning warbler (*Oporornis philadelphia*), could potentially breed within the Project area. This species prefers stands of dense saplings and shrubs, primarily in disturbed habitats with shrubby understories. The photos taken of the Project area include some showing dense sapling growth (Appendix C, Photo 1). The potential presence of Indiana bat or eastern small-footed bat (*Myotis leibii*) will be discussed in Section 3.2.4.

Habitat requirements of two additional species of warbler appear to match those present in the Project area. Northern parula (*Parula americana*), a state-listed threatened species, prefers open woodlands; however, it most strongly prefers mature, moist forests near riparian habitat. Forests of the Project area are relatively dry and early successional as a result of recent timber harvesting activities. The blackpoll warbler (*Dendroica striata*), a state-listed species of special concern that generally prefers low coniferous forest, tends to nest at elevations between 4000 feet and 4500 feet, significantly higher than elevations within the Project area.

### 3.3 Information Review of Avian and Bat Resources

#### 3.3.1 Breeding Bird Atlas Data

Data were reviewed for four areas closest to the Project area where breeding bird surveys have been performed: East Lee (Blocks 0741-0746; 0751-0753; 0756), East Pittsfield (Blocks 0521-0536; 0531-0536), West Pittsfield (Blocks 0506-0511; 0512-0516), and Stockbridge (Blocks 0724-0726; 0731-0736; Figure 2). From 2007 to August 2010, a total of 141 bird species were documented during breeding bird surveys in the four areas combined (USGS 2010; Appendix D). Five state-listed endangered species (American bittern [*Botaurus lentiginosus*], bald eagle [*Haliaeetus leucocephalus*], least bittern [*Ixobrychus exilis*], sedge wren [*Cistothorus platensis*] and pied-billed grebe [*Podilymbus podiceps*]), two state-listed threatened species (grasshopper sparrow [*Ammodramus savannarum*] and northern harrier [*Circus cyaneus*]) and four state-listed special concern species (common loon [*Gavia immer*], common moorhen [*Gallinula chloropus*], mourning warbler, and sharp-shinned hawk [*Accipiter striatus*]) were documented within these survey areas.

### 3.3.2 National Audubon Society Data

#### *Christmas Bird Counts*

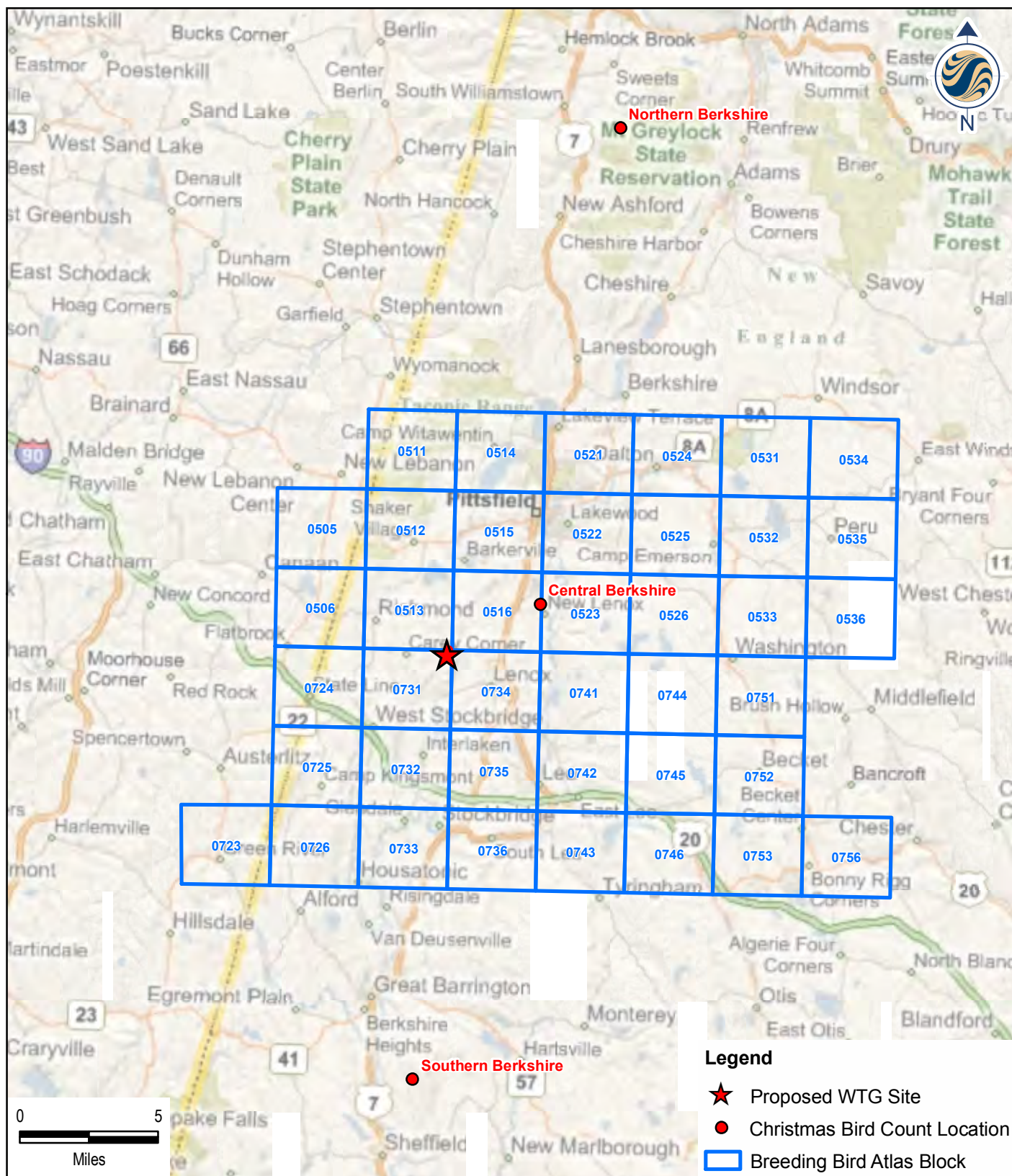
No Christmas Bird Counts have occurred in the Project area; however one has been conducted within a five mile radius just east of the Project area in Central Berkshire County. Two other Christmas Bird Count sites in close proximity to the Project area have occurred in Northern Berkshire County, located roughly 22 miles north of the Project area, and Southern Berkshire County, located roughly 20 miles south of the Project area (Figure 2).

Between 2000 and 2009, a total of 93 species were documented at Christmas Bird Counts conducted at the Central Berkshire County location (Audubon 2010; Appendix E, Table 1). Two state-listed endangered species (bald eagle and pied-billed grebe), one state-listed threatened species (northern harrier), and one state-listed special concern species (sharp-shinned hawk) were documented at the both the Central Berkshire location and the Northern Berkshire location, at which 86 species were documented (Appendix E, Table 2). A total of 90 species were documented at the Southern Berkshire location (Appendix E, Table 3). One state-listed endangered species (bald eagle), one state-listed threatened species (northern harrier) and one state-listed special concern species (sharp-shinned hawk) were documented at this location.

#### *Important Bird Areas*

No IBAs or portions of IBAs are located within the Project area. There are five IBAs in Berkshire County within 20 miles of the Project area (Mass Audubon 2010; Figure 3; Appendix F). These include Central Berkshire Lakes, Upper Housatonic Valley, Konkapot and Agawam Marshes, Little River Watershed and Hiram Fox Wildlife Management Area.

The closest IBA to the Project area is The Upper Housatonic Valley IBA, approximately three miles from the Project area. This IBA has extensive riparian habitat which includes 1,300 acres of woodlands, marshes, swamps, upland woods and grasslands and the Housatonic River. This area borders the October Mountain State Forest and thousands of acres of Pittsfield watershed land. Numerous wetland species breed in this corridor and it has been known to be a migration passageway for multiple species of birds. State-listed species identified during surveys conducted along the Housatonic River in 2001 include American bittern (state-listed endangered), common moorhen (state-listed special concern), bald eagle (state-listed endangered), northern harrier (state-listed threatened), sharp-shinned hawk (state-listed special concern), northern parula (state-listed threatened) and blackpoll warbler (state-listed special concern) (Woodlot Alternatives, Inc. 2002).



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00634-F002-BBA-Christmas-Bird-Count-Map.mxd

**Client/Project**  
**WESTON Solutions, Inc.**  
**Town of Lenox Wind Project**  
**Lenox, Massachusetts**

Figure No.

**2**

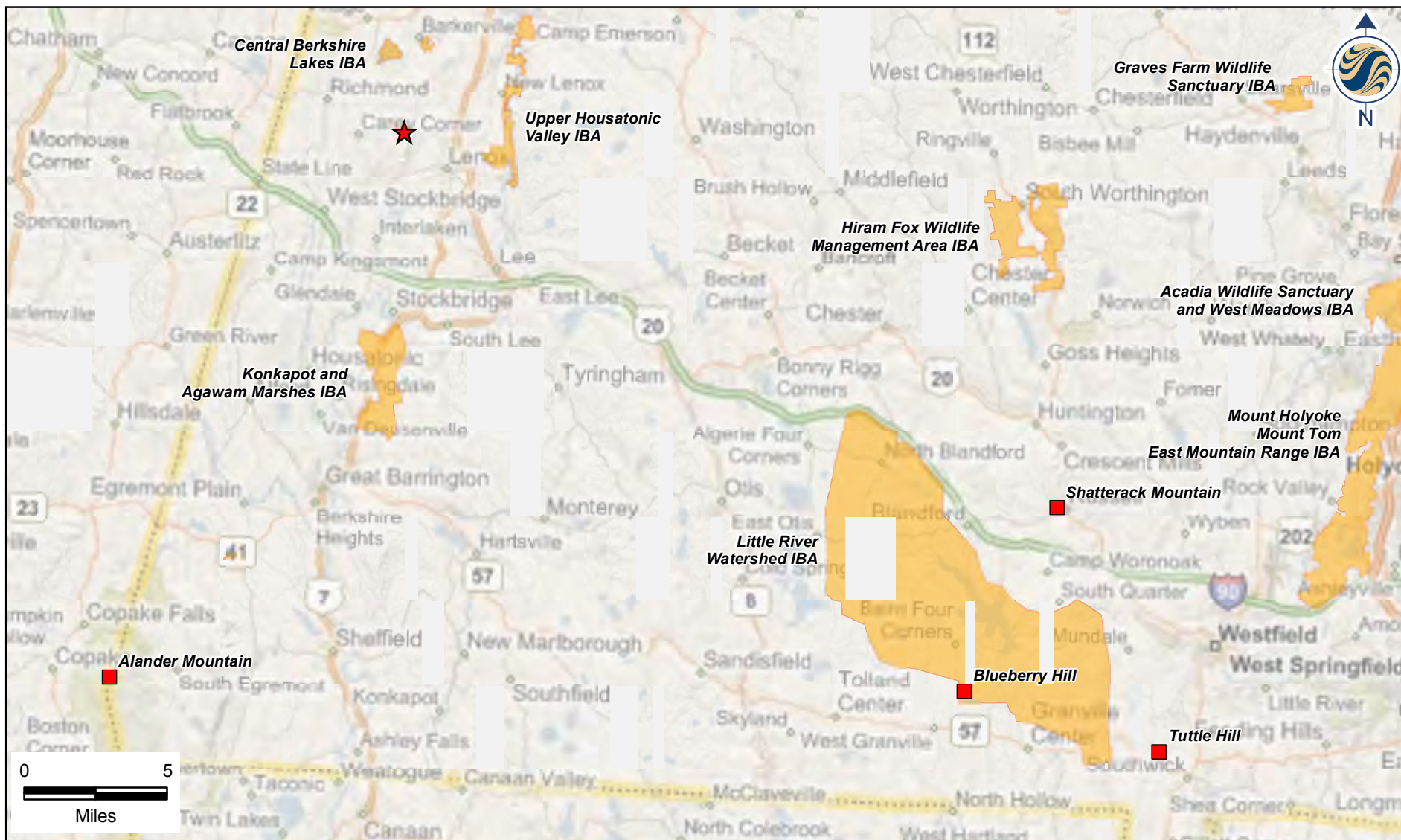
Title

**Breeding Bird Atlas Survey Blocks  
 and Christmas Bird Count Locations**

September 8, 2010

195600634





195600634



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#### Legend

- ★ Proposed WTG Site
- Hawk Watch Site
- Important Bird Area (IBA)

#### Client/Project

WESTON Solutions, Inc.  
Town of Lenox Wind Project  
Lenox, Massachusetts

Figure No.

3

Title

**Hawk Watch and Important  
Bird Area Sites**

September 8, 2010

The Central Berkshire Lake IBA, also three miles from the Project area, consists of five large lakes and reservoirs and a small pond. These bodies of water are known to be visited by a number of species each year during fall migration, including loons, grebes, ducks, geese, coots, gulls and others. This site is considered an important stopover point for waterfowl migrating along the Housatonic River valley. Marshlands in the area also serve as a breeding habitat for the marsh wren, a species identified as of “conservation interest” in Massachusetts.

The Konkapot and Agawam Marshes IBA is approximately seven miles from the Project area and covers over 3,000 acres of marshes and ponds near the junction of Agawam and Konkapot brooks. This IBA encompasses Fountain Pond, where common moorhens, wood ducks (*Aix sponsa*) and hooded mergansers (*Lophodytes cucullatus*) have been documented breeding in recent years.

The Little River Watershed IBA, located approximately 18 miles southeast of the Project area, comprises most of the watershed land and all of the water of Cobble Mountain and Borden Brook reservoirs (Springfield), and Granville Reservoir (Westfield). There is a known bald eagle nest at Cobble Mountain, and the reservoirs in this IBA are known feeding areas for birds. It also includes part of the Tolland State Forest and the Phelon Forest owned by the New England Forestry Foundation. The Blueberry Hill Hawk Watch Site is located within this IBA. The habitat is primarily upland forest, supporting both northern and southern plant species. This IBA also includes beaver flowages as well as some hayfields, overgrown fields, and wild blueberry fields. The bald eagle nest at Cobble Mountain reservoir is used all year as a feeding area. American bitterns nest in several beaver swamps contained within this IBA.

The Hiram Fox Wildlife Management Area, roughly 20 miles east of the Project area, comprises 3,200 acres of second-growth forest. This IBA is primarily in the town of Chester, and includes relatively unfragmented forest with a limited amount of agriculture and rural development in the surrounding land. The topography is of moderate and occasional steep slopes interspersed with abrupt ledge outcrops. Habitats within the area are primarily northern hardwoods (with scattered mixed northern hardwood/northern red oak, mixed eastern white pine/hardwoods, and eastern hemlock/hardwoods. The site was deemed an IBA for its long-term breeding study of forest-nesting birds. Large numbers of deep forest species consistently breed in this IBA.

### 3.3.3 HMANA Hawk Watch Site Data

There are four HMANA sites within 34 miles of the Project area. The closest site is the Alander Mountain Hawk Watch, which is located roughly 22 miles northeast of the Project area. The three other sites are located southeast of the Project area. These sites, Shatterack Mountain, Blueberry Hill and Tuttle Hill, are located, respectively, approximately 26, 28 and 34 miles from the Project area.

Data were available for a Hawk Watch at Alander Mountain in fall 2006 (Appendix G). A total of 472 raptors were observed at this site, including 6 bald eagles, 1 peregrine falcon (*Falco peregrinus*), 13 northern harrier, and 156 sharp-shinned hawks. The Shatterack Mountain Hawk Watch site recorded 2,539 raptors in the fall of 2009, including 6 bald eagles, 3 peregrine falcons, 3 northern harrier, and 86 sharp-shinned hawks. In the fall of 2009, the Blueberry Hill Hawk Watch site recorded 7,227 raptors, 48 of which were bald eagles, 5 were peregrine falcons, 61 were northern harrier and 754 were sharp-shinned hawks. Tuttle Hill Hawk Watch recorded 58 hawks in fall 2002, including 4 sharp-shinned hawks.

### 3.3.4 Bat Data

Nine species of bats occur in Massachusetts, based upon their normal geographical range. These are the little brown bat (*Myotis lucifugus*), northern long-eared bat, (*M. septentrionalis*), Indiana bat, eastern small-footed bat, silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and hoary bat (*L. cinereus*) (BCI 2001). Two species of bats are considered rare in Massachusetts. The Indiana myotis is state and federally-listed as endangered. The eastern small-footed myotis is state-listed as a species of special concern.

Neither the NHESP nor USFWS identified any known hibernacula containing Indiana myotis or eastern small-footed myotis within the Project area. It is unknown whether tree-roosting bats occur at the Project.

The State's largest hibernaculum is located in Chester, Massachusetts, approximately 19 miles (direct) southeast of the Project area. It has been recently reported that the 8,000 to 10,000 bats known to overwinter in this hibernaculum have apparently died due to White Nose Syndrome (WNS) (MA DFG 2009).

### 3.3.5 BioMap Core Habitats

The NHESP's *Guiding Land Conservation Biodiversity in Massachusetts Report* (2004) identified one Core Habitat, Core Habitat BM677, less than one mile northeast of the Project area. This particular Core Habitat includes portions of the Housatonic River, Sackett Brook, Yukon Brook, Pleasant Valley, and Lenox Mountain. It should be noted that rare species could potentially occur anywhere within the mapped Core Habitat, and may not be present in the Project area. Large portions of this Core Habitat are protected as conservation land, and NHESP identified the following areas as protection priorities: areas along the Housatonic River, the lower and middle reaches of Yukon Brook and around Mud Pond. The following bird species were identified by NHESP as possibly occurring in Core Habitat BM677: American bittern, common moorhen and least bittern.



NHESP identified shallow freshwater marshes, wet meadows, beaver-impounded wetlands and oxbows along the Housatonic River and the lower reaches of Sackett Brook which may provide habitat for American bittern. Riverine marshes with cattails, aquatic bed vegetation and open water were also identified within this Core Habitat which may support American bittern, least bittern, common moorhen, and other marsh birds. In addition, mature floodplain forests at lower elevations may be important habitat for numerous species of songbirds.

The NHESP's *Guiding Land Conservation Biodiversity in Massachusetts Report* (2004) also identified a Core Habitat site in Pittsfield (BM492), approximately five miles northeast of the Project, which is known to contain a bat hibernaculum. The site is characterized by NHESP as being important for overwintering bats.

### 3.3.6 Department of Conservation and Recreation's Areas of Critical Environmental Concern (ACEC) Program Data

The Project area is not contained within any ACECs. One ACEC, the Upper Housatonic River ACEC, was identified in the town of Lenox, east and north of the Project area. This ACEC was designated in March of 2009 and covers 12,276 acres in the towns of Lee, Lenox, Pittsfield and Washington.

## 3.4 Information Review of Publicly Available Data

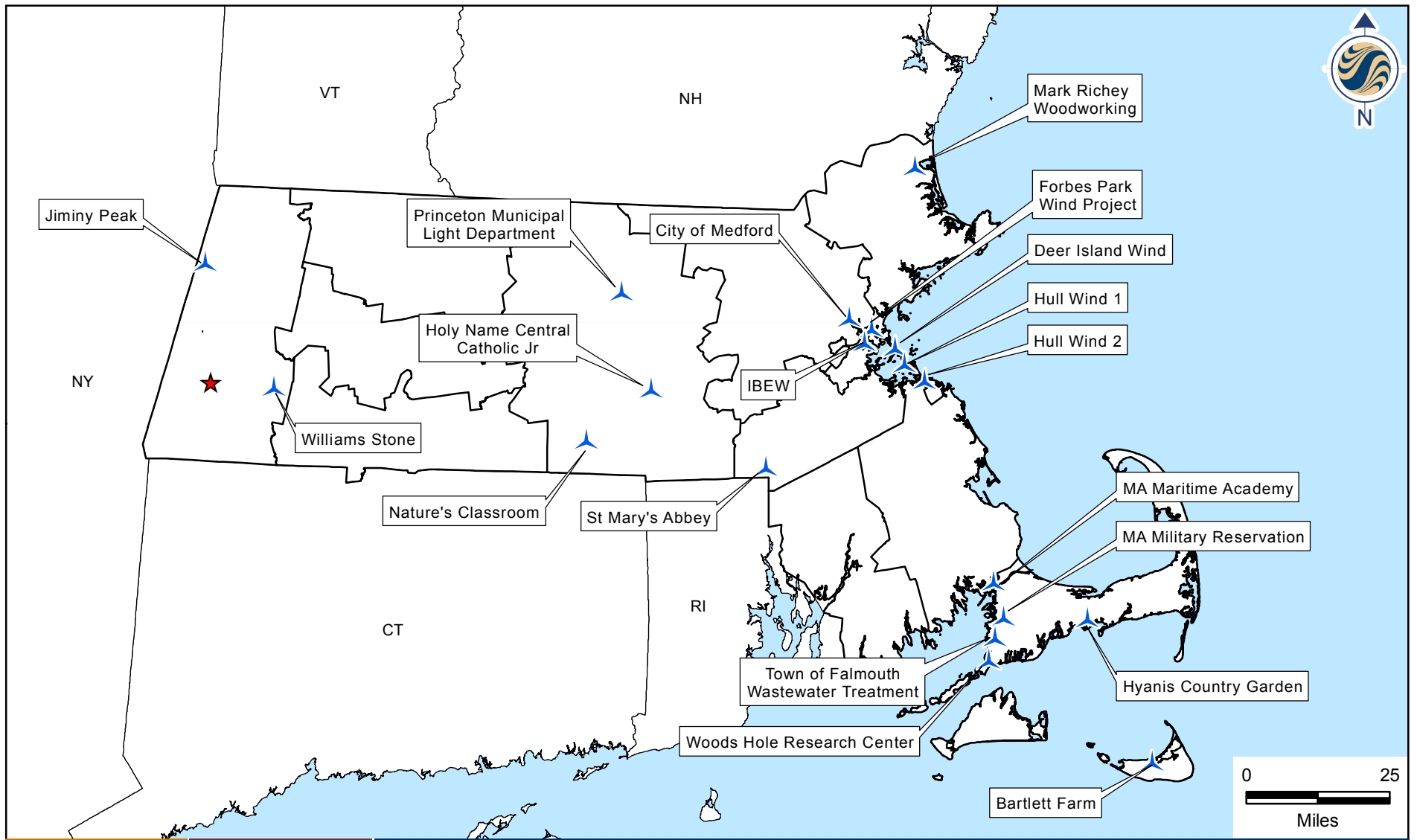
### 3.4.1 Publicly available pre-construction data from Massachusetts wind energy projects

There are currently 19 operational wind energy projects in Massachusetts (Figure 4). Additionally, there are 3 projects under construction, 3 permitted, 9 seeking permits, 32 in development, and 3 planned in Massachusetts (US Department of Energy 2010). Of the operating wind projects, six are over 1000 kilowatts (kW) in size, seven are greater than 100 kW and less than 1000 kW, and six are 100 kW projects.

Publicly available pre-construction data related to bird and bat studies are lacking for Massachusetts wind energy projects, which likely reflects limited State guidelines for these projects and the relatively small size of community-scale projects. However, one study targeting avian species at a restoration project in close proximity to the Project area and three pre-construction acoustic studies at wind energy projects in Massachusetts were identified during the literature review. The results of these studies are summarized below.

#### *Avian*

Several surveys targeting avian species were performed along the Housatonic River in the towns of Pittsfield, Lenox and Lee from 1998 to 2001, including a waterfowl survey, wading and marsh bird survey, hawk and owl playback survey, a belted kingfisher (*Ceryle alcyon*) nest survey, and a forest breeding bird survey. The following species were observed or identified either during surveys or incidentally near the Housatonic River site. Three waterfowl species were observed, including Canada goose (*Branta canadensis*), wood duck (*Aix sponsa*) and mallard (*Anas platyrhynchos*) (Woodlot Alternatives, Inc. 2002). Four wading bird species were identified including American bittern, great blue heron, green heron (species of conservation interest), and black-crowned night heron (*Nycticorax nycticorax*), and four marsh birds were identified,



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## **Legend**

- ★ Proposed WTG Site
- ✈ Massachusetts Operational Wind Energy Project
- Massachusetts County Boundary

Client/Project  
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Town of Lenox Wind Project  
Lenox, Massachusetts

Figure No.  
**4**

Title  
**Massachusetts Operational  
Wind Energy Projects**

September 8, 2010

including Virginia rail (species of conservation interest), common moorhen, sora (species of conservation interest), and American coot (*Fulica americana*) (Woodlot Alternatives, Inc. 2002). A total of eleven raptor species and three owl species were documented. Species which either responded to the playback calls or were identified incidentally included northern harrier, sharp-shinned hawk, Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipiter gentilis*), red-shouldered hawk (*Buteo lineatus*), broad-winged hawk (*Buteo platypterus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), bald eagle, osprey (*Pandion haliaetus*), turkey vulture (*Cathartes aura*), great horned owl (*Bubo virginianus*), barred owl (*Strix varia*) and northern saw-whet owl (*Aegolius acadicus*) (Woodlot Alternatives, Inc. 2002). A total of three belted kingfisher nests were found, and a total of 47 species of passerines (perching songbirds) were documented in forested wetlands at the site; no state-listed species were observed during the forest breeding bird survey (Woodlot Alternatives Inc, 2002).

### *Acoustic*

Woodlot Alternatives, Inc. performed acoustic surveys in 1999 to determine species composition adjacent to the Housatonic River in portions of the towns of Pittsfield, Lenox and Lee. Bat surveyors held detectors while walking transects parallel (and approximately 1 kilometer) away from the river, or while canoeing transects, depending on the water level. Three transects were surveyed for three consecutive nights in late July or August. Surveys recorded silver-haired bats (9% of total calls), big brown bats (6% of total calls), eastern red bats (3% of total calls), hoary bats (1% of total calls), tri-colored bats (1% of total calls), and northern long-eared bats (1% of total calls) (Woodlot Alternatives, Inc. 2002).

In the summer and fall of 2006, Arnett *et al.* (2007) conducted an acoustic monitoring study to estimate bat activity near the rotor-swept zone of a proposed wind project in Berkshire and Franklin Counties, Massachusetts. Bat biologists deployed three detectors in each of five met towers at heights of 10 m, 31 m and 39 m from July 26 to December 20 and sampling occurred from 1900 to 0700 hours. The site was located on a forested ridge at an elevation was 720 to 870 m. Peak call activity occurred in late July, early and mid-August, and in late September. More high frequency calls (likely feeding calls) were detected by the 10 m detector, while more low frequency calls were detected by the 39 m detector.

In the spring of 2009, a similar pre-construction acoustic monitoring study was conducted at Mt. Wachusett Community College in Worcester County, Massachusetts, approximately 70 miles east (direct) of the Project area. Bat biologists deployed five Anabat SD-1 ultrasonic detectors at three different heights (10 m, 30 m and 50 m) in an on-site meteorological (met) tower and at two sites adjacent to a wetland. Continuous, on-site sampling occurred from March 19 to July 15 from 18:00 to 08:00, hours, which coincides with nighttime foraging or migration activity of bats. The low detector showed a peak in bat activity during the week of June 1. Both the 30 m and 50 m detectors showed a peak in activity during the week of June 6 with most calls belonging to the same guild. The majority of the bats recorded were believed to be foraging, although a few calls were detected from hoary bats, which were likely migrating (Reynolds 2009).

### 3.4.2 Publicly available post-construction data from wind energy projects in the eastern United States

Stantec has compiled publicly available post-construction data from surveys conducted at operational wind energy projects in the eastern United States (Appendix H, Table 1). In general, avian fatalities at operational wind projects in the east range from 0.44 to 2.5 birds/turbine/year (birds/t/yr) to 5.67 to 6.31 birds/t/yr. Bat fatalities at operational wind projects in the east range from 0.17 to 0.68 bats/t/yr to 47.53 bats/t/yr. No post-construction data for Massachusetts wind projects were identified during the literature review.

## 4.0 DISCUSSION

This report is a guidance document that synthesizes what is known about the avian and bat resources present in the region, and examines available data regarding the Project footprint and known habitats occurring in the Project vicinity. This report discusses the likelihood for rare, threatened or endangered bird and bat species to occur in the Project area, and provides an initial assessment of the likelihood for the proposed Project to significantly impact bird and bat species. This initial bird and bat risk identification report included three primary steps: 1) request for natural resource information from state and federal agencies and desktop analysis of maps identifying known resources; 2) an information review of avian and bat resources in the vicinity of the Project area; and 3) a review of publicly available pre- and post-construction data from other proposed and operational wind projects in Massachusetts and the Northeast.

The USFWS identified no federally-listed or proposed threatened or endangered bird or bat species or critical habitat in the Project area. Similarly, the NHESP identified no Estimated Habitat of Rare Wildlife or Priority Habitat for bird or bat species in the Project area.

### 4.1 Key Issues

The information review performed for this Project identified two issues which may require agency follow-up. These are the potential breeding presence of mourning warbler, and the species composition and foraging behavior of bats in the hibernaculum identified in Core Habitat BM492 (Pittsfield).

#### *Mourning warbler*

Although the NHESP response letter did not indicate the presence of this species in the Project area, this information review suggested they could occur in the vicinity of the Project area based on the fact that this species was documented during recent breeding bird surveys conducted in nearby towns of East Lee, East Pittsfield, and Stockbridge (Appendix D), and suitable habitat occurs in the Project area. This species prefers stands of dense saplings and shrubs, primarily in disturbed habitats with shrubby understories. Photographs of the site revealed cover types indicative of current and past timber harvesting, with mixed hardwood/softwood appearing to be the dominant cover type. Prior timber harvesting activities have created areas where early-successional species and disturbance-tolerant shrubs are prevalent. Direct mortality of mourning warblers and destruction of their nests during construction and operation phases of the

Project could potentially occur during site construction. However, indirect effects of Project construction on this species are likely to be minimal or potentially positive, as this species depends on small-scale clearings resulting from such actions as clear-cut logging and construction of utility corridors (DeGraaf and Yamasaki 2001).

Efforts to minimize impacts to this species and others may be employed. For example, construction could be timed to occur outside of the breeding and nesting season to minimize disturbance. Consultation with state and federal agencies would determine if the presence of mourning warbler will be an issue for the Project.

#### *Hibernaculum in Core Habitat BM492*

The fact that the Project is in the vicinity of a known bat hibernaculum does not mean the site is at greater potential risk than others further away. However, it is difficult to gauge level of impact without specific information about the hibernaculum, such as species composition and foraging behavior. White Nose Syndrome has been confirmed in western Massachusetts, therefore it is not known at this time whether or not this hibernaculum supports bats. No known Indiana bat hibernacula occur in Massachusetts (USFWS 2007), and the only documented winter record of eastern small-footed bat in Massachusetts is of five individuals in Bat's Den Cave, in Egremont, Berkshire County, approximately 16 miles southwest of the Project (Veilleux 2007 as cited in Reynolds and Veilleux 2008). It is not likely that the Project would negatively impact bats in this hibernaculum, as these species would likely utilize habitat along the Upper Housatonic River (an ACEC) instead of the Project area; Indiana bats congregate in the bark of dead trees along banks of streams in spring and swarm caves and mines in late summer. Eastern small-footed bats utilize talus slopes and rocky outcrops in spring, not present in the Project area. However, consultation with MA DFG and USFWS would help assess whether or the Project could impact these listed species.

## **4.2 Other Avian Resources**

### *Passerines*

Some amount of direct avian mortality of nocturnal migrants should be expected if the Project is developed and becomes operational based upon post-construction surveys conducted at operational wind energy projects (Appendix H, Table 1). Avian collision mortality documented in the eastern United States has involved night-migrating passerines more than any other group (Erickson *et al.* 2001). This is due to the fact that passerines migrate at night and across a large geographic range in the eastern United States; inclement weather conditions force passerines to fly at lower heights which makes them susceptible to turbine collisions. The summary of known avian collision mortality at wind facilities by Erickson *et al.* (2001) reported that 78 percent of fatalities were passerines, whereas waterfowl, shorebirds, raptors, owls, and other species accounted for small percentages of documented fatalities. Mortalities at operational facilities are believed to be attributed to both small-scale and localized resident bird movements, as well as nighttime migration movements (Stantec 2009). The effect of this mortality on local and regional populations cannot be accurately projected from what is known currently.



Pre-construction radar surveys cannot identify specific species and do not correlate with post-construction fatalities; therefore performing radar studies at the Project would be less useful than determining whether or not significant mortality events occur post-construction. Given the size and location of the project, impacts to passerines are not expected to be high.

### *Raptors*

Based on habitat requirements of raptor species in Massachusetts, state- and federally-listed raptor species are not likely to breed in the Project area. Other raptor species may potentially breed in the Project area.

Previous projects have shown that state and federal agencies tend to be more concerned with raptor collisions at wind turbines along ridgelines during the migration season than during the breeding season, since raptors use prominent ridgelines for visual orientation and vertical lift during migration (Bingman *et al.* 1982). Raptor use data were available for four HMANA sites in the vicinity of the Project area. Of the four HMANA sites located within 34 miles of the Project area, the closest site (Alander Mountain, 22 miles away) recorded the second fewest (472) raptor observations; this is compared to the Blueberry Hill Hawk Watch site (28 miles away) which recorded 7,227 observations. The variance in hawk observation numbers at two sites relatively close to one another reflects both the variation in numbers between seasons and between sites, and the effect of site-specific topography on migration.

Studies have documented high raptor collision avoidance behaviors at modern wind facilities (Whitfield and Madders 2006, Chamberlain *et al.* 2006). As most raptors are diurnal, raptors may be able to visually, as well as acoustically detect turbines during periods of fair weather. Raptor mortality in the United States, outside of California, has been documented to be relatively low. For example, mortality rates found at wind developments, outside of Altamont Pass in California, have documented 0 to 0.07 fatalities/turbine/year from 2000-2004 (GAO 2005). Several recent studies conducted in the United States have documented low raptor mortality with few more than 20 raptor fatalities reported at more than a dozen sites combined (Osborn *et al.* 2000, Johnson *et al.* 2002, Kerlinger 2002, Young *et al.* 2003, Erickson *et al.* 2000, Kerlinger 2006, Erickson *et al.* 2002, Johnson *et al.* 2003, Kerns and Kerlinger 2004, Arnett 2005, Koford *et al.* 2005, Fiedler *et al.* 2007, Jain *et al.* 2007, Jain *et al.* 2008, Stantec 2008, Stantec 2009a and b, Stantec 2010a and 2010b). However, foraging raptors that may become distracted by prey, or migrant raptors flying during periods of reduced visibility, may be at increased risk of collision with wind turbines.

Based on the results of post-construction data collected from publicly available projects in the United States and the size and geographic location of the Project, raptor fatalities at the Project are expected to be comparable to other projects, therefore low.

## **4.2 Other Bat Resources**

No bat hibernacula were identified in the vicinity of the Project area by NHESP or USFWS. Photos of the Project area did not reveal habitat suitable for overwintering bats, however it is unknown whether or not roosting or foraging habitat exists in the Project area.



Based upon recent studies, wind projects have emerged as a potentially significant source of mortality for migrating bats (Johnson and Strickland 2004, Kerns and Kerlinger 2004, Arnett *et al.* 2005, Curry and Kerlinger 2007). Concern for bat mortality at wind energy developments appears to lie primarily with those developments on forested ridgelines in the eastern United States, where documented bat fatality rates have been higher (bats/turbine/year) than at western and mid-western wind energy developments (Johnson *et al.* 2000, Williams 2003, Arnett *et al.* 2005). Bat collision mortality may have serious demographic consequences for bat populations, particularly given the recent spread of WNS to the Northeast, as bats tend to reach reproductive maturity at a relatively late age, and females tend to give birth to only one offspring per year.

Despite the fact that the Project area likely does not provide habitat for bats during overwintering periods, tree-roosting bats could potentially occur in the Project area, and bats likely fly over the Project area during migration and foraging activities. Data from operational wind projects in the eastern US suggest that long-distance migratory bats species are more vulnerable to collision than overwintering bats which make more localized, short-distance foraging flights during spring and summer. It is expected that bat activity at the Project would be comparable to activity documented at the three other sites in Massachusetts, particularly to activity near the Housatonic River due to its close proximity to the Project area (Woodlot Alternatives, Inc. 2002). Other studies in Massachusetts (Arnett *et al.* 2007, Reynolds 2009) showed that there are fairly distinct seasonal peaks in bat activity in the State, and seasonal trends in bat behavior (i.e. migrating versus foraging) also may be expected to occur at the Project area.

Due to the small size and location of the Project near potentially more suitable roosting and foraging habitat, impacts to bats are not expected to be significant.

## **5.0 SUMMARY AND RECOMMENDATIONS**

Stantec conducted an initial bird and bat risk identification report for a proposed Project in the Town of Lenox, Massachusetts. The purpose of this report is to identify potential risks to avian and bat resources presented by construction and/or operation of the proposed Project and to make recommendations for further investigation or regulatory coordination as necessary to ensure project compliance with applicable environmental regulations.

No federally-listed or proposed threatened or endangered bird or bat species or critical habitat were identified in the Project area by USFWS during the information-gathering step of this report. Similarly, the NHESP identified no Estimated Habitat of Rare Wildlife or Priority Habitat for bird or bat species in the Project area.

The analysis identified the possible presence of one state-listed avian species and potential concerns regarding bats in a nearby hibernaculum that may warrant consultation with state agencies and potentially further investigation. Consulting with these agencies at this stage of project development is suggested as potential issues identified by these agencies at a later stage may make field investigations difficult.

In addition to characterizing the level of risk to state- or federally-listed avian and bat species as a result of the Project, there are multiple development strategies for lessening impacts to a range of species of birds and bats based on the USFWS interim guidelines and MEPA. These include the use of tubular wind towers in lieu of lattice

structures, curtailment during times of heavy migration events and low visibility, reduction in blade rotation speed, avoiding guy wires on met towers, placing electrical lines underground, reducing and modifying lighting, and minimizing habitat disturbance/alteration during and after Project development.

The results of this initial avian and bat risk identification report do not suggest that avian and bat issues at the Project are unique or greater than those at other projects in the Northeast for which data are publicly available; however, the data provided in this report are qualitative and should not be used in lieu of on-site ecological surveys. Without the existence of state guidelines regarding wind power projects and wildlife to identify the requirements necessary for permitting a Massachusetts wind project, one must use the best site-specific and regionally-specific biological information available to inform the project as it is reviewed by multiple entities; consultation with agencies on the issues mentioned above would help ensure this. Please see Appendix A for a summary of possible local and state regulations and permits that may be required for this Project.

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## **Appendix A**

### **SUMMARY OF RELEVANT USFWS INTERIM GUIDELINES AND MEPA**

## **Federal Laws and Guidelines**

The following descriptions of federal laws are intended to inform the Town of Lenox Project (Project) of the legal requirements regarding the protection of wildlife. These descriptions explain the importance of performing appropriate biological site assessments thereby demonstrating that guidelines were followed to reduce direct and indirect impacts to avian and bat species. In addition, the following descriptions demonstrate why project site selection is important to minimize the risk of adverse effects on avian and bat species.

### *The Federal Endangered Species Act (ESA)*

The ESA, 16 U.S.C.A. §§ 1531 to 1543, is designed to protect species listed as endangered or threatened under federal regulations, 50 CFR Part 17. See Appendix B for the United States Fish and Wildlife Service (USFWS) *Recommendations and Recommended Guidelines Submitted to the Secretary of the Interior* (March 4, 2010). The ESA is administered principally by the United States Department of the Interior, specifically, the USFWS. The ESA prohibits the unauthorized “taking” of endangered and threatened species by any person. A “take” means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The term “harm” within the definition of “take” means an act “which actually kills or injures wildlife.” Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

A “take” under the ESA must be based on a case-specific, factual showing of actual harm, or in cases of future activity (i.e., proposed projects), a reasonably certain threat of imminent harm to a member of a listed species resulting from the proposed action or project. Speculation, the mere potential for harm, or even a “significant risk of harm” do not imply “take”; rather, “take” encompasses only those harmful consequences that are “reasonably foreseeable and proximately caused” by the act/project in question.

The project applicant may request an incidental take permit from the USFWS to proceed with the project if a project is anticipated to pose actual harm based on pre-construction survey results. If an applicant decides not to obtain a permit and an unauthorized take occurs that can be attributed to the project, (e.g. a wind project), that individual or entity would be liable under the ESA. An incidental take permit must be accompanied by a habitat conservation plan that identifies potential impacts, mitigation measures, and alternatives to the proposed action.

### *The Federal Migratory Bird Treaty Act (MBTA)*

The MBTA, 16 U.S.C.A. §§ 703 to 712, protects migratory birds by prohibiting the killing or “taking” of any migratory bird, except under the terms of a valid permit issued pursuant to federal regulations. Specifically, the MBTA implements several conventions between the United States and other countries aimed at conserving and protecting specified migratory birds, a listing of which is contained in 50 CFR § 10.13. Although the statute does not define “take,” the implementing regulations define it as “pursue, hunt, shoot, wound, kill, trap, capture or collect.” Federal courts have held that habitat modification (which may result in “harm” or “indirect” deaths) does not violate the MBTA, even where it is conceded that the activity will kill migratory birds.

The USFWS acknowledges that major projects may result in the death of migratory birds, even if all feasible mitigation measures are implemented. The USFWS Office of Enforcement and the Department of Justice tend to focus on those who fail to make good faith efforts during the pre-construction phase of wind energy projects to avoid the take of migratory birds, or those who fail to develop or properly implement appropriate mitigation. Proper biological site assessments and development of a subsequent risk assessment may help demonstrate the Project’s good faith efforts and due diligence to minimize the risk of taking migratory birds.

### *The Bald and Golden Eagle Protection Act (BGEPA)*

The BGEPA, 16 U.S.C.A. § 668-668c as amended, provides further protection to bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) beyond the MBTA. The BGEPA is administered by the USFWS. This statute prohibits the unauthorized “taking” of any bald eagle or golden eagle, with “take” broadly defined to include “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” This act prohibits the “take” of these eagles including their parts, eggs or nests without a permit issued by the Secretary of the Interior. The BGEPA applies only to those who act “knowingly, or with wanton disregard for the consequences of [their] acts.” Like the MBTA, the Federal BGEPA has a provision allowing the Secretary of the Interior to authorize, by regulation, takings that are compatible with the preservation of these species.

In 2009, two new permit regulations were put into place to specifically address “take” under the BGEPA. The first regulation (50 CFR § 22.26) establishes a permit that allows for the “take” of bald and golden eagles where the “take” is incidental to, but not the purpose of an otherwise legal activity, and where the “take” cannot be practically avoided. It is expected that most permits issued under this regulation will authorize “take” in the form of disturbance rather than non-purposeful mortality. The second regulation (50 CFR § 22.27) establishes a permit that allows for the removal of eagle nests under a restrictive set of circumstances. Initially, the USFWS will only issue permits that will result in a “take” of five percent of a regions annual productivity of bald eagles. Issuance of permits allowing the “take” of golden eagles will be much more restricted. In general, these permits will be issued only when they are not counter to the goals of maintaining existing stable breeding populations or increasing these breeding populations.

As with the MBTA, the USFWS acknowledges that under the BGEPA wind projects may result in a “take” “even if all reasonable measures are implemented. Compliance with the BGEPA is determined by whether any “takes” of bald eagles or golden eagles are anticipated to result from the Project. “Takes” are evaluated under the Massachusetts ESA takings analysis (see below). For wind energy projects, pre-construction biological assessments can help assess potential impacts to eagles, and proper site selection will demonstrate efforts to avoid/reduce the potential for “taking” of eagles.

To date, federal permits have not been required of small, community-based wind projects in Massachusetts.

### **State Laws and Guidelines**

As in the federal version of the ESA, the Massachusetts ESA (MESA; G.L c.131A and regulations 321 CMR 10.00) defines take as "in references to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat." Permits for taking rare species for scientific, educational, conservation, or management purposes can be granted by the Division of Fisheries and Wildlife within the MA DFG.

In addition to MESA, the Massachusetts Environmental Policy Act (MEPA) – Mass. General Laws, Title III, Ch. 30, §§61, 62-62H, 301 CMR 11.00, 1977, may also apply to the Project. MEPA requires that state agencies study the environmental consequences of their actions including permitting and financial assistance. It also requires agencies to take all feasible measures to avoid, minimize, and mitigate damage to the environment. MEPA applies to any project for which a state agency must grant a permit or license, provide financial assistance or transfer state land. It does not apply to projects needing only local approval, which is decided by the Town Conservation Commission.

A project requires MEPA jurisdiction when it meets or exceeds one or more review thresholds, which includes a list of project categories, size (25 acres or more) or location that are likely to cause damage to the environment, either directly or indirectly. A project may also require MEPA jurisdiction when the Secretary requires fail-safe review. The process of gaining MEPA jurisdiction begins with the completion of an Environmental Notification Form (ENF) which includes a description of the project and its alternatives, identifies any thresholds the project may meet or exceed and any action by agencies it may require, and presents an initial assessment of potential environmental impacts, mitigation measures or a proposed scope. A full Environmental Impact Report (EIR) requires a description of the nature and extent of the proposed project and its environmental impact, measures utilized to minimize environmental damage, adverse short-term and long-term environmental consequences which cannot be avoided should the project be developed, and reasonable alternatives to the proposed project and their environmental consequences. It is likely that this Project will require filing of an ENF.

MEPA does not include specific guidelines for wildlife, however the Department of Energy Resources and the Executive Office of Environmental Affairs have developed

wind zoning by-laws to assist the cities and towns in establishing reasonable standards for wind power development. The zoning guidelines include specific construction components which primarily relate to utility-scale facilities, including a plan indicating all proposed changes to the landscape of the site. This includes temporary or permanent roads or driveways, grading, vegetation clearing and planning, exterior lighting, and screening vegetation or structures. Design guidelines recommend using minimized lighting. Site development recommendations include limiting clearing of natural vegetation to what is necessary for construction, operation and maintenance of the facility and is otherwise prescribed by laws, regulations and ordinances. There are no guidelines related to consultation with wildlife agencies including USFWS, mitigation requirements, post-construction operational surveys, or decommissioning.

A permit is required if wetlands will be altered in any way; this permit is called a Notice of Intent (NOI) which is sent to the Town Conservation Commission, who may send it to the Massachusetts Department of Environmental Protection (MDEP) for review depending on the project size and other thresholds. This permit is also required for projects that fall within Massachusetts Natural Heritage and Endangered Species Program's (NHESP) determination of "Estimated Habitat" for rare wildlife. This project does not fall within land designated as such.

Other state permits related but not limited to general access, noise, historical properties, water quality, and structure height requirements will be required for any Massachusetts project.

### **Local Permits**

The Town Zoning Board will review Zoning permits for all towns on which the project or project features are constructed. Permits are required for review by the Building Inspector and Planning Board, as well as the Town Conservation Commission, who will review the Order of Conditions permit.



## **Appendix B**

### AGENCY RESPONSE LETTERS



Commonwealth of Massachusetts

# Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

September 01, 2010

Sarah Boucher  
Stantec Consulting  
30 Park Dr  
Topsham ME 04086

RE: Project Location: Lenox Mountain, Lenox  
Project Description: Lenox Wind Feasibility Study  
NHESP Tracking No.: 10-28551

Dear Ms. Boucher:

Thank you for contacting the Natural Heritage and Endangered Species Program ("NHESP") of the MA Division of Fisheries & Wildlife for information regarding state-listed rare species in the vicinity of the above referenced site.

Based on a review of the information that was provided and the information that is currently contained in our database, the NHESP has determined that although this site **does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat** as indicated in the *Massachusetts Natural Heritage Atlas* (13<sup>th</sup> Edition), the following state-listed rare species have recently been observed in the vicinity of the site:

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	Amphibian	Special Concern

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. Please note that we recommend that potential impacts to birds be considered during the design and permitting process for all wind turbines.

If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at (508) 389-6361.

Sincerely,

Thomas W. French, Ph.D.  
Assistant Director

[www.masswildlife.org](http://www.masswildlife.org)

Division of Fisheries and Wildlife  
Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7891  
*An Agency of the Department of Fish and Game*



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

New England Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301-5087  
<http://www.fws.gov/newengland>



August 31, 2010

Reference:	<u>Project</u>	<u>Location</u>
	Wind facility	Lenox, MA

Ms. Sarah Boucher  
Stantec Consulting  
30 Park Drive  
Topsham, ME 04086

Dear Ms. Boucher:

This responds to your recent correspondence requesting information on the presence of federally-listed and/or proposed endangered or threatened species in relation to the proposed project referenced above.

Based on information currently available to us, no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required.

This concludes our review of listed species and critical habitat in the project location(s) and environs referenced above. No further Endangered Species Act coordination of this type is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Operation of wind turbines can adversely affect a variety of wildlife species, including migratory birds and bats. In order to assess the level of risk and the scope of species potentially present in a wind turbine project area, this office recommends that 1) the spatial and temporal uses of the rotor-swept zone by wildlife be identified and evaluated using radar and other remote sensing techniques for a period of three years; and 2) the local site environs be evaluated to determine the presence and magnitude of habitat fragmentation syndrome of effects that would be implicated by project construction and/or operation. These effects may include the direct loss of habitat; an increase in edge habitat; increased nest parasitism and predation; increased isolation of remaining forest; a decrease in abundance and diversity of area-sensitive species; a decrease in size of remaining forest patches; increased human disturbance; a decrease in habitat suitability for area-sensitive species and a concurrent increase in habitat suitability for edge or generalist species; and interruption of travel corridors, displacement and other behavioral effects.

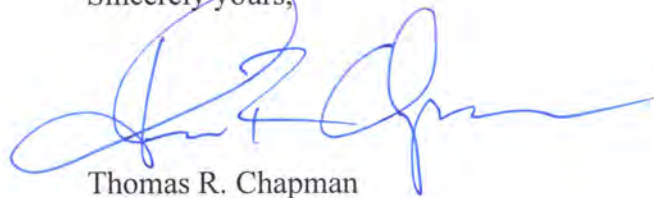
We recommend that the above pre-construction surveys be conducted to inform the project proponent, as well as the Service, of potential wildlife conflicts during the site selection and planning stages. With this information, risks can be assessed, and methods to avoid, minimize and mitigate impacts to wildlife may be accommodated. Without these pre-construction surveys, operational disruptions could reduce the benefits of this important alternative energy source while attempting to avoid impacts to wildlife. Absent adequate pre-construction surveys and careful analysis of subsequent data, the siting, construction and operation of a wind project that results in mortality to wildlife would likely result in violation of federal laws, such as the Migratory Bird Treaty Act and the Endangered Species Act.

Thank you for your coordination. Please visit the Wind Energy page on the New England Field Office's website for useful links, including guidance documents for avoiding and minimizing impacts to wildlife:

(<http://www.fws.gov/newengland/FedActivities-WindEnergyProj.htm>)

Please contact Maria Tur or Anthony Tur of this office at 603-223-2541 if we can be of further assistance.

Sincerely yours,

A handwritten signature in blue ink, appearing to read 'Tom Chapman', with a long horizontal flourish extending to the right.

Thomas R. Chapman  
Supervisor  
New England Field Office

## **Appendix C**

### SITE PHOTOS





Photo 1. Beech-Birch-Maple Forest at the Town of Lenox Wind Project.



Photo 2. Northern Hardwood Forest at the Town of Lenox Wind Project.





Photo 3. White Pine-Red Oak-Red Maple Forest at the Town of Lenox Wind Project.



Photo 4. Eastern Hemlock Forest at the Town of Lenox Wind Project.

## **Appendix D**

### BREEDING BIRD SURVEY DATA

Appendix C. Breeding Birds Documented During Breeding Birds Surveys in the Vicinity of the Project Area -Lenox, MA							
Common Name	Scientific Name	Habitat	MA Status	Breeding Bird Atlas Survey Towns			
				East Lee	Pittsfield East	Pittsfield West	Stockbridge
Acadian Flycatcher	<i>Empidonax virescens</i>	Deciduous and mixed forests, open space in understory				PR S	
Alder Flycatcher	<i>Empidonax alnorum</i>	Thickets, low shrubs, clearings		PR S; CO NB; PO X	PO X; PR T; PR S	PR S; CO CF; PO X	PR S; CO CF; PO X; CO CF
American Bittern	<i>Botaurus lentiginosus</i>	Freshw ater wetlands w ith tall vegetation	Endangered	PR P; PR C; PR S; PO X	PR C; PR P; PR S	PR C	PR S; PO X; PR C
American Black Duck	<i>Anas rubripes</i>	Coastal and fresh water		CO PY	CO FL	CO PY	CO FY; CO PY
American Crow	<i>Corvus brachyrhynchos</i>	Variety of rural to suburban habitats, open areas		OB O; PO X; CO FL; CO FY	CO FY; PO X; CO FL	PO X; PR S; CO FY	CO FY; PO X; CO CN; PO X; CO FL
American Goldfinch	<i>Carduelis tristis</i>	Open, weedy fields with scattered small trees		PO X; CO NB; PR P; PR S	PR P; PR S; PO X	PR P; PR S	CO FY; PR P; PR S; CO NB
American Redstart	<i>Setophaga ruticilla</i>	Deciduous forest and shrub habitats		PO X; CO CF; CO FL; PR S	CO CF; PO X; PR A; PR S; CO NB	PO X; PR A; CO FY; PR S	PR S; CO CF; PO X;
American Robin	<i>Turdus migratorius</i>	Law ns, fields, agricultural areas, forest openings		CO CF; PO X; CO CF; CO ON; CO NB	CO FY; CO CN; CO ON; CO CF; PR S; CO NB	PR S; PO X; CO NY; CO CF; CO CN	CO CF; PR S; CO NE; CO FL
American Woodcock	<i>Scolopax minor</i>	Old farmland turning to forests		PR C; CO DD; PO X	PR C	PR C	CO FL; PR S; PR C
Bald Eagle	<i>Haliaeetus leucocephalus</i>	large bodies of w ater w ith abundant fish and tall trees for nesting	Endangered	PO X	PO X; OB O	CO NY	
Baltimore Oriole	<i>Icterus galbula</i>	Tall scattered deciduous trees		PO X; CO NB; CO FL; PR S	CO NB; PR P; CO NY; PO X; PR S; CO ON	CO FY; PR P; CO FL; CO UN; PR S	CO CF; PR S; PO X; CO NB
Bank Sw allow	<i>Riparia riparia</i>	open habitat near flow ing w ater w ith steep banks		OB O; CO CF; PO X	PO X; CO ON; CO NB	CO CF	PR T; CO FY; PR N; CO CF; PR S
Barn Sw allow	<i>Hirundo rustica</i>	buildings near open habitat		CO FY; CO NB; PO X; PR P	CO FY; CO CF; CO ON; CO NB; PO X	CO NB; CO CN; CO NY; PR P	CO NY; CO FL; CO FY; CO CN; PO X; CO NB
Barred Owl	<i>Strix varia</i>	Cool, damp low lands, cavity trees >20" dbh		PR C; PO X; PR S; CO FL	PR S; OB O; PR C; PR T; PR P	PO X	CO FL; PO X; PR C
Belted Kingfisher	<i>Megasceryle alcyon</i>	nest sites w ithin a mile of clear w ater w ith abundant prey		PO X; CO NB	CO CF; PO X; PR P; CO FL	PO X; PR S	CO CF; PO X
Black Vulture	<i>Coragyps stratus</i>	Low land areas around rivers			OB O		OB O
Black-and-w hite Warbler	<i>Mniotilta varia</i>	Deciduous and mixed forests and w oodlands		PR S; CO FL; CO CN; PO X; CO CF	PR S; PO X; CO CF; CO FL; PR P	PO X; PR S; CO FY	PR S; CO CF; PR P
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Low , dense thickets		PR S; PR C; PO X; CO CF	PO X		PO X; PR S
Blackburnian Warbler	<i>Dendroica fusca</i>	Mature coniferous and mixed forests		PR S; CO CN; PO X	PR S; PO X; CO CF; CO NY; PR T	CO CF; PR S	CO CF; PO X; CO CN
Black-capped Chickadee	<i>Poecile atricapillus</i>	Cavity trees >4" dbh		PR P; PR S; PR T; PO X; CO FL; CO FY; CO NB	CO FY; CO CF; PO X; CO ON; PR S; PR C; PR P; CO FL	PR S; PO X; CO FY; CO NB	CO FL; CO CF; PO X; PR P; CO FY
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Deciduous and mixed w oodlands		PR S; PR A; CO CF; CO FL; CO NE	PR S; PO X; OB O; PR C; CO FL; PR T	PO X; PR S	PR S; CO CF; CO ON
Black-throated Green Warbler	<i>Dendroica virens</i>	Coniferous forests, mixed w oodlands		PR S; CO CF; PO X	PR S; CO CF; PO X; PR C; CO FL	PO X; PR S	CO CF; PO X; CO FL
Blue Jay	<i>Cyanocitta cristata</i>	Variety of rural to urban habitats		PO X; PR T; PR S; CO FS	CO ON; PO X; CO CF; CO FY; PR C; CO FL; PR P	PO X; PR S; CO FY; PR T	CO FY; PO X; CO FL
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	Forests and forest fragments with significant hardw ood proportion			CO CF		
Blue-headed Vireo	<i>Vireo solitarius</i>	Coniferous and mixed forests		PO X; PR S; CO CF; PR P	PR S; CO CF; PO X; PR T	PO X; CO ON	CO CF; PR S
Blue-w inged Teal	<i>Anas discors</i>	Freshw ater marshes, ponds, lakes		PR P		OB O	
Blue-w inged Warbler	<i>Vermivora pinus</i>	old fields with scattered shrubs and trees		PR S; PO X	CO FY; PO X	CO NB; PO X	CO CF; PO X; OB O; PR S
Bobolink	<i>Dolichonyx oryzivorus</i>	large expanses of grassland or older hay fields		CO CF; PO X	PR S; CO CF; PO X; CO FL; PR T	CO CF; CO NY; PO X	CO CF; PO X; PR S; CO NB
Broad-w inged Hawk	<i>Buteo platyterus</i>	Extensive w oodlands w ith roads or clearings		CO NY; PR P; PO X	PO X; PR P; PR T; CO FL	CO FL; PO X	PR A; PO X; PR P
Brown Creeper	<i>Certhia americana</i>	Standing dead trees w ith loose bark		PR S; PR C; PO X; CO NB	CO CF; PR C; PO X; PR T; PR P	PO X; PR S	PR S; PO X; PR P
Brown Thrasher	<i>Toxostoma rufum</i>	low , dense, w oody vegetation		PR A	PR P; PO X	PO X; CO FY	PR S; PO X
Brown-headed Cow bird	<i>Molothrus ater</i>	Open fields, mowed grassy areas, low trees		PR P; PR C; PO X; CO NE	CO FY; PR S; PO X; CO FL; OB O	PR S; PR P; PO X	PR P; PO X; PR S; CO FL
Canada Goose	<i>Branta canadensis</i>	elevated sites in marshes for nesting		CO PY; PR P	CO FL; CO PY; CO ON; PR P	CO FL; CO PY; CO FY; CO ON	CO PY; CO PY; CO FL; CO ON
Canada Warbler	<i>Wilsonia canadensis</i>	Forest w ith dense understory, along moist areas		PR S; PO X	PO X; PR A; PR S; CO CF; PR T	PR T; PR S; PO X	PR A; CO CF
Carolina Wren	<i>Thryothorus ludovicianus</i>	low , brushy vegetation		PO X	PR S; PO X	PO X; PR S	PR S; PO X
Cedar Waxw ing	<i>Bombycilla cedrorum</i>	Early successional forests, berry producing trees, shrubs		CO ON; CO NB; CO CN; PO X; PR C	PO X; PR P; CO FL; CO NB	PO X; CO CF; CO NB; PR P	PO X; CO CN; PR A
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	Brush at w ood margins, hardw ood seedling stands		CO CF; PO X; PR A; PR S	PR S; PO X; CO FY; CO FL; CO CF	PR T; PO X; OB O; CO FY; CO CF	CO CF; PO X; PR S; CO NB
Chimney Sw ift	<i>Chaetura pelagica</i>	Chimneys for nesting		PR C	PO X; CO OB O	OB O; PO X	PO X; PR C
Chipping Sparrow	<i>Spizella passerina</i>	Fields and law ns in close proximity to trees (often conifers)		PO X; CO CF; PR S; CO NE; CO FY; PR C	CO FY; CO NY; PO X; PR S; CO CF; CO FL; CO NB; PR P	PR S; CO NB; CO FY	CO CF; CO FL; PR S; PO X
Cliff Sw allow	<i>Petrochelidon pyrrhonota</i>	Cliffs and banks, grasslands		CO NB	CO CF; CO ON	PO X; CO NY; CO ON	CO NY; PO X; CO ON
Common Grackle	<i>Quiscalus quiscula</i>	Conifers near water, shorelines, fields and law ns		PR P; PO X; CO CF; PR S; CO FS	CO CF; CO FY; PO X; CO FS; CO FL	PR T; PR S; CO FY; CO CF	CO CF; PO X; CO NY; CO FY
Common Loon	<i>Gavia immer</i>	Bodies of w ater w ith little human disturbance	Special Concern		PO X		
Common Merganser	<i>Mergus merganser</i>	Clear forested lakes		PR N; PR P	PO X		
Common Moorhen	<i>Gallinula chloropus</i>	shallow w ater bodies w ith emergent vegetation	Special Concern				PO X
Common Raven	<i>Corvus corax</i>	Cliffs or tall trees		PO X; CO NY	PO X; PR P; OB O; CO FL	PR S	OB O; PO X
Common Yellow throat	<i>Geothlypis trichas</i>	moist areas w ith dense, herbaceous vegetation		CO FL; PO X; CO FY; PR S; CO CN	CO CF; CO FY; PO X; PR S; CO NB; CO FL; PR T	PR P; PO X; PR S; CO CF; CO FL	CO CF; PR A; PR S; CO CN; CO FL
Cooper's Hawk	<i>Accipiter cooperii</i>	Undisturbed forests		PO X	CO FL; OB O	PO X	PR A; PO X
Dark-eyed Junco (Slate-colored Junco)	<i>Junco hyemalis</i>	Mature conifer forests (often eastern hemlock)		CO ON; PR S; PR P; PO X; PR A	PO X; PR P; PR A; PR S; CO FL; CO CF	PO X; PR S	CO CF; CO FL; PR P; CO FY; CO CN; PO X
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Undisturbed nesting sites			OB O	OB O	
Dow ny Woodpecker	<i>Picoides pubescens</i>	Trees, limbs w ith decay column >6" dbh		PO X; CO NY; PR A	CO FY; CO PY; PO X; PR P; PR S; CO FL	CO FY; PR S; CO CF	CO FL; PO X; PR C; CO NY
Eastern Bluebird	<i>Sialia sialis</i>	Low cavities, open country		PR P; CO NE; PO X; PR N	CO NE; CO NY; PR P; PO X; OB O; CO ON; CO CF	PO X; CO NY; CO FY	CO NY; PR P; CO FY
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Clearings, fields, edges . Fallen shoreline trees		PR P; CO NE; CO FY; PO X; PR S	PR S; CO ON; CO NY; PR P; PO X; CO FL	PR P; CO NY; CO ON; PR S	CO FL; PO X; PR T; CO FY
Eastern Meadowlark	<i>Sturnella magna</i>	extensive open grassland w ith elevated song perches			PR T		CO CF; PR S; PO X
Eastern Phoebe	<i>Sayornis phoebe</i>	Exposed, streamside perches, sheltered ledges for nesting		PO X; CO NB; CO ON; CO NY; CO CF; CO UN; PR A	CO NY; CO NE; PO X; CO ON; PR S; PR P; CO FL; CO NB	PO X; CO FY; CO ON; CO NY	CO NY; CO CF; PO X; CO NB
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	dense, brushy, dry cover		CO FL; PO X; PR S	CO CF; PO X	PO X; CO FY; PR S	PR S; PR P; CO CF
Eastern Wood-Pewee	<i>Contopus virens</i>	Open deciduous and mixed forests, forest edge		PO X; PR S	PR S; PO X; OB O; PR FL; PR T	PR S; PO X; OB O	PR S; CO CF; PO X
European Starling	<i>Sturnus vulgaris</i>	Cavity trees >10" dbh, open fields		CO FL; PO X; PR S; CO CN; CO CF	CO FY; CO CF; PO X; CO CN; OB O; CO FL	CO FY; CO CN; CO CF; PR S	CO NB; CO FY; PO X; CO FL; CO CF
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Conifers		PO X			
Field Sparrow	<i>Spizella pusilla</i>	Open grassy areas, old fields			CO CF; PO X; PR S; CO ON	PR S; PO X	CO CF; CO FL; PO X
Fish Crow	<i>Corvus ossifragus</i>	Low coastal areas, w ooded marine shorelines			CO FY; PO X		OB O; PO X
Golden-crow ned Kinglet	<i>Regulus satrapa</i>	Coniferous forests		PR S; CO FL; PO X	PR S; PO X		PR P
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Dry grassy areas	Threatened			CO CF	
Gray Catbird	<i>Dumetella carolinensis</i>	Shrubs, thickets in open country		PR A; CO FS; PO X; CO CF; PR S; CO CN	CO CF; CO CN; PR S; CO FL; CO NE; PR T	PR S; PO X; CO CF; CO FS	CO CF; PR A; PR S; CO FS
Great Blue Heron	<i>Ardea herodias</i>	Open w ater or w etland habitats w ith tall trees for nesting		PO X; OB O	CO ON; OB O; PO X; CO NY	PO X; ON O; CO ON	PO X; CO ON; CO NY
Great Crested Flycatcher	<i>Myiarchus cineritus</i>	natural tree cavities, deciduous edge		PR S; CO CN	PR S; PO X; OB O	PO X; PR T; PR S	PR S; PO X; PR T; PR C
Great Horned Owl	<i>Bubo virginianus</i>	Large abandoned hawk nests, large tree cavities		PR C; PO X	OB O		PO X; CO NY
Green Heron	<i>Butorides virescens</i>	w ooded w etlands, shallow w aterbodies		PO X	CO FY; PO X; PR P	PO X; CO FY	PO X
Green-w inged Teal	<i>Anas crecca</i>	Shallow streams, ponds		CO PY			
Hairy Woodpecker	<i>Picoides villosus</i>	Trees, limbs w ith decay column >10" dbh		PO X; CO NY; CO ON; PR P	CO FY; PO X; PR A; PR C; PR S; PR P; CO ON; CO FL	PO X; CO FY	CO FY; PO X; PR P; CO FL
(continued)							
Appendix C (cont). Breeding Birds Documented During Breeding Birds Surveys in the Vicinity of the Project Area -Lenox, MA							



Appendix C (cont). Breeding Birds Documented During Breeding Birds Surveys in the Vicinity of the Project Area -Lenox, MA							
Hermit Thrush	<i>Catharus guttatus</i>	Dense coniferous or mixed forests		CO CF; CO ON; CO FY; PO X; PR S	PO X; PR S; PR T	PR S; PO X; CO CF	PO X; CO FL; PR S; CO CF
Hooded Merganser	<i>Lophodytes cucullatus</i>	Wooded areas with cavity trees, clear fresh water		CO PY; PO X; PR P	CO FL; PO X; CO ON; CO PY	PR S; CO PY; CO FL	PO X; CO FL; CO PY
House Finch	<i>Carpodacus mexicanus</i>	developed areas with open ground		PO X; PR P	CO FY; CO CF; PO X; OB O	CO FY; CO NB; PO X	CO FL; PO X; CO NB
House Sparrow	<i>Passer domesticus</i>	villages, farms, cities, parks		PO X; CO CF; CO NB; CO CN	CO FY; CO CF; PR P; PO X; OB O	CO CF; CO ON; PR S	CO ON; CO FL; PO X; CO CN; PR N; CO CF
House Wren	<i>Troglodytes aedon</i>	Cavity trees, shrubs		PR B; PR S; PO X	CO FY; CO ON; PR S; CO FL; PR T	OB O; PR S; CO FY	CO CF; PR S; PO X; PR S
Indigo Bunting	<i>Passerina cyanea</i>	high song perches, open areas at forest edges, old fields		PO X; CO FL; PR S	PR S; PO X; CO FL; PR T	PR P; PR A; PR S	CO CF; PO X; PR T; PR S
Killdeer	<i>Charadrius vociferus</i>	open fields with sparse vegetation		PR P; CO PY; PO X; OB O	CO FL; CO PY; CO FY; CO DD; OB O; PO X	CO FL; PR P	CO PY; PO X; CO FL; CO NE
Least Bittern	<i>Ixobrychus exilis</i>	Freshwater wetlands with tall vegetation	Endangered		PR P		
Least Flycatcher	<i>Empidonax minimus</i>	Open deciduous and mixed forests, forest edge		PR P; PR S; PO X; PR T	PO X; PR S; PR P	PR S; PO X	PR S; CO CF; PO X
Louisiana Waterthrush	<i>Seiurus motacilla</i>	Woodlands with flowing water		PR P; PO X; CO FL; PR S	PO X	PO X; CO CF	PR P; PR T
Magnolia Warbler	<i>Dendroica magnolia</i>	Young stands of spruce or fir		PR S; PO X	PR S; OB O; PR T; CO FL; PO X		PO X
Mallard	<i>Anas platyrhynchos</i>	Variety of rural to urban aquatic habitats		CO PY; PR P; PO X; CO FL	CO FL; PO X; CO PY; PR P	PO X; CO PY	CO FL; PR P; OB O; CO PY
Marsh Wren	<i>Cistothorus palustris</i>	Marshes with tall emergent vegetation			PR S; OB O; PO X	PR S	PR B; PR S
Mourning Dove	<i>Zenaidura macroura</i>	Open land with bare ground		PR P; PO X; PR C; PR S; CO CN; PR C	CO FY; CO CN; PR S; PR P; CO FL	PO X; CO NB; CO FY; CO CN; PR C	CO FL; PR S; PO X
Mourning Warbler	<i>Oporornis philadelphia</i>	stands of dense saplings, shrubs	Special Concern	CO CF	PO X; PR T		
Mute Swan	<i>Cygnus olor</i>	Shallow waters with abundant aquatic vegetation			PO X		PO X
Nashville Warbler	<i>Vermivora ruficapilla</i>	Second-growth deciduous forests		PR S	PO X; PR T; PR S		PR P; PO X
Northern Cardinal	<i>Cardinalis cardinalis</i>	Thickets, dense shrubs		PO X; CO CF; PR S	CO FL; CO FY; PR S; PR P; PO X; PR T	PR S; CO CF	CO FY; PR S; PO X; PR N; CO FL
Northern Flicker (Yellow-shafted Flicker)	<i>Colaptes auratus</i>	Open areas, trees with heart rot		PO X; CO NY; PR P; PR C; CO CF; PR S	PR C; PO X; PR P; OB O; PR T; CO FL	PO X; PR S; CO FY; PR P	CO NY; PO X; PR S; PR T
Northern Harrier	<i>Circus cyaneus</i>	open country	Threatened		PO X	OB O	
Northern Mockingbird	<i>Mimus polyglottos</i>	low, dense, woody vegetation			CO FY; PO X; PR S	CO CF; PR S	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	nest sites within 0.6 miles of water		PO X; CO NB	PO X; CO ON		CO FS; PO X; CO NB
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Large trees, dense vegetation		PO X			CO NE; PO X
Northern Waterthrush	<i>Seiurus noveboracensis</i>	Cool, shaded, wet ground with shallow pools		PR S; PO X	PO X; PR S; PR T	CO FL	CO FY; PO X; PR T; CO CF
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Tall, exposed perches near bogs and swamps		PO X	PO X		
Osprey	<i>Pandion haliaetus</i>	elevated nest sites near water with abundant fish		PO X			PO X
Ovenbird	<i>Seiurus aurocapilla</i>	large areas of contiguous mature deciduous interior habitat		CO DD; PO X; CO FL; PR S; CO NY; PR A	CO CF; PO X; PR S; PR C; PR T	PR S; PO X; PR C	CO DD; CO CF; PR S; CO NE; CO FL
Red-billed Grebe	<i>Podilymbus podiceps</i>	fresh marshes, ponds > 12.5 acres	Endangered				PO X
Fleated Woodpecker	<i>Dryocopus pileatus</i>	Mature trees >20" dbh with decay		PO X; PR C; PR S	PR S; PO X; CO ON; PR T	PR S; PO X	PO X; PR S; CO FL; PR C
Fine Siskin	<i>Carduelis pinus</i>	Coniferous forests			PO X		
Fine Warbler	<i>Dendroica pinus</i>	open pine forests		CO FL	CO CF; PR S; PO X; OB O	CO CF; PR S	PO X; PR S; CO CF
Prairie Warbler	<i>Dendroica discolor</i>	Dry areas with low trees and shrubs			PO X		PR S
Purple Finch	<i>Carpodacus purpureus</i>	coniferous trees		PR S; CO FY; PO X	CO FY; PO X; PR P; PR S; CO CF; PR T	PO X; PR P	CO FY; CO CF
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	extensive open, mature woodlands with dead trees for nesting		PR S; OB O	CO FY; PR S; PO X	PO X	CO FL; CO NY; PO X
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Cavity trees in mixed or coniferous woods		PR S; PR P; PO X	CO FY; CO FS; PR S; CO CF; PR T; PO X	PO X	CO FL; PR S
Red-eyed Vireo	<i>Vireo olivaceus</i>	Deciduous forests with continuous canopy		PR S; PO X; CO CF; CO NB; CO CN; CO ON	PR S; PO X; PR P; CO FL; CO ON	PR S; CO ON	CO CF; PO X; PR S; CO FY
Red-shouldered Hawk	<i>Buteo lineatus</i>	riparian deciduous woodlands with tall trees for nesting		PO X	OB O; PO X; PR P; PR T	PO X	PO X; CO FL
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Mature forest-field ecotone		PR C; PO X	OB O; PO X; PR T	OB O; PO X; PR P	PO X; PO X; PR P
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Emergent marshes, often with robust, graminoid vegetation		CO FY; PO X; PR T; CO CF; PR P; CO CN	CO CF; PR S; CO NE; PO X; PR P	CO CF; PO X; CO CN; PR S	CO FY; CO CF; PR P; PR S; CO FL
Ring-billed Gull	<i>Larus delawarensis</i>	Sparsely vegetated islands		OB O	OB O	OB O	
Rock Pigeon	<i>Columba livia</i>	open country		PO X; PR C; PR P	CO FL; CO NE; CO ON; OB O	OB O; CO NB; CO NY; PR P	PO X; OB O
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Forest-field ecotones, thickets, sapling stands		PO X; PR S; CO FL	PR S; PO X; CO FY; CO FL; PR P; PR T	PO X; PR S; PR P	CO FY; CO FL; PO X; PR S
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Tubular flowers, especially red		PR T; PO X	PR P; PR T; PO X; CO CF; PR C	PO X; PR P; PR T; PR C	CO FL; PO X; OB O; PR T
Ruffed Grouse	<i>Bonasa umbellus</i>	Fallen logs amidst dense saplings		PO X; PR C; CO PY; PR S	PO X; CO PY; PR S; PR C; CO FL	PO X	CO FY; PO X; CO PY; PR C
Savannah Sparrow	<i>Passerculus sandwichensis</i>	large areas of grassland of intermediate height		CO ON; PR S	PO X; PR S; PR T	CO CF; PR S; PO X	CO CF; CO FY
Scarlet Tanager	<i>Piranga olivacea</i>	mature or pole-sized deciduous or mixed woodlands		PR S; CO CF; PO X	PR S; PO X; PR T	PR S; PO X; CO CF	CO CF; CO FL; PR S
Sedge Wren	<i>Cistothorus platensis</i>	Wet meadows	Endangered				PO X
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Extensive, undisturbed open mixed woodlands	Special Concern	PR P; PO X	PO X	OB O; PO X	PO X
Song Sparrow	<i>Melospiza melodia</i>	Wet areas with brushy vegetation		CO CF; PO X; PR S; PR A	CO FY; CO FL; CO CF; PO X; PR S; PR T	PR S; PO X; CO FY; CO CN; CO CF	CO CF; CO DD; PO X; PR S
Sora	<i>Porzana carolina</i>	Large marshes and wetlands with abundant vegetation			PO X; PR S		PO X; PR P
Spotted Sandpiper	<i>Actitis macularia</i>	Open margins of freshwater bodies		CO PY; PR P	CO FL; CO PY; PR P; PR S		CO DD; PO X; OB O
Swainson's Thrush	<i>Cartharus ustulatus</i>	Coniferous or mixed forests, adjacent to water		PO X	PO X		
Swamp Sparrow	<i>Melospiza georgiana</i>	Variety of wetland and shoreline habitats		CO FL; CO CF; PR S; PR P; CO FY	PR S; PO X; CO CF; PR T; CO FL	CO FY; PO X; PR S	PR S; CO CF; PO X
Tree Swallow	<i>Tachycineta bicolor</i>	Cavity trees >10" dbh, open areas		PO X; CO FL; CO NB; CO FS; PR N	CO NY; CO ON; CO FY; PO X; PR N	CO CF; CO NE; CO CN	CO FY; PO X; CO NB; CO FL
Tufted Titmouse	<i>Baeolophus bicolor</i>	Cavity trees >8" dbh		PO X; CO FL; PR S; PR A	CO FY; PO X; OB O; PR S; PR T	PR S; CO FY	CO FL; PR S; PO X
Turkey Vulture	<i>Cathartes aura</i>	Forest openings, fields, large dead tree trunks		OB O; PR P; PO X	PO X; OB O; PR P	OB O	PO X; OB O
Veery	<i>Catharus fuscescens</i>	Moist woodlands with understory		PR S; PO X; CO CF	PR S; PR P; CO FY; PO X; CO CF	CO FL; PO X; PR S; CO CF	CO CF; PR S; CO FL; PO X
Virginia Rail	<i>Rallus limicola</i>	freshwater marshes with emergent vegetation		PR P	PR S; PO X	PR S	PR P; CO FL; PR S; CO PY
Warbling Vireo	<i>Vireo gilvus</i>	Scattered deciduous trees		PR S; CO NB; PO X; PR T	PR S; PO X	PR S	CO CF; PO X; PR S; CO FY
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Cavity trees in hardwoods or mixed woods		PO X; PR S; PR P; CO FY	PR P; PO X; CO FY; PR S; PR T; CO FL	PR S; CO FY; PR P	CO FL; CO CF; PR S; PO X
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Open forests with brushy understory		PR S; CO CF	PO X; CO CN; PR S; PR T; CO FL		PO X; PR A; CO FL
Wild Turkey	<i>Meleagris gallopavo</i>	Open, mast-producing woodlands		CO PY; PO X; CO FL	PO X; PR P; CO FL; PR S; PR C	PO X; CO FY; PR P	PO X; CO PY; PR C; CO NE
Willow Flycatcher	<i>Empidonax traillii</i>	Open areas with scattered shrubs		PR S; PO X	PR S; PO X	PR S; PO X	PR S; PO X; CO CF
Common Snipe (Wilson's Snipe)	<i>Gallinago gallinago</i>	Wet thickets and meadows with low vegetation		PR C	PR C		PR C
Winter Wren	<i>Troglodytes troglodytes</i>	Moist coniferous woodlands		CO FY; PO X; PR S	PO X; PR S; PR T	PO X; PR S	PR S; PO X
Wood Duck	<i>Aix sponsa</i>	Trees >16" dbh with large cavities, persistent wetlands		CO PY; PR P; OB O	CO FL; PR P; PO X; CO PY	PO X; CO PY	CO PY; PO X; CO FL
Wood Thrush	<i>Hylocichla mustelina</i>	Cool, moist, mature deciduous or mixed forests		PR S; CO CF; PO X	PR S; PO X; PR P; PR T	PR S; PO X	CO CF; PO X; PR S; OB O
Yellow Warbler	<i>Dendroica petechia</i>	Scattered small trees or dense brush		PR S; CO CF; PO X; PR A	CO FY; CO NY; PR S; PR P; PO X; CO CF; PR T	CO CF; PR S	CO CF; PR S; PR P; CO CN; CO FS
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Cavity trees with >10" dbh		CO NY; CO FY; CO CF; PO X; PR S	CO FY; CO NY; PR P; CO CN; PO X; PR B; PR N; CO FL	PO X; CO NB; CO FY; CO NY	CO NY; PO X; PR P
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Low, dense thickets		PO X	PO X; OB O	PO X; CO NY	PO X
Yellow-rumped Warbler (Myrtle Warbler)	<i>Dendroica coronata</i>	Coniferous trees, bayberry thickets		PO X; PR S	PO X; CO FL	PO X; PR S	CO CF; PR S; PO X
Yellow-throated Vireo	<i>Vireo flavifrons</i>	Mature deciduous forest		PR S; CO FL; PO X	PR S	PR S	CO FL; PR S; PO X; CO NY

## Initial Bird and Bat Risk Identification Report Town of Lenox Wind Project

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OB-Observed, not breeding evidence

*O-Species known to breed in the state, but seen passing through*

PO-Possible breeding evidence

*X- Species seen or heard in suitable nesting habitat within safe dates but no further evidence of breeding is uncovered*

PR- Probably breeding evidence

*P- A pair seen in suitable nesting habitat within safe dates*

*S- Permanent territory presumed through song, heard at same location on at least 2 occasions<sup>7</sup> or more days apart*

*T- Permanent territory presumed through defense of territory within safe dates*

*A- Agitated behavior or anxiety calls from adult observed within safe dates*

*C- Courtship behavior or copulation*

*N- Visiting probable nest site within safe dates*

*B- Building nests by wrens or excavation of holes by woodpeckers within safe dates*

CO-Confirmed evidence of breeding

*ON-Occupied nest. Adult seen sitting on nest*

*CN- Carrying nesting materials such as sticks, grass, bark, etc.*

*NB- Nest building at the actual nest site by any species except wrens and woodpeckers*

*PE-Physiological evidence of breeding*

*DD-Distracted display or injury feigning*

*UN-Used nest found.*

*PY- Flightless young of precocial species restricted to the natal area by dependence on adults or limited mobility*

*FL- Recently fledged young incapable of sustained flight, restricted to natal area by dependence on adults or limited mobility*

*CF- Adult carrying food for young*

*FY- Adult feeding recently fledged young*

*FS- Adult carrying fecal sac*

*NE- Nest with egg(s)*

*NY- Nest with young seen or heard*

## **Appendix E**

### CHRISTMAS BIRD COUNT DATA



Appendix D Table 1. Christmas Bird Count for Central Berkshire County, 2000-2001 to 2009-2010.											
Central Berkshire County											
Species	MA Status	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
American Black Duck		13	41	13	10	30	7	36	22	19	35
American Coot								1			
American Crow		306	311	391	295	379	308	945	703	718	765
American Goldfinch		14	129	70	288	119	140	233	151	362	103
American Kestrel				1							
American Robin		2	238	47	78	211	44	57	47	21	28
American Tree Sparrow		48	71	88	130	56	85	25	90	50	52
American Wigeon			1								
Bald Eagle	Endangered			1	1	1		1	1	2	1
Barred Owl			1			1	3		1		1
Belted Kingfisher		2	3	3	1	2	3	1	2		
Black-capped Chickadee		218	590	459	368	464	557	505	476	427	461
Blue Jay		81	210	226	108	90	123	89	137	165	216
Brown Creeper		2	7	2		6	1	2		3	8
Brown-headed Cowbird					1					0	
Bufflehead						0		0			
Canada Goose		899	3487	703	67	312	235	1145	85	183	77
Carolina Wren		1		3	1		4	5			
Cedar Waxwing		116	232	169	422	88	264	121	333	330	255
Common Goldeneye			8		4	0		35		4	
Common Grackle		1			10	1		1		0	
Common Loon	Special Concern									0	
Common Merganser		35	169	0	3	17		300	2	12	1
Common Raven			3	1	3		9	2	1	4	5
Common Redpoll			86		4		45	6	153		
Cooper's Hawk			1	3		1	1	3	3	3	3
Dark-eyed (Slate-colored) Junco		157	108	132	144	94	117	283	103	87	400
Double-crested Cormorant			1								
Downy Woodpecker		13	58	58	51	43	68	55	51	51	56
Eastern Bluebird		2	49	16	17	26	62	36	27	30	18
European Starling		735	2724	2627	1464	1742	503	1558	947	1646	1737
Evening Grosbeak			68				28			0	
Fish Crow				1				2			2
FoxSparrow											0
Gadwall			5	2							
Golden-crowned Kinglet		3	15	34	5	22	1	7	2	9	7
Gray Catbird					1						
Great Black-backed Gull		7	15	2	3	2		4		0	4
Great Blue Heron (Blue form)			1					4	1	2	1
Great Horned Owl			1	1	2	2	1			3	
Green-winged Teal							3	6		7	
Hairy Woodpecker		5	19	19	16	14	17	18	23	13	15
Hermit Thrush				1							
Herring Gull		22	69	6	15	19	6	49	43	9	15
Hooded Merganser		2	171		1	0	6	35	42	26	8
Horned Lark			45		16				1	40	
House Finch		21	149	34	43	38	50	52	34	110	96
House Finch			149								
House Sparrow		25	324	156	102	220		203	174	137	143
Iceland Gull						0					
Lesser Scaup									5		
Mallard		103	856	166	186	269	186	411	317	373	302
Merlin										1	1
Mourning Dove		83	124	123	62	111	187	93	188	115	140
Northern (Yellow-shafted) Flicker			2	2			2			3	
Northern Cardinal		17	37	28	57	68	59	52	65	36	84
Northern Goshawk						1					
Northern Harrier	Threatened				1	1		1		2	
Northern Mockingbird		2	4	1	1	2	2			1	
Northern Pintail			4				1			1	
Nothern Shrike		1	2			3		1	1	2	
Orange-crowned Warbler								1			
Pied-billed Grebe	Endangered							1		1	
Pileated Woodpecker			1	2	1	8	3	2	5	4	1
Pine Gosbeak			8						46		
Pine Siskin			51		4		6		2	252	
Purple Finch			3		4	23	6			0	
Red-bellied Woodpecker		1		4	2	10	5	1	8	12	11
Red-breasted Nuthatch		1	17	4	2	5	13	3	5	5	12
Red-necked Grebe								2			
Red-shouldered Hawk							0				
Red-tailed hawk		2	20	12	16	19	12	14	10	18	19
Red-winged Blackbird		80		4	3		1	20	6	18	6
Ring-billed Gull		44	262	132	150	179	71	325	269	143	85
Ring-necked Duck			42			0			8		
Ring-necked Pheasant		1	1					1			
Rock Dove		187	262	845							
Rock Pigeon					227		330	340	357	332	321
Rough-legged Hawk			1						1	1	
Ruby-crowned Kinglet				1							
Ruddy Duck									1		
Ruffed Grouse			7	0	1	1					1
Sharp-shinned Hawk	Special Concern	2	3	4	3	1	0	3		2	2
Snow Buntin										83	
Snow Goose		20	3	1	40					0	
Song Sparrow		1	7	9	1	4	7	5	4	3	0
Swamp Sparrow							2				
Total Birds		3275	11276	6607	4435	4705	3584	7101	4953	5881	5498
Tufted Titmouse		15	32	43	42	55	70	47	42	53	70
White-breasted Nuthatch		6	72	55	40	70	63	68	63	68	58
White-throated Sparrow		27	18	4	26	3	24	24	38	30	62
Wild Turkey			25	31	58	19	88	14	34	15	56
Winter Wren				1							
Wood Duck			1							1	
Yellow-bellied Sapsucker									3	2	1



Appendix D Table 2. Christmas Bird Count for Northern Berkshire County, 2000-2001 to 2009-2010.											
Northern Berkshire County											
Species	MA Status	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
American Black Duck		33	41	79	37	46	28	36	44	27	56
American Crow		239	442		292	266	810	731	202	429	692
American Goldfinch		73	56	119	259	112	150	148	59	119	70
American Kestrel					1		0				
American Robin		6	6	5	14	19	35	13	4	74	22
American Tree Sparrow		61	34	56	130	38	66	56	75	73	69
Bald Eagle	Endangered					2		1	1		2
Barred Owl		0	1		2	1	2	1	1	1	2
Belted Kingfisher		2	3		1	2	2	1	0		1
Black-capped Chickadee		249	364	292	458	441	677	365	297	349	527
Blue Jay		99	256	153	219	116	337	161	100	134	317
Bohemian Waxwing					1						
Brown Creeper		1	6	5	3	3	7	4	3	3	12
Brown Thrasher							1				
Brown-headed Cowbird		8							0		
Bufflehead			3								
Canada Goose		157	331	142	4	207	77	656	83	293	402
Carolina Wren		1		2		1	4	1	1	2	2
Cedar Waxwing		303	367	25	764	130	317	50	180	758	48
Common Goldeneye								1			45
Common Grackle				1	7		1				
Common Merganser		10	15	14	37	5	20	16	18	48	
Common Raven		4	8	14	1	9	2	4	4	6	4
Common Redpoll					90		1		202		
Common Yellowthroat											1
Cooper's Hawk			0		2	1	1	1	1	1	3
Dark-eyed (Slate-colored) Junco		190	74	87	150	85	126	208	105	207	201
Downy Woodpecker		26	37	41	64	43	75	37	34	47	54
Eastern Bluebird		28	13	28	20	18	29	37	81	36	16
Eastern FoxSparrow				1							
Eastern Towhee		1					1				
European Starling		760	1029	1556	1397	762	932	434	842	758	810
Evening Grosbeak			18		16						
Field Sparrow					1						
Fish Crow											3
Gadwall						1					
Golden-crowned Kinglet		7	15	61	16	6	5	4	8	4	15
Gray Catbird									1	1	
Great Black-backed Gull					3						
Great Blue Heron (Blue form)		0		2	2	1	1	1	1		
Great Horned Owl		2	3	2	4	1	4	0	3	2	0
Green-winged Teal		1									
Hairy Woodpecker		10	11	9	18	17	24	15	25	17	19
Hermit Thrush					1						
Herring Gull		22		1	1	7	1		1		1
Hooded Merganser			2					1			
Horned Lark		2		6	97		84	35	65	110	77
House Finch		56	108	61	126	149	54	111	97	28	48
House Sparrow		60	95	210	207	417	359	233	266	273	214
Mallard		204	103	203	139	108	123	120	160	270	360
Mourning Dove		156	142	118	294	170	363	184	143	44	165
Northern (Yellow-shafted) Flicker		2	3	2	4	1		1	3		0
Northern Cardinal		48	24	49	98	115	68	40	40	65	86
Northern Goshawk		2	0		3	1	2	1			
Northern Harrier	Threatened									1	
Northern Mockingbird		1	1	1	1	1	2	2	2		1
Nothern Shrike		0			1				0		
Pied-billed Grebe	Endangered									1	
Pileated Woodpecker		1	1	5	7	5	5	1	3	5	10
Pine Gosbeak			14	1					26		
Pine Siskin			26		45		6			185	
Purple Finch		10	7			6	2	4	1	2	0
Red-bellied Woodpecker		1	5	2	4	3	9	2	6	11	10
Red-breasted Nuthatch		4	2	3	2	1	9	0	5	1	9
Red-tailed hawk		7	8	13	24	15	18	18	9	14	20
Red-winged Blackbird											5
Ring-billed Gull		4	24	18	5	15		36	1	3	4
Ring-necked Duck			1	1					1	1	
Ring-necked Pheasant		1	1				1	1			3
Rock Dove		388	482	741							
Rock Pigeon					760	429	295	415	229	185	444
Rough-legged Hawk								1	0	1	
Ruby-crowned Kinglet				1							
Ruddy Duck										2	
Ruffed Grouse		1	10	13	3	3	6	6	7	3	3
Rusty Blackbird									1		
Sharp-shinned Hawk	Special Concern	1		3	1		1	3	2	1	6
Snow Bunting		90			111				9	1	371
Song Sparrow		12	4	9	7	4	5	12	7	4	13
Swamp Sparrow					1					0	
Total		3344	4196	4155	5955	3783	5148	4209	3459	4600	5243
Tufted Titmouse		12	45	27	50	62	98	47	37	38	81
White-breasted Nuthatch		20	52	43	65	54	109	71	33	44	89
White-throated Sparrow		18	4	18	30	2	41	8	20	52	49
White-winged Crossbill										35	
Wild Turkey		3	66	43	96	199	134	57	64	15	132
Yellow-bellied Sapsucker									2	2	1

Appendix D Table 3. Christmas Bird Count for Southern Berkshire County, 2000-2001 to 2009-2010.											
Southern Berkshire County											
Species	MA Status	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
American Black Duck		11	3	31	192	92	7	78	10	3	2
American Crow		473	669	326	465	704	373	353	374	242	342
American Goldfinch		75	134	87	255	104	152	52	171	297	117
American Kestrel			2	1				1			1
American Robin		370	1646	437	431	519	1118	275	748	124	471
American Tree Sparrow		78	232	168	105	42	99	137	222	139	105
Bald Eagle	Endangered	2	1		1						
Barred Owl			1	1		1	1		3	4	3
Belted Kingfisher			4	7	3	3	3	3	3		7
Black Vulture					17	1				3	
Black-capped Chickadee		241	440	529	409	511	455	440	606	528	419
Blue Jay		136	249	240	71	61	131	158	291	110	252
Brown Creeper		2	6	5	8	5	12	4	5	5	9
Brown-headed Cowbird		1	3	8	38	111	11	151	5	34	27
Bufflehead		1									
Canada Goose		766	995	1459	2725	2864	825	2773	325	337	854
Carolina Wren			1	6		1	1	4	7	2	9
Cedar Waxwing		415	475	353	259	334	603	321	563	22	205
Common Goldeneye		2									
Common Grackle		1		5	1	4	1	26		2	150
Common Merganser		6		26	48	23	16	56	6	6	18
Common Raven		4	5	6	3	8	6		7	2	7
Common Redpoll			65		10				182		
Cooper's Hawk		1	3	1	1	2	4	1		1	2
Dark-eyed (Slate-colored) Junco		872	204	242	200	255	157	694	660	429	1580
Downy Woodpecker		34	96	81	51	59	56	63	73	63	78
Eastern Bluebird		37	37	80	48	52	61	76	78	36	48
Eastern Screech-Owl						1		1	3		1
European Starling		850	636	3095	1305	1564	1642	2114	978	636	2551
Evening Grosbeak							12		7		
Field Sparrow								1			
FoxSparrow		1									4
Golden-crowned Kinglet		12	17	16	22	22	12	20	19	5	40
Gray Catbird		1					1				
Great Black-backed Gull					1						
Great Blue Heron (Blue form)					1	1		1	1		1
Great Horned Owl			17	3	1		2		7	6	1
Greater Yellowlegs				1							
Hairy Woodpecker		15	22	20	13	14	17	19	31	15	22
Hermit Thrush			1	1	2		2			1	2
Herring Gull			1	5	4	1	1	1	1		1
Hooded Merganser				5			4	11	1	3	4
Horned Lark		33	85	240	2		334	37	27	262	305
House Finch		73		102	101	64	40	71	95	62	41
House Finch			121								
House Sparrow		39	92	171	82	139	115	49	219	114	286
Lapland Longspur		1									
Mallard		43	86	79	347	164	32	204	50	85	69
Merlin								1	1	2	
Mourning Dove		163	206	308	145	114	196	238	276	119	533
Northern (Yellow-shafted) Flicker		1	7	10	3	4	1	4	8	2	10
Northern Cardinal		39	55	76	38	53	60	76	78	91	68
Northern Goshawk					1						1
Northern Harrier	Threatened					1					
Northern Mockingbird		4	7	8	1	7	2	1	2		3
Northern Pintail										2	
Northern Saw-whet Owl			1								
Nothern Shrike				1					1		2
Peregrine Falcon									1		
Pileated Woodpecker		4	3	8	1	2	7	4	6	2	11
Pine Gosbeak					3				38		
Pine Siskin			17				5		1	437	
Purple Finch		25	5	3	21	25	1		5	14	22
Red Crossbill							2				
Red-bellied Woodpecker		13	25	23	24	18	21	19	34	27	34
Red-breasted Nuthatch		11	9	9	20	8	13	5	9	2	4
Red-tailed hawk		13	46	22	1	26	26	22	28	18	43
Red-winged Blackbird		34	6	2	68	50	2	171	6	2	420
Ring-billed Gull		8		219	83	42	12	6	14	3	19
Ring-necked Duck		3									
Ring-necked Pheasant		57						3			
Rock Dove		133	351	444							
Rock Pigeon					175	224	278	167	110	142	441
Rough-legged Hawk									1	1	
Ruffed Grouse		3	3	1	1	3	1	4		1	1
Rusty Blackbird						1	12				
Savannah Sparrow				1			1				
Sharp-shinned Hawk	Special Concern	3	9	4	1	3	3		4		5
Snow Bunting							27		40	40	115
Snow Goose		8						1			2
Song Sparrow		9	10	24	7	19	19	15	1	4	17
Swamp Sparrow				4				2			1
Tufted Titmouse		44	100	109	83	98	87	100	93	88	128
Tundra Swan						1					
White-breasted Nuthatch		28	87	81	67	97	59	63	77	57	117
White-throated Sparrow		188	28	17	38	11	31	68	94	44	672
Wild Turkey		44	74	99	16	31	97	38	20		1
Winter Wren				1							
Wood Duck					2			2			
Yellow-bellied Sapsucker									3	2	5



## **Appendix F**

### IMPORTANT BIRD AREA DATA

### IBAs in vicinity of Project Area – Lenox, MA

- **Central Berkshire Lakes**

- 100 acres
- Towns and Counties:  
Pittsfield, Richmond; Berkshire
- 95% lake/pond. 2% emergent freshwater wetland, 1% cultural grassland, 1% palustrine wooded swamp. 1% river stream
- Category 3: Sites where birds concentrate in significant numbers in the breeding season, in winter, or during migration
- Category 5: Sites important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education
- Site Description: Five major lakes/reservoirs and one smaller water body (Mud Pond) are situated in the Berkshires' central valley. The six (from north to south) are Hoosic Lake (500 acres) in Cheshire (aka Cheshire Reservoir), Pontoosuc Lake (470 acres) in Lanesborough and Pittsfield, Onota Lake (617 acres) in Pittsfield, Mud Pond/Marsh (100 acres) in Richmond, Richmond Pond (217 acres) in Pittsfield and Richmond, and Stockbridge Bowl (372 acres) in Stockbridge. These lakes annually host considerable species of geese, ducks, loons, grebes, coots, gulls, and other water-loving species of birds during migration, especially fall. A combined total of at least 32 species of swans, geese, and ducks have been found on these lakes, as well as 3 species of loons, 3 species of grebes, the Double-crested Cormorant, and the American Coot. The lakes represent an important stopover point for waterfowl migrating along the Housatonic River valley. In 1946 the late Bartlett Hendricks and the Hoffmann Bird Club inaugurated an annual waterfowl census of these lakes (and other smaller water bodies south to the town of Sheffield) that continues to this day. Significant numbers of geese, dabbling ducks, diving ducks, loons, and grebes are counted annually. There have also been many records of species that are considered rare or casual in western New England. Among these are King Eider (1993), Pacific Loon (1964, 1985), Parasitic Jaeger (1970), Greater White-fronted Goose (1991), Barrow's Goldeneye, (1946, 1984), Wilson's Storm-Petrel (1985), Leach's Storm-Petrel (1985), Franklin's Gull (1997), Little Gull (1946), 2 Black-legged Kittiwakes (1997), and Lesser Black-backed Gull (1992, 1996). In addition, associated marshlands provide breeding habitat for locally uncommon marsh birds such as the Marsh Wren
- Current Conservation Status: Residential development around nearly all of the lakes is quite extensive, and the problems caused by leaky septic systems, lawn fertilizer, and pesticide runoff, etc. are potentially serious. The lakes are also quite heavily used for fishing and boating, but these recreational uses are very minimal during the migratory periods when waterfowl use the lakes. Some of the lakes (notably Pontoosuc) continue to be drawn down in the fall for weed control. Eurasian Milfoil is quite abundant.
- Ornithological Significance: This site provides an important stopover/feeding area for dozens of species of waterfowl in the Housatonic River valley region of western Massachusetts. An extensive cattail marsh along the outlet of

Richmond Pond hosts the areas' only breeding population of Marsh Wrens. Censuses have taken place annually in the proposed IBA in early November since 1946, and the information from more than one-half century of observation represents a very valuable data set. In recent years, Mud Pond has been the best location in western Massachusetts to find Ring-necked Ducks during migration. 900+ were counted there in November 2001 (E. Neumeth).

**State Listed Species:**

Species	Breeding	Winter	Migration
Pied-billed Grebe	*	*	Spring, Fall, 25
Common Loon	*	*	Spring, Fall, 64 (1979)

**Other Important Species:**

Species	Season	Maximum Numbers	Years
Snow Goose	Fall migration	3,500+	1979
Canada Goose	Spring migration, Fall migration	3,000+	1979, 2002
Mallard	Spring migration, Fall migration	367+	1994
Ring-necked Duck	Fall migration	900+	2001
Red-necked Grebe	Fall migration	14	1997
Long-tailed Duck	Fall migration	41	1988
Lesser Scaup	Spring migration, Fall migration	30	*
Red-breasted Merganser	Fall migration	35+	*
Green-winged Teal	Spring migration, Fall migration	50	*
American Coot	Fall migration	149+	*
Ruddy Duck	Fall migration	60	1996
Common Merganser	Fall migration	77	*
Hooded Merganser	Spring migration, Fall migration	173	2002



Bufflehead	Spring migration, Fall migration	270	1997
Common Goldeneye	Spring migration, Fall migration	125	1993
White-winged Scoter	Fall migration	120	1948
Black Scoter	Fall migration	1,000	1970
Greater Scaup	Spring migration, Fall migration	1,200+	1953
Canvasback	Fall migration	99	*
American Black Duck	Spring migration, Fall migration	500	*
Wood Duck	Fall migration	100	*
Horned Grebe	Spring migration, Fall migration	74	*
Red-throated Loon	Fall migration	23/day (stockbridge bowl)	*

\* No data currently available

- Other Flora or Fauna of Significance:  
Town Brook, which empties into Pontoosuc Lake at its northern end, is the only place in the Commonwealth where all three species of trout reproduce; of course only Brook Trout are native. Sizable bat maternity colonies, especially of the Little Brown Bat, are located in close proximity to these lakes. The non-native Mud Puppy has been found in Stockbridge Bowl.
- Data Sources:  
Hendricks, B. 1999 (Third Edition) Birds of Berkshire County. 75 pp.  
1992. Waterfowl in the Berkshires. Bird Observer. pp. 240-244.  
1946-2002. Data from Hoffmann Bird Club Waterfowl Counts.  
Laubach, R. 1985-2002. Field Notes.

- **Upper Housatonic Valley**

- 1300 acres
- Towns and Counties:  
Lee, Lenox, Pittsfield; Berkshire
- 30% emergent freshwater wetland, 22% river stream, 12% scrub-shrub wetland, 9% palustrine woodland swamp, 8% cultural grassland, 5% early successional shrubland, 5% oak-conifer transition forest, 5% lake/pond, 3% cultivate field
- Category 1: Sites important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education
- Category 2: Sites containing assemblages of species characteristic of representative, rare, threatened, or unique habitat within the state or region
- Category 4: Sites regularly holding significant numbers of species of high conservation priority in Massachusetts
- Category 5: Sites regularly holding significant numbers of an endangered, threatened, vulnerable, or declining species.
- Site Description: Approximately 1,300 acres of riparian woodland, oxbow ponds, marshes, beaver swamps, grasslands, and upland woods along the meandering Housatonic River, this IBA represents some of the finest riparian habitat remaining in central Berkshire County. The area is comprises MassAudubon's 262-acre Canoe Meadows Wildlife Sanctuary in Pittsfield at the northern end of the proposed IBA; the 816-acre Housatonic River Valley Wildlife Management Area, south of Canoe Meadows, extending from Pittsfield to Lenox and Lee; and the 200-acre Post Farm, the site of a former Lenox town dump, currently managed by the Lenox Conservation Commission and abutting the Wildlife Management Area at its southern end. Canoe Meadows was established in 1975, the Housatonic Valley Wildlife Management Area was established in 1968, and Post Farm was established in the early 1980s. More than 200 species of birds have been recorded at the combined areas since 1970. The Housatonic is the major river of the Berkshires and flows almost 150 miles from its three sources near Pittsfield to Long Island Sound. The river valley is underlain by calcareous bedrock, and it is the alkaline properties of the soils created that give rise to numerous unusual species of flora and fauna. The area is bordered immediately to the east by the 16,000-acre October Mountain State Forest and several thousand acres of city of Pittsfield watershed land. This riparian corridor serves as a breeding habitat for numerous wetland species, as well as serving as a migration corridor for many other species of birds.

**State Listed Species:**

Species	Breeding	Winter	Migration
Common Moorhen	1-2 pairs (2002)	*	*
American Bittern	4-5 pairs	*	*

**Other Important Species:**

Species	Season	Maximum Numbers	Years
Brown Thrasher	Spring, Summer, Fall	*	*
Veery	Spring, Summer	*	*
Cliff Swallow	Spring, Summer	17 active nests and 9 active nests	1998 and 2001
Eastern Kingbird	Spring, Summer, Fall	*	*
Great Crested Flycatcher	Spring, Summer, Fall	*	*
Least Flycatcher	Spring, Summer, Fall	*	*
Alder Flycatcher	Spring, Summer, Fall	6 pairs	2002
Eastern Wood-Pee wee	Spring, Summer, Fall	*	*
Common Nighthawk	Spring, Summer, Fall	2,927 (FM)	1993
American Woodcock	*	*	*
American Kestrel	Spring, Summer, Fall	4-5 pairs	*
American Black Duck	Year-round	*	*

\* No data currently available

- Other Flora or Fauna of Significance:  
A breeding population of Wood Turtle a species of special concern in

Massachusetts, occurs in the area. Canoe Meadows Wildlife Sanctuary contains certified vernal pools where spotted salamanders breed. The Northern Leopard Frog also occurs there. A number of state-listed plant species have been recorded at Canoe Meadows Wildlife Sanctuary including Bristly Buttercup, and White Adder's-mouth. All three state sites of Wapato are located in the wildlife management area. Foxtail Sedge, a plant listed as threatened in the state, has been found at one site on the IBA.

- Data Sources:

Hendricks, Bartlett. 1999. *Berkshire Birds*. Third ed. The Berkshire Museum. 75 pp.

Laubach, RenÃ©. 1999. Canoe Meadows Wildlife Sanctuary. *Bird Observer*. pp. 324-331.

Perkins, Simon. 2000. A Checklist of the Birds, Canoe Meadows Wildlife Sanctuary. Mass Audubon.

Robinson, Scott and Joan Robinson. 2001. The Pittsfield Nighthawk Watch: 1993-2001. *Bird Observer* pp. 446-447.

St. James, David P. 1986. Birds of the Housatonic Wildlife Management Area (checklist). MassWildlife. 1993.

Birding the Housatonic Valley Wildlife Management Area. *Bird Observer* pp. 76-84. 1999.

Wetland Specialties in Berkshire County. *Bird Observer*. pp. 313-316.

Veit, Richard R. and Wayne R. Petersen. 1993. *Birds of Massachusetts*. Mass Audubon. 514 pp.

- **Konkapot and Agawam Marshes**

- 3000 acres
- Towns and Counties:  
Great Barrington, Stockbridge; Berkshire
- northern hardwood forest, cultural grassland, cultivated field, emergent fresh-water wetland, palustrine wooded swamp, shrub/scrub wetland, lake/pond, river/stream
- The IBA is a series of broad cattail and sedge marshes and ponds near the convergence of the Agawam and Konkapot brooks. There are also large areas of Common Reed and many other kinds of emergent vegetation, including Buttonbush and horsetails. The southern end of the area is mostly wooded marshes and small Beaver ponds. The entire area is surrounded by high steep hills. Parts of the marshes contain many dead trees. There is extensive Beaver activity. The land area surrounding the marshes is a combination of mixed forest on steep hills, farms, and private land. Some of the marshes, especially at the southern end, are not even accessible by canoe because of the dense surrounding woody growth. Monument Mountain owned by The Trustees of Reservations is on the western upper edge of the proposed IBA, while Beartown Mountain on state forest land is at the upper eastern edge. The site also includes a section of the Appalachian Trail. A portion of Great Barrington State Forest and Agawam Lake Wildlife Management Area are found around Fountain Pond and areas north of the pond. Fountain Pond next to the marsh system also has been the site of breeding Common Moorhens in recent years, as well as breeding Wood Ducks and sometimes breeding Hooded Mergansers. This pond consists of shallow water and large stands of cattails.

**State Listed Species:**

Species	Breeding	Winter	Migration
Common Moorhen	X	*	*
Pied-billed Grebe	X	*	*
American Bittern	1 to 3	*	*

- Other Flora or Fauna of Significance:  
Mammals include Beavers, Muskrats, Red Foxes, Coyotes and Black Bears. Herps found so far include Red-spotted Newt, Green Frogs, Bull Frogs, Spring Peepers, Eastern Painted Turtles and Snapping Turtles. An extensive vertebrate survey of species other than birds has yet to be conducted. The area has many species of butterflies and odonates.
- Data Sources:  
Personal data from M. Lynch accumulated during the breeding season. M. Lynch, and S. Carroll. Stockbridge: 1/1/98-6/7/02, Great Barrington: 1/1/98-6/7/02. All data submitted to *Bird Observer*.

- **Little River Watershed**

- 32,000 acres
- Towns and Counties:  
Blandford, Granville, Otis, Russell, Southwick, Tolland; Berkshire, Hampden
- 50% northern hardwood forest, 15% oak-conifer forest, 8% early successional shrubland, 5% emergent freshwater marsh, 5% shrub-scrub wetland, 4% river/stream, 8% lake/pond, 1% cultural grassland
- Category 1: Sites important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.
- Category 2: Sites containing assemblages of species characteristic of a representative, rare, threatened, or unique habitat within the state or region.
- Category 3: Sites where birds concentrate in significant numbers in the breeding season, in winter, or during migration
- 3e. Single-species Concentrations: The site regularly supports significant concentrations of a flocking species, but may not meet the thresholds above. The site should support a higher proportion of a species' statewide population (more than 1%, if known) than other similar sites.
- 3g. Shorebirds: The site regularly supports 1,000 or more shorebirds at one time at a coastal site, during some part of the year, or a significant concentration of shorebirds at one time at a nontidal site. The designation "shorebirds" includes birds such as plovers, sandpipers, snipe, woodcocks, and phalaropes.
- Category 4: Single-species Concentrations: The site regularly supports significant concentrations of a flocking species, but may not meet the thresholds above. The site should support a higher proportion of a species' statewide population (more than 1%, if known) than other similar sites.
- Category 5: Shorebirds: The site regularly supports 1,000 or more shorebirds at one time at a coastal site, during some part of the year, or a significant concentration of shorebirds at one time at a nontidal site. The designation "shorebirds" includes birds such as plovers, sandpipers, snipe, woodcocks, and phalaropes.
- This IBA comprises most of the watershed land and all of the water of Cobble Mountain and Borden Brook reservoirs (Springfield), and Granville Reservoir (Westfield). It also includes part of the Tolland State Forest, the Noble View Camp owned by the Appalachian Mountain Club, and the Phelon Forest owned by the New England Forestry Foundation. Located in the Phelon Forest is the Blueberry Hill Hawk Watch Site used to count migrating raptors since 1970; full-time fall coverage has occurred since 1999. Roadside breeding bird censuses have been done in the Granville portion by Seth Kellogg between 1981 and 1996 and in the Blandford portion by Tom Swochak between 1995 and 1996. The Drake Mountain-Sodom Mountain ridge is on the edge of the Connecticut River valley and this ridge is cut in two by the Granville Gorge, partly owned by the town of Southwick. The Little River Gorge divides Westfield Mountain from Sweetman and Drake Mountain and is the site of a small hydroelectric generating plant. The habitat is primarily upland forest, with both northern and southern species. There are quite a few Beaver flowages, as well as some



hayfields, overgrown fields, and wild blueberry fields. There are fewer than 20 dwellings and a limited amount of mostly small private land holdings.

**State Listed Species:**

Species	Breeding	Winter	Migration
American Bittern	X	*	*

**Other Important Species:**

Species	Season	Maximum Numbers	Years
Broad-winged Hawk	FM	4,329	*
Scarlet Tanager	B	58 singing males	*
Chestnut-sided Warbler	B	80 singing males	*
Eastern Wood-Pewee	B	19 singing males	*
Canada Warbler	B	13 singing males	*
American Redstart	B	90 singing males	*
Acadian Flycatcher	B	4-5 pair	*
Cerulean Warbler	B	2-3 pair	*
Worm-eating Warbler	B	10+ pair	*
Raptors (assorted migration total)	FM	5,125	*
American Kestrel	FM	478	*

- Other Flora or Fauna of Significance  
Black Bears, Moose, Bobcats, Jefferson Salamanders
- Data Sources:  
unknown.

- **Hiram Fox Wildlife Management Area**

- 1,000 acres
- Towns and Counties:  
Chester, Huntington, Worthington; Hampden, Hampshire
- northern hardwoods 60%, oak-conifer 40% (palustrine wooded swamp, emergent fresh-water wetland, river/stream)
- Category 5: Sites important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.

- The entire area comprises 3,200 acres of second-growth forest spread over four towns. The nominated site is a portion of this entire area (approximately 1,000 acres) and is located predominantly in Chester. The site comprises relatively unfragmented forest with a limited amount of agriculture and rural development in the surrounding areas. Topography is characterized by moderate and occasional steep slopes, interspersed with upland and abrupt ledge outcrops. The proposed site lies within the Westfield watershed and is interspersed with annual streams. Habitats within the area are primarily northern hardwoods (60%) with scattered occurrences of mixed northern hardwood/northern red oak (10%), mixed white pine/hardwoods (20%), and hemlock/hardwoods (10%). The proposed IBA is exclusively forested, except for an interspersed of Beaver impoundments along the Moss Meadow Brook drainage totaling approximately 13 acres of upland forest, forested wetlands totaling approximately 30.3 acres, and at least 11 vernal pools. The overall wetland area is 44.4 acres or about 5% of the study area.
- Ornithological Significance:  
The site was specifically selected for a long-term breeding study of forest-nesting birds. The study is designed to be replicable, long-term, and open-ended using established stations along transects through the forest, and to establish accurate trend information on neotropical migrant land birds from annual census. The study, begun in 1987, uses standard point count survey methods. In thirteen survey years the 100-station subsample has produced a mean of 1,119 individuals, representing 58 species. At all 336 stations, 102 species have been recorded on the proposed IBA. During 2001 the ten most abundant species derived from the results were (abundance in parentheses) Yellow-bellied Sapsucker (35), Red-eyed Vireo (217), Ovenbird (183), Black-throated Green Warbler (94), Veery (68), Wood Thrush (47), American Redstart (38), Black-and-white Warbler (32), and Black-throated Blue Warbler (26). The area contains breeding populations of both state and regional high conservation priority species. This site was proposed for consideration for an IBA because of the long-term study in progress. Regrowth of forest clearings seems to be responsible for a decrease in species richness. In the early 1990s, forest clear-cuts and subsequent burns to maintain the clearings resulted in the appearance of nesting Mourning Warblers and a spectacular spike in the number of Chestnut-sided Warblers. These classic "fugitive species," as well as other early successional species such as the Alder Flycatcher, Eastern Kingbird, Gray Catbird, Indigo Bunting, and White-throated Sparrow have declined and have disappeared or have been reduced to trace occurrences. Numbers of deep forest species have mostly remained consistently robust.
- Other Flora or Fauna of Significance:  
None mentioned.
- Data Sources:  
Source of data is exclusively MassWildlife file data collected on the property since 1987 and compiled by B. Blodgett.

## **Appendix G**

### HMANA DATA

Appendix F. Hawk Migration Association of North America (HMANA) Data for Sites in Proximity to the Project Area - Lenox, MA															
Site	Distance from Lenox	Season/Yr	Obs Hrs	BV	TV	OS	BE	NH	SS	CH	NG	RS	BW	RT	RL
Alander Mountain Hawk Watch	22 mi SW	Fall/06	51	1	5	34	6	13	156	11	1	2	151	45	0
Shatterack Mountain Hawk Watch	26 mi SE	Fall/09	54	--	0	19	6	3	86	4	0	1	2402	0	0
Blueberry Hill Hawk Watch	28 mi SE	Fall/09	428	0	433	140	48	61	754	100	6	49	5003	299	0
Tuttle Hill Hawk Watch	34 mi SE	Fall/02	6	0	0	4	0	0	4	0	0	0	50	0	0
Site			Obs Hrs	SW	GE	AK	ML	PG	UA	UB	UF	UE	UR	TOTAL	
Alander Mountain Hawk Watch (cont)			51	--	1	24	9	1	0	1	0	0	11	472	
Shatterack Mountain Hawk Watch (cont)			54	--	0	11	1	3	0	0	0	0	3	2539	
Blueberry Hill Hawk Watch (cont)			428	8	240	6	35	5	6	1	2	0	31	7227	
Tuttle Hill Hawk Watch (cont)			6	--	0	0	0	0	0	0	0	0	0	58	

Species Codes	
BV	Black Vulture
TV	Turkey Vulture
OS	Osprey
BE	Bald Eagle
NH	Northern Harrier
SS	Sharp-shinned Hawk
CH	Cooper's Hawk
NG	Northern Goshawk
RS	Red-shouldered Hawk
BW	Broad-winged Hawk
RT	Red-tailed Hawk
RL	Rough-legged Hawk
SW	Swaynson's Hawk
GE	Golden Eagle
AK	American Kestrel
ML	Merlin
PG	Peregrine Falcon
UA	Unidentified Accipiter
UB	Unidentified Buteo
UF	Unidentified Falcon
UE	Unidentified Eagle
UR	Unidentified Raptor

## **Appendix H**

### **PUBLICLY AVAILABLE POST-CONSTRUCTION MORTALITY DATA FOR OPERATING WIND PROJECTS IN THE EASTERN U.S.**

Table G Table 1. Comparison of bird and bat mortality at existing wind farms in the east and upper mid-west, U.S.								
Site	Habitat type (# turbines)	Dates surveyed	Search interval	# BATS found during surveys (incidental)	Estimated total BAT fatalities/turbine /year (total)	# BIRDS found during surveys (incidental)	Estimated total BIRD fatalities/turbine /year (total)	Reference
Buffalo Ridge, Minnesota	agricultural grassland (73)	April 1994 - Dec 1995	30-50 weekly	n/a	n/a	7	0.33-0.66 fatalities/t/yr (36 total)	Osborn <i>et al.</i> 2000
Buffalo Ridge, Minnesota (Phase 3)	agricultural grassland (138)	15 March - 15 November, 1999	30 every 14 days	n/a	n/a	20	4.45/t/yr (613)	Johnson <i>et al.</i> 2002
Buffalo Ridge, Minnesota	agricultural grassland (281)	15 June - 15 September, 2001 and 2002	83 of 103 bi-weekly	151	1.30-3.02/t/yr (364-849)	n/a	n/a	Johnson and Strickland 2004
Searsburg, Vermont	forested (11)	30 June - 18 October, 1997	11 total (4 per search) 2 to 6 days per month	0	n/a	0	n/a	Kerlinger 2002
Kewaunee County, Wisconsin	agricultural (31)	1999 - 2001	n/a	n/a	1.16-4.26/t/yr (36-132)	25	1.29/t/yr (40)	Sagrillo 2003, Sagrillo 2007
Somerset County, Pennsylvania	agricultural (8)	2000 (12 months)	n/a	0	n/a	0	n/a	Kerlinger 2006
Mountaineer, West Virginia	forested ridgeline (44)	4 April - 11 Nov, 2003	2x per week	475	47.53/t/yr (2092)	69*	4.04/t/yr (178 + 33 due to substation lighting)	Kerns and Kerlinger, 2004
Mountaineer, West Virginia	forested ridgeline (44)	31 July- 11 September, 2004	22 daily, 22 weekly	398 (68)	38/t/yr (1364-1980)	15 (n/a)	n/a	Arnett 2005
Myersdale, Pennsylvania	forested ridgeline (20)	2 August - 13 September, 2004	10 daily, 10 weekly	262 (37)	25/t/yr (400-660)	13 (4)	n/a	Arnett 2005
Top of Iowa, Iowa	agricultural (89)	24 March- 10 December, 2004	26 every 3-days	44 (n/a)	10.17/t/yr (905)	5 (n/a)	0.9/t/yr (80 total)	Koford <i>et al.</i> 2005
Buffalo Mtn, Tennessee	reclaimed mine on ridge (18)	April - December, 2005	18 of 18 every week, every 2 weeks, or every 2-5 days	243 (14)	63.9/t/yr (1,149)	9 (2)	1.8/t/yr (111.6 total)	Fiedler <i>et al.</i> 2007
Maple Ridge, New York	woodland, grassland, agricultural (120)	June 17 - November 15, 2006	10 every 3-days, 30 7-days, 10 daily	326 (58)	11.39-20.31/t/yr (1367-2437.2)	123 (15)	3.10-9.48/t/yr (372-1138 total)	Jain <i>et al.</i> 2007
Maple Ridge, New York	woodland, grassland, agricultural (195)	April 30 - November 14, 2007	64 weekly	202 (81)	15.54-18.53/t/yr (3030-3614)	64 (32)	5.67-6.31/t/yr (1106-1230)	Jain <i>et al.</i> 2008
Maple Ridge, New York	woodland, grassland, agricultural (195)	April 15 - November 9, 2008	64 weekly	140 (76)	8.18 - 8.92/t/yr (1595-1739)	74 (23)	3.42-3.76/t/yr (667-733)	Jain <i>et al.</i> 2009a
Mars Hill, Maine	forested ridgeline (28)	23 April- 3 June, 15 July-23 Sept 2007	2 of 28 daily, 28 of 28 weekly, seasonal dog searches	22 (2)	0.43/t/yr-4.4/t/yr (12.1-122.5)	19 (3)	0.44-2.5/t/yr (26.8-69.2 total)	Stantec 2008
Mars Hill, Maine	forested ridgeline (28)	19 April- 6 June, 15 July-8 Oct 2008	28 of 28 weekly, seasonal dog searches	5	0.17/t/yr-0.68/t/yr (5-19)	17(4)	2.4/t/yr-2.65/t/yr (57-74)	Stantec 2009
Munnsville, NY	agricultural and forested uplands	April 15-November 15, 2008	12 of 23 weekly, seasonal dog searches	9 (1)	0.70-2.90/t/yr	7 (3)	1.71-2.22/t/yr (39.2-51.12)	Stantec 2009b
Mount Storm, WV	forested ridgeline (82)	July 18-October 17 2008	18 weekly, 9 daily	182 (27)	7.76-24.21/t/yr (636-1985)	29 (8)	2.41-3.81/t/yr (198-312)	Young <i>et al.</i> 2009
Clinton, NY	agricultural, woodland (67)	April 26 to October 13, 2008	8 daily, 8 every 3-days, 7 every 7-days	39 (14)	3.76-5.45/t/yr (252-365)	14 (9)	1.43-2.48 small birds/t/yr (96 -166); 0.88 med-large birds/t/yr (59)	Jain <i>et al.</i> 2009b
Ellenburg, NY	agricultural, woodland (54)	April 28 to October 13, 2008	6 daily, 6 every 3-days, 6 every 7-days	34 (25)	3.37-6.59/t/yr (226-441)	12 (10)	0.92-1.10 small birds/t/yr (62-74); 0.77 med-large birds/t/yr (51)	Jain <i>et al.</i> 2009c
Bliss, NY	agricultural, woodland (67)	April 21 - Nov 14, 2008	8 daily, 8 every 3-days, 7 every 7-days	74 (15)	7.58-14.66/t/yr (508-983)	20 (7)	0.74-4.04 small birds/t/yr (50-271); 0.25-0.66 med-large birds/t/yr (17-44)	Jain <i>et al.</i> 2009d
Lempster, NH	forested ridgeline (12)	April 20 to June 1**, 2009	4 daily	1	not calculated for interim report	1 (2)	not calculated for interim report	Tidhar 2009
Cohocton/Dutch Hill	agricultural (50)	15 April to 15 November, 2009	17 weekly	62 (7)	13.8/t/yr (691) to 40.04/t/yr (2002)	15 (3)	2.9/t/yr (147) to 4.7/t/yr (235)	Stantec 2009c
Stetson I	forested ridgeline(38)	20 April to 21 October, 2009	19 weekly	5 (0)	2.11/t/yr (80)	30 (9)	4.03/t/yr (153)	Stantec 2009d
*33 birds found on May 23, 2003 at turbines near a substation and at substation associated with sodium vapor lights								
**Results of spring interim report, study period April 20 to June 1.								



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## BIRD DATA SPREADSHEET

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### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/8/2005	PLEASANT VALLEY	1A	ST JAMES	6:24	6:34	NOCA CSWA VEER ETTI AMGO AMRO RBGR YWAR AMRE MODO CEDW COYE COGR GRCA	1 1 3     2 1  2 1	           2	           1	1   2 1 1 1  1 1 1	   <				

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/8/2005	PLEASANT VALLEY	5A	ST. JAMES	8:10	8:20	AMRE AMCR REVI BAOR LEFL RBGR BTBW VEER	4  3			2  1 1		1  2 1 1			
6/8/2005	PLEASANT VALLEY	6A	ST. JAMES	8:28	8:38	YBSA REVI BTBW EAWP OVEN BLJA SCTA VEER AMCR	3 1 1  1 1			1 1  1 3  1	1	      1			
6/8/2005	PLEASANT VALLEY	7A	ST. JAMES	8:55	9:05	ALFL RWBL LEFL YWAR BAOR SWSP VEER RBGR SOSP WAVI WOTH COYE YBCU OVEN AMRE	1 3 1 2 2 1 1 1 1 1 1			   1  1 1 1  1	      1 1	       1			
6/7/2005	PLEASANT VALLEY	8A	ST. JAMES	8:28	8:38	INBU GCFL YBCU AMGO YWAR SOSP MODO BLJA SWSP ALFL AMRO VEER BAOR WAVI RBWO TRES EAKI	1 1   1 1   1 1			1 1  3 3 1 1  1 1	1  2	       1  1			CHECK CODE

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### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/7/2005	PLEASANT VALLEY	9A	ST. JAMES	8:50	9:00	INBU	1					1			
						SOSP	1		1						
						OVEN				2					
						AMRE	1								
						REVI				1					
						AMRO				1					
						AMCR				1					
						CSWA				1					
						COYE				2					
						VEER				1					
						BAWW					1				
						TRES		4							
						GRCA		1							
						EAKI		1							
						BLJA			1			1			
						ALFL						1			
						RBWO						1			
6/7/2005	PLEASANT VALLEY	10A	ST. JAMES	8:06	8:16	RBGR	1								
						OVEN	1								
						BLJA				2					
						EAWP				1				5	
						SCTA				1				1	
						DOWO	1								
						AMCR				1					
						REVI	1				1				
						WBNU		1							
						WOTH								1	
						ETTI			1						
						BDOW			1						
						CAGO								3	
6/14/2005	PLEASANT VALLEY	1B	ST. JAMES	6:06	6:16	RWBL	2								
						CSWA	2								
						OVEN	1								
						CEDW	1								
						BAOR	1								
						NOCA	1								
						ETTI	1								
						AMRE		1		1					
						YWAR	2								
						GRCA	2		2						
						COYE	1								
						AMGO		1							
						GCFL		1							
						BLJA			1						

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/14/2005	PLEASANT VALLEY	2B	ST. JAMES	6:34	6:44	BRCR EAWP REVI OVEN WOTH AMRO AMRE BTBW VEER YBSA BTGW SCTA	1 1 2 1   1    1    1	   1     1	    1    1	1 2 1 1 1	       1	       1			
6/14/2005	PLEASANT VALLEY	3B	ST. JAMES	7:01	7:11	REVI AMRE EAWP WIWR BAWW SCTA AMRO YBSA OVEN BHVI									
6/14/2005	PLEASANT VALLEY	4B	ST. JAMES	7:19	7:29	AMRE OVEN REVI EAWP WOTH BHVI YBSA BAWW BRCR SCTA AMCR BLJA BHCO	1 1 2   1 1 1 1  1	  1 1     1	   1  1  1   1	1 1 1       1 1	          1 1				
6/14/2005	PLEASANT VALLEY	5B	ST. JAMES	7:47	7:57	VEER WOTH REVI AMRO AMRE OVEN RBGR NOCA SCTA EAWP	1  2 1 3 2 1  1	        1	   1  1   1	1       1	          1				

## Bird Data Spreadsheet

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## Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/24/2005	PLEASANT VALLEY	9B	ST. JAMES	8:34	8:44	GRCA COYE AMGO SOSP BCCH CEDW RBGR CSWA TRES MODO AMCR BHCO VEER AMRO	1 3 2 3 2 3 2	1	1      3      1	1       1       1	1             2				
6/18/2005	PLEASANT VALLEY	10B	ST. JAMES	8:27	9:37	EAWP REVI WOTH COYE SCTA ETTI AMCR WBNU BAWW BBCU GRCA DOWO VEER OVEN	1 1 1 1 2   1	1	1             1 1 1 1	1                2    1					
6/7/2005	CANOE MEADOWS	1A	ST. JAMES	5:31	5:41	COYE BCCH AMRE VEER CSWA BHCO WOTH ALFL NOCA GRCA AMCR DOWO REVI AMRO EUST	1			1 1 1 3 3 1 1 1 3 2 2 1 1	1 1             1 1				

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments	
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f		
6/7/2005	CANOE MEADOWS	2A	ST. JAMES	6:03	6:13	SOSP COYE BOBO AMCR AMRO VEER RWBL GRCA SAVS REVI BLJA EAKI NOCA YWAR BCCH TRES				4 1 4 7 1 1 3 1 1 1 1						
											1 1			1 2 1		
6/7/2005	CANOE MEADOWS	3A	ST. JAMES	6:24	6:34	REVI OVEN VEER BAWW AMCR ETTI BLJA BCCH BRCR	1 1 1	1	1	3 1 1 1 1	1		1			
											1					
6/7/2005	CANOE MEADOWS	4A	ST. JAMES	6:40	6:50	VEER REVI BAWW BRCR SCJU BCCH EAWP BTGW YBCU	2 1 1		1	2 1 1			1		1 1	
											1					
6/7/2005	CANOE MEADOWS	5A	ST. JAMES	6:57	7:07	YWAR COYE RWBL CSWA RBWO GRCA AMCR VEER EUST BHCO SOSP BAWW BOBO BEKI BCCH	1 1 1 1 1 2 2	1 1			1 1 3 2 1	1		1 1 1 1		

## Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/7/2005	CANOE MEADOWS	6A	ST. JAMES	7:16	7:26	COGR RWBL BAOR COYE EAKI WAVI HOWR AMCR YWAR BCCH SOSP BRCR AMGO	2 4 1 1 1 1 1	3  3     1 1	3        1 1 2	        1					
6/18/2005	CANOE MEADOWS	1B	ST. JAMES	6:00	6:10	AMCR WOTH YBCU GCFL CSWA SOSP COYE BAWW BLJA BCCH VEER YWAR GRCA GBHE ETTI BEKI CHSP REVI RWBL BHCO	1 1  1  1 1	   1   1 2  1 1	    1   1  1  1  1	3  1 1 1		2			
6/18/2005	CANOE MEADOWS	2B	ST. JAMES	6:30	6:40	RWBL COYE AMCR BCCH SOSP VEER NOCA BAWW DOWO SCTA WBNU AMGO BLJA PIWA REVI BOBO	4    1		3	1 1 3 3 1 1 1 1		1 2 1			

**Bird Data Spreadsheet**

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/18/2005	CANOE MEADOWS	3B	ST. JAMES	6:50	7:00	OVEN SCTA AMCR REVI BHCO AMGO VEER BLJA	3 1  2 2				1 1  1	1			
6/18/2005	CANOE MEADOWS	4B	ST. JAMES	7:08	7:18	BTGW OVEN AMCR BCCH SCTA ETTI RWBL WBNU BHCO GCFL	1 2 1 1	2			1 1  1 1 1	3			
6/18/2005	CANOE MEADOWS	5B	ST. JAMES	7:28	7:38	COYE SOSP AMCR RWBL RBWO SCTA DOWO YWAR GRCA BLJA WOTH CEDW BARS BAOR OVEN EAKI EUST NOCA	2 2 6 1   2	1 4	1		1 2 1  1 1 1	1			

## Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/18/2005	CANOE MEADOWS	6B	ST. JAMES	7:47	7:57	HOWR COGR CAGO YWAR BRCR WAVI RWBL AMCR TRES VEER EAKI COYE CEDW SOSP AMGO NOCA SWSP HAWO	2 8 21 1  1 4 2 1	        1 1 2	       2 1 1 1	1   1     	      1     2			FLYOVER	
6/13/2005	ROAD'S END	1A	ST. JAMES	9:45	9:55	OVEN AMRO BLJA WOTH REVI BDOW	2 1 1	1		2  1	  1 1				
6/13/2005	ROAD'S END	2A	ST. JAMES	10:03	10:13	BLJA REVI BAOR COYE SOSP RWBL RBGR BHCO TRES INBU	 1 1 1 1	1		3 1	     1 1				
6/6/2005	LAUGHING BROOK	1A	ST. JAMES	5:40	5:50	AMRO EAWP OVEN RBNU VEER AMCR AMGO BCCH BHCO GCFL	1 1 2 1			3  1 1	1   1 1	1   1 1			

## Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/6/2005	LAUGHING BROOK	4A	ST. JAMES	6:05	6:15	EAWP OVEN AMRO WBNU ETTI WOTH SCTA  WITU BCCH REVI BHCO PIWA AMCR	1  1 1  1	      2 1	    1	1 4 1  1 1	1     1   1 1		CHECK CODE- WILD TURKEY		
6/6/2005	LAUGHING BROOK	2A	ST. JAMES	6:28	6:38	ETTI WOTH PIWA OVEN HAWO MODO SCTA EAWP REVI AMRO AMCR BLJA WITU BCCH BHCO	1  1 1 1	1           	       1	1 1 1  1 1 1 1 1	1  2   1   1 1 1				
6/6/2005	LAUGHING BROOK	3A	ST. JAMES	6:50	7:00	VEER EAWP WBNU RBGR MODO REVI OVEN BHCO AMCR BCCH WOTH BLJA SOSP	1  1 1	1   1	   3	3 1  1 1 1	   2 1 2  1 1 1				
6/13/2005	LAUGHING BROOK	1B	ST. JAMES	6:05	6:15	WEWA HETH WOTH AMGO ETTI OVEN EAWP BCCH AMRO	1  1 1 1 1 1 1	     1	   1	1 1 2 1 4					

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/13/2005	LAUGHING BROOK	4B	ST. JAMES	6:25	6:35	EAWP WOTH BLJA OVEN REVI HETH AMRO SCTA AMCR ETTI NOWA	1 1     1      	       1	       1	1 1 1 2 1 1 1	         1	          1 1			
6/13/2005	LAUGHING BROOK	2B	ST. JAMES	6:46	6:56	WBNU EAWP BCCH ETTI AMCR NOCA DOWO OVEN BLJA SCTA AMRO WOTH REVI	1  1            	       1 1	2  2  2 2	            	          1	          1 1 1 2 1			
6/13/2005	LAUGHING BROOK	3B	ST. JAMES	7:06	7:16	ETTI BLJA NOWA OVEN MODO AMRO YSFL AMCR BCCH GCFL	2 2    1      	       1	            	       1 1 1 1	            	          1 1 1			
6/9/2005	MT. EVERETT	1A	ST. JAMES	5:55	6:05	WOTH VEER REVI OVEN SCTA AMRO AMCR SOSP RWBL RBGR BCCH YBCU ETTI BHCO	1 2 2 1  1            	            	1          1	1  1 1 1	          1 1 1 1	             1 1			



### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/9/2005	MT. EVERETT	3A	ST. JAMES	6:39	6:49	COYE	1		1						
						GRCA	1								
						CHSP	1								
						SOSP	2								
						WBNU	1								
						AMCR					1				
						VEER					1				
						OVEN					1				
						RTHA	1								
						LEFL					1				
						RSHA					1				
						BAWW					1				
						WOTH						1			
						YSFL			1						
						REVI							1		
						YBCU							1		
6/9/2005	MT. EVERETT	2A	ST. JAMES	7:05	7:15	RBWO	1								
						WOTH	2	1							
						OVEN	1				1				
						REVI	1	1					1		
						EAWP		1			1				
						BCCH	1				1				
						LOWA	1								
						VEER	1					1			
						YBCU								1	
6/9/2005	MT. EVERETT	4A	ST. JAMES	7:29	7:39	REVI	1			1					
						BLJA	1							1	
						EAWP	1								
						OVEN	1								
						BHCO	1								
						AMRO		1		1					
						ETTI				1					
						HETH					1				
						WBNU						1			
6/16/2005	MT. EVERETT	1B	ST. JAMES	6:00	6:10	VEER	2					1			
						GCFL	1								
						OVEN	1				1				
						BHVI	1								
						REVI	1								
						BTGW	1								
						WBNU		1						1	
						AMCR									
						EAWP									
						WOTH				1					
						BRCR				1					
						BLJA				1					

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/16/2005	MT. EVERETT	3B	ST. JAMES	6:30	6:40	WOTH REVI AMGO COYE VEER OVEN BCCH SOSP INBU CEDW AMRO BWVA WITU BLJA	  1 2    2       7   1			1 1  2 1 1	1  1				
6/16/2005	MT. EVERETT	2B	ST. JAMES	6:51	7:01	WOTH OVEN EAWP SCTA REVI COYE BHCO GRCA BCCH	2  1 1  1 2	1	1   2	1 1 2  1					
6/16/2005	MT. EVERETT	4B	ST. JAMES	7:05	7:15	YBSA AMRE RBGR REVI EAWP BLJA ETTI OVEN WOTH RTHA	1 1 1 1 1 1 1 1 1	1		1	1				
6/21/2005	MT. EVERETT	1C	ST. JAMES	6:16	6:26	YBCU RSHA OVEN EAWP WOTH BHVI BTGW REVI GCFL WBNU ETTI VEER	 3  3 3 3 2	1		1 1 3 1  1 1	1				

## Bird Data Spreadsheet

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### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/20/2005	LAUGHING BROOK	1C	ST. JAMES	5:59	6:09	AMCR HETH BCCH WBNU OVEN BAOR SCTA EAPH MODO BLJA ETTI WEWA WOTH RWBL	1 1 1 1 1		1	1 1 1 1	1 1	1			FLYOVER
6/20/2005	LAUGHING BROOK	4C	ST. JAMES	6:22	6:32	EAWP WOTH OVEN PIWA ETTI REVI WITU SCTA HETH	1		2 1	1 1 1	1	1 1 1			
6/20/2005	LAUGHING BROOK	2C	ST. JAMES	6:40	6:50	EAWP WOTH OVEN BCCH BLJA PIWA BHCO WITU	1 1	1 1		1 2 1 1	1	1			
6/20/2005	LAUGHING BROOK	3C	ST. JAMES	6:59	7:09	BLJA ETTI OVEN EAWP WBNU AMCR PIWA BCCH WOTH WITU AMGO DOWO	1 3 2 1 1		2 1 2 1	1 1 1 1	1 1				
6/10/2005	WEST MOUNTAIN	1A	ST. JAMES	5:49	5:59	REVI HETH WOTH OVEN SCTA EAWP CEDW	3	1 1		1 1 1		1 1 1			FLYOVER

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/10/2005	WEST MOUNTAIN	2A	ST. JAMES	6:13	6:23	HETH BLBW OVEN REVI X BRCR MAWA DOWO	2 3 2			1	1	1			
6/10/2005	WEST MOUNTAIN	3A	ST. JAMES	6:45	6:55	BAWW WIWR REVI SCTA BCCH RBGR OVEN AMRO HETH PUFI BLJA	1 1 1 1 1 1 1			1 1		1 1 1 1 1			
6/10/2005	WEST MOUNTAIN	4A	ST. JAMES	9:55	10:05	BTBW BCCH CEDW REVI OVEN	1 2		1 1	1					
6/10/2005	WEST MOUNTAIN	5A	ST. JAMES	9:27	9:37	REVI OVEN			1	1 1		1			
6/10/2005	WEST MOUNTAIN	6A	ST. JAMES	8:14	8:24	HETH REVI BTGW OVEN MYWA AMRO BCCH YBSA	1 2 1			1 1 1	1	1			
6/10/2005	WEST MOUNTAIN	7A	ST. JAMES	9:09	9:19	BTGW REVI SCTA OVEN	1 1		1	1 1 1	1				
6/17/2005	WEST MOUNTAIN	1B	ST. JAMES	5:35	5:45	REVI HETH OVEN BTBW BRCR	3 1 1			2	1	1 1			
6/17/2005	WEST MOUNTAIN	2B	ST. JAMES	6:00	6:10	BAWW HETH OVEN BTBW	1 1 1 1			2 1		1			

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/17/2005	WEST MOUNTAIN	5B	ST. JAMES	7:36	7:46	OVEN BLJA VEER	1 1		1						
6/23/2005	WEST MOUNTAIN	3B	ST. JAMES	7:25	7:35	OVEN HETH BCCH REVI WIWR MYWA BLBW SCTA SCJU	1 1 1 1 1 1		1	1 1 1	1 1	1			
6/23/2005	WEST MOUNTAIN	4B	ST. JAMES	6:50	7:00	BLBW OVEN BCCH REVI BTGW BLJA EAWP BTBW RBNU YBSA WOTH SCTA BHVI	2 2 2 2 2 2	1	1 1 1 1 2 1	1 1 1 1		1 1			
6/23/2005	WEST MOUNTAIN	6B	ST. JAMES	9:22	9:32	REVI BTGW OVEN RBNU SCTA BLJA	1 1 1 1			1 1		1 1			
6/23/2005	WEST MOUNTAIN	7B	ST. JAMES	9:52	10:02	HETH OVEN REVI SCTA RSHA	1 1 3 1		1	1 1	1				
6/22/2005	ROAD'S END	1B	ST. JAMES	6:08	6:18	REVI OVEN HETH YBSA WBNU WOTH BCCH BLJA AMCR SCTA AMGO AMRO	1 2 1 2 1 1		1	2 1	1	1 1			

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/22/2005	ROAD'S END	2B	ST. JAMES	6:29	6:39	BBCU				1					
						AMGO	3								
						COYE	1			1					
						RWBL	2								
						SCTA				1					
						BAOR	1								
						TRES	1								
						AMCR				1					
						CSWA	1								
						INBU	1								
						BCCH	1								
						REVI	2			1					
						YBSA					1				
						RBGR						1			
						OVEN						1			
						SOSP			1						
6/24/2005	CANOE MEADOWS	1C	ST. JAMES	7:30	7:40	AMCR				1					
						BLJA	1			1					
						CSWA	1								
						VEER	1			2					
						CEDW	3								
						BCCH	2								
						REVI	1								
						COYE	2								
						GRCA	1			1					
						YWAR				1					
						WOTH					1				
						AMGO		1	1						
						RBGR					1				
						YBCU					1				
						DOWO						1			
						WBNU						1			
6/24/2005	CANOE MEADOWS	2C	ST. JAMES	6:55	7:05	REHA	1								
						BCCH	4								
						SOSP	3								
						BLJA				1					
						NOCA				1					
						RWBL				1					
						HOWR				1					
						BHCO		1				1			
						AMCR					1				
						AMGO		2	1			2			
						HAWO									
						YWAR			1						
						BAWW							1		
						GRCA							1		
						WBNU							1		



### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/24/2005	CANOE MEADOWS	3C	ST. JAMES	6:38	6:48	BCCH BLBW OVEN REVI BTGW AMCR MODO AMGO BHCO GCFL BRCR NOCA	2 1 1 2	1  1	1	    1 1 1	     2				
6/24/2005	CANOE MEADOWS	4C	ST. JAMES	6:24	6:34	OVEN REVI VEER DOWO BTGW BLJA BRCR BCCH AMCR	2 1 2 1 2	     2	1 1  1	     1	     1				
6/24/2005	CANOE MEADOWS	5C	ST. JAMES	6:07	6:17	AMCR RWBL BAWW SOSP ETTI MODO BLJA GRCA YWAR DOWO BHCO BAOR VEER AMGO COYE	2 5  3  1 3 1 1 1	       2	       2	1  1	         1 1 1				
6/24/2005	CANOE MEADOWS	6C	ST. JAMES	5:36	5:46	RWBL COGR AMCR COYE SWSP SOSP HOWR YWAR EAKI REVI WODU GCFL OVEN AMGO	15 15  1 1 1 1 1 1	5 2      1	       2	         1 1	          1 1				

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/27/2005	WEST MOUNTAIN	3C	ST. JAMES	6:30	6:40	BLJA HETH BCCH BRCR BTGW OVEN MYWA PUFI RBNU BLBW REVI SCJU GCKI	3 2 4 1 1 1 1 1 1 1								
								1				2			
6/27/2005	WEST MOUNTAIN	4C	ST. JAMES	6:03	6:13	BHVI OVEN REVI BLBW BTGW YBSA	1 1 1				1				
									1 1						
6/27/2005	WEST MOUNTAIN	5C	ST. JAMES	5:28	5:38	OVEN BCCH BTBW BLGW	2 3			1		1			
									1						
6/27/2005	WEST MOUNTAIN	6C	ST. JAMES	7:36	7:46	REVI OVEN RBNU BTGW BTBW EAWP WOTH HETH SCTA AMRO	2 1 1 2			1	1 1 1	1 1			
									1						
6/27/2005	WEST MOUNTAIN	7C	ST. JAMES	8:13	8:23	SCTA REVI OVEN HETH BTBW EAWP BCCH	1 2 2			1 1 1 1					
								1			1				
6/28/2005	ROAD'S END	1C	ST. JAMES	5:50	6:00	GCFL REVI BCCH COYE INBU BAOR YBCU RTHU		1 2		2 2				1 1	
							2	2	1						

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX M/F	Detection v,s,c,f	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min			
6/28/2005	ROAD'S END	2C	ST. JAMES	6:15	6:25	BR CR EA WP WO TH YBSA RE VI BL JA	1	1	1	1	1	1			
6/29/2005	PLEASANT VALLEY	1C	ST. JAMES	5:47	5:57	COYE GRCA AMCR AMRE YWAR WBNU WO TH AMRO BR CR BCCH SOSP CSWA CEDW SCTA EAKI REVI	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3	1	1 1 2 1	1	1			
6/29/2005	PLEASANT VALLEY	2C	ST. JAMES	6:14	6:24	LOWA BR CR WO TH REVI SCTA YBSA VEER OVEN BLBW BCCH EA WP BHVI	1 1 1 1 1 1 1 1 1 1 1 1	1	1	1 1 1 2 2 1 1	2	2			
6/29/2005	PLEASANT VALLEY	3C	ST. JAMES	6:43	6:53	REVI WO TH EA WP VEER OVEN YBSA SCTA AMRO BR CR BTGW	1 2 1 1 1 1 1 1 1 1	1	1	1 3	1	1			

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/29/2005	PLEASANT VALLEY	4C	ST. JAMES	7:03	7:13	OVEN YBSA WOTH VEER BTGW BAWW BHVI REVI SCTA BLBW	2 1 2 1 1 1 1 1 1 1	1 1     1	  1      1						
6/29/2005	PLEASANT VALLEY	5C	ST. JAMES	7:27	7:37	REVI AMRE OVEN WOTH AMCR VEER RBGR EAWP LEFL	2 3  1  1		1      1	1 1  1 1	1     1	       1			
6/29/2005	PLEASANT VALLEY	6C	ST. JAMES	7:55	8:05	WBNU REVI EAWP VEER BCCH BLJJA GRCA AMRO ETTI BTBW SCTA	1 1 1 1 1  1 1		1   2    2 1 1		1    2      1				
6/29/2005	PLEASANT VALLEY	7C	ST. JAMES	8:34	8:44	LEFL AMRE WOTH RWBL AMRO WAVI DOWO BLJA BAOR SWSP YWAR AMGO VEER CEDW GRCA WBNU BCCH REVI SOSP YBSA	1 1 1 3 2 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1	   1       1   2 1 1 1	             1  1		1             1  1				

### Bird Data Spreadsheet

Date	Sanctuary	Circle #	Observer	Time Start	Time End	Species	Number in Circle			Number out Circle			SEX	Detection	Comments
							0-3Min	3-5Min	5-10Min	0-3Min	3-5Min	5-10Min	M/F	v,s,c,f	
6/29/2005	PLEASANT VALLEY	10C	ST. JAMES	9:31	9:41	REVI BTGW COYE AMCR BCCH MODO BLJA YBSA AMRO SCTA	2 1 1 5 3	1	1 1 1			1			
6/30/2005	PLEASANT VALLEY	8C	ST. JAMES	8:12	8:22	SOSP GRCA ALFL TRES MODO VEER LEFL AMCR COYE BCCH BLJA WBNU SWSP CSWA DOWO RBWO  EAPH	2 1 1 2 1 1 1 1 1 1 1	1	1        1	1        1   1	1        1 1		EASTERN PHEOBE		
6/30/2005	PLEASANT VALLEY	9C	ST. JAMES	8:40	8:50	GRCA COYE YBCU CWAX AMRO WBNU SOSP BHCO TRES AMCR BLJA	1 1  2 1 1  4 1			1  1  1 1 1 1	1				
6/30/2005	WEST MT.	1C	ST. JAMES	6:03	6:13	OVEN REVI AMCR BTBW BLJA	1 2  1	1		1 1					
6/30/2005	WEST MT.	2C	ST. JAMES	6:32	6:42	HETH EVGR CEDW OVEN BLBW MYWA	1  2 2 1	1  1		2  1				FLYOVER	

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## **PLEASANT VALLEY BREEDING BIRD SURVEY**

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**Pleasant Valley Breeding Bird Survey Compilation  
(Singing Male Count)**

Species	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
1 Great Blue Heron												1fly.			1fly.			
2 Canada Goose										pr.	**				1?			
3 Wood Duck							1fly.				2	1	3	pr.fly.				
4 Mallard																1		
5 Hooded Merganser					1					1fly.		1						
6 Broad-winged Hawk	1																	
7 Ruffed Grouse				1														
8 Wild Turkey							1											
9 Killdeer															1			
10 Spotted Sandpiper															1ns			
11 Mourning Dove		1			1*													1
12 Barred Owl											1		1					
13 Ruby-throated Hummingbird															1			
14 Belted Kingfisher								1						1				1
15 Yellow-bellied Sapsucker	1*	2	1	2+*	3	3	2	3	2		1	1	2	1	3	2	1	5+1
16 Downy Woodpecker		3	1	3	2	2			1	2	1		2	1	2	1ns	1	
17 Hairy Woodpecker				1				1ns	1			1	1					
18 Northern Flicker		1				2	2						1		1	1		1
19 Pileated Woodpecker								1						1			1	
20 Eastern Wood-Pewee	4	4	5	2	6	6	2	4	4	4	3	2	4	2	2	4	3	3
21 Alder Flycatcher		1			3					1	1	1	1			2	2	1
22 Acadian Flycatcher				1														
23 Least Flycatcher	1	12	6	12	2	7	5	7	2	3	4	4	1	3	5	2	2	2
24 Eastern Phoebe	1														1*			
25 Great Crested Flycatcher				2	1				1	1					1	1	1	1
26 Eastern Kingbird				1+*	2	1							1				1?	pr.
27 Barn Swallow		1																
28 Tree Swallow			1	1	1		1	2	1	2	1*	4fly.	1		1*	2	3	1
29 Blue Jay		1	1	2	1		1ns			1		1	3		1	1	2	
30 American Crow				3	1		2	1		h	h	3	1	1?			1	
31 Common Raven							1	2?										
32 Black-capped Chickadee	3	4	1	2	3	1		2		1	2	1	4	5	2	1	3	2
33 Tufted Titmouse											2		1	1	2	3	2	1
34 Red-breasted Nuthatch				1			2											



**Pleasant Valley Breeding Bird Survey Compilation  
(Singing Male Count)**

	Species	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
35	White-breasted Nuthatch		1		1		1			2		4	1	1		1	3	1	2
36	Brown Creeper	1	2	5	3	3	1	2	7	1	2	1	1	2	2	3	2	2	2
37	Winter Wren		1	3	3	2		3			2	4							
38	Veery	5	6	4	5	8	5	3	9	6	5	5	9	3	6	5	4	7	4
39	Hermit Thrush				2	1	1	4		1							1		
40	Wood Thrush	1	4	3	7	6	4	6	2	3	1	2	2	3	1	3	4	4	6
41	American Robin	1	1	2	3	3	1ns	4	3	8	3	3ns		1	1	1	2		4
42	Gray Catbird	1	1	3	2	2	1	1	1	2	1	4	2	3	2	2	2	1	
43	Cedar Waxwing			3				4	2					1	1	h	1	#	1
44	Blue-headed Vireo	1?					1	5	2	2	1	2		2	2	1	2	4	3
45	Yellow-throated Vireo	4	7	3	5	1	3	2	1		1	2		1					1
46	Warbling Vireo									1						1		1	1
47	Red-eyed Vireo	8	8	10	10	9	11	11	7	9	11	10	8	8	6	13	10	7	11
48	Yellow Warbler	2	3	4	4	3	2	2	1	2		2		2	1	3	2	6	3
49	Chestnut-sided Warbler	2			1		3	3	3	6	2	2	5	4	1	1	3	1	1
50	Black-throated Blue Warbler	1	1	1	3	4	1	1	4		2			1	3	1			
51	Black-throated Green Warbler		2	2	3	3	5	2	4	1	2	3	1	1		4	3	2	3
52	Blackburnian Warbler				1				1					1	1				1
53	Black-and-White Warbler		1	2		1	1	1	2	2	1	2	1			3	2	1	1
54	American Redstart	3	7	10	11	11	10	2	8	7	11	8	5	5	2	4	4	7	8
55	Ovenbird	5	4	5	7	13	7	11	9	7	7	4	3	7	2	3	1	1	5
56	Northern Waterthrush								1										
57	Louisiana Waterthrush		2	1	1	3	2ns							1			1ns		1
58	Common Yellowthroat		3	2	2	2ns	3	3	2	1	1	2	3	3	2	1ns	2		3
59	Canada Warbler											1			1				
60	Scarlet Tanager	1			1	3	4	1	2	2	2	1	1	1		6	3	3	3
61	Northern Cardinal		1																
62	Indigo Bunting		1																
63	Rose-breasted Grosbeak	1	1	1	1	1	11			1							2		2
64	Song Sparrow		2			1	1	1	2	2	1	1	1		2	1	1	2	1
65	Swamp Sparrow			1	2	2	3	2	2	1	1	2	3	2	1	3		1	1
66	White-throated Sparrow				1				1ns										
67	Dark-eyed Junco				1														
68	Red-winged Blackbird	1	2	1	2	2	1ns			2	3	3	1	4	3	1	3	2	3
69	Common Grackle		3		1	3	1ns	1ns				1fly	1ns		3fly.	4ns		1ns	8 ns
70	Brown-headed Cowbird		1			3		2	3	3	2	1	1	2	1	1		2	1

**Pleasant Valley Breeding Bird Survey Compilation  
(Singing Male Count)**

	Species	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
71	Baltimore Oriole	2	2	2	2	4	2		1	2	1			1		1	1	1	2
72	Purple Finch		1	2	1			1ns								1	2		
73	House Finch	2																	
74	American Goldfinch	1			1				2	1		1	2	2	1	2ns	1	1ns	1 ns
	<b>Totals</b>	54	99	83	121	121	98	97	104	87	82	86	69	89	59	94	86	81	94
	* = nest found, ** = parents w/ young, # = number unknown																		

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**APPENDIX H**

**TOWN OF LENOX ZONING BYLAW,  
TAX MAPS, SCENIC MOUNTAIN ACT**

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*TOWN OF LENOX*  
*MASSACHUSETTS*

ZONING BYLAW

2010

Adopted Special Town Meeting: April 15, 2008

This edition includes amendments through Special Town Meeting March 24, 2009 and  
Annual Town Meeting May 6, 2010.

This Zoning Bylaw is Chapter VI of the "Bylaws (As Amended)  
of the Town of Lenox, Massachusetts"

## TOWN OF LENOX, MASSACHUSETTS AMENDMENTS TO THE ZONING BYLAW

Amendments adopted at the Annual Town Meeting of February 23, 1973 were approved by the Attorney General on April 10, 1973, the effective date.

Amendments adopted at the Special Town Meeting of September 28, 1973 were approved by the Attorney General on October 29, 1973, the effective date.

Amendments adopted at the Special Town Meeting of November 22, 1974 were approved by the Attorney General on December 13, 1974, the effective date.

The amendment adopted at the Special Town Meeting of December 5, 1975 was approved by the Attorney March 1, 1976, the effective date.

The amendments adopted at the Annual Town Meeting of May 7, 1976 were approved by the Attorney General in August, 1976 and their effective date is May 7, 1976.

The amendments adopted at the Special Town Meeting of February 9, 1977 were approved by the Attorney General by default and their effective date is February 9, 1977. (NOTE: Section 7.4 deleted)

The amendments adopted at the Annual Town Meeting of May 6, 1977 were approved by the Attorney General on August 2, 1977, and their effective date is May 6, 1977. (NOTE: Sections 11.7 and 12.5 deleted)

The amendment adopted at the Special Town Meeting of November 30, 1981 was approved by the Attorney General on March 15, 1982 and its effective date is November 30, 1981.

The amendments adopted at the Annual Town Meeting of May 7, 1982 were approved by the Attorney General on August 12, 1982, and their effective date is May 7, 1982.

The amendments adopted at the Annual Town Meeting of May 6, 1983 were approved by the Attorney General on June 14, 1983 and their effective date is May 6, 1983.

The amendments adopted at the Special Town Meeting of June 8, 1984 were approved by the Attorney General as follows: First Estate Preservation Area Bylaw: January 11, 1985; all other amendments: September 12, 1985. The effective date of all amendments is June 8, 1984.

The amendments adopted at the Special Town Meeting of August 8, 1985 (Second Estate Preservation Area Bylaw) was approved by the Attorney General on August 27, 1985, and its effective date is August 8, 1985.

The amendment adopted at the Special Town Meeting of September 28, 1988 were approved by the Attorney General on November 7, 1988 and their effective date is September 28, 1988.

The amendments adopted at the Annual Town Meeting of May 8, 1993 were approved by the Attorney General on July 28, 1993 and their effective date is May 8, 1993.

The amendments adopted at the Annual Town Meeting of May 5, 1995 were approved by the Attorney General on July 24, 1995 and their effective date is May 5, 1995.

The amendments adopted at the Special Town Meeting of December 16, 1996 were approved by the Attorney General on April 7, 1997 and their effective date is December 16, 1996.

The amendments adopted at the Annual Town Meeting of May 1, 1998, and Special Town Meeting, June 3, 1998, and were approved by the Attorney General on August 7, 1998 and September 4, 1998 and their effective date is May 1, 1998 and June 3, 1998.

The amendments adopted at the Annual Town Meeting of May 5, 2000 were approved by the Attorney General on July 21, 2000 and their effective date is May 5, 2000.

The amendments adopted at the Annual Town Meeting of May 3, 2002 were approved by the Attorney General on October 4, 2002 and their effective date is May 3, 2002.

The amendment adopted at the Annual Town Meeting of May 2, 2003 were approved by the Attorney General on November 13, 2003 and their effective date is May 2, 2003.

The amendment adopted at the Annual Town Meeting of May 6, 2004 were approved by the Attorney General on July 20, 2004 and their effective date is May 6, 2004.

The amendments adopted at the Annual Town Meeting of May 5, 2005 were approved by the Attorney General on August 25, 2005 and their effective date is May 5, 2005.

The amendments adopted at the Annual Town Meeting of May 4, 2006 were approved by the Attorney General on August 28, 2006 and their effective date is May 4, 2006.

The amendments adopted at the Special Town Meeting of April 15, 2008 were approved by the Attorney General on July 23, 2008 and their effective date is April 15, 2008.

The amendments adopted at Town Meeting of May 1, 2008 were approved by the Attorney General On July 21, 2008 and their effective date is May 1, 2008.

The amendments adopted at Special Town Meeting of March 24, 2009 were approved by the Attorney General on July 20, 2009 and their effective date is March 24, 2009.

The amendments adopted at Annual Town Meeting on May 6, 2010 were approved by the Attorney General on June 7, 2010 and their effective date is May 6, 2010.

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## **SECTION 1        PURPOSE AND AUTHORITY**

### **1.1    PURPOSE**

These regulations are enacted to promote the general welfare of the Town of Lenox, to protect the health and safety of its inhabitants, to encourage the most appropriate use of land throughout the town, and to increase the amenities of the town, all as authorized by, but not limited by, the provisions of the Zoning Act, G.L. c. 40A, as amended, and Section 2A of 1975 Mass. Acts 808.

### **1.2    AUTHORITY**

This Zoning By-Law is enacted in accordance with the provisions of the General Laws, Chapter 40A, any and all amendments thereto, and by Article 89 of the Amendments to the Constitution of the Commonwealth of Massachusetts.

### **1.3    SCOPE**

For these purposes, the construction, repair, alteration, reconstruction, height, number of stories, and size of buildings and structures, the size and width of lots, the percentage of lot area that may be occupied, the size of yards, courts, and other open spaces, the density of population, and the location and use of buildings, structures, and land in the Town are regulated as hereinafter provided.

### **1.4    APPLICABILITY**

All buildings or structures hereinafter erected, reconstructed, altered, enlarged, or moved, and the use of all premises in the Town, shall be in conformity with the provisions of the Zoning By-Law. No building, structure or land shall be used for any purpose or in any manner other than is expressly permitted within the district in which such building, structure or land is located.

Where the application of this By-Law imposes greater restrictions than those imposed by any other regulations, permits, restrictions, easements, covenants, or agreements, the provisions of this By-Law shall control. Nothing herein shall be construed to supersede the provisions of the State Building Code, 780 CMR 1.00, et seq.

### **1.5    ZONING AMENDMENTS**

#### **1.5.1    Initiation**

Any person desiring a zoning amendment shall propose it in writing to the Selectmen for insertion in the warrant of a town meeting, either regular or special.

#### **1.5.2    Brief Written Statement**

If geographic change of a zoning boundary description is proposed, the words of the proposed description change for insertion in the warrant shall be accompanied by a brief written statement of the nature, extent and location in the town of the zoning map change proposed, together with three black-line prints of a diagram to scale showing the area to be changed, stating pertinent dimensions in feet, and also showing ownership and outline of all properties affected by the change.



### **1.5.3 Public Hearing**

On each zoning amendment proposal accepted by the Selectmen for insertion in a town meeting warrant, or on any such proposal inserted in a town meeting warrant by petition as provided by statute, the Planning Board shall hold a public hearing thereon, first causing notice of the time and place of such hearing and of the subject matter, sufficient for identification, to be published in a newspaper of general circulation in the Town of Lenox once in each of two successive weeks, the first publication being not less than fourteen (14) days before the day of such hearing, and by posting such notice in a conspicuous place in the Town Hall for a period of not less than fourteen (14) days before the day of such hearing. No amendment shall be adopted until the Planning Board has submitted a final report with recommendations to the Town Meeting or until twenty-one (21) days shall have elapsed after such hearing without the submission of such report.

No change of any zoning bylaw shall be adopted except by a two-thirds (2/3) vote of a town meeting.

### **1.5.4 Costs**

The costs of publication and of mailing of notices of hearing shall be paid by the zoning amendment proponents.

## **1.6 SEPARABILITY**

The invalidity of any section or provision of this By-Law shall not invalidate any other section or provision herein.

## **SECTION 2        DISTRICTS**

### **2.1   ESTABLISHMENT**

For the purpose of this By-Law, the Town is divided into the zoning districts set forth below:

#### ***RESIDENTIAL DISTRICTS***

R-3A

R-1A

R-30

R-15

#### ***COMMERCIAL DISTRICTS:***

C

C-1A

C-3A

#### ***INDUSTRIAL DISTRICTS:***

I

### **2.2   OVERLAY DISTRICTS**

In addition, the following overlay districts are also hereby established in SECTION 8.0:

Wireless Telecommunications Overlay District:        WTOD

Gateway Mixed Use Development  
Overlay District:    LMUD

Flood Plain Overlay District                                        FPOD

### **2.3   ZONING MAP**

The location and boundaries of these districts are hereby established as shown on a map entitled "Zoning Map of the Town of Lenox" dated December 12, 1969, as amended, and on file in the office of the Town Clerk, which map, with all explanatory matter thereon, is declared to be a part of this Bylaw.

#### **2.3.1    Amendment**

Any changes or amendments shall be indicated by the alteration of the map referred to herein, and the map thus altered is declared to be a part of the Bylaw thus amended.

#### **2.3.2    Interpretation**

Where a district boundary is indicated as within or parallel to a street, railroad right of way, water course or town municipal boundary, such district boundary shall be construed as the street line or

being parallel to the street line of such street or the centerline of the railroad right-of-way, water course or town municipal boundary.

### **2.3.3 Uncertainty**

Whenever any uncertainty exists as to the exact location of a boundary line, the location of such line shall be determined by the Building Commissioner.

### **2.3.4 Split Lots**

Where a lot is transected by a zoning district boundary, the regulations of the By-law applicable to the larger part of the area of such lot may also at the option of the lot owner be deemed to govern in the smaller part beyond such zoning district boundary but not to exceed thirty (30) linear feet beyond such zoning district boundary, if the smaller part has frontage on an accepted way.

## SECTION 3 USE REGULATIONS

### 3.1 PRINCIPAL USES

Except as provided by law or in this By-law in each district, no building or structure shall be constructed, used or occupied, nor shall land be used or occupied, except for the purposes permitted as set forth in the accompanying Table of Use Regulations.

**Table 3.1– Use Regulations**

Districts		Residential				Commercial			Ind
		R3A	R1A	R30	R15	C3A	C1A	C	I
<b>A.</b>	<b>Residential Uses</b>								
1	Detached dwelling on a separate lot by not more than one family	Y	Y	Y	Y	N	N	Y	N
2	One, two family or one duplex dwelling on a separate lot	N	N	N	BA	N	N	BA	N
3	Townhouse	N	N	N	BA	BA	N	N	N
4	<i>Retirement Community - Removed STM 4/15/08</i>								
5	Apartment Building	N	N	N	BA	BA	N	N	N
6	Renting of rooms in a 1 or 2 family dwelling from June 1 through Labor Day	Y	Y	Y	Y	Y	Y	Y	Y
7	Seasonal Bed & Breakfast In-Home Stay/Room Rental (Seasonal): Renting of rooms in a 1 or 2 Family dwelling from Memorial Day weekend through Labor Day and on weekends only through Columbus Day. Limited to 3 guests.	Y	Y	Y	Y	Y	Y	Y	Y
8	Renting of rooms in an existing dwelling to not more than 3 persons.	N	N	BA	BA	BA	BA	BA	N
9	Bed & Breakfast Inn: Renting of rooms in an existing 1 or more family dwelling to 4 to 20 guests	BA	BA	BA	BA	BA	BA	BA	BA
10	Conversion of an existing dwelling to accommodate not more than 6 families	N	N	N	BA	N	N	N	N
11	Open Space Flexible Development	N	PB	N	N	N	N	N	N
12	Dwelling units located above the first story of a non-residential use	N	N	N	BA	N	N	BA	N
13	Nursing home, convalescent home	N	BA	BA	BA	BA	BA	BA	N
14	Extended care nursing facility	N	BA	BA	BA	BA	BA	BA	N
15	Assisted living, congregate care	N	BA	BA	BA	BA	BA	BA	N
16	Residential Inclusionary Development	BA	BA	BA	BA	BA	BA	BA	BA
<b>B.</b>	<b>Institutional, Recreational and Educational Uses</b>								
1	Use of land for religious purposes	Y	Y	Y	Y	Y	Y	Y	Y
2	Use of land or structures for educational purposes on land owned or leased by the commonwealth or any of its agencies, subdivisions or bodies politic, or by a religious sect or denomination, or by a nonprofit or for profit educational corporation	Y	Y	Y	Y	Y	Y	Y	Y
3	Cemeteries	BA	BA	N	N	N	N	N	N
4	Recreation facility owned or operated by an agency of town or other government	Y	Y	Y	Y	Y	Y	Y	Y

**Table 3.1– Use Regulations**

Districts		Residential				Commercial			Ind
		R3A	R1A	R30	R15	C3A	C1A	C	I
5	Essential services	BA	BA	BA	BA	BA	BA	BA	BA
6	Municipal Use	BA	BA	BA	BA	BA	BA	BA	BA
7	Private nonprofit libraries	BA	BA	BA	BA	BA	BA	BA	N
8	Private nonprofit museums	BA	BA	BA	BA	BA	BA	BA	N
9	Child care facility	Y	Y	Y	Y	Y	Y	Y	Y
<b>C. Places of Public Assembly</b>									
1	Private membership club or lodge	N	N	N	N	N	N	BA	N
2	Entertainment and recreational facilities operated as a business for gain, according to the use and district regulations in this table provided such use is housed indoors in a sound insulated structure protecting the neighborhood from noise	N	N	N	N	BA	BA	BA	N
3	Bowling Alley	N	N	N	N	BA	BA	BA	N
4	Live Theater	N	N	N	N	BA	BA	BA	N
5	Movie Theater	N	N	N	N	N	BA	N	N
6	Sports facilities such as golf courses, country clubs, tennis clubs, riding stable, riding rings (indoor & outdoor) swimming club	BA	BA	BA	BA	BA	N	N	N
7	Resorts	BA	BA	BA	BA	N	N	N	N
<b>D. Agricultural Uses</b>									
1	Agricultural use, exempt	Y	Y	Y	Y	Y	Y	Y	Y
2	Farm stand, exempt	Y	Y	Y	Y	Y	Y	Y	Y
3	Agricultural use, nonexempt	BA	BA	BA	N	N	N	N	N
4	Farm stand, nonexempt	BA	BA	BA	BA	BA	N	N	N
<b>E. Office And Laboratory</b>									
1	Business, professional or governmental offices	N	N	N	N	Y	Y	Y	Y
2	Clinics or offices for medical, psychiatric or other health services for the examination or treatment of persons as outpatients, including laboratories that are part of such clinic or office	N	N	N	N	N	Y	Y	N
3	Laboratory or research facility for medical, dental, technical, scientific uses and uses accessory to them (but excluding direct services to patients) provided that all uses are in enclosed buildings	N	N	N	N	BA	BA	Y	Y
4	Laboratory or research facility	N	N	N	N	BA	BA	Y	Y
5	Planned unit office or research center	BA	BA	BA	N	BA	BA	BA	N
<b>F. Retail Business &amp; Consumer Service Establishments</b>									
1	Retail establishment	N	N	N	N	N	Y	Y	N
2	Apparel or antiques store or art gallery having a maximum building footprint of 4000 square feet.	N	N	N	N	BA	N	N	N
3	Furniture Store	N	N	N	N	BA	N	N	N
4	Eating place serving food and beverages to be consumed within the building	N	N	N	N	N	Y	Y	BA
5	Outdoor dining to be allowed by special permit from 5/15 to 10/31	N	N	N	N	BA	BA	BA	BA
6	Planned Unit Comm. Development	N	N	N	N	N	BA	BA	N

**Table 3.1– Use Regulations**

Districts		Residential				Commercial			Ind
		R3A	R1A	R30	R15	C3A	C1A	C	I
7	Establishment for manufacture, assembly or packaging of consumer goods	N	N	N	N	N	Y	Y	Y
8	Reserved								
9	Personal service establishment	N	N	N	N	N	Y	Y	N
10	General service or trade establishment	N	N	N	N	BA	Y	Y	N
11	Motel	N	N	N	N	BA	BA	BA	N
12	Mortuary or funeral establishment	N	N	N	N	BA	Y	N	N
13	Store for retail sale of merchandise such as lumber yards and building supply yards wherein merchandise is stored in the open, provided that all merchandise so stored is screened from ground level view from any abutting street or abutting property at the property line where such materials are stored	N	N	N	N	N	Y	N	Y
14	Motor vehicle light service	N	N	N	N	N	SB	N	N
15	Motor vehicle and boat sales, rental and repair; indoors	N	N	N	N	N	Y	BA	N
16	Motor vehicle and boat sales or rental; outdoors	N	N	N	N	N	BA	BA	N
17	Car Washing establishment	N	N	N	N	N	BA	N	N
18	Conversion of existing structures to time sharing or time interval ownership	N	N	N	N	N	BA	BA	N
19	The storage and sale of oxygen and/or propane gas from a bulk storage in which the volume does not exceed 1000 gallons (3,786 liters) & 150 lbs per square inch pressure for the for the expressed purpose of refueling residential oxygen or propane tanks	N	N	N	N	N	BA	BA	N
20	Adult Use	N	N	N	N	N	BA	N	N
<b>G. Industrial Wholesale &amp; Transportation Uses</b>									
1	Laundry & dry cleaning plants	N	N	N	N	N	Y	Y	Y
2	Printing, binding, publishing and related arts & trades	N	N	N	N	N	BA	N	Y
3	Place for manufacturing, assembling or packaging of goods	N	N	N	N	N	N	N	BA
4	Wholesale business & storage in an enclosed structure	N	N	N	N	N	N	N	BA
5	Trucking or freight terminal	N	N	N	N	N	N	N	BA
6	Bus Storage	N	N	N	N	BA	BA	N	BA
7	Collection, treatment, storage, burial, incineration or disposal of radioactive waste, including but not limited to wastes classified as low level radioactive waste	N	N	N	N	N	N	N	N
<b>H. Accessory Uses And General Offstreet Parking</b>									
1	Private garage or offstreet parking for private automobiles registered at the premises	Y	Y	Y	Y	Y	Y	Y	Y
2	Not more than one commercial vehicle per lot and only in a garage	Y	Y	Y	Y	N	N	N	N
3	Privately owned garage for rental purposes	N	N	N	N	BA	BA	BA	Y

**Table 3.1– Use Regulations**

Districts		Residential				Commercial			Ind
		R3A	R1A	R30	R15	C3A	C1A	C	I
4	Off-street parking for commercial vehicles registered at the premises or leased to occupant	N	N	N	N	Y	Y	Y	Y
5	Private greenhouse, tennis court, swimming pool or other similar storage in connection with this off premises occupation provided there is no external change which alters the residential appearance of the building	Y	Y	Y	Y	Y	Y	Y	Y
6	The raising or keeping of domestic pets	Y	Y	Y	Y	Y	Y	Y	Y
7	The raising or keeping of animals, other than domestic pets, for use by the residents of the premises, not as a commercial venture, provided that the stable or enclosure for any such animal be not less than 100 feet from any lot line	Y	Y	Y	Y	Y	Y	Y	Y
8	Customary home occupation	Y	Y	Y	Y	Y	Y	Y	Y
9	Office of a resident physician, dentist, attorney at law, architect, engineer, or accountant	BA	BA	BA	BA	BA	Y	Y	Y
10	The use of a portion of a dwelling or accessory building thereto by a resident carpenter, painter, plumber, electrician or mason or by a resident tree surgeon, landscape gardener or similar tradesman for incidental work and indoor storage in connection with this off-premises occupation provided there is no external change which alters the residential appearance of the building	Y	Y	Y	Y	Y	Y	Y	Y
11	Seasonal storage of equipment owned by residents of the premises, such as boats, travel trailers, pickup campers motorized campers, tent trailers provided that at no time will such parked or stored equipment be occupied or used for living, sleeping, or housekeeping purposes. If parked outside of a garage, it shall be parked or stored no closer to the street line than the actual building setback and screened from view	Y	Y	Y	Y	Y	Y	Y	Y
12	Accessory dwelling unit	BA	BA	BA	BA	N	N	N	N
13	Fencing	Y	Y	Y	Y	Y	Y	Y	Y
14	An eating place which is accessory to a permitted use (such as a cafeteria for employee use)	N	N	N	N	BA	N	N	N
15	Seasonal Outdoor Display	N	N	N	N	N	Y	BA	N
16	Drive Through Facilities Fast Food & Drive Through Facilities Other	N	N	N	N	N	BA	N	N
I.	<b>Estate Preservation Area</b>								
1.	Estate Preservation Area	N	BA	N	N	N	N	N	N
2.	Estate Preservation Area Great Estate Inn	N	Y	N	N	N	N	N	N

### 3.1.1 By Right

A use listed in the Table of Use Regulations is permitted as of right in any district under which it is denoted by the letter "Y" subject to such restrictions as may be specified elsewhere in this Bylaw.



### **3.1.2 Special Permit; Board of Appeals**

A use designated in the Table by the letters "BA" may be permitted as a special permit only if the Board of Appeals so determines and grants a special permit therefore as provided in Section 9.4 of this Bylaw subject to such restrictions as are set forth elsewhere in this Bylaw, and such restrictions as said Board may establish.

### **3.1.3 Special Permit: Planning Board**

A use designated in the Table by the letters "PB" may be permitted as a special permit only if the Planning Board so determines and grants a special permit therefore as provided in Section 9.4 of this Bylaw subject to such restrictions as are set forth elsewhere in this Bylaw, and such restrictions as said Board may establish.

### **3.1.4 Special Permit; Board of Selectmen**

A use designated in the Table by the letters "SB" may be permitted as a special permit only if the Board of Selectmen so determines and grants a special permit therefore as provided in Section 9.4 of this Bylaw subject to such restrictions as are set forth elsewhere in this Bylaw, and such restrictions as said Board may establish..

### **3.1.5 Prohibited Uses**

A use designated in the Table by the letter "N" is prohibited. Any use not set forward in the Table is also prohibited.

## **3.2 ACCESSORY USES**

### **3.2.1 General**

Accessory uses and structures shall be permitted or permitted by special permit as set forth in the Table of Use Regulations.

## **3.3 NONCONFORMING USES AND STRUCTURES**

### **3.3.1 Applicability**

This zoning by-law shall not apply to structures or uses lawfully in existence or lawfully begun, or to a building or special permit issued before the first publication of notice of the public hearing required by G.L. c. 40A, s. 5 at which this zoning by-law, or any relevant part thereof, was adopted. Such prior, lawfully existing nonconforming uses and structures may continue, provided that no modification of the use or structure is accomplished, unless authorized hereunder.

### **3.3.2 Nonconforming Uses**

The Board of Appeals may award a special permit to change a nonconforming use in accordance with this section only if it determines that such change or extension shall not be substantially more detrimental than the existing nonconforming use to the neighborhood. The following types of changes to nonconforming uses may be considered by the Board of Appeals:

1. Change or substantial extension of the use; or

2. Change from one nonconforming use to another, less detrimental, nonconforming use.

### **3.3.3 Nonconforming Structures**

The Board of Appeals may award a special permit to reconstruct, extend, alter, or change a nonconforming structure in accordance with this section only if it determines that such reconstruction, extension, alteration, or change shall not be substantially more detrimental than the existing nonconforming structure to the neighborhood. The following types of changes to nonconforming structures may be considered by the Board of Appeals:

1. Reconstructed, extended or structurally changed; or
2. Altered to provide for a substantially different purpose or for the same purpose in a substantially different manner or to a substantially greater extent.

### **3.3.4 Variance Required**

Except as provided in subsection 3.3.5, below, with regard to single and two-family residential structures, the reconstruction, extension or structural change of a nonconforming structure in such a manner as to increase an existing nonconformity, or create a new nonconformity, shall require the issuance of a variance from the Board of Appeals; provided, however, the extension of an exterior wall at or along the same nonconforming distance within a required yard, shall require the issuance of a special permit from the Board of Appeals.

### **3.3.5 Nonconforming Single and Two Family Residential Structures**

Nonconforming single and two family residential structures may be reconstructed, extended, altered, or structurally changed upon a determination by the Building Commissioner that such proposed reconstruction, extension, alteration, or change does not increase the nonconforming nature of said structure. The following circumstances shall not be deemed to increase the nonconforming nature of said structure as long as such addition does not increase the habitable floor area of the original structure by more than fifty (50%) percent:

1. alteration to a structure located on a lot with insufficient area which complies with all current setback, yard, building coverage, and building height requirements,
2. alteration to a structure located on a lot with insufficient frontage which complies with all current setback, yard, building coverage, and building height requirements.
3. alteration to a structure which encroaches upon one or more required yard or setback areas, where the alteration will comply with all current setback, yard, building coverage and building height requirements.

In the event that the Building Commissioner determines that the nonconforming nature of such structure would be increased by the proposed reconstruction, extension, alteration, or change, the Board of Appeals may, by special permit, allow such reconstruction, extension, alteration, or change where it determines that the proposed modification will not be substantially more detrimental than the existing nonconforming structure to the neighborhood.

### **3.3.6 Abandonment or Non-Use**

A nonconforming use or structure which has been abandoned, or not used for a period of two years, shall lose its protected status and be subject to all of the provisions of this zoning by-law; provided, however, that such use or structure may be restored to its protected status by special permit from the board of Appeals.

### **3.3.7 Reconstruction after Catastrophe or Demolition**

Any nonconforming structure may be reconstructed after a catastrophe or after demolition in accordance with the following provisions:

1. Reconstruction of said premises shall commence within two years after such catastrophe or demolition.
2. Building(s) as reconstructed shall be located on the same footprint as the original nonconforming structure, shall be only as great in volume or area as the original nonconforming structure, and shall meet all applicable requirements for yards, setback, and height.
3. In the event that the proposed reconstruction would (a) cause the structure to exceed the volume or area of the original nonconforming structure or (b) exceed applicable requirements for yards, setback, and/or height or (c) cause the structure to be located other than on the original footprint, a special permit shall be required from the Board of Appeals prior to such demolition.

### **3.3.8 Reversion to Nonconformity**

No nonconforming use shall, if changed to a conforming use, revert to a nonconforming use.

**Section 3.4 removed in accordance with the Attorney General Approval dated July 23, 2008.**

## SECTION 4 DIMENSIONAL REQUIREMENTS

### 4.1 GENERAL REQUIREMENTS

#### 4.1.1 Table of Dimensional Requirements

No building or structure shall be constructed nor shall any existing building or structure be enlarged or altered except in conformance with the Table of Dimensional Requirements as to lot coverage, lot area, land area per dwelling unit, lot width, front, side and rear setbacks, and maximum height of structures except as may otherwise be provided elsewhere herein.

Table 4.1.1– Table of Dimensional Requirements

Requirements	Residential				Commercial			Industrial
	R-3A	R-1A	R-30	R-15	C-3A	C-1A	C	I
1. Minimum lot size	3 acres	1 acre	30,000 SF	15,000 SF	3 acres	1 acre	5,000 SF	2 acres
2. Minimum lot frontage	200'	150'	125'	85'	300'	200'	75'	200'
3. Minimum lot width at building setback line	200'	150'	125'	85'	300'	200'	(4)	200'
4. Minimum setbacks:								
A. Building or structure (1)								
-Street Line	50'	35'	35'	35'	75' <sup>(5)</sup>	50'	(4)	50'
-Lot line	30'	25'	20'	20'	30'	30'	(4)	25'
-District Boundary Line (2)	30'	25'	20'	20'	50'	50'	(4)	50'
B. Sign Setback					35'	30'	(4)	30'
C. Parking Area Setback					30'	30'	(4)	30'
5. Maximum Building or structure height (3)								
-Stories	2	2	2	2	2	2	2	2
-Feet	35'	35'	35'	35'	35'	35'	35'	35'
6. Maximum building coverage	10%	20%	20%	20%	20%	30%	75%	35%

Footnotes:

(1) On lots abutting streets on more than one side, the front setback requirements shall apply to each of the abutting streets. However, a dwelling need not be set back more than the average of the setbacks of the dwellings on the abutting lots on either side. If a vacant lot exists on one side it shall be considered as a dwelling setback the depth of the required front setback. No fence shall be constructed so as to obstruct intersection view within front setbacks at street intersections.

(2) Where district boundary lines separate residential districts from commercial districts and industrial districts, setback areas shall be planted with screening to protect the residential districts.

(3) These height restrictions shall not apply to chimneys, water towers, skylights and other necessary features appurtenant to buildings which are usually carried above roofs and are not used for human occupancy. The Board of Appeals may allow greater height when permitting Planned Unit Office, Great Estates, Gateway Mixed Use Developments, and uses located in the Commercial Zone. In no instance shall height, not including exemptions as stated above, exceed 50 feet.

Stairways leading to any floor or story above the first floor story shall be located within the walls of the building whenever practicable; otherwise, stairways and fire escapes shall be located on the rear wall in preference to either side wall. In no instance shall a stairway or fire escape be located on any wall fronting on a street.

(4) In view of small and irregular lot sizes, applications for new building will be accepted for consideration based on areas no less than current lot sizes. Fireproof walls on one side to the lot line are permissible if there is at least 15' setback on the other side of the building.

(5) The street line building or structure setback in C-3A may be reduced to a minimum of thirty-five (35) feet by a Special Permit from the Zoning Board of Appeals pursuant to SECTION 6 of this Bylaw if the Board determines that the proposed plan will significantly enhance the aesthetics of the property. (See Section 4.3 - Reduction of Street Line Setback in C-3A.) (S.T.M. 12/16/96)

(6) The Zoning Board of Appeals may allow by special permit the reduction of the lot line setback, streetline setback and setback between buildings for accessory buildings in residential districts provided such reduction does not reduce the requirements for each district by fifty (50%) percent. (A.T.M. 5/5/05)

### **4.1.2 Computation**

1. The land and yard spaces required for any new building or use shall not include any land or area required by any other building or use to fulfill these zoning requirements.
2. Land within the lines of a street on which a lot abuts shall not be counted as part of such lot for the purpose of meeting the area requirements of this Bylaw even though the fee to such land may be in the owners of abutting lots.

### **4.1.3 Multiple Buildings**

If more than one building (other than a one-, two-, or three-car garage, a tool shed, a greenhouse or a cabana) is lawfully placed on any lot in single or common ownership, the distance between the nearest parts of such buildings shall be not less than twenty (20) feet.

### **4.1.4 Land Split by Town Line**

When a lot is situated in part in the Lenox and in part in the adjacent municipality, the provisions of this By-law shall be applied to the portion of such lot in Lenox in the same manner as if the entire lot were situated in Lenox

### **4.1.5 Frontage Required**

No buildings or structures except those of an accessory nature shall be constructed except on a lot fronting on a street.

## **4.2 SPECIAL DIMENSIONAL REQUIREMENTS**

### **4.2.1 Two-Family House or Duplex.**

No two-family house or duplex dwelling shall be constructed on a lot containing less than 20,000 square feet.

### **4.2.2 Effect of Eminent Domain**

Any land taken by eminent domain, or conveyed for a public purpose for which the land could have been taken or was taken by eminent domain, shall not be deemed to be transferred in violation of the land area, width, setback, or frontage provisions of the Bylaw.

### **4.2.3 Commercial Stable, Golf Course, Country Club, Swimming Club**

1. No building or structure or developed area, except in Commercial 3-A, shall be less than 200 feet from any lot line.'
2. No commercial stable or commercial riding ring shall be allowed on a lot less than five acres in area.

## **4.3 REDUCTION OF STREET LINE SETBACK IN C-3A**

### **4.3.1 Special Permit Required**

The street line building or structure setback in C-3A may be reduced to a minimum of thirty-five (35) feet by a special permit from the Zoning Board of Appeals if the Board determines that the proposed plan will significantly enhance the aesthetics of the property.

### **4.3.2 Submittals**

The applicant shall submit a detailed landscape plan prepared by a registered landscape architect or professional engineer at a scale of 1" = 40'. The proposed plan must be consistent with all other applicable provisions of this By-law.

### **4.3.3 Findings**

The Board's findings shall take into account the following criteria:

1. Overall quality of the plan including design and materials;
2. Consistency of materials and design elements (stone walls, for instance) with the historic character of the Town of Lenox;
3. Landscape treatment of parking areas;
4. Location and landscaping of signs on the site;
5. Integration into the existing terrain and surrounding landscape;
6. Enhancement of scenic views or unique features from the roadway or other publicly accessible locations;
7. Preservation of unique or sensitive natural or historic features;
8. Minimizing of changes to existing trees, other vegetation or soils;
9. Maximizing retention of open space; and
10. Screening of objectionable features from neighboring properties and the roadway.

## SECTION 5      GENERAL REGULATIONS

### 5.1 OFF-STREET PARKING AND LOADING REQUIREMENTS

#### 5.1.1 General

No building or structure shall be erected or enlarged unless the off-street parking and loading space requirements are provided as specified in this section. For the purpose of this section an enlargement of any building shall require the provision of off-street parking for the existing building as if it were newly constructed.

#### 5.1.2 Location

Required off-street parking facilities or loading bays shall be provided on the same lot as the principal use they are designed to serve, except as may be provided elsewhere in this Bylaw.

#### 5.1.3 Spaces

Each required car space shall be not less than nine (9) feet in width and twenty (20) feet in length exclusive of drives and maneuvering space and the total area of any parking facility for more than five (5) cars shall average at least three hundred (300) square feet per car exclusive of driveways.

#### 5.1.4 Multiple Uses

Unless otherwise set forth herein, where one building is used for more than one use, parking requirements shall be computed for each use. For example, a motel with a restaurant would be required to provide parking for both rental units and for seating capacity of the restaurant; a professional office in a residence must provide the space for office use in addition to the residential requirement.

#### 5.1.5 Required Spaces

Uses shall provide parking spaces in accordance with the following table. Where the computation of required parking spaces results in a fractional number, only the fraction of one-half (1/2) or more shall be counted as one (1).

**Table 5.1.5– Parking Space Quantity Requirements**

<b>Principal Use</b>	<b>Number of Spaces</b>
One and two family dwellings	2 spaces per dwelling unit
Apartments	2 spaces per dwelling unit
Rooming House	2 spaces plus 1 space for each rental unit over 1
Motels, Resorts	1 space for each sleeping room, plus 2 spaces for employees, plus 1 space for each 250 square feet of floor space for public functions
Permitted office in residence	4 spaces plus 1 space for each nonresident employee
Retail business and consumer service establishment	1 space for each 300 square feet of gross floor area
Restaurants, theaters and other places of assembly	1 space for each three seats



**Table 5.1.5– Parking Space Quantity Requirements**

<b>Principal Use</b>	<b>Number of Spaces</b>
Bowling alleys	2 spaces for each alley
Offices	1 space for each 300 square feet of gross floor area
Mortuary; funeral establishment	Minimum of twenty (20) off-street parking spaces shall be provided.
Warehouses and other commercial or industrial buildings	1 space for each 1,000 square feet of gross floor area

### **5.1.6 Shared Parking**

To the extent feasible, parking areas shall be shared with adjacent uses. This may be accomplished by access via a common driveway serving adjacent lots or premises; or, access via an existing side street; or, access via a cul-de-sac or loop road shared by adjacent lots or premises.

1. Up to fifty percent (50%) of the parking spaces serving a building may be used jointly for other uses not normally open, used or operated during similar hours. The applicant must show that the peak parking demand and principal operating hours for each use are suitable for a common parking facility.
2. The satellite parking spaces will be used solely by the employees and, where practicable, clients of the commercial use;
3. The off-site parking spaces shall be located to adequately serve the proposed use and shall be within six hundred (600) feet of the building served for clients of the commercial use.
4. A written agreement defining the joint use acceptable to the SPGA of the common parking facility shall be executed by all parties concerned and approved by the Zoning Board of Appeals as part of the special permit process. Such agreement shall be recorded at the Berkshire Registry of Deeds.
5. Any subsequent change in land uses for which the shared parking proposal was approved, and which results in the need for additional parking spaces, shall require a new special permit application under this subsection.

### **5.1.7 Reduction of Parking Requirements**

Any parking requirements for a development may be modified by a Special Permit granted by the Zoning Board of Appeals pursuant to SECTION 9 of the Zoning Bylaws upon determination that specific circumstances render a lesser provision adequate for all parking needs.

### **5.1.8 Parking Design Standards**

The following standards shall apply to all parking facilities.

1. A minimum of eighty percent (80%) of the required parking area shall be located to the side or rear of the structure. No parking shall be permitted within the required front

setback of any building.

2. All off-street parking areas with a capacity in excess of 35 spaces shall be paved. All off-street parking facilities with a capacity of 35 spaces or fewer shall be paved unless covered with a surfacing material meeting the following specifications:
  - a. Surface course to be minimum 8" thick compacted gravel - type B. Layers to be 4" lifts maximum. Sub-base - rolled and suitable to the Superintendent of Public Works. Areas unsuitable to be excavated and replaced with road stone and re-rolled.
  - b. Parking facilities for more than thirty-five (35) cars which will be used only from 1 June to 31 October need not be paved if a grass cover satisfactory to the Superintendent of Public Works is used on top of the required gravel base.
  - c. Parking spaces accompanying uses by right in residential districts shall be exempt from the above surfacing requirements.
3. In C-3A and C-1A Districts, the minimum dimensions for off-street parking spaces, exclusive of drives and maneuvering spaces, shall be as follows:

**Table 5.1.8 – Parking Space Dimensional Requirements**

<b>Space</b>	<b>Equivalent 90° Width</b>	<b>Minimum Equivalent 90° Depth</b>	<b>Vertical Clearance</b>	<b>Angle of Parking</b>	<b>Aisle Width</b>
Regular	8 ½ feet	19 feet	7 ½ feet	60°	22 feet
Handicapped	12 feet	20 feet	7 ½ feet	60°	22 feet

4. Off-street parking facilities shall have maneuvering areas and appropriate means of vehicular access to a street and shall be so designed as not to constitute a nuisance, hazard, or unreasonable impediment to traffic.
5. Curb cuts on town ways shall comply with the following standards:
  - a. The maximum width of a curb cut shall be 34 feet measured at the property line except that the ZBA may increase the maximum width to 60 feet if it finds that a larger curb cut is needed to accommodate commercial vehicles; and a larger curb cut is demonstrated not to cause danger to vehicles or pedestrians using the town way and vehicles entering and exiting the property; and the property will not generate traffic which will lower levels of service on the town way or at any nearby intersection below a level of service C at peak hour.
  - b. No more than 1 curb cut per lot. The ZBA may allow an additional curb cut if it finds that an additional curb cut would materially improve safety for vehicular traffic or pedestrians using the site or traveling on adjacent public ways, or a secondary curb cut for emergency vehicular access only is desirable and the cut shall be secured for that purpose.

- c. Sight distances for curb cut locations shall be based on the standards established by the American Association of State Highway officials (ASSHO) in effect on May 1, 1988, as amended.

### **5.1.9 Driveways**

Driveways from town ways shall comply with the following standards:

1. The minimum traveled width for a one-way driveway shall be twelve (12) feet. The minimum traveled width for a two-way driveway shall be twenty-four (24) feet.
2. No curb cut shall be located closer than 25 feet to a street or road intersection or within 15 feet of a crosswalk.

### **5.1.10 Layout of Off-Street Parking Facilities**

Any parking facility located within a structure, unless it is completely underground, must conform to the yard requirements for the zoning district in which it is located. Setbacks for on-grade open parking facilities shall be provided as follows:

1. No on-grade open parking space shall be located within ten (10) feet of that portion of a building wall containing windows or rooms at basement or first story levels habitable or occupiable by people. However, on-grade open parking spaces serving 1, 2, or 3 family dwellings may be located within five (5) feet of that portion of such building wall.
2. No on-grade open parking space or driveway shall be located within 30 feet of any side or rear property line.
3. The area between the required parking setback line and the building or lot line shall be landscaped and maintained in accordance with the requirements of Subsections 5.1.12 and 5.1.16.
4. In an C-3A district, no part of any parking facility or internal roadway shall be located within 30 feet of a residential district or of an open space district, a park or public recreation area or within 50 feet of the right-of-way of Route 7/20.
5. All roads, streets, sidewalks and other public rights-of-way and all landscaped areas shall be protected from vehicular overhang by wheel bumpers, curbs or other suitable method.
6. Off-Street parking facilities shall be marked so as to indicate clearly the space to be occupied by each vehicle, in accordance with the dimensions specified above, and including directional arrows and traffic signs as necessary for traffic control. Such markings shall be maintained so as to be plainly visible.

### **5.1.11 Drainage, Surfacing and Maintenance**

All sections of off-street parking facilities which are paved according to the requirements of this subsection shall be graded, surfaced and maintained to the satisfaction of the Town Board of Public Works to the extent necessary to prevent nuisance of dust, erosion, or excessive water flow onto any public way or onto another lot.

### **5.1.12 Maintenance**

Off-street parking areas shall be kept plowed, clean and free from rubbish and debris. All fences, barriers, walls, landscaping and lighting shall be maintained and kept repaired or replaced with facilities satisfying the requirements of this Section.

### **5.1.13 Snow Storage**

Parking areas shall have a designated area(s) to place snow. This snow storage area shall be adjoining or reasonably near the parking area and shall be of a size to hold a reasonable amount of snow as may be generated from the parking area after a heavy snowfall. In addition to or in lieu of providing a storage area, the Town Board of Public Works may approve a procedure for trucking snow from the area.

### **5.1.14 Lighting**

Off-street parking facilities which are used at night shall be provided with adequate lighting installed and maintained in such a manner so as not to reflect or cause glare on abutting or facing residential premises nor cause reflection or glare which adversely affects safe vision of operators of vehicles moving on nearby streets. A recommended standard for lighting is a minimum intensity of one (1) foot candle on the entire surface of the parking facility.

### **5.1.15 Screening**

Off-street parking facilities containing thirty-five or more spaces and not in a structure shall be effectively screened from abutting streets and lots. However, such screening shall not obstruct vehicle sight distances, entrances and exits. Screening shall meet the following requirements:

1. A strip at least five (5) feet in width of densely planted shrubs or trees which are at least three (3) feet high at the time of planting and are of a type that may be expected to form within three years after the time of planting a continuous, unbroken, year-round visual screen.
2. For rear and side yards only, a wall, barrier, or fence of uniform appearance. Such wall, barrier, or fence may be opaque or perforated provided that not more than fifty percent (50%) of the face is open. The wall, barrier or fence shall be at least four (4) feet and not more than six (6) feet in height.
3. The screening as required in this subsection shall be located so as not to obstruct vehicle sight distances, entrances and exits. Such screening shall not be higher than two (2) feet within thirty (30) feet of an intersection or ten (10) feet of a driveway.
4. Every effort shall be made to retain existing trees. Removal of any tree exceeding six (6) inch caliper to accommodate construction of a parking facility is discouraged.
5. Perimeter landscaping required for screening may include a landscaped yard area otherwise required.
6. Screening shall be continuously maintained so as to effectively serve the purpose for which it is intended. No advertising devices of any kind shall be allowed on or in screening.

7. Screening shall be continuous except for required access.
8. Screening requirements may be waived in the following cases:
  - a. If said parking facility is already effectively screened by an existing building, wall, fence or hedge on an adjoining lot and within five feet of the common property line, screening shall not be required so long as such adjoining screening is maintained.
  - b. If said parking facility is already effectively screened by a natural terrain feature or change in grade.
  - c. If said parking facility abuts another parking facility under different use or ownership, a landscaped planting strip at least 5 feet in width may be used in lieu of screening along the common property line.

#### **5.1.16 Landscaping**

For the purpose of this section, landscaping shall consist of any of the following or a combination thereof: grass, ground covers, shrubs, vines, hedges, or trees; and non-living durable material commonly used in landscaping, such as but not limited to rocks, pebbles or wood chips, but excluding asphalt or concrete. Required screening elements as specified above may be allowed in perimeter landscaped areas. On-grade, open facilities which contain thirty-five or more parking spaces shall be landscaped in accordance with the following requirements:

1. At least fifteen percent (15%) of the interior area of the parking facility shall be landscaped. This does not include perimeter planting provided for beautification or to satisfy screening requirements.
2. Each planting area shall be at least twenty-five (25) square feet in area and have no dimensions less than five (5) feet.
3. Each planting area shall contain at least one tree and the facility as a whole shall contain at least one tree for every ten parking spaces.
4. Trees used to satisfy parking lot landscaping requirements shall be a minimum of three (3) inch caliper at planting and shall be suitable for location in parking lots.
5. The trees required for the landscaping of on-site parking areas - whether such trees are coniferous or deciduous, flowering or non-flowering - should be tolerant of environmental conditions, able to screen parking areas by virtue of their size, form, density of foliage and spread, and easy to maintain. A suggested list of trees which meet these criteria is:

Coniferous. Botanical name (common name)

Pinus Strobus (Eastern White Pine); Tsuga Canadensis (Canadian Hemlock); Pinus Resinosa (Red Pine); Picea Glauca (White Spruce); Picea Abies (Norway Spruce); Picea Pungens Glauca Kosteriana (Blue Spruce); Picea Rubens (Red Spruce).

Deciduous. Botanical name (common name)

Fagus Grandifolia (American Beech); Acer Platanoides (Norway Maple); Acer rubrum (Red Maple); Acer saccharum (Sugar Maple); Fraxinus Americana (White Ash); Fraxinus Pennsylvanica (Green Ash); Thuja Occidentalis (Eastern Arborvitae); Quercus palustris (Pin Oak); Quercus rubra (Red Oak); Tilia cordata greenspire (Littleleaf Linden); Tilia Europaea (Common Linden); Ulmus Americana (American Elm).

6. Existing healthy trees shall be preserved wherever possible.
7. Existing and new trees shall be protected by bollards, high curbs or other barriers sufficient to prevent damage.
8. Extensive unbroken paved areas in large on-grade open parking facilities shall not be permitted. In parking lots containing 35 or more spaces, a row shall contain no more than 15 contiguous parking spaces without a densely planted landscaped buffer of at least the dimensions of one space.
9. No regular certificate of occupancy shall be issued unless an inspection by the Building Commissioner establishes that the landscaping meets the requirements provided herein. Pending issuance of a regular certificate of occupancy, a temporary certificate may be issued for such period as the Building Commissioner may designate but no longer than six months. All landscaping covered under this section shall be continuously maintained so as to effectively serve the purpose for which it was intended.

#### **5.1.17 Bicycles**

Bicycle parking spaces shall be located near the entrance of the use being served and within view of pedestrian traffic, if possible, and shall be sufficiently secure to reasonably reduce the likelihood of bicycle theft.

#### **5.1.18 Loading Bays**

Each loading bay shall be not less than ten (10) feet in width and thirty-five (35) feet in length exclusive of drives and maneuvering space, and all required bays, drives and maneuvering space shall be located entirely on the lot with direct access to the building intended to be served.

#### **5.1.19 Loading Standards.**

Adequate off-street loading facilities and space must be provided to service the needs created by new structures, additions to existing structures, or changes in use in existing structures. Facilities shall be so sized and arranged that no vehicles need back onto or off of a public way, or be parked on a public way while loading, unloading or waiting in queue. In addition loading facilities shall be located so as to not interfere with internal traffic circulation.

### **5.2 SIGNS**

#### **5.2.1 General**

No signs or advertising devices of any kind or nature shall be erected on any premises or affixed to the outside of any structure or be visible from the outside of any structure in the Town except as specifically permitted, except that in a commercial or industrial district permanent professional

lettering or logo identifying the occupancy will be permitted on doors or windows. A permit is required for all new signs or alterations of existing signs in Residential, Commercial, and Industrial Districts. The Building Commissioner is the official who issues sign permits, except as specifically provided hereafter.

1. The Selectmen may issue a permit for any sign of a permanent nature on public land after review by the Planning Board.
2. All signs in the Historic District except as provided here must be approved by the Historic District Commission.

### **5.2.2 Dimensions**

In determining the dimensions of signs, the area shall be determined by measuring from the top of the topmost display elements, and from exterior side to exterior side of display elements and including in such measurements any blank or open area between display elements. Display elements include any letters, words, trademarks, medallions, symbols or other devices intended to advertise or indicate the name of the premises or the products or services available thereat. Signs having a backing strip shall be measured at the extreme dimensions of such backing.

1. Two similar signs back to back so as to face opposite directions shall be considered one sign and area requirements shall be determined from the measurement of one side only. Likewise, two signs may be oriented at a maximum of 90° to one another and still be considered one sign.

### **5.2.3 General Standards**

1. All signs shall be stationary and shall contain no visible moving parts. Signs producing noise and/or odors or vapors are prohibited.
2. There shall be no temporary special promotion signs, banners, streamers, or placards erected, suspended, posted or affixed in any manner outdoors or on the exterior of any building in a Business District except by special permission of the Selectmen. Temporary shall mean no more than two weeks.
3. No sign shall be hung from any other sign.

### **5.2.4 Signs in All Districts**

The following signs are permitted in all districts.

1. One "For Sale" or "For Rent" sign, not more than three (3) square feet in signboard area and which advertises for sale or for rent only the premises on which the sign is located.
2. One Building Contractor's sign (which may include subcontractor and architectural information) on a building while actually under construction, not exceeding six (6) square feet in signboard area.
3. The Zoning Board of Appeals in granting a Special Permit or Variance may issue a permit



for a sign which does not conform to the requirements of the district in which it is located. On the premises with a non-conforming use the Zoning Board of Appeals may issue a permit for a sign which does not conform to the requirements of the district in which it is located.

4. For churches and institutions, signs shall be governed by the provisions of the district in which they are located except that in any district two bulletin or announcement boards or identification signs up to ten (10) square feet in size are permitted.
5. Directional signs limited to the name of the business on public property or on private property not contiguous with the advertiser's lot may be erected by special permission of the Selectmen, after review by the Planning Board and if within the Historic District by the Historic District Commission. Such signs shall not exceed six (6) square feet of signboard area and shall be so placed or hooded that the light shall not be noxious or offensive to the neighborhood.
6. In Commercial Districts, temporary signs not exceeding 1/12th of the permitted sign area in size may be affixed (not hung) to a permitted sign or to a building. This includes signs advertising "Sale", "Grand Opening", "Clearance" and the like.

#### **5.2.5 Signs in Residential Districts**

The following signs are permitted in Residential Districts.

1. One non-illuminated sign which displays the street number, name of the occupant or the premises or both, not exceeding three (3) square feet in area, or not more than two signs, not exceeding two (2) square feet in area each. Such sign may be attached to a building or may be on a rod or post not more than four (4) feet high and not less than three (3) feet from any lot line.

#### **5.2.6 Signs in Commercial and Industrial Districts**

In Commercial and Industrial Districts, signs shall relate to the premises on which they are located and shall only identify the occupancy of such premises or advertise the articles or services available within such premises. Illuminated signs are permitted. The following signs are permitted in Commercial and Industrial Districts.

**Table 5.2.6 – Commercial and Industrial District Sign Requirements**

<b>District</b>	<b>Number</b>	<b>Size</b>	<b>Location</b>
C	See 5.2.8	12 sq. ft.	On building, 6" maximum projection
C	1 per lot	36 sq. ft.	Free standing, planned unit commercial development only, setback to be determined
C	1 per occupancy See 5.2.8 in lieu of 12 sq. ft. sign on building	6 sq. ft.	Two-faced sign from building or on free standing post; any portion of sign must be 12" back of any property line.
C-1A	1 per occupancy	24 sq. ft.	On building, 12" maximum projection
C-1A	1 per lot	36 sq. ft.	Free standing, 25' setback
C-3A	1 per occupancy	36 sq. ft.	On building, 12" maximum projection

**Table 5.2.6 – Commercial and Industrial District Sign Requirements**

<b>District</b>	<b>Number</b>	<b>Size</b>	<b>Location</b>
C-3A	1 per lot	36 sq. ft.	Free-standing, 35 ft. setback
I	1 per occupancy	24 sq. ft.	On building, 12" maximum projection
I	1 per lot	36 sq. ft.	Free standing, 1.5' setback

### **5.2.7 Entrance and Exit Signs in Commercial and Industrial Districts**

The following signs designating entrance and exit are permitted:

C - 6" x 12"

All other districts except Residential - 8" x 24"

### **5.2.8 Other Signs Permitted in Commercial and Industrial Districts**

Each occupant in a Commercial or Industrial District is permitted one sign affixed parallel to the exterior face of the building fronting upon a public street and also one sign affixed parallel to the exterior face of the building fronting upon a parking lot if there is an entrance from the parking lot leading to the occupant's premises. Multiple occupants having a common entrance are restricted to group listings on a single sign.

### **5.2.9 Free-standing Signs**

In C-1A and C-3A and Industrial Districts where a free-standing sign is permitted, the top edge of any such free-standing sign shall not be higher than twenty (20) feet vertical measure above the average level of the ground between the supports of each sign. Any such free-standing sign may not be nearer to lot lines than setbacks given in Table 5.2.6. Maximum dimension for a free-standing sign in any direction is sixteen (16) feet.

### **5.2.10 Signs in Historic District**

Signs in the Historic District which the Building Commissioner determines have met the requirements of the zoning bylaw must then be submitted to the Historic District Commission for approval before a permit can be issued by the Building Commissioner for the erection of said sign.

## **5.3 LIGHTING**

### **5.3.1 General**

Lighting shall conform with the following standards.

### **5.3.2 Sign Lighting**

1. Sign lighting shall be continuous, not intermittent nor flashing, nor changing.
2. Sign illumination is permitted only between the hours of seven (7:00) o'clock in the morning and eleven (11:00) o'clock in the evening, except that signs of retail business and consumer service establishments may be illuminated during any hours these establishments are open to the public.

3. For the safety of pedestrians and vehicles at night, the preferred type of lighting for signs is direct illumination from a shielded light source (in compliance with the standards described in 5.3.3, below). Any illumination provided for signs shall be white only. Internally-lit signs with opaque backgrounds and glowing translucent letters may be permitted. Individual solid metal letters with internal lighting tubes that back-light the wall in a “halo” effect may also be allowed.

### **5.3.3 Outdoor Lighting**

1. Any private outdoor lighting fixture newly installed or replaced shall be shielded at the source so as not to produce a strong direct light beyond the property boundaries. The light level at the lot line shall not exceed 0.2 foot-candles, measured at ground level.
2. No private outdoor light shall be located at a height greater than twenty-five (25) feet.

## **5.4 DRAINAGE AND EROSION CONTROL**

### **5.4.1 Applicability**

Any religious purpose, educational purpose, or use requiring a special permit or variance which permits the construction of more than ten (10) new dwelling units, or any religious purpose, educational purpose, motel, nursing home, planned unit commercial development, resort, office building, or industrial use which:

1. is located on 25 acres or more of land, and/or
2. results in more than 20,000 square feet of ground floor area and paved parking area

shall be subject to the regulations set forth below.

### **5.4.2 Submittals**

The applicant shall submit with its application for a certificate of occupancy, building permit, special permit, or variance the following information:

1. a plan of the tract and adjacent and downstream areas showing proposed drainage facilities together with a statement showing the impact of storm water runoff on adjacent downstream surface water bodies and flood plains.
2. a plan for control of erosion and sedimentation both temporary and permanent measure prepared by a professional engineer, which shall include the following:
  - a. a plan map showing property lines, wetlands, stream courses, water bodies, location of areas to be stripped of vegetation, location of areas to be regraded, the contour data including existing and proposed grades.
  - b. a schedule of operations, to show the sequence and timing of major improvement phases such as clearing, grading, paving, installation of drainage features, and the like.

- c. seeding, sodding, or revegetation plans and specifications for all unprotected or unvegetated areas.
- d. a map showing the location, design and timing of structural sediment-control measures, such as diversions, waterways, grade stabilization structures, debris basins, and the like.
- e. the calculations used in designing erosion-control structures.
- f. a description of procedures to be followed to maintain sediment-control measures, including the manner in which sediment removed from control structures will be disposed of.

### **5.4.3 Standards**

Performance standards shall conform to those described in the "Guidelines for Soil and Water Conservation in Urbanizing Areas of Massachusetts", (USDA, Soil Conservation Service, 1975).

1. The applicant shall demonstrate that adequate provisions have been made for the provision of surface water according to the following standards; catch basins and culverts shall be built in conformity with specifications of the Superintendent of Public Works on both sides of any roadway on continuous grades at intervals of not more than 400 feet, at low points and sags in any roadway, and near the corners of the roadway at intersecting streets.
2. The applicant may be required by the Board of Public Works and its Superintendent to carry away by pipe or open ditch any spring or surface water that may exist either previous to or as a result of the development. Such drainage facilities shall be located in the road right-of-way, where feasible, or in perpetual unobstructed easements of appropriate width shown on the plan.
3. A culvert or other drainage facility shall, in each case, be large enough to accommodate potential runoff from its entire upstream drainage area.
4. The Board of Public Works and its Superintendent shall approve the design and size of the facility based on anticipated runoff from a "twenty-five year frequency" storm under conditions of total potential development permitted by the zoning bylaw in the watershed. A lesser frequency storm calculation may be allowed where downstream flooding problems are minimal. In any event, the Soil Conservation Service Modified Soil Cover Complex Method will be used to determine runoff.
5. The applicant's engineer shall also study the effect of the existing downstream drainage facilities outside the area of development. This study shall be reviewed by the Board of Public Works and the Superintendent of Public Works and where it is anticipated that the additional runoff incident to the development will overload the existing downstream drainage facility. The Zoning Board of Appeals shall not approve the development, nor

shall the Building Commissioner issue a building permit or certificate of occupancy until provision has been made for the improvement of said conditions.

#### **5.4.4 Security**

A completion bond or covenant shall be required for improvements in the proposed development.

A bond shall be sufficient to cover the costs of accomplishing the erosion and sedimentation control measures.

## **SECTION 6        SPECIAL REGULATIONS**

### **6.1    MOTELS, INNS, HOTELS, OUTDOOR DINING**

#### **6.1.1     General Requirements**

1. Each rental unit shall contain not less than two hundred (200) square feet of habitable floor area.
2. Each motel site shall be provided with not more than two (2) motor vehicle driveways for each abutting street which shall intersect the abutting street or streets at ninety (90) degrees.

#### **6.1.2     Special Requirements**

1. Except in Commercial C districts, no motel shall be constructed on a lot having less than two hundred (200) feet frontage and less than 90,000 square feet lot size. If a larger lot size is specified for the district in which the motel is proposed, such larger lot size is required.
2. Except in Commercial C districts, there shall be 3,000 square feet of land area for each motel unit. The minimum acreage requirement may be included in calculating this land area.
3. On each lot used for motel purposes, except in Commercial C districts, there shall be provided front, rear and side yards each not less than fifty (50) feet in depth. If a larger setback is specified for the district for which the use is proposed, the larger setback is required.
4. Except in Commercial C districts, a space not less than 20 feet wide shall be maintained open with grass, bushes, flowers, or trees all along each side lot line, rear lot line and front lot line, except for entrance and exit driveways and such open space shall not be built upon nor paved, nor used for parking.

### **6.2    SEASONAL OUTDOOR DISPLAYS**

#### **6.2.1     Outdoor Displays; C1A District**

Outdoor displays may be allowed by right from May 15 to October 15. Such displays:

1. shall be established in a orderly manner with a high level of design quality so as to not adversely impact surrounding uses;
2. shall be in an area, parallel to the front of the building in which the principal use is located, of no more than fifty percent (50%) of the front facade of such building, and;
3. shall not be in those areas designated for zoning purposes as front, side or rear yards, or on public or private streets or ways, or parking spaces, or traffic lanes, or on public sidewalks,

and where there are private sidewalks, four (4) feet of the sidewalk width remain unencumbered;

4. shall be a maximum of six (6) feet in height;
5. shall not have additional signs except as otherwise provided herein;
6. shall be located outdoors only during regular business hours; and
7. shall be of the type that is displayed or sold in the ordinary and customary operations of the principal use.

### **6.2.2 Outdoor Displays; Commercial (C) District**

Outdoor displays may be allowed by special permit from May 15 to October 15. Such displays:

1. shall be established in a orderly manner with a high level of design quality so as to not adversely impact surrounding uses;
2. shall be in an area, parallel to the front of the building in which the principal use is located, of no more than fifty percent (50%) of the front façade of such building; and
3. shall not be in those areas designated for zoning purposes as front, side or rear yards, or on public or private streets or ways, or parking spaces, or traffic lanes, or on public sidewalks, and where there are private sidewalks, four (4) feet of the sidewalk width remain unencumbered;
4. shall be a maximum of six (6) feet in height;
5. shall not have additional signs except as otherwise provided herein;
6. shall be located outdoors only during regular business hours; and,
7. shall be of the type that is displayed or sold in the ordinary and customary operations of the principal use. The assembly or packaging of consumer goods including food and beverage products may be allowed in the Commercial District provided that not more than 10% of the outdoor display area is devoted to this operation.

## **6.3 OUTDOOR DINING**

### **6.3.1 General Requirements.**

Seasonal outdoor dining, including sidewalk cafes, courtyard or terrace dining and similar uses may be permitted in the C, C1A, and C3A districts by special permit as an accessory use to a restaurant, cafeteria, or similar eating establishment or to a bakery, deli or other similar establishment for the production and sale of food or beverage on the premises. Where appropriate health, fire and building permits have been obtained, seasonal outdoor dining uses may also include the outdoor preparation and cooking of food or beverages.



1. All aspects of outdoor dining shall conform to any and all Board of Health regulations.
2. Outdoor dining shall take place in a specified area.

### **6.3.2 Indoor Seating.**

The number of seats indoors to be the number indicated on the applicable Certificate of Occupancy

### **6.3.3 Outdoor Seating**

The number of seats allowed outdoors shall be based on the following criteria:

1. Total number of seats allowed to be based on square footage of above-mentioned specified area divided by 15 square feet per seat.
2. Specified dining area shall not impede or infringe upon public spaces, especially concerning pedestrian and vehicular movement.
3. Specified dining area shall have minimum setbacks of 10 feet from streets and 5 feet from sidewalks and, at the discretion of the Board of Appeals, be screened.

## **6.4 PLANNED UNIT COMMERCIAL DEVELOPMENT**

### **6.4.1 General Requirements**

1. A mall or other form of walkway, interrupted by parking areas, shall be provided to link together the various stores and service outlets in the planned unit commercial development.
2. The minimum lot size for a planned unit commercial development shall be seven (7) acres except in Commercial C where the minimum lot size required shall be 40,000 square feet.
3. In examining an application for a Planned Unit Commercial Development, the Board of Appeals shall pay particular attention to on-site traffic mitigation measures such as shared highway access, joint driveways, good internal traffic access to adjacent parcels, shared parking. The Board of Appeals shall consider landscaping.

### **6.4.2 Special Requirements**

1. In the Commercial District the Board of Appeals may allow for residential uses to exist in combination with retail business and consumer services as part of the entire Planned Unit Commercial Development. Residential uses shall not be located on the first floor of a structure when developed in combination with commercial or retail uses.

## **6.5 PLANNED UNIT OFFICE OR RESEARCH CENTER**

### **6.5.1 Planned Unit Office or Research Center; Residential Districts**

A planned unit office or research center shall consist of a building or a group of physically interrelated buildings where the main function is the processing, compilation or analysis of records or data; research activity in the physical or social sciences; applied research in product

development. No manufacturing shall be permitted. Minimum lot size for a planned unit office or research center in a residential district shall be fifteen (15) acres. Maximum percentage of building coverage to lot size shall be five (5%) percent. In examining an application for a planned unit office or research center, the Board of Appeals shall pay particular attention to the landscape provisions of the proposal and to the adequacy of streets and highways at the locus of the proposed development.

### **6.5.2 Planned Unit Office or Research Center; Commercial Districts**

A planned unit office or research center shall consist of a building or a group of physically interrelated buildings where the main function is the processing, compilation or analysis of records or data; research activity in the physical or social sciences; applied research in product development. Accessory manufacturing and processing shall be permitted. Minimum lot size for a planned unit office or research center in a commercial district shall be three (3) acres. Maximum percentage of building coverage to lot size shall be twenty-five (25%) percent, except that the following additional building coverage may be permitted if the Board of Appeals finds that the additional coverage will not result in undue adverse impacts, and that the applicant has provided the specified desirable features as permanent parts of the development.

1. Bonus for providing on-site traffic mitigation measures such as shared highway access, joint driveways, good internal traffic access to adjacent parcels and shared parking, as deemed appropriate by the Board of Appeals as part of their findings during the Special Permit Review process: five percent (5%).
2. Bonus for parcels of over fifteen (15) acres which are submitted under a single special permit application and which incorporate traffic mitigation measures: five percent (5%).

In examining an application for a planned unit office or research center, the Board of Appeals shall pay particular attention to the landscape provisions of the proposal and to the adequacy of streets and highways at the locus of the proposed development.

## **6.6 RESORTS**

### **6.6.1 General Requirements**

1. A resort shall have a minimum of 15 acres of land area.
2. A buffer area of 200 feet shall be maintained between the resort activity area and abutting property lines. The purpose of this area is to prevent unreasonable intrusion of the resort activity upon abutting properties. Therefore, no resort activity of any kind shall take place within this area. Further the character of the area shall be one in which natural tree or shrub growth has been retained or formal planting has been provided or an attractive type of fabricated screening has been installed to achieve the stated effect.

## **6.7 EDUCATIONAL AND RELIGIOUS USES**

### **6.7.1 General Requirements**

Any non-municipal educational use or any religious use is subject to the following regulations:

1. Maximum building height - 2 stories or 35 feet.
2. Maximum building coverage - 4%.
3. Setback - two hundred (200) feet buffer surrounding the property to be kept undeveloped except for entrance and exit roadways.
4. Major access roads and major parking areas subject to frequent use day or night shall be paved. Major roads are to be eighteen (18) feet wide and shall not exceed a 7 1/2 % grade.
5. Parking areas shall be screened as provided in 5.1.15
6. Parking areas shall be within three hundred (300) feet of the building to be served.

### **6.7.2 Parking Requirements**

- |                                   |   |
|-----------------------------------|---|
| 1. Places of assembly             | 1 space for every three (3) seats   |
| 2. Classrooms and/or dormitories: |   |
| Grades 1-10:                      | 1 space for each staff member;  |
| Grades 10-12:                     | 1 space for each staff member plus 1 space for every two students.              |
| College:                          | 1 space for each staff member plus two (2) spaces for every three (3) students. |

### **6.7.3 Special Requirements**

Any property located in the Commercial C-Zone or Residential R-15 Zone used primarily for religious purposes shall be exempt from the provisions of this Section 6.7.

## **6.8 ADULT ENTERTAINMENT USES**

### **6.8.1 Purpose and Intent**

The purpose and intent of this section is to address and mitigate the secondary effects of the adult uses and businesses referenced herein. The provisions of this section are not intended to impose a limitation or restriction on the content of any communicative matter or materials, including sexually oriented matter or materials. Also, the provisions of this section are not intended to restrict or deny access by adults to adult uses and to sexually oriented matter or material protected by the Constitution of the United States of America and of the Commonwealth of Massachusetts, nor to restrict or deny rights that distributors or exhibitors of such matter or materials may have to sell, rent, distribute, or exhibit such matter or materials. Neither is it the purpose or intent of this section to legalize the sale, rental, distribution, or exhibition of obscene or other illegal matter or materials.

It is also the purpose of this section to address and mitigate the secondary effects of the adult entertainment establishments and sexually oriented businesses that are referenced and defined herein. Secondary effects have been shown to include increased crime, adverse impacts on public

health, adverse impacts on the business climate of the Town, adverse impacts on the property values of residential and commercial properties, and adverse impacts on the quality of life in the Town. All of said secondary impacts are adverse to the health, safety, and general welfare of the Town of Lenox and its inhabitants.

### **6.8.2 Special Permit**

No adult use shall be allowed except by a Special Permit granted by the Board of Appeals. Said Board may impose such conditions as it deems appropriate for the protection of public health, safety, and welfare in any district permitting such use. Said Special Permit shall only be issued following a public hearing held within sixty-five (65) days after filing of an application with the Board of Appeals, a copy of which shall forthwith be given to the Town Clerk by the applicant.

### **6.8.3 Location**

An adult use shall be prohibited in all zoning districts except in the C-1A Zone. An adult use may not be located within four hundred (400) feet of

1. a boundary line of a residential zoning district;
2. any other adult bookstore or adult motion picture theater; or
3. any establishment licensed under the provisions of Chapter 138, §12.

The distances specified above shall be measured by a straight line from the nearest property line of the premises on which the proposed adult use is to be located to the nearest boundary line of a residential zoning district or to the nearest property line of any of the other designated uses set forth above.

### **6.8.4 Requirements**

1. All building openings, entries and windows shall be screened in such a manner as to prevent visual access to the interior of the establishment by the public.
2. No adult entertainment use shall be allowed to display for advertisement or other purpose any signs, placards or other like materials to the general public on the exterior of the building or on the interior where the same may be seen through glass or other like transparent material any sexually explicit figures or words as defined in M.G.L. Chapter 272, §31.
3. No adult entertainment use shall be allowed to disseminate or offer to disseminate adult matter or paraphernalia to minors or suffer minors to view displays or linger on the premises.
4. No adult entertainment use shall be allowed within a building containing other retail, consumer or residential uses.
5. No adult entertainment use shall be allowed within a shopping center, shopping plaza or mall.
6. The proposed adult entertainment use shall comply with the off-street parking

requirements set forth in Section 5.1.

7. No adult entertainment use shall have any flashing lights visible from outside the establishment.
8. No adult entertainment use shall have a freestanding accessory sign.
9. No adult entertainment use shall be established prior to submission and approval of a site plan by the Board of Appeals. The site plan shall depict all existing and proposed buildings, parking spaces, driveways, service areas and other open uses. The site plan shall show the distances between the proposed adult entertainment use and the boundary of the nearest residential zoning district and the property line of each of the uses set forth in Section 6.8.3.

#### **6.8.5 Application**

The application for a Special Permit for an Adult Use shall include the following information:

1. name and address of the legal owner of the proposed establishment;
2. name and address of all persons having a lawful ownership, equity or security interest in the proposed establishment;
3. a sworn statement that neither the applicant, owner, nor any person having a lawful ownership, equity or security interest in the proposed establishment has been convicted of violating the provisions of Massachusetts General Laws Chapter 119, §63 or Chapter 272, §28;
4. name and address of the manager of the proposed establishment;
5. proposed provisions for security;
6. number of employees; and
7. proposed physical layout of the interior of the proposed establishment.

#### **6.8.6 Conditions**

The special permit granting authority may impose reasonable conditions, safeguards and limitations on time or use of any special permit granted shall be personal to the applicant, shall not run with land and shall expire upon sale or transfer of the subject property.

#### **6.8.7 Expiration**

A special permit to conduct an adult entertainment use shall expire after a period on one calendar year from its date of issuance and shall be renewable for successive two-year periods thereafter, provided that a written request for such renewal is made to the special permit granting authority prior to said expiration and that no objection to said renewal is made and sustained by the special permit granting authority based upon the public safety factors applied at the time that the original special permit was granted, and that a site plan is submitted to, and approved by the Board of Appeals as set forth above.

## **6.9 BED AND BREAKFAST ESTABLISHMENTS**

### **6.9.1 Bed & Breakfast In-Home Stay/Room Rental**

The following requirements shall apply:

1. Establishment limited to not more than three (3) guests;
2. Parking must be off street, on premises, with one (1) space per room rented and one (1) per owner.
3. No other uses except for customary home occupation shall be permitted on the property.
4. No additions or external modifications may be made to the property for lodging use.
5. A certificate of occupancy required and premises shall be subject to annual inspection.

### **6.9.2 Bed & Breakfast Inn**

1. Lodging for four (4) to twenty (20) guests.
2. Parking must be off street, on premises, with one space per room rented and one per owner.
3. No other uses except for customary home occupation permitted on the property.
4. No external additions to be made to property for lodging use. External modifications for access and safety are permitted but such modification shall be designed for minimum impact on abutters.
5. Requires a special permit, which is subject to review.
6. Certificate of occupancy required. Subject to annual inspection.
7. Property must be served by town water and sewer.
8. Except in the commercial district, an open space not less than 20 feet wide shall be maintained along each lot line with grass bushes, flowers or trees to provide a buffer.

## **6.10 ESTATE PRESERVATION AREA**

### **6.10.1 Purpose**

The purpose of this Estate Preservation Area is to encourage the preservation and restoration of the original features and character of buildings inherited from the estate system of the turn of the century and the open space, vistas, stonework, gardens and recreation facilities associated with the original buildings. Use flexibility and a density bonus system are the means by which these objectives shall be encouraged.

### **6.10.2 Special Permit**

The Zoning Board of Appeals may allow, by Special Permit, the development of an Estate Preservation Area, as prescribed herein, upon determination that such development will preserve and protect qualifying buildings and open space and settings associated with such buildings and subject to further restrictions as may be imposed by the Zoning Board of Appeals in accordance with this bylaw.

### 6.10.3 Eligibility

A property/building qualifies as an Estate Preservation Area if, and only if, the property/building is included in the following list:

**Table 6.10.3 – List of Estates**

<b>Property Name</b>	<b>Building Name</b>	<b>Map/Parcel No.</b>	<b>Street Address</b>
Bellefontaine	Mansion (Excluding Dorm and Gym Addition) Plus Gatehouse	7-43	Kemble St.
Belvoir Terrace	Main Building (Excluding Kitchen Wing)	12-4	Cliffwood St.
Blantyre	Main Building	4-75	East St.
Cranwell (Wyndburst) (Coldbrooke)	Cranwell Hall (Excluding West Wing) Wickham Hall, Berchman's Hall	3-55	Lee Rd.
Ethelwynde	Main Building	12-2	Yokun Ave.
Elms (Windsor Mtn.)	Main Building (Excluding Dining Hall Wing) (Groton Place)	11-1	West St.
Shakespeare & Co. Springlaw	Clipston Grange Frelinghusen Cottage (Bassett Hall) Springlawn (Schmerhorn Hall)	7-22/7-22-5	Kemble St.
Wayside (Lenox Club)	Main Building	12-3	Yokun Ave.

(Note that Town sewer is readily accessible to all.) All of the estate buildings in the above list are Category 1 buildings hereafter defined.

### 6.10.4 Designation

The applicant shall designate in its application hereafter referred to, the particular Category #1 building(s) to be preserved ("Designated Building"), and the area of land to be included in the Estate Preservation Area ("Designated Area") which area need not be the entire area listed above but shall contain at least 25 acres and 75% of the land, whichever is greater, listed above and shall include the Designated Building.

### 6.10.5 Division

Division of a Designated Area into separate parcels by reason of public ways or multiple ownership shall not prevent the qualification of an area that otherwise complies with the requirements set forth herein.

### 6.10.6 Requirements

The development of an estate Preservation Area as provided for herein may be permitted subject to the following requirements:

1. preservation and rehabilitation of the original exterior features, character and structural integrity of Category #1 buildings inherited from the estate system of the turn of the



century and the open space, vistas, stonework, gardens, and other historic landscape features and recreation facilities associated with Category #1 buildings. The Zoning Board of Appeals shall refer to the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (1982), as amended, for guidance;

2. acreage of not less than 25 acres;
3. connection to the town sewer;
4. water for domestic purposes is available, and water mains shall satisfy equivalent subdivision standards;
5. town water when available will be connected for fire protection;
6. all driveways are constructed and maintained to a standard at least equal to the contemporary requirements of a subdivision road, except that the Zoning Board of Appeals may waive requirements for width of layout and traveled way, paving, monuments, sign posts, trees, sidewalks and curbing;
7. off-street parking is screened from abutters and adjoining streets;
8. preservation of Designated Buildings and associated features and installation of driveways, services, and soil and erosion control measures shall be secured by a completion bond and/or covenant approved as to form and substance by the Zoning Board of Appeals and manner of execution by Town Counsel. Preservation of the Designated Buildings(s) and associated features must be secured as above set forth prior to the commencement of any development permitted by this Section. Development and rehabilitation may proceed in stages, and if so, the required bond or covenant shall be similarly staged;
9. unless required by the building code, no new buildings shall be erected within two hundred (200) feet of a Designated Building;
10. no new structure or building shall be permitted on the land lying between a Category 1 Building and its corresponding street address as listed above unless located more than 1500 feet from any Category 1 Building.

#### **6.10.7 Health Clinics**

An Estate Preservation Area may include health clinics provided that:

1. a buffer area up to two hundred (200) feet wide, as determined by the Zoning Board of Appeals, is maintained between activity areas and off premises neighbors; and
2. at least one hundred fifty (150) feet of frontage and twenty-five (25) acres of land are allocated to this use. (Activity areas as used herein means areas of activity which would be intrusive to off premises neighbors.)

### 6.10.8 Multifamily Uses

An Estate Preservation Area may include any mix of single family dwelling units, apartments and townhouses if the following requirements are satisfied:

1. frontage of one hundred fifty (150) feet plus an additional five (5) feet of frontage for each apartment, single family dwelling unit or townhouse unit;
2. a buffer area up to two hundred (200) feet wide as determined by the Zoning Board of Appeals, is maintained between off premises neighbors and on premises activity areas which would be intrusive to such neighbors.
3. the density required for apartments, townhouses and single family dwelling units in an Estate Preservation Area varies according to the distribution of dwelling units across these three building categories.

CATEGORY #1:	buildings listed on the list of eligible estates herein
CATEGORY #2:	buildings constructed prior to July 1, 1983, which are not listed herein
CATEGORY #3:	buildings constructed or to be constructed after 1 July 1983 and not listed herein (see Table 6.10.3)

#### THE REQUIRED LAND AREA PER DWELLING UNIT IS:

CATEGORY #1:	1 acre
CATEGORY #2:	2 acres
CATEGORY #3:	3 acres

4. Density for apartments, townhouses and single family dwelling units may be greater than these requirements depending on the area of permanently dedicated open space. In order to qualify, a perpetual restriction ("Restriction") of the type described in General Laws, Chapter 184, Section 31 (including future amendments thereto and corresponding provisions of future laws), running to or enforceable by the Town shall be recorded with respect to such land. Such Restriction need not grant rights of access or use to the public for land so dedicated but shall provide that the open space shall be retained in perpetuity for one or more of the following uses: conservation; passive recreation; golf course; or other use determined by the Zoning Board of Appeals to be similar in character and protection to the above.

To determine the Open Space Density Bonus ("Bonus"), the acreage of the property shall be increased by one (1) acre for each two (2) acres of land so dedicated (including any area of flood plain, wetland, and required buffers so dedicated). A bonus calculated in the same manner shall be available in the event of a conveyance of the fee in such land to the Town.

Open space shall include any part of the Designated Area designated by the applicant as the area to be used for the purposes listed above. The Bonus shall not be available until the Restriction has been recorded in the Registry of Deeds.

### **6.10.9 Combined Uses**

A combination of uses, including any use permitted in an R-1A zone by right and by special permit and herein, may be permitted, subject to the density and other requirements herein set forth.

### **6.10.10 Application Requirements**

The application for development of an Estate Preservation Area shall be submitted to the Zoning Board of Appeals together with the following plans and supporting materials, copies of which shall also be submitted to the Planning Board and to the Lenox Historical Commission:

1. a written statement containing the following:
  - a. how the development accomplishes the purposes set forth in this Section;
  - b. the applicant's designation of the building or buildings (Designated Building) and the land area (Designated Area), all as provided for herein;
  - c. the intended open space portions of land;
  - d. the method of preservation and maintenance of the Designated Buildings.
2. plan of the Designated Area showing location, boundaries, northpoint, date, scale, legend size of property, wetlands, water bodies, wooded areas, and other significant natural features and owners of record.
3. preliminary site development plans showing proposed and existing streets, drives, parking areas, recreation areas, walks, paved areas, utilities, open space, plantings, screened landscaping, and other improvements, existing and proposed system of drainage including adjacent existing natural waterways, existing and proposed topography at a suitable contour level as required by the Zoning Board of Appeals, and the locations and outlines of proposed and existing buildings together with preliminary architectural drawings for proposed buildings.
4. the plans shall be prepared by a registered land surveyor and/or a registered civil engineer whose seal shall appear on the plans.
5. a tabulation of proposed and existing buildings by type, size, ground coverage, and a summary showing the percentages of the Designated Area to be occupied by buildings, parking, and other paved vehicular areas, and the amount of open space.
6. calculations showing compliance with 6.10.8
7. good quality recent photographs sufficient to document the existing conditions of the Designated Buildings. Photographs must:
  - a. show all exterior elevations and distinctive exterior architectural details;

- b. show at least one (1) view of each Designated Building in its setting;
- c. be labeled to include property name, what is shown, and date of photograph;
- d. be large enough to show architectural details clearly.

#### **6.10.11 Ownership and Development in Stages**

Provided that the Restriction described herein has been recorded, ownership of the land and/or buildings constructed and maintained may be in different ownership.

1. It is contemplated that the development of an Estate Preservation Area may proceed in stages, and application therefore may be made in one or several applications, provided, if more than one application is made, the first such application will provide the overall preliminary plan of development.

#### **6.10.12 Release**

The election permitted by this Section is permissive but if made, shall not be revoked subsequent to the issuance of any building permits for dwelling units available because of the Bonus, nor subsequent to the recording of the Restriction, except with the approval of the Zoning Board of Appeals, which shall release the Restriction on behalf of the Town.

#### **6.10.13 Great Estate Inn**

The purpose of this section is to encourage the preservation and restoration of the Great Estate buildings and land inherited from the estate system of the early 1900s by the allowance of limited uses by right. In furtherance of the public purposes set forth in Section 1.1 and Section 6.10.1 of the Lenox Zoning Bylaw, the preservation and restoration of the Great Estates buildings and land will encourage the most appropriate use of land throughout the Town, increase the amenities of the Town by encouraging the preservation and restoration of historic properties, and increase the economic viability of these Great Estates, which will benefit the general welfare of the Town by increasing amenities available to the inhabitants and visitors, as well as increasing employment and tax revenue.

The Great Estate properties as listed in Section 6.10.3 of the Lenox Zoning Bylaw are unique properties, distinguishable in character from other properties located in the R-1A zone in that they all have unique historic buildings with important open spaces, vistas, gardens and landscaping which were constructed as Great Estates in the early 1900s on at least twenty-five acres of land and connected to town sewer.

Accordingly, notwithstanding any contrary provisions of Section 6.10, an Estate Preservation Area may include by right a Great Estate inn, which is defined as an inn use located in an existing Category #1 building, at its current height with the existing setbacks and nonconforming driveways, limited to twenty rooms for transient guests, and also to be used for indoor and outdoor events ("Great Estate Inn"). Historic exterior features and historic character of a Category #1 building in which a Great Estate Inn is located shall be preserved. "Events" are defined as social and cultural gatherings. Outdoor events shall be limited to one hundred seventy-five (175) persons. All interior and exterior building plans for the conversion of the Category #1 building to a Great Estate Inn shall be submitted to the building inspector and the Planning Board.

The following shall require a special permit from the Zoning Board of Appeals:

1. Outdoor events for more than one hundred seventy-five (175) persons.
2. Outdoor amplified music.
3. A restaurant open to non-guests of the Great Estate Inn.

The criteria for issuance of a special permit are set forth in Section 9.4.2 of this Zoning Bylaw.

## **6.11 PERSONAL WIRELESS SERVICE FACILITIES AND TOWERS**

### **6.11.1 Purpose**

The purposes of this Personal Wireless Service Facilities and Towers Bylaw are to:

1. Preserve the character and appearance of the Town while simultaneously allowing Adequate Personal Wireless Services to be developed;
2. Protect the scenic, historic, environmental, and natural or man-made resources of the community;
3. Provide standards and requirements for regulation, placement, construction, monitoring, design, modification and removal of Personal Wireless Service Facilities and Towers;
4. Provide a procedural basis for action within a reasonable period of time for requests for authorization to place, construct, operate or modify Personal Wireless Service Facilities and Towers;
5. Preserve property values;
6. Locate Towers so that they do not have negative impacts, such as, but not limited to, visual blight, attractive nuisance, noise and falling objects, on the general safety, welfare and quality of life of the community;
7. Require owners of Personal Wireless Service Facilities and Towers to configure them so as to minimize and mitigate the adverse visual impact of the Facilities and Towers; and
8. Require the clustering, sharing and camouflaging of personal wireless service facilities and Towers.

### **6.11.2 Consistency with Federal Law**

These regulations are intended to be consistent with The Telecommunications Act of 1996 in that: a) they do not prohibit or have the effect of prohibiting the provision of Personal Wireless Services; b) they are not intended to be used to unreasonably discriminate among providers of functionally equivalent Services; c) they do not regulate Personal Wireless Services on the basis of the environmental effects of radio frequency emissions to the extent that the regulated Services and Facilities comply with the FCC's regulations concerning such emissions.

1. Any decision by the SPGA to deny an Application for a Special Permit under this Article shall be in conformance with SEC. 332 [47 U.S.C. 332] (7)(B)(ii),(iii) of the Act, in that it shall be in writing and supported by substantial evidence contained in a written record.

### **6.11.3 Definitions**

**ACT** - The Telecommunications Act of 1996.

**ADEQUATE COVERAGE** - Coverage is considered to be "adequate" within that area surrounding a Base Station where the predicted or measured median field strength of the transmitted signal for at least 75% of the covered area is greater than -95 dbm. It is acceptable for there to be holes within the area of Adequate Coverage where the signal is less than -95 dbm, as long as the signal regains its strength to greater than -95 dbm further away from the Base Station. For the limited purpose of determining whether the use of a Repeater is necessary or desirable, there shall be deemed not to be Adequate Coverage within said holes. The outer boundary of the area of Adequate Coverage, however, is that location past which the signal does not regain a strength of greater than -95 dbm.

**ADEQUATE CAPACITY** - Capacity is considered to be "adequate" if the Grade of Service is p.05 or better for a worst case day in a preceding month, based on the Erlang B Tables, prior to the date of Application; or as measured using direct traffic measurement of the Personal Wireless Service Facility in question for existing Facilities requesting Major Modification, and where the call blocking is due to frequency contention at the antenna(s).

**ANTENNA** - A device which is attached to a Tower, or other structure, for transmitting and receiving electromagnetic waves.

**BASE STATION** - The primary sending and receiving site in a wireless telecommunications network.

**CHANNEL** - The segment of the radiation spectrum from an Antenna which carries one signal. An Antenna may radiate on many Channels simultaneously.

**COMMUNICATION EQUIPMENT SHELTER** - A structure located at a Base Station designed principally to enclose equipment used in connection with Personal Wireless Service transmissions.

**DBM** - Unit of measure of the power level of an electromagnetic signal expressed in decibels referenced to 1 milliwatt.

**EMF** - Electromagnetic Frequency Radiation

**FACILITY SITE** - The location within a Wireless Telecommunications Overlay District leased by one or more Personal Wireless Service Providers and upon which one or more Personal Wireless Service Facility(s) and required landscaping are located.

**FACILITY/TOWER SPECIAL PERMIT (F/TSP)** - The Special Permit required to be obtained in order to install any Tower or Personal Wireless Service Facility or for any Major Modification Of

An Existing Facility within the Wireless Telecommunications Overlay District.

FCC - Federal Communications Commission. The Government agency responsible for regulating telecommunications in the United States.

FCC 96-326 - A Report and Order which sets new national standards for emissions of Radio Frequency emissions from FCC-regulated transmitters. This Report And Order is now contained within Title 47 Regulations, Section 1, §1.1307.

GRADE OF SERVICE - A measure of the percentage of calls which are able to connect to the Base Station, during the busiest hour of the day. Grade of Service is expressed as a number, such as p.05 - which means that 95% of callers will connect on their first try. A lower number (p.04) indicates a better Grade of Service.

HERTZ - One hertz is the frequency of an electric or magnetic field which reverses polarity once each second, or one cycle per second.

MAJOR MODIFICATION OF AN EXISTING FACILITY - Any change, or proposed change in power input or output, number of Antennas, change in Antenna type or model, repositioning of Antenna(s), change in number of Channels per Antenna above the maximum number approved under an existing Special Permit. Also any increase, or proposed increase in dimensions of an existing and permitted Tower or other structure designed to support Personal Wireless Service transmission, receiving and/or relaying antennas and/or equipment.

MAJOR MODIFICATION OF AN EXISTING REPEATER - Any removal of or change in location of any Repeater(s) from the Repeater Site(s) for which a Special Permit has been received.

MONITORING - The measurement, by the use of instruments in the field, of the radiation from a Site as a whole, or from individual Personal Wireless Service Facilities, Towers, Antennas or Repeaters.

MONITORING PROTOCOL - The testing protocol, initially the Cobbs Protocol, which is to be used to monitor the emissions from existing and new Personal Wireless Service Facilities and Repeaters upon adoption of this Article. The SPGA may, as the technology changes, require, by written regulation, the use of other testing protocols. A copy of the Monitoring Protocol shall be on file with the Board of Selectmen and the Town Clerk.

MONOPOLE - A single self-supporting vertical pole with below grade foundations.

PERSONAL WIRELESS SERVICES - Commercial Mobile Services, unlicensed wireless services, and common carrier wireless exchange access services. These services include: cellular services, personal communications services (PCS), Specialized Mobile Radio Services, and Paging Services.

PERSONAL WIRELESS SERVICE FACILITY (or FACILITY) - All equipment (excluding any Repeaters) with which a Personal Wireless Service Provider broadcasts and receives the radio-

frequency waves which carry their services and all locations of said equipment or any part thereof. This Facility may be sited on one or more Towers or structure(s) owned and permitted by another owner or entity.

**PERSONAL WIRELESS SERVICE PROVIDER** - An entity, licensed by the FCC to provide Personal Wireless Services to individuals or institutions.

**RADIATION PROPAGATION STUDIES OR RADIAL PLOTS** - Computer generated estimates of the radiation emanating from Antennas or Repeaters sited on a specific Tower or structure. The height above mean sea level, power input and output, frequency output, type of antenna, antenna gain, topography of the site and its surroundings are all taken into account to create these simulations. They are the primary tool for determining whether a site will provide Adequate Coverage for the Personal Wireless Service Facility proposed for that Site.

**REPEATER** - A small receiver/relay transmitter of not more than 20 watts output designed to provide service to areas which are not able to receive Adequate Coverage directly from a Base Station.

**REPEATER SITE** - The location within the Town of Lenox leased by one or more Personal Wireless Service Providers and upon which one or more Repeater(s) and required camouflage or screening are located.

**REPEATER SPECIAL PERMIT (RSP)** - The Special Permit required to be obtained in order to install any Repeater, or for Major Modification Of An Existing Repeater within the Town of Lenox.

**SPECIAL PERMIT GRANTING AUTHORITY (SPGA)** - The Zoning Board of Appeals (ZBA) shall be the SPGA for this Article.

**TELEPORT** - A multi-user commercial facility utilizing satellite dishes of greater than 2.0 meters in diameter designed to uplink to communications satellites for transmission of data.

**TOWER** - A lattice structure or framework, or Monopole that is designed to support Personal Wireless Service transmission, receiving and/or relaying antennas and/or equipment.

**WIRELESS TELECOMMUNICATIONS OVERLAY DISTRICT (WTOD)** - Specific area(s), determined by engineering analysis to contain sites where Adequate Service may be provided to the Town of Lenox, which, at the same time, have the potential of reducing or mitigating negative impacts in accordance with Section 6.11.1 of this bylaw. The Overlay District is defined in Section 8.3 of this Bylaw.

#### **6.11.4 Exempted Wireless Telecommunications Uses**

This Article specifically exempts the following wireless telecommunications facilities: police, fire, ambulance and other emergency dispatch; citizens band radio. Amateur radio towers used in accordance with the terms of any amateur radio service license issued by the FCC, are exempt, provided that (1) the tower is not used or licensed for any commercial purpose; and (2) the tower shall be removed upon loss or termination of said FCC license. No Personal Wireless Service



Facility or Repeater shall be considered exempt from this Article for any reason whether or not said Facility or Repeater is proposed to share a Tower or other structure with such exempt uses.

#### **6.11.5 Provision of Independent Consultants**

Upon submission of an Application for any Special Permit under this Article, the Applicant shall pay a review fee determined by the SPGA, consisting of reasonable costs to be incurred by the SPGA for the employment of independent consultants.

1. These Consultants shall each be qualified professionals with a record of service to municipalities in one of the following fields: a) telecommunications engineering, b) structural engineering, c) monitoring of electromagnetic fields, and, if determined necessary by the SPGA, d) other relevant fields of experience as determined by the SPGA.
2. The SPGA shall select the Independent Consultant(s) after consultation with the Planning Board, the Board of Health, and the Conservation Commission, each of which shall propose a list of qualified candidates.

#### **6.11.6 Prohibition of Teleports.**

There shall be no Teleport(s) within the Town of Lenox.

#### **6.11.7 Eligible Locations**

1. Towers and Personal Wireless Service Facilities shall be located only within Wireless Telecommunications Overlay District(s) within the Town of Lenox.
2. Repeaters may be located within these District(s), but are also allowed in the rest of the Town by Special Permit.

#### **6.11.8 Access**

Access shall be provided to the Tower or Facility or Repeater Site by a roadway which respects the natural terrain, does not appear as a scar on the landscape and is approved by the SPGA and the Chiefs of all emergency services in the Town to assure emergency access at all times. Consideration shall be given to design which minimizes erosion, construction on unstable soils and on steep slopes.

#### **6.11.9 Special Permit Required**

No Personal Wireless Service Facility, Tower, or Repeater shall be erected, constructed, or installed or undergo Major Modification without first obtaining a Special Permit from the SPGA in accordance with the requirements set forth herein. One or both of two kinds of Special Permits are required; a) A Facility/Tower Special Permit (henceforth F/TSP) for new Facility/Tower construction (or Major Modification Of An Existing Facility); b) A Repeater Special Permit (henceforth RSP) for Repeater(s) to be mounted on an existing, or newly permitted, Tower or structure (or Major Modification Of An Existing Repeater). If Applicant is applying for both Permits, they shall be submitted and examined concurrently.

1. For Personal Wireless Service Facilities or Towers a F/TSP is required. Applicant must submit all information required in Section 6.11.11 and 6.11.12.
2. For all Repeaters proposed for installation, an RSP is required. An RSP may be applied

for by an Applicant who is currently applying for a F/TSP under this Article, or by an Applicant who has previously received a F/TSP under this Article or by an entity which is providing Personal Wireless Services to the Town of Lenox from a base station outside the Town. Applicant must submit all information required in Section 6.11.

#### **6.11.10 Adequate Coverage, Adequate Capacity, and Justification of Need for F/TSP**

1. The Applicant shall provide written documentation of any Facility Site(s) in Lenox, and any sites in abutting towns located within eight miles of any boundary of the Town of Lenox, in which it has a legal or equitable interest, whether by ownership, leasehold or otherwise. For each such Facility Site, it shall demonstrate with written documentation that this Facility Site is not already providing, or does not have the potential by adjusting the Site, to provide Adequate Coverage and/or Adequate Capacity to the Town of Lenox. The documentation shall include, for each Facility Site listed;
  - a. the exact Tower location (in Longitude and Latitude, to degrees, minutes, seconds);
  - b. ground elevation above mean sea level at the Tower location;
  - c. height of Tower or structure;
  - d. type, manufacturer and model number of Antennas;
  - e. Antenna gain;
  - f. height of Antennas on Tower or structure;
  - g. output frequency;
  - h. number of channels;
  - i. power input; and
  - j. maximum power output per channel.

Potential adjustments to these existing Facility Sites, including changes in Antenna type, orientation, gain, height or power output shall be specified. Radial Plots from each of these Facility Sites, as they exist, and with adjustments as above, shall be provided as part of the Application.

2. Applicant shall demonstrate with written documentation that they have examined all existing Facility Sites located in Lenox and in any sites in abutting towns located within eight miles of any boundary of the Town of Lenox, in which Applicant has no legal or equitable interest, whether by ownership, leasehold or otherwise to determine whether those existing Facility Sites can be used to provide Adequate Coverage and/or Adequate Capacity to the Town of Lenox. The documentation shall include, for each existing Facility Site examined:

- a. the exact Tower location (in Longitude and Latitude, to degrees, minutes, seconds);
- b. ground elevation above mean sea level at the Tower location;
- c. height of Tower or structure;
- d. type, manufacturer and model number of proposed Antennas;
- e. proposed Antenna gain;
- f. height of proposed Antennas on Tower or structure;
- g. proposed output frequency;
- h. proposed number of channels;
- i. proposed power input; and
- j. proposed maximum power output per channel.

Radial Plots from each of these existing Facility Sites, configured as documented above, shall be provided as part of the Application.

3. Applicant shall demonstrate with written documentation that they have analyzed the feasibility of Repeaters in conjunction with all existing Facility Sites listed in compliance with Section 6.11.10 (1) & (2) (above) to provide Adequate Coverage and/or Adequate Capacity to the Town of Lenox. Radial Plots of all Repeaters considered for use in conjunction with these Facility Sites shall be provided as part of the Application.

#### **6.11.11 Required Documentation for F/TSP**

The Applicant shall include reports prepared by one or more professional engineers, which shall demonstrate that the Personal Wireless Service Facility and Tower comply with all applicable standards of the Federal and State governments. Specifically:

1. Copies of all submittals and showings pertaining to: FCC licensing; Environmental Impact Statements; FAA Notice of Construction or Alteration; Aeronautical Studies; and, all data, assumptions and calculations relating to service coverage and power levels regardless of whether categorical exemption from Routine Environmental Evaluation under the FCC rules is claimed.
2. Copies of all information submitted in compliance with requirements of Massachusetts Department of Public Health, 105 CMR 122 nonionizing Radiation limits for: the general public from non-occupational exposure to electromagnetic fields, employees from occupational exposure to electro-magnetic fields, and exposure to microwave ovens, or any revisions thereof as the Department of Public Health may, by written notice, create.

3. The exact legal name, address or principal place of business and phone number of the Applicant. If any Applicant is not a natural person, it shall also give the state under which it was created or organized.
4. The name, title, address and phone number of the person to whom correspondence or communications in regard to the application are to be sent. Notice, orders and other papers may be served upon the person so named, and such service shall be deemed to be service upon the Applicant.
5. Name, address, phone number, and written consent to apply for this permit, of the owner of the property on which the proposed Personal Wireless Service Facility and/or Tower shall be located, or of the owner(s) of the Tower or structure on which the proposed Personal Wireless Service Facility shall be located.
6. The documentation shall include, for each Facility Site listed, the exact Tower or Repeater location (in Longitude and Latitude, to degrees, minutes, seconds) and by street address or Pole number (if applicable), ground elevation above mean sea level at the Tower or Repeater location and proposed height of Tower or structure.
7. Required Plans and engineering plans, prepared, stamped and signed by a Professional Engineer licensed to practice in Massachusetts. (Note: survey plans shall also be stamped and signed by a Professional Land Surveyor registered in Massachusetts.) Plans shall be on 24" x 36" sheets, on as many sheets as necessary, and at scales which are no smaller (i.e. no less precise) than listed below in Sections 6.11.12 and 6.11.13. Each plan sheet shall have a title block indicating the project title, sheet title, sheet number, date, revision dates, scale(s), and original seal and signature of the P.E. and other professionals who prepared the plan.

#### **6.11.12 Required Site Plan for F/TSP**

Applicant shall, as part of its application, provide the SPGA with the following Site Plan. The Site Plan shall show Facility Site layout, grading and utilities at a scale no smaller than 1" = 40' (1:480 or metric equivalent 1:500) showing the entire vicinity within a 400' radius of the Tower site with topography drawn with a minimum of 2' (0.6 meter) contour interval. The Site Plan must have been completed, on the ground, by a Professional Land Surveyor within two years prior to the application date. The Site Plan shall show:

1. Existing utilities, property lines, existing buildings or structures, stone walls or fence lines, wooded areas, individual trees with diameters greater than 12" within a 200' radius from the base of the proposed Tower (labeled with their current heights).
2. The boundary of any wetlands or floodplains or watercourses, and of any bodies of water within 200' from the Tower or any related facilities or access ways or appurtenances.
3. Proposed Tower location and any appurtenances, if any, and any accessory building (Communication Equipment Shelter or other). Indicate property boundaries of the Overlay District and setback distances to the base(s) of the Tower and to the nearest corners of each of the appurtenant structures to those boundaries, and dimensions of all proposed

improvements.

4. Indicate proposed spot elevations at the base of the proposed Tower and at the base of any guy wires, and the corners of all appurtenant structures.
5. Proposed utilities, including distance from source of power, sizes of service available and required, locations of any proposed utility or communication lines, and whether underground or above ground.
6. Limits of areas where vegetation is to be cleared or altered, and justification for any such clearing or alteration.
7. Any direct or indirect wetlands alteration proposed.
8. Detailed plans for drainage of surface and/or sub-surface water; plans to control erosion and sedimentation both during construction and as a permanent measure.
9. Plans indicating locations and specifics of proposed screening, landscaping, ground cover, fencing, etc; any exterior lighting or signs.
10. Plans of proposed access driveway or roadway and parking area at the Facility Site. Include grading, drainage, traveled width. Include a cross section of the access drive indicating the width, depth of gravel, paving or surface materials.

#### **6.11.13 Other Required Plans for F/TSP**

Applicant shall, as part of its application, provide the SPGA with the following Plans. The Plans, elevations, sections and details shall be at appropriate scales but no smaller than 1" = 10'.

1. Two cross sections through proposed Tower drawn at right angles to each other, and showing the ground profile to at least 100 feet beyond the limit of clearing. Indicate proposed spot elevations at the base of the proposed Tower. Dimension the proposed height of tower above average grade at Tower Base. Indicate the maximum allowable structural height of the Tower after addition of any modular sections. Show all proposed antennas, including their location on the Tower.
2. Details of typical Tower foundation, including cross sections and details. Show all ground attachments, specifications for anchor bolts and other anchoring hardware.
3. Detail proposed exterior finish and camouflage of the Tower. Indicate relative height of the Tower to the tops of surrounding trees as they presently exist.
4. Illustration of the modular structure of the proposed Tower indicating the heights of sections which could be removed or added in the future to adapt to changing communications conditions or demands.
5. Structural Professional Engineer's written description of the proposed Tower structure and its capacity to support additional Antennas or other communications facilities at different

heights and the ability of the Tower to be shortened if future communications facilities no longer require the original height.

6. A description of Available Space on the tower, providing illustrations and examples of the type and number of Personal Wireless Service Facilities which could be mounted on the structure.
7. Proposed Communications Equipment Shelter with Floor Plans, elevations and cross sections at a scale of no smaller than  $1/4" = 1'$  (1:48) of any proposed appurtenant structure, including representative elevation views, indicating the roof, facades, doors and other exterior appearance and materials.
8. Proposed Equipment Plan with such plans, elevations, sections and details at appropriate scales but no smaller than  $1" = 10'$  indicating:
  - a. Number of Antennas and Repeaters (if any), as well as the exact locations of all Repeaters (if any) located on a map as well as by Degrees, minutes and seconds of Latitude and Longitude.
  - b. Mounting locations on Tower or structure, including height above ground.
  - c. Antenna type(s), manufacturer(s), model number(s).
  - d. For each Antenna, the Antenna gain and Antenna radiation pattern.
  - e. Number of channels per Antenna, projected and maximum.
  - f. Power input to the Antenna(s).
  - g. Power output, in normal use and at maximum output for each Antenna and all Antennas as an aggregate.
  - h. Output frequency of the Transmitter(s).
9. Balloon Test. Within 35 days of submitting an Application, Applicant shall arrange to fly, or raise upon a temporary mast, a three foot diameter brightly colored balloon at the maximum height and at the location of the proposed Tower. The dates, (including a second date, in case of poor visibility on the initial date), times and location of this balloon test shall be advertised, by the Applicant, at 7 and 14 days in advance of the first test date in a newspaper with a general circulation in the Town of Lenox. The Applicant shall inform the SPGA and the Planning Board, in writing, of the dates and times of the test, at least 14 days in advance. The balloon shall be flown for at least four consecutive hours sometime between 9:00 am and 5:00 pm of the dates chosen.

#### **6.11.14 Application Requirements for RSP**

The use of Repeaters to assure Adequate Coverage, or to fill holes within areas of otherwise

Adequate Coverage, while minimizing the number of required Towers is permitted and encouraged. An Applicant who has received, and is in compliance with a current F/TSP under this Article, or an entity which is providing Personal Wireless Services to the Town of Lenox from a base station outside the Town, may apply for a RSP. Applicants shall provide the following information:

1. the exact location (in Longitude and Latitude, to degrees, minutes, seconds), as well as by street address or Pole number (if applicable)
2. ground elevation,
3. type, manufacturer and model number of proposed Repeater,
4. height of proposed Repeater above ground,
5. proposed output frequency,
6. proposed number of channels,
7. proposed power input and
8. proposed maximum power output per channel
9. Radial Plots from any proposed Repeater(s), configured as documented above, shall be provided as part of the Application.
10. Name, address, phone number, and written consent to apply for this permit, of the owner of the property on which the proposed Repeater shall be located, and of the owner(s) of the Tower or structure on which the proposed Repeater shall be located.
11. Proposed Repeater Site layout, grading and utilities at a scale no smaller than 1" = 40' (1:480 or metric equivalent 1:500) showing the entire vicinity within a 300' radius of the Repeater site with topography drawn with a minimum of 2' (0.6 meter) contour interval.
12. Proposed Repeater location and any appurtenances, if any, and any accessory building (Communication Equipment Shelter or other). Indicate property boundaries of abutters within 300' of the Repeater, and dimensions of all proposed improvements.
13. Limits of areas where vegetation is to be cleared or altered, and justification for any such clearing or alteration.
14. Plans of any proposed access driveway or roadway and parking area at the Repeater site. Include grading, drainage, traveled width. Include a cross section of the access drive indicating the width, depth of gravel, paving or surface materials.

#### **6.11.15 General Requirements for F/TSP**

1. A Special Permit shall not be granted for a Tower to be built on speculation. If Applicant

is not simultaneously installing a Personal Wireless Service Facility on the Tower, it shall provide a copy of its existing lease/contract with a Personal Wireless Service Provider. Said Provider shall provide all necessary data to comply with the terms of this Article, as a part of Applicant's application for a F/TSP or the Special Permit shall not be granted.

2. Applicant shall provide a written, irrevocable commitment valid for the duration of the existence of the Tower, to rent or lease Available Space for co-location on the Tower at fair-market prices and terms, without discrimination to other Personal Wireless Service Providers.
3. Tower(s) shall minimize, to the extent feasible, adverse visual impacts on the environment. The SPGA may impose reasonable conditions to ensure this result, including, but not limited to, requiring the use of camouflage, painting, lighting standards and screening.
4. There shall be no clearing at a distance in excess of 25 feet in radius from the base of the Tower except where the access drive is located.
5. Fencing: The area around the Tower and Communication Equipment Shelter(s) shall be completely fenced for security within an area no greater than 25 feet in radius from the base of the tower, and to a height of six feet, and gated. Use of razor wire is not permitted.
6. Signs: There shall be no signs, except the following. A sign no greater than two (2) square feet indicating the name of the Personal Wireless Service Facility's owner(s) and a 24 hour emergency telephone number shall be posted adjacent to the entry gate. In addition, No Trespassing or other warning signs may be posted on the fence. All signs shall conform to the sign requirements of this bylaw.
7. Communication Equipment Shelters and Accessory Buildings shall be designed to be architecturally similar and compatible with each other, and shall be no more than 12 feet high. The buildings shall be used only for the housing of equipment related to this particular site. Whenever possible, the buildings shall be joined or clustered so as to appear as one building.
8. New Towers shall be the lesser of (a) 105 feet (measured from ground level to the highest point on the Tower), or (b) the minimum height determined by the independent consultant(s) to provide the applicant Adequate Coverage from the Personal Wireless Service Facility(s) proposed for use on the Tower.
9. Towers shall be located at least one and one half times their maximum structural height within the outer boundary of any Wireless Telecommunications Overlay District(s).
10. Tower Finish: The SPGA shall have the right to determine the type of construction of the Tower(s) (either monopole or lattice), as well as the type(s) of camouflage, painting, or finish. The SPGA may require Tower(s) to resemble or mimic a native coniferous species of tree to minimize their adverse visual impact.



11. Tower(s) must be placed to minimize visual impacts.
12. All network interconnections to and from the telecommunications site and all power to the site shall be installed underground. At the initial construction of the access road to the site, sufficient conduit shall be laid to accommodate the maximum possible number of Personal Wireless Service Providers licensed to provide services to the Town of Lenox and surrounding areas.
13. If primary coverage (greater than 50%) from proposed Personal Wireless Service Facility is outside Lenox, then the permit may be denied unless the Applicant demonstrates to the satisfaction of the SPGA that the Applicant is unable to locate within the Town which is primarily receiving service from the proposed Facility.
14. Unless required by the Federal Aviation Administration, no night lighting of Towers, or the Personal Wireless Service Facility, is permitted, except for manually operated emergency lights for use only when operating personnel are on site.
15. No Tower or Personal Wireless Service Facility that would be classified as a hazard to air navigation, as defined by the Federal Aviation regulations (Title 14 CFR) is permitted.
16. No Tower or Personal Wireless Service Facility with the exception of Repeaters shall be located within any of the following prohibited areas:
  - a. Massachusetts or federally regulated wetland;
  - b. Massachusetts Certified Vernal Pool;
  - c. The habitat of any State-listed Rare or Endangered Wildlife or Rare Plant Species;
  - d. Within 100' horizontally from any Massachusetts regulated wetland;
  - e. Within 200' horizontally of the Outer Riparian Zone of any river or perennial stream;
  - f. Within 500' horizontally from any Historic District or property listed or eligible to be listed on the state or federal Register of Historic Places;
  - g. Within 500' horizontally from any known archaeological site.
17. No Repeater shall be located closer than 50' to an existing Dwelling Unit, nor less than 25' above ground.
18. The SPGA may require the use of screening, painting or camouflage to reduce the visual impacts of Repeaters.
19. Repeaters shall be located so as to have the least possible impact on the views of the residents of the Town of Lenox.

### **6.11.16 Decision**

In addition to the findings required by the Bylaw in Section 9.4, the SPGA shall, in consultation with the Independent Consultant(s), make all of the applicable findings before granting the Special Permit, as follows:

1. That Applicant is proposing to locate its Personal Wireless Service Facility or Tower (other than Repeaters) within a Wireless Telecommunications Overlay District;
2. That Applicant is not able to use Existing Towers/Facility Sites in or around the Town of Lenox, either with or without the use of Repeaters, to provide Adequate Coverage and/or Adequate Capacity to the Town of Lenox;
3. That proposed Personal Wireless Service Facility/Tower or Repeater will not have an undue adverse impact on historic resources, scenic views, residential property values, natural or man-made resources;
4. That the Applicant has agreed to implement all reasonable measures to mitigate the potential adverse impacts of the Towers and Facilities; and
5. That the proposal shall comply with FCC 96-326 and any and all other applicable FCC regulations, regarding emissions of electromagnetic radiation and that the required Monitoring program is in place and shall be paid for by the Applicant.

### **6.11.17 Monitoring and Evaluation of Compliance**

It shall be a condition of any Special Permit granted under this bylaw that:

1. Pre-testing: After the granting of a Special Permit and before Applicant's Personal Wireless Service Facilities begin transmission, the applicant shall pay for an Independent Consultant, hired by the Town, to Monitor the background levels of EMF radiation, around the proposed Facility Site and/or any Repeater locations to be utilized for Applicant's Personal Wireless Service Facilities. The Independent Consultant shall use the Monitoring Protocol. A report of the Monitoring results shall be prepared by the Independent Consultant and submitted to the Board of Selectmen, the Planning Board, the Board of Health, the Building Commissioner and the Town Clerk, in order to determine the Tower and Facility's or Repeater's radio frequency emissions and their compliance with FCC regulations.
2. Initial Test: The Applicant shall, after the granting of a Special Permit and within 30 days of the date that Applicant's Personal Wireless Service Facility(s) or Repeater(s) begin(s) transmission, pay for an Independent Consultant, hired by the Town, to Monitor the levels of EMF radiation, around the proposed Facility and/or Repeater Site(s). The Independent Consultant shall use the Monitoring Protocol. A report of the Monitoring results shall be prepared by the Independent Consultant and submitted to the Board of Selectmen, the Planning Board, the Board of Health, the Building Commissioner and the Town Clerk.
3. Ongoing Monitoring: It shall be a condition of any Special Permit granted under this bylaw that, in order to determine ongoing compliance with FCC regulations, after

transmission begins, the owner(s) of any Personal Wireless Service Facility(s) or Repeater(s) located on any Facility or Repeater Site shall pay for an Independent Consultant, hired by the Town, to conduct testing and Monitoring of EMF radiation emitted from said Site, and to report results of said Monitoring, as follows:

- a. There shall be routine annual Monitoring of emissions by the Independent Consultant using actual field measurement of radiation, utilizing the Monitoring Protocol. This Monitoring shall measure levels of EMF radiation from the Facility Site's primary Antennas as well as from Repeater Site(s) (if any). A report of the Monitoring results shall be prepared by the Independent Consultant and submitted to the Board of Selectmen, the Planning Board, the Board of Health, the Building Commissioner and the Town Clerk.
  - b. Any Major Modification of Existing Facility, or the activation of any additional permitted channels, shall be cause for new Monitoring in accordance with Sections 6.11.17 - 2 & 3 above.
4. Excessive Emissions: Should the Monitoring of a Facility or Repeater Site reveal that the Site exceeds the FCC 96-326 standard, or any other applicable FCC standard, then the owner(s) of all Facilities utilizing that Site shall be so notified. The owner(s) shall submit to the SPGA and the Building Commissioner a plan for the reduction of emissions to a level that complies with the FCC 96-326 standard and any and all other applicable FCC regulations within 10 business days of notification of non-compliance. That plan shall reduce emissions to the applicable FCC standard within 15 days of initial notification of non-compliance. Failure to accomplish this reduction of emission within 15 business days of initial notification of non-compliance shall be a violation of the Special Permit and subject to penalties and fines as specified in Section 9.2.3 of the Bylaw. Such fines shall be payable by the owner(s) of the Personal Wireless Service Facilities with Antennas on the Facility Site, until compliance is achieved.
5. Structural Inspection: It shall be a condition of the Special Permit that, Tower owner(s) shall pay for an Independent Consultant (a licensed professional structural engineer), hired by the Town, to conduct inspections of the Tower's structural integrity and safety. Towers shall be inspected every five years. A report of the inspection results shall be prepared by the Independent Consultant and submitted to the Board of Selectmen, the Planning Board, the Board of Health, the Building Commissioner, and the Town Clerk. Any Major Modification of Existing Facility which includes changes to Tower dimensions or antenna numbers or type shall require new structural inspection.
6. Unsafe Structure: Should the inspection of any Tower reveal any structural defect(s) which, in the opinion of the Independent Consultant render(s) that Tower unsafe, the following actions must be taken. Within 10 business days of notification of unsafe structure, the owner(s) of the Tower shall submit a plan to remediate the structural defect(s). This plan shall be initiated within 10 days of the submission of the remediation plan, and completed as soon as reasonably possible. Failure to accomplish this remediation of structural defect(s) within 10 business days of initial notification shall be a violation of the Special Permit and subject to penalties and fines as specified in 9.2.3 of the Bylaw.

Such fines shall be payable by the owner(s) of the Tower, until compliance is achieved.

#### **6.11.18 Removal Requirements**

Any Personal Wireless Service Facility or Repeater which ceases to operate for a period of one year shall be removed. Cease to operate is defined as not performing the normal functions associated with the Personal Wireless Service Facility or Repeater and its equipment on a continuous and ongoing basis for a period of one year. At the time of removal, the Facility or Repeater Site shall be remediated such that all Personal Wireless Service Facility or Repeater improvements which have ceased to operate are removed. If all Facilities on a Tower have ceased to operate, the Tower shall also be removed, and the Facility or Repeater Site, including any access road(s) which lead to that Facility or Repeater Site from the main access road, shall be revegetated. If all Facility or Repeater Sites have ceased to operate, the owner of the last Personal Wireless Service Facility or Repeater to leave the site shall revegetate the access road in its entirety. Existing trees shall only be removed with the written permission of the SPGA, and only if the SPGA determines such removal of trees to be necessary to complete the required removal of Personal Wireless Service Facility(s) or Repeater(s).

#### **6.11.19 Performance Guarantee**

Applicant shall, as a condition of the Special Permit:

1. Post an initial cash bond in a reasonable amount determined and approved by the SPGA. This bond shall be in force to cover the costs of the remediation of any damage to the landscape which occurs during the clearing of the Site; and to cover the cost of the removal of the Tower or Facility or Repeater from the Site, and remediation of the landscape, should the Facility or Repeater cease to operate.
2. Post a maintenance bond for the access road(s), site(s) and tower(s) in amounts approved by the SPGA.

#### **6.11.20 Fees and Insurance**

1. Towers, Personal Wireless Service Facilities and Repeaters shall be insured by the owner(s) against damage to persons or property. The owner(s) shall provide a Certificate of Insurance to the Selectmen's Office on an annual basis. The Town of Lenox shall be an additional named insured.
2. A schedule of fees for Personal Wireless Service Facility, Tower and Repeater permitting and renewal, any Monitoring of emissions and inspection of structures, and any other fees shall be established by the SPGA pursuant to M.G.L. c. 40A, Section 9. This schedule may be amended from time to time.

#### **6.11.21 Expiration and Renewal**

All Special Permits granted under this section shall be granted for five years with the SPGA retaining the option, at their discretion, to renew said Special Permit for additional five year period(s), if the SPGA determines that the Tower and/or Facility and/or Repeater so permitted shall have been and shall remain in compliance with all terms and conditions of this bylaw and of any conditions placed upon the original Special Permit at the time of granting.

## **6.12 DRIVE-THROUGH FACILITIES**

### **6.12.1 Purpose**

The purpose of this section is to protect the safety, public health, convenience and general welfare of the inhabitants of the Town of Lenox by providing detailed review of the design and layout of drive-through facilities, which have a substantial impact upon the character of the town and upon traffic, utilities and services therein.

### **6.12.2 Powers and Administrative Procedures**

The Zoning Board of Appeals is hereby designated the Special Permit Granting Authority (SPGA) for drive-through plan approval. After notice and public hearing and after due consideration of the reports and recommendations of other town boards, commissions and or departments, the SPGA may grant such a permit. The SPGA shall also impose, in addition to any applicable conditions specified in this section, such applicable conditions as the SPGA finds reasonably appropriate to improve the site design, traffic flow, safety and otherwise serve the purposes of this section. Such conditions shall be imposed in writing and the applicant may be required to post a bond or other surety for compliance with said conditions in an amount satisfactory to the SPGA.

### **6.12.3 Applicability**

This section applies to all uses identified as requiring a special permit for drive-through facilities in the Table of Uses and Section 3.1 regarding the C1-A District.

### **6.12.4 Site Plan Review**

Any proposed drive-through facility shall be subject to site plan review in accordance with the requirements as set forth in Section 9.5, herein.

### **6.12.5 Traffic Impact Study**

1. A detailed traffic impact analysis in accordance with professional engineering standards is required for any special permit or site plan approval application containing a drive-through facility for fast food. The SPGA may require a traffic impact study for other drive-through facilities. A registered professional engineer experienced and qualified in traffic engineering shall prepare the traffic impact study.
2. A proposed mitigation plan must be included: A plan (with supporting text) to minimize traffic and safety impacts through such means as physical design and layout concepts, or other appropriate means; and an interior traffic and pedestrian circulation plan designed to minimize conflicts and safety problems. Measures shall be proposed to achieve the following post development standards: All streets and intersections to be impacted by the project shall have the same level of service or better than predevelopment conditions. The SPGA must determine that the mitigation is satisfactory.

### **6.12.6 Standards**

1. There must be a minimum of two hundred (200) feet between curb cuts unless reduced by the SPGA in those instances when the reduction may be granted without detriment to the public good and without substantially derogating from the intent and purpose of this section.

2. The width of any curb cut shall not exceed twenty-five (25) feet, unless the traffic impact study identifies the need for a larger curb cut and the requirement is increased by the SPGA.
3. Curb cuts must be sufficiently setback from intersections and directional restrictions (i.e. right-in/right-out only and/or a restrictive median) must be provided as required by the Board.
4. A system of joint use driveways and cross access easements shall be established wherever feasible and the proposed development shall incorporate the following:
  - a. A service drive or cross access corridor extending the width of the parcel;
  - b. Sufficient width to accommodate two-way travel lanes;
  - c. Stub-outs and other design features to make it visually obvious that the abutting properties may be tied in to provide cross-access via a service drive.
5. Developments that provide service drives between properties may be permitted a ten (10) percent reduction in the required number of parking spaces. If information can be provided to show that peak demand periods of development with shared parking or a service drive connection are not simultaneous, the number of required parking spaces may be reduced by twenty (20) percent.
6. Drive-through facilities-fast food, shall provide a minimum of eight (8) stacking spaces (within the site) before the order board. The facility shall provide another four (4) stacking spaces between the order board and the transaction window. If the facility has two (2) transaction windows the four (4) stacking spaces may be split between each of the windows. An additional stacking space shall be provided adjacent to the last transaction windows within the site.
7. Drive-through facilities-Other: Number of stacking spaces to be at the discretion of the Board.
8. Each stacking space shall be a minimum of twenty (20) feet in length and ten (10) feet in width along straight portions. Stacking spaces and stacking lane shall be a minimum of twelve (12) feet in width along curved segments.
9. Stacking lanes shall be delineated from traffic aisles, other stacking lanes and parking areas with striping, curbing, landscaping and/or the use of alternative paving materials or raised medians.
10. Entrances to stacking lane(s) shall be clearly marked and a minimum of twenty (20) feet from the curb cut measured at the property line.
11. Stacking lanes shall be designed to prevent circulation congestion, both on site and on adjacent public streets. The circulation shall: separate drive-through traffic from site

circulation; not impede or impair access into or out of parking spaces; not impede or impair vehicle or pedestrian traffic movement; and minimize conflicts between pedestrian and vehicular traffic. Stacking lanes shall not interfere with required loading and trash storage areas and loading or trash operations shall not impede or impair vehicle movement within stacking lanes. If said separate stacking lane is curbed an emergency by-pass or exit shall be provided.

12. Any outdoor service facilities (including service lane, menu boards, speakers, etc.) for drive-through facilities fast food shall be a minimum of two hundred (200) feet from the property line of a residential use. Any outdoor service facilities (including service lane, menu boards, speakers, etc.) for drive-through facilities-other shall be 3 minimum of fifty (50) feet from the property line of a residential use. For any drive-through facility, a landscaped buffer and solid wooden panel fence must be provided along side and rear yards directly adjacent to residential uses to screen the abutting residential use. The landscaped buffer must be a minimum of twenty (20) feet.
13. Menu boards shall be a maximum of thirty (30) square feet, with a maximum height of six (6) feet and shall be shielded from any public street and residential properties.
14. A leveling area shall be provided having a minus one percent grade for a distance of thirty (30) feet measured from the nearest exterior line of the intersecting street, to the point of vertical curvature.
15. When a drive-through is proposed on a property with an historic building, the architectural character defining exterior elements of historic building shall be preserved. Signage should be compatible with the historic character of the building.
16. Noise levels generated by all operations, including but not limited to noise emanating from speakers from the resultant establishment(s), shall not increase the broadband sound level by more than ten (10) dB(A) above the ambient levels measured at the property line by the Board of Health or its designee.

#### **6.12.7 Compliance**

1. No building permit shall be issued by the Building Commissioner and no construction or site preparation shall be started, until the special permit decision approving a drive-through facility has been filed with the Town Clerk.
2. An as-built plan, certified by a registered professional land surveyor or engineer shall be submitted to the Building Commissioner before the issuance of a permanent occupancy permit.
3. No permanent occupancy permit shall be issued for any building/drive-through facility subject to this section unless such building and all its related facilities have been completed according to the approved site/drive-through plan.

4. Any changes in the approved site/drive-through plan, or in the activity to be conducted on the site shall be submitted to the SPGA for review and approval pursuant to all requirements of this section.
5. The SPGA may, in appropriate cases as it determines, impose further restrictions upon the development or parts thereof as a condition to granting the approval.



## **SECTION 7        SPECIAL RESIDENTIAL REGULATIONS**

### **7.1    APARTMENT AND TOWNHOUSE BUILDINGS**

#### **7.1.1    General Requirements**

1. No apartment project shall be constructed unless it has town water and town sewer and has the required frontage on an accepted public way.
2. All parking must be screened from abutters and from street line.
3. The front setback area shall be maintained open with grass, bushes, trees, or flowers all along its length except for those areas where it is crossed by driveways or walkways.
4. A buffer area of 200 feet shall be maintained between buildings, accessory uses or outdoor activity areas and any abutting property used or zoned for a residence or nursing home.

#### **7.1.2    Decision**

The Zoning Board of Appeals in reviewing an application for an apartment building (or buildings) shall consider the following factors:

1. Possible drainage problems;
2. Driveway entrances and exits;
3. Underground wiring;
4. Traffic provisions for storage of refuse, equipment, carriages, bicycles;
5. Retention of trees as buffer zones or for aesthetic purposes;
6. Usable open space or recreation area;
7. Location of buildings within area; and
8. Design of buildings in relation to neighborhood.

#### **7.1.3    R-15 or C-3A Districts**

No apartment or townhouse building shall be constructed in an R-15 or C-3A district unless it meets the following minimum requirements:

- |    |         |   |
|----|---------|---|
| 1. | 3 units | 120' frontage, 120' width at building setback |
|    | 4 units | 125' frontage, 125' width at building setback |
|    | 5 units | 130' frontage, 130' width at building setback |
|    | 6 units | 135' frontage, 135' width at building setback |

Where more than 6 units are proposed, an additional 5' of frontage per unit and an

additional 5' of width at building setback shall be required.

2. There shall be at least 10,000 square feet of land area for each apartment unit and 15,000 square feet of land are for each townhouse.
3. No apartment building in an R-15 district shall contain more than six units.
4. Buildings on the same lot shall be a minimum of 40 feet apart.
5. If a six-unit apartment building is to be constructed on one level, at least two of the units shall be offset from the others, said offset to be at least one-quarter of the width of the building.
6. Building setback from the street line shall be 60 feet; building setback from lot line shall be 40 feet.
7. All driveways in an apartment complex will be constructed to a standard at least equal to the contemporary requirements of a subdivision road.

## **7.2 ACCESSORY DWELLING UNIT**

### **7.2.1 Purpose**

The intent of permitting accessory apartments is to:

1. Provide older homeowners with a means of obtaining rental income, companionship, security and services, and thereby to enable them to stay more comfortably in homes and neighborhoods they might otherwise be forced to leave;
2. Add moderately priced rental units to the housing stock to meet the needs of smaller households and make housing units available to moderate income households which might otherwise have difficulty finding housing;
3. Develop housing units in single-family neighborhoods that are appropriate for households at a variety of stages in their life cycle; and
4. Protect stability, property values, and the single-family residential character of a neighborhood by ensuring that accessory apartments are installed only in owner occupied houses.

### **7.2.2 Special Permit Required**

One Accessory Dwelling Unit (ADU) per lot may be allowed in the R-3A, R-1A, R-30, and R-15 by special permit from the Zoning Board of Appeals, notwithstanding any provision in the Zoning Bylaw that may restrict the total number of dwelling units , subject to the following standards.

### **7.2.3 Standards**

1. Configuration. An ADU may be located either within, attached to, or detached from the

- principal structure. Not more than one such unit shall exist on any lot.
2. Density. Only one ADU may be created in conjunction with each single-family residence.
  3. Minimum lot size. An ADU shall not be established on any parcel smaller than 10,000 square feet.
  4. Maximum unit size. The gross floor area, calculated from finished wall to finished wall, of an existing structure, an addition, or new detached structure, converted to, or constructed for the purpose of creating an ADU shall not exceed 40% of the gross floor area of the principal single family structure, not including garage and/or detached accessory buildings or 800 square feet, whichever is less.
  5. Minimum unit size. The gross floor area of an ADU shall not be less than 300 square feet even if this exceeds the maximum requirement above, or as otherwise established by the requirements of the Town of Lenox.
  6. Setbacks and lot coverage. Additions to existing structures or accessory structures, associated with the establishment of an ADU shall not exceed the allowable lot coverage or encroach into required setbacks as prescribed in the underlying zone. The applicable setbacks shall be the same as those prescribed for the principal structure, not those prescribed for detached accessory structures. An applicant may establish an ADU as part of a preexisting nonconforming structure provided alterations or extensions do not exceed 50% of the existing floor area and do not increase the nonconforming nature of said structure as it relates to front, rear and side setbacks and lot coverage.
  7. Scale and visual subordination. The ADU shall be visually subordinate to the principal unit. Specifically, new detached structures, or additions to existing structures, created for the purpose of establishing an ADU, shall be consistent in massing, scale and detail with the existing structure and to the greatest extent possible be indistinguishable from the single-family nature of the property.
  8. Design and Appearance. The external appearance of the existing structure shall not be significantly altered from the original and shall maintain the character of the neighborhood. Any stairways, access, or egress alterations serving the ADU shall be enclosed, screened, or located so that visibility from public ways is minimized. The roof pitch, siding materials, color and window treatment of the ADU shall be the same as the principal structure.
  9. Parking. Additional on-site parking of one space is required in conjunction with the establishment of an ADU. The off-street parking requirements set forth in Section 5.1 shall be maintained for the principal residence.
  10. Construction standards. The accessory apartment shall meet the standards of the State Building Code and State Environmental Code, 780CMR 6th edition MA Building Code, Chapter 3603.41, Title V. An applicant is encouraged to consult with local and state officials prior to making an application to the ZBA.

11. Accessibility. To encourage the development of housing units for people with disabilities, the ZBA may allow reasonable deviation from the stated requirements to install features that facilitate accessibility. Such facility shall be in conformance with state ADA and applicable building codes.

#### **7.2.4 Occupation**

Either the ADU or the principal unit shall be occupied by the owner of the property except for bona fide temporary absence. Prior to the issuance of a special permit, the owner of the premises must submit a notarized affidavit certifying under the pains and penalties of perjury that the premises will continue to be occupied by the owner as his or her principal domicile, except for bona fide temporary absences.

1. When a structure which has received a permit for an ADU is sold, the new owner(s), if they wish to continue to exercise the permit, must, within thirty (30) days of the sale, submit a notarized affidavit to the Building Commissioner stating that they will occupy one of the dwelling units on the premises as their primary residence, except for bona fide temporary absences.
2. The special permit and the notarized affidavit must be made part of the special permit and recorded in the Berkshire Middle District County Registry of Deeds, in the chain of the title to the property, with documentation of the recording provided to the Building Commissioner, prior to the occupancy of the accessory dwelling unit.
3. For the purposes of this by-law, the "owner" shall be defined as one or more individuals residing in a dwelling, who hold title and for whom the dwelling is the primary residence for voting and tax purposes. Said owner may designate a legal relative as a "life tenant" who may occupy the house in the owner's stead. Certification by affidavit shall be provided by the owner.

#### **7.2.5 Conversion of an Accessory Structure**

Conversion of an accessory structure. An accessory garage structure or other outbuilding may be converted to accommodate an accessory dwelling unit provided that the structure complies with the established setback standards for a principal structure, not accessory structure, as prescribed in the underlying zone, applicable building codes, and all other applicable standards, unless otherwise exempt. Conversion of such accessory structure shall not result in the elimination of the requirement of one legal on-site parking space to serve the single family residence.

### **7.3 *Reserved (Retirement Community Removed - STM 4/15/08.)***

## **7.4 EXTENDED-CARE NURSING FACILITIES AND ASSISTED LIVING OR CONGREGATE CARE**

### **7.4.1 General Standards**

1. The minimum lot size for such facilities shall be three (3) acres.

2. For each 20 beds in the facility, one acre of land shall be required, except in Commercial C. districts. The minimum land acreage requirement may be included in calculating this land area.
3. Facilities must be served by town water and town sewer.
4. On each lot used for these purposes, except in Commercial C districts there shall be provided front, rear, and side yards each not less than seventy-five (75) feet in depth.
5. Except in Commercial C districts, a space not less than fifty (50) feet wide shall be maintained open with grass, bushes, flowers, or trees all along each side lot line, rear lot line and front lot line, except for entrance and exit driveways, and such open space shall not be built upon nor paved, nor used for parking.
6. Each facility shall be provided with not more than two driveways for motor vehicles for each abutting street which shall intersect the abutting street or streets at ninety (90) degrees.

## **7.5 MIXED USE DEVELOPMENT**

Dwelling units may be located on premises which also include nonresidential use, provided that all residential living areas are above the first story of a structure. If the gross floor area in residential exceeds that in nonresidential use, lot area shall equal not less than 3,500 square feet per dwelling unit (no additional area required for the nonresidential use). The minimum gross floor area for each dwelling unit shall be seven hundred (700) square feet.

## **7.6 RESIDENTIAL CONVERSIONS**

### **7.6.1 Conversion of an Existing Dwelling**

Any building which is to be converted shall meet all of the requirements of Section 7.1.3.1 and 4.1.1.

### **7.6.2 Floor Area**

Regardless of the minimum square feet of habitable floor area specified elsewhere in this Bylaw, each dwelling unit resulting from conversion shall have at least 600 square feet of habitable floor area.

## **7.7 OPEN SPACE FLEXIBLE DEVELOPMENT OVERLAY DISTRICT**

### **7.7.1 Purpose**

The purposes of this section, the Open Space Flexible Development Overlay District (OSFD), are to:

1. Encourage the preservation of open land for its scenic beauty and to enhance agricultural, open space, forestry, and recreational use.
2. Preserve historical and archeological resources; to protect the natural environment, including the Town's varied landscapes and water resources.

3. Protect the value of real property.
4. Promote a more sensitive arrangement of buildings and better overall site planning.
5. Perpetuate the appearance of the Town's traditional New England landscape.
6. Facilitate the construction and maintenance of streets, utilities, and public services in a more economical and efficient manner.
7. Offer an alternative to standard subdivision development.
8. Preserve, as applicable, the historic buildings and structures of the Town, as well as historic landscape features associated with such buildings and structures.

### **7.7.2 Definitions**

The following term shall have the following definition for the purposes of this section: "Contiguous open space" shall mean open space suitable, in the opinion of the Planning Board, for the purposes set forth herein. Such open space may be separated by the road(s) constructed within the OSFD. Contiguous open space shall not include any front, side or rear yards, if any, within the development, but may include the Buffer Areas as required in Section 7.7.14 around the project perimeter. Wetland areas may be included in the contiguous open space, but the area of such wetland shall be excluded from the calculations of percentage of contiguous open space required in Sections 7.7.8 and 7.7.12.

### **7.7.3 Applicability**

In accordance with the following provisions, an OSFD project may be created, whether a subdivision or not, from any parcel or set of contiguous parcels held in common ownership and located entirely within the Town. Only parcels located in the R1-A District are eligible for consideration as an OSFD.

### **7.7.4 Procedures**

An OSFD may be authorized upon the issuance of a special permit by the Planning Board. Applicants for OSFD shall file with the Planning Board seven (7) copies of the following:

1. A development plan conforming to the requirements for a preliminary plan as set forth in the Subdivision Rules and Regulations of the Planning Board.
2. Where wetland delineation is in doubt or dispute, the Planning Board may require appropriate documentation, including an Order of Resource Area Delineation.
3. Data on proposed wastewater disposal shall be submitted with the application and shall be referred to a consulting engineer for review and recommendation.
4. The Planning Board may also require as part of the development plan any additional information necessary to make the determinations and assessments cited herein.

### **7.7.5 Design Process**

Each development plan shall follow the design process outlined below. When the development

plan is submitted, applicants shall be prepared to demonstrate to the Planning Board that this Design Process was considered in determining the layout of proposed streets, house lots, building location and contiguous open space. The Planning Board has developed design examples that are available for review at Town Hall.

1. Understanding the Site. The first step is to inventory existing site features, taking care to identify sensitive and noteworthy natural, scenic and cultural resources on the site, and to determine the connection of these important features to each other.
2. Evaluating Site Context. The second step is to evaluate the site in its larger context by identifying physical (e.g., stream corridors, wetlands), transportation (e.g., road and bicycle networks), and cultural (e.g., recreational opportunities) connections to surrounding land uses and activities.
3. Designating the Contiguous Open Space. The third step is to identify the contiguous open space to be preserved on the site. A minimum of 35% contiguous open space is required. Such open space should include the most sensitive and noteworthy resources of the site, and, where appropriate, areas that serve to extend neighborhood open space networks.
4. Location of Development Areas. The fourth step is to locate building sites, streets, parking areas, paths and other built features of the development. The design should include a delineation of private yards, public streets and other areas, and shared amenities, so as to reflect an integrated community, with emphasis on consistency with the Town's historical development patterns as well as any exiting historical architectural and landscape features.
5. Lot Lines. The final step is simply to draw in the lot lines (if applicable).

#### **7.7.6 Modification of Lot Requirements**

The Planning Board encourages applicants for OSFD to modify lot size, shape, and other internal dimensional requirements. Lots having reduced area or frontage shall not have frontage on a street other than a street created by the OSFD; provided, however, that the Planning Board may waive this requirement where it is determined that such reduced lot(s) are consistent with existing development patterns in the neighborhood. An OSFD may have individual lots, or multiple units or buildings on a single lot without individual lot lines. Please see Section 7.7.14 Buffer Area for requirements for project setbacks to abutting properties.

#### **7.7.7 Maximum Number of Dwelling Units**

The Maximum Number of dwelling units allowed in a OSFD shall not exceed the number of lots which could reasonably be expected to be developed upon the site under a conventional plan in full conformance with all zoning, subdivision regulations, health regulations, wetlands regulations and other applicable federal, state and local requirements (hereinafter, the Yield Plan). The Yield Plan shall be prepared in conformance with the requirement for a preliminary plan as set forth in the Subdivision Rule and Regulations of the Planning Board. If the percent of the total results in a fraction, the Maximum Number shall be rounded up to the next whole number where the fractional portion is equal to 0.5 or greater, and shall be rounded down to the next whole number where the fractional portion is less than 0.5. The proponent shall have the burden of proof with regard to the design and engineering specifications for such Yield Plan.

### **7.7.8 Density Bonus**

The Planning Board may award a density bonus to increase the preservation of additional open space over and above the required thirty-five percent (35%). The density bonus shall be computed as the ratio of additional contiguous open space applied to increase Maximum Number of Units. For example, if an additional ten percent (10%) of the property is preserved as contiguous open space, a density bonus of ten percent (10%) of the Maximum Number of Units will be awarded. The maximum bonus is twenty percent (20%) of the basic yield. If the percent of the total results in a fraction, the number shall be rounded up to the next whole number where the fractional portion is equal to 0.5 or greater, and shall be rounded down to the next whole number where the fractional portion is less than 0.5. For the purpose of this section, the Contiguous Open Space shall not include any wetlands as defined in GL Chapter 131, Section 40.

### **7.7.9 Types of Buildings**

The OSFD may consist of any combination of single-family and two-family residential structures. The architecture of all buildings shall be residential in character, particularly providing gabled roofs, predominantly wood siding, an articulated footprint and varied facades. Residential structures shall be oriented toward the street serving the premises and not the required parking area.

### **7.7.10 Roads**

The principal roadway(s) serving the site shall be designed and constructed to conform to the standards of the Town where the roadway is or may be ultimately intended for dedication and acceptance by the Town. The Planning Board may allow proposed Private Ways to be designed and constructed to a standard less than the subdivision regulations. These Private Ways shall be adequate for the intended use, vehicular traffic and emergency vehicles, and shall be maintained by an association of unit owners or by the Applicant.

### **7.7.11 Parking**

Each dwelling unit shall be served by two (2) off-street parking spaces. Parking spaces in front of garages may count in this computation. The Planning Board may in appropriate cases allow some of the required parking to be located along the street, provided adequate width is provided for the on-street parking.

### **7.7.12 Contiguous Open Space**

A minimum of thirty-five percent (35%) of the parcel shown on the development plan shall be preserved as contiguous open space. Any proposed contiguous open space, unless conveyed to the Town or its Conservation Commission, shall be subject to a recorded conservation restriction enforceable by the Town, providing that such land shall be perpetually kept in an open state, that it shall be preserved for exclusively agricultural, horticultural, educational and/or recreational purposes, and that it shall be maintained in a manner which will ensure its suitability for its intended purposes.

1. For the purpose of this section, the calculation of required or additional “contiguous open space” shall exclude any wetland as defined in GL chapter 131, Section 40. Wetland may be included within the contiguous open space, but will not count toward the calculation.



2. The contiguous open space shall be used for conservation, historic preservation and education, outdoor education, active and/or passive recreation, park purposes, agriculture, horticulture, forestry, or for a combination of these uses, and shall be served by suitable access for such purposes.
3. The contiguous open space shall remain unbuilt upon, provided that the Planning Board may permit up to ten (10%) percent of such open space to be paved or built upon for structures accessory to the dedicated use or uses of such open space, pedestrian walks, and bike paths.
4. Underground utilities to serve the OSFD site may be located within the contiguous open space.

#### **7.7.13 Ownership of the Contiguous Open Space**

The contiguous open space shall, at the Planning Board's election, be conveyed to:

1. The Town or its Conservation Commission;
2. A nonprofit organization, the principal purpose of which is the conservation of open space and any of the purposes for such open space set forth above;
3. A corporation or trust owned jointly or in common by the owners of lots within the Open Space Flexible Development. If such corporation or trust is utilized, ownership thereof shall pass with conveyance of the lots in perpetuity. Maintenance of such open space and facilities shall be permanently guaranteed by such corporation or trust which shall provide for mandatory assessments for maintenance expenses to each lot. Each such trust or corporation shall be deemed to have assented to allow the Town to perform maintenance of such open space and facilities if the trust or corporation fails to provide adequate maintenance, and shall grant the town an easement for this purpose. In such event, the town shall first provide fourteen (14) days written notice to the trust or corporation as to the inadequate maintenance, and, if the trust or corporation fails to complete such maintenance, the town may perform it. Each individual deed, and the deed or trust or articles of incorporation, shall include provisions designed to effect these provisions. Documents creating such trust or corporation shall be submitted to the Planning Board for approval, and shall thereafter be recorded.

#### **7.7.14 Buffer Areas**

There shall be a buffer area provided at the perimeter of the property. No vegetation in this buffer area will be disturbed, destroyed or removed, except for normal maintenance, except for roadways necessary for access and egress to and from the site or for utilities serving the development. The buffer area requirements are:

1. A buffer area of 100 feet shall be provided where it abuts residentially zoned or occupied properties.
2. Where the land abutting the site is the subject of a permanent restriction for conservation or recreation the Planning Board may reduce the buffer requirement to no less than 50 feet in depth, unless the Planning Board determines that a smaller buffer will suffice to

accomplish the objectives set forth herein.

### **7.7.15 Stormwater Management**

Stormwater management shall be consistent with the requirements for subdivisions set forth in the Rules and Regulations of the Planning Board.

### **7.7.16 Planning Board Decision**

The Planning Board may approve, approve with conditions, or deny an application for an OSFD after determining whether the OSFD better promotes the purposes of Section 7.7.1 of this Bylaw than would a conventional subdivision development of the same locus.

### **7.7.17 Relation to Other Requirements**

The submittals and permits of this section shall be in addition to any other requirements of the Subdivision Control Law or any other provisions of this Zoning Bylaw.

### **7.7.18 Parcels Under Ten Acres**

The Planning Board recognizes that parcels that are ten acres or less may not be feasible as OSFD projects unless waivers from the above requirements are available. For a project that is on a parcel that is ten acres or less the Planning Board may grant a waiver from one or more requirements of this bylaw if it finds that the waiver is in the public interest, that the specific information for which the waiver is sought is relevant to the project that is the subject of the application, and that the waiver is consistent with the intent of the Zoning Bylaws. A waiver shall be granted only by an affirmative vote of two-thirds (2/3) of the Planning Board.

## **7.8 RESIDENTIAL INCLUSIONARY DEVELOPMENT**

### **7.8.1 Purpose.**

The purpose of this bylaw is to promote the general public welfare, including but not limited to ensuring an economically integrated and diverse community by maintaining and increasing the supply of affordable and accessible housing in the Town of Lenox. This purpose includes:

1. Ensuring that new residential development generates affordable housing as defined in Section 7.8.2.
2. Ensuring that affordable housing created under this section remains affordable over the long term, with the majority of such housing remaining affordable in perpetuity, except as may be otherwise required under state or deferral programs.
3. Maintaining a full mix of housing types while providing affordable housing opportunities in Lenox.
4. To the extent allowed by law, ensuring that preference for new affordable housing is given to eligible persons who live or work in Lenox.

### **7.8.2 Definitions**

The following terms shall have the following definitions for the purposes of this section:

1. "Affordable to persons or families qualifying as low income" shall mean affordable to

households or persons earning less than 50% of the median income under the applicable guidelines of the Commonwealth's Department of Housing and Community Development.

2. "Affordable to persons or families qualifying as moderate income" shall mean affordable to households or persons earning more than 50% but less than 80% of the median income under the applicable guidelines of the Commonwealth's Department of Housing and Community Development.
3. "Affordable units" shall mean any combination of dwelling units restricted in perpetuity as affordable to persons or families qualifying as low or moderate income.

### **7.8.3 Applicability**

In all zoning districts, the following regulations shall apply to residential development in Lenox.

1. All residential development requiring a Special Permit and resulting in additional new dwelling units shall provide affordable housing units at the following minimum rates:

<b>Total Development Unit Count</b>	<b>Required Affordable Unit Provision</b>
1 - 15 units	None*
16 – 20 units	Minimum one (1) dwelling unit
21 – 30 units	Minimum two (2) dwelling units
31 units and up	Minimum 10% of total unit count**

\* While provision of affordable units is not required for developments containing 1 -15 units under this section, the Bylaw encourages affordability and provides for incentives. See Section 7.8.6.2.a.

\*\* For developments of 31 or more units, calculation of the number of affordable units shall, if the required percent of the total results in a fraction, be rounded up to the next whole number where the fractional portion is equal to 0.5 or greater, and shall be rounded down to the next whole number where the fractional portion is less than 0.5.

2. Applicants for residential development who are not subject to the requirements of Section 7.8.3.1 may voluntarily include affordable units and are eligible to apply for a special permit for the density bonus outlined in Section 7.8.6.2.

### **7.8.4 Special Permit Authority**

The development of any project set forth in Section 7.8.3 (above) shall require the grant of a Special Permit from the Zoning Board of Appeals (ZBA). The Special Permit shall conform to the requirements of this bylaw and to Massachusetts General Laws Chapter 40A, and to regulations which the ZBA may adopt for carrying out its requirements hereunder.

### **7.8.5 Minimum Requirements for Inclusionary Development**

An Inclusionary Development Special Permit shall be subject to the following conditions, and the ZBA shall make a determination that the proposed development meets the requirements for granting a Special Permit, as well as the following conditions:

1. **Buffer Areas.** A buffer area of 50 feet shall be provided at the perimeter of the property where it abuts residentially zoned or occupied properties, except for driveways necessary

for access and egress to and from the site. No vegetation in this buffer area will be disturbed, destroyed or removed, except for normal maintenance. The ZBA may reduce the buffer requirement to no less than 25 feet (i) where the land abutting the site is the subject of a permanent restriction for conservation or recreation or (ii) where the land abutting the site is held by the Town for conservation or recreation purposes; unless the ZBA determines that a smaller buffer will suffice to accomplish the objectives set forth herein.

2. Each inclusionary development shall provide, at the applicant's choice, one of the following:
  - a. Construct or rehabilitate affordable units comparable in appearance and setting to the rest of the development or neighborhood.
  - b. A cash payment equivalent to the value of structures, land and appropriate on-site and off-site improvements, be made to the Town of Lenox Housing Trust Fund. The cash payment shall be equal to the total cost of construction for each low or moderate income dwelling unit. The conditions of payment shall be determined through the Special Permit process.
  - c. As a condition for granting of a Special Permit, all affordable housing units shall be subject to an affordable housing restriction and a regulatory agreement in the form acceptable to the ZBA. The affordable restriction shall be approved as to form by legal counsel to the Zoning Board of Appeals and a right of first refusal upon the transfer of such restricted units shall be granted to the Town or its designee for a period of not less than 120 days after notice thereof. The regulatory agreement shall be consistent with any applicable guidelines issued by the Department of Housing and Community Development and shall ensure that affordable units can be counted toward the Lenox Subsidized Housing Inventory. The special permit shall not take effect until the restriction, the regulatory agreement and the special permit are recorded at the Registry of Deeds and a copy is provided to the ZBA and the Building Commissioner.

#### **7.8.6 Dimensional Requirements**

1. Design Process. Each development plan shall follow the design process outlined below. When the development plan is submitted, applicants shall be prepared to demonstrate to the Zoning Board of Appeals that this process was considered in determining the layout of the proposed inclusionary development.
  - a. *Understanding the Site.* The first step is to inventory existing site features, taking care to identify sensitive and noteworthy natural, scenic and cultural resources on the site, and to determine the connection of these important features to each other.
  - b. *Evaluating Site Context.* The second step is to evaluate the site in its larger context by identifying physical (e.g., stream corridors, wetlands), transportation (e.g., road and bicycle networks), and cultural (e.g., recreational opportunities) connections to surrounding land uses and activities.
  - c. *Location of Development Areas.* The third step is to locate building sites, streets, parking areas, paths and other built features of the development. The design should include a delineation of private yards, public streets and other areas, and shared amenities, so as to reflect an integrated community, with emphasis on consistency with the Town's historical development patterns as well as any existing historical

architectural and landscape features.

2. The applicant shall prepare a plan showing the Basic Maximum Number of dwelling units allowed in the residential zoning district. The Basic Maximum Number shall not exceed the number of units which could reasonably be expected to be developed upon the site under a conventional as of right residential plan in full conformance with all zoning, subdivision regulations, health regulations, wetlands regulations and other applicable federal, state and local requirements (hereinafter, the Yield Plan). The proponent shall have the burden of proof with regard to the design and engineering specifications for such Yield Plan. The ZBA may award a density bonus to increase the number of dwelling units beyond the Basic Maximum Number as follows:
  - a. For projects with a Yield Plan of 15 or fewer units the ZBA has the discretion to award a density bonus of two market rate units for each affordable unit provided.
  - b. For projects with a Yield Plan of 16 or greater units the ZBA has the discretion to award the addition of two market rate units for each affordable unit provided as part of compliance with Section 7.8.3.
3. The street line and lot line setbacks, minimum lot size and minimum frontage of the proposed inclusionary development will be determined through the Special Permit process as outlined in Section 7.8.6.1. At least 50% of the lot line setback shall be maintained.

#### **7.8.7 Types of Buildings**

The inclusionary development may consist of any combination of single-family, two-family and multifamily residential structures. A multifamily structure shall not contain more than four (4) dwelling units. The architecture of all multifamily buildings shall be residential in character, particularly providing gabled roofs, predominantly wood siding, an articulated footprint and varied facades.

#### **7.8.8 Roads**

The principal roadway(s) serving the site shall be designed to conform with the standards of the Town where the roadway is or may be ultimately intended for dedication and acceptance by the Town. Private ways shall be adequate for the intended use and vehicular traffic and shall be maintained by an association of unit owners or by the Applicant.

#### **7.8.9 Parking**

Each dwelling unit shall be served by two (2) off-street parking spaces. Parking spaces in front of garages may count in this computation.

#### **7.8.10 Stormwater Management**

Stormwater management shall be consistent with the requirements for subdivisions set forth in the Rules and Regulations of the Planning Board.

#### **7.8.11 Decision**

The ZBA may approve, approve with conditions, or deny an application for an Inclusionary Development after determining whether the Inclusionary Development promotes the purposes of Section 7.8.1.

### **7.8.12 Relation to Other Requirements**

The submittals and permits of this section shall be in addition to any other requirements of the Subdivision Control Law or any other provisions of this Zoning Bylaw.

### **7.8.13 Maximum Incomes and Selling Prices: Initial Sale:**

1. To ensure that only eligible households purchase affordable housing units, the purchaser of an affordable unit shall be required to submit copies of the last three years federal and state income tax returns and certify, in writing and prior to transfer of title, to the developer of the housing units or his/her agent, and within thirty (30) days following transfer of title, to the local housing trust, housing authority or other agency as established by the town, that his/her or their family's annual income level does not exceed the maximum level as established by the Commonwealth's Department of Housing and Community Development, and as may be revised from time to time.
2. The maximum housing cost of affordable units created under this bylaw is established by the Commonwealth's Department Housing and Community Development, Local Initiative Program.

### **7.8.14 Reservation of Affordability; Restrictions on Resale:**

1. Each affordable unit created in accordance with this bylaw shall have limitations governing its resale through the use of a regulatory agreement (Section 7.8.5.2.c). The purpose of these limitations is to preserve the long-term affordability of the unit and to ensure its continued availability for affordable income households. The resale controls shall be established through a restriction on the property and shall be in force in perpetuity.
  - a. Resale price. Sales beyond the initial sale to a qualified affordable income purchaser shall include the initial discount rate between the sale price and the sale price and the unit's appraised value at the time of resale. The percentage shall be recorded as part of the restriction on the property noted in Section 7.8.14.1, above.
  - b. Right of first refusal to purchase. The purchaser of an affordable housing unit developed as a result of this bylaw shall agree to execute a deed rider prepared by the town, consistent with model riders prepared by Department of Housing and Community Development, granting, among other things, the municipality's right of first refusal to purchase the property in the event that a subsequent qualified purchaser cannot be located.
  - c. The ZBA shall require, as a condition for Special Permit under this bylaw, that the applicant comply with the mandatory set-asides and accompanying restrictions on affordability, including execution of the deed rider noted in Section 7.8.14.1.b, above. The Building commissioner shall not issue an occupancy permit for any affordable unit until the deed restriction is recorded.

### **7.8.15 Conflict with Other Bylaws:**

The provisions of this bylaw shall be considered supplemental of existing zoning bylaws. To the extent that a conflict exists between this bylaw and others, the more restrictive bylaw, or provisions therein, shall apply.

### **7.8.16 Severability:**

If any provision of this bylaw is held invalid by a court of competent jurisdiction, the remainder of the bylaw shall not be affected thereby. The invalidity of any section or section or parts of any section of this bylaw shall not affect the validity of the remainder of the town's zoning bylaw.

**7.8.17 Waivers**

The Zoning Board of Appeals may grant a waiver or amendment from one or more requirements of this bylaw if it finds that the waiver is in the public interest, that the specific information for which the waiver is sought is relevant to the project that is the subject of the application, and that the waiver is consistent with the intent of the zoning Bylaws. A waiver shall be granted only by an affirmative vote of two-thirds (2/3) of the Zoning Board of Appeals.

## **SECTION 8      SPECIAL DISTRICT REGULATIONS**

### **8.1 FLOOD PLAIN OVERLAY DISTRICT**

#### **8.1.1 Purpose**

The purposes of the Flood Plain Overlay District (FPOD) are:

1. to protect the public health, safety, and general welfare;
2. to protect human life and property from the hazards of periodic flooding;
3. to preserve the natural flood control characteristics and the flood storage capacity of the flood plain; and to preserve and maintain the ground water table and water recharge areas within the flood plain.

#### **8.1.2 Location**

The general boundaries of the FPOD are shown on the Town of Lenox Flood Insurance Rate Map (FIRM), dated 5 July 1982 as Zones A.A 1-30 to indicate the 100 year water surface elevations shown on the FIRM and further defined by the Flood Profiles contained in the Flood Insurance Study, dated 5 July 1982. The floodway boundaries are delineated on the Town of Lenox Flood Boundary Floodway Map (FBFM), dated 5 July 1982, and further defined by the Floodway Data Tables contained in the Flood Insurance Study. These two maps as well as the accompanying Study are incorporated herein by reference and are on file with the Town Clerk, Planning Board, Building Commissioner, and Board of Selectmen.

1. Within Zone A, where the 100 year flood elevation is not provided on the FIRM, the developer/applicant shall obtain any existing flood elevation data and it shall be reviewed by the Building Commissioner. If the data is sufficiently detailed and accurate, it shall be relied upon to acquire compliance with this Bylaw. (Revised in accordance with the Attorney General Approval dated July 23, 2008.)

#### **8.1.3 Overlay District**

The FPOD is established as an overlay district to all other districts. All development, including structural and non-structural activities, whether permitted by right or by special permit must be in compliance with Chapter 131, Section 40 of the Massachusetts General Laws, and with the requirements of the Massachusetts State Building Code pertaining to construction in the flood plains.

#### **8.1.4 Permitted Uses**

The following uses of low flood damage potential and causing no obstruction to flood flows shall be allowed provided they are permitted in the underlying district and they do not require structures, fill, and storage of materials or equipment:

1. Agricultural uses such as farming, grazing, truck farming, horticulture;
2. Forestry and nursery uses;



3. Outdoor recreational uses, including fishing, boating, play areas;
4. Conservation of water, plants, wildlife;
5. Wildlife management areas, foot, bicycle, and/or horse paths;
6. Temporary non-residential structures used in connection with fishing, growing, harvesting, storage, or sale of crops raised on the premises;
7. Buildings lawfully existing prior to the adoption of these provisions.

### **8.1.5 Special Permit**

No structure or building shall be erected, constructed, substantially improved or otherwise created or moved; no earth or other materials dumped, filled, excavated, or transferred, unless a special permit is granted by the Zoning Board of Appeals. Said Board may issue a special permit hereunder (subject to other applicable provisions of this bylaw) if the application is complaint with the following provisions:

1. The proposed use shall comply in all respects with the provisions of the underlying District, and
2. Within 10 days of receipt of the application, the Board shall transmit one copy of the development plan to the Conservation Commission, Planning Board, Board of Health, Building Commissioner, and Board of Public Works. Final action shall not be taken until reports have been received from the above Boards or until 35 days have elapsed, and
3. All encroachments, including fill, new construction, substantial improvements to existing structures, and other development are prohibited unless there is certification by a registered professional engineer provided by the applicant demonstrating the such encroachment shall not result in any increase in flood levels during the occurrence of the 100 year flood, and
4. The Board may specify such additional and conditions it finds necessary to protect the health, safety, and welfare of the public and the occupants of the proposed use.

## **8.2 GATEWAY MIXED USE DEVELOPMENT OVERLAY DISTRICT**

### **8.2.1 Purpose**

The purpose of this bylaw are to foster a greater opportunity for creative development by providing guidelines which encourage a mix of uses compatible with existing and neighboring properties. The intent, furthermore, is to ensure that the appearance and effects of buildings and uses are harmonious with the character of the area in which they are located by:

1. Allowing a diversity of uses in close proximity in the district within a limited area, including residential, retail, office, entertainment, and open space;
2. Preserving and restoring the overall character of the district;

3. Promoting a balance of land uses;
4. Promoting the opportunity for people to work, meet, shop and utilize services in the vicinity of their residences;
5. Providing opportunities for the development of housing;
6. Providing opportunities for a mixture of uses in the same building;
7. Promoting a positive pedestrian environment in the district;
8. Facilitating integrated physical design;
9. Promoting a high level of design quality;
10. Encouraging the development of flexible space for small and emerging businesses;
11. Facilitating development proposals responsive to current and future market conditions; and
12. Encouraging the development of open spaces and parks within the district to accommodate workers, residents, pedestrians and shoppers.

### **8.2.2 Location**

The area known as the Gateway Mixed Use Development Overlay District (LMUD) shall include such land shown on the official zoning map dated May 2005.

### **8.2.3 Overlay District**

The LMUD is an overlay mapped over the other districts. It modifies and, where there is inconsistency, it supercedes the regulations of the underlying district. Except as modified or superseded, the regulations of the underlying districts apply.

### **8.2.4 Special Permit and Site Plan Approval Required**

A Mixed Use Development requires a special permit from the Zoning Board of Appeals in compliance with this section and also requires site plan approval by the Planning Board as described in this Bylaw. The following uses are eligible for consideration in an application for such special permit in the LMUD. Where a proposed use in an application for a Mixed Use Development requires a special permit in the underlying district, the applicant shall only be required to submit a single application or a special permit and a single application for site plan approval for the purposes of gaining approval for all uses in such application for a Mixed Use Development.

### **8.2.5 Eligible Uses**

The following uses are eligible for consideration as part of a Mixed use Development:

1. All uses listed as permitted uses in the underlying zoning district;

2. A store serving retail business needs;
3. Restaurant;
4. Professional offices and governmental offices;
5. Offices of physicians, dentists, attorneys, architects, engineers or accountants;
6. Movie theater not to exceed 650 seats.

### **8.2.6 Prohibited Uses**

The following uses are prohibited in the LMUD:

1. Animal hospitals, animal sales;
2. Automobile or truck sales;
3. Drive-up services associated with any commercial use;
4. Junkyards;
5. Recycling collection facilities (not including typical recycling activities associated with the legal operation of a business or residence);
6. Motor Vehicle Light Service Stations;
7. Wholesale business, except if affiliated with and accessory to another use on the same lot; and
8. All other uses not specifically authorized herein.

### **8.2.7 Combination of Uses**

Within an approved Mixed Use Development, there shall be no restriction on combining different categories of use within the same building except those, if any, imposed by the State Building Code or other federal, state, or local regulations.

### **8.2.8 Area Regulations**

1. At least 10% of the entire development shall incorporate residential uses. Residential uses shall not be located on the first floor of a structure when developed in combination with commercial uses.
2. Uses must follow the performance standards in this section. A proposed Mixed Use Development shall demonstrate that the project shall be served by town water and sewer service upon completion of the proposed development.
3. Each building footprint for office, retail or restaurant use shall not exceed 20,000 square feet.

4. Setback between buildings shall be not less than twenty (20) feet unless otherwise specified in the Zoning Bylaw.

### **8.2.9 Open Space**

In a Mixed Use Development, at least 25% of the land shall be set aside as permanent usable open space, for the use of the Mixed Use Development residents, or for all users, or for the community. The required open space shall be conveyed to the Lenox Conservation Commission; a nonprofit organization, the principal purpose of which is the conservation of open space and any of the purposes for such open space set forth above; or, a corporation or trust owned jointly or in common by the owners of lots within the LMUD. If such corporation or trust is utilized, ownership thereof shall pass with conveyance of the lots in perpetuity. Documents creating such trust corporation shall be submitted to the Board of Appeals for approval, and shall thereafter be recorded.

1. Open Space is defined as lands that are restricted from development and shall be naturally vegetated areas, open fields, parks or landscaped areas. Where possible, proposed open space shall be linked to existing open spaces from green corridors. Setback, disconnected parcels, and left over space including but not limited to areas between buildings shall not be considered as open space. The following may be considered open space:
2. No more than fifty (50%) percent of the dedicated open space shall constitute wetlands, and land subject to seasonal flooding. The term “wetland” shall be limited to the definition of wetlands as specified under G.L. c. 131, Section 40, the Wetlands Protection Act, as amended.
3. No more than fifty (50%) percent of the slope greater than twenty (20%) percent shall be dedicated as open space.
4. The open space shall be used for wildlife habitat, conservation, historic preservation, outdoor education, passive recreation, park purposes, or any combination of these uses. Additional uses may be permitted upon approval of the Planning Board, provided that such uses are in harmony with the promotion and retention of open space.

### **8.2.10 General Design and Performance Standards**

1. No use shall be permitted that causes or results in dissemination of dust, smoke, gas or fumes odor, noise, vibration or excessive light under standards set forth in the performance criteria in this chapter.
2. Any other performance standards of the town shall also apply to uses conducted under this Section.
3. Architecture should demonstrate the cohesive planning of the development and present a clearly identifiable design feature throughout. Applicants are encouraged to use traditional New England architectural elements in the design. It is not intended that buildings be totally uniform in appearance or that designers and developers be restricted in their creativity. Rather, cohesion and identity can be demonstrated in similar building scale or mass; consistent use of facade materials; similar ground level detailing, color or signage; consistency in functional systems such as roadway or pedestrian way surfaces, signage, or

landscaping; the framing of outdoor open space and linkages, or a clear conveyance in the importance of various buildings and features on the site.

4. Buildings adjacent to usable open space should generally be oriented to that space, with access to the building opening onto the open space.
5. It is strongly encouraged that landscaped space, and particularly usable open space, be designed and located to connect as a network throughout the Mixed Use Development. It is also generally intended that said space be designed and located to connect with existing off-site usable open space, and provide potential for connection with future open space by extending to the perimeter of the Mixed Use Development, particularly when a plan exists for the location and networking of such future open space.
6. Commercial uses shall be designed and operated, and hours of operation limited where appropriate, so that neighboring residents are not exposed to offensive noise, especially from traffic or late-night activity. No amplified music shall be audible to neighboring residents.
7. Signs shall conform to the existing bylaws of the Town of Lenox.
8. Vehicular access to and from public roads is intended to be consolidated. Vehicular access to Mixed Use Development lands from a public roadway shall generally be limited to one (1) access point, particularly when Mixed Use Development frontage along said roadway is three hundred (300) feet or less.
9. The design should preserve and enhance natural features such as topography, waterways, vegetation, and drainage ways.
10. The design should minimize impervious surfaces and incorporate other design features to minimize storm water runoff.
11. Storage of waste and waste facilities shall be screened from view from public ways and neighboring properties and shall follow State and Town Board of Health regulations.
12. The design should maximize pedestrian transit-oriented development. Specifically they should use "traffic-calming" techniques liberally; provide networks for pedestrians as good as the networks for motorists; provide pedestrians and bicycles with shortcuts as alternatives to travel along high-volume streets, and emphasize safe and direct pedestrian connections to transit stops and other commercial and/or employment nodes; provide long-term, covered, bicycle parking areas; provide well-lit, transit shelters; incorporate transit-oriented design features; and establish Travel Demand Management programs at employment centers.
13. All materials, supplies and equipment shall be stored in accordance with Fire Prevention Standards of the National Board of Fire underwriters and shall be screened from view from public ways and abutting properties.

14. Internal streets shall consist of local and collector roadways, designed in accordance with standard traffic engineering practice. Any street proposed for public dedication shall meet the town standards. Driveway consolidation should be undertaken so as to reduce traffic conflicts on Routes 7 and 20.

#### **8.2.11 Interior Roadways and Common Curb Cuts; Density Bonus**

To allow for the least disruption in flow of north/south traffic on Routes 7 and 20, and the opportunity for orderly growth within the zoning districts bordering this state roadway, the town considers the reduction of entrances and exits on the highway of major concern. All site plans shall show reasonable plans for interior roadways linking neighboring parcels presently developed or which could be developed or which could be developed as future site development activity occurs to a common access point.

The Zoning Board of Appeals may approve provisions for interior roadways utilizing joint access and/or egress, recognizing that the final design and permitting of access to Routes 7 and 20 is to be accomplished only through the access permit process of the Massachusetts Highway Department. The ZBA shall have the authority to authorize the density bonuses for abutting owners who develop interior roadways or feeder streets utilizing a common drive and curb cuts thereby eliminating per parcel access/egress point on the highway based on the following:

1. the number of square feet occupied by the interior roadway on the owner's land; and,
2. an additional five (5%) percent in the amount of lot coverage allowed by the requirements of the bylaw for an existing or proposed use; and,
3. an increase of one dwelling unit per acre for an existing or proposed residential use.

Applicants should notify the Massachusetts Highway Department as soon as possible of their intent to utilize the provisions of this bylaw in order to facilitate an orderly and cooperative permitting process between the ZBA and said Department.

#### **8.2.12 Lighting**

1. All outdoor lighting shall be designed so as not to adversely impact surrounding uses, while also providing a sufficient level of illumination for access and security purposes. Such lighting shall not blink, flash, oscillate or be of unusually high intensity of brightness.
2. Parking areas shall be illuminated to provide appropriate visibility and security during hours of darkness.
3. Any outdoor lighting fixture newly installed or replaced shall be shielded so that it does not produce a strong, direct light beyond the property boundaries, and shall be directed toward the object or area to be illuminated. Light shall be directed away from residences.
4. Lighting of the site shall be adequate at ground level for the protection and safety of the public in regard to pedestrian and vehicular circulation. The glare from the installation of outdoor lights and illuminated signs shall be contained on the property and shall be

shielded from abutting properties. Lighting structures shall be integrated with the site and surrounding uses.

### **8.2.13 Parking and Loading; Shared Parking Requirements**

Parking shall conform to the existing bylaws of the Town of Lenox and the following requirements.

1. Parking shall be located to the side or rear of buildings. In no case shall parking be allowed in the planting strip adjacent to the sidewalk or within the front setback of any lot.
2. Buildings that do not have frontage on a street must provide access for emergency and service vehicles through the layout and design of driveways, interior service roads, or pedestrian and bicycle circulation corridors.
3. Where there is more than one category of use, then the number of spaces required shall be 70% of the sum of required spaces for each category of use.
4. Parking areas shall be screened from adjacent residential uses, streets, and walkways using trees and shrubs adapted to the region, of specimen quality conforming to the American Standard for Nursery Stock, (American Standards Institute, Inc.), and shall be planted according to accepted horticultural standards. Berms may be used for screening along the street in conjunction with plant materials.

### **8.2.14 Pre-Application**

Prior to an application for Mixed Use Development, the owner/applicant may, and is encouraged to, arrange for an informal review of the Mixed Use Development plan by the Planning Board.

### **8.2.15 Submission Requirements**

An application to the SPGA shall be in accordance with Section 9.4. In addition, any application for a Mixed Use Development shall submit a master plan for tract in accordance with the Lenox Gateway Redevelopment Plan and including the following supportive information:

1. A neighborhood context map, at a scale not less than one inch (1") equals one hundred feet (100'), providing a graphic description of the neighborhood in which the tract lies, including roads, utilities and other public facilities, major existing buildings and structures. There shall also be a statement and/or plan as to the general impact of the proposed Mixed Use Development upon the area, indicating how the Mixed Use Development relates to surrounding properties and what measures will be taken to create appropriate transitions and access from the subject property to abutting public properties (i.e. parks and other recreational lands) or other neighboring tracts (if applicable);
2. A conceptual site plan drawn to a scale of not less than one inch (1") equaling fifty feet (50'), or series of drawings at the same scale, and any necessary supporting information;
3. Analysis of compliance with regulations as to dwelling units per square feet of lot area, height, building coverage, floor area ratio (FAR) and parking requirements;

4. Names of all property owners within three hundred (300) feet of the Mixed Use Development boundary;
5. Explanation of provisions for the landscaping and maintenance of all open space and drainage areas;
6. A traffic analysis and recommendations prepared by a registered professional engineer qualified to conduct such studies, including current traffic counts for streets surrounding the project, analysis of the existing capacity of those streets, projections of the amount of traffic that will be generated by the proposed development, and the ability of the thoroughfare system to absorb the increased traffic without decreasing the level of service below an acceptable level - said level to be determined by the SPGA in consultation with the Chief of Police and Superintendent of Public Works;
7. A utilities analysis and recommendations prepared by a registered professional engineer qualified to conduct such studies. Said analysis shall contain an inventory of existing utilities including, but not limited to, storm sewers and drains, sanitary sewers, electrical lines, Fire alarm boxes and lines, gas lines/mains, water mains, lighting, curb and gutter, etc. Said inventory shall illustrate utility locations, sizes, diameters, carrying capacity and present load on the system. The engineer's report shall state if the current system is capable of adequately serving the proposed development. If the current utility system is found to be inadequate for the proposed development, the report shall confirm the deficiencies and make recommendation(s) as to the infrastructure improvements necessary to properly service the proposed development and maintain the existing service. The report shall also present a formal plan for infrastructure improvements, documenting timing, funding mechanisms and coordination with the Town;
8. In addition, in making an application for final approval of the Mixed Use Development (or phase thereof), an applicant shall supply full documentation as to how the final level plan complies with the approved Lenox Gateway Redevelopment Study. When final Mixed Use Development approval is applied for in phases or stages of development, the applicant shall keep and submit with each final application a running total or status report of Mixed Use development compliance with the approved preliminary master plan, including, but not limited to, floor area ratio, residential density and number of units, Mixed Use Development ground coverage, required landscaped area and usable open space and the like. The applicant shall provide full documentation and a comparison of approved master plan development data, existing Mixed Use Development site data to date, final approved development data to date, and the currently proposed development data.
9. Any other supportive information the applicant feels may be beneficial to the Town of Lenox in the evaluation of the request.

#### **8.2.16 Decision**

The SPGA shall review and determine whether an application is complete and place special emphasis in its review as to compliance with provisions of this Section, including compliance with the purpose and general requirements/features of a Mixed Use Development. The SPGA shall also determine whether the proposal is consistent with the most suitable development of the



Town, and conduct a review in accordance with the requirements for special permit with site plan review as set forth in Section 9.5 of this Bylaw.

### **8.2.17 Deviation**

The Mixed Use Development shall comply with all requirements of this Bylaw unless a deviation from these strict requirements is authorized herein. The SPGA may modify or waive any requirement of the overlay district upon finding that due to topography, location or other unusual conditions affecting the property, the requirements of this section would unreasonably restrict the use of the property or would be detrimental to the orderly development the area. In granting such modifications or waiver, the Board may impose conditions it deems necessary to protect the public interest and to insure that the development will be consistent with the purpose of this section.

## **8.3 WIRELESS TELECOMMUNICATIONS OVERLAY DISTRICT (WTOD)**

### **8.3.1 Purpose**

The Wireless Telecommunications Overlay District (WTOD) is intended to protect the scenic, historic, natural and other resources of the Town of Lenox, while allowing adequate Wireless Telecommunications to be developed

### **8.3.2 Location**

This District includes the properties listed below. These properties are included by reason of their potential to provide technically feasible and accessible locations for the siting of facilities which can provide adequate wireless telecommunications services to the Town of Lenox. The Overlay District is defined, delineated and mapped on the Map entitled “Wireless Telecommunications Overlay District Map, Town of Lenox, MA”, and incorporated by this reference herein.

<b>Address</b>	<b>Assessors' Map &amp; Parcel #</b>
Junction Rtes 7 & 20	Map 17, Lot 57
Route 7	Map 17, Lots 54, 55 & 56
Route 7	Map 12, Lot 9

### **8.3.3 Overlay District**

The WTOD is an overlay district mapped over other districts. It modifies and where there is inconsistency, supersedes the regulations of such other districts. Except as so modified or superseded, the regulations of the underlying districts remain in effect.

### **8.3.4 Applicability**

Any use of lands within the WTOD for purposes of placement, construction, modification or removal of Personal Wireless Service Facilities and/or Towers shall be subject to the requirements of Section 6.11 of this Bylaw

## **SECTION 9        ADMINISTRATION AND PROCEDURES**

### **9.1    BUILDING PERMIT; CERTIFICATE OF OCCUPANCY**

#### **9.1.1      Permit Required**

No building or structure shall be erected, altered or moved in Lenox without a written permit issued by the Building Commissioner. Such permits shall be applied for in writing to the Building Commissioner. The Building Commissioner shall not issue any such permit unless the plans for the building and the intended use thereof in all respects fulfill the provisions of the Zoning By-law, except as may have been specifically permitted otherwise by action of the Board of Appeals or the Board of Selectmen, provided a written copy of the decision governing any such permission be attached to the application and to the resulting building permit issued. One copy of each such permit as issued, including any conditions or restrictions attached thereto, shall be kept on file in the office of the Building Commissioner.

#### **9.1.2      Application**

Each application for a permit to build, alter, or move a building or structure shall be accompanied by a plot plan in such number of copies and drawn to such scale as is required in the State Building Code. Each such plot plan shall show dimensions in feet and areas of lots and structures to be erected altered or moved, and adjacent streets or ways. Such plot plans shall accurately indicate dimensions and angles of all lot lines shown thereon, also of any streets or ways. Such plot plans shall indicate approved street grades and proposed elevations of the tops of foundations. Also such plot plans shall show the locations of existing sanitary sewers, storm drains, and water pipes in any street shown and the locations of all existing buildings and structures within the application area, as well as the location of any proposed buildings or structures.

#### **9.1.3      Construction to Conform to Plans**

Special permits or building permits issued on the basis of plans and applications approved by the Board of Selectmen, Board of Health, Planning Board or the Board of Appeals authorize only the use, arrangement and construction as set forth in such approved plans and applications. Use, arrangement or construction at variance with that authorized shall be deemed a violation of this Bylaw and punishable as provided herein.

#### **9.1.4      Certificate of Occupancy**

No building or structure hereafter erected or altered so as to require a building permit shall be occupied or used, in whole or in part, until a certificate of occupancy shall have been issued by the Building Commissioner certifying that such building conforms to the conditions of the building permit and the provisions of the building code. Upon the request of the holder of a permit, the Building Commissioner may issue a temporary certificate of occupancy for part of a building, provided that such temporary occupancy or use would not jeopardize life or property. No change of occupancy or use shall be made in a building hereafter erected or altered that is not consistent with the last certificate issued for such building unless a permit is secured. A certificate of occupancy shall be issued within seven days after receipt of written application therefore, if the building at the time of such application shall be entitled thereto.

## **9.2 ENFORCEMENT**

### **9.2.1 Zoning Enforcement Officer**

The Zoning By-law shall be enforced by the Building Commissioner. The Building Commissioner, upon being informed in writing of a possible violation of the Bylaw or on his own initiative shall make or cause to be made an investigation of facts and an inspection of the premises where such violation may exist. The Building Commissioner, on evidence of any violation, after investigation and inspection, shall give written notice of such violation to the owner and to the occupant of such premises. The Building Commissioner shall demand in such notice that such violation be abated within a reasonable time, designated therein by the Building Commissioner. Such notice and demand may be given by mail addressed to the owner at the address appearing for him on the most recent real estate tax records of the Town and to the occupant at the address of the premises of such seeming violation.

### **9.2.2 Action by Board of Selectmen**

If, after such notice and demand, such violation has not been abated within the time specified, the Building Commissioner shall notify the Board of Selectmen of the Town who shall take such action or initiate such proceedings in the name of the Town as it shall deem appropriate and necessary to prevent, correct, restrain, or abate any violation of this Bylaw.

### **9.2.3 Penalty**

Any violation of any provision of this Bylaw pursuant to this bylaw shall be punishable by a fine of not more than Three Hundred Dollars (\$300.00). Each violation and each day of violation shall constitute a separate offense, punishable by fine as aforesaid.

### **9.2.4 Noncriminal Disposition**

In addition to the procedures for enforcement as described above, the provisions of this zoning bylaw may also be enforced, by the Building Commissioner, by non-criminal complaint pursuant to the provisions of G.L. c. 40, section 21D. Each day on which a violation exists shall be deemed to be a separate offense. The penalty for violation of any provision of this bylaw shall be \$25.00 for the first offense; \$50.00 for the second offense; \$100.00 for the third offense and \$300.00 for the fourth and each subsequent offense.

## **9.3 BOARD OF APPEALS**

### **9.3.1 Establishment**

As provided by statute, there shall be in Lenox a Board of Appeals for zoning matters, which shall also be the Subdivision Board of Appeals. Such Board of Appeals shall consist of five (5) members and four (4) associate members, all of whom shall be appointed by the Selectmen in the manner specified by statute. Such Board members shall have and exercise the powers available under said statute.

### **9.3.2 Powers**

The Board of Appeals shall have the following powers:

1. To hear and decide appeals taken by any person aggrieved by reason of his inability to obtain a permit from any administrative official under the provisions of said G.L. Chapter

40A, or by any officer or board of the Town or by any person aggrieved by any order or decision of the Building Commissioner or any other administrative official in violation of any provision of said Chapter 40A or any bylaw adopted thereunder.

2. To hear and decide applications for special permits for exceptions as provided in this By-law, subject to any general or specific rules therein contained and subject to any appropriate conditions and safeguards imposed by the Board.
3. To authorize upon appeal, or upon petition in cases where a particular use is sought, with respect to a particular parcel of land or to an existing building thereon a variance from the terms of this Bylaw where, owing to circumstances relating to the soil conditions, shape or topography of such land or structures, but not affecting generally the zoning district in which it is located, a literal enforcement of the provisions of this Bylaw would involve substantial hardship, financial or otherwise, to the petitioner or appellant, and that desirable relief may be granted without substantial hardship, financial or otherwise, to the petitioner or appellant, and that desirable relief may be granted without substantial detriment to the public good and without nullifying or substantially derogating from the intent or purpose of this Bylaw, but not otherwise. The Board may authorize a use or activity variance. In exercising the powers of this paragraph, the Board may impose limitations both of time and of use and a continuation of the use permitted may be conditioned upon compliance with regulations to be made and amended from time to time thereafter.
4. To hear and decide comprehensive permits for construction of low or moderate income housing by a public agency or limited dividend or nonprofit corporation, as set forth in G.L. c. 40B, ss. 20-23.

### **9.3.3 Rules and Regulations**

The Board of Appeals shall adopt rules and regulations not inconsistent with the provisions of the Zoning By-law for conduct of its business and otherwise carrying out the purposes of said Chapter 40A, and shall file a copy of such rules in the office of the Town Clerk.

### **9.3.4 Fees**

The Board of Appeals may adopt reasonable administrative fees and technical review fees for petitions for variances, administrative appeals, and applications for comprehensive permits.

## **9.4 SPECIAL PERMITS**

### **9.4.1 Special Permit Granting Authority**

Unless specifically designated otherwise, the Board of Appeals shall act as the Special Permit Granting Authority.

### **9.4.2 Criteria**

Special permits shall be granted by the Special Permit Granting Authority, unless otherwise specified herein, only upon its written determination that the adverse effects of the proposed use will not outweigh its beneficial impacts to the town or the neighborhood, in view of the particular characteristics of the site, and of the proposal in relation to that site. In addition to any specific

factors that may be set forth in this By-Law, the determination shall include consideration of each of the following:

1. Community needs served by the proposal;
2. Traffic flow and safety, including parking and loading;
3. Adequacy of utilities and other public services;
4. Neighborhood character and social structures;
5. Impacts on the natural environment; and
6. Potential economic and fiscal impact to the Town, including impact on town services, tax base, and employment.

#### **9.4.3 Rules and Regulations**

The Special Permit Granting Authority may adopt rules and regulations for the administration of this section. An application for a special permit shall be filed in accordance with such Rules and Regulations.

#### **9.4.4 Conditions**

Special permits may be granted with such reasonable conditions, safeguards, or limitations on time or use, including performance guarantees, as the Special Permit Granting Authority may deem necessary to serve the purposes of this By-Law. Any conditions, safeguards or limitations shall be imposed in writing and shall be made a part of the special permit and building permit. Such conditions, safeguards or limitations may include, but are not limited to, the following:

1. Limitations upon the size, number of occupants, method and time of operation, time duration of the permit, or extent of facilities;
2. Regulation of number and location of driveways, or other traffic features; and off-street parking or loading, or other special features beyond the minimum required by this Bylaw.

#### **9.4.5 Fees**

The Special Permit Granting Authority may adopt reasonable administrative fees and technical review fees for applications for special permits.

#### **9.4.6 Lapse**

A special permit shall lapse in two (2) years if a substantial use or construction has not begun under the permit within said two years, except for good cause. The Special Permit Granting Authority may establish a shorter period if it so votes, on a specific application.

### **9.5 SITE PLAN APPROVAL FOR DEVELOPMENTS IN THE C-1A AND C-3A ZONES**

#### **9.5.1 Purpose**

It is the intent of this section that no individual, corporation or any business entity, regardless of

the form chosen, shall occupy any building structure or premises or change the use thereof or the construction or alteration to the exterior of any structure in the C-1A or C-3A zones without first complying with the provisions of site plan review. In considering a site plan, the Zoning Board of Appeals (ZBA) shall assure that all structures and uses are developed in a manner which considers community needs, including protection of abutting properties and visual amenities, convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent areas, adequacy of methods of disposal for wastes and surface water drainage and protection of environmental features on the site and in adjacent area.

### **9.5.2 Projects Requiring Site Plan Review**

Notwithstanding anything contained in the Bylaw to the contrary, no building permit for the construction, exterior alteration, or relocation, occupancy or change in use of any building, structure or premises in the C-1A or C-3A zones shall be issued, nor shall an occupancy certificate for any change of use of a building, structure, or premise be issued, without site plan review and approval by the ZBA.

### **9.5.3 Waiver**

If the ZBA determines upon review at a regularly posted meeting that there is no substantive change in use and the proposed use is not more detrimental than its present or immediate prior use and that the external enlargement, if applicable, is less than 2,000 square feet, the Board may waive any or all of the requirements of site plan review.

### **9.5.4 Action by the ZBA**

The Board of Appeals may approve a site plan subject to conditions, modifications and restrictions as the Board may deem necessary; and any construction, reconstruction, alteration or addition shall be carried out only in conformity with such conditions, modifications or restrictions and in conformity with the application and site plan. The Board of Appeals may condition its approval under Section 9.4.4 as follows:

1. in the case of multi-family dwellings, by requiring the provision of up to 25 percent (25%) of the total housing units for persons of low or moderate income pursuant to G.L. Ch. 40B and regulations promulgated thereunder;
2. for any development requiring a special permit under these provisions, provision of certain vegetated open space, protection for solar access, natural contours and existing vegetation, or limitations on use or hours of operation of such developments; and
3. the improvement of road or utility facilities and on off-site to accommodate increased demand likely to be generated by the proposal.

### **9.5.5 Contents of Site Plan**

A site plan shall be prepared by a Registered Professional Engineer and/or a Registered Land Surveyor and/or a Registered Landscape Architect at a scale of 1" = 20' or such scale as may be approved by the ZBA on standard 24" x 36" sheets and continuation on 8 1/2" x 11" sheets as necessary for narrative. The site plan shall include:

1. Name of the project, locus, boundaries, date and scale of the plan.

2. Name and address of the record owner, developer, and seal of the engineer or surveyor.
3. Name and addresses of all record owners within three hundred (300) feet of the property lines.
4. All existing lot lines, easements, rights-of-way, size in acres or square feet, abutting land uses and location and use of structures within three hundred (300) feet of the site.
5. The location and use of all existing and proposed buildings and structures within the site plan, including dimensions and height, and showing exterior entrances, exits and all anticipated future additions or alterations, and a rendering of buildings to be constructed. The requirements of this Section do not apply to residential developments.
6. Location of all present and proposed public and private ways, parking areas, driveways, sidewalks, ramps, curbs, fences, buffers for screening purposes, paths, landscaping, lighting fixtures, planting areas, walls, signs, service areas, refuse and other waste disposal containers.
7. Location of all present and proposed utility systems including sewage or septic systems, water supply system, existing and proposed surface and subsurface drainage systems, telephone, cable and electric lines. Storm drainage system will include existing and proposed drainlines, culverts, drainage swells, catch basins, headwalls, endwalls, hydrants, manholes, channels, and subdrainage along with soil logs, percolation tests when necessary, and drainage calculations.
8. Plans to prevent the pollution of surface or groundwater, erosion of soil, excessive run-off of precipitation, excessive raising or lowering of the water table and flooding of other properties.
9. Existing and proposed topography at a two (2) foot contour level.
10. Sufficient information to indicate areas in the site and within 50 feet of the site where gravel removal or filling is proposed and the approximate volume in cubic yards. All elevations shall refer to the nearest United States Coastal and Geodetic Bench Mark.
11. A landscape plan showing all existing natural land features, forest coverage and water sources, and all proposed changes to these features. Water sources will include ponds, lakes, brooks, streams, wetlands, floodplains and drainage retention areas.
12. Zoning District boundaries within five hundred (500) feet of the site's perimeter shall be drawn and identified on the plan. Floodplain boundaries and the square feet within this district shall be shown.
13. Existing and proposed business signs and traffic signs located on the site and within one hundred feet of the site, and the size, dimension, height, color and illumination of all signs.

14. A traffic study to include:

- a. Traffic flow patterns within the site, egresses and entrances, loading and unloading areas, and curb cuts on site and within one hundred feet of the site.
- b. Traffic impact - the projected number of motor vehicle trips to enter or depart from the site shall be estimated for daily hour and peak hour traffic levels.
- c. A projected traffic flow pattern for both vehicular and pedestrian access shall be described and related to the site plan, including vehicular movements at all major intersections likely to be affected by the proposed use of the site.
- d. The impact of this traffic upon existing abutting public and private ways in relation to road capacities. Existing and proposed daily hour and peak hour traffic levels will be given and road capacity levels.

As a result of subparagraph items a-d, above, the ZBA may request a plan to implement the improvements needed to provide for the free flow of traffic in areas surrounding the site and identified by the ZBA as impacted by the proposed uses.

- 15. With respect to vehicular and pedestrian circulation, including entrances, ramps, walkways, drives, and parking, special attention shall be given to location and number of access points to the public streets (especially in relation to existing traffic controls and public transit facilities), width of interior drives and access points, general interior circulation, separation of pedestrian and vehicular traffic, access to community facilities, and arrangement of parking areas that are safe and convenient and, insofar as practicable, do not detract from the use and enjoyment of proposed buildings and structures and the neighboring properties.
- 16. A plan for the control of erosion, dust and silt, both during and after construction. Such plan shall include all existing and proposed slopes, construction sequencing, temporary and permanent erosion control, and protection of water bodies. In addition, applicant must comply with Section 5.4, Drainage and Erosion Control, if applicable.
- 17. For alterations to any existing or new business/commercial/industrial uses a table containing the following information:
  - a. Maximum area of building to be used for selling, offices, business, industrial or other uses.
  - b. Maximum number of employees where applicable.
  - c. Maximum seating capacity where applicable.
  - d. Number of parking spaces existing or required for the intended use, based on Section 5.1 of the Bylaw.



### **9.5.6 Waiver of Submittal Requirements**

The ZBA shall have the right to waive any of the items set forth in Section 9.5.5 under unique site conditions or request any additional data it should need to render its decision. A majority vote of the ZBA would be required to waive any of the site plan items.

### **9.5.7 Procedure**

An applicant for Site Plan Review under this section shall file (4) copies each of the application and Site Plan with the Land Use Clerk on the forms provided by the ZBA. A copy of the application shall be given to the Town Clerk by the applicant. An applicant may seek to waive the requirements of this section by making a written request to the ZBA at least fourteen (14) days prior to the next regularly scheduled ZBA meeting. The ZBA shall consider the request at the next regularly scheduled posted meeting and notify the applicant within seven (7) days of its decision.

1. The Board shall transmit to the Planning Board, Conservation Commission, Board of Health and Building Commissioner or other boards as deemed necessary copies of the application and site plan. The boards shall have up to thirty-five (35) days to make recommendations to the ZBA.
2. The applicant shall submit a filing fee to cover any expenses connected with the public hearing and review of the plan.
3. The ZBA shall hold a public hearing within sixty-five (65) days of receipt of an application and shall take final action within ninety (90) days from the time of hearing, as provided in G.L., Chapter 40A, Sections 9 and 11, and in Section 9.3.3 of this Bylaw relating to special permit procedures. Such final action shall consist of either (1) a finding that the proposed project will constitute a suitable development and will not result in detriment to the neighborhood or the environment; or (2) a written denial of the application stating the reasons for such denial. Approval may be made subject to conditions, modifications and restrictions as the Board may deem necessary; and any construction, reconstruction, alteration or addition shall be carried out only in conformity with such conditions, modifications or restrictions and in conformity with the application and site plan. A denied applicant may resubmit his application to comply with the requirements of this Site Plan Review Bylaw and resubmit the plan for review. In no event may the Board deny an application that meets all the standards set forth in this Section of the Bylaw.
4. The Board may require the posting of a security to assure compliance with the plan and conditions and may suspend any permit or license when work is not performed as required.

### **9.5.8 Rules and Regulations**

The Board may after a public hearing adopt and periodically amend or add rules and regulations relating to the procedures and administration of this section and shall file a copy of said rules with the Town Clerk.

### **9.5.9 Standards for Review**

In reviewing site plans, the Board shall consider the following:

1. Protection of the abutting properties and community to minimize any detrimental use of the site.
2. Convenience and safety of vehicular and pedestrian movement within the site and the relationship to adjoining ways and properties.
3. Adequacy of the methods of disposal of sewage and refuse and the drainage of surface and subsurface water.
4. Adequate means of protecting wetlands, watersheds, aquifers, and well areas.
5. Provisions for off-street loading and unloading of vehicles incidental to the normal operation of the establishment, parking, lighting and internal traffic control.
6. Provision of open space consistent with Town Open Space Plan Concepts.
7. The natural landscape shall be preserved in its existing state insofar as practicable, by minimizing tree cutting, and soil removal or filling of the site. Any grade changes shall be in keeping with the general appearance of neighboring developed areas.
8. Location and design shall not cause avoidable damage to wildlife habitats or corridors, or to any plant species listed as endangered, threatened or of special concern by the Massachusetts Natural Heritage Program, or to any tree exceeding 24 inches trunk diameter four and a half (4 ½) feet above grade. Applicants must submit documentation to the SPGA of having consulted with the Conservation Commission and the MA NHP regarding these considerations, and that the proposed site either contains no such habitats or materials or that all feasible efforts to avoid, minimize or compensate for damage have been reflected in the proposal.
9. The layout of design features, such as vegetative buffers, within developments which will integrate into the existing landscape.
10. Consistency of the proposed development with the Town Master Plan Concepts.
11. Compliance with the provision of Massachusetts General Laws, Chapter 40A and 41A, the rules and regulations of state and federal agencies and the Bylaw of the Town of Lenox.

### **9.5.10 Sewer and Water Capacity**

Each development proposal shall demonstrate that it will not adversely affect the existing loads on the public water and public sewer systems of the Town. The Department of Public Works or its agent shall serve to determine the existing load on the public water and public sewer systems of the Town. In the event that the Applicant is unable to demonstrate that there will be no adverse effect or if the Board should find there will be an adverse impact, the Board may require the Applicant to redesign the development proposal to minimize such impact and may require the Applicant to proceed with development in phases as specified by the Board.

The Board may specifically require a development density less than that otherwise permitted under this Bylaw. In the alternative, the Applicant may offer to fund any required capital improvements deemed necessary by the Board to handle the increased water and sewer demands of the proposed development and the Board may require bonding in an amount sufficient to provide adequate security to the Town for the completion of said capital improvements. Any such capital improvements will be subject to the approval and continuing review of the Board of Public Works.

#### **9.5.11 Stormwater Management**

All development shall be designed so that resulting stormwater conditions resemble, as nearly as possible, preexisting conditions of volume, velocity, quality and location of runoff.

#### **9.5.12 Erosion Control**

Any area of bare earth exposed through nonagricultural building development must be permanently stabilized through replanting, paving, or other means of eliminating wind or water erosion. Such stabilization must be completed prior to building occupancy, or a performance bond must be posted in an amount sufficient to assure completion of such work. All construction must comply with the following:

1. Stripping of vegetation, regarding or other development shall be done in a way which will minimize soil erosion.
2. Whenever practical, natural vegetation shall be retained, protected and supplemented.
3. The disturbed area shall be kept to a minimum.
4. Where necessary, temporary vegetation and/or mulching shall be used to protect areas exposed during development.
5. Sediment basins (debris basins, desilting basins or silt traps) shall be installed and maintained where necessary to remove from runoff water any sediment from land undergoing development.
6. The angle of graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or alternative proposed erosion control devices or structures. In any event, slopes left exposed must immediately be planted or otherwise provided with permanent ground cover or other means sufficient to retain erosion.
7. The development plan or land-disturbing activity shall be fitted to the topography and soils so as to create the least erosion potential.

#### **9.5.13 Design Standards**

1. Any proposed landscape development or alteration should be compatible with the character and appearance of the surrounding area and the proposed project. Landscape and

streetscape elements should provide continuity and definition to the street, pedestrian areas and surrounding landscape.

2. The design should give attention to the placement of storage, waste or mechanical equipment so as to screen it from view. Exposed storage areas, exposed machinery installations, service areas, truck loading areas, utility buildings and structures, and similar accessory areas and structures shall be subject to setbacks, screen plantings or other screening methods described in this section and in Section 5.1.15 to hide their existence and cause them to blend in with the existing or contemplated environment and the surrounding properties.
3. The proposed materials and colors must be compatible with the character of the Town and the intent of the design standards. With respect to Lenox's unique architectural heritage, removal or alteration of historic, traditional or significant uses, structures, or architectural elements shall be minimized insofar as practicable, whether these exist on the site or on adjacent properties.
4. Where feasible, fire escapes, window mounted air conditioners or other mechanical features should not be located on facades which front major streets, or face residential districts.
5. Architectural details including but not limited to additions, signage, awnings, lighting, pedestrian furniture, planting and paving, shall be compatible with the architecture of the principal building and site landscaping with regards to scale, materials, color, and texture.
6. Buildings and structures shall be designed and arranged so as to relate to open space in a manner compatible with adjacent lots.
7. New development shall be compatible with existing natural and developed environment within the surrounding visual area. New buildings, additions or alterations shall be related to their surroundings with respect to:
  - a. Street façade. All buildings should present high quality and architecturally related front facades to streets.
  - b. Buildings on corner lots. If one street is more heavily used, then the facade of a new or renovated building facing that street may be more highly articulated and/or detailed than the facade which faces the side street.
  - c. Renovations to historic buildings. Historic buildings should be renovated so as to retain historic features with original storefront elements and facade detailing.
  - d. Roof Slopes. Heights of new buildings erected on sites without an existing building shall approximate those of adjacent buildings where feasible. Diverse roof heights are encouraged, however, should be complementary to the surrounding developed environment.

**9.5.14 Lapse**

Site plan approval shall lapse after one year from the grant thereof if a substantial use thereof has not sooner commenced except for good cause. Such approval may, for good cause, be extended in writing by the Board upon the written request of the applicant.

**9.5.15 Fee**

The Board may adopt reasonable administrative fees and technical review fees for site plan review.

**9.5.16 Appeal.**

Any decision of the Board pursuant to this Section shall be appealed in accordance with G.L. c. 40A, s. 17 to a court of competent jurisdiction.

## SECTION 10 DEFINITIONS

In this by-law, the following terms and constructions shall apply unless a contrary meaning is required by the context or is specifically prescribed in the text of the by-law. Words used in the present tense include the future. The singular includes the plural and the plural includes the singular. The word "shall" is mandatory and "may" is permissive or discretionary. The word "and" includes "or" unless the contrary is evident from the text. The word "includes" or "including" shall not limit a term to specified examples, but is intended to extend its meaning to all other instances, circumstances, or items of like character or kind. The word "lot" includes "plot"; the word "used" or "occupied" shall be considered as though followed by the words "or intended, arranged, or designed to be used or occupied". The words "building," "structure," "lot," or "parcel," shall be construed as being followed by the words "or any portion thereof." The word "person" includes a firm, association, organization, partnership, company, or corporation, as well as an individual. Terms and words not defined herein but defined in the Commonwealth of Massachusetts state building code shall have the meaning given therein unless a contrary intention is clearly evident in this by-law.

***Accessory buildings:*** Accessory buildings, not including a private garage, - a building or structure subordinate and incidental to the principal use of the primary building on a property lot or on an adjoining lot under the same ownership. Accessory buildings in a residential zone shall not exceed twenty (20) feet to the ridge (height) above mean grade at the foundation and shall not be located nearer than twenty (20) feet to the principal building or occupy more than ten (10) percent of the lot area and shall not be located any nearer to any street than the required minimum street line set back of the zoning district. Allowed by right.

***Accessory dwelling unit:*** An accessory dwelling unit (ADU) is a self-contained dwelling unit in an owner occupied single-family home that is either enclosed within the principal dwelling unit or made part of an accessory structure on the same property.

***Apartment unit:*** Any number of rooms comprising one complete housekeeping unit of not less than 700 square feet with its own cooking and food storage equipment and facilities and its own bathing and toilet facilities wholly within such suite of rooms. Apartment shall include condominium or cooperative ownership.

***Accessory use:*** A use customarily incidental to that of the main or principal building or use of the land.

***Adult day care facility:*** A social day care or adult day health facility as those terms are defined by the Commonwealth's Department of Elder Affairs.

***Agricultural use, exempt:*** Agricultural use of property exempted by G.L. c. 40A, s. 3 on a parcel larger than five acres.

***Agricultural use, nonexempt:*** Farms, livestock or poultry, but not swine, mink, chinchilla or other animals raised for their pelts on a parcel with less than five acres, provided that any that any building housing livestock or poultry may not be less than 300 feet from the property boundary.

**Apartment building:** A free-standing building used exclusively for residential use in three (3) or more apartment units.

**Assisted living/congregate care:** A residential development subject to certification under G.L. Chapter 19D, which provides room and board; provides assistance with activities of daily living for three or more adult residents who are not related by consanguinity or affinity to their care provider; and collects payments or third party reimbursement from or on behalf of residents to pay for the provision of assistance.

**Bed and breakfast in-home stay/room rental:** Seasonal rental of rooms to not more than three (3) persons in a dwelling whose principal use is a private home for its owner with lodging as an accessory use. The home shall be the legal residence of the owner. Only continental breakfast from the common family kitchen is permitted.

**Bed and breakfast inn or lodging:** Rental to four (4) or more people and/or furnishing of room and breakfast to not more than twenty (20) people in a dwelling that shall be the legal residence of the owner. Only breakfast from the family kitchen is permitted. A food establishment permit is required for continental or full breakfast.

**Building:** A combination of materials to form a construction that is safe and stable, built according to any applicable building codes, and adapted to permanent or continuous occupancy for assembly, business, education, industrial, institutional, residential or storage purposes; and the term "building" shall be construed as if followed by the words "or portion thereof".

**Building height:** The vertical distance as measured from the mean grade at the foundation to the building's ridge line. Thirty-five (35) feet is the maximum height.

**Building setback** - see setback, building.

**Business office:** A building or part thereof, for the transaction of business or the provision of services exclusive of the receipt, sale, storage, or processing of merchandise; no medical or dental offices directly serving patients, no retail business, no manufacturing and no processing.

**Bus storage** – Any area used or intended for use for the parking of busses (not to exceed 19 Ton GVW per bus) related to educational and religious purposes (A.T.M. 5/6/02).

**Child Care Facility:** A day care center or school age child care program, as those terms are defined in G.L. c. 28A, s. 9.

**Clinic:** An establishment where patients are admitted for examination and treatment on an outpatient basis by one or more physicians, dentists, other medical personnel, psychologists, or social workers and where patients are not lodged overnight.

**Club, Private** - See PRIVATE CLUB.

**Constructed:** The word "constructed" shall include the words "built", "erected", "reconstructed", "altered", "enlarged", "moved", and any others of like significance.

**Customary Home Occupation:** Self-employed resident occupants in their private homes working at an occupation which is limited to the home, carried forth at the home, employing no persons outside of the household, utilizing no outside structure or equipment, and requiring no more off-street parking facilities than would ordinarily be used by the household, such as dressmaking, preserving or home cooking, real estate agent, attorney, photographer, the giving of private music and dance lessons, or a one-chair beauty parlor. Customary home occupation does not include gift shop, antique shop, or any similar retail establishment.

**Domestic Pets:** See PETS, DOMESTIC.

**Drive-Through Facility:** A commercial facility which provides a service directly to a motor vehicle or where the customer drives a motor vehicle onto the premise and to a window for mechanical device through or by which the customer is serviced without exiting the vehicle. This shall not include for example, the selling of fuel at a motor fuel facility or the accessory function of a carwash facility such as a vacuum cleaning station.

**Drive-Through Facility – Fast Food:** A drive-through facility that serves food or drink.

**Drive-Through Facility – Other:** A drive-through facility that does not include food or drink; includes banks, pharmacies, and similar uses.

**Dwelling:** A building occupied or suitable for occupancy as a residence but not including trailers or mobile homes however mounted or commercial accommodations offered for periodic occupancy, e.g. motel, hotel.

**Dwelling, One Family:** A free-standing building used exclusively for residential use by not more than by one family.

**Dwelling, Two Family:** A free-standing building exclusively for residential use by two families but not more than two families. Each unit shall contain not less than 700 square feet of habitable floor area. This definition shall also include the term "duplex".

**Dwelling, Multifamily:** A free-standing building used exclusively for residential use by three or more families.

**Eating Establishment:** An establishment with kitchen facilities where food is prepared for consumption, including the serving of alcoholic beverages.

**Eating establishment, fast-food:** An establishment whose principal business is the sale of prepared or rapidly prepared food directly to the customer in a ready to consume state for consumption either within the restaurant building or off premises and usually requires ordering food at a counter.

**Essential services:** Services provided by a public service corporation or by governmental agencies through erection, construction, alteration, or maintenance of gas, electrical, steam, or water transmission or distribution systems and collection, communication, supply, or disposal



systems whether underground or overhand, but not including wireless communications facilities. Facilities necessary for the provision of essential services include poles, wires, drains, sewers, pipes, conduits, cables, fire alarm boxes, police call boxes, traffic signals, hydrants and other similar equipment in connection therewith.

***Establishment for manufacture, assembly or packaging of consumer goods:*** provided that some of the merchandise is sold at retail on the premises and that all display, sales & storage is conducted within a building; and further provided that not more than 25% of floor area is devoted to manufacturing, assembly, or packaging of consumer goods and that not more than 5 persons are employed at any one time for the manufacturing, assembly, or packaging of such goods.

***Extended-Care Nursing Facility:*** Extended care nursing facility, rehabilitation facility, convalescent facility, or any such institution, however named, whether conducted for charity or for profit, which is maintained for the purpose of caring for up to one-hundred forty (140) persons, requiring medium to intensive medical, rehabilitative, or convalescent therapy and who need assistance or monitoring on a regular basis.

***Family:*** An individual residing in one dwelling unit, or any number of related individuals or up to four unrelated individuals living as one housekeeping unit and using in common among them one set of cooking and food storage equipment and facilities.

***Family day care home, large or small:*** Any private residence operating a facility as defined in G.L. c. 28A, s. 9.

***Farm stand, exempt:*** Facility for the sale of produce, wine and dairy products on a parcel of five acres exempted by G.L. c. 40A, s. 3.

***Farm stand, nonexempt:*** Facility for the sale of produce, wine and dairy products on a parcel of less than five acres not exempted by G.L. c. 40A, s. 3.

***Fencing:*** Any opaque or semi-opaque fence, wall, sign, or any other fabricated visual barrier or enclosure. Fences in side and rear yards are not to exceed six (6) feet in height. Fences in the street line setback are not to exceed four (4) feet in height and be not more than fifty (50) percent solid, and be finished on the good side which is to face the abutting property. (Revised in accordance with the Attorney General Approval dated July 23, 2008.)

***Floor Area, Gross:*** Gross floor area shall be the floor area within the perimeter of the outside walls of the building under consideration, without deduction for hallways, stairs, closets, thickness of walls, columns, or other features.

***Frontage Lot:*** A lot line coinciding with the sideline of a street which provides both legal rights of vehicular access and physical vehicular access to the lot, said line to be measured continuously along a single street or along two (2) intersecting streets if their angle of intersection is greater than one hundred and twenty (120) degrees. Vehicular access to a building site on the lot shall be exclusively through the frontage of the lot.

**Funeral home:** Facility for the conducting of funerals and related activities such as embalming.

**Garage, private:** A structure used exclusively for parking and storage of motor vehicles and owned or operated by residents of nearby dwelling units, not operated for commercial purposes and not available to the general public.

**General Laws (G.L.):** The General Laws of the Commonwealth of Massachusetts.

**General service establishment:** Professional trades and crafts serving local needs such as job printing, electrical, plumbing, interior design or carpentry shop- in every case all indoor operations

**Home Occupation, Customary:** See CUSTOMARY HOME OCCUPATION.

**Hospital:** An institution providing primary health services and medical or surgical care to persons, primarily inpatients, suffering from illness, disease, injury, and other physical or mental conditions and including, as an integral part of the institution, related facilities, including laboratories, outpatient facilities, training facilities, medical offices, and staff residences.

**Kennel, commercial:** A commercial establishment in which more than three (3) dogs or domesticated animals are housed, groomed, bred, boarded, trained or sold.

**Laboratory or research facility:** including but not limited to computer-related and media businesses, printing, binding, and publishing, with accessory manufacturing or processing, provided such use and its storage materials are total enclosed in a building. No use will be allowed which is determined to be noxious, detrimental or dangerous to the surrounding area.

Limited retailing and/or mail order processing of furniture, antique, clothing collectible dolls and related products: Manufactured on site. All display, sales and storage must be conducted within the building. No more than 2 persons including the proprietor shall be employed at any time for the manufacturing, assembly, packaging or processing of such goods. Permissible retail floor area shall be tied to provision of on-site parking spaces in full compliance with the requirements of this bylaw.

**Loading Space, Off-Street:** See OFF-STREET LOADING SPACE.

**Lot:** An area of land in one ownership or one leasehold with ascertainable boundaries established by deed or deeds of record, or a segment of land ownership defined by lot boundary lines on a land division plan duly recorded, said plan having been either approved by the Planning Board under the Subdivision Control Law, or endorsed by the Planning Board "approval under the Subdivision Control Law not required".

**Lot Line:** The boundary between lots.

**Lot Line Setback:** See SETBACK, LOT LINE

**Lot Width:** The width of a lot, measured at the street building setback line, measured parallel to or concentric with the street line.

**Mixed Use Development:** The development of a tract of land, building, or structure with multiple uses such as, but not limited to, residential, office, retail, institutional, entertainment, or light industrial, in a compact village form, with vehicular access to an accepted public way (ATM 5/5/05).

**Motel:** The word "motel" shall include "hotel", "inn", "tourist home", "guest house", and any others of like significance.

**Motel Unit:** Any room or suite of rooms with its own bathing facilities and toilet facilities wholly within such room or suite of rooms but without its own cooking and food storage equipment and facilities.

**Motor vehicle body repair:** An establishment, garage or work area enclosed within a building where repairs are made or caused to be made to motor vehicle bodies, including fenders, bumpers and similar components of motor vehicle bodies, but does not include the storage vehicles for the cannibalization of parts.

**Motor vehicle general repairs:** Premises for the servicing and repair of autos, but not to include fuel sales.

**Motor vehicle light service:** Premises for the supplying of fuel, oil, lubrication, washing, or minor repair services, but not to include body work, painting, or major repairs.

**Municipal Use:** Any TOWN OF LENOX use of land in accordance with statutory laws governing municipal powers and functions including participation in regional uses.

**Non-Conforming Use:**

A non-conforming use of land or buildings is an existing use of land or buildings which does not conform to the regulations for the district in which such use of land or building exists but which legally existed at the time of publication of notice of the hearing before the Planning Board respecting the regulation to which it does not conform.

**Nursing or convalescent home:** Any building with sleeping rooms where persons are housed or lodged and furnished with meals and nursing care for hire.

**One Family Dwelling:** See DWELLING, ONE FAMILY

**Off-Street Loading Space:** For the purposes of this Bylaw an off-street loading space is defined as accommodations off the street for loading and unloading of trucks, in the form of one or more truck berths located either within a building or in open space on the same lot. The area of each berth shall not be less than 350 square feet and it shall have a minimum clear height, including access to it from the street of fourteen (14) feet.

***Out Patient Facility:*** An ambulatory health care facility is where patients are seen for examination and treatment on an outpatient basis by one or more physicians, dentists or other medical personnel, psychologist, or social workers.

***Parking Area:*** Any area used or intended for use for vehicular parking including loading and unloading areas but not including driveways except for one and two family dwellings.

***Parking Area Setback:*** See SETBACK, PARKING AREA.

***Personal service establishment:*** A facility providing personal services such as hair salon, barber shop, tanning beds, dry cleaning, print shop, photography studio, tailor shop, shoe repair, laundry, self-service dry cleaning or pick-up agency, in every case an all indoor operation.

***Pets, Domestic:*** Those animals which may be and commonly are kept in the home, e.g., dogs, cats, fish, birds.

***Planned Unit Commercial Development:*** A planned unit commercial development shall consist of retail business and consumer service establishments conceived as an integrated unit characterized by common party walls between most of the individual retail and consumer service establishments.

***Private Club:*** Land and/or buildings used exclusively by members of an organized group, whose members are either elected by a committee of the group or by the membership, and not open to public use.

***Research Center:*** See Section 6.5.

***Resident:*** A person living in the particular building in question.

***Resort:*** Building or group of buildings, a portion thereof designed for serving food in a public dining room and containing 15 or more sleeping rooms for transient guests together with both indoor and outdoor recreational facilities with a variety of activities provided which could be judged self-sufficient for the entertainment of the guests therein.

***Retail establishment:*** A store serving retail business needs including but not limited to bakery, grocery, meat market, fruit store, hardware or paint store florist, news & tobacco store, drug store, provided display, storage and sales of material are conducted within a building and provided there be not manufacturing or assembly on the premises.

***Retirement Community:*** Removed at STM 4/15/08.

***Screening:*** A screen shall consist of one of the following:

- (a) Plant materials, at least three feet in height at the time of planting, which are of a type that may be expected to form a year-round dense screen and will reach a height in maturity of at least five feet.

- (b) A masonry wall or a wooden or fabricated fence from five to six feet in height at least 50% solid designed in an attractive manner to obscure any view.
- (c) Any existing growth of trees and shrubs if in the judgment of the Zoning Board of Appeals, or if the use is by right, the Building Commissioner, such growth provides equivalent screening.

**Setback:** The required minimum horizontal distance between the front, side, or rear property line and the related line(s) beyond which building or other improvements are permitted. (See definitions of Building Setback, Parking Area Setback, Street Setback and Lot Line Setback in this section.)

**Setback, building:** A setback in which there shall be no building or high fences.

**Setback, Parking Area:** A setback in which there shall be no parking area or intermediate height fencing.

**Setback, Street:** A setback along a street line.

**Setback, Lot Line:** A setback along a lot line other than a street line.

**Sign:** Any letter, word, symbol, drawing, picture, design, device, article or object that advertises, calls attention to or indicates any premises, person or activity, whatever the nature of the material and manner of composition or construction.

**Statute:** Statute shall mean, unless otherwise defined, MASSACHUSETTS GENERAL LAWS, as most recently amended.

**Story:** That portion of a building contained between any floor and the floor or roof next above it, but not including any portion so contained if more than one-half of such portion vertically is below the average mean finished grade of the ground adjoining such building.

**Street:** A public way, or a private way open to travel by the general public, or a way shown on a plan of a subdivision duly approved by the Planning Board.

**Street Setback:** See SETBACK, STREET

**Street Line:** The boundary between a street and a lot.

**Structure:** Any construction or any production or piece of work artificially built up or composed of parts joined together in some definite manner including but not limited to tents, reviewing stands, platforms, stagings, towers, display signs, fences, and swimming pools, but not including those fences which delineate property lines.

**Temporary Structures:** Trailers (such as construction), and tents that are for commercial use and are at least one-hundred twenty (120) square feet in size and will be occupied by more than ten (10) people may be issued a temporary permit by the Building Commissioner if the Building

Commissioner determines that such uses shall be reasonably required or customary. Such permit shall be for a period of not more than a year with renewal for successive period of not more than one additional year with permission of the Building Commissioner.

***Time-Sharing or Time Interval Ownership:*** An ownership in which the exclusive right of use, possession or occupancy circulates among various owners or lessees thereof in accordance with a fixed or floating time schedule on a periodically recurring basis, whether such use, possession or occupancy is subject to either:

- (a) Time-Share Estate, in which the ownership or leasehold estate in property is devoted to time-share fee (tenants in common, time span ownership, interval ownership) and a time-share lease; or
- (b) Time-Share Use, including any contractual right of exclusive occupancy which does not fall within the definition of Time-Share Estate, including, but not limited to a vacation license, prepaid hotel reservation, club membership, limited partnership or vacation bond.

***Townhouse:*** A group of attached dwelling units occupied by not more than one family in each unit between side walls, each unit having a separate entrance from the street and sharing a common open space. Townhouse shall include condominiums or cooperative ownership.

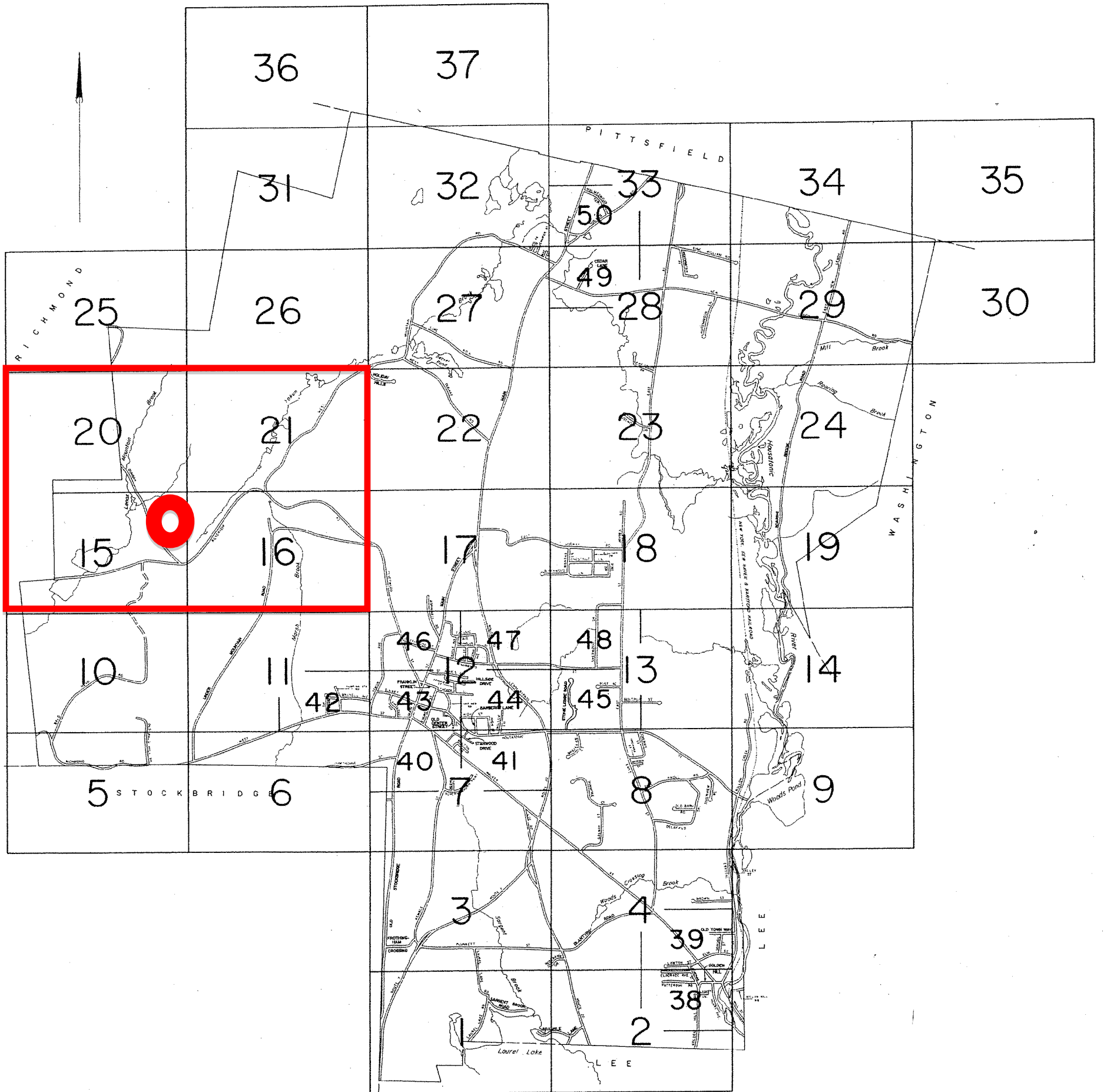
***Two Family Dwelling:*** See DWELLING, TWO FAMILY.

***Use, Accessory:*** See ACCESSORY USE.

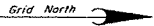
***Use Municipal:*** See MUNICIPAL USE.

***Use Non-conforming:*** See NON-CONFORMING USE.

***Utility, Public:*** See PUBLIC UTILITY.



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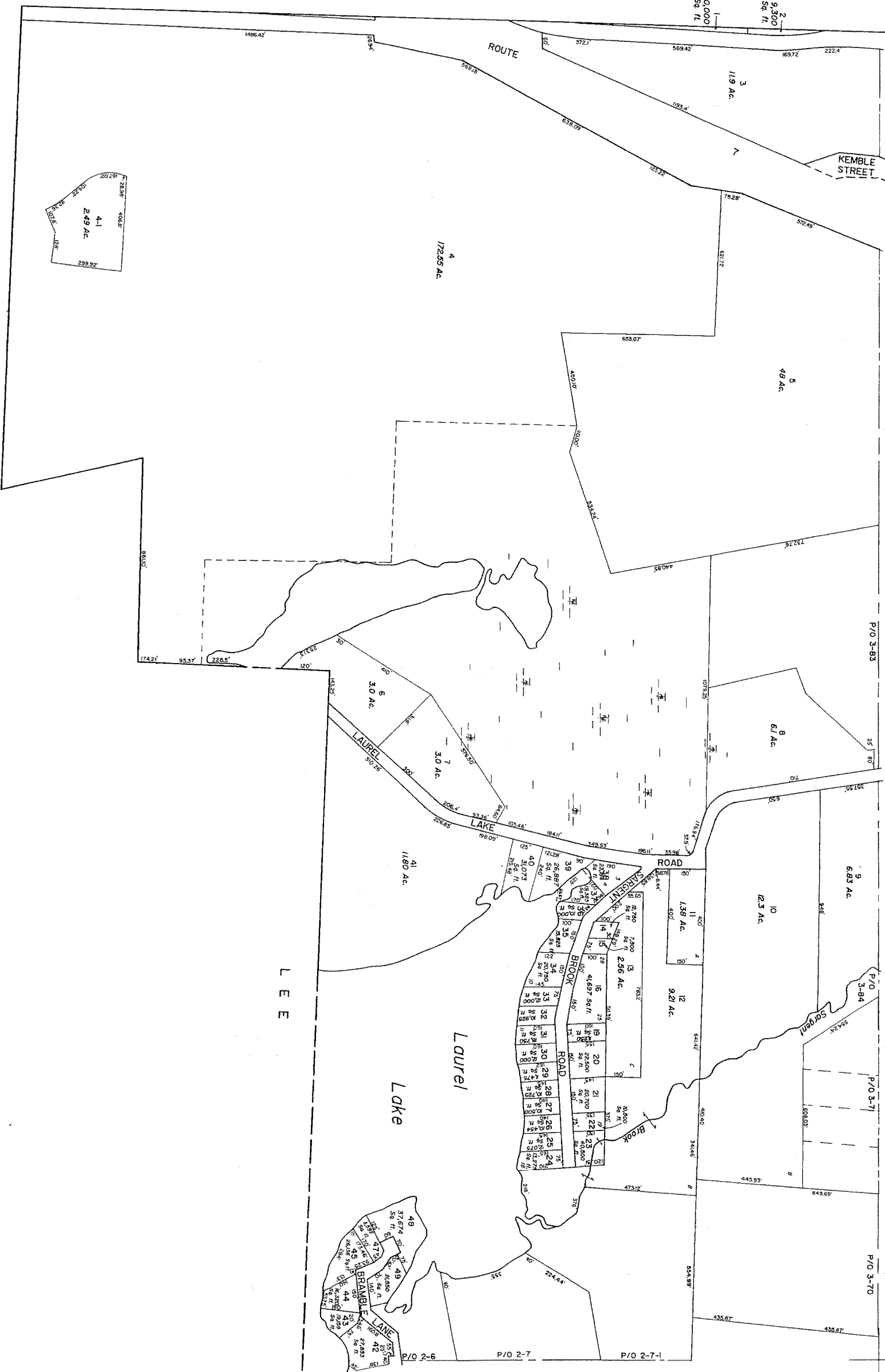
For Assessment Purposes  
Not to be used for Conveyances

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TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

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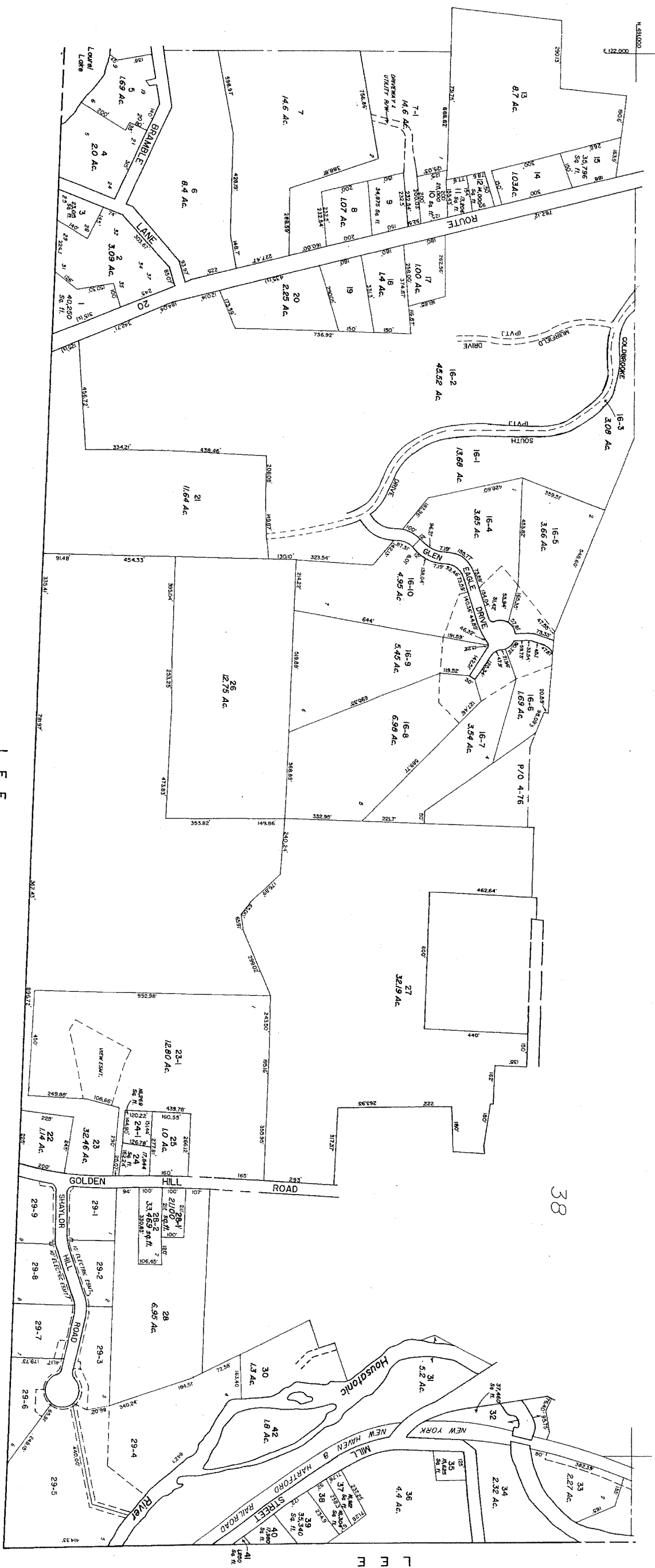
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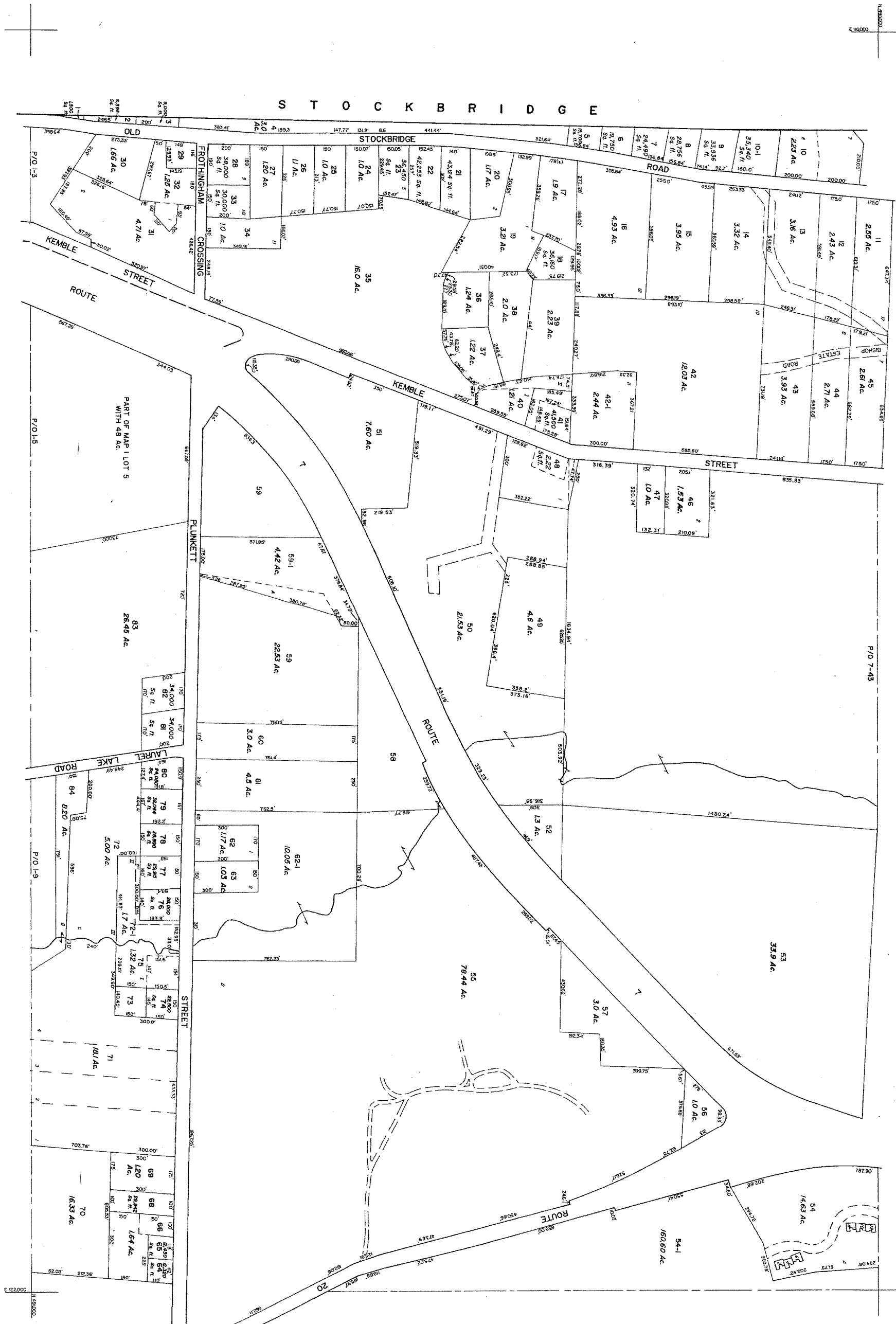
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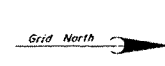
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JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
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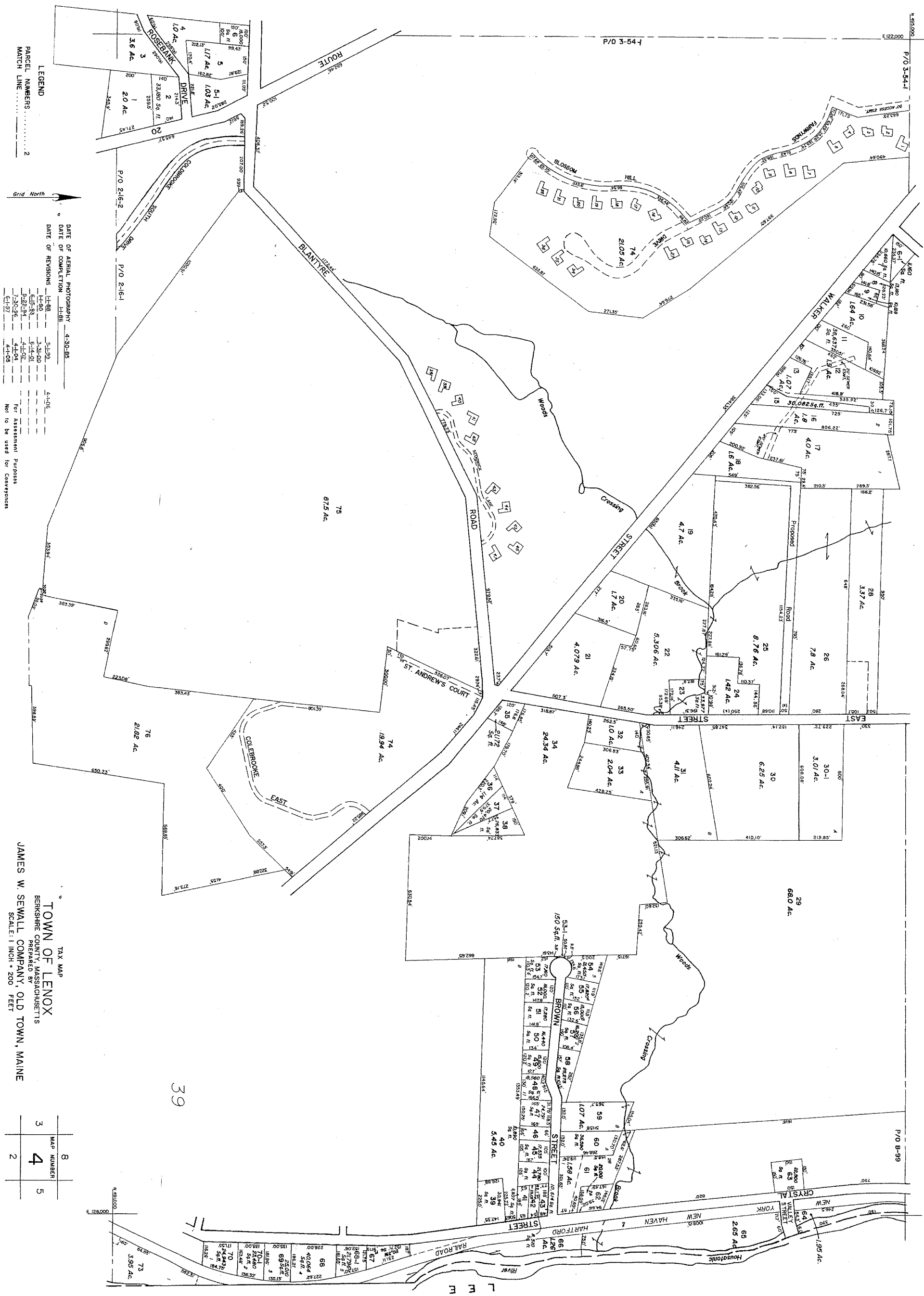


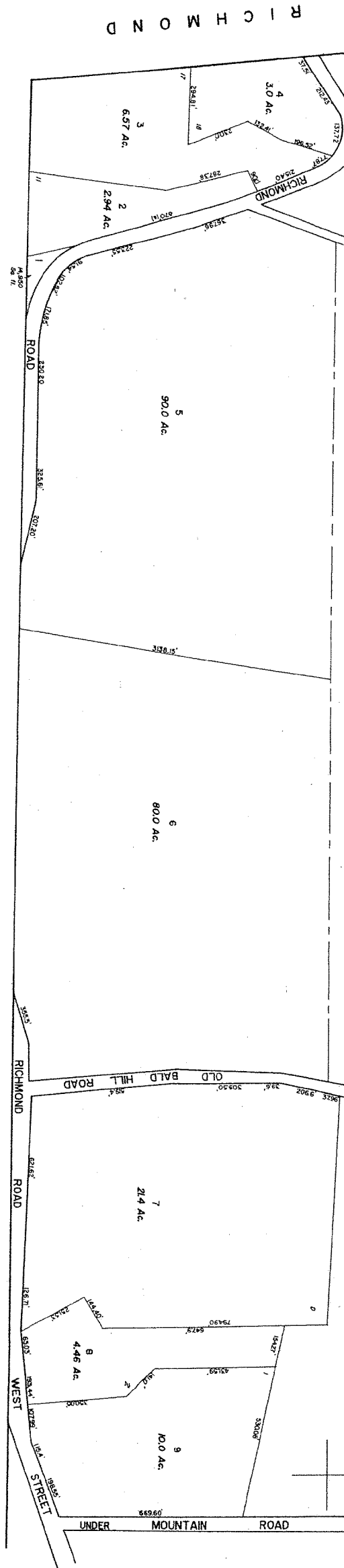
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TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
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JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

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RICHMOND

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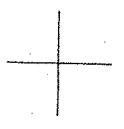
OLD BALD HILL ROAD

RICHMOND ROAD

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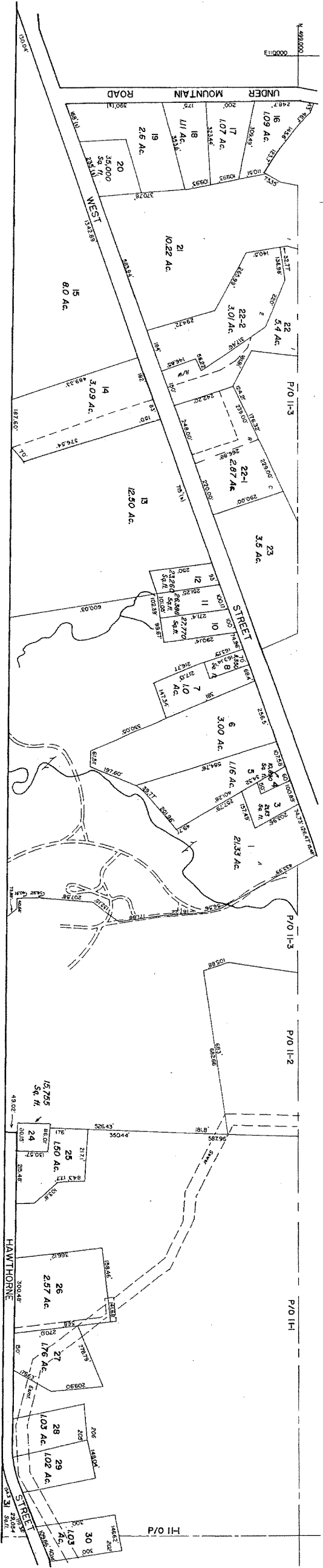
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Not to be used for Conveyances

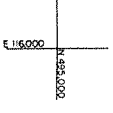
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PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
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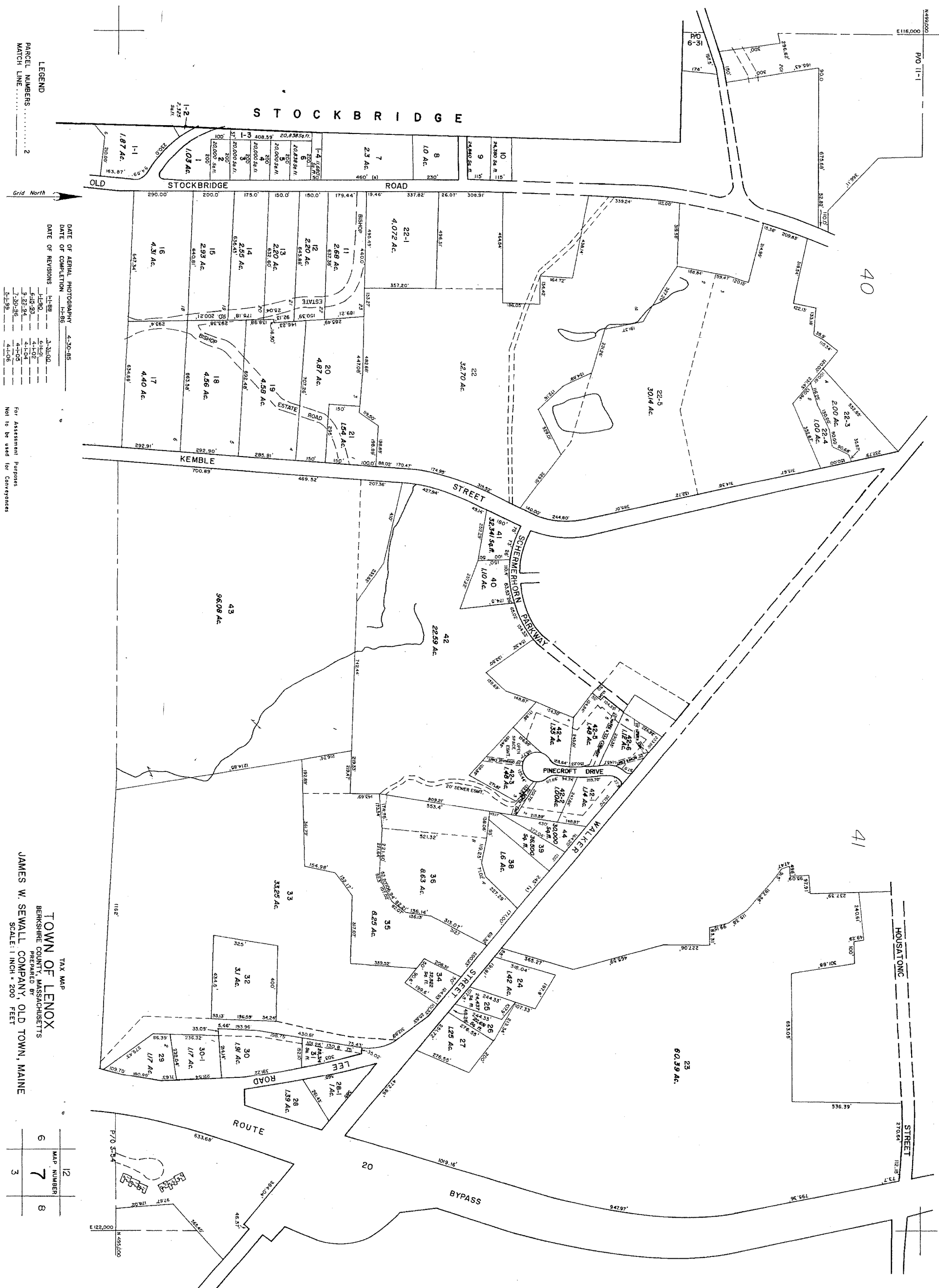
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For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
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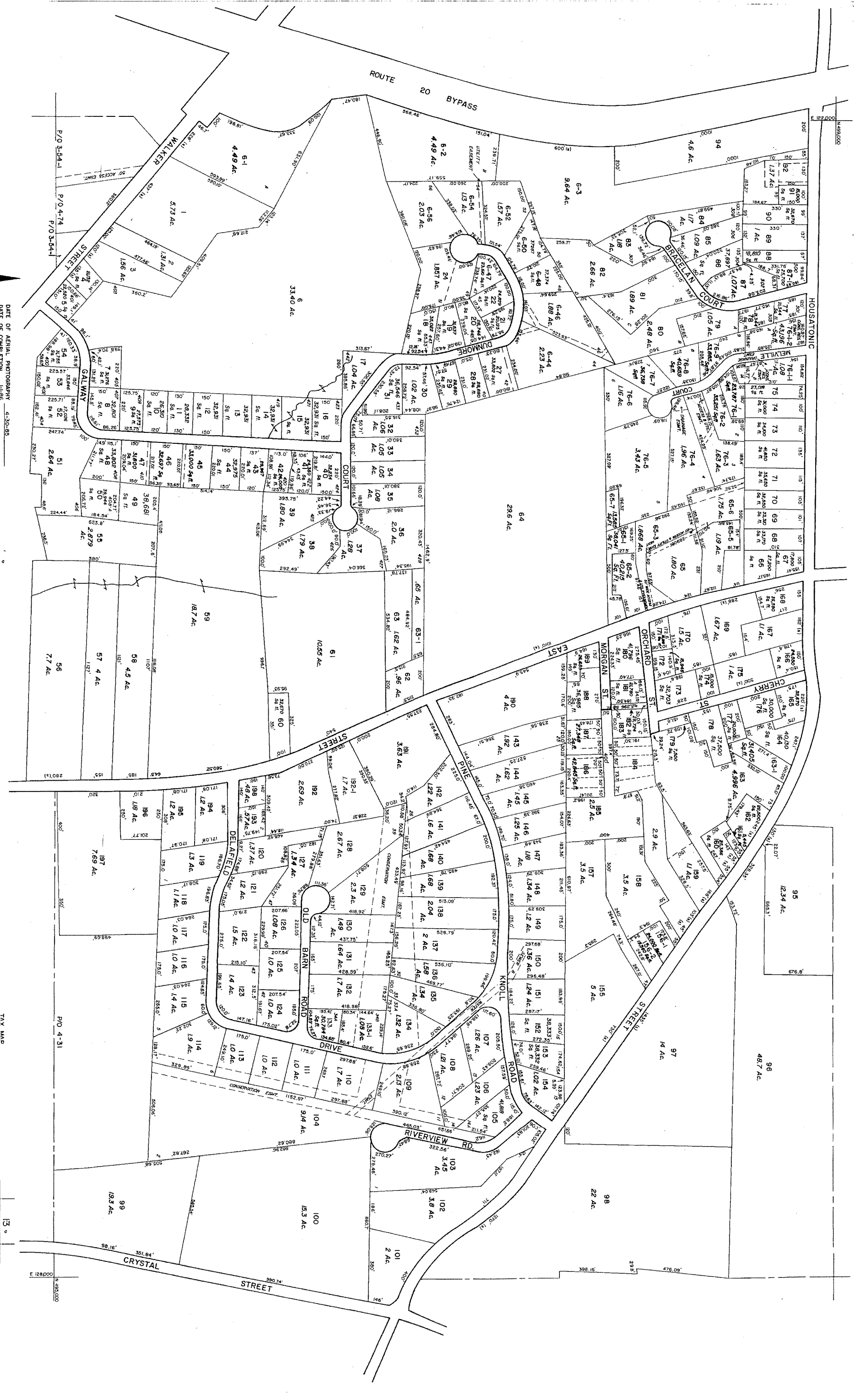
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For Assessment Purposes  
Not to be used for Conveyances

TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
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JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
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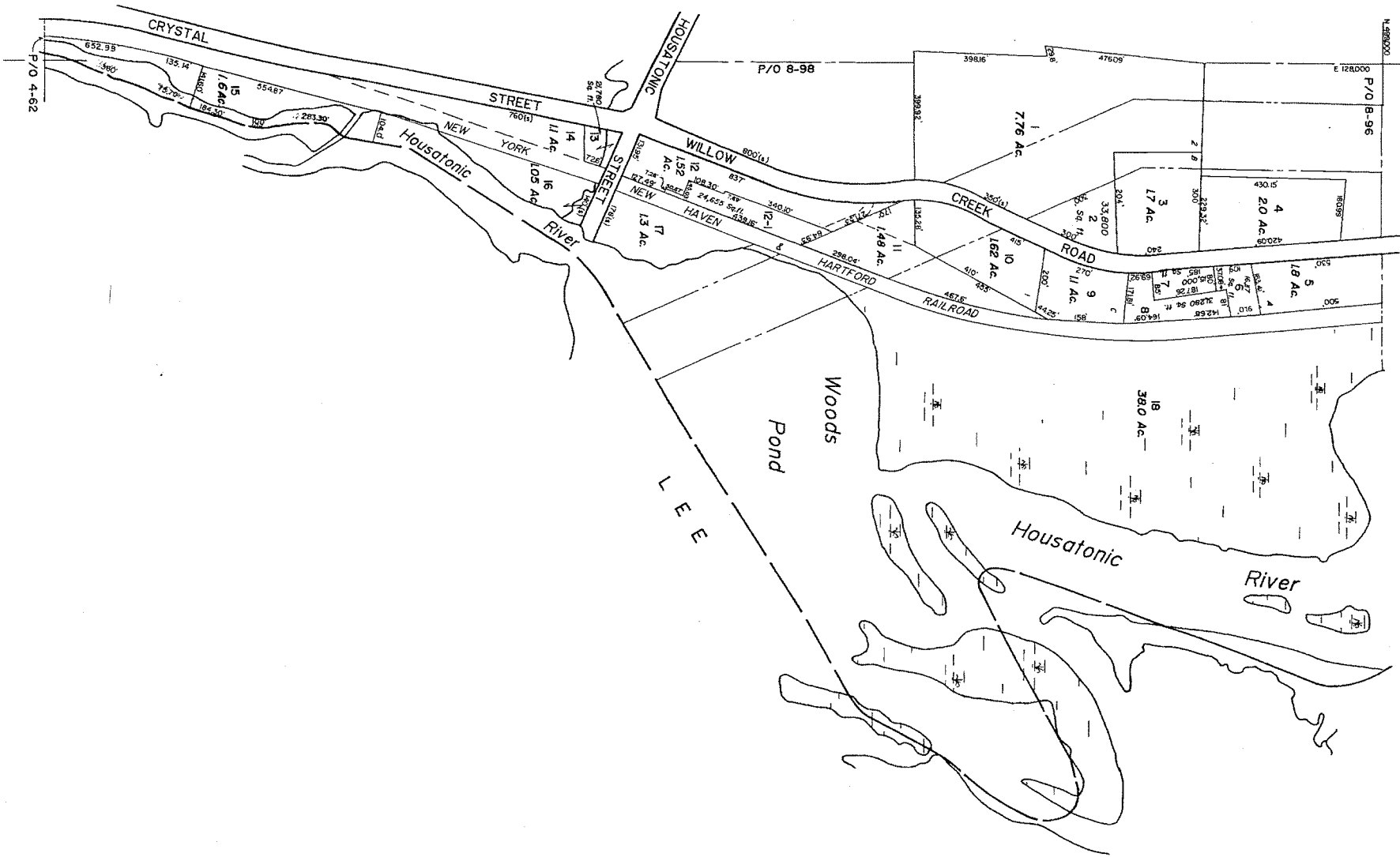
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TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER	13
7	8
4	9



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2

Grid North

DATE OF AERIAL PHOTOGRAPHY	4-30-85
DATE OF COMPLETION	7-8-85
DATE OF REVISIONS	
1-89	
7-30-96	
5-1-99	
4-1-06	

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

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N 435,000  
E 84,000



Lenox Mountain

Brook

2482.86

2  
225.0 Ac.

3  
85.25 Ac.

29.4 Ac.

B.14 Ac.

P/O 5-5

P/O 5-6

5  
17,820 Sq. Ft.  
207.06'

4  
126 Ac.  
214.60'

273.09'

BALD HILL ROAD

51.50'  
15.40'  
99.00'  
43.60'

29.4 Ac.


308/14

UNDER MOUNTAIN ROAD

LEGEND

PARCEL NUMBERS.....2

MATCH LINE.....

Grid North 

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 4-1-86  
DATE OF REVISIONS 5-13-87

[illegible]

For Assessment Purposes  
Not to be used for Conveyances

TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

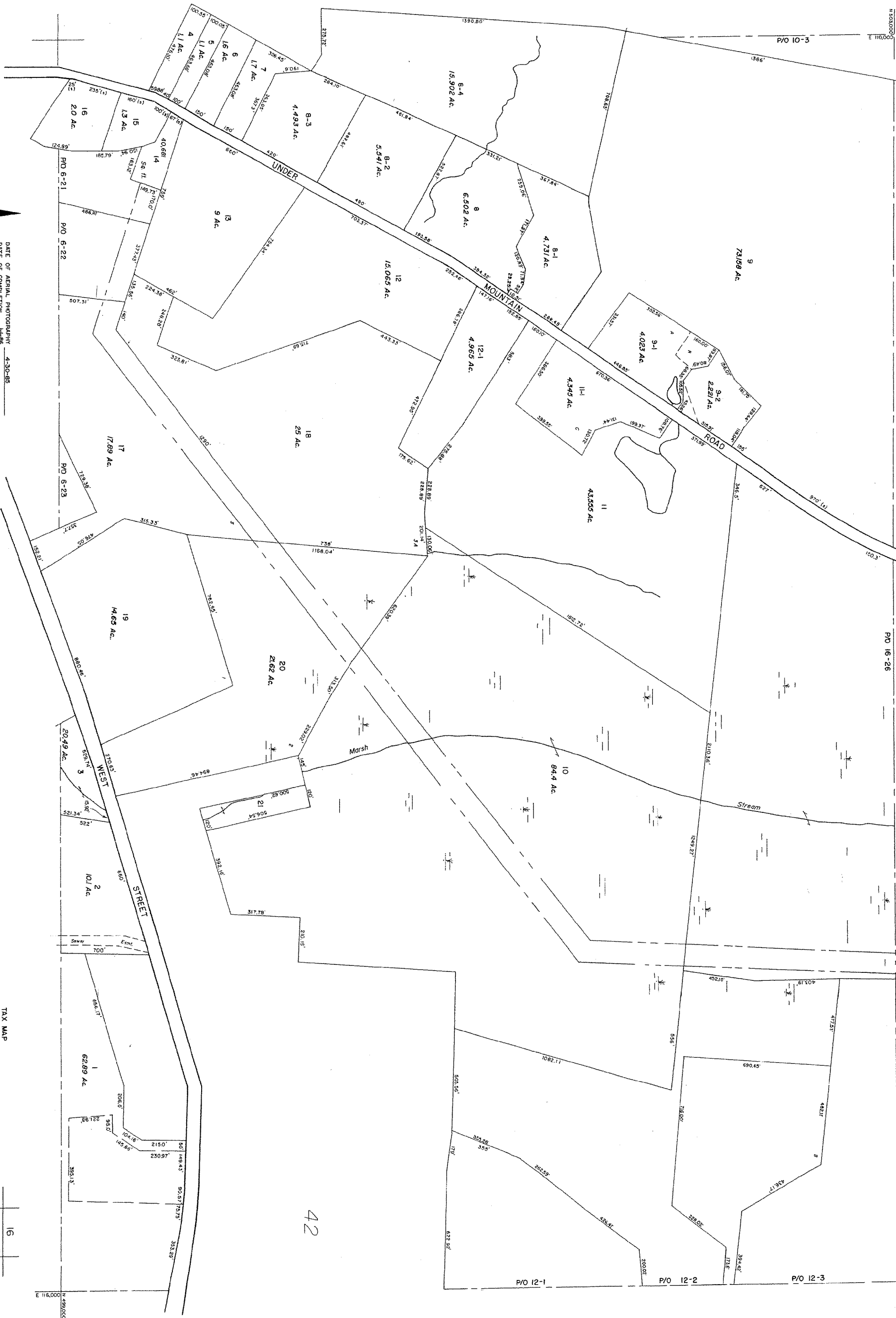
SCALE: 1 INCH = 200 FEET

TAX MAP  
OF

TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS

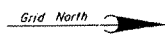
PREPARED BY

NUMBER	10
	11



42

LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE..... 2

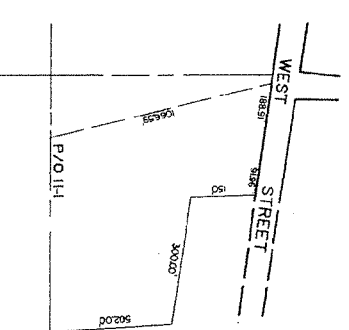


DATE OF AERIAL PHOTOGRAPHY	4-30-85
DATE OF COMPLETION	4-86
DATE OF REVISIONS	5-15-85
	5-22-84
	5-28
	5-31-80
	6-14-81
	7-1-82

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

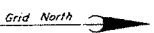
16	MAP NUMBER	10
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12		



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LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE.....



DATE OF AERIAL PHOTOGRAPHY	4-30-65
DATE OF COMPLETION	1-1-86
DATE OF REVISIONS	3-1-86
	3-1-89
	3-1-90
	4-1-04

For Assessment Purposes  
Not to be used for Conveyances

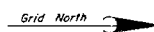
TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWELL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

11	17	13
7	12	



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE.....

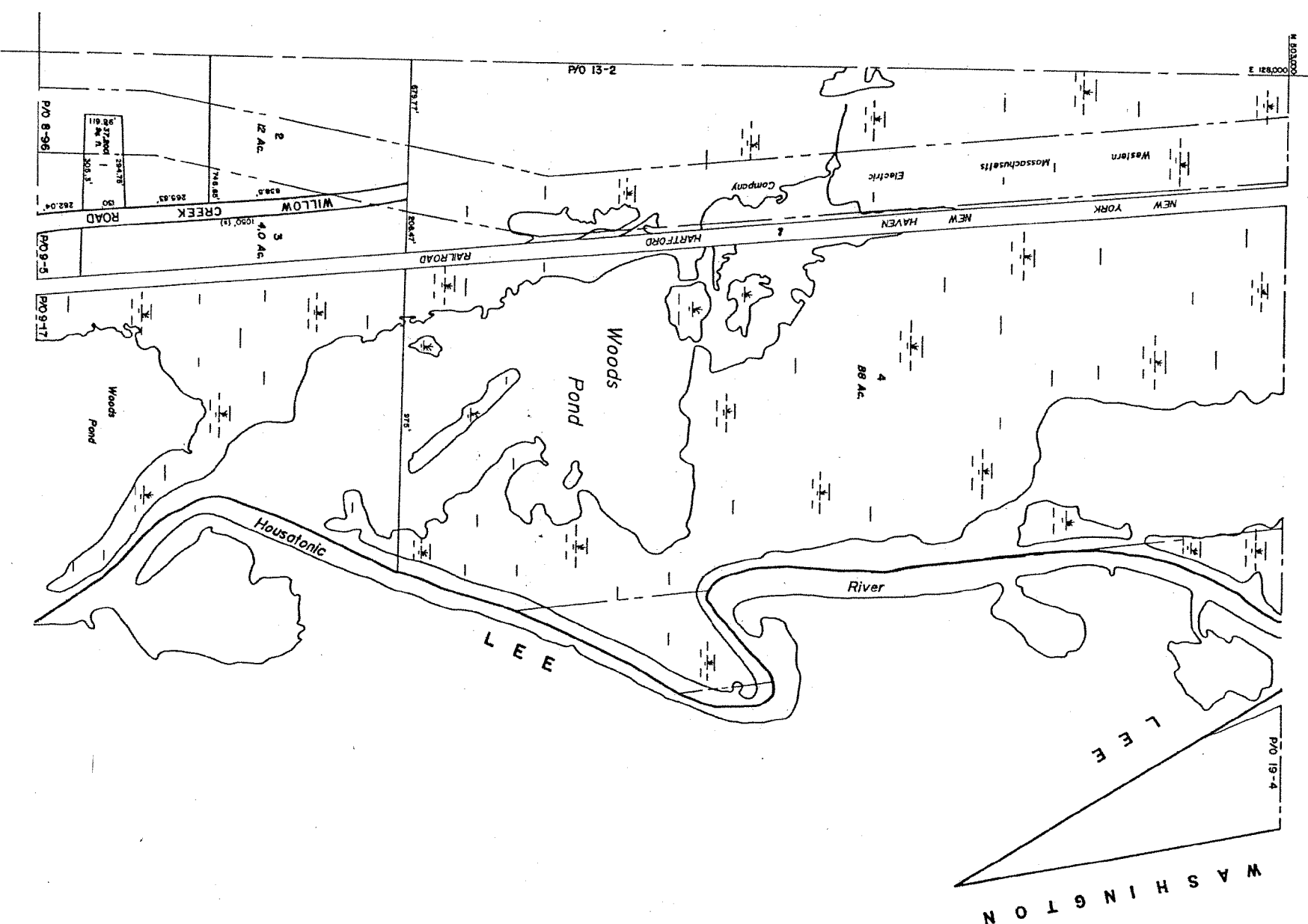
DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-1-86  
DATE OF REVISIONS 4-1-06  
5-1-93  
5-1-99  
6-1-01  
1-1-02  
4-1-04



For Assessment Purposes  
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TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

12	13	14
18	13	14



LEGEND

PARCEL NUMBERS ..... 2

MATCH LINE .....

Grid North 

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS \_\_\_\_\_

For Assessment Purposes  
Not to be used for Conveyance

TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

13	MAP NUMBER	19
9	14	



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

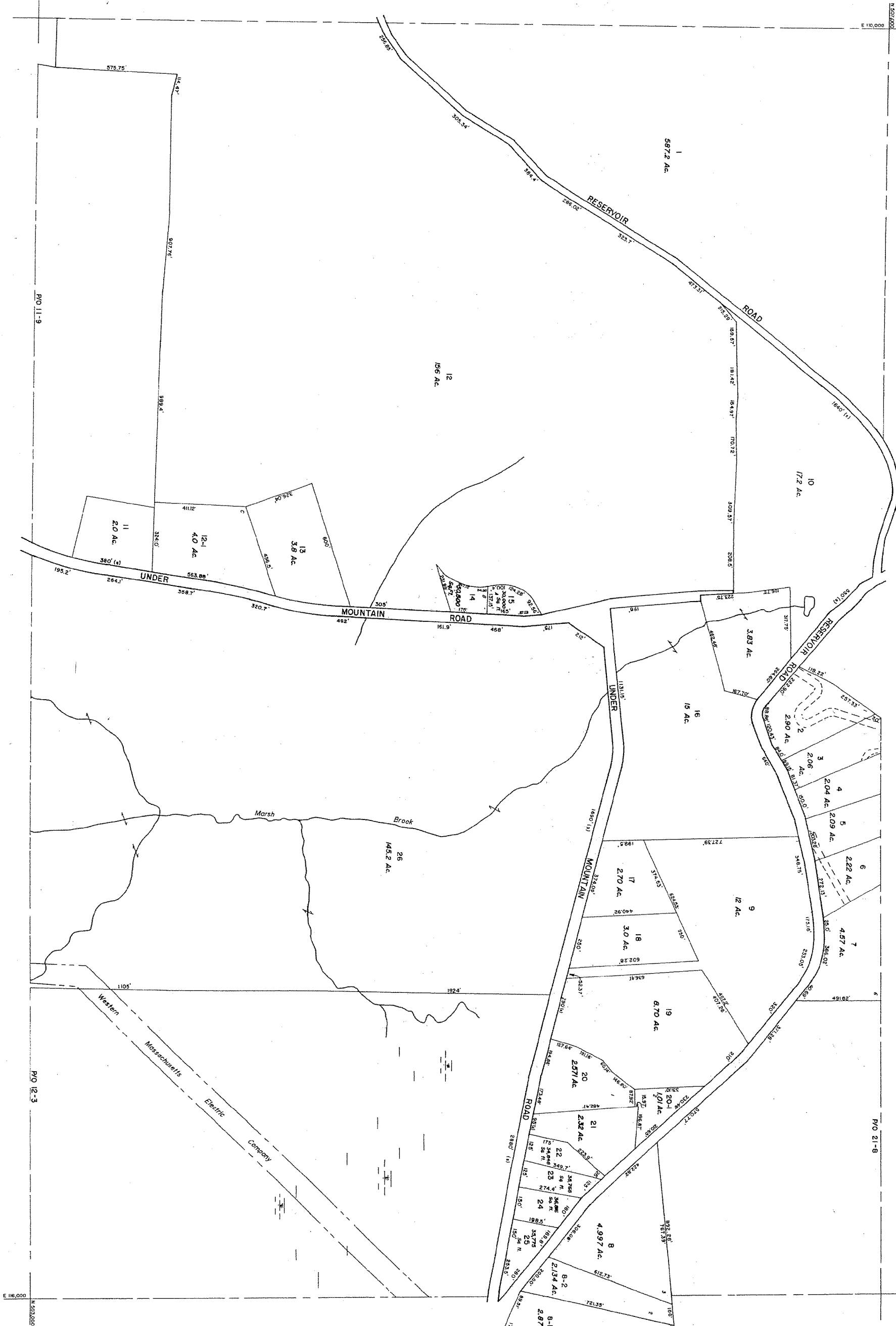


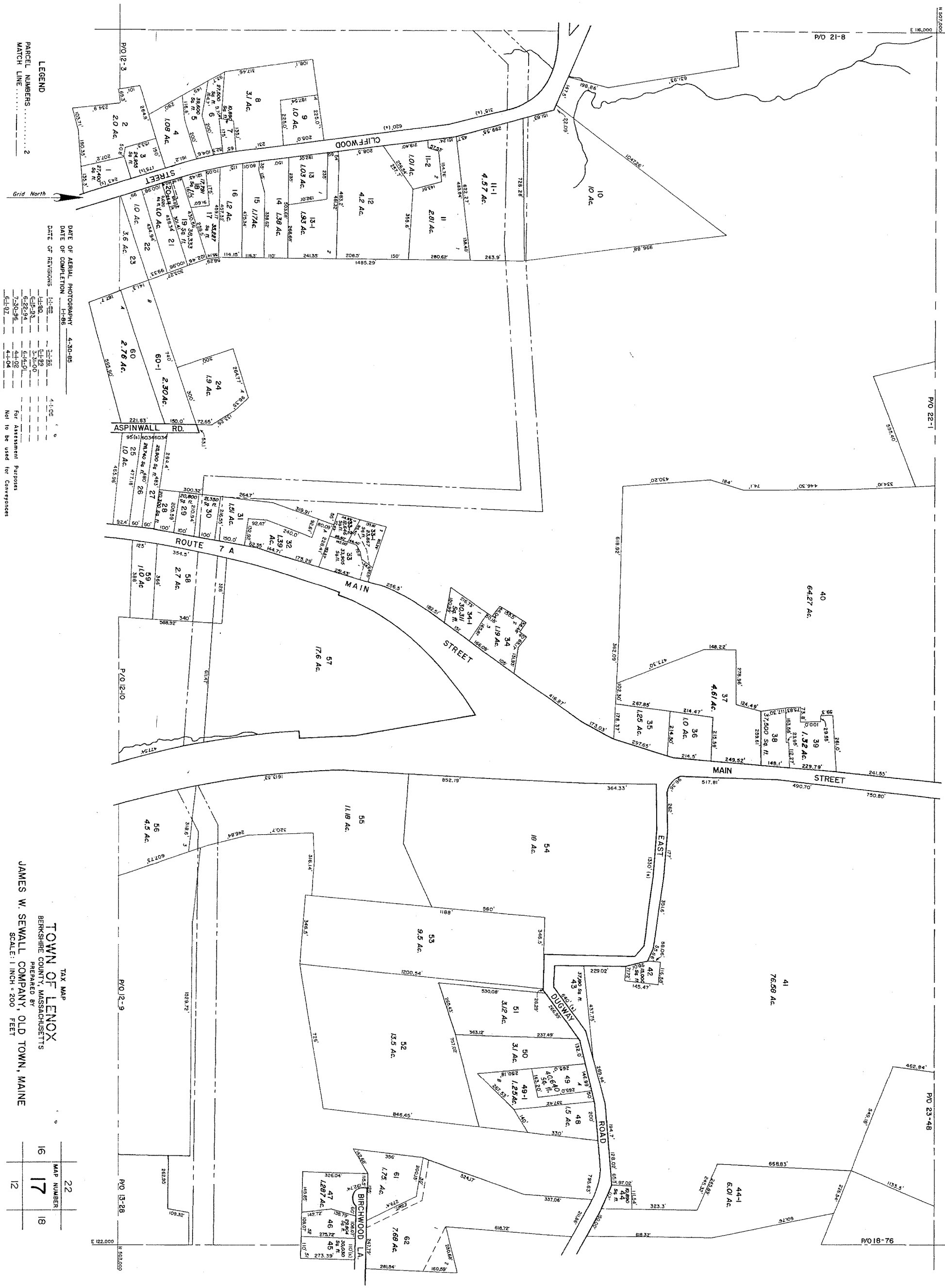
DATE OF AERIAL PHOTOGRAPHY	4-30-85
DATE OF COMPLETION	H-86
DATE OF REVISIONS	H-80
	6-25-83
	6-22-84
	7-30-85
	6-1-87
	3-3-00

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

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PARCEL NUMBERS.....2

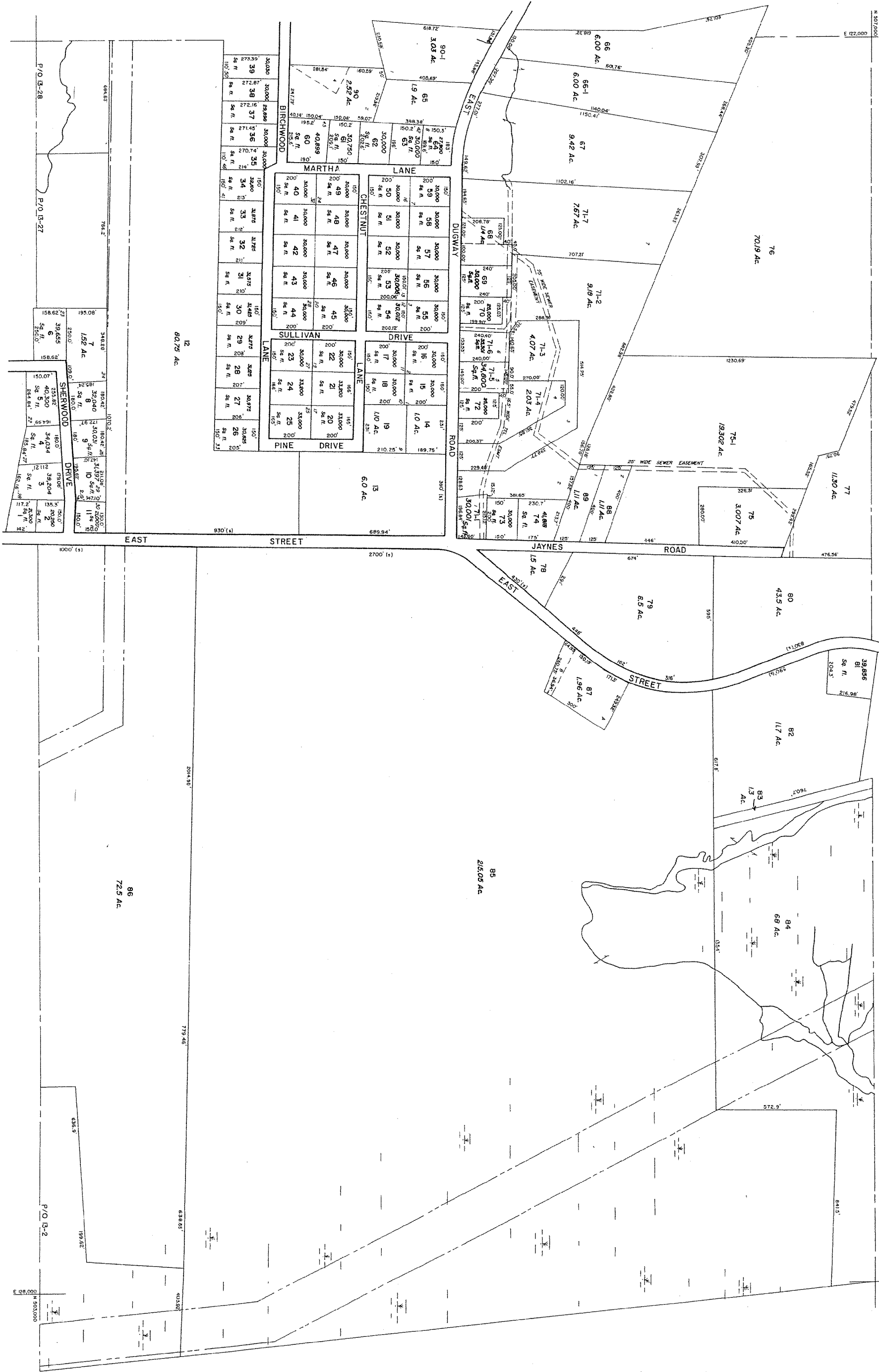
MATCH LINE.....

DATE OF AERIAL PHOTOGRAPHY		4-30-65	
DATE OF COMPLETION		4-66	
DATE OF REVISIONS	1-1-66	2-1-66	4-1-66
	4-1-60	5-1-60	
	6-1-63	3-31-60	
	6-22-64	6-16-60	
	7-26-65	4-1-62	
	6-1-67	4-1-64	
			For Assessment Purposes
			No to be used for Conveyances

TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
TAX MAP  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

16	MAP NUMBER	22
12	17	18





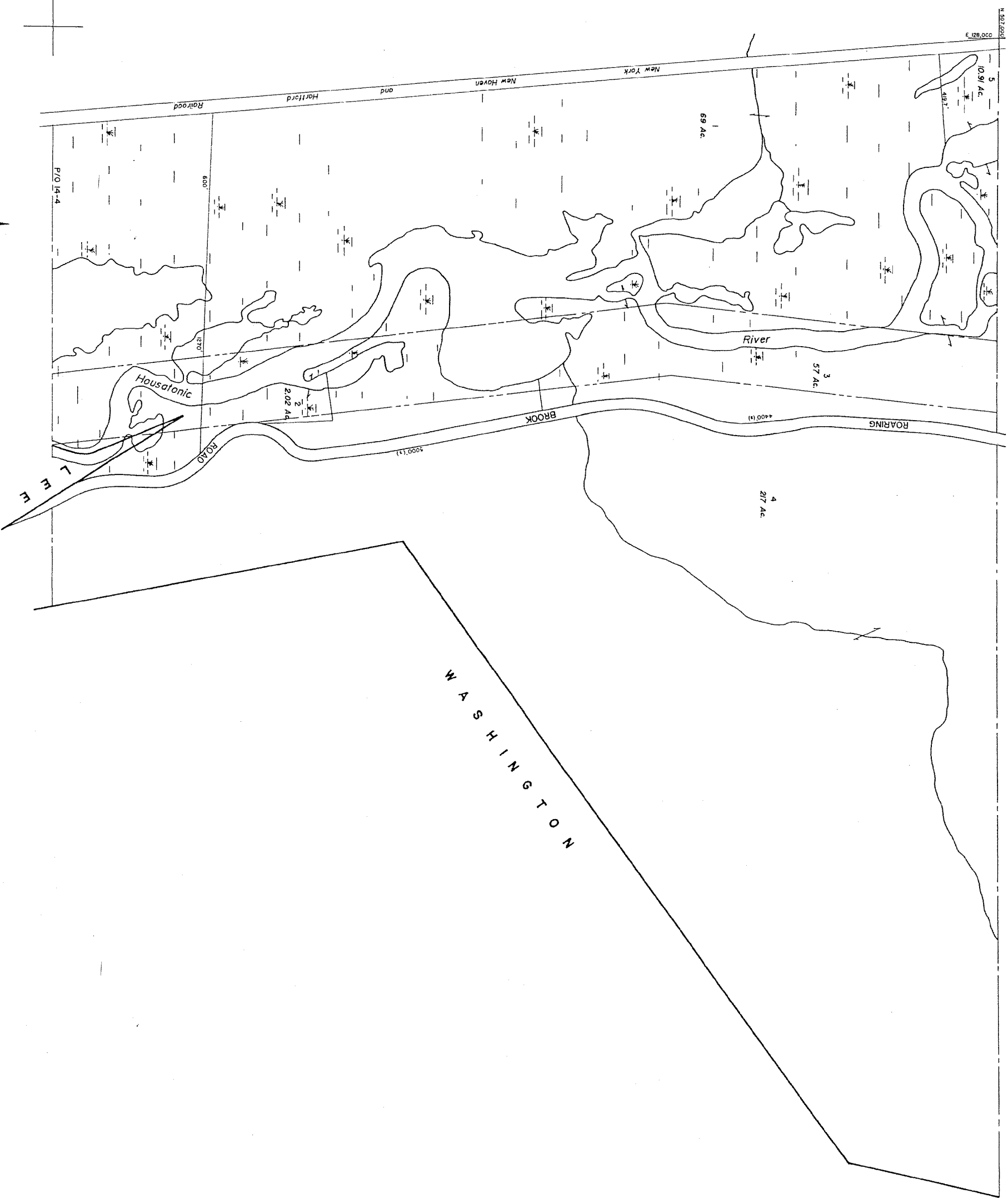
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PARCEL NUMBERS.....2  
MATCH LINE.....2

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 4-30-85  
DATE OF REVISIONS 4-30-85  
7-30-86  
6-1-87  
5-1-89  
5-14-01

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER  
17 18 19  
23



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-1-86  
DATE OF REVISIONS 6-15-93

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

24	18	14
MAP NUMBER	19	

N 503,000  
E 134,000

**E 104,000**

## LEGEND

PARCEL NUMBERS ..... 2  
MATCH LINE .....

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-88

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-88

1100

**For Assessment Purposes**  
**Not to be used for Conveyance**

**R I C H M O N D**

4.46 Ac

17.79 Ac

4344

## 7.0 Ac

**Figure 1**

P/O

Lenox

P/O MS-

21 Ac

4.0 AC

**S.O. Ad**

M.77 Ac

### 16.03 Ac

*Brent*

TAX MAP

TOWN OF LENOX

SCALE: 1 INCH = 200 FEET

25

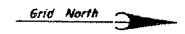
20

21

ॐ

NOT TO SCALE

LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

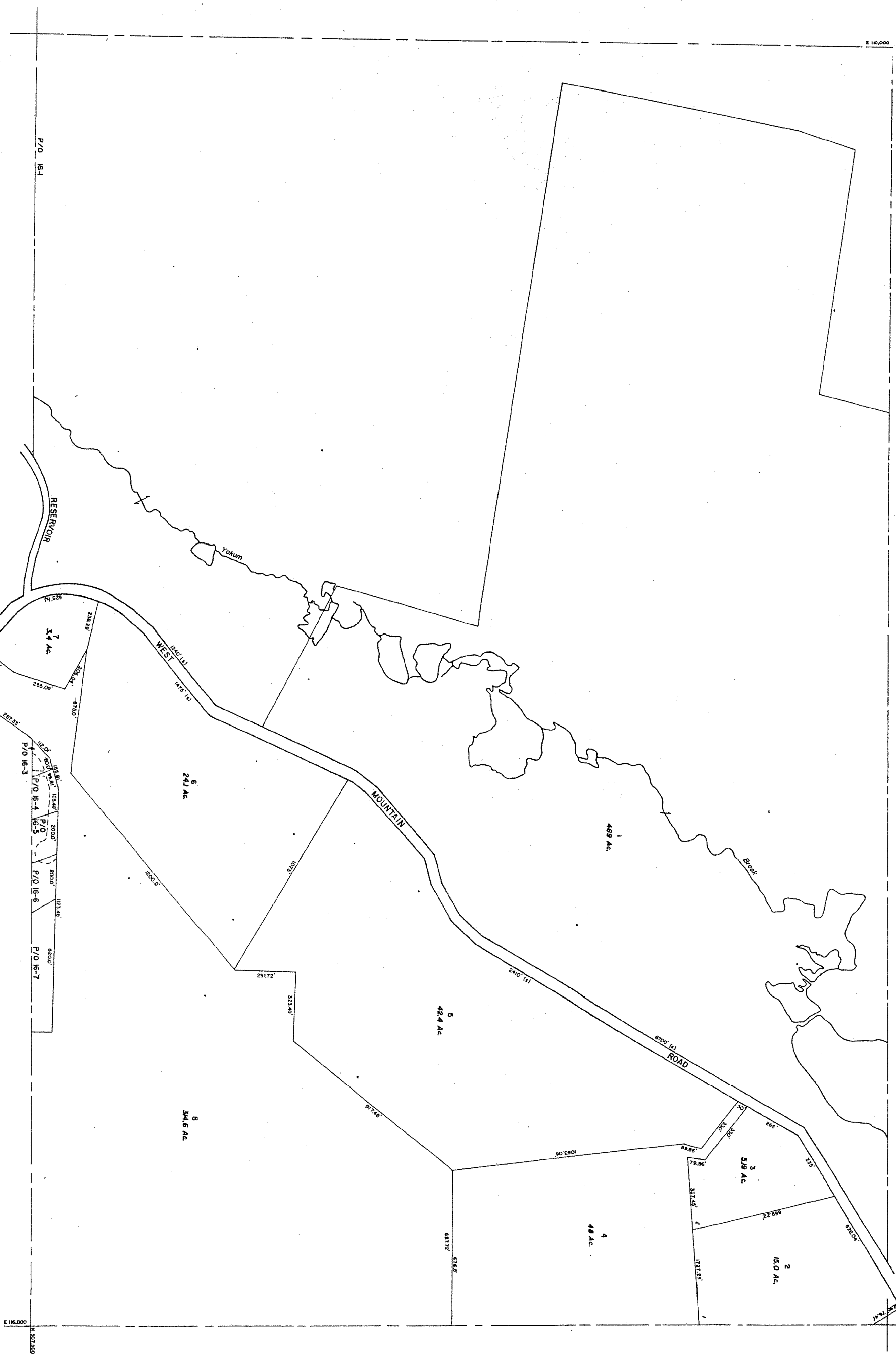


DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-90  
9-22-91  
-----  
-----  
-----  
-----

For Assessment Purpose  
Not to be used for Conveyances

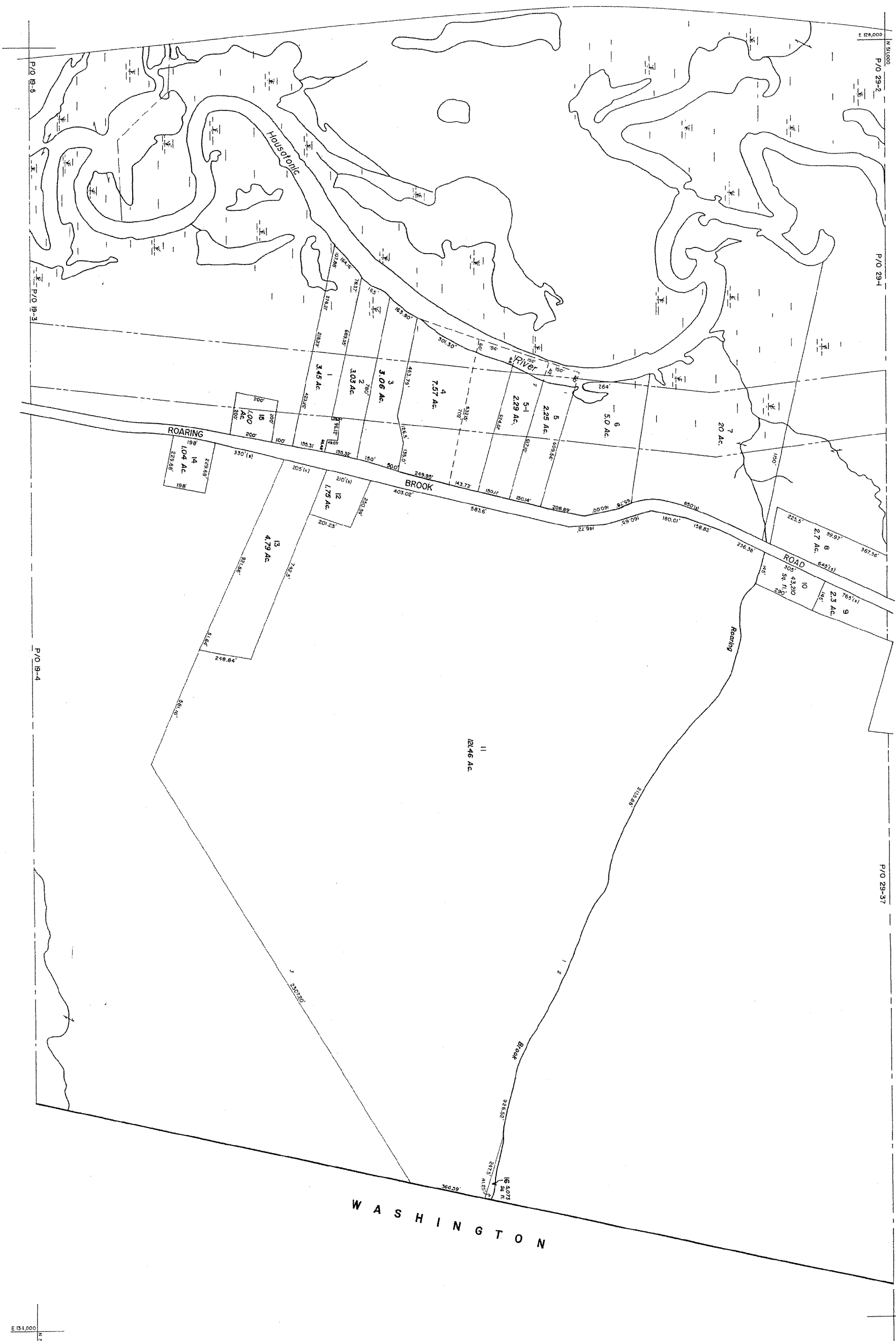
TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

26	MAP NUMBER
20	21
22	16









LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-85  
1-86  
5-15-93  
3-1-98  
4-1-04

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

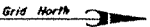
23	29
MAP NUMBER	24
19	

N 507,000  
E 134,000

N 10,000  
E 104,000

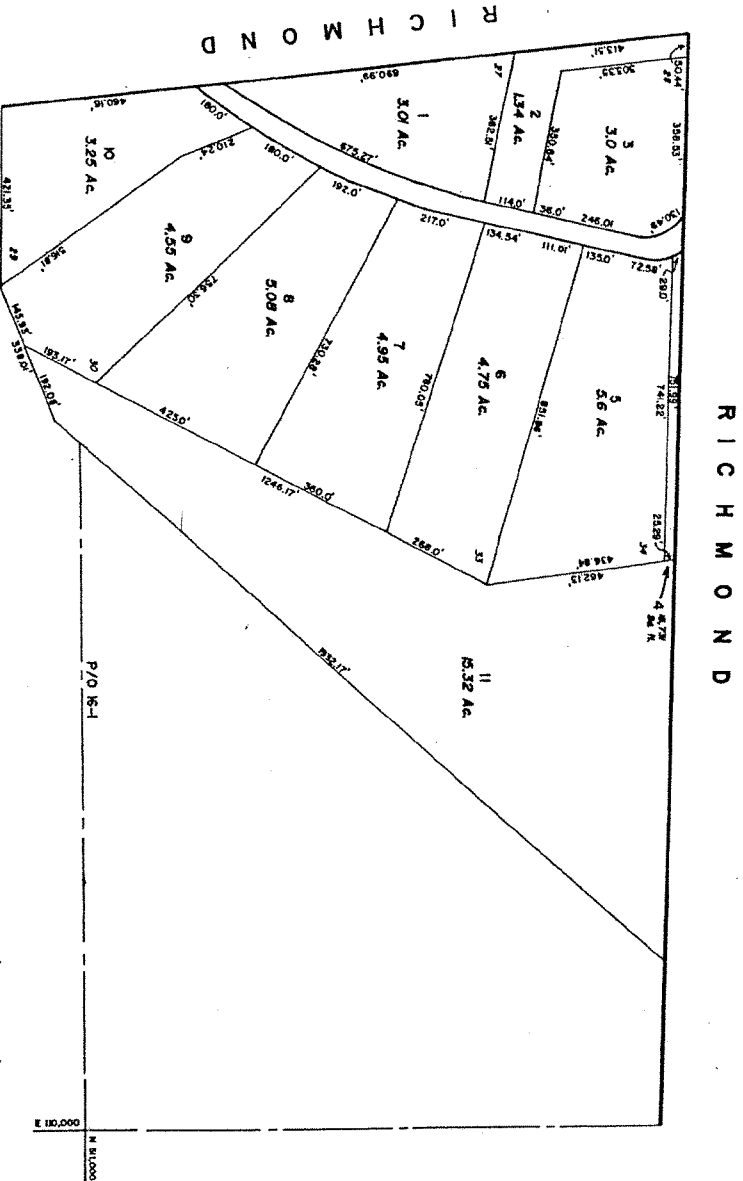


LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....



DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS

For Assessment Purpose  
Not to be used for Conveyance



TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER  
25  
26



1:25,000  
E 10,000

R I C H M O N D

2  
105 AC

227

1  
100

P/O 16-1

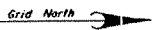
P/O 21-1

P/O 27-24

E 10,000  
N 5,000

LEGEND

PARCEL NUMBERS.....2  
MATCH LINE.....



DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS

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-----  
-----  
-----  
-----

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

31	MAP NUMBER
25	26
21	27



LEGEND  
PARCEL NUMBERS .....  
MATCH LINE ..... 2

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS  
1-88 3-1-98  
1-90 5-1-98  
5-15-93 3-31-00  
5-22-94 6-14-01  
5-22-03 5-22-03  
5-22-03 5-22-03  
5-22-03 5-22-03

For Assessment Purposes  
Not to be used for Conveyances

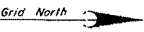
TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

32	MAP NUMBER
26	27
22	28



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-88 4-104  
1-89 4-105  
3-23-94 4-106  
3-198 4-107  
5-2-95 4-108  
4-1-02 4-109



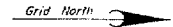
Grid North

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER	33
27	28
29	23

LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

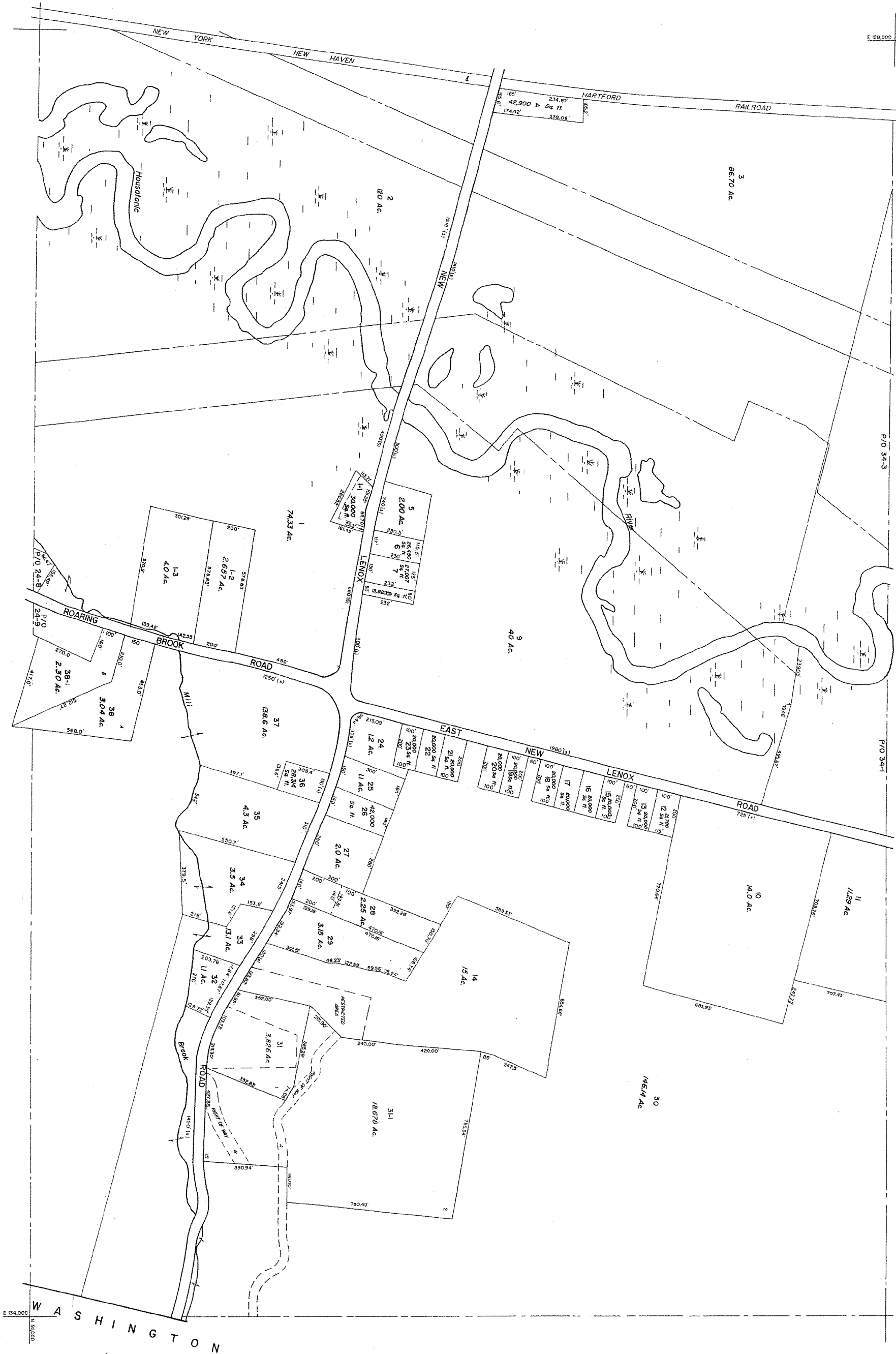


DATE OF AERIAL PHOTOGRAPHY	4-30-85
DATE OF COMPLETION	11-85
DATE OF REVISIONS	
1-89	5-1-89
1-90	3-31-90
6-15-93	6-28-93
9-23-94	
7-30-96	
6-1-97	

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

34	MAP NUMBER	28
29		30
24		



MAP FOR

LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....

Grid North

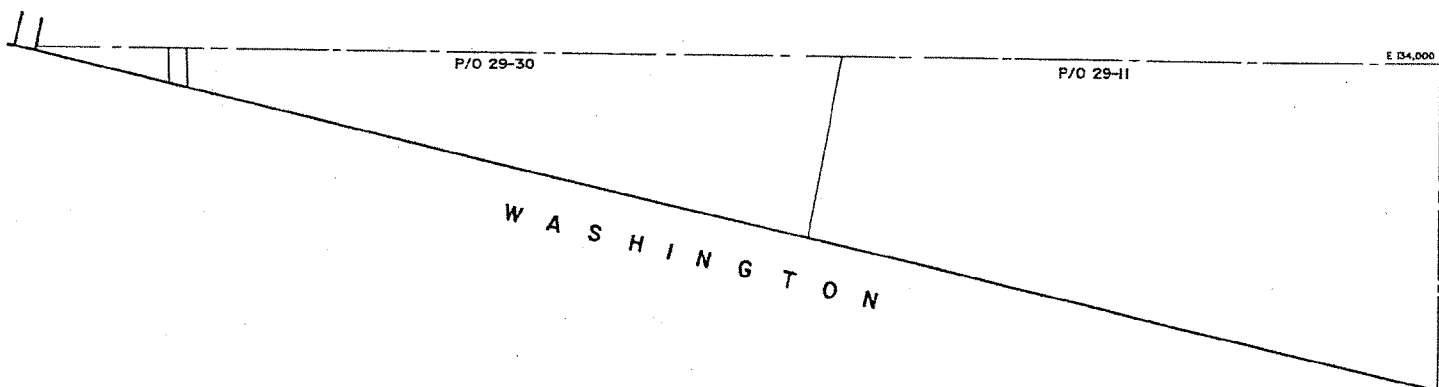
DATE OF AERIAL PHOTOGRAPHY 4-30-88  
DATE OF COMPLETION H-86  
DATE OF REVISIONS 9-23-94

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

35  
30  
29

E 134,000



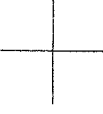


P/O 36-1  
25.35°  
21.87°

R I C H M O N D

P42.9 Ac

P/O 27-24



LEGEND

PARCEL NUMBERS ..... 2  
MATCH LINE .....

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-1-86  
DATE OF REVISIONS 5-15-93

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

36	MAP NUMBER	32
31		
26		

N 39,000  
E 116,000

P I T T S F I E L D



P/O 31-1

P/O 27-24

P/O 27-25

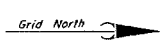
P/O 33-1

P/O 33-4

P/O 28-34

LEGEND

PARCEL NUMBERS.....2  
MATCH LINE.....



DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 7-86

DATE OF REVISIONS

5-1-87  
5-1-89  
3-31-00  
6-14-01  
4-1-05

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

37	31	33
37	32	33
27		



Grid North 

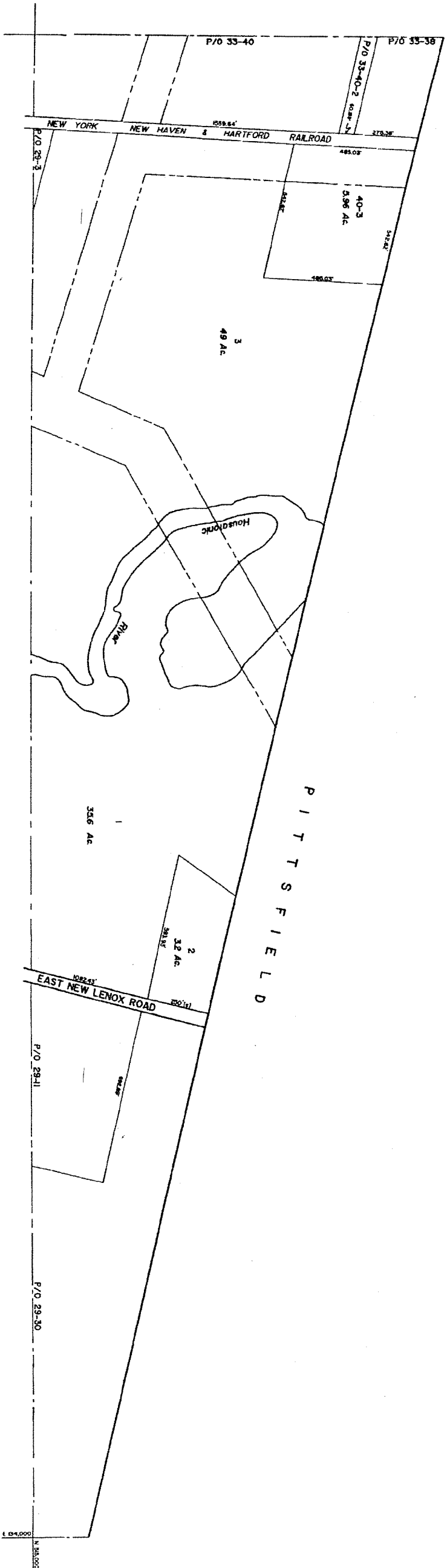
For Assessment Purposes  
Not to be used for Conveyance

32	MAP NUMBER	34
	<b>33</b>	
28		



N 50,000  
E 100,000

N 50,000  
E 100,000



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-61  
DATE OF COMPLETION 1-1-62  
DATE OF REVISIONS 1-1-62  
1-1-62  
1-1-62  
1-1-62  
1-1-62  
1-1-62  
1-1-62

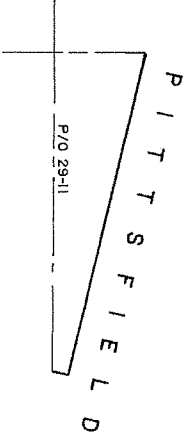
For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BENKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

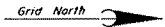
33	MAP NUMBER	35
34		
29		

N 59,000  
E 134,000

N 59,000  
E 140,000



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2



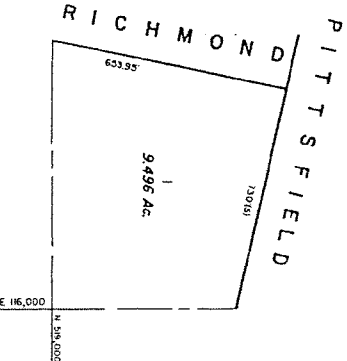
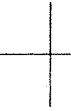
DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS  
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For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER  
34 35 30

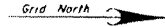
N 223,000  
E 110,000



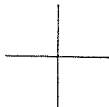
TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

MAP NUMBER	36	37
31		

DATE OF AERIAL PHOTOGRAPHY 4-30-65  
DATE OF COMPLETION 11-86  
DATE OF REVISIONS 6-15-93  
PARCEL NUMBERS  
MATCH LINE

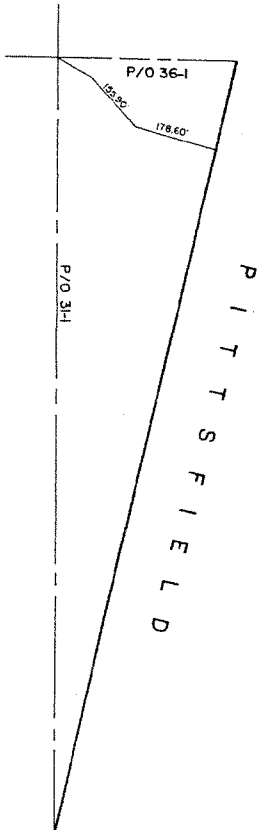


LEGEND  
PARCEL NUMBERS  
MATCH LINE



4 234,000  
E 116,000

4 234,000  
E 116,000



LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-1-86  
DATE OF REVISIONS 5-15-93

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 200 FEET

36	MAP NUMBER
37	
32	

E 122,000  
N 59,000

N 428,000  
E 125,000

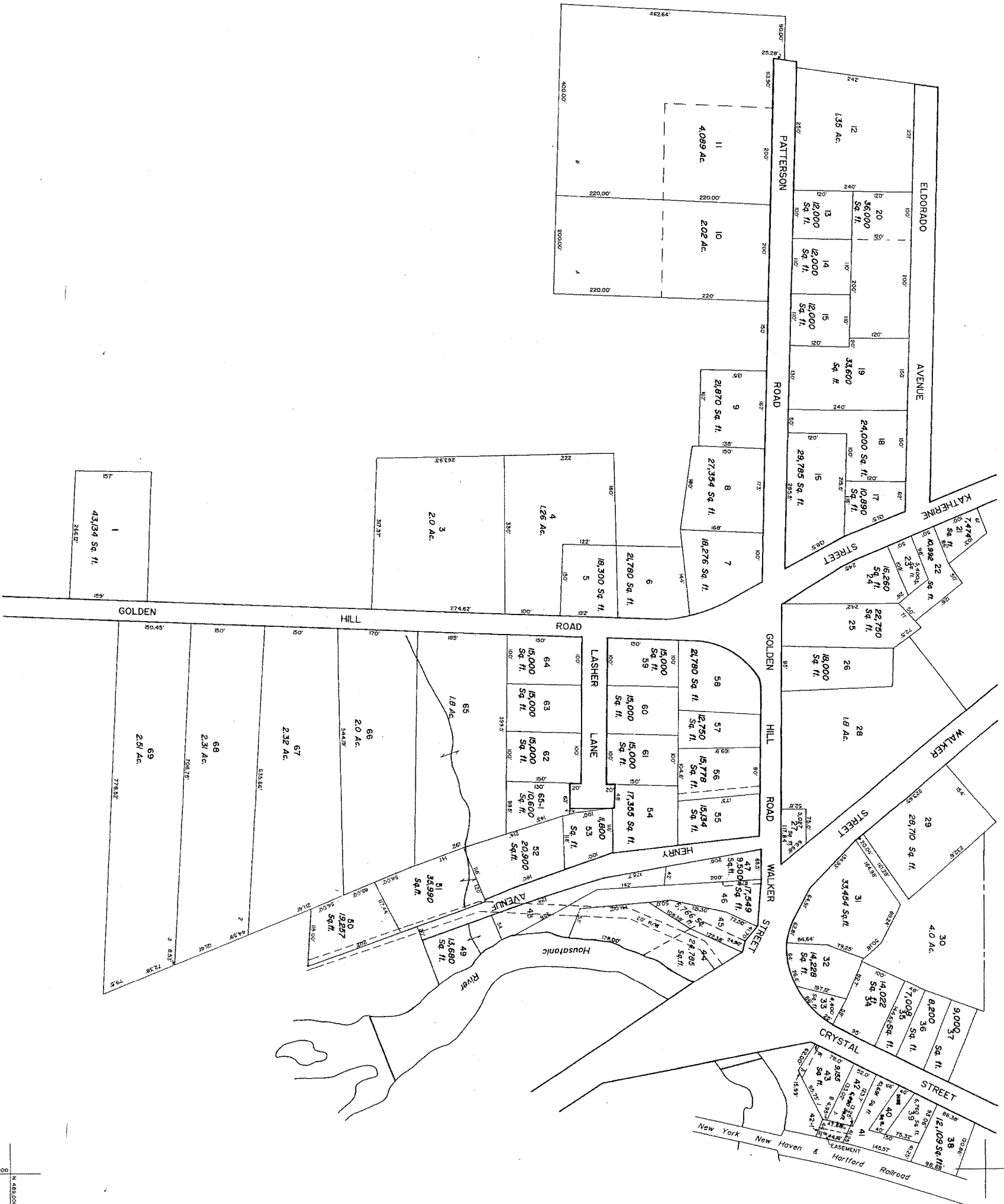


LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS  
1-88 4-1-04  
6-10-93 4-1-05  
7-30-98  
6-1-97  
3-1-98  
5-22-03

For Assessment Purposes  
Not to be used for Conveyances



N 428,000  
E 125,000

39  
MAP NUMBER  
38

E 125,000	
	R 495,000

LEGEND

PARCEL NUMBERS.....2

MATCH LINE.....

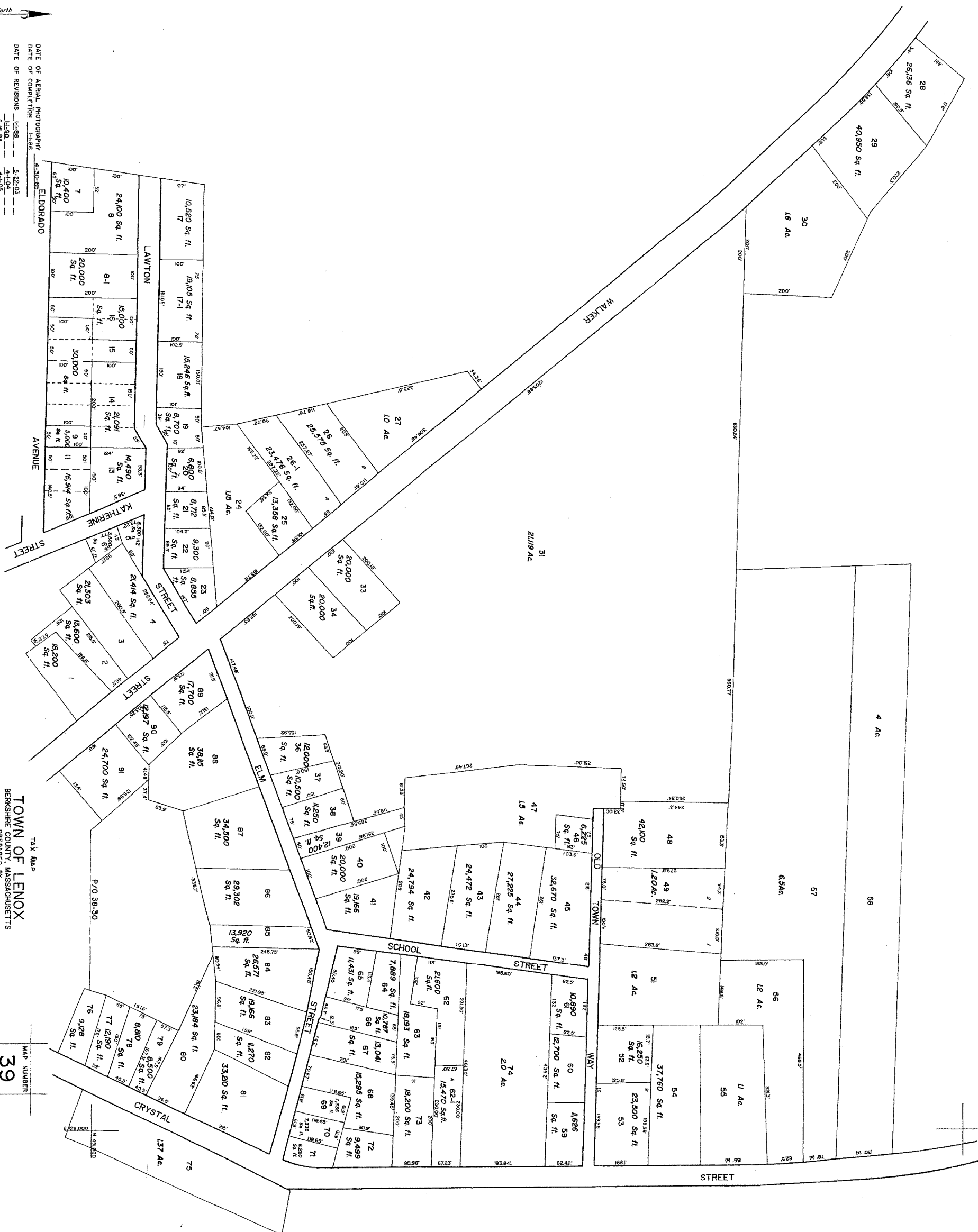
Grid North 

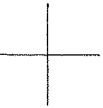
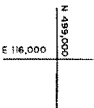
DATE OF AERIAL PHOTOGRAPHY	4-30-85	EL DORADO
DATE OF COMPLETION	11-86	
DATE OF REVISIONS	11-86	5-22-83
		11-80
	6-15-83	4-1-04
	9-23-94	4-1-05
	3-11-98	
	3-31-00	

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

AP NUMBER  
39





LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....

Grid North

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-88 5-82-03  
2-83 4-86  
3-84 5-83-34  
7-89-96  
3-88  
6-14-01

For Assessment Purposes  
Not to be used for Conveyance



TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

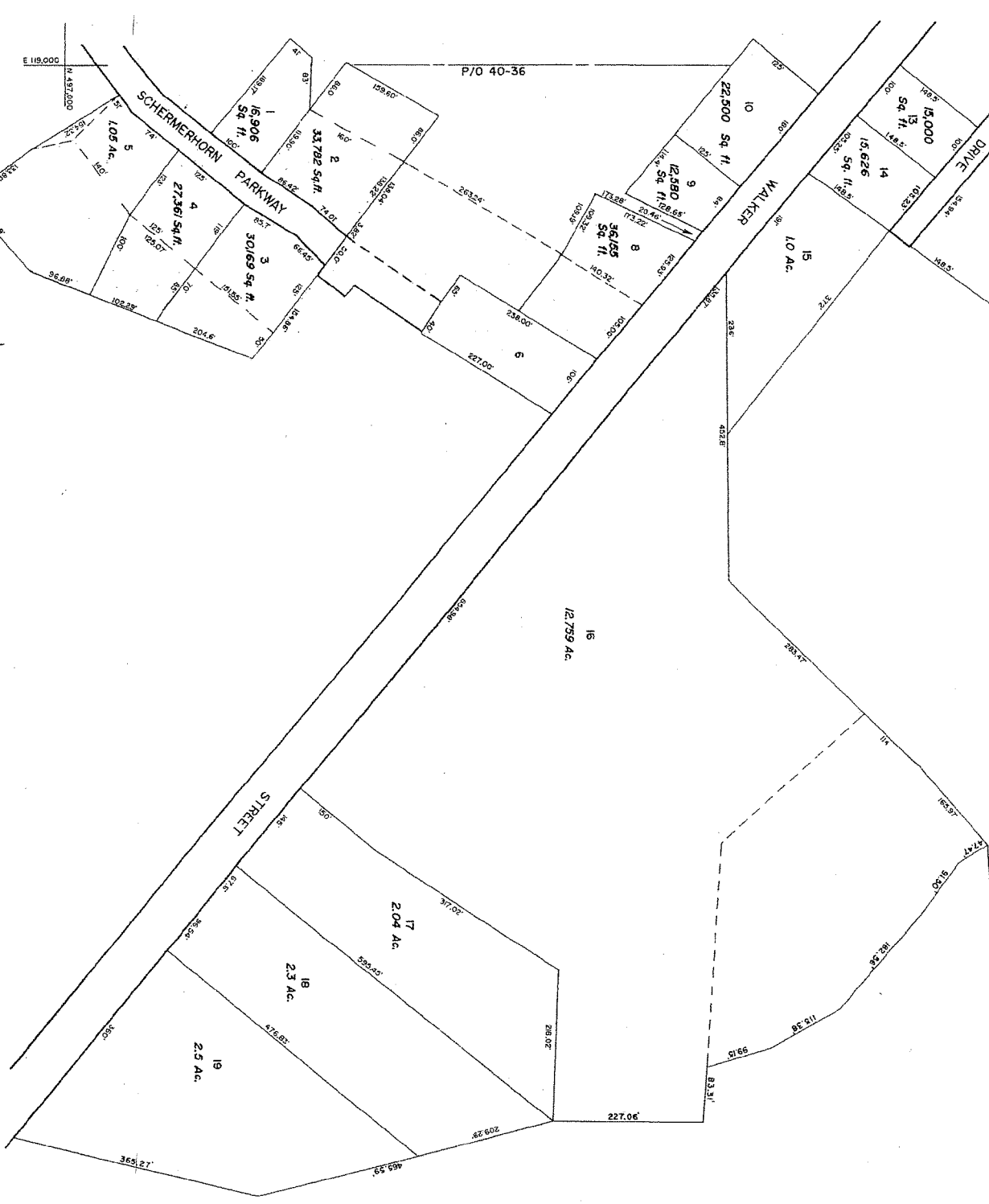
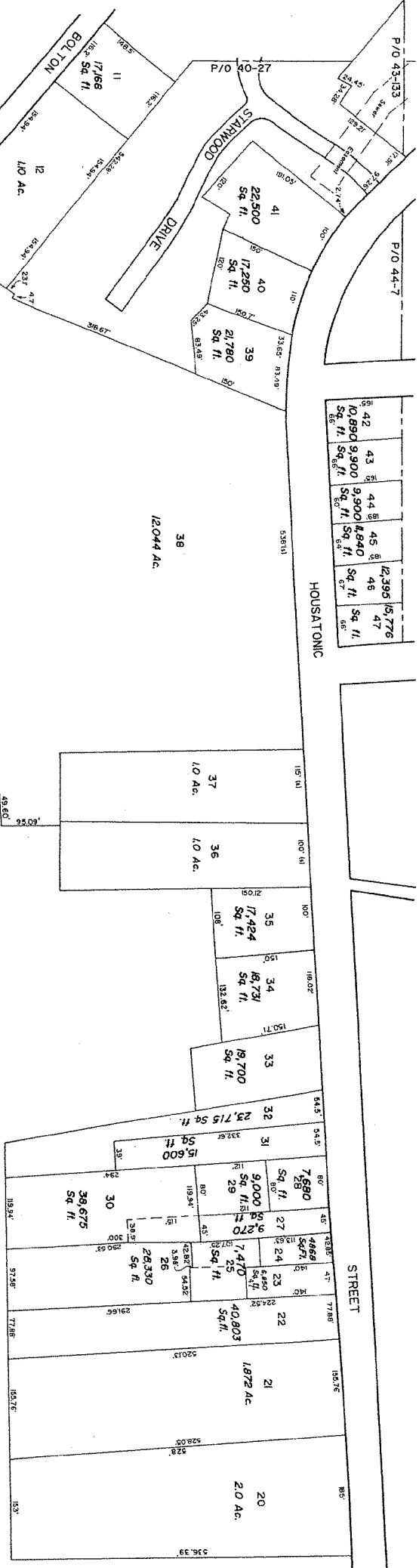
43	MAP NUMBER
40	
41	

42	43	44	45	46	47	48
10,890	9,900	9,900	12,395	15,776	12,395	15,776
Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.

HOUSATONIC

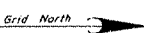
STREET

LENOX



E 118,000  
N 487,000

LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE ..... 2



DATE OF AERIAL PHOTOGRAPHY	4-30-85
DATE OF COMPLETION	1-86
DATE OF REVISIONS	1-88
	4-1-02
	6-10-91
	5-22-03
	9-23-94
	6-1-97
	5-1-98
	3-31-07

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

44	MAP NUMBER
41	

ROUTE 20

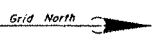
BYPASS



E 113,000  
N 59,000

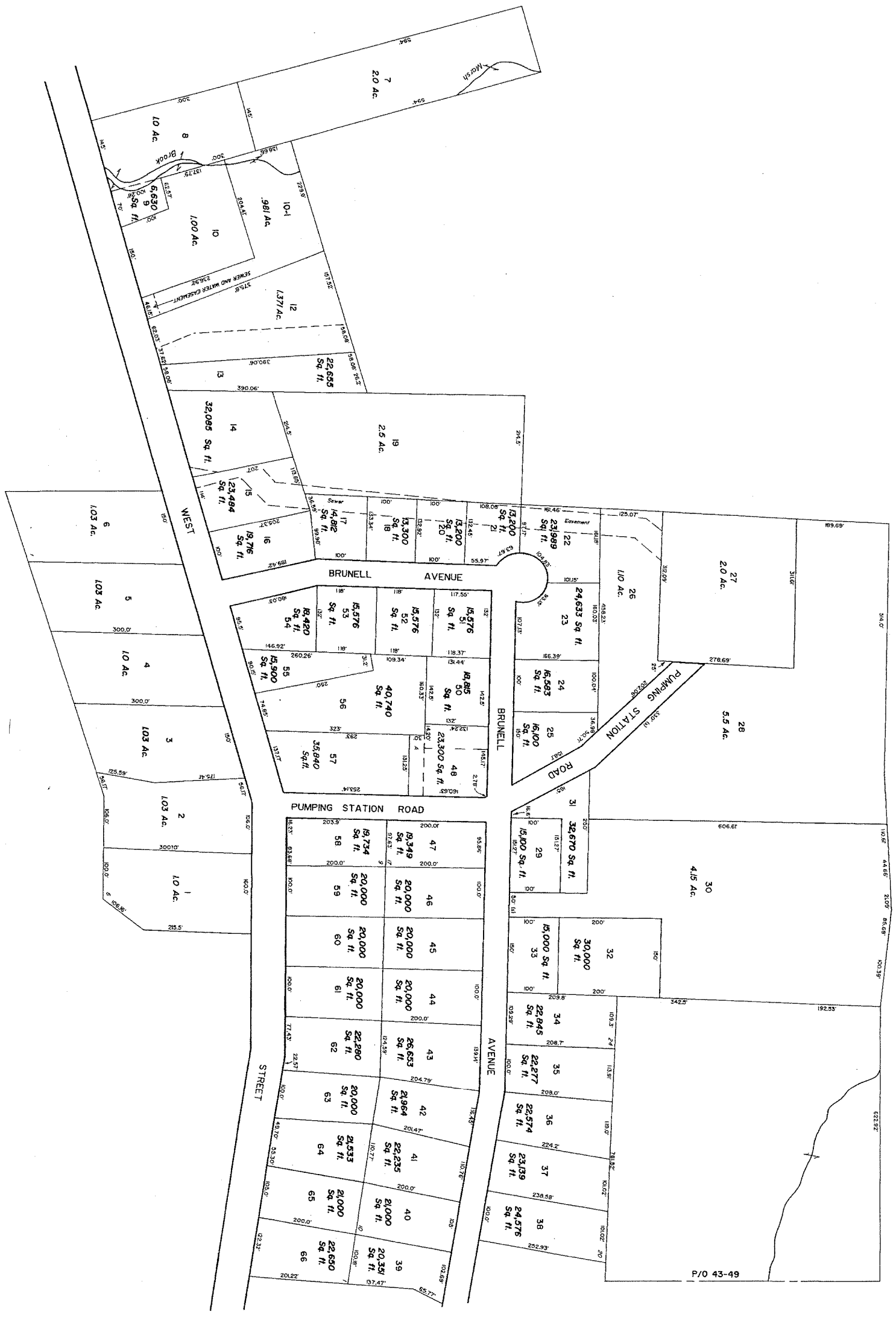
E 116,000  
N 499,000

LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....



DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 7-86  
DATE OF REVISIONS  
6-10-83  
7-30-86  
3-1-88  
3-31-90  
4-1-05

For Assessment Purposes  
Not to be used for Conveyances



TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET


MAP NUMBER  
42 43



LEGEND

PARCEL NUMBERS.....2

MATCH LINE.....

Grid North 

DATE OF AERIAL PHOTOGRAPHY	DATE OF COMPLETION	DATE OF REVISIONS	PURPOSE
4-30-85	4-30-85	1-1-83	4-1-04
1-1-86	1-1-86	1-1-80	4-1-06
		6-15-83	5-21-00
		8-28-84	4-1-07
		7-30-85	5-22-00
		5-1-87	4-1-04
			Non to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

46	MAP NUMBER	42
	43	44
40		

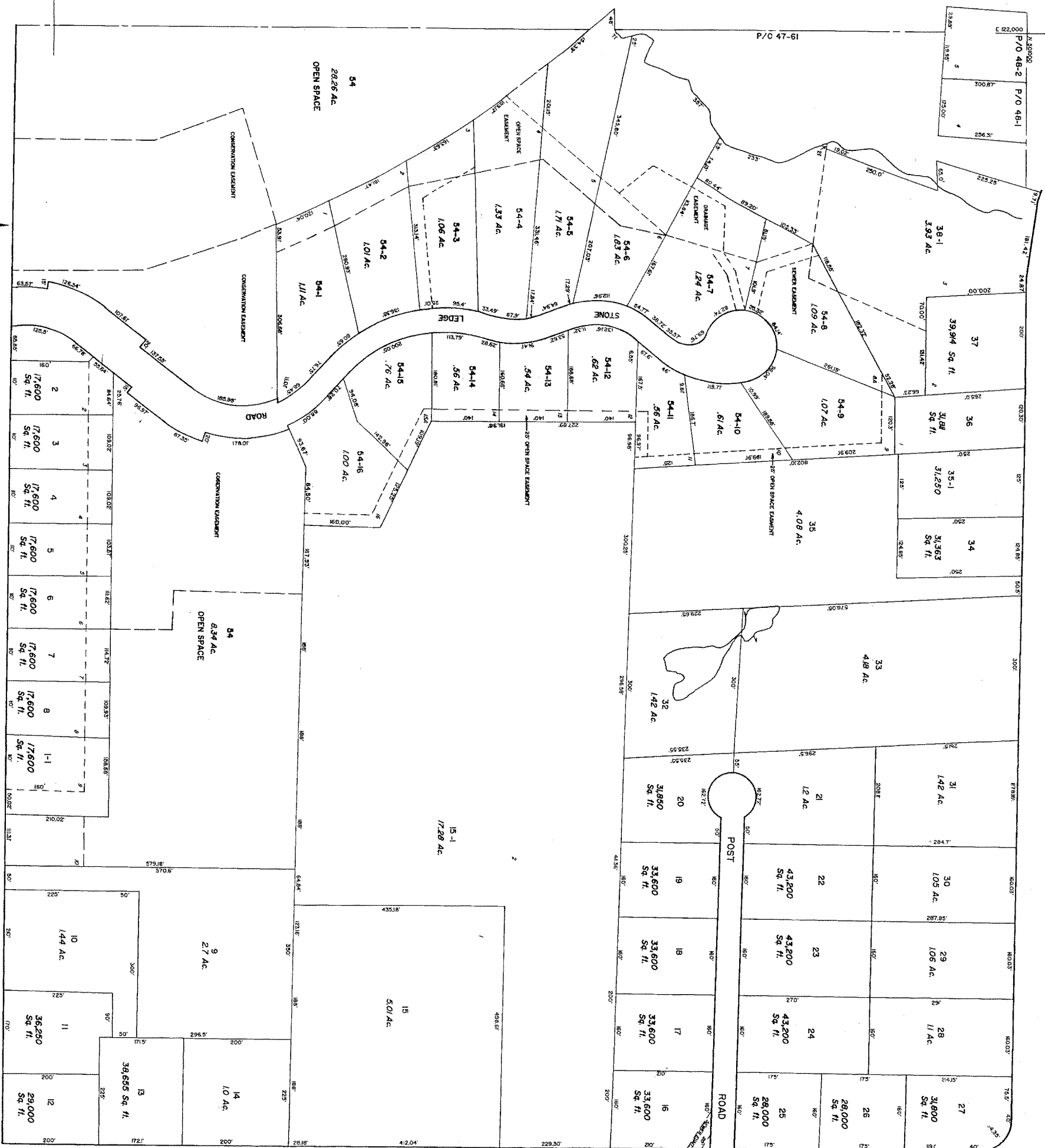


Grid North 

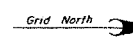
For Assessment Purposes  
Not to be used for Conveyances.

TAX MAP  
TOWN OF LENOX  
SHERBURY COUNTY, MASSACHUSETTS  
PREPARED BY  
WALL COMPANY, OLD TOWN  
SCALE: 1 INCH = 100 FEET

43	MAP NUMBER	45
41	44	

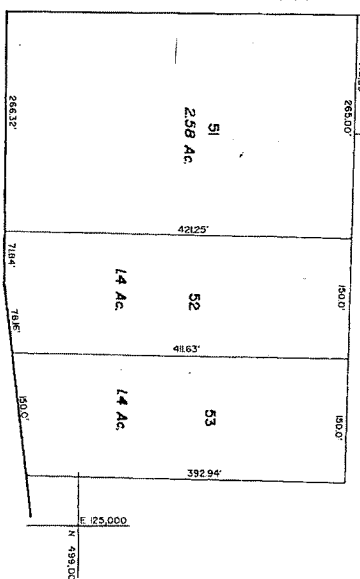
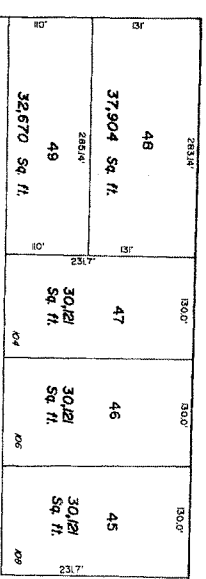
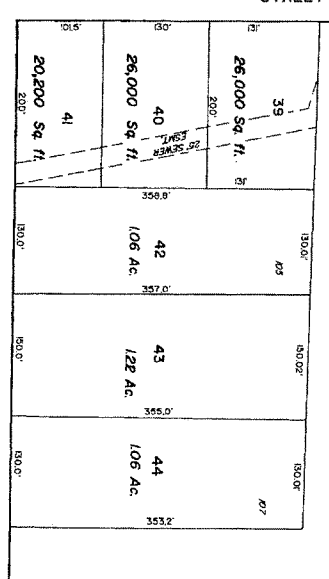


LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....2



DATE OF AERIAL PHOTOGRAPHY 4-30-88  
DATE OF COMPLETION 11-86  
DATE OF REVISIONS  
11-88 5-22-03  
6-15-93 4-1-04  
9-23-94 4-1-05  
3-31-00 4-1-06  
6-14-01  
4-1-02

HOUSATONIC  
STREET  
TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET



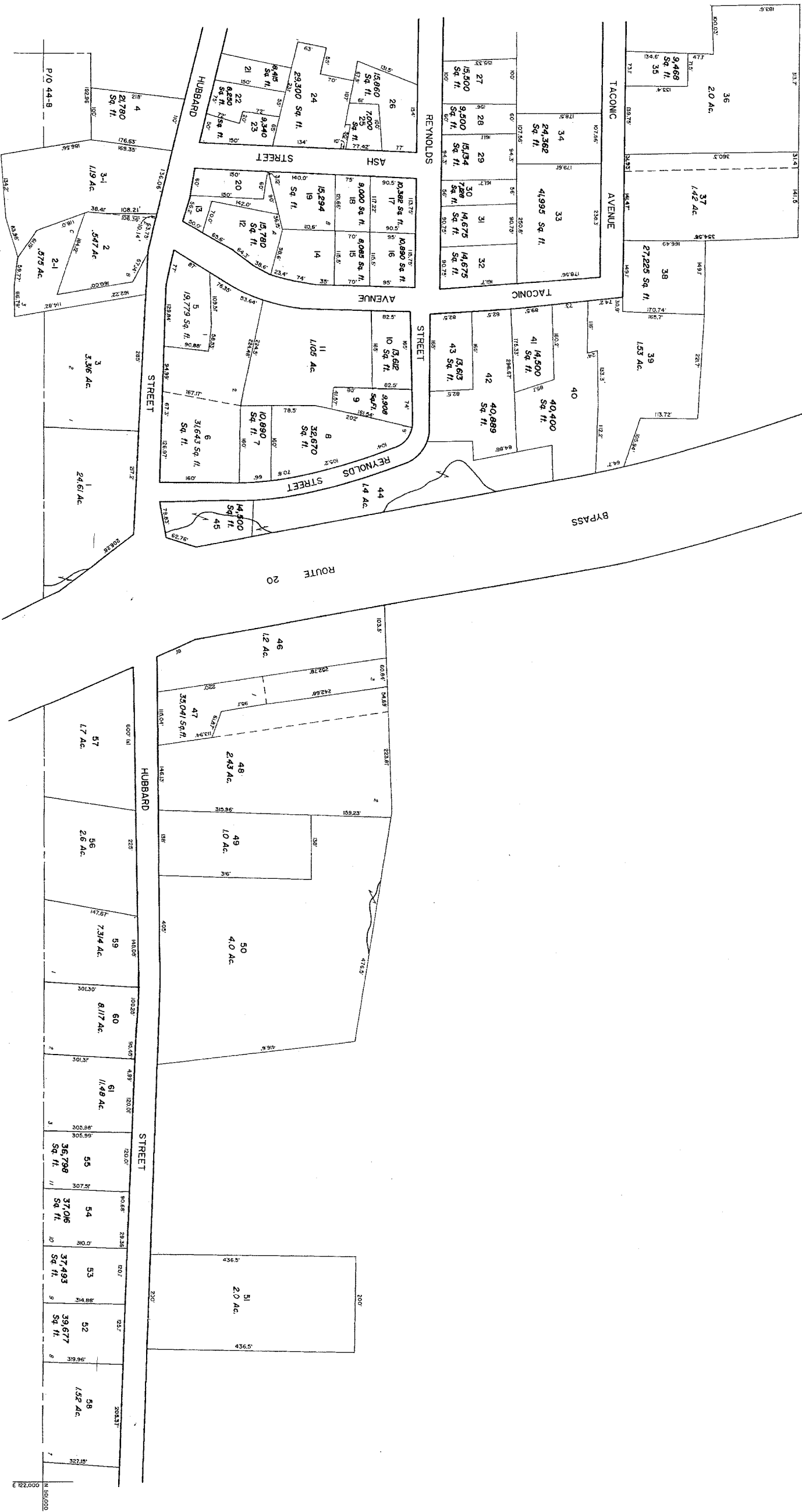
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

MAP NUMBER  
44 45

E 96,000  
N 503,000



N 503,000  
E 119,000



LEGEND  
PARCEL NUMBERS.....2  
MATCH LINE.....2

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 11-85  
DATE OF REVISIONS 1-88 3.31-00  
1-90 5.14-01  
5-93 5.22-03  
5-97 7.1-04  
3-98 7.1-05  
2-99 7.1-06

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

46	MAP NUMBER	48
47		
44		

E 122,000  
N 503,000



LEGEND

DATE OF AERIAL PHOTOGRAPHY 4-30-65

DATE OF COMPLETION 4-1-06

DATE OF REVISIONS 9-23-94 4-1-06

3-31-00

4-1-02

5-22-03

PARCEL NUMBERS 2

MATCH LINE

For Assessment Purposes  
Not to be used for Conveyances

TAX MAP

TOWN OF LENOX

BERKSHIRE COUNTY, MASSACHUSETTS

PREPARED BY

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE

SCALE: 1 INCH = 100 FEET

MAP NUMBER

47

48

45

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E 122.000

P/O 50-56

24

STREET

8.31 Ac.

WEST MOUNTAIN ROAD

12 37,360 Sq. Ft.

14 18,295 Sq. Ft.

13 23,650 Sq. Ft.

11 38,640 Sq. Ft.

15 1.7 Ac.

15-1 15.85 Ac.

28-5 1.14 Ac.

28-6 1.20 Ac.

28-7 41,000 Sq. Ft.

28-8 1.04 Ac.

28-9 31,400 Sq. Ft.

28-10 28,800 Sq. Ft.

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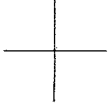
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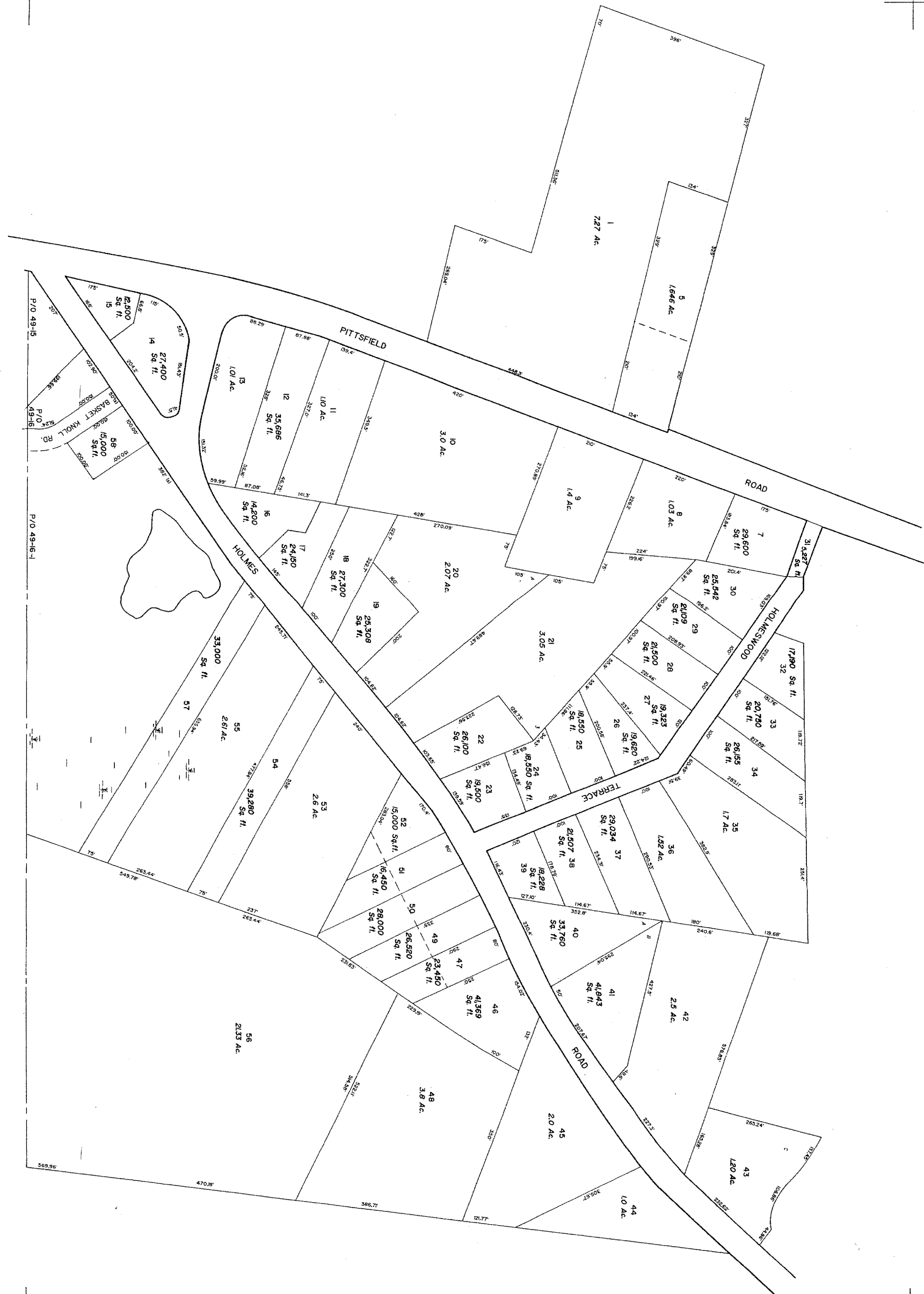
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LEGEND  
PARCEL NUMBERS ..... 2  
MATCH LINE .....

DATE OF AERIAL PHOTOGRAPHY 4-30-85  
DATE OF COMPLETION 1-86  
DATE OF REVISIONS 1-80 4-04  
6-15-83 4-15-86  
7-30-86  
8-1-87  
1-1-88  
3-31-00

For Assessment Purposes  
Not to be used for Conveyances



TAX MAP  
TOWN OF LENOX  
BERKSHIRE COUNTY, MASSACHUSETTS  
PREPARED BY  
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE  
SCALE: 1 INCH = 100 FEET

MAP NUMBER  
50  
49

N 85,000  
E 125,000

## TOWN OF LENOX SCENIC MOUNTAIN ACT

(Adopted by Annual Town Meeting May 2, 1975 and as amended at Special Town Meeting December 18, 1985.)

Regulations under Massachusetts General Laws, Chapter 131, Section 39A, the  
Berkshire Scenic Mountains Act – Regulations & Map Approved by the Selectmen -September 12, 2007 &  
Regulations & Map Approved the Department of Conservation & Recreation – January 29, 2008

### PREAMBLE

Activities that alter the natural characteristics of mountaintops and steep slopes may irreversibly change these environmentally sensitive areas. Excavation, construction, clearing, and fill may be visible for many miles. Destruction of the natural ground cover can result in severe erosion. Alteration of mountainsides increases the likelihood of uncontrolled runoff. Steep, rocky slopes impede adequate sewage disposal. Aquifer recharge areas are usually located at elevations higher than the valley floors, and can be polluted by mountainside alteration.

The intent of these regulations is to review Owner applications to conduct activities with the goal of avoiding or minimizing or mitigating the impact of proposed activities. The intent of these regulations is not to prohibit construction, nor to hinder farmers or gardeners in their normal pursuits, or landowners in the normal maintenance of their properties.

If a mountain, a steep slope, or a ridgeline is to be altered, the regulations that follow provide both protection for the regulated scenic areas and due process for those who propose changes. The Conservation Commission carries responsibility for these regulations.

### 1.0 GENERAL PROVISIONS

#### 1.1 Authority.

The Conservation Commission of the Town of Lenox, having been designated as hearing authority under General Laws Chapter 131, Section 39A in a vote at Town Meeting 1985, promulgates these regulations pursuant to the authority granted to it.

#### 1.2 Purpose of the Regulations

The purposes of the regulations are:

- a. to protect watershed resources;
- b. to preserve the natural scenic qualities of the mountain region.

These regulations create a consistent process and clarify the provisions of the Act by establishing standard definitions and procedures.

A true copy:

Attest:

*Marie L. Duby*  
Town Clerk

### 1.3 Implementation of the Regulations

The Act and these regulations shall take effect when the following events have occurred:

1. The text and map describing boundaries for the mountain regions have been approved by a two-thirds vote of the Select Board,
2. The Commissioner of the Department of Conservation and Recreation has approved the text and the map,
3. The text and map delineating the boundaries of the mountain regions subject to regulation have been filed with the Town Clerk, recorded in the Registry of Deeds, and sent to the Commissioner as specified in the Act.

### 1.4 Statement of Jurisdiction

These regulations apply to the areas delineated in the Town of Lenox and shown on the approved map entitled "Town of Lenox, Scenic Mountain Act Mapped Mountain Regions".

The areas in the map include the following:

- a. All areas above 1400 feet (426.7 meters) in elevation;
- b. All areas below 1400 feet (426.7 meters) in elevation where any portion of the project is located on a steep slope, as defined in Section 2.31.

Adopted by the Lenox Board of Selectmen on September 12, 2007.

## 2.0 DEFINITIONS

2.1 Abutter is any landowner, as determined by the most recent Assessor's records, whose land is within 300 feet of the property line that is the subject of the Request for Determination or the Notice of Intent including land which lies directly across any street or road from said property.

2.2 Alteration includes, but is not limited to, one or more of the following actions taken within the mapped mountain regions:

- a. removal, filling, excavation, or dredging of soil, sand, gravel, rock, or aggregate material of any kind in excess of 20 cubic yards;
- b. changing of pre-existing drainage characteristics, sedimentation patterns and flow patterns;
- c. drainage or disturbance of existing watercourses or water table;

d. substantial change in topographic or scenic features;

e. erection of any building or structure with a footprint square footage in excess of 500 square feet or a height in excess of 22 feet between maximum existing ground elevation within the footprint and the ridge;

f. dumping or discharging of any material except where it is necessary to stockpile materials to conduct the project;

g. removal or destruction of plant life, including clearing of trees in a ground area of more than 5,000 square feet;

h. construction and/or paving of any new road or parking lot greater than 800 square feet.

2.3 Bona fide purchaser for value without notice is a buyer for value who has not been informed, verbally or in writing, or had actual knowledge, that activities have been done on the purchased property in violation of the Act.

2.4 Certificate of Compliance a form issued by Conservation Commission that establishes all conditions set forth in the Order of Conditions have been met.

2.5 Clearing is cutting or otherwise removing 50% or more of canopy coverage of trees.

2.6 Commencement of activity is commencement of physical work on the premises, not merely surveying or site testing.

2.7 Commission is the Lenox Conservation Commission.

2.8 Commissioner is the Commissioner of the Massachusetts Department of Conservation and Recreation.

2.9 Department is the Massachusetts Department of Conservation and Recreation in the Executive Office of Environmental Affairs.

2.10 Day. All time periods of ten days or less specified in M.G.L. c. 131 Section 39A and these regulations shall be computed using business days only. All other time periods shall be computed on the basis of calendar days, unless the last day falls on a Saturday, Sunday, or legal holiday, in which case the last day shall be the next business day following.

2.11 Determination of Applicability is a written finding by the Commission as to whether the land or proposed activity shall or shall not require the filing of a Notice of Intent under the Act. It shall be made on Form B of these regulations.

2.12 Environmental Impact Statement is a full-scale Environmental Impact Statement issued under the National Environmental Policy Act or a full-scale Environmental Impact Report issued under the Massachusetts Environmental Policy Act.

2.13 Excavation is the disturbance of any material to lower the surface or create a cavity of any kind, either temporarily or permanently of any area subject to these regulations; however, shall not apply to percolation tests which fall under requirements of 310 CRM 15.000 Subsurface Disposal of Sanitary Sewage (Title V) and implementation of the Lenox Board of Health.

2.14 Farming-agricultural use is the raising of animals, including but not limited to, dairy cattle, beef cattle, poultry, sheep, swine, horses, ponies, mules, goats, bees and fur-bearing animals and supporting activities; or when primarily and directly used in a related manner which is incidental thereto and represents a customary and necessary use in raising such animals, as defined in General Laws 61A, Section 1, as amended. Also horticultural uses, the raising of fruits, vegetables, berries, nuts and other foods for human consumption, feed for animals, tobacco, flowers, sod, trees, nursery or greenhouse products, and ornamental plants and shrubs; or when primarily and directly used in raising forest products under a program certified by the state forester to be a planned program to improve the quantity and quality of a continuous crop; or when primarily, directly used in a related manner which is incidental thereto and represents a customary and necessary use in raising such products, as defined in General Laws, Chapter 61A, Section 2, as amended.

2.15 Filling is the placing of any material that raises, either temporarily or permanently the elevation of any area subject to the Act.

2.16 Flooding is a local, temporary inundation, or a rise in the surface of a body of water, however caused, such that it covers land not usually under water.

2.17 Form definitions;

- Form A -Request for Determination of Applicability
- Form B -Determination of Applicability
- Form C -Notice of Intent
- Form D -Order of Conditions
- Form E -Certificate of Compliance
- Form F -Extension Permit

2.18 Hearing Authority shall mean the Commission.

2.19 Mapped mountain regions are those areas within the town, which are subject to the provisions of the Act and are designated on the map referred to in these regulations.

2.20 Notice of Intent is a written description of any proposed regulated activity to be performed in the mapped mountain regions, as submitted to the Commission. It shall be submitted on Form C of these regulations.

2.21 Order of Conditions is a document issued by the Conservation Commission or on appeal by the Commissioner, stating ways in which the activity shall be performed, modified, regulated, forbidden or otherwise controlled to protect the interests in the Act. It shall be made and issued on Form D of these regulations.

2.22 Owner is the person appearing as the owner of record at the Berkshire Middle District Registry of Deeds.

2.23 Person includes any individual, group of individuals, association, partnership, corporation, company, business organization, trust, estate, the Commonwealth or any political subdivision thereof, administrative agency, public or quasi public corporation or body, authority, or any other legal entity or its legal representative, agents or assigns.

2.24 Preservation of natural scenic qualities is the protection of the existing features of the environment by regulating activities to minimize potential adverse effects due to pollution or diminution of ground or surface water supply; flooding; substantial changes in topographic features or substantial destruction of vegetation.

2.25 Regulated Activities shall mean the removal, filling, excavation or other alterations of land within mountain regions regulated herein, as defined in Section 1.4, which is likely to have a significant adverse effect on watershed resources or natural scenic qualities because of the pollution or diminution of ground or surface water supply, public or private; erosion; flooding; changes in topographic features or substantial destruction of vegetation.

2.26 Removal is the act or process of taking away any type of material that has been excavated or severed from any area subject to these regulations.

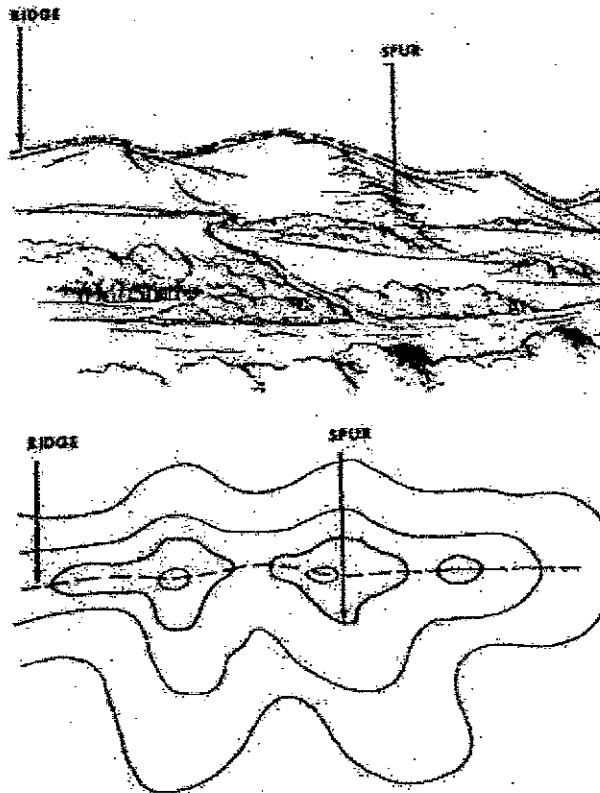
2.27 Request for Determination of Applicability is a written request made by any person to the Commission for a determination as to whether or not the proposed work is significant enough that it requires the filing of a more detailed Notice of Intent. It shall be submitted on Form A. See 4.0 below for requirements.

2.28 Ridgeline, as in the illustration following, for the purpose of the Scenic Mountain regulation, is the ground surface, not the tops of the trees, along the top of a mountain.

A ridgeline is the high line of the topography that divides a watershed. Water flows in different directions down from this line. Drainage basins or watershed shall be

the Housatonic River and the small-scale drainage systems of local water carrying features such as lakes and perennial streams

The ridgeline may slope up or down as it connects peaks of different elevations.



2.29 Scenic shall be defined as applying to vistas, open space, woodlands, fields, meadows and agricultural lands that contribute to preserving the natural scenic qualities of the environment.

2.30 Slope is the measurement of a continuous change in elevation divided by the horizontal distance in which the change takes place, expressed as a percentage.

2.31 Steep slopes are defined as areas with slopes averaging 15% or greater over a horizontal distance of 200 feet. Steep slopes shall be measured by transects spaced a minimum of 35 feet apart along the base of the slope. A box 35 feet x 200 feet defines the area of a steep slope.

2.32 Significant means what is of importance and of consequence as determined by the Commission.

2.33 Topographic features comprise the configuration of the land's surface, including its relief and relative elevation.

2.34 Tree Canopy coverage is the horizontal area covered by the foliage of a tree in full vegetation.

2.35 Vegetation is the plant life or total plant cover of a given area, including but not limited to grass, ground-cover, shrubs and trees.

2.36 Vista Pruning is the selective thinning of tree branches or mowing and removal of understory brush, to establish a specific "window" to improve visibility. Vista Pruning does not include the cutting of trees over 4 inches in diameter.

2.37 Watershed is a region or area within which all water drains ultimately to a particular watercourse or body of water.

### 3.0 PERFORMANCE STANDARDS

3.1 Applicants seeking approval under these regulations must meet all applicable state standards intended to implement the provisions of M.G.L. CH. 131, Section 39A. Said standards are herein incorporated by reference. The Commission further finds that protection of the interests identified in these regulations requires that applicants meet the following additional standards.

3.2 In considering any application for work, within the mapped mountain regions, the Commission shall make the following presumptions:

- a. Man-made protuberances above ridgelines damage natural scenic qualities;
- b. Clearing of contiguous, regulated lands totaling one-half (1/2) acre or more damages natural scenic qualities and/or causes erosion;
- c. Alteration of steep slopes causes erosion, promotes flooding, damage to water quality, and degrades scenic qualities.

3.3 The presumptions in 3.2 above may be rebutted by the applicant upon submission of a preponderance of the evidence to the satisfaction of the Conservation Commission that:

- a. one or more of the presumptions does not apply to the site of the proposed work, which would result in the Commission issuing the applicant a Negative Determination of Applicability; or
- b. the proposed work will be mitigated in such a way that it will have no unacceptable or significant adverse effects upon the watershed resources or natural scenic qualities, which would result in the Commission issuing the applicant, if applicable a Negative Determination of Applicability, or an Order of Conditions.



### 3.4 Drainage

#### 3.41 General Conditions for Site Design and Construction of all projects.

- a. Construction on any site subject to these regulations shall be managed to control stormwater runoff and to prevent erosion and sedimentation, both during construction and after completion of construction.
- b. The Owner shall operate and maintain all permanent drainage and erosion control measures in good working condition.
- c. Erosion and sedimentation control measures shall be installed at the beginning of site work, and shall be maintained throughout the construction period until the site is stabilized. The measures used shall conform to the Best Management Practices (BMP's) included in the sources listed in Section 6.6 following. The applicant shall demonstrate to the Conservation Commission that the selected BMP's are appropriate for the project.
- d. Site work on all projects should be designed to:
  - i) minimize the amount of land disturbance;
  - ii) retain natural vegetation where possible;
  - iii) use existing and newly planted trees and shrubs as a vegetative buffer to minimize visual impact of new buildings when viewed from off-site roads;
  - iv) avoid cutting or substantial thinning of trees along ridgelines or creating a "notch" in the tree line along a mountain top;
  - v) minimize the amount of impervious surfaces and maximize the use of permeable materials such as porous pavement in parking areas;
  - vi) disperse site drainage as much as possible;
  - vii) avoid concentrating storm water runoff and discharging it at one point;
  - viii) avoid discharging drainage onto steep slopes;
  - ix) utilize open vegetated or rock-lined drainage swales wherever possible;
  - x) minimize the use of piped drainage systems;
  - xi) provide for stabilized drainage outlets, aprons, stilling basins, or similar scour protection measures where drainage discharges onto the ground.
- e. Any culverts such as driveway cross culverts, shall be at least 12" diameter and have a slope of at least 1% with a preferred slope of 2%.

#### 3.42 Drainage Requirements for larger projects.

- a. Any construction project subject to these regulations that will disturb a total of one (1.0) acre or more of land surface shall, unless waived by the Conservation Commission, require the submission of hydrologic calculations and plans of storm water mitigation measures designed by a

registered professional engineer.

b. Hydrologic calculations shall be submitted comparing the existing drainage conditions on the site before construction (pre-development condition) with proposed and shall include the following design storms: 2-year, 10-year, 25-year, and 100-year intervals. Calculations shall include a description of the methodology used, and a narrative description of the soil conditions, slopes, vegetative cover, and runoff curve numbers for each sub-drainage area affected by the project.

c. All components of the piped drainage system shall be designed with capacity to handle at least the peak runoff from a 25-year storm in the post-development condition.

d. Storm water management measures shall be installed so that the post development project will not increase the peak rate of runoff from the site during a 25-year design storm compared to pre-development conditions.

### 3.5 Septic systems

3.51 Any septic system that is to be constructed in compliance with requirements of 310 CMR 15.000 *Subsurface Disposal of Sanitary Sewage (Title V)*, or more stringent local board of health requirements, proposed within the regulated areas described herein shall be presumed to protect the interest identified herein. The construction impact around the system shall be the subject of regulation.

3.52 Any emergency septic system repairs need only the oversight of the Board of Health.

3.6 Compliance with the Forest Cutting Practices Act shall be demonstrated by submission to the Conservation Commission a copy of the permit issued under that Act.

## 4.0 REQUEST FOR DETERMINATION OF APPLICABILITY

4.1 Any person who believes that the Act does not apply to a particular area or proposed work for one or more of the reasons listed below, or that the proposed work is not likely to have a significant adverse impact on watershed resources or natural scenic qualities, may submit a written Request for Determination of

Applicability to the Conservation Commission at Town Hall for any of the following reasons:

- a. Land is not within the mountain regions regulated under the Act; or
- b. Proposed work is exempt under the Act; or
- c. Proposed work is not an alteration as listed in 2.2; or
- d. Proposed work includes appropriate mitigation measures so the work will not have a significant adverse impact on watershed resources or natural scenic qualities.

4.2 The request shall be made on Form A and submitted by certified mail or by hand delivery to the Conservation Commission at Town Hall. The requests shall include such information or plans as may be necessary to describe in general terms the nature and scope of the proposed activity and any mitigating measures proposed to protect the watershed resources and preserve the natural scenic quality.

Engineering drawings and accompanying documents shall include sufficient information to demonstrate to the satisfaction of the Conservation Commission that the interests of these regulations will be protected.

Plans shall include landscaping, erosion controls, and drainage to show how the proposed work will not adversely affect the interests of these regulations. Any area proposed for removal of vegetation where soil will be exposed for more than 10 days shall be mulched, or otherwise treated, to prevent erosion.

Any activity shall be limited to what is described in the submittal.

4.3 Upon receipt of such notice the hearing authority shall designate a file number for such notice and within 21 days, shall make a determination whether or not the proposed work is a regulated activity.

4.4 The Commission shall send to the applicant a written Preliminary Determination of Applicability signed by a majority of the Commission, within 21 days following receipt of the request. Copies shall be sent to all persons so requesting. If a person other than the owner submitted the Request for Determination of Applicability, a copy shall also be sent to the owner. The Determination shall be made on Form B of these regulations.

4.5 The Commission may rescind a Determination of Applicability issued and require filing of a Notice of Intent if any individual, an owner of abutting land, or any ten residents of the town who has been negatively affected by a Determination of

Applicability where the land is located, file an appeal requesting by certified mail a hearing within ten days of the issuance of the Determination.

4.6 If the Applicant is not notified within 14 days after an Order is issued that the hearing authority has rescinded the order, the applicant may perform the proposed activity.

## 5.0 NOTICE OF INTENT

5.1 Any persons proposing an activity subject to the Act as specified in section 1.2 of these regulations shall send to the Commission, by certified mail or in-hand delivery, 4 copies of a completed Notice of Intent. A filing fee of \$65.00 payable to the Town of Lenox must accompany the Notice. The date of filing of said notice shall be the date of receipt of a completed filing by the Commission, and all time periods set forth in the Act shall commence from this date. The Notice shall be filled out on Form C of these regulations.

5.2 No Notice of Intent shall be sent before all permits, variances, and approvals required by law or local bylaw with respect to the activity have been applied for. Such permits, variances, and approvals required by local by-law may include, among others, the following:

- a. Zoning variances;
- b. Special permits including comprehensive permit issued under chapter 40B, Sect.20-23;
- c. Gravel removal or mining permits;
- d. any required permit from the Board of Health, such as a Disposal Works Construction permit or Well Construction permit.

5.3 Upon receipt of a Notice of Intent, the Commission shall designate a file number.

5.4 The applicant must submit any other reasonable information, relevant to the project, later requested by the Commission. If such information is not submitted, the Commission may, after a public hearing, issue an Order prohibiting the activity.

## 6.0 Plans

6.1 Plans sent with a Notice of Intent shall include the following:

Two locus maps showing property's location. One shall be an enlarged section of

a United States Geological Survey map or MASS GIS equivalent, and the other shall be a copy of the current Lenox Zoning Map, each showing the location of the property. Each shall have an arrow indicating True North.

6.2 Drawings should be drawn to a scale in which 1" equals no more than 40', with the title designating the name of the project location and the names(s) of the persons preparing the drawings and the date prepared, including all the latest revision dates. The Commission may require drawings to be stamped and signed by a registered professional engineer, architect, landscape architect, or registered land surveyor of the Commonwealth.

6.3 Drawings and accompanying documents shall include sufficient information to demonstrate to the satisfaction of the Conservation Commission that the interests of these regulations will be protected. These drawings and documents shall include some or all, as may be applicable to the proposed property and work, of the following:

- a. Present and proposed contours of the entire work area and affected adjacent areas showing contours at elevation intervals of no more than 2 feet;
- b. All property lines and zoning setbacks;
- c. All brooks, creeks, rivers, streams, ponds, lakes, wetlands, and buffer zones, whether continuous or intermittent, natural or man-made, regulated by the Massachusetts Wetland Protection Act General Laws 131 Section 40 within 200 feet of any work area(s); and or any local bylaws.
- d. Location of major site features, such as existing stone walls, fences, large trees, and rock outcroppings;
- e. Location, extent, and area of all present and proposed paved areas, roads, driveways, and parking areas;
- f. Location of proposed water retention areas;
- g. Location of areas to be removed, dredged, filled or otherwise altered in any way;
- h. Location of underground utilities, rights of way or easements of any kind;
- i. Soil characteristics within 200 feet of the work area(s) in representative portions of the site, including the type of soil found in building sites. Sampling sites shall be specified;
- j. All existing and proposed structures, including height thereof;
- k. All calculations necessary to show the effect of the proposed activity on soil and water;
- l. Location of any spoils areas;
- m. Existing and proposed water supplies for proposed activities;
- n. Existing and proposed sewage disposal systems, specifically showing the location and type to be used;
- o. Erosion and sedimentation prevention plans for during and after construction;
- p. Description of the potential impact on natural scenic qualities of the

mapped mountain region and specific measures for mitigating those impacts;

q. Proposed alterations, within the work area(s) to existing tree canopy coverage, expressed as a percentage reduction from the existing conditions.

6.4 Engineering drawings shall also include a profile map showing principal features of the site, proposed alterations, and a profile drawing of site vegetation. These profile maps should be drawn from multiple radians from various angles.

6.5 The applicant may submit, or the Commission may require, further information that will assist in the review if deemed necessary by the Commission to determine the effect of the proposed activity on the mapped mountain regions.

6.6 Performance standards and engineering practices acceptable for work to be performed under this Act are contained in the most recent versions of the following:

- a. U.S. Dept. of Agriculture, Soil Conservation Service. Guidelines for Soil and Water Conservation in Urbanizing Areas of Massachusetts,
- b. U.S. Dept. of Agriculture, Soil Conservation Service. Erosion and Sediment Control in Site Development: Massachusetts Conservation Guide Volume I, September, 1983. (Available from Berkshire Conservation District),
- c. U.S. Dept. of Agriculture, Soil Conservation Service. Vegetative Practices in site Development: Massachusetts Conservation Guide Volume II, (Available from Berkshire Conservation District),
- d. U.S. Dept. of Agriculture, Soil Conservation Service. Soil Survey of Berkshire County, Massachusetts, February 1988. (Available from Berkshire Conservation District),
- e. Massachusetts Stormwater Management, DEP, Boston, MA, March 1997, Volume One and Two.

## 7.0 HEARINGS

7.1 The Commission shall hold a public hearing on the proposed activity within 21 days after receipt of the Notice of Intent.

7.2 Notification of the time and place of the hearing shall be given by the Commission, at the expense of the applicant, not less than 5 days prior to such hearing, by publication in a newspaper of general circulation in the Town of Lenox. Applicant shall notify abutters of the hearing by certified mail, return receipt requested, not less than 10 days prior to such hearing and provide proof of said mailing to the Commission.

7.3 The Commission shall mail, by certified mail, a copy of the published notice to the applicant and to the Board of Health and Planning Board of the town.

7.4 The hearing shall be public, and all interested persons shall be allowed to testify.

7.5 The Commission, with the consent of the applicant, may continue a hearing for good cause provided that notice of continuance to a specific date, time and place is given at the public hearing.

## 8.0 ORDER OF CONDITIONS

8.1 Within 21 days after the end of the hearing, the Commission shall issue a written Order which may impose reasonable conditions on the proposed activity in an effort to protect watershed resources, or to preserve the natural scenic qualities against any significant adverse effect because of the pollution or diminution of ground or surface water supply, public or private; erosion; flooding; substantial changes in topographic features; or substantial destruction of vegetation of the mapped mountain regions. The Order shall be made on Form D of these regulations.

8.2 The Order shall be signed by a majority of the Commission, and a copy thereof shall be sent by Certified Mail to the applicant, the owner of the land if other than the applicant, and the Department. The order shall also be posted, within 1 day of issuance in the hearing authorities' customary place of general public notice.

8.3 Any applicant undertaking an activity regulated by this Section shall record the Order in the Berkshire Middle District Registry of Deeds after the expiration of the ten-day Appeal Period. No activity shall commence until the Order is recorded and the applicant sends a receipt for this recording from the Registry of Deeds by certified mail or hand delivered to the Commission.

8.4 The Order of Conditions shall be valid for one year unless extended or revoked in accordance with the provisions of the Act or these regulations. Extension of the OOC requires written application on Form F, with the hearing authority prior to the expiration of the existing OOC.

## 9.0 APPEALS

9.1 An appeal request to the Department may be made in accordance with M.G.L., 131, Sect. 39A, within ten days after the Commission has acted, or failed to act, as follows:

a. If the Commission has issued an Order;

b. If the Commission fails to hold a hearing within 21 days after receipt of the

Notice of Intent;

- c. If the Commission holds a hearing but fails to issue an Order within 21 days after the hearing.

9.2 Appeal may be initiated by any of the following:

- a. The applicant; or
- b. Any abutter of land upon which the proposed activity would be carried out; or
- c. Any ten residents of the town where such land is located.

9.3 The person(s) appealing may request the Department to determine if other reasonable conditions should be imposed on the proposed activity or if such conditions should be modified in order to protect against a significant adverse effect on watershed resources or natural scenic qualities, or if conditions can be modified or eliminated without any loss of protection against any significant adverse effect on watershed resources or scenic qualities.

9.4 The request shall be sent by certified mail to the Department within ten days after the Commission has acted or failed to act. At the same time, the person(s) appealing shall send copies thereof to the Commission and, if the person(s) appealing be other than the owner and applicant, to the owner and applicant. Upon receiving a copy of the request, the Commission shall within seven days forward the file on the matter to the Department.

9.5 Any Order issued by the Department shall supersede the prior Order of the Commission and all work shall be done in accordance therewith.

9.6 A copy of the Superseding Order shall be sent by Certified Mail to the applicant, the Owner, to the Hearing Authority, and to the party who requested the order if not the applicant.

9.7 If the applicant is not notified of a request of the Department within 14 days after the after issuance of an Order by the Hearing Authority, or upon the issuance of an order by the Department, said applicant may conduct any regulated activities in accordance with the terms of the order, issued by the Hearing Authority.

9.8 Any person aggrieved by an Order of the Department may appeal under the provisions of General Laws Chapter 30A. Such rights of appeal shall be exclusive.

## 10.0 CERTIFICATE OF COMPLIANCE



10.1 Upon completion of an activity in compliance with an Order, the applicant may request a Certificate of Compliance from the agency that issued the Order. The request shall be in writing.

10.2 Where a project has been completed in accordance with plans stamped by a registered professional engineer, architect, landscape architect, or land surveyor, a written statement by the aforesaid professional people, certifying compliance with the plans, shall accompany the request for a Certificate.

10.3 After receipt of the request for a Certificate, the Commission may conduct an on-site inspection of the completed work by the applicant and the Commission.

10.4 If any of the work is not in compliance with the Order, the Commission shall refuse to issue a Certificate.

10.5 Upon completion of a portion of work under an Order of Conditions, the Commission may issue a Certificate of Compliance as to that portion, if the applicant so requests.

10.6 The Certificate shall certify in recordable form that the activity described in the Notice of Intent and plans has been completed in accordance with the Order. The Certificate shall be made on Form E of these regulations.

10.7 The applicant may record the certificate in the appropriate Registry of Deeds.

10.8 The applicant may request an extension of an Order before it expires. The Commission may grant two extensions of the Order, each for a period of no longer than one year. Extensions shall be made on Form F of these regulations.

## 11.0 VIOLATIONS AND ENFORCEMENT

11.1 Any person, except a bona fide purchaser for value without notice, who purchases or otherwise acquires land upon which an activity has been done in violation of this MGL Chapter 131, Section 39A or in violation of an order issued under MGL Chapter 131, Section 39A, shall forthwith comply with the order or restore the land to its condition prior to any violation.

11.2 The Commission, its agents, officers, and employees, may enter upon privately owned land for the purpose of carrying out the provisions of the Act, and may issue a cease and desist order to anyone found in violation of the Act.

11.3 The Commission may revoke an Order if it finds that the applicant has exceeded the scope of the activity as set forth in the Order or has not complied with the conditions set forth in the Order, or if it determines that facts not available or not brought to its attention at the time the Order was issued warrant such revocation.

11.4 No revocation shall be made without notice to the applicant of the facts or conduct, which warrant the intended revocation and a hearing at which the applicant is given an opportunity to show compliance with the Order.

11.5 Any court having equity jurisdiction may restrain a violation of this section and enter such Orders as it deems necessary to remedy such violations, upon the petition of the Attorney General, Commissioner, the town, an owner or occupant of property which may be affected by such violation; or any ten residents of the Commonwealth under General Laws Chapter 214, Section 7A.

11.6 Whoever violates any provisions of this Act shall be punished by a fine of not more than one thousand dollars or by imprisonment for not more than six months or both. Each day or portion thereof of continuing violation shall constitute a separate offense.

11.7 Officers of the Executive Office of Environmental Affairs shall enforce the Act.

## 12.0 EXEMPTIONS

12.1 The Act does not apply to the cutting of forest products on land devoted to forest purposes whose owners have complied with the provisions of the Forest Cutting Practices Act, General Laws Chapter 132 Sections 40 - 46, by obtaining a permit thereunder and which has been submitted to the Commission for review prior to cutting.

12.2 The Act does not apply to any activity that is subject to the provisions of the the Wetlands Protection Act, MGL Chapter 131, Section 40.

12.3 Any activity conducted in connection with the construction or maintenance of any facility as defined in General Laws Chapter 164, Section 69G Manufacture and Sale of Gas and Electricity.

12.4 Any activity conducted in connection with construction or maintenance of any electrical, transmission or distribution facilities used in transmission of intelligence by electricity or by telephone or otherwise for which location has been approved by the Select Board or under General Laws Chapter 166, Section 22.

12.5 Construction or maintenance of any electrical distribution facilities required to serve a building or structure whose construction has been approved under the Act.

12.6 Notwithstanding the provisions of MGL Chapter 131, Section 39A and these Regulations, certain activities or areas are exempted from regulation:

- a. Maintenance, and ordinary repairs;

b. Vista pruning, provided the activity meets the definition of 2.36 above;

c. Plantings of native species of trees, shrubs, or groundcover;

d. Pruning of landscaped areas;

e. Farming-agricultural and associated maintenance of farming agricultural lands, such lands being farmed as of the effective date of these regulations, but not the creation of new or expansion of existing farmlands which shall require the filing by the applicant under the SMA.

f. Normal use and maintenance, not substantial enlargement, of land in use for agriculture, gardening, landscaping, or similar activities on existing residential properties.

End of regulations.

# Town of Lenox Scenic Mountain Act

## Scenic Mountain Act Regulated Areas:

- a) All areas above 426.7 meters (1400 feet) in elevation (shown in red)
- b) All areas below 426.7 meters (1400 feet) in elevation where any portion of the project is located on a steep slope ( $\geq 15\%$ ) (not illustrated on this map)

Regulated Area > 1400 ft



A true copy:

Attest: *Maria L. Dwyer*  
Town Clerk

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## **APPENDIX I**

### **WIND TURBINE PRODUCT INFORMATION**

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## **FUHRLANDER**

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[HTTP://WWW.FUHRLAENDER.DE/DOWNLOADS/DOWNLOADS/FL-TB-08-EN-DE-IT.PDF](http://www.fuhrlaender.de/downloads/downloads/FL-TB-08-EN-DE-IT.pdf)



**Fuhrländer**

AKTIENGESELLSCHAFT

**Fuhrländer wind turbines**  
**Fuhrländer Windenergieanlagen**  
**Impianti eolici Fuhrländer**

FL 2500



FL 1500



FL MD 70/77



FL 1250



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**GE**

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[HTTP://WWW.GEPOWER.COM/PROD\\_SERV/PRODUCTS/WIND\\_TURBINES/EN/DOWNLOADS/GEA14954C15-MW-BROCH.PDF](http://www.gepower.com/prod_serv/products/wind_turbines/en/downloads/gea14954c15-mw-broch.pdf)



GE Power & Water  
Renewable Energy

# 1.5 MW

## Wind Turbine Series



imagination at work

a product of  
**ecomagination**

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## VESTAS

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[http://www.vestas.com/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFiler%2fEN%2fBrochures%2fProductBrochureV821\\_65\\_UK.pdf](http://www.vestas.com/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFiler%2fEN%2fBrochures%2fProductBrochureV821_65_UK.pdf)

# V82-1.65 MW

Creating more from less

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## **APPENDIX J**

### **PROJECT FINANCIAL MODELS**

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Cash Flow Statement Town Ownership Scenario	Closing Date	Annual Year 1	Annual Year 2	Annual Year 3	Annual Year 4	Annual Year 5	Annual Year 6	Annual Year 7	Annual Year 8	Annual Year 9	Annual Year 10
	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/30/2016	12/31/2017	12/31/2018	12/31/2019	12/30/2020	12/31/2021	12/31/2022
Project Revenues											
Energy Sales		\$198,956	\$204,924	\$211,072	\$217,404	\$223,926	\$230,644	\$237,564	\$244,690	\$252,031	\$259,592
REC Sales		\$86,160	\$86,160	\$86,160	\$86,160	\$86,160	\$86,160	\$86,160	\$86,160	\$86,160	\$86,160
Energy Savings		\$236,737	\$243,839	\$251,154	\$258,689	\$266,449	\$274,443	\$282,676	\$291,157	\$299,891	\$308,888
Total Revenues		\$521,853	\$534,923	\$548,386	\$562,253	\$576,536	\$591,247	\$606,400	\$622,007	\$638,082	\$654,640
Project Expenses											
Transactional/Closing Costs	\$ 50,000										
Operation and Maintenance Expense		\$50,000	\$51,500	\$53,045	\$54,636	\$56,275	\$57,964	\$59,703	\$61,494	\$63,339	\$65,239
Long Term Maintenance Escrow Fund		\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Total Operating Expenses	\$ 50,000	\$55,000	\$56,500	\$58,045	\$59,636	\$61,275	\$62,964	\$64,703	\$66,494	\$68,339	\$70,239
Debt Service - Municipal Bond	\$ 5,304,000										
Interest Expense		\$235,255	\$227,564	\$219,520	\$211,106	\$202,306	\$193,101	\$183,474	\$173,404	\$162,871	\$151,855
Principal Payment		\$167,414	\$175,105	\$183,149	\$191,563	\$200,363	\$209,568	\$219,195	\$229,265	\$239,797	\$250,814
Total Debt Service	\$ 5,304,000	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669
Annual Cash Flow	\$ 5,354,000	\$64,184	\$75,755	\$87,673	\$99,948	\$112,592	\$125,615	\$139,029	\$152,845	\$167,075	\$181,733

Primary Project Assumptions	
Assumption Description	Value
Turbine Quantity/Manufacturer	(1) - Fuhrländer FL 1500
Aggregate Nameplate Capacity (kW)	1,500
Estimated Annual Generation (kWh)	4,308,000
Fully Installed System Cost	\$5,254,000
Transactional/Closing Costs	\$50,000
Date to Begin Operation	12/31/2012
Net Metering Credit Value for Town Usage via National Grid (\$/kWh)	\$0.13
Net Metering Credit for Town Usage Annual Escalator	3%
Annual Town Usage Offset by WTG (kWh)	\$1,821,053
Net Metering Credit Value for Excess Generation (\$/kWh)	\$0.08
Net Metering Credit PPA Term (Yrs)	20
Net Metering Credit PPA Annual Escalator	3%
REC Sales, Years 1-10 (\$/MWh)	\$20.00
Annual Operation and Maintenance	\$50,000
Operation and Maintenance Annual Escalator	3%
Annual Long-Term Maintenance Escrow Fund	\$5,000
Debt to Equity Ratio	All Debt
Municipal Bond Term (Yrs)	20
Municipal Bond Interest Rate	4.50%

Cash Flow Statement Town Ownership Scenario	Annual Year 11	Annual Year 12	Annual Year 13	Annual Year 14	Annual Year 15	Annual Year 16	Annual Year 17	Annual Year 18	Annual Year 19	Annual Year 20	Totals
	12/31/2023	12/30/2024	12/31/2025	12/31/2026	12/31/2027	12/30/2028	12/30/2029	12/30/2030	12/30/2031	12/29/2032	
Project Revenues											
Energy Sales	\$267,380	\$275,401	\$283,663	\$292,173	\$300,938	\$309,967	\$319,266	\$328,844	\$338,709	\$348,870	\$5,346,016
REC Sales	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$861,600
Energy Savings	\$318,155	\$327,699	\$337,530	\$347,656	\$358,086	\$368,828	\$379,893	\$391,290	\$403,029	\$415,120	\$6,361,209
Total Revenues	\$585,534	\$603,101	\$621,194	\$639,829	\$659,024	\$678,795	\$699,159	\$720,134	\$741,738	\$763,990	\$12,568,825
Project Expenses											
Transactional/Closing Costs											
Operation and Maintenance Expense	\$67,196	\$69,212	\$71,288	\$73,427	\$75,629	\$77,898	\$80,235	\$82,642	\$85,122	\$87,675	\$1,343,519
Long Term Maintenance Escrow Fund	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$100,000
Total Operating Expenses	\$72,196	\$74,212	\$76,288	\$78,427	\$80,629	\$82,898	\$85,235	\$87,642	\$90,122	\$92,675	\$1,443,519
Debt Service - Municipal Bond											
Interest Expense	\$140,333	\$128,281	\$115,676	\$102,491	\$88,701	\$74,278	\$59,192	\$43,412	\$26,908	\$9,646	\$2,749,373
Principal Payment	\$262,336	\$274,388	\$286,993	\$300,177	\$313,967	\$328,391	\$343,477	\$359,256	\$375,761	\$393,023	\$5,304,000
Total Debt Service	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$402,669	\$8,053,373
Annual Cash Flow	\$110,670	\$126,220	\$142,237	\$158,734	\$175,726	\$193,228	\$211,255	\$229,823	\$248,947	\$268,646	\$3,071,932

Primary Project Assumptions	
Assumption Description	Value
Turbine Quantity/Manufacturer	(1) - Fuhrländer FL 1500
Aggregate Nameplate Capacity (kW)	1,500
Estimated Annual Generation (kWh)	4,308,000
Fully Installed System Cost	\$5,254,000
Transactional/Closing Costs	\$50,000
Date to Begin Operation	12/31/2012
Net Metering Credit Value for Town Usage via National Grid (\$/kWh)	\$0.13
Net Metering Credit for Town Usage Annual Escalator	3%
Annual Town Usage Offset by WTG (kWh)	\$1,821,053
Net Metering Credit Value for Excess Generation (\$/kWh)	\$0.08
Net Metering Credit PPA Term (Yrs)	20
Net Metering Credit PPA Annual Escalator	3%
REC Sales, Years 1-10 (\$/MWh)	\$20.00
Annual Operation and Maintenance	\$50,000
Operation and Maintenance Annual Escalator	3%
Annual Long-Term Maintenance Escrow Fund	\$5,000
Debt to Equity Ratio	All Debt
Municipal Bond Term (Yrs)	20
Municipal Bond Interest Rate	4.50%