PETITION NO. 983 - BNE Energy, Inc. petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the construction, maintenance, and operation of a 4.8 MW Wind Renewable Generating facility located on Flagg Hill Road, Colebrook, Connecticut.	}	Connecticut Siting Council

June 2, 2011

FINDINGS OF FACT

Introduction

1. On December 6, 2010, BNE Energy Inc. (BNE), pursuant to Connecticut General Statutes (CGS) §16-50k and §§16-50j-38 to 16-50j-40 of the Regulations of Connecticut State Agencies, submitted a petition to the Connecticut Siting Council (Council) for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the construction, maintenance, and operation (Petition) of a 4.8 megawatt (MW) Wind Renewable Generating facility at Flagg Hill Road in Prospect, Connecticut. The proposed project is referred to as "Wind Colebrook South." (BNE 1, Vol. 1, p. 1)

2. BNE proposes to install three General Electric (GE) 1.6 MW wind turbines at the site, referred to as Turbine 1 (Southern Turbine), Turbine 2 (Northeastern Turbine), and Turbine 3 (Northwestern Turbine) (Refer to Figure 2). (BNE 1, Vol. 1, pp. 7-8; BNE 1, Vol. 2, Ex. F; BNE 18b)

3. On December 13, 2010, the Council received another petition filing for a 4.8 MW Wind Renewable Generating facility at Winsted-Norfolk Road (Route 44) in Colebrook. That project is referred to as "Wind Colebrook North." (Council Records – Petition No. 984)

4. BNE is a Delaware corporation with a principal place of business located at 29 South Main Street in West Hartford, Connecticut. BNE was founded in 2006 for the purpose of constructing and operating commercial wind generation projects in Connecticut and elsewhere. (BNE 1, Vol. 1, p. 2)

5. Pursuant to CGS §16-50k(a), the project is eligible to be approved by a declaratory ruling since it is a grid-side distributed resources facility under 65 MW that is in compliance with air and water quality standards of the Connecticut Department of Environmental Protection (DEP). (BNE 1, Vol. 1, p. 1)

6. Pursuant to CGS § 16a-35k, Connecticut state energy policy includes the goal to "develop and utilize renewable energy resources, such as solar and wind energy, to the maximum extent possible." (BNE 1, Vol. 1, p. 1)

7. The State of Connecticut has implemented renewable portfolio standards (RPS) that required 14 percent of electric generation within the state be produced by renewable resources by 2010. By 2020, RPS requirements increase to 27 percent, and at least 20 percent of which must be from Class I renewable energy sources, which includes wind. (BNE 1, Vol. 1, p. 3)

8. The parties in this proceeding are the Petitioner (BNE), Robin Hirtle, Stella and Michael Somers, FairwindCT, Inc. (Fairwind), Dr. David Lawrence and Jeannie Lemelin, the Town of Colebrook (Town), Benjamin and Kristin Mow, Walter Zima, Brandy Grant, Eva Villanova, and Susan Wagner. The intervenor in this proceeding is The Connecticut Light and Power Company (CL&P). Robin Hirtle and Benjamin and Kristin Mow were grouped for the purpose of these proceedings. Dr. David Lawrence, Jeannie Lemelin and Eva Villanova were also grouped. Fairwind, Stella and Michael Somers, and Susan Wagner were also grouped. (Transcript 1, 03/22/11, 6:39 p.m. [Tr. 1], pp. 8-9; Transcript 2, 03/23/11, 3:00 p.m. [Tr. 2], pp. 6-7)

9. On November 24, 2010, BNE provided notice of the filing to all adjacent landowners via certified mail, return receipt requested. BNE received return receipts for all abutting property owners except for one, which is the Nature Conservancy of Connecticut, Inc. BNE sent a second notice to this property owner via first class mail. (BNE 1, Vol. 1, Tab D; BNE 2, R. 1)

10. BNE submitted copies of its petition to local and state officials who are normally required to receive notice of applications for a Certificate of Environmental Compatibility and Public Need under CGS § 16-50l (b). This includes the Town of Norfolk and the Town of Winchester because they are located within 2,500 feet of the proposed project. (BNE 1, Vol. 1, Tab E)

11. Pursuant to § 16-50j-21 and 16-50j-40 of the Regulations of Connecticut State Agencies, the Council, after giving due notice thereof, held a public hearing on March 22, 2011 beginning at 6:30 p.m. and on March 23, 2011, beginning at 3:00 p.m. and continuing at 6:30 p.m. at the Northwestern Regional 7 High School, Battistoni Drive, Winsted, Connecticut. (Tr. 1, p. 4; Tr. 2, p. 4; Transcript 3, March 23, 2011, 6:30 p.m.[Tr. 3], p. 4)

12. Evidentiary hearings were continued on April 14, April 21 and April 26, 2011 at the office of the Connecticut Siting Council, 10 Franklin Square, New Britain, Connecticut. (Transcript 4, April 14, 2011, 11:11 a.m. [Tr. 4], p. 3; Transcript 5, April 21, 2011, 11:10 p.m. [Tr. 5], p. 3; Transcript 6, April 26, 2011, 11:05 a.m. [Tr. 6], p. 3)

13. The Council and its staff inspected the proposed site and surrounding area on March 23, 2011. (Council Hearing Notice dated February 7, 2011)

14. BNE published notice of the petition filing in the Litchfield County Times on December 3, 2010. (BNE 1, Vol. 1, p. 33 and Tab D)

15. The Council published a legal notice announcing the date, time and place for the public hearings in The Hartford Courant on February 11, 2011. (Council Hearing Notice dated February 7, 2011)

16. BNE installed a sign at the edge of 17 Flagg Hill Road that presented information regarding the petition and the Council hearing. (Tr. 2, pp. 34-35)

17. BNE expects the proposed project to be completed and ready for commercial operation in late 2011, if approved by May 2011. (BNE 1, Vol. 1, p. 31)

18. The respective population densities of Connecticut, Litchfield County, and the Town of Colebrook are shown in the table below.

Location	Estimated 2008 Population	Land Area (Square Miles)	Population Density (Pop./Sq. Mi.)
Connecticut	3,501,252	4,845.4	723
Litchfield County	187,745	920.0	204
Town of Colebrook	1,520	31.5	48

(Council Record)

State Agency Comment

19. Pursuant to CGS § 16-50j (h), on February 7, 2011, and April 26, 2011, the following state agencies were solicited by the Council to submit written comments regarding the proposed facility: DEP, Department of Public Health (DPH), Council on Environmental Quality (CEQ), Department of Public Utility Control (DPUC), Office of Policy and Management (OPM), Department of Economic and Community Development (DECD), Department of Agriculture (DOAg) and the Department of Transportation (DOT). (Council Hearing Package dated February 7, 2011; Council Request for Additional State Agency Comments dated April 26, 2011)

20. On April 6, 2011, DEP submitted comments regarding the proposed project, which are referred to in various portions of the Environmental Impacts section of these findings. (DEP comments dated April 6, 2011)

21. On March 23, 2011, the DOT submitted a no comment letter. (DOT comments dated March 23, 2011)

22. The following agencies did not respond with written correspondence: DPH, CEQ, DPUC, OPM, DECD and DOAg. (record)

Municipal Consultation

23. On November 24, 2008, BNE received local approval from the Town for the installation of a meteorological (Met) tower to be located on the property. (BNE 1, Vol. 1, p. 5)

24. On October 8, 2010, BNE submitted an informational filing for the proposed project with the Town of Colebrook. (BNE 1, Vol. 1, p. 5)

25. On November 10, 2010, BNE conducted a public informational meeting regarding the project. (BNE 1, Vol. 1, p. 5)

26. The Town of Colebrook Planning and Zoning Commission expressed concerns about the proposed project, primarily the incompatibility with the Town zoning regulations and Plan of Conservation and Development. (Town 3)

27. The Town of Colebrook Inland Wetlands Commission expressed concern about the project's potential permanent direct wetlands impacts associated with the proposed gravel access road, potential temporary direct wetlands impacts associated with tree clearing, and potential temporary disturbance associated with clearing and grading. (Town 2)

28. If approved, the Inland Wetlands Commission has asked for permission to enter the property at reasonable times to inspect the proposed project during construction, and has requested a list of contacts from BNE that would be available to call in the event of an emergency during project construction. (Town 2)

29. The Town Conservation Commission expressed concern about the proposed project's potential damage to scenic, historic and recreational values. (Town 5)

30. If the proposed project is approved, BNE is committed to negotiating a Host Community Agreement with the Town concerning a number of subjects including but not limited to infrastructure and decommissioning. BNE has agreed to a number of the Town's conditions including but not limited to infrastructure and decommissioning issues. (Tr. 4, pp. 29-31; Tr. 6, pp. 124- 146, 235-236)

State and Federal Permits

31. BNE will file with DEP for a General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. (BNE 1, Vol. 1, p. 31)

32. On December 15, 2009, the Federal Aviation Administration (FAA) issued a determination that the proposed turbines do not exceed obstruction standards and would not be a hazard to air navigation; however, the structures must be marked and/or lighted in accordance with FAA regulations. (BNE 1, Vol. 1, p. 32)

33. BNE would install flashing red lights on the nacelles of the turbines, which would be lit at night, and paint the towers white, which would eliminate the requirement of lighting the structures during the day. The proposed lights would flash approximately 20 to 30 times per minute. (BNE 1, Vol. 1, pp. 32-33)

34. BNE would also notify the FAA within five days after the construction reaches its greatest height. (BNE 1, Vol. 1, p. 33)

Proposed Site

35. The proposed site is located at 29 Flagg Hill Road and 17 Flagg Hill Road in Colebrook, with a total area of 79.44 acres. To the west, the host property boundary is the Norfolk/Colebrook Town Line. To the east, the host property boundary is Flagg Hill Road. To the south, the host property boundary is located approximately 700 feet north of the Winchester Town Line (refer to Figure 1). To the north, BNE's property abuts The Northwestern Connecticut Sportsmen's Association, Inc. (BNE 1, Vol. 1, p. 4)

36. Surrounding land uses include a Nature Conservancy property to the west, land owned by a sportsmens' gun club to the north, and residential properties to the east and south. (BNE 1, Vol. 1, p. 7)

37. The host property is currently undeveloped and zoned residential (R-2), which requires just under two-acres to develop a residential parcel. (BNE 1, Vol. 1, pp. 2, 7)

38. There are 19 residences within 2,000 feet of the proposed turbine locations. (BNE 2, R. 4)

39. The three turbines would be located on the property as follows: the Southern Turbine would be located on the south slope of the knoll and near the beaver pond; the Northeastern turbine would be located on the northeast slope of the knoll; and the Northwestern turbine would be located on a slight ridge in the northwest corner of the site. (BNE 1, Vol. 2)

40. The specific locations of the proposed turbines are listed in the following table.

	Northwestern Turbine	**Northeastern Turbine**	**Southern Turbine**
Longitude and Latitude Coordinates	41-57-55.714 N 73-8-56.622 W	41-57-54.386 N 73-8-40.651 W	41-57-44.229 N 73-8-46.814 W
Ground Elevation Above Mean Sea Level	1,446 feet	1,457 feet	1,449 feet
Distance Between NW and NE Turbines	1,210 feet	N/A	N/A
Distance Between NE and S Turbines	N/A	1,128 feet	N/A
Distance Between NW and S Turbines	N/A	N/A	1,378 feet

(BNE 4, R. 1; BNE 1, Vol. 2, Sheet C-201 through C-203)

41. The distances from the proposed turbines to the nearby properties and street are shown in the following table.

	Northwestern Turbine	**Northeastern Turbine**	**Southern Turbine**
Distance to nearest property line	235 feet	435 feet	140 feet
Distance to nearest residential property line	1,370 feet	675 feet	140 feet
Distance to nearest residential building	2,040 feet	1,050 feet	1,005 feet
Distance to Flagg Hill Road	2,075 feet	920 feet	1,570 feet

*This table excludes 17 Flagg Hill Road, which is owned by BNE. (BNE 4, R. 41, R. 42)

42. The distances from the proposed turbines to the abutting property lines are shown in the following table.

Address and Owner	**Northwestern Turbine**	**Northeastern Turbine**	**Southern Turbine**
17 Flagg Hill Road – BNE	1,631 feet	534 feet	1,453 feet
8 Flagg Hill Road – Bank of America	2,060 feet	940 feet	1,960 feet
Winsted-Norfolk Road – State of CT	2,060 feet	895 feet	1,710 feet
33 Flagg Hill Road - Marchetti	1,830 feet	675 feet	875 feet
29A Flagg Hill Road - Dziedzic	1,820 feet	895 feet	740 feet
Flagg Hill Road – NW CT Sportmens	265 feet	435 feet	1,450 feet
45 Flagg Hill Road - Matarainen	1,370 feet	1,130 feet	140 feet
Beckley Road – Nature Conservancy	235 feet	1,450 feet	1,200 feet

(BNE 4, R. 41; BNE 1, Vol. 2, Tab F, Sheet C-002)

43. The distances from the proposed turbines to structures on abutting properties are shown in the following table.

Address and Owner	Northwestern Turbine	Northeastern Turbine	Southern Turbine
17 Flagg Hill Road – BNE	1,838 feet	669 feet	1,673 feet
8 Flagg Hill Road – Bank of America	2,290 feet	1,275 feet	2,340 feet
Winsted-Norfolk Road – State of CT	N/A (no structure)	N/A (no structure)	N/A (no structure)
33 Flagg Hill Road - Marchetti	2,300 feet	1,150 feet	1,505 feet
29A Flagg Hill Road - Dziedzic	2,040 feet	1,050 feet	1,005 feet
Flagg Hill Road – NW CT Sportmens	N/A (no structure)	N/A (no structure)	N/A (no structure)
45 Flagg Hill Road - Matarainen	2,465 feet	1,440 feet	1,390 feet
Beckley Road – Nature Conservancy	N/A (no structure)	N/A (no structure)	N/A (no structure)

(BNE 4, R. 41; BNE 1, Vol. 2, Tab F, Sheet C-002)

Project Description

44. At the proposed site, BNE proposes to install three GE 1.6 MW wind turbines and associated equipment; an access road; an ancillary building for storage, office space and an educational area; and an electrical collector yard at the proposed site (refer to Figure 2). (BNE 1, Vol. 1, p. 7)

Access Road

45. Access to the proposed site would extend approximately 1,480 feet from Flagg Hill Road in a southwesterly direction to the site. The access drive would traverse the 17 Flagg Hill Road parcel and then continue onto the subject parcel located at 29 Flagg Hill Road. (BNE 1, Vol. 1, p. 8; BNE 1, Vol. 2, Tab F, Sheet C-002)

46. The access road would be constructed of compacted stone. No paved roads or parking areas are proposed. (BNE 18, R. 19)

Ancillary Building

47. The proposed ancillary building would include restroom facilities and use an on-site well to meet sanitary and drinking needs. An on-site septic system would be required to dispose of wastewater. (BNE 1, Vol. 1, pp. 8-9)

Electrical Collector Yard

48. BNE's turbines would generate power which would be conducted via underground cables that would run from each turbine to the collector yard. The collector yard would collect power from the underground cables. The power would be then reduced to the distribution voltage of 23-kV via a pad-mounted transformer located within the collector yard. (BNE 1, Vol. 2, Sheet E-101 and E-501; BNE 1, Vol. 1, p. 9)

49. Additional electrical equipment in the yard would also include a utility class circuit breaker or recloser with a multifunctional relay to serve as the interconnection interruption device. (BNE 1, Vol. 1, p. 8)

50. The generated power would feed into the distribution system via an overhead line from the collector yard headed east directly to Flagg Hill Road. (BNE 1, Vol. 2, Sheet E-101)

51. Details of the electrical interconnection would be subject to an agreement with CL&P. (Tr. 5, pp. 221-222)

GE 1.6 MW Turbines

52. Each of BNE's turbines would consist of a tower, hub, nacelle, and three blades. The nacelle contains the gearbox, generator and other operational equipment. The hub is located at one end of the nacelle and is where the three blades connect to the turbine. (BNE 1, Vol. I, pp. 7-8; BNE 1, Vol. I, Tab C)

53. For the purposes of this document, the hub height is defined as the distance from ground level to the center of the hub, which is 100 meters (100m or 328 feet). (BNE 1, Vol. I, pp. 7-8; BNE 1, Vol. I, Tab C)

54. The sweep area of the three blades is created by the rotor diameter. In this document, two variations of the rotor diameter that could be installed on the GE 1.6 MW turbines will be discussed, as follows: an 82.5m (270-foot) rotor diameter and a 100m (328-foot) rotor diameter. (BNE 1, Vol. I, pp. 7-8; BNE 1, Vol. 1, Tab C)

55. The 82.5m rotor diameter is proposed in this petition; however, BNE is requesting permission from the Council to allow for a 100m rotor diameter if it becomes commercially available in 2012. (BNE 1, Vol. I, pp. 7-8; Tab C; Tr. 4, p. 16)

56. The total maximum height of the tower and rotor blades would be 150m (492 feet) with the 100m rotor diameter, or 141.25m (463 feet) with the 82.5m rotor diameter. (BNE 1, Vol. 1, pp. 7-8)

57. Independent pitch motors are used for each blade to provide adjustment of the blade pitch angle during operation. (BNE 1, Vol. 1, p. 10)

58. The turbine foundations are proposed to be octagonal, approximately 48 feet in diameter, and about four feet deep. They would be made of reinforced concrete. (Tr. 6, p. 50)

59. The useful lifespan of the proposed turbines is over 20 to 30 years. At the end of that period, the equipment would be reviewed and a determination would be made to decommission or change out existing equipment. BNE would be willing to file a decommissioning plan during the Development and Management (D&M) Plan phase of the proposed project, if required by the Council. (BNE 1, Vol. 1, p. 9; Tr. 6, pp. 62-63)

60. The following information regarding specific features of the turbine was filed subject to a Protective Order: Mutual Non-Disclosure Agreement; Setback Considerations for Wind Turbine Siting; Mechanical Loads Analysis; Noise Emission Characteristics; Technical Descriptions and Data; Calculated Power Curves; Raw Wind Data; Wind Turbine Series; Weights and Dimensions; and Wind Turbine Fact Sheet. (Council Protective Order of April 14, 2011)

Facility Operation

Capacity

61. BNE began searching for a site in Colebrook because of Colebrook's ground elevation and potential for wind resources. The search was focused on available property with sufficient acreage to accommodate several turbines, with a location convenient for a connection to the grid, and with a low residential density in the surrounding area. (BNE 1, Vol. 1, p. 13)

62. BNE installed a Met tower on the property on December 2008 to begin collecting wind data. (BNE 1, Vol. 1, p. 13)

63. Data from the Met tower was collected for approximately 14 months, from December 2008 through January 2010. (BNE 1, Vol. 3, Tab M, p. 12)

64. The average (mean) wind speeds for each month are shown in the table below.

Month	**Extrapolated Mean Wind Speed at 100m**
January	8.6 m/s (19 mph)
February	8.7 m/s (19 mph)
March	7.3 m/s (16 mph)
April	7.3 m/s (16 mph)
May	6.7 m/s (15 mph)
June	5.1 m/s (11 mph)
July	5.6 m/s (13 mph)
August	5.7 m/s (13 mph)
September	6.5 m/s (15 mph)
October	7.1 m/s (16 mph)
November	7.2 m/s (16 mph)
December	9.0 m/s (20 mph)

(BNE 1, Vol. 3, Tab M, p. 17, Table 10)

65. The proposed 328-foot (100m) hub height would result in a higher energy output and capacity factor compared to the 262-foot (80m) hub height. (Tr. 2, pp. 39-40)

66. The cut-in wind speed for the 270-foot (82.5m) diameter blade is 7.8 mph (3.5 m/s). The cut-in speed is the same for the 328-foot (100m) diameter blade. The cut-out speed is 56 mph (25 m/s). (BNE 2, R. 16; BNE 9h)

67. If the proposed wind turbines were placed too close together, turbulence caused by the upwind turbine could impinge on the turbine downwind, such that the downwind turbine could be damaged over time and/or produce less electricity. (Tr. 4, p. 56-57)

Reliability

68. The proposed project would generate approximately 12,614 megawatt-hours (MWh) of Class I renewable energy annually. (BNE 1, Vol. 1, p. 11)

69. The capacity factor is a measure of the project's efficiency. It refers to the amount of electricity the project generates in a year as a percent of electricity it would theoretically produce if it were to operate at its maximum output for 100 percent of the hours in the year. (BNE 1, Vol. 1, pp. 11-12)

70. The capacity factor of the proposed project is expected to be approximately 30 percent, based on the 82.5m rotor diameter. The capacity factor would increase to roughly 35 percent with a 100m rotor diameter. (BNE 1, Vol. 1, pp. 12; Tr. 2, pp. 39-40)

71. The proposed wind turbines are designed to have an availability of approximately 99.3 percent. (BNE 1, Vol. 1, p. 12; Tr. 5, p. 262)

72. Total availability would be approximately 95 percent, allowing about three percent for maintenance and general down time and about two percent for icing conditions. (Tr. 5, pp. 168-170)

73. Maintenance is generally scheduled every six months and requires turbines to be shut down for approximately one-and-a-half days. Maintenance includes tightening of bolts, changing filters, and topping off lubricants in the nacelle. (Tr. 2, pp. 68-69)

74. The proposed turbines could withstand a maximum extreme gust for a three-second period of approximately 125 miles per hour (mph) and for ten minutes at approximately 89 mph, in accordance with International Electrotechnical Commission standards. (BNE 1, Vol. 1, p. 12)

Public Health and Safety

Setbacks

75. Connecticut does not have state-issued setbacks for commercial wind turbines. Only four states do (Minnesota, Ohio, South Dakota, Wisconsin). (BNE 9g, with attachment from OLR)

76. Twelve states have established model siting ordinances or similar guidance concerning wind turbines (commercial and noncommercial) at the state level, despite having assigned regulatory control over such facilities to county or local jurisdictions (California, Delaware, Illinois, Maine, Massachusetts, Michigan, New Hampshire, New York, North Carolina, Oregon, Pennsylvania, and Wyoming). North Dakota and Vermont have also delegated control to lower jurisdictions. Vermont and New Jersey are currently debating whether to set state standards, while the record is ambiguous on the extent of North Dakota's state guidance. (BNE 9g, with attachment from OLR; Fairwind Administrative Notice Items 66, 67)

77. Setbacks mandated or advised by these 18 states are typically worded as being a multiple of total turbine height, (tower plus blade length), with the multiple most commonly used varying from 1.1 to 1.5. A few variations are as follows: setbacks with a specified increase for residential zones; setbacks as multiples of rotor diameter; setbacks based on a multiple of rotor diameter in the direction of the prevailing wind. (BNE 9g, with attachment from OLR; Fairwind Administrative Notice Items 66, 67)

78. Setbacks tend to be measured to property lines, not residences, except in cases where the setbacks are based on noise. (BNE 9g, with attachment from OLR)

79. Exceptions to setbacks are typically allowed where adjoining property owners agree. (BNE 9g, with attachment from OLR)

Operational Safety

80. The proposed turbines can be controlled from: a) the nacelle, by use of an interface; b) the bottom of the tower, by use of a control box; and c) a remote location, by use of a Supervisory Control and Data Acquisition System with local lockout capacity. (BNE 1, Vol. 1, pp. 10, 14)

81. Emergency stop buttons would be located within the tower base and within the nacelle to stop the turbine in the event of an emergency. (BNE 1, Vol. 1, p. 10)

82. Each proposed turbine would have an automatic fire suppression system as well as hand-held fire extinguishers. (Tr. 4, p. 54)

Noise

83. Noise—unwanted sound—is conveyed from a source to the human ear as waves of air pressure. Sound pressures can be measured in terms of sound-level (loudness, volume), or in terms of frequency (pitch, tone). Sound-levels are expressed in decibels (dB). Frequencies are expressed in cycles-per-second, known as Hertz (Hz). (BNE 1, Vol. 3, Tab M, p. 1)

84. The decibel scale extends from zero dB (the threshold of hearing) to above 120 dB (painful). The scale is logarithmic, not linear. A 1 dB increase is not perceptible to the average person. Adding two equal sound levels creates a 3 dB increase in the overall sound level: that increase is at the threshold of perceptibility. A 10 dB increase is a tenfold increase in sound pressure but is only perceived as a doubling in loudness. (BNE 1, Vol. 3, Tab M, p. 1)

85. In terms of frequencies, the ear can hear from about 20 Hz up to about 20,000 Hz, but it is most sensitive to sounds in the middle range (1,000 to 8,000 Hz). (BNE 14, R. 5; BNE 1, Vol. 3, Tab M, p. 2)

86. Community noise is measured in ways that combine the scale of loudness (in dB) with the range of frequency response (in Hz) for the human ear. Noise measurement devices can present a simple graph of combined pressures and frequencies in one-third octave bands. However, they can also weight sound pressure changes in ways that more closely track human sensitivities. The most commonly used weighting scheme is called the "A-weighted" scale (dBA): it emphasizes sound-levels at middle to high frequencies and de-emphasizes sound-levels at low frequencies. Another scheme (dBC) is equally sensitive to all frequencies above 32 Hz, with the result that, compared to dBA, it comes closer to representing perceived loudness in cases where low frequencies matter. (BNE 1, Vol. 3, Tab M, p. 2; Lawrence/Lemelin and Villanova B1, p. 6 [Kamperman and James, pp. 8-9]; Fairwind B2a, pp. 9-10)

87. Wind turbines emit two main sources of noise: noise from the mechanical components that drive the blades (mechanical noise); and noise from the rotor blades sweeping through the air (aerodynamic noise). (BNE 1, Vol. 3, Tab M, pp. 5-7)

88. The sound level for the GE 1.6 MW wind turbine at 9 m/s (20.1 mph)—its maximum sound-level—is 106 dBA. The noise levels would be the same for both rotor diameters (i.e. 82.5m and 100m). (BNE 1 Vol. 3, Tab M, p. 7; Tr. 2, p. 36; Tr. 6, p. 188)

89. Aerodynamic noise is generally characterized by rhythmic pulsations (modulations) that vary according to wind conditions and the rotor's positions in the air. For instance, a blade passing by the tower itself at the low point of its cycle can make a noise up to five dB louder than at the top of its cycle. Blades can also sound different as they encounter wind shear. Finally, certain contours of the terrain cause turbulence, which in turn can cause variations in the aerodynamic noise produced by blades. (Lawrence/Lemelin and Villanova B1, p. 6 [Harrison, p. 4])

90. Modulations of aerodynamic noise occur at low frequencies (20-200 Hz), sometimes occurring at frequencies even lower than 20 Hz, a frequency range called "infrasound", which is generally inaudible. (Lawrence/Lemelin and Villanova B1, p. 6 [Harrison, p. 2]; BNE 14, R. 5, R. 8)

91. Loud mechanical noise in the environment can disturb people's sleep. DEP has developed noise control regulations to limit community exposure. These regulations allow higher sound-levels during the daytime than at night. (Council Administrative Notice 42 [DEP Noise Regulations]; BNE 14, R. 6)

92. Audible low-frequency noise (20-300 Hz) can cause sleep disturbance, headaches, ear pressure, skin sensations, and other similar symptoms in some people. Complaints of annoyance about noise appear to increase when outside noise levels exceed 35 dBA. (Fairwind 2a, R. 43, 2b, R. 18; Lawrence/Lemelin and Villanova B1, R. 5)

93. DEP's noise regulations are expressed in terms of the "A-weighted" scale (dBA). (Council Administrative Notice 42 [DEP Noise Regulations])

94. To establish a baseline for existing conditions, BNE monitored noise at two locations in the area of the proposed turbines, following procedures set by the DEP noise regulations. Both daytime sound levels (37 dBA) and nighttime sound levels (37-38 dBA) were consistent. Background noise modeling of one location performed for a longer duration by Fairwind's noise consultant, Noise Control Engineering, Inc., found a background nighttime noise level of 30 dBA. None of the results suggested a "High Background Noise Area", which would have increased the noise limits allowable for the proposed project. (BNE 1, Vol. 3, Tab M, pp. 6-7; BNE 9d, R. 4; Fairwind 4, R. 56, R. 57)

95. In Connecticut, noise is controlled in terms of the sound-levels that may be emitted from a source property (Class A, B, or C) to an abutting property (Class A, B, or C). The class of any property is determined by its actual use. Class A is generally residential use. Class B is generally commercial use. Class C is generally industrial use. (Council Administrative Notice 42 [DEP Noise Regulations])

96. Properties abutting the site are zoned residential. (BNE 1d, p. 6; Fairwind 2a, R. 16)

97. DEP noise criteria from an emitter to a receptor are as follows:

Emitter Class	**Receptor Noise Zone**			
	Class A (Daytime)*	**Class A (Nighttime)****	**Class B**	**Class C**
Class A (Residential)	55	45	55	62
Class B (Commercial)	55	45	62	62
Class C (Industrial)	61	51	66	70

*(7:00 a.m. to 10:00 p.m.) ** (10:00 p.m. to 7:00 a.m.)
(Council Administrative Notice 42 [DEP Noise Regulations])

99. In determining compliance with DEP noise regulations, BNE categorized the wind turbine as a Class C emitter. (BNE 1, Vol. 3, Tab M, p. 4)

100. To predict the sound level of the proposed turbines, BNE conducted noise modeling in accordance with the ISO-9613-2 standard using sound levels contained within GE's specifications. (BNE 1, Vol. 3, Tab M, pp. 5,7)

101. In modeling noise at all of the receptor locations in both Colebrook North and South, BNE assumed noise from all six of the turbines. (Tr. 2, p. 101; Tr. 4, p. 84)

102. BNE's noise modeling is based on maximum daytime wind speeds of 9 m/s and maximum nighttime wind speeds of 8 m/s. It indicates that the maximum noise emissions from the turbines at the nearest residence would be 49 dBA during the daytime and 47 dBA at nighttime. If wind speeds were calculated at a maximum 9 m/s both day and night, then the turbines' maximum noise at the nearest residence would be 49 dBA both day and night. In either case, the turbines would meet DEP noise limits for Class C emitters to Class A receptors. (BNE 1, Vol. 3, Tab M, p. 9; Tr. 2, pp. 99-100; Council Administrative Notice 42 [DEP Noise Regulations])

103. If the site property were to be considered a Class A use, then the Class A to Class A criteria would be applied (55 dBA during the daytime and 45 dBA during the nighttime). In this case, noise levels from the turbine would exceed the nighttime noise threshold by 2 dB. (Council Administrative Notice 42 [DEP Noise Regulations]; Fairwind 2a, R. 16)

104. There are no DEP criteria regarding the time limit for the type of noise produced by an emitter. Turbine noise can occur repeatedly as long as it meets the noise level criteria. In the case of the BNE project, the turbines would emit their maximum noise level (49 dBA) for 11 percent of their operating time during a year. The remaining 89 percent of the time, they would emit less than 49 dBA. (Council Administrative Notice 42 [CT DEP Noise Regulations]; BNE 1, Vol. 3, Tab M, p. 9; Tr. 2, p. 100)

105. The extent of regulation regarding noise emissions from wind turbines, the structure of such regulation, and the nature of authority over such regulation, varies widely around the world. The US does not have federal standards regarding noise emissions from wind turbines. Foreign countries are not consistent in their approaches to regulating wind-turbine noise. Several international bodies have set recommended guidelines (for example, American National Standards Institute [ANSI], International Organization for Standardization [ISO]) have issued technical protocols and specifications for measuring such noise. The World Health Organization (WHO), an internationally recognized agency that has developed guidelines for protecting human health against adverse environmental impacts in general, including noise, has also issued such guidelines specifically directed to wind-turbine noise. (Lawrence/Lemelin and Villanova B1, p. 6 [Kamperman and James, pp. 1, 6-8])

106. A decrease in wind speed of one m/s causes a decrease in noise of two decibels. (Tr. 2, p. 103)

107. Connecticut has established separate noise emissions limits for certain types of noise: impulsive noise, infrasonic noise, ultrasonic noise, and prominent discrete tones (Council Administrative Notice 42 [CT DEP Noise Regulations])

108. Impulsive noise is not a concern for wind turbines. (Fairwind, B2a, R. 14)

109. Infrasonic and ultrasonic noise would range from 13 to 29 dBA, both of which are below DEP's limit of 100 dBA. (BNE 14, R. 5)

110. A prominent discrete tone, in general terms, is acoustic energy concentrated in a narrow frequency range. This type of noise shows up on the graph of one-third octave bands as a noticeable feature in which one band diverges sharply from its neighboring bands. The graph of one-third octave bands for the GE 1.6 MW turbine does not display this feature. (Fairwind 2a, R. 32; Tr. 6, p. 96)

111. If the proposed project is approved, BNE would provide two years of post-construction sound monitoring. (Tr. 6, p. 143)

Noise Mitigations

112. Noise mitigation can be accomplished through adding air-conditioning, insulating or rebuilding walls, or insulating around windows at receptor locations. (Tr. 5, p. 264)

113. Neither landscaping nor sound barriers at receptor locations are effective to screen noise from wind turbines, given the turbines' height. (Tr. 5, p. 264)

Ice Throw/Drop

114. Ice can form under appropriate weather conditions that typically include temperatures in the range of 28° F to 36° F, and a relative humidity greater than 97 percent. Glaze ice is of most concern with wind turbines, and can be formed through accumulations of freezing rain or drizzle. (BNE 9h, R. 6; Tr. 4, pp. 57-58)

115. Ice can collect on the rotating and non-rotating portions of the turbine, although ice formation on operating blades is more likely under appropriate weather conditions. Ice fragments can be thrown from the blade of an operating turbine or drop off a stationary turbine. (BNE 9h)

116. The risk level associated with ice throw and ice drop depends on the amount of icing assumed for the site. Based on climate data collected from the Met tower during one winter season, the estimated amount of icing at the site is 288 hours per season. This is consistent with information maintained by the U.S. Department of Commerce National Climatic Data Center. An increase in the hours of icing would increase the risk of ice being thrown. (BNE 9h; Tr. 4, p. 39; Tr. 5, pp. 217-218)

117. Ice can accumulate on stationary turbines and can drop off during melting conditions. The worst-case distance for ice drop distance assumes a 0.5 kg (1.1 pound) ice fragment falling from a turbine with 100m rotor diameter: the ice fragment would fall 394 feet from the turbine. However, 90 percent of all ice drops would land within 131 feet. Generally, the probability of a falling ice fragment striking one square meter at distance of 50m from the turbine base would be once in 124,671 years. (BNE 9h)

118. The range of potential ice throw from a turbine, assuming no mitigation methods are employed, is given below.

	100m rotor diameter	**82.5m rotor diameter**
Typical range of ice throw for 0.5 kg ice fragment (90% of occurrences)	0 to 492 feet	0 to 427 feet
Exceptional range of ice throw for 0.5 kg ice fragment (10% of occurrences)	492 to 869 feet	427 to 820 feet
Typical range of ice throw for 1 kg ice fragment (90% of occurrences)	0 to 525 feet	0 to 459 feet
Exceptional range of ice throw for 1 kg ice fragment (10% of occurrences)	525 to 935 feet	459 to 869 feet

(BNE 9h)

119. With proper mitigation including but not limited to pre-startup inspection, there would no risk of ice throw. (BNE 9h)

120. The closest residence to the turbines (not located on the subject property) is located at 29A Flagg Hill Road, at distance of approximately 1,005 feet (306m) from the nearest turbine. If ice mitigation methods were not employed, the probability of an ice fragment being thrown and striking a square meter section of the residence would be nil, i.e. less than on the order of once in 100 million years. (BNE 9h)

121. GE has developed recommended setback distances related to ice throws. All three turbines would meet such setback distances. (BNE 9g and 9h)

Ice Throw/Drop Mitigations

122. Remote and internal monitoring of the turbines can detect icing events, or other problems, through changes in turbine operating characteristics when compared to wind speed. Ice formation can affect the aerodynamics of the turbine: accumulating ice slows the blades down. Sensors would detect lower power outputs when compared to wind speed, or detect vibrations, causing the turbine to automatically shut down. (BNE 9h, p. 6)

123. The turbine would be monitored continuously by GE during operation. During known or predicted icing events, BNE would dispatch personnel to the site to monitor the turbines visually for icing. (Tr. 2, pp. 67-68)

124. Once the turbines are shut down, BNE would have personnel on-site to assess ice accumulation and operating conditions. (BNE 2, R. 24; Tr. 4, pp. 114-116)

125. Restarting a turbine with ice on the blades is the most dangerous scenario for ice throws. To prevent this risk upon re-start, BNE would have on-site personnel inspect and ensure ice has melted and fallen from the blades prior to re-start. (BNE 9h)

126. GE offers an optional Winter Ice Operation Mode that would allow the turbine to spin at slower speeds during icing events to keep the turbines operational while decreasing the risk of ice throws and ice drops. (BNE 2, R. 24)

Shadow Flicker

127. "Shadow flicker" describes the alternating pattern of light and dark that happens when wind turbine blades sweep through the path of sunlight low in the sky. (BNE 9b)

128. Under certain circumstances, shadow flicker can be cast through an unobstructed window of a home so that a room could experience repetitive changes in brightness. Shadow flicker can also occur outside, where the alternating shadows would appear on the ground. (BNE 9b)

129. The frequency of shadow flicker is determined by rotor speed and the number of blades on the rotor. The frequency is measured in Hertz (Hz), with 1 Hz being equivalent to one flicker per second. (BNE 9b)

130. The proposed turbines, with either an 82.5m or 100m rotor diameter, would rotate at a speed of 9.75 to 16.18 revolutions per minute, which corresponds to 29.3 to 48.5 shadows per minute or 0.49 to 0.81 Hz. (BNE 9b)

131. The Epilepsy Foundation determined that flicker frequencies above 3 Hz could be a concern to individuals who are afflicted with photosensitive epilepsy. Shadow flicker from the turbines would be below this recommended level. (BNE 9b)

132. There are no Federal or State of Connecticut standards for shadow flicker. Some communities in various parts of the county have adopted standards that range from 10 hours per year to 30 hours per year at an occupied structure. (BEN 9b)

133. In order to measure the likely occurrence of shadow flicker in areas surrounding the proposed turbines, a probable case shadow flicker model was generated. The location of every receptor with a line-of-sight to the wind turbines was marked and labeled. The model accounts for vegetation and weather conditions not favorable for generating shadows, such as lack of sun or absence of wind. Additionally, the model assumes a conservative "greenhouse mode", which stipulates line-of-sight shadows falling on a residential dwelling from all sides. (This model is conservative in that the windows of many houses do not face the sun directly during all shadow flicker occurrences.) However, varying widths of the blade are not factored into the model. (Shadow flicker is more pronounced when the shadow is cast by the portion of a blade close to the hub than by the blade tip.) (BNE 9b)

134. The probable case model was limited to a distance of approximately 1.25 miles from the turbines. Beyond this distance, shadow flicker would be negligible. (BNE 9b)

135. The probable case model indicates seven residential dwellings would experience some shadow flicker ranging from 10 hours to 48 hours per year. Of those seven residences, one would experience over 30 hours per year. Three would experience 20 to 30 hours per year. Three would experience 10 to 17 hours per year (refer to figure 4). (BNE 9b)

136. The residence receiving the most shadow flicker (i.e. over 30 hours per year) is located on the subject property at 17 Flagg Hill Road. (BNE 9b)

137. Listed below are the shadow flicker receptor locations, hours, and distances, assuming a rotor diameter of 100m.

Residence and Address	Worst-case Shadow Flicker (Hours Per Year)	Probable Case Shadow Flicker (Hours Per Year)	Distance to Northwestern Turbine (Feet)	Distance to Northeastern Turbine (Feet)	Distance to Southern Turbine (Feet)
8 Flagg Hill Road	42.90	21.45	2,443	1,378	2,378
8 Flagg Hill Road	40.07	20.03	2,349	1,284	2,287
114 Winsted-Norfolk Road	23.48	11.74	2,761	1,741	2,789
110 Winsted-Norfolk Road	19.92	9.96	2,758	1,789	2,880
120 Winsted-Norfolk Road	33.70	16.85	2,791	1,730	2,689
26A Flagg Hill Road	58.18	29.09	1,020	1,071	2,055
17 Flagg Hill Road (owned by BNE)	96.72	48.36	1,668	682	1,847

(BNE 2, R. 17)

138. Listed below are the shadow flicker receptor locations, hours, and distances, assuming a rotor diameter of 82.5m.

Residence and Address	Worst-case Shadow Flicker (Hours Per Year)	Probable Case Shadow Flicker (Hours Per Year)	Distance to Northwestern Turbine (Feet)	Distance to Northeastern Turbine (Feet)	Distance to Southern Turbine (Feet)
8 Flagg Hill Road	42.90	21.45	2,443	1,378	2,378
8 Flagg Hill Road	40.07	20.03	2,349	1,284	2,287
114 Winsted-Norfolk Road	23.48	11.74	2,761	1,741	2,789
110 Winsted-Norfolk Road	19.92	9.96	2,758	1,789	2,880
120 Winsted-Norfolk Road	33.70	16.85	2,791	1,730	2,689
26A Flagg Hill Road	55.07	27.53	1,020	1,071	2,055
17 Flagg Hill Road (owned by BNE)	96.72	48.36	1,668	682	1,847

(BNE 9b)

Environmental Impacts

Air and Water Quality Standards

139. The proposed project would comply with DEP air quality standards. The project would produce no air emissions during operation. (BNE 1, Vol. 1, pp. 1-2; Council Administrative Notice 41)

140. Water quality standards have been developed by the DEP to protect surface and groundwater resources in Connecticut. (Council Administrative Notice 40)

141. Surface water quality can be affected by construction and development activities through direct discharge or through run-off. (Council Administrative Notice 40)

142. Permanent structural controls would not be required for the treatment of stormwater runoff. Following construction, the site would be returned to pre-construction conditions. The constructed access road would remain in place, but the width would be reduced by one-half. The diversion swale constructed as part of the Erosion and Sedimentation Control Plan would remain in place and would be converted to a water quality swale. Once site conditions and vegetation have been reestablished, stormwater discharges would return to the pre-construction state for quality and quantity. (BNE 1, Vol. 2, Tab G)

143. Stormwater generated at the site would be controlled in accordance with the *2004 Connecticut Stormwater Quality Manual* and the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*. (BNE 1, Vol. 1, p. 30)

144. Blasting is anticipated as part of the construction process, but would be performed upon receipt by BNE of the proper permit from the Town of Colebrook Fire Marshall. (Tr. 6, p. 186)

Wildlife

145. The BNE site property generally contains a second-growth, northern hardwood forest with a small hilltop clearing (used recently to collect wind data) and a large wetland complex, including an approximately 6.70-acre beaver pond that is centrally located (refer to Figure 4). (BNE 1, Vol. 3, Tab I, p. 2)

146. The site has moderate to high wildlife habitat value with good interspersion (i.e. intermixing) of habitat types, including upland and wetland forest, various early successional habitat types including meadow and forest, a pond, and an intermittent watercourse. Good interspersion generally attracts a greater diversity of wildlife species. Thus, the subject property has the potential to support several dozen species of wildlife ranging from amphibians and reptiles to large mammals. (BNE 1, Vol. 3, Tab I, p. 16)

147. Construction of the project would cause relocation of some wildlife to adjacent areas. Relocation opportunities would be convenient since neighboring lands to the west, south, and north are not developed. Slower-moving species could experience some mortality. Once construction is completed, it is expected that many of the individuals and species will return to the subject property and occupy suitable habitats once again. Generally, long-term impacts to wildlife would be minimal. (BNE 1, Vol. 3, Tab I, p. 17)

Amphibians and Reptiles

148. The subject property contains wetland and wooded habitat that may support several species of reptiles and amphibians. Amphibian species mostly like to be found at the site include the snapping turtle, red-spotted newt, northern redback salamander, green frogs, American bullfrogs, American toad, gray tree frog, and northern spring peeper. (BNE 1, Vol. 3, Tab I, p. 11; BNE 1, Vol. 3, Tab I, pp. 11-12)

149. Reptile species could include snakes such as the northern redbelly, eastern garter snake, and the eastern milk snake. The most likely turtle species is the snapping turtle. Other turtle species are not likely, due to the high elevation and the till substrate. (BNE 1, Vol. 3, Tab I, p. 11)

150. Egg masses of wood frogs, spotted salamanders, and spring peepers were observed at the site. Spotted salamanders and red-spotted newts were also observed at the site. (BNE 15)

151. Two state-designated Species of Special Concern - the Jefferson Salamander, and the smooth green snake - have been reported in the Colebrook area. (BNE 15)

152. The eastern ribbon snake is another state-designated Species of Special Concern. The eastern ribbon snake is expected to benefit from the clearing of the proposed project because, like the green snake, it prefers un-forested open habitat. (BNE 15)

153. BNE's herpetologist recommends that the cleared area around the Met tower not be allowed to become reforested and be mowed annually in an October through November time-frame to maintain its habitat value to the smooth green snake. (BNE 15, pp. 3-4)

154. No adverse impacts to the amphibians and reptiles noted are expected. The project, on the whole, increases the prime habitat. (BNE 15)

Mammals

155. Mammal species most likely to be found at the site include white-tailed deer, red fox, raccoon, opossum, skunk, woodchuck, coyote, beaver, grey squirrel, eastern chipmunk, eastern cottontail, various rodents, fisher, porcupine, and bats. (BNE 1, Vol. 3, Tab I, pp. 8-11)

156. A bat survey performed from June 25 to November 1, 2010 identified six species of bats utilizing the site. Three of these species, the eastern red bat, hoary bat, and silver-haired bat, are listed as state-designated species of special concern. (BNE 9e, pp. 16, 20; DEP Comments dated April 6, 2011; Council Administrative Notice Item No. 29)

157. The proposed project is not far from several hibernacula locations. This increases the likelihood that cave bats could be moving through the area at certain times of the year. (DEP Comments dated April 6, 2011)

158. Standing water attracts foraging bats: thus, the turbines build close to standing water may be particularly harmful to bats. (Fairwind 9, p. 15; BNE 9e, p. 3)

159. Most recorded bat fatalities at wind turbine sites are of migratory tree-roosting species, generally during post-breeding and migratory periods. The most affected species (75% of reported fatalities) are the eastern red, hoary, and silver-haired bats. (BNE 9e)

160. While wind turbines do cause collision-induced bat mortalities, it has not been shown that this would result in population-level effects. (BNE 9e)

161. Based on existing studies, the typical number of bat fatalities per megawatt of wind turbine output ranges from 0 to 39.7 fatalities per year. (Tr. 2, p. 48)

162. The projected number of bat fatalities for the proposed project ranges from 0 to 190 per year. (Tr. 2, pp. 48-49)

163. The color of the wind turbine lighting (whether red or white) is not expected to significantly change the number of bat fatalities. (Tr. 2, p. 45)

164. Known methods of mitigating or reducing bat fatalities include raising the turbines cut-in speed during the time of year when bat fatalities are the highest. One experimental method is an electronic bat deterrent device, but it is not yet commercially available. (Tr. 2, pp. 43-44)

165. Minimizing tree clearing would reduce adverse impacts to bats. (BNE 9e, p. 3)

166. Based on review of the interim report, DEP notes that some negative impacts to bat species are likely. DEP recommends, at a minimum, of BNE's bat expert that post-construction monitoring be performed to document bat mortality and allow for adaptive management, if possible. DEP's Wildlife Division would prefer to be consulted with respect to the post-construction monitoring and would like access to the site to search for bat carcasses. (DEP Comments dated April 6, 2011)

167. BNE agrees to perform additional bat monitoring from May - November 2011, and for two years post-construction. These studies will be filed with the Council and the DEP. (BNE 17, R. 8; BNE 11, R. 18)

Birds

168. In a study of breeding birds undertaken by BNE, 39 unique bird species were observed in the vicinity of the proposed site. Cumulatively, three species composed 26.5 percent of the individual observations. These species were passerines, the red-eye vireo, and the ovenbird. (BNE 1, Vol. 3, Tab L)

169. No state or federally listed threatened or endangered species of birds were indentified by the breeding bird study that BNE commissioned. (BNE 9e, p. 4)

170. While wind turbines do cause collision-induced bird mortalities, it has not been shown that this would result in population-level effects. (BNE 9e, R. 6)

171. Based on existing studies, the typical number of bird fatalities per megawatt of wind turbine output ranges from 0 to 13.9 fatalities per year. The projected number of bird fatalities for the proposed project ranges from 0 to 66.7 per year. (Tr. 2, pp. 48-49)

172. The color of the wind turbine lighting (whether red or white) is not expected to significantly change the number of bird fatalities. (Tr. 2, pp. 45-46)

173. BNE commissioned an additional migratory bird survey on-site from March – April 2011: the results were not available at the close of record. BNE is conducting ongoing bird studies that will be concluded in the fall of 2011. (BNE 17; Tr. 6, p. 226)

Visibility

174. Each turbine tower would extend to a height of 100m agl to the turbine hub. A turbine with an 82.5m rotor diameter would extend to a height of approximately 141m (463 feet). A turbine with a 100m (328 feet) rotor diameter would extend to a height of 150m (492 feet) agl. (BNE 1, Vol. 1, pp. 7-8)

175. The turbine hub with at least one blade that is extended to its full apex would be visible from approximately 254 acres within five miles of the site and 103 acres within one mile of the site (refer to Figure 7). Some portions of this visibility will include portions of the turbine tower below the hub (refer to Figure 8). A majority of the visibility within one mile occur on the host property, the Nature Conservancy parcel west of the site and the sportsmen's gun club to the north of the site. (BNE 9b, pp. 5-7, with attachments)

176. Generally, moving objects such as the blades would have more visual impact to the viewer than a static (non-moving) object. (Tr. 2, p. 59)

177. Approximately 35 properties (residential, agricultural, commercial, and recreational) within one mile of the site would have areas of year-round views of at least the hub and a blade at its full apex. (BNE 9b, pp. 5-7, with attachments)

178. An additional 16 properties (residential, agricultural, commercial, and recreational) would have views of the portions of the 82.5m rotor diameter blades (above hub height). Reliable information regarding the visibility impact of the 100m rotor diameter blades on area properties is not in the record. (BNE 9b, pp. 5-7, with attachments)

179. The 100m hub with 100m rotor diameter would be visible year-round from Route 44 for a total distance of 0.1 miles. With the 100m hub and 82.5m rotor diameter, the combined year-round visibility would be 0.04 miles. (BNE 9b, pp. 5-7, with attachments; BNE 1, Vol. 3, Tab J)

180. A portion of the blades for the 82.5m and 100m rotor diameters would be visible above the trees from at least 457 acres within five miles of the site and 158 acres within one mile of the site. (BNE 9b, pp. 5-7, with attachments)

181. The 100m turbine hub would be visible through vegetation during leaf-off conditions from approximately 1,327-acres within five miles of the site and 965 acres within a mile of the site. Approximately 45 properties (residential, agricultural, commercial, and recreational) within one mile of the site would have areas of seasonal views of at least the hub. (BNE 9b, pp. 5-7, with attachments)

182. There are no "blue blazed" hiking trails maintained by the Connecticut Forest and Parks Association within five miles of the site. (Council Administrative Notice Item 34)

183. Hiking trails are present at Dennis Hill State Park, approximately 2.5 miles southeast of the site and at Haystack Mountain State Park, approximately 4 miles northwest of the site. The turbines would be visible from the observation tower on top of Haystack Mountain (refer to figure 9). No views are expected from Dennis Hill. (BNE 9b, pp. 5-7, with attachments)

184. There are two state-designated scenic roads within five miles of the site. One is Route 183 in Colebrook, located to the northeast of the proposed site. The second is Route 272 in Norfolk, located west of the proposed site. The wind turbines are not expected to be visible from Route 183. The wind turbines would be visible from Route 272 for approximately 0.1 miles. (Council Administrative Notice Item 35; BNE 1, Vol. 3, Tab J)

185. On August 25, 2010, Stella and Michael Somers were notified that Rock Hall was added to the National Register of Historic Places by the National Park Service on June 22, 2010. (Fairwind 2e)

186. BNE initially contacted the State Historic Preservation Office (SHPO) in regard to the proposed project. On November 29, 2010, the SHPO determined the proposal would have no effect on historical or cultural resources. (BNE 1, Vol. 1, Tab B)

187. By letter dated March 21, 2011, the SHPO rescinded its finding of "no effect" pending review of photo-simulations of the proposed wind turbines from Rock Hall. (Tr. 5, p. 110; Fairwind Administrative Notice Item 72)

188. By letter dated May 19, 2011, upon review of the photo-simulations, various documents in Petition No. 983 and a site visit, the SHPO determined that the proposed project appears to have no adverse effect on the cultural resource as defined in 36 CFR Part 800, subsection 800.5. (SHPO Letter dated May 19, 2011)

189. There would be limited year-round visibility of the proposed project, as well as the project proposed in Petition No. 984, from the Rock Hall property. (Fairwind 2m)

Site Disturbance/Restoration

190. Construction of the proposed project would include the clearing of approximately 14 to 15 acres of woodland. Approximately 0.6 acres of disturbance would occur within 100 feet of the wetland areas. (BNE 18, R. 19)

191. Disturbed areas associated with each proposed turbine would include the location of the turbine itself, a blade assembly and laydown area, a temporary stockpile area, a crane assembly area, a tower section laydown area, and a crane pad. (BNE 1, Vol. 2, Tab F)

192. The total cut required to construct the proposed project is approximately 31,435 cubic yards; total fill would be approximately 25,985 cubic yards. The excess of approximately 5,450 cubic yards of cut material would be spread on-site. (BNE 5, R. 107 and 108)

193. Approximately nine acres of disturbance on the site would be restored, leaving five to six acres of permanent impact. (BNE 18, R. 19)

194. BNE does not plan to develop any part of the property unrelated to the wind turbine facilities and will permanently protect environmentally sensitive areas. (Tr. 6, p. 185)

195. Modifications to existing roads including Flagg Hill Road are anticipated to accommodate the turning radius and weight of the wind turbine equipment to be delivered. (Tr. 5, pp. 20-38)

Wetlands

196. Five separate wetland areas were identified or near the site (refer to Figure 6). Wetland 1 is a large wetland complex that is dominated by a beaver pond. Wetland 2 is a small wetland finger extending onto the site from a wetland on the adjacent property to the north. Wetlands 3 and 4 are seasonally saturated forested wetlands located off-site immediately south of the southern property boundary. Wetland 5 is a forested hillside seep wetland draining northeast along the east property boundary. (BNE 1, Vol. 1, p. 29)

197. The nearest wetland is approximately 130 feet to the west of the Southern turbine. (BNE 1, Vol. 1, p. 28)

198. 17 Flagg Hill Road contains a conservation easement due to the existence of wetlands. (Tr. 6, p. 182)

199. The proposed project would require temporary and permanent direct wetland impacts associated with the construction of a gravel access road crossing over a portion of forested wetland (Wetland 1) totaling 4,702 square feet. This crossing has been designed so as to minimize impacts to the wetland. (BNE 1, Vol. 1, pp. 29-30, Vol. 3, Tab 1, pp. 19-24; BNE 9c, pp. 1-5)

200. Clearing and grading to construct the laydown and assembly areas for the blades of the Southern turbine and the Northwestern turbine would cause temporary disturbance in proximity to Wetland 1. (BNE 1, Vol. 1, p. 30)

201. Best Management Practices would be utilized in accordance with the 2002 Connecticut Guidelines for Erosion and Sedimentation Control throughout construction, and maintained until the disturbed areas are stabilized. (BNE 1, Vol. 3, Tab I)

202. A wildlife/conservation seed mix containing native grasses and forbs would be used to stabilize and restore exposed areas. (BNE 1, Vol. 3, Tab I)

203. BNE's expert herpetologist, Dr. Klemens, recommended that specific measures be taken to protect certain cryptic vernal pools embedded in the general area of Wetland 1. (BNE 15, p. 2)

204. If additional wetland mitigation were required, BNE agreed to investigate potential off-site measures if on-site measures were not feasible. (BNE 9c, p. 5; Tr. 6, pp. 167-171)

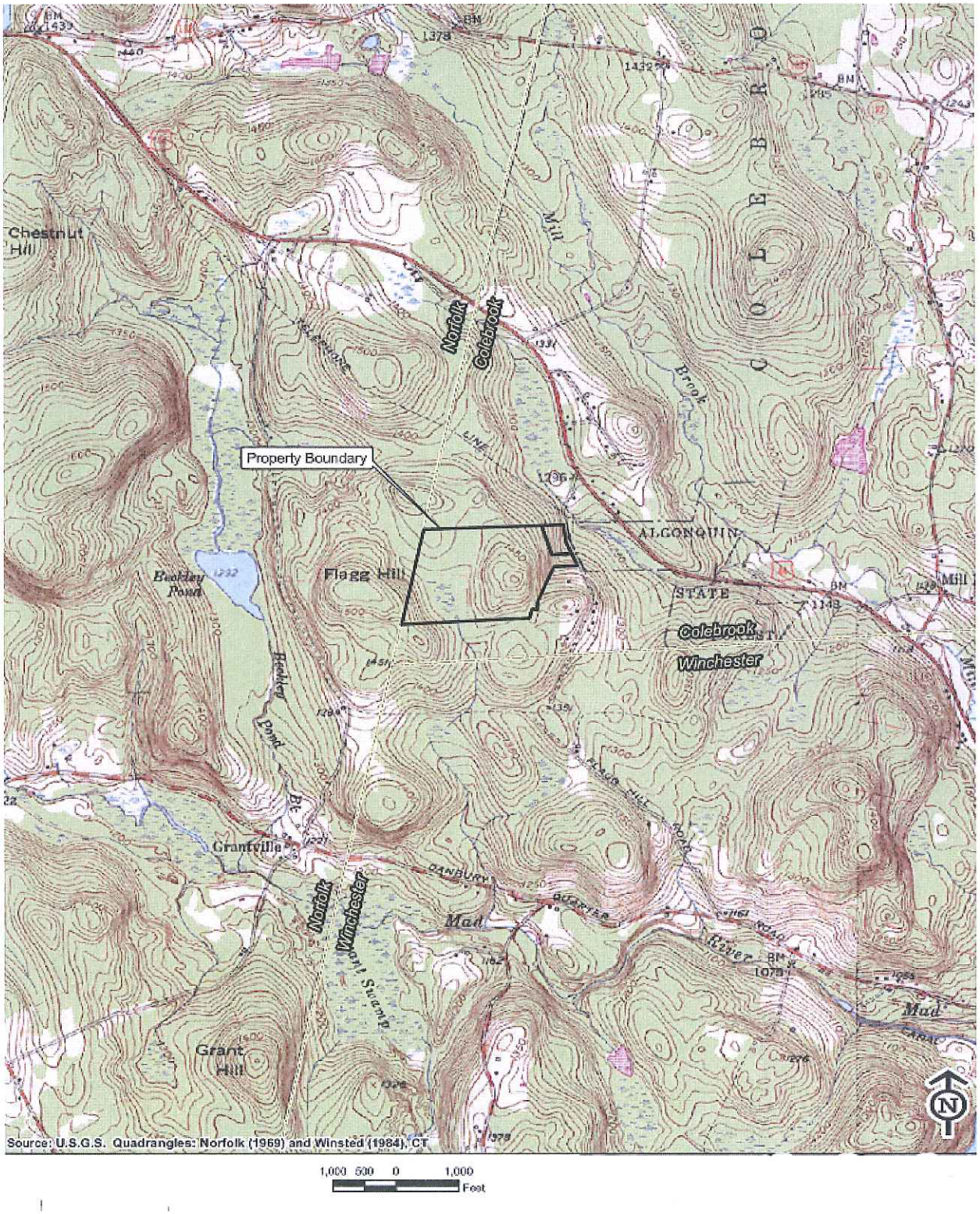


Figure 1: Site Location at Flagg Hill Road, Colebrook, CT. (BNE 1, Vol. 3, Tab I)

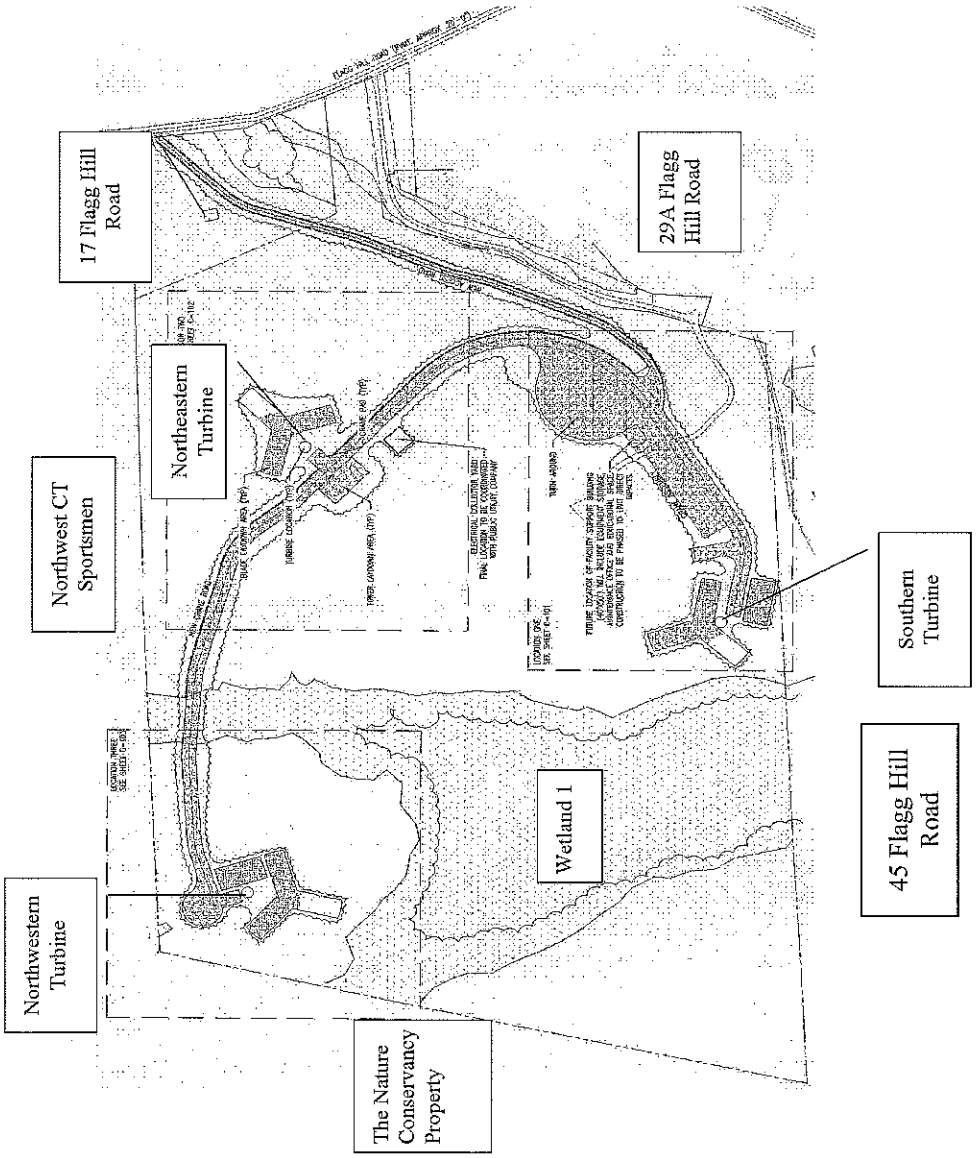


Figure 2: Site Plan – showing turbine locations, blade laydown areas and clearing limits. (BNE 1, Vol. 2, Tab F)

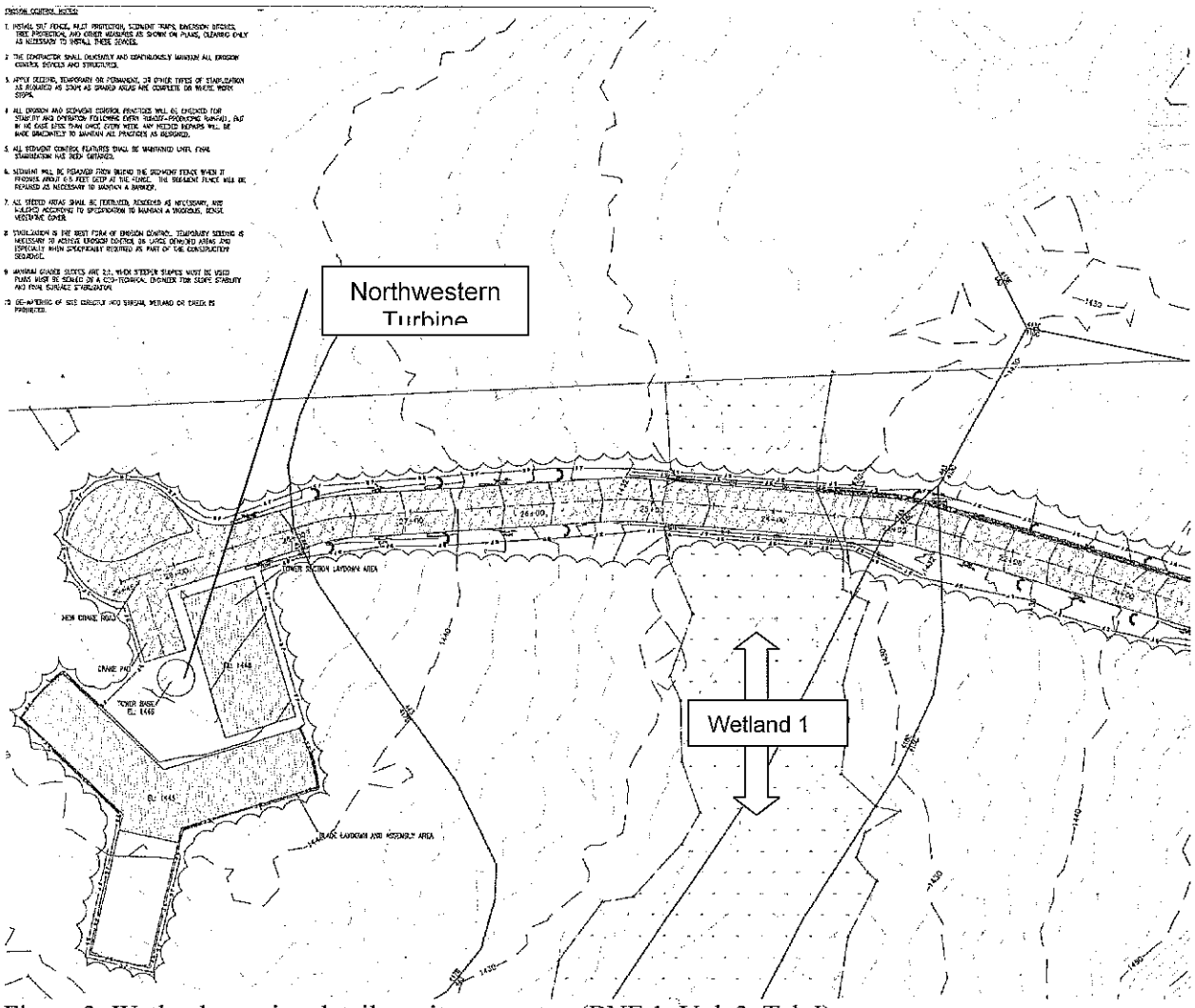
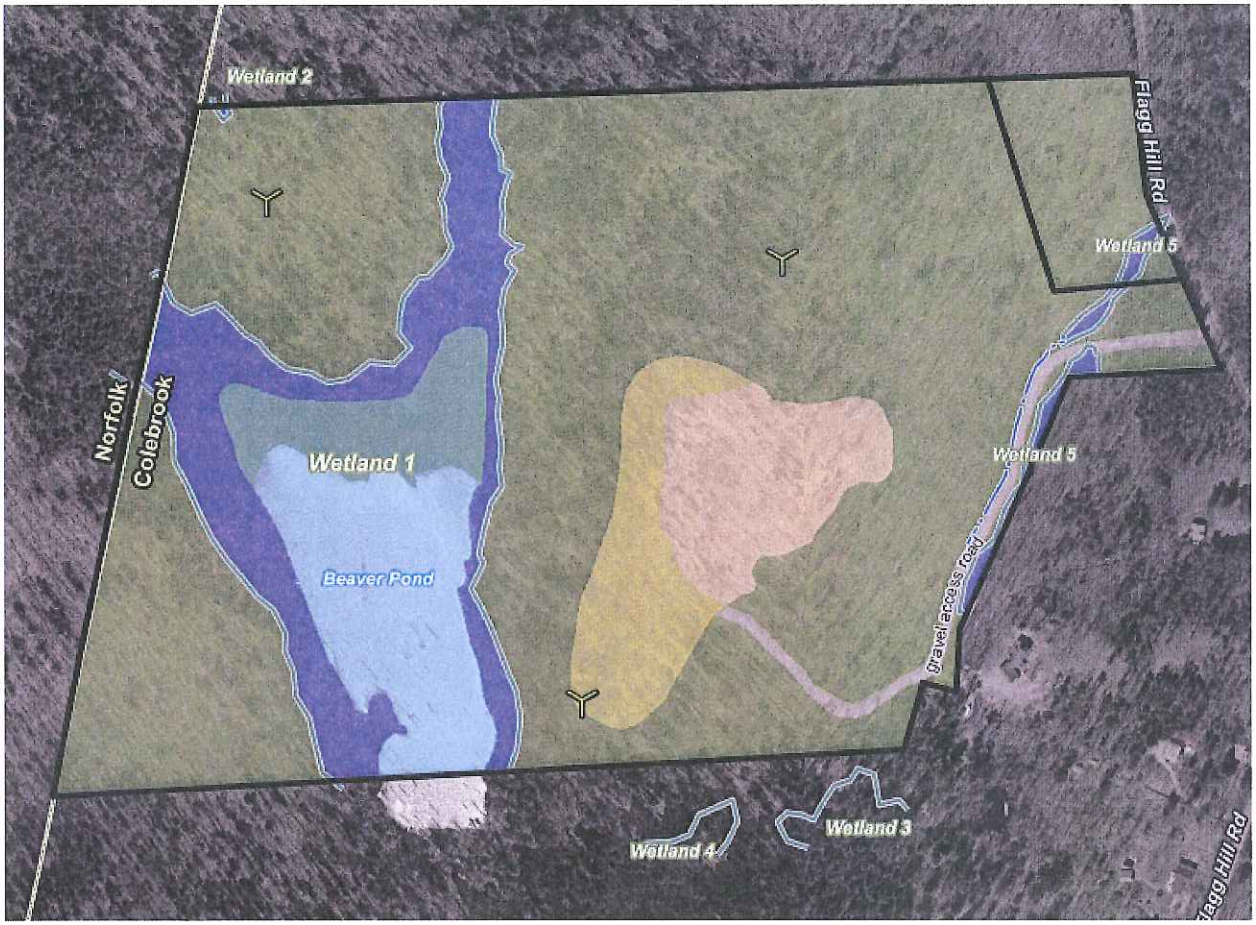


Figure 3: Wetland crossing detail on site property. (BNE 1, Vol. 3, Tab I)



Legend

- Proposed Wind Turbine Location
- Property Boundary

Habitat Type

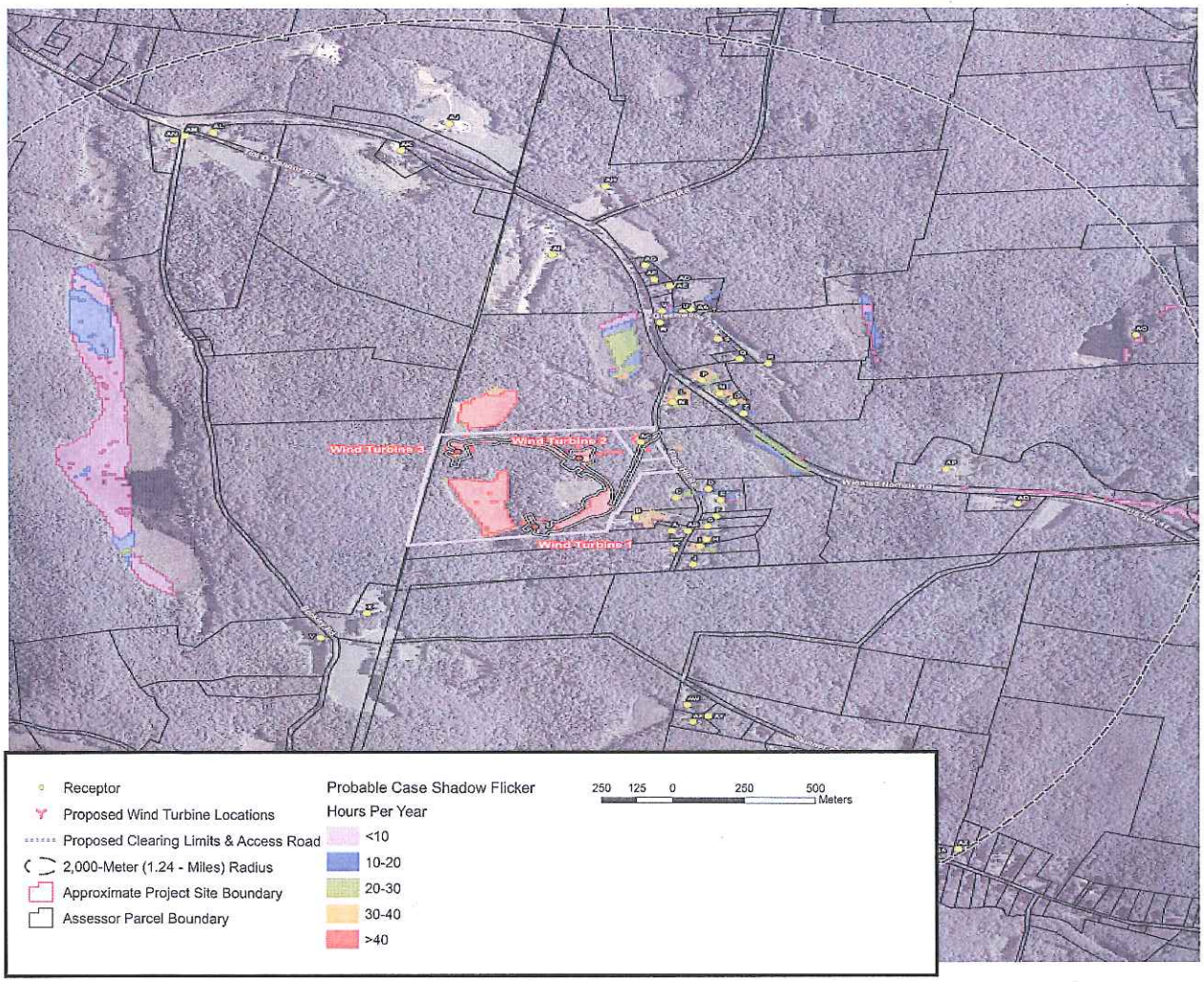
- Early Old Field Meadow
- Existing Telecommunications Tower Compound
- Forested Wetlands
- Second Growth Upland Hardwood Forest
- Open Water

l Forest

- Second Growth Northern Hardwood Forest
- Forest Wetland
- Scrub/Shrub - Emergent Wetland
- Open Water (Beaver Pond)
- Gravel Access Road

Base Map Source: ConnDOT 2004 aerial photograph with 0.5-foot resolution.

Figure 4: Habitat types on site property. (BNE 1, Vol. 3, Tab I)



Hours Per Year

- <5
- 5 - 10
- 10 - 20
- 20 - 30
- >30

Figure 5: Shadow Flicker Probable Case Model using turbines in original locations with worst-case 100m rotor diameter - showing exterior shadow flicker. (BNE 2, R. 17)

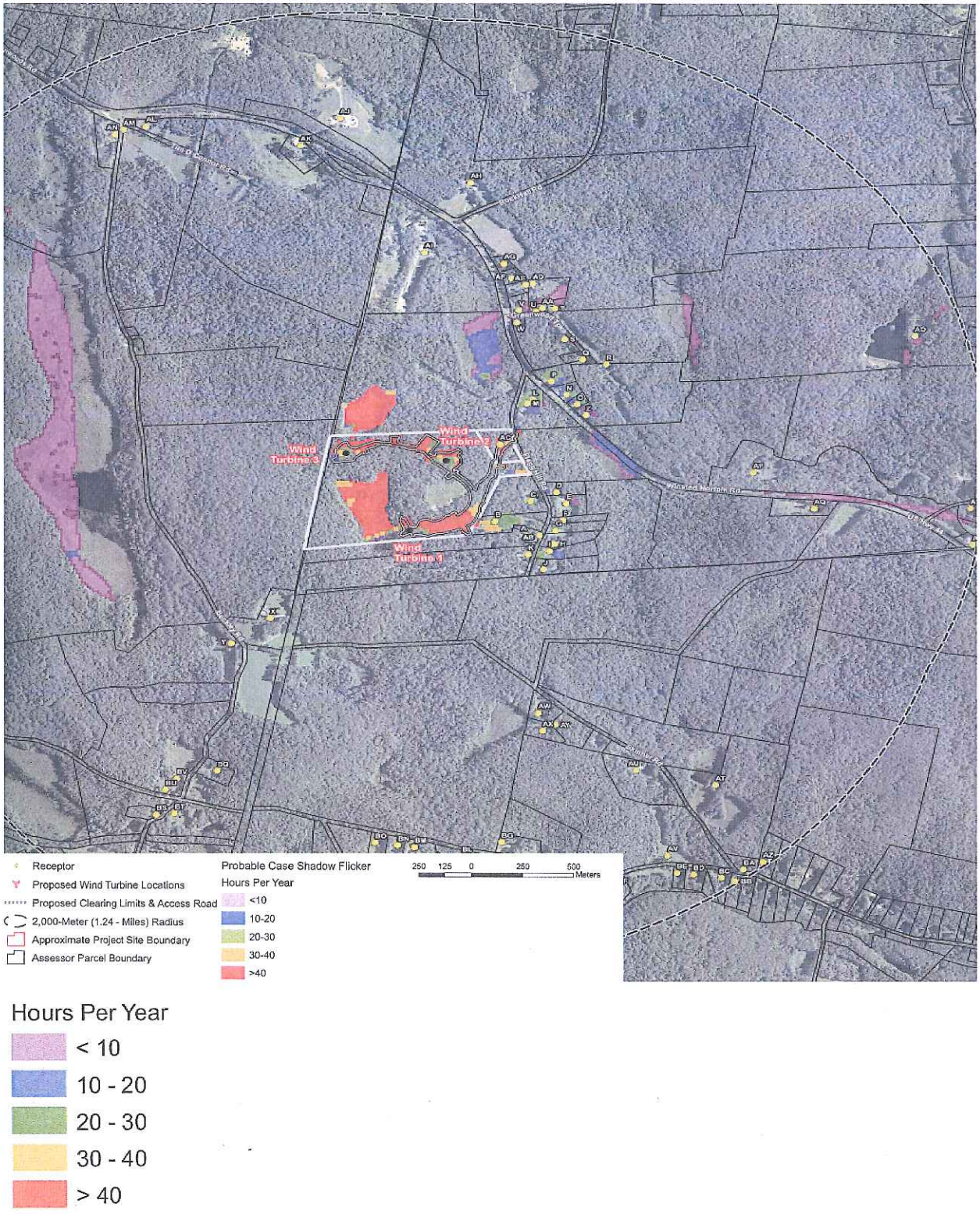


Figure 6: Shadow Flicker using 82.5-meter rotor diameter (BNE 9b)

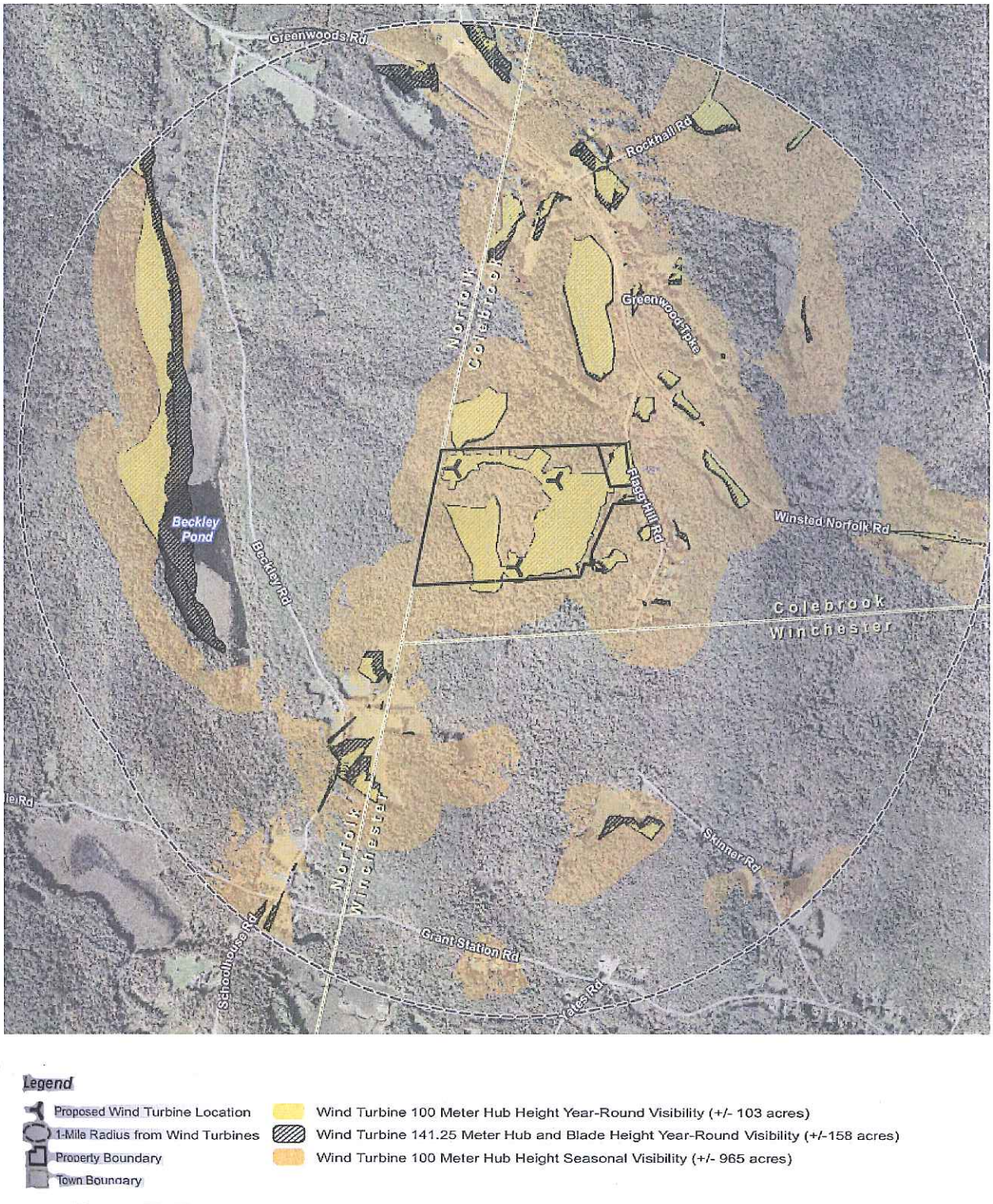


Figure 7: Visibility of turbines from areas near turbines. Black dashed line represents one-mile radius around turbines (82.5m rotor diameter). (BNE 1, Vol. 3, Tab J; BNE 14, R. 50)

Figure 8: Photo-simulation of turbines from Route 44 adjacent to The Northwestern Connecticut Sportsmen's Association property (100m rotor diameter) (distance: 0.69 miles). (BNE 1, Vol. 3, Tab J)

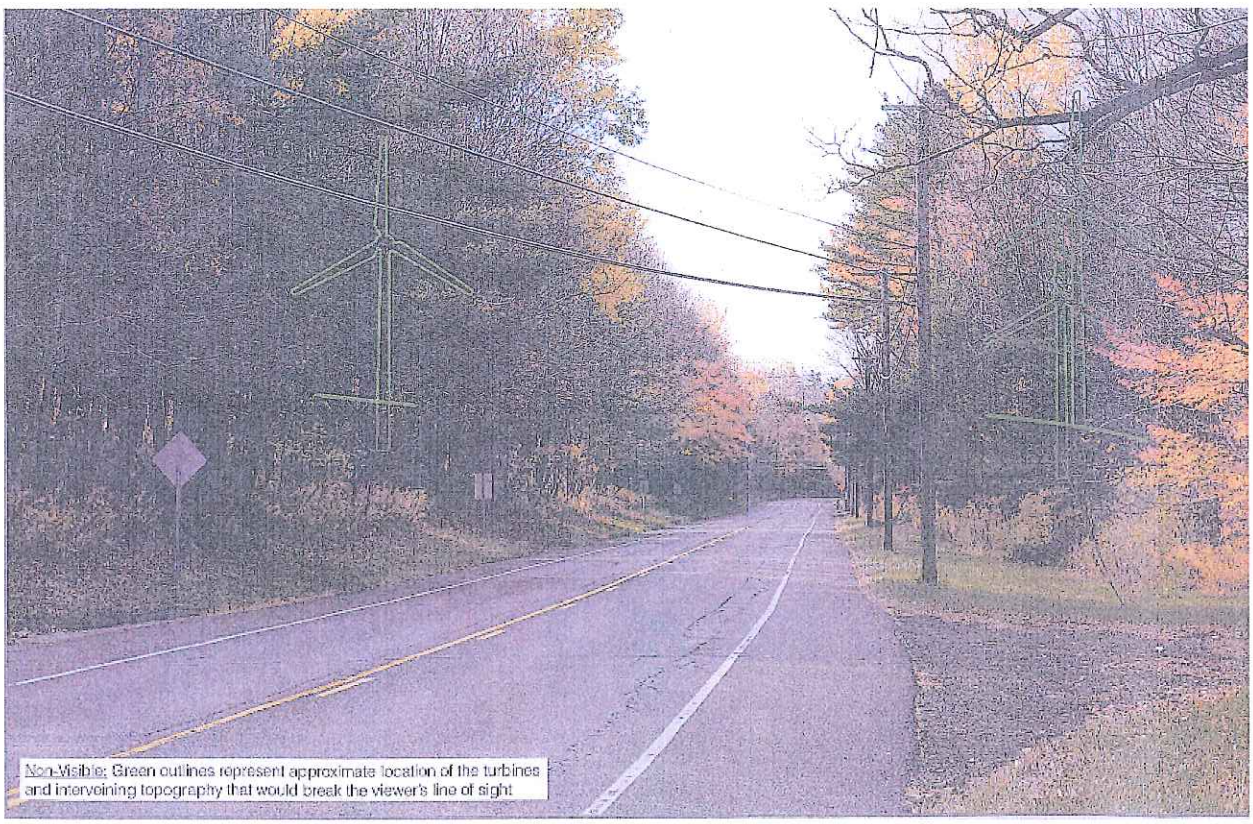


Figure 9: Photo-simulation of turbines from Route 44 (100m rotor diameter) (distance: 1.08 miles). (BNE 1, Vol. 3, Tab J)

Figure 10: Photo-simulation of turbines from Approx. 42 Stillman Hill Road (100m rotor diameter) (distance: 2.26 miles). (BNE 1, Vol. 3, Tab J)

Figure 11: Photo-simulation of turbines from Old Colebrook Road (100m rotor diameter) (distance: 2.70 miles). (BNE 1, Vol. 3, Tab J)

Figure 12: Photo-simulation of turbines from Lookout Tower on Haystack Mountain (100m rotor diameter) (distance: 4.20 miles). (BNE 1, Vol. 3, Tab J)

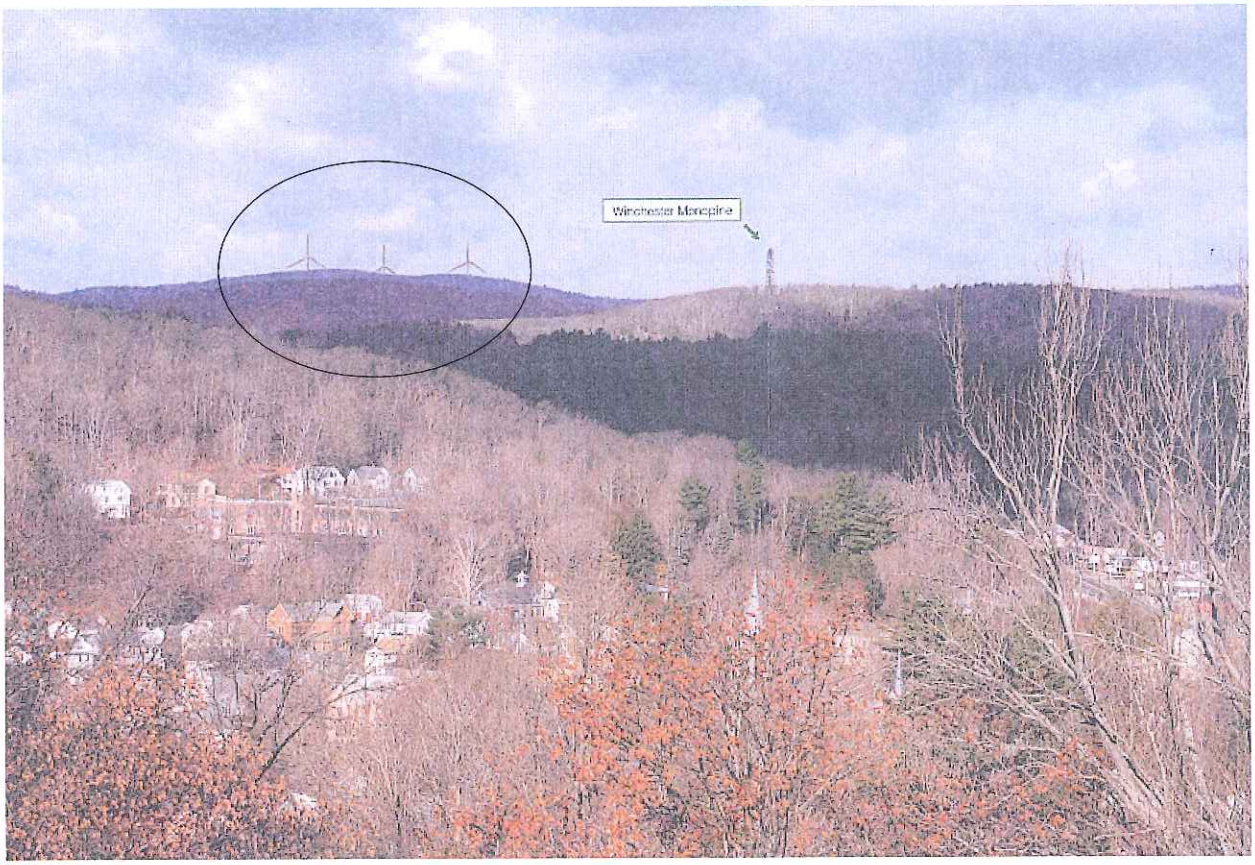


Figure 13: Photo-simulation of turbines from Lookout Tower at Soldiers' Memorial Park (100m rotor diameter) (distance: 4.72 miles). (BNE 1, Vol. 3, Tab J)

Figure 14: Photo-simulation of turbines from Route 44 adjacent to The Northwestern Connecticut Sportsmen's Association property (82.5m rotor diameter) (distance: 0.69 miles). (BNE 9b)

Figure 15: Photo-simulation of turbines from Route 44 (82.5m rotor diameter) (distance: 1.08 miles). (BNE 9b)

Figure 16: Photo-simulation of turbines from Approx. 42 Stillman Hill Road (82.5m rotor diameter) (distance: 2.26 miles). (BNE 9b)

Figure 17: Photo-simulation of turbines from Old Colebrook Road (82.5m rotor diameter) (distance: 2.70 miles). (BNE 9b)

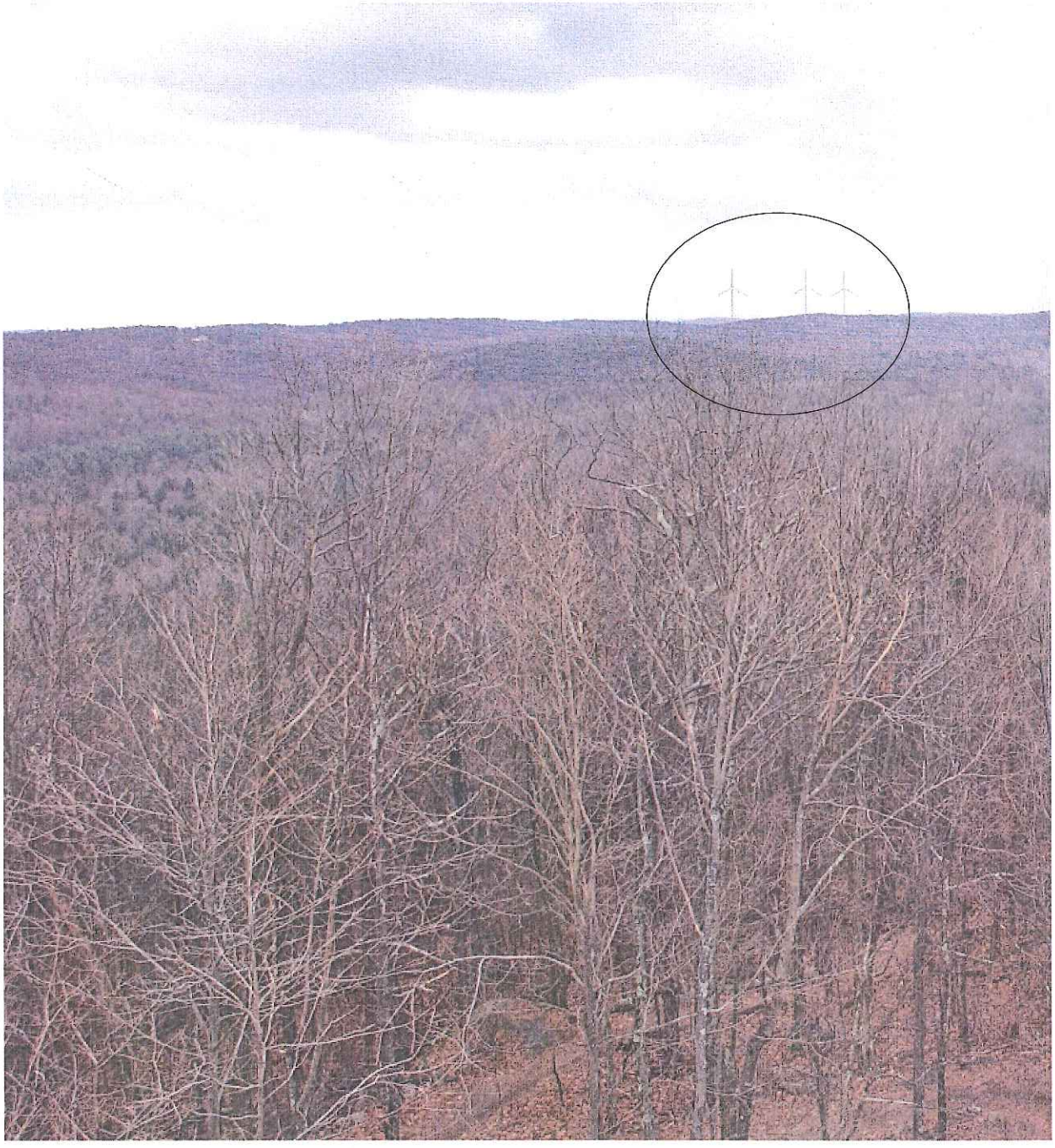


Figure 18: Photo-simulation of turbines from Lookout Tower on Haystack Mountain (82.5m rotor diameter) (distance: 4.20 miles). (BNE 9b)

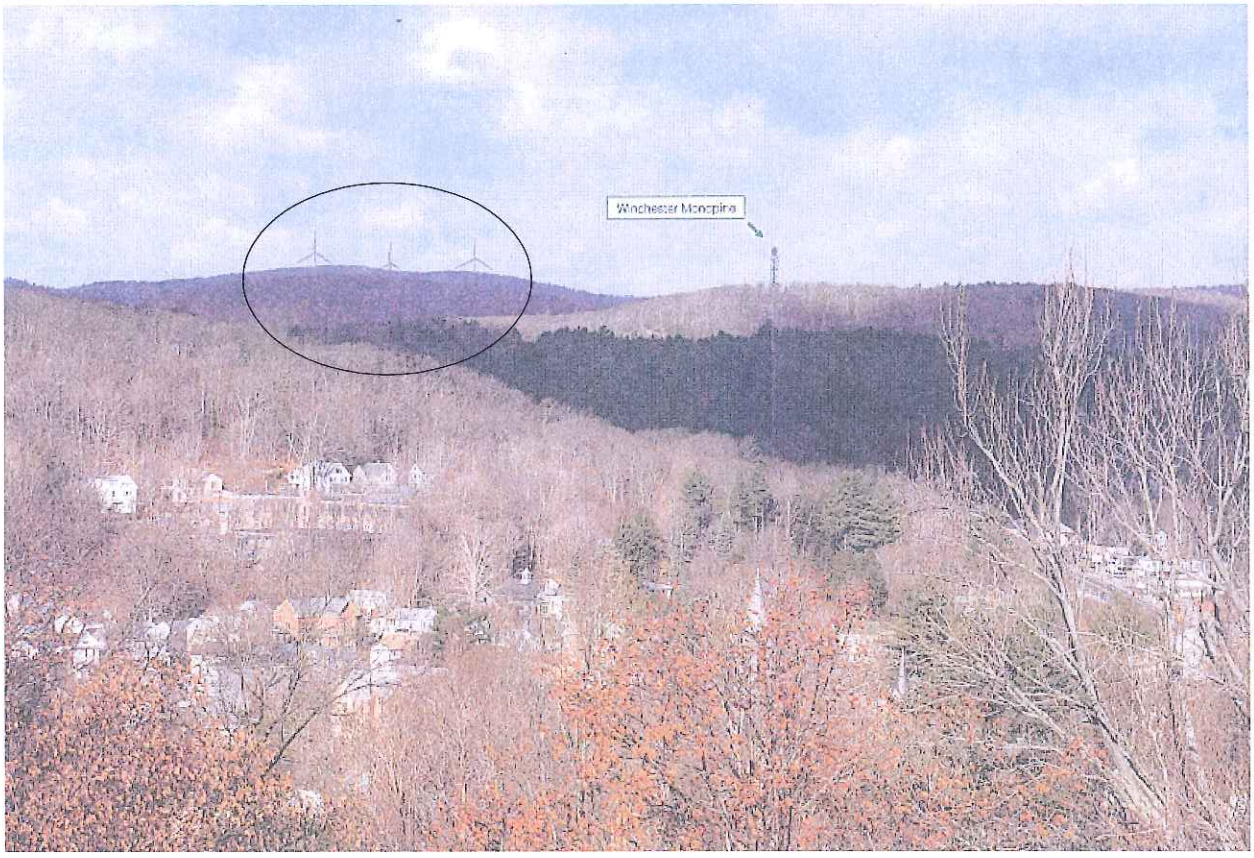


Figure 19: Photo-simulation of turbines from Lookout Tower at Soldiers' Memorial Park (82.5m turbines) (distance: 4.72 miles). (BNE 9b)