SCITUATE WIND TURBINE DOCUMENTATION

SEPTEMBER 3, 2020

Scituate Wind Turbine Table of Contents

Update: 20200903 LD

FILE MEMO

Chronology of Scituate Wind Turbine Project

2005

- Board of Selectmen formed a Renewable Energy Resource Committee ("Energy Committee") to explore energy projects. (Members: Selectman Paul Reidy, Planning Board Member Bill Limbacher, and residents Peter Toppan, Jay Silva, and Myron Boluch.)
- The Energy Committee worked with the University of Massachusetts' Renewable Energy Research Laboratory ("UMass RERL") to do a preliminary site screening analysis and selected the Waste Water Treatment Plant property for further study.

2006

- UMass RERL erected a meteorological tower at 161 Driftway.
- 8/06 through 6/07 the Energy Committee members downloaded wind data weekly.

2007

- The Energy Committee applied for a grant from the Massachusetts Technology Collaborative to provide technical assistance in further evaluating the feasibility of wind energy. The consulting firm KEMA, Inc. was assigned the project.
- The Energy Committee held several public information sessions in the High School Auditorium.

2008

- 3/29/08 Town Meeting voted to approve Article 25 sponsored by the Planning Board to amend Zoning Bylaw 740 concerning wind energy.
- 4/28/08 KEMA issued a report on the feasibility of a community wind project in Scituate. The Study was posted on the Town's website.

2009

- 2/12/09 Planning Board reviewed proposed wind energy project.
- 4/13/09 Town Meeting voted to approve Article 5 sponsored by the Board of Selectmen to lease land for the purpose of constructing and operating a wind turbine.
- 4/21/09 a Request for Proposals for construction of a wind turbine on Town property was initiated.
- *4/23/09 UMASS Wind Energy Center Shadow Flicker Analysis
- 5/21/09 three responses to the RFP were received.
- 6/15/09 and 6/18/09 the Energy Committee and consultant KEMA, Inc. evaluated the three RFP respondents and prepared a recommendation to the Board of Selectmen.
- 6/23/09 Board of Selectmen voted to enter into negotiations with Solaya Energy of Wilmington, MA for property lease and power purchase agreement.
- 11/17/09 Board of Selectmen voted to accept a Lease and Power Purchase Agreement with Scituate Wind LLC for a 15-year lease period with two possible 5-year extensions.

2010

- *3/25/10 & 4/8/10 Planning Board Public Hearings
- 4/9/10 Planning Board voted to approve Special Permit-Wind Energy Conversion System.

- *05/28/10 Permit filed after appeal period with Registry of Deeds

2011

- 3/3/11 Plymouth County Commissioners voted to approve Qualified Energy Conservation Bonds for the Scituate Wind project.
- 6/22/11 Building Commissioner issued decision that wind turbine location complies with applicable Zoning Bylaw.
- 8/11 construction on the turbine begins.
- 9/21/11 Board of Selectmen voted to grant easement to National Grid for the purpose of installing power lines to the wind turbine.

2012

- *1/1/12 DEP Wind Turbine Health Impact Study
- 1/3/12 Board of Selectmen were given detailed update on turbine project status by the principals of Scituate Wind LLC.
- 1/21/12 turbine blades are delivered and a "Blade Signing Event" took place in the Widow's Walk parking lot on a cold, snowy day. 1,200 residents signed the blade.
- 3/30/12 turbine commences operation.

2013

- Board of Health commissioned a post-construction noise study to be financed by turbine owner as per the contract.
- 4/9/13 Town Meeting voted to not approve Article 28 sponsored by citizen petition to rescind the Special Permit granted to Scituate Wind LLC.
- *10/21/13 Shadow Flicker Assessment Wind Turbine

2014

- *1/7/2014 Shadow Flicker Study presentation to the Board of Selectmen
- Noise study completed by Tech Environmental. Results showed that on all three test nights (8/15/13, 3/15/14, 6/3/14) differences between "ambient noise" and "turbine noise" were below the 10dBa threshold specified in the DEP regulations 310CMR7.10.
- Board of Health with the assistance of Scituate Wind began tracking noise complaints vs. wind conditions.

2016

- A pilot program to curtail turbine operation under certain wind conditions was conducted.
- 10/18/16 Board of Selectmen voted to curtail turbine operation during occurrences of southwest winds (+/- 15 degrees) of less than 10 mph during the hours of 11pm and 6am from June 1st to October 15th.

2017

- 10/16/17 Board of Selectmen reviewed a file memo on the cost to cease turbine operation from 11pm to 6am during the period 4/15/17 through 10/15/17 ($162,885).
- The Board directed that a second turbine noise study be commissioned to see if noise levels were increased due to the age of the turbine.

2018

- 5/29/18 Board of Selectmen voted to award a $50k contract to Epsilon Associates to conduct a turbine noise compliance study.

2020

- *3/6/20 Epsilon Sound Level Compliance Evaluation Report Published

Income from Turbine *(report dates and amounts differ due to different criteria from Town Accountant report please refer to Wind Turbine Revolving Fund Summary tab for financial info)

- FY12 $ 37,600
- FY13 $198,600
- FY14 $224,800
- FY15 $319,200
- FY16 $344,200
- FY17 $289,500
- FY18 $329,400

Albert Bangert
Special Projects Director

Wind Turbine Revolving Fund Summary

The Wind Turbine Fund is a MGL Ch 44 §53E1/2 revolving fund which must be re-authorized annually. It was first authorized as Article 4 of the April 2011 ATM and has been authorized every year since.

	Opening Balance	Revenue	Interest Earned	Scituate Wind Expenses	Independent Studies	Electricity Bills Paid	Debt Exclusion Offset/Budget per ATM vote	Closing Balance	Rev Over Exps
FY 2012	$0.00	$103,024.80	$58.59	($50,994.95)	$0.00	$0.00		$52,088.44	$52,088.44
FY 2013	$52,088.44	$461,680.25	$325.29	($338,791.41)	$0.00	($27,776.85)		$147,525.72	$95,437.28
FY 2014	$147,525.72	$543,638.63	($383.88)	($337,759.41)	$0.00	($57,514.69)		$295,506.37	$147,980.65
FY 2015	$295,506.37	$585,344.10	$0.00	($254,273.19)	$0.00	($58,661.40)		$567,915.88	$272,409.51
FY 2016	$567,915.88	$581,807.76	$0.00	($264,104.02)	$0.00	($51,471.60)	($100,000.00)	$734,148.02	$166,232.14
FY 2017	$734,148.02	$611,629.53	$0.00	($378,628.82)	$0.00	($896.81)	($100,000.00)	$866,251.92	$132,103.90
FY 2018	$866,251.92	$623,192.23	$0.00	($333,866.17)	$0.00	$0.00	($200,000.00)	$955,577.98	$89,326.06
FY 2019	$955,577.98	$452,390.09	$0.00	($317,540.89)	($14,395.91)	$0.00	($100,000.00)	$976,031.27	$20,453.29
FY 2020	$976,031.27	$464,199.43	$0.00	($365,489.74)	($35,604.09)	($1,568.82)	($100,000.00)	$937,568.05	($38,463.22)
FY 2021 YTD	$937,568.05	$21,013.27	$0.00	($34,000.46)	$0.00	$0.00	($100,000.00)	$824,580.86	($112,987.19)
		$4,426,906.82	**$0.00**	**($2,641,448.60)**	**($50,000.00)**	**($197,890.17)**	**($600,000.00)**		

9/6/2020

Cost analysis: reducing turbine operation

28 August 2020

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Question 1: *What would be the cost to the taxpayer of shutting down the wind turbine operation completely?*

- $701,267 per year for the remaining 6 years of the base contract.[1]

Question 2: *What would be the cost to the taxpayer of shutting down the wind turbine from 10pm to 6am during the period April 1st through October 31st?*

- $108,767 per year.

Question 3: *What would be the cost to the taxpayer of shutting down the wind turbine from 10pm to 6am during the entire year?*

- $231,418 per year.

How was this calculated?

- Based upon 6 years of data, the average annual production of energy by the turbine is 3,261,708 kilowatt-hours (kWh) per year.
- April through October production is typically 47% of the annual amount or 1,533,003 kWh.[2]
- Assume that 33% of the day's production occurs between 10pm though 6pm.
- When the turbine runs, the Town receives a 19-cents per kWh rebate from National Grid and pays Scituate Wind 10-cents per kWh – Net Income 9-cents per kWh.
- When the Town asks Scituate Wind to shut down the turbine, the Town loses the 9-cents per kWh of Net Income plus must pay Scituate Wind 12.5-cents[3] per kWh for its lost revenue – Total cost to the Town of 21.5-cents per kWh.

- Calculation for Question 1 - Complete shutdown of turbine:
  - 3,261,708 kWh annual production x 21.5-cents per kWh = $701,267 per year.
- Calculation for Question 2 - Shut down from 10pm – 6am during Apr-Oct:
  - 3,261,708 kWh x 21.5-cents per kWh x 47% of the year x 33% of the day = $108,767 per year.
- Calculation for Question 3 – Shut down from 10pm – 6am all year:
  - 3,261,708 kWh x 21.5-cents per kWh x 33% = $231,418 per year.

A. G. Bangert

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[1] In addition, the turbine contract includes provision for two 5-year extensions; there would be legal fees to negotiate out of this provision and a cost to remove the turbine.
[2] Production in the winter months is higher than in the summer months.
[3] Scituate Wind's lost revenue is the 10-cents/kWh that the Town pays it for the power produced plus the 2.5-cents/kWh it receives from a third party for the Renewable Energy Credits.

WIND TURBINE BOH NOISE COMPLAINT LOG

DATE	TIME	ADDRESS OF REPORT	NOTES
6/13/2019	2:35 PM	120 Gilson road	Noise
6/13/2019	2:35 PM	122 Gilson road	Noise
6/15/2019	12:40 AM	122 Gilson road	Noise
6/18/2019	8:59 AM	34 Driftway	Noise
7/5/2019	1:10AM	122 Gilson road	Noise
7/5/2019	6:38 AM	120 Gilson road	Noise
7/9/2019	6:20 AM	120 Gilson road	Noise
7/16/2019	12:25 PM	120 Gilson road	Noise
7/17/2019	12:25 PM	120 Gilson road	Noise
8/22/2019	9:15 AM	122 Gilson Road	Noise
9/11/2019	9:23 AM	120 Gilson Rroad	Noise
9/20/2019	3:46 AM	122 Gilson road	Noise
9/20/2019	6:30 AM	120 Gilson road	Noise
9/20/2019	7:15 AM	151 Driftway	Noise
9/28/2019	11:05 PM	122 Gilson road	Noise
9/29/2019	8:56 AM	120 Gilson road	Noise
10/10/2019	6:32 PM	122 Gilson road	Noise
3/23/2020	4:25 AM	26 Hewes road	Noise/ request for test results
4/22/2020	9:00 AM	120 Gilson road	Noise
5/14/2020	8:57 PM	120 Gilson road	Noise
5/14/2020	9:21 PM	151 Driftway	Noise
5/15/2020	1:37 AM	151 Driftway	Noise
5/18/2020	2:51 AM	151 Driftway	Noise
5/19/2020	5:00 AM	151 Driftway	Noise
5/30/2020	12:45 PM	151 Driftway	Noise
5/30/2020	12:16 PM	122 Gilson road	Noise
5/30/2020	10:43 AM	120 Gilson road	Noise
7/9/2020	12:12 PM	127 Gilson road	Noise
7/26/2020	10:09 AM	151 Driftway	Noise
8/12/2020	11:38 AM	120 Gilson road	Noise

9 Apr 2010
Planning Board
Spec. Permit

mail Town of Scituate
Attn: Al Bangert
600 C.J. Cushing Hwy
Scituate, MA 02066

ATTEST: John R. Buckley Jr.
REGISTER
PLYMOUTH COUNTY REGISTRY OF DEEDS

M.R. BOOK 3054
PAGE 248

RECEIVED
OFFICE OF THE TOWN CLERK
2010 APR 15 P 3:11
SCITUATE, MASS.

Town of Scituate
Planning Board

Special Permit – Wind Energy Conversion System – 167 Driftway

2010 00042140
Bk: 38573Pg: 234 Page: 1 of 8
Recorded: 05/28/2010 12:53 PM

Decision:	**APPROVED with conditions**
Applicants:	Scituate Wind LLC and Town of Scituate
Date:	April 9, 2010
Location:	167 Driftway Assessor's Map-Block-Lot 59-1-2A1
Plans:	Special Permit Site Plans for the Scituate Community Wind Project, Scituate, Massachusetts, March 3, 2010 by Atlantic Design Engineers, Sandwich, MA

Background: Scituate Wind LLC and the Town of Scituate jointly submitted an application for a Wind Energy Conversion special permit for a wind turbine on town owned land adjacent to the Sewer Treatment Plant at 167 Driftway. The property is located in the Commercial Zoning District and Planned Development District Subdistrict H-E, Wastewater Treatment. Its frontage is on the Driftway. An area of land on this site not to exceed 15,000 sq. ft. would be leased to Scituate Wind LLC for the purpose of installing and operating the turbine.

The height of the wind turbine would be approximately 80 meters (approximately 263.07'). It would have three blades of approximately 40.25 meters (approximately 132.36') in length. The turbine would produce electrical energy which would be used by the adjacent Wastewater Treatment Plant. The town would get credit for additional energy produced through net metering, as stipulated in the Site Lease Agreement. The nameplate capacity of the turbine will be 1.5Mw.

A copy of the Site Lease Agreement is attached to, and made part of, this decision.

Procedural Summary: Prior to the receipt of this application, the Planning Board held two informational meetings on the wind turbine on February 12, 2009 and March 12, 2009. The application for this Special Permit was filed with the Town Clerk and the Planning Board on March 3, 2010. A Public Hearing before the Planning Board was duly advertised and notices sent to all abutters in accordance with MGL Chapter 40A. The Public Hearing was opened on March 25, 2010. Donna Chisholm, William Limbacher, Donald Walter, Robert Vogel and Dr. Nico Afanasenko were present. The Public Hearing was continued to April 8, 2010, when the public hearing was closed and the Planning Board voted to approve the special permit with conditions. At the April 8 meeting, Donna Chisholm, William Limbacher, Robert Vogel and Dr. Nico Afanasenko were present.

Hearing Summary: At the Public Hearing, Mr. Bangert, DPW Director, addressed the board. He said the Town and Scituate Wind LLC are seeking a special permit for a 1.5MW wind turbine on town property. Sumul Shah, CEO of Solaya Energy, Richard Tabaczynski, Atlantic Design Engineers and Francis Colpoys, attorney for Solaya Energy also represented Scituate Wind at the public hearing. Mr. Bangert stated Solaya would design, finance, construct, own, operate and maintain a 1.5MW wind turbine on the town's site on the town's behalf. The town will purchase all of the energy that is produced at an attractive price that has been contracted for. As a result, this will provide a significant portion of the town's municipal power purchases at an average savings of

$300,000.00 per year to the town. Mr. Bangert said the energy cost savings would be shared across departments based on usage. Mr. Bangert went through each section of Zoning Bylaw 740, Wind Energy Conversion Systems, to demonstrate how this project works within the bylaw.
The Planning Board asked if a maintenance issue or lack of maintenance could cause the noise level to increase. Mr. Tabaczynski responded that part of the process is maintenance of the turbine. Mr. Shah responded that the type of noise that may occur with a mechanical failure would be inside the turbine and not something that would be heard from outside the turbine. There was further discussion on the measurement of noise.

The Planning Board asked if the electric rate that the Town pays remains level or rises with market rates. Mr. Bangert responded that there is a specific contract rate in three-year increments. The Town feels that the rate increases at a slow rate. With the Net Metering law there is the cost of generation and the cost of delivery. The Town will pay for the cost of generation, but not the cost of delivery.

The Planning Board asked about issues with flicker, ice throw and high wind shutdown. Mr. Shah responded that all the turbines have safety features built into them. If there is too much wind it will shutdown to help protect itself. Regarding icing, Mr. Shah said that their experience in this region is that icing events are located closer to the base of the turbine. Mr. Tabaczynski added that most turbines would sense an imbalance or ice buildup on the blades and shut down immediately. However, there should be a plan in place and visual observation during an ice storm to be sure it doesn't start up again before the ice sheds off. He stated his company has made recommendations to Solaya regarding communication efforts be kept in place to prevent any occurrences that could cause damage. Mr. Shah responded that they typically disable auto restart if there is a detected blade imbalance. Regarding flicker, Mr. Shah said he is not aware of any flicker complaints. Mr. Tabaczynski said his office is close to Mass Maritime that has a smaller turbine but it is still good sized. They have talked to the residents who are closer to that turbine than any abutter will be to this one and they have no issues with flicker.

The Planning Board said a 5ft. fence as stated in the bylaw is not high enough to keep people out. Mr. Bangert responded that there would be a 6ft. fence. The Board continued with discussion regarding construction. Mr Shah stated that the structural engineer who designs the foundation would also do inspections. When construction is complete the manufacturer would also inspect the turbine from top to bottom.

Public Input: Mr. Mark McKeever, 151 Driftway, asked what the distance of that turbine is to the closest abutter. Mr. Tabaczynski responded within 400ft. Mr. McKeever said he is the only abutter to the property where the wind turbine will be located. He is not happy about it. He said he was here to beg the Board to move it from 600ft. to 1,600ft. so he and his family can enjoy their home. The Planning Board noted that it could not be positioned further away because that is conservation land. Mr. McKeever said he is the only resident being affected by this. His property value will go down. He doesn't understand why it can't be built offshore or on the landfill. With the new Net Metering law, you can put it anywhere as long as it can tie into the grid.

The Planning Board asked if the applicants could meet and work with the abutter. There was discussion with Mr. McKeever about the noise from the Green Connection. Mr. McKeever responded he couldn't open his windows. There was discussion about whether the Green Connection was required to use water to reduce dust. It was noted that the Green Connection is in the Commercial zone and Mr. McKeever's home is in the Commercial zone. Mr. McKeever said he wrote to the

Selectmen about the situation but did not get a response.

Regarding the use of the other site, Mr. Paul Reidy, Chairman Renewable Energy Committee, said if the State would open up Conservation land it would be easier but that is not the case. He said the State would not consider use of the other site because we have a site that meets all the parameters. Mr. Reidy stated he believed the sound study was done from Mr. McKeever's property line.

Findings of Fact: At the 4/8/2010 Planning Board meeting, after the close of the public hearing, the Planning Board voted to make the following Findings of Fact based on the information received and the testimony given at the public hearing. Donna Chisholm, William Limbacher, Robert Vogel and Dr. Nico Afanasenko voted in favor of the motion to make each of the following Findings of Fact. Donald Walter was absent and the alternate position was vacant.

1. The property at 167 Driftway is a parcel of approximately 6 acres which contains the Town of Scituate Sewerage Disposal Site. This parcel is within the Commercial Zoning District and the Planned Development District, Subdistrict E, Wastewater Treatment.

2. This parcel is immediately adjacent to Driftway Park, which is owned by the Town of Scituate Conservation Commission and is over 50 acres. It is across the street from Widow's Walk, a municipal golf course.

3. KEMA, Inc., consultants to Massachusetts Technology Collaborative, and Ecology & Environment, Inc., collected approximately one year of wind data from a meteorological tower near the Waste Water Treatment Plant. As a result of this research, the property at 167 Driftway was recommended as the location for a wind turbine. KEMA's findings are presented in a report titled Town of Scituate Wind Project Feasibility Materials, March, 2008. The Town of Scituate Community Wind Project Feasibility Study was also completed in April, 2008.

4. Annual Town Meeting of March, 2008 voted to pass Article 25 to adopt changes to Scituate Zoning Bylaw Section 740, to bring the Town's bylaw for wind energy systems into conformance with Massachusetts Department of Environmental Protection's Division of Air Quality Noise Regulations, 310 CMR 7.1.

5. Special Town Meeting of April, 2009 voted to pass Article 5 to allow the lease of the property at 167 Driftway for up to 25 years for the purpose of constructing and operating a wind turbine based on this report and the recommendation of the Renewable Energy Committee.

6. After an RFP process, Solaya Energy was chosen as the operator of the wind turbine. The town agreed to lease 15,000 sq. ft. on the southern side of this parcel plus an access easement from the Driftway for 15 years with the option to extend said lease for up to 25 years, to Scituate Wind LLC, an affiliate of Solaya, for 15 years, for installation and operation of a wind turbine.

7. An application for a Wind Energy Conversion System special permit for a wind turbine located on this parcel was jointly submitted by the Town of Scituate and Solaya Energy Group, LLC on March 3, 2010. Prior to receiving the application for the special permit, the Planning Board held a public discussion on the wind turbine on March 12, 2009. Abutters were notified of this discussion and it was publicized in the Patriot Ledger.

8. The wind turbine will have 1.5 Megawatt Nameplate Capacity. Net metering allows electricity generated beyond what is used by the Waste Water Treatment Plant to be used at other town-owned buildings before being sold back to the grid. According to the Town of Scituate Department of Public Works, the electricity it produces is expected to save the town approximately $300,000 per year in energy costs.

9. As indicated in Exhibit B of the Lease Agreement, Description of the Permitted Improvements, the hub of the proposed wind turbine will be 80 meters (approximately 263.07') in height. There will be three blades with a length of 40.25 meters (approximately 132.36'). The applicant's design engineers conducted a balloon test to show the approximate height of the proposed wind turbine. The results are provided in a report, Balloon Test & Photosimulation Report, Scituate Community Wind Project, 167 Driftway, Scituate, MA. The plans show the wind turbine will be situated at least 480.6' from the property line on the Driftway, and 609.5' from the nearest adjacent property. This demonstrates that the wind turbine meets the requirements of Scituate Zoning Bylaw Sections 740.1 and 740.2, Setbacks from Traveled Ways and Setbacks from Property Lines.

10. The applicant has stated the design of the turbine and supporting foundations shall be certified by a registered professional engineer prior to obtaining a building permit. This shall be a condition of receiving this special permit. Obtaining this certificate demonstrates the wind turbine meets the requirements of Scituate Zoning Bylaw Section 740.3, Tower and Foundation Design.

11. The applicant has stated they will construct a fence around the base of the turbine to prevent access. Construction of a fence will be required by a condition of this special permit. This demonstrates that the wind turbine will meet the requirements of Scituate Zoning Bylaw Section 740.4, Prevention of Tower Access.

12. Prior to obtaining a building permit, the applicant shall provide certification to the Planning Board and Building Department that the wind turbine conforms to Regulations of the Federal Communications Commission regarding electromagnetic interference with radio or television reception (14 CFR Part 15.) This demonstrates the wind turbine meets the requirements of Scituate Zoning Bylaw Section 740.5, Conformance to Electromagnetic Regulations.

13. The applicant's design engineers, Atlantic Design Engineers LLC, conducted an acoustic analysis of the proposed wind turbine. The results were provided in two reports, Acoustic Analysis, Scituate Community Wind Project, 167 Driftway, Scituate, MA, and Addendum to Acoustic Analysis, Scituate Community Wind Project, 167 Driftway, Scituate, MA. The conclusion of the reports was that at the nearest residential property, and five additional residential properties, the Scituate Community Wind Project would increase ambient sound by a range of 0.4 dBA to 7.5 dBA, and would not produce any audible "clear tones." These reports concluded that the Wind Project would comply with Scituate Zoning Bylaw Section 740.6, Noise Level Standards.

14. The applicant's design engineers conducted a shadow flicker analysis of the proposed wind turbine. The results are provided in a report, Shadow Flicker Analysis, Scituate Community Wind Project, 167 Driftway, Scituate, MA. This report used a conservative approach, and concluded that most of the specific receptors analyzed in the report were predicted to have

below the commonly accepted tolerance of 30 experienced hours per year, with the exception of 141 and 151 Driftway, with 36.22 and 50.53 experienced hours per year, respectively. The report noted that the shadow flicker was expected to occur at these locations in the mid-afternoon in the late fall and winter months.

15. As specifically set forth in the lease, Scituate Wind LLC will maintain public liability and property damage insurance in standard form with a general aggregate limit of not less than $5,000,000, and will post a cash deposit or performance bond at the time of delivery to the Town of the Final Completion Certificate, in the amount of $150,000, to guarantee that the turbine will be decommissioned and removed within ninety days of the termination of the lease with the Town, if the Town so desires. This demonstrates that the wind turbine meets the requirements of Scituate Zoning Bylaw Section 740.7, Abandonment.

16. The proposal meets the requirements of Scituate Zoning Bylaw Section 740 for a Wind Energy Conversion System.

Decision: A motion was duly made and seconded to approve the Special Permit with the following conditions:

1. The wind turbine shall be constructed as shown on a plan titled Special Permit Site Plans for the Scituate Community Wind Project, Scituate, Massachusetts, March 3, 2010 by Atlantic Design Engineers, Sandwich, MA. The wind turbine shall be built according to design specifications submitted with the application for this Special Permit and as fully set forth on Exhibit B to the Site Lease Agreement dated January 5, 2010, by and between Scituate Wind LLC and the Town of Scituate, which is included in, and made a part of, this special permit, and which is attached hereto. Operation of the turbine shall comply with all provisions of the lease with the Town of Scituate, which provisions are made conditions of this Special Permit and which is attached hereto.

2. Prior to issuing the building permit, the applicant shall provide the building inspector engineering data to demonstrate conformance with Section 740.5 and 740.6 of the Zoning Bylaw.

3. No exterior lighting or signage shall be installed with the exception of lighting and signs required by the Federal Aviation Administration (FAA) and the Town, and informational signage to educate the general public about the wind turbine and the use of wind as a source of renewable energy. Any such signage shall conform to Scituate Zoning Bylaw Section 700, Signs. FAA Certification shall be provided at the time of Building Permit application.

4. To ensure public safety and structural stability, the design of the turbine and any supporting foundations shall be certified by a Registered Professional Engineer to be in conformance with the Massachusetts State Building Code (780 CMR) at the time of application for a building permit.

5. The applicant shall maintain the turbine for the period of the lease as stipulated in the Site Lease Agreement.

6. An 8' fence with a Knox lock box acceptable to the Fire Department shall be provided around the base of the turbine as a security barrier to prevent access. The fence shall be surrounded

with crushed stone to discourage vegetation.

7. Except in the area of the fence, the existing vegetation surrounding the wind turbine will be maintained in its natural state to the extent possible. Vegetation in areas disturbed during the construction phase shall be replaced.

8. Up to six evergreen trees shall be added on the high part of the adjacent town-owned property if desired by the immediate residential abutter to the north, at appropriate spacing to allow for growth, to provide screening for his property.

9. Any hazardous materials in use on the site should be identified and MSDS sheets maintained on file with the Fire Department as required.

10. In the event there is a reasonable basis to allege that there are violations of the applicable noise standards as required by the Section 740 of the Town of Scituate Zoning Bylaw and if reasonably required by the Town of Scituate Building Inspector, a noise analysis shall be performed to insure conformance with the requirements of Scituate Zoning Bylaw Section 740.6, Noise Level Standards.

11. Deconstruction and removal of the wind turbine, if necessary, shall be undertaken in conformance with the terms of the Site Lease Agreement.

12. This Special Permit shall lapse within 2 years from the date of its issuance or within 2 years from the final disposition of any appeal to a court of competent jurisdiction of the issuance of this Special Permit, unless substantial use or construction has commenced prior to that time in accordance with MGL C. 40A Section 9.

13. The applicant must obtain all necessary permits, including but not limited to, permits from the Building Commissioner, Board of Health, and the Conservation Commission, before beginning construction to the extent applicable.

14. Prior to application for a building permit, a preconstruction conference will be held including the owner and contractor or their representative, the Town of Scituate DPW and the Town Planner. The applicant shall provide information to Town personnel about construction timelines and location of staging areas on the site.

15. The applicant shall assume the reasonable and customary costs of Planning Board monitoring for compliance with this Special Permit only if there is a reasonable basis to concluded that there is non-compliance with these Conditions.

16. This Special Permit shall be void if it is not recorded at the Registry of Deeds within 60 days of the date of the filing with the Scituate Town Clerk. The Applicant shall provide proof of this recording to the Planning Board.

Vote: Donna Chisholm, William Limbacher, Robert Vogel and Dr. Nico Afanasenko voted to approve the Special Permit with conditions. Donald Walter was absent and the alternate position was vacant.

Project: Wind Turbine Special Permit
167 Driftway

Date: _____

SCITUATE PLANNING BOARD

Donna L Chisholm

William Limbacher

Robert B Vogel

_____

_____

Note: This document will not become effective until such time as an attested copy of the Decision has been filed with the Plymouth County Retistry of Deeds, following the expiration of the appeal period of 20 days.

DATE FILED WITH TOWN CLERK _____

cc: Albert Bangert, Director, DPW
Chief Judge, Scituate Fire Department
Neil Duggan, Building Commissioner
Jennifer Sullivan, Health Director
Planning Board
Francis L. Colpoys, Jr., Esq.
Sumul Shah, Solaya Energy LLC
Richard Tabaczynski, Atlantic Design Engineers

AMENDED AND RESTATED
NET METERING POWER SALES AGREEMENT

This Amended and Restated Net Metering Power Sales Agreement ("***Agreement***") is entered into as of the 10th day of May, 2010 and is by and between Scituate Wind LLC, a Massachusetts limited liability company with a principal place of business at 56 Cummings Park, Woburn, Massachusetts, as seller ("***Seller***"), and the Town of Scituate, a municipal corporation having its principal office at 600 Chief Justice Cushing Highway, Scituate, Massachusetts, as buyer ("***Buyer***"). In this Agreement, Seller and Buyer are sometimes referred to individually as a "***Party***" and collectively as the "***Parties***."

RECITALS

WHEREAS, Buyer desires to purchase wind-generated electricity for use by Buyer, and proposes to lease a portion of real property located at 161 Driftway, Scituate, Massachusetts (the "***Premises***") to facilitate the development and operation of a wind power electric generation facility;

WHEREAS, Seller is in the business of financing, developing, owning, operating and maintaining wind power electric generation facilities;

WHEREAS, Seller proposes to finance, install, own, operate and maintain the Wind Energy Facility on the Premises;

WHEREAS, Buyer proposes to lease to Seller the Premises to allow Seller to construct, operate, maintain and remove the Wind Energy Facility on the Premises; and

WHEREAS, Seller desires to sell and deliver to Buyer, and Buyer desires to purchase and receive from Seller, all of the Net Energy generated by the Wind Energy Facility during the Term, subject to the terms and conditions, and at the prices, set forth in this Agreement.

WHEREAS, the Parties previously entered into a Net Metering Power Sales Agreement on January 5, 2010, and have agreed to amend and restate herein that agreement in its entirety, to be effective as of January 5, 2010 (the ***"Effective Date"***).

NOW, THEREFORE, in consideration of the foregoing recitals, the mutual premises, representations, warranties, covenants, conditions herein contained, and the Exhibits attached hereto, Seller and Buyer agree as follows.

ARTICLE 1
DEFINITIONS

When used in this Agreement, the following terms shall have the meanings given below, unless a different meaning is expressed or clearly indicated by the context. Words defined in this Article 1 which are capitalized shall be given their common and ordinary meanings when they appear without capitalization in the text. Words not defined herein shall be given their common and ordinary meanings.

"***Affiliate***" means, with respect to Seller, (i) each Person that, directly or indirectly, controls or is controlled by or is under common control with Seller; (ii) any Person that

beneficially owns or holds ten percent (10%) or more of any class or voting securities of Seller or ten percent (10%) or more of the equity interest in Seller; or (iii) any Person of which Seller beneficially owns or holds ten percent (10%) or more of the equity interest. For the purposes of this definition, "control" (including, with correlative meanings, the terms "controlled by" and "under common control with"), as used with respect to any Person, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of Seller, whether through the ownership of voting securities or by contract or otherwise.

"***Applicable Legal Requirements***" means any present and future law, act, rule, requirement, order, by-law, ordinance, regulation, judgment, decree, or injunction of or by any Governmental Authority, ordinary or extraordinary, foreseen or unforeseen, and all licenses, permits, and other governmental consents, which may at any time be applicable to a Party's rights and obligations hereunder, including, without limitation, the construction, operation, ownership, maintenance, repair, decommissioning and removal of the Wind Energy Facility, as well as the selling and purchasing of power therefrom.

"***Appraised Value***" means the fair market value assigned to the Wind Energy Facility, the Environmental Attributes, and any other power sales agreements, emission trading agreements, renewable energy certificate sales agreements or revenue producing agreements to which Seller is a party and which are not subject to contractual limitations on assignment or which may reasonably arise from the ownership and operation of the Wind Energy Facility, as determined by the Independent Appraiser (collectively, the "***Assets***").

"***Assets***" has the meaning set forth in the definition of Appraised Value.

"***Business Day***" means a day on which Federal Reserve member banks in Boston are open for business; and a Business Day shall open at 8:00 a.m. and close at 5:00 p.m. Eastern Prevailing Time.

"***Commercially Reasonable***" means any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known, or which in the exercise of due diligence, should have been known, at the time the decision was made, would have been expected to accomplish the desired result consistent with reliability, safety, expedition, project economics and applicable law and regulations in the southern New England region. The term "Commercially Reasonable" is not intended to be limited to consideration of any one practice, method or act, to the exclusion of all others, but rather, is intended to require the consideration of a spectrum of possible practices, methods or acts.

"***Confidential Information***" means all oral and written information exchanged between the Parties which contains proprietary business or confidential information of a Party, and is designated as "confidential" by such Party. The following exceptions, however, do not constitute Confidential Information for purposes of this Agreement: (a) information that is or becomes generally available to the public other than as a result of a disclosure by either Party in violation of this Agreement; (b) information that was already known by either Party on a non-confidential basis prior to this Agreement; (c) information that becomes available to either Party on a non-confidential basis from a source other than the other Party if such source was not

subject to any prohibition against disclosing the information to such Party; and (d) information a Party is required to disclose in connection with any administrative or regulatory approval or filing process in connection with the conduct of its business or in accordance with any statute or regulations. In connection with the above, the Parties acknowledge that notwithstanding the above, Buyer is a public entity which is subject to certain public records disclosure statutes and regulations.

"Contract Year" means the consecutive 12-month period commencing on the Full Operations Date.

"Effective Date" means the date set forth in the recital paragraphs of this Agreement.

"Environmental Attributes" has the meaning set forth in Section 4.6.

"Energy" means the amount of electricity either used or generated over a period of time, expressed in terms of kilowatt hour ("kWh") or megawatt hour ("MWh"). Energy shall not include capacity credits, credits for Environmental Attributes, or any investment or production tax credits under Section 45 of the Internal Revenue Code, or otherwise, to the extent that the Wind Energy Facility receives or is entitled to receive any such credits.

"Event of Default" means any event of default as defined in Article VIII of this Agreement.

"Final Completion Certificate" means a certificate of final completion issued by the manufacturer of the wind turbine generator with respect to the construction and commissioning of the Wind Energy Facility.

"Financier" means any individual or entity providing money or extending credit to Seller for the purpose of procuring, constructing, owning, operating, maintaining, repairing, decommissioning or removing the Wind Energy Facility, including, but not limited to: (i) the construction, term or permanent financing of the Wind Energy Facility; or (ii) investment capital, working capital or other ordinary business requirements for the Wind Energy Facility (including the maintenance, repair, replacement or improvement of the Wind Energy Facility); or (iii) any development financing, bridge financing, credit support, credit enhancement or interest rate protection in connection with the Wind Energy Facility. Financier shall include any entity through which Seller has a lien in connection with the Wind Energy Facility. "Financier" shall not include common trade creditors of Seller.

"Force Majeure" means any cause not within the reasonable control of the affected Party which precludes that Party from carrying out, in whole or in part, its obligations under this Agreement, including, but not limited to, Acts of God; high winds, hurricanes or tornados (but not the lack of wind); fires; epidemics; landslides; earthquakes; floods; other natural catastrophes; strikes; lock-outs or other industrial disturbances; acts of public enemies; acts, failures to act or orders of any kind of any Governmental Authority acting in its regulatory or judicial capacity, provided, however, that any such discretionary acts, failures to act or orders of any kind by Buyer may not be asserted as an event of *Force Majeure* by Buyer; insurrections;

military action; war, whether or not it is declared; sabotage; riots; civil disturbances or explosions. A Party may not assert an event of *Force Majeure* to excuse it from performing due to any governmental act, failure to act, or order, where it was reasonably within such Party's power to prevent such act, failure to act, or order. Economic hardship of either Party shall not constitute an event of *Force Majeure*.

"Full Operations Date" means the date on which the Final Completion Certificate is issued.

"Governmental Authority" means any national, state or local government, independent system operator, regional transmission owner or operator, any political subdivision thereof or any other governmental, judicial, regulatory, public or statutory instrumentality, authority, body, agency, department, bureau, or entity.

"Governmental Charges" means all applicable federal, state and local taxes (other than taxes based on income or net worth, but including, without limitation, sales, use, gross receipts or similar taxes), governmental charges, emission allowance costs, duties, tariffs, levies, licenses, fees, permits, assessments, adders or surcharges (including public purposes charges and low income bill payment assistance charges), imposed or authorized by a Governmental Authority, local electric distribution company, or other similar entity, on or with respect to the Net Energy.

"Guaranteed Annual Electric Output" means the minimum amount of Net Energy that is guaranteed by Seller to be generated by the Wind Energy Facility for sale and delivery to Buyer in any Contract Year, as set forth in Exhibit C.

"Host Customer Costs" shall mean the cost of performing all of the Host Customer's obligations under the Interconnection Agreement or the Tariff, such as those pertaining to the provision of insurance, and the reading or testing of meters, but specifically excluding all costs associated with the design, construction, or installation of facilities or metering devices necessary for interconnecting the Wind Turbine Facility to the National Grid electric power system (via the Host Customer), or any upgrade of to the electric system of National Grid's that is necessary for the delivery of Net Energy to the National Grid electric power system.

"Independent Appraiser" means an individual who is a member of a national accounting, engineering or energy consulting firm qualified by education, certification, experience and training to determine the Appraised Value of wind energy generating facilities of the size and age and with the operational characteristics of the Wind Energy Facility. Except as may be otherwise agreed by the Parties, the Independent Appraiser shall not be (or within three years before his appointment have been) a director, officer or employee of, or directly or indirectly retained as consultant or adviser to, Seller, any Affiliate of Seller, or Buyer.

"Interconnection Agreement" shall mean the Interconnection Service Agreement entered into with National Grid which authorizes the interconnection of the Wind Energy Facility with the local electric distribution system of National Grid, which confirms the eligibility of Wind Energy Facility for treatment as a Class III Municipal Wind Net Metering

Facility, and which specifies whether any Net Excess Generation (as defined in the Tariff) shall be subject to allocation or cash-out.

"Interest Rate" means a fluctuating interest rate per annum equal to the sum of (i) the Prime Rate as stated in the "Bonds, Rates & Yields" section of The Wall Street Journal on the Effective Date and thereafter on the first day of every calendar month, plus (ii) two percentage points. (In the event that such rate is no longer published in The Wall Street Journal or such publication is no longer published, the Interest Rate shall be set using a comparable index or interest rate selected by Seller and reasonably acceptable to Buyer.) The Interest Rate hereunder shall change on the first day of every calendar month. Interest shall be calculated daily on the basis of a year of three hundred sixty five (365) days and the actual number of days for which such interest is due.

"ISO-NE" means the independent system operator established in accordance with the NEPOOL Agreement (the Second Amended and Restated New England Power Pool Agreement dated as of February 1, 2005) and the Interim Independent System Operator Agreement as amended, superseded or restated from time to time.

"kW" means Kilowatt.

"kWh" means Kilowatt hour.

"Lease" means the Site Lease Agreement executed between the Parties of even date herewith, as such Lease may be amended from time to time.

"Metering Device" means any and all revenue quality meters installed by Seller or National Grid after the Point of Delivery necessary or appropriate for the delivery of Energy into the National Grid local electric distribution system and (except for the Net Metering Device) the calculation of Net Metering Credits.

"MW" means Megawatt.

"MWh" means Megawatt hour.

"National Grid" means National Grid USA, the local electric distribution company for Buyer, or its successor.

"NEPOOL" means the New England Power Pool and any successor organization.

"Net Energy" means the actual and verifiable amount of Energy generated by the Wind Energy Facility and delivered to Buyer at the Point of Delivery in excess of any Energy consumed by the Wind Energy Facility, as metered in kilowatt-hours (kWh) at the Net Metering Device, and that conforms to Applicable Legal Requirements and the Tariff.

"Net Metering" means the process of measuring the difference between electricity delivered by a local electric distribution company and electricity generated by a net metering

facility and fed back to the local electric distribution company, as set forth under M.G.L. c. 164, §§138 – 140 and 220 C.M.R. §18.00, as may be amended from time to time by a Governmental Authority.

"***Net Metering Credits***" shall have the meaning set forth in 220 C.M.R. § 18.00, as implemented by the Tariff

"***Net Metering Device***" means any and all revenue quality meters installed by Seller at or before the Point of Delivery necessary or appropriate for the registration, recording, and transmission of information regarding the amount of Net Energy generated by the Wind Energy Facility and delivered to the Point of Delivery for sale to Buyer.

"***Parties***" means Buyer and Seller, and their respective successors and permitted assignees.

"***Party***" means Buyer or Seller, and their respective successors and permitted assignees.

"***Permits***" means all state, federal, and local authorizations, certificates, permits, licenses and approvals required by any Governmental Authority for the construction, operation and maintenance of the Wind Energy Facility, including, but not limited to, a special permit for a Wind Energy Conversion System under Scituate Zoning Bylaw 740 and construction related permits.

"***Person***" means an individual, partnership, corporation (including a business trust), limited liability company, joint stock company, trusts, unincorporated association, joint venture, or other business entity.

"***Point of Delivery***" means the point of delivery for Net Energy from Seller to Buyer, as further set forth on Exhibit C.

"***Premises***" shall have the meaning set forth in the Lease, and as set forth in Exhibit A.

"***Production Shortfall***" means the amount, expressed in kWh, by which the actual amount of Net Energy generated by the Wind Energy Facility and sold to Buyer in any Contract Year is less that the Guaranteed Annual Electric Output for that Contract Year.

"***Substantial Alteration***" has the meaning set forth in the Lease.

"***Tariff***" means the National Grid tariffs M.D.P.U. No. 1176 and M.D.P.U. No. 1177 for interconnection for distributed generation and net metering services, as approved in DPU Docket 09-72, and any subsequent amendments and approvals thereto.

"***Wind Energy Facility***" means the wind power electrical generation facility to be constructed owned, operated and maintained by Seller, with specifications for an aggregate nameplate capacity of approximately one and one half (1.5) MW, together with all appurtenant facilities, including, but not limited to, the Net Metering Device, Metering Device and any

interconnection facilities, and transformers required to interconnect the Wind Energy Facility to the Point of Delivery and the National Grid local electric distribution system, and any and all Substantial Alterations, additions, replacements or modifications thereto, all to be located on or adjacent to the Premises and as further set forth in Exhibit B.

"***Wind Net Metering Facility***" shall have the meaning set forth in 220 C.M.R. § 18.00.

ARTICLE 2
TERM

2.1 Term.

a. The term of this Agreement (the "***Term***") shall commence on the Effective Date, and shall end at the earlier of (i) 11:59 PM on the day preceding the fifteenth (15th) anniversary of the issuance of the Full Operations Date (the "***Termination Date***"), or (ii) such date as of which this Agreement may be earlier terminated pursuant to the provisions hereof.

b. Subject to the right granted herein to Buyer to purchase the Wind Energy Facility, and provided that this Agreement has not been earlier terminated pursuant to the provisions herein, either Party may request to extend the Term of this Agreement for up to two additional consecutive terms of five (5) years upon the expiration of the then Term by giving the other Party at least two hundred seventy (270) days prior written notice of its desire to extend the Term along with the proposed pricing terms for Net Energy during such 5-year extension. The Parties will negotiate in good faith the pricing terms for any such extension. Any extension of the Term of this Agreement shall occur only pursuant to a mutual written agreement of the Parties.

c. In the event that the Parties are not able to agree on the pricing terms for an extension of this Agreement pursuant to subparagraph (b) above at least one hundred and eighty (180) days prior to the end of the Term, Seller shall have the right (in its sole discretion) to solicit offers to enter into one or more agreements to sell Net Energy from the Wind Energy Facility to one or more third parties upon the end of the Term, subject to the following.

i. Promptly after receipt of an acceptable offer from one or more third parties, but in no event later than thirty (30) days prior to the end of the Term, Seller shall provide notice of the bona fide offers and related pricing terms that Seller has received from third parties, and shall provide Buyer with the right to extend the term of this Agreement on the most favorable pricing term that has been offered by a third party.

ii. Within thirty (30) days of receipt of such notice pursuant to subparagraph (i) above, Buyer shall notify Seller as to whether Buyer intends to exercise its right to extend pursuant to subparagraph (i) above.

1. In the event that Buyer elects to exercise such right, the Parties shall enter into a written agreement that extends the Term of this Agreement on such pricing term.

2. In the event that Buyer declines to exercise such right, this Agreement shall terminate at the end of the Term, and Buyer shall reasonably cooperate with Seller to allow Seller to interconnect directly with National Grid or another Host Customer, in Seller's sole discretion and at Seller's sole cost.

2.2. Early Termination. Either Party may terminate this Agreement without penalty or any liability to the other Party prior to the achievement of the Full Operations Date as specified below:

a. in the event that Seller has not prepared for submission to National Grid by Buyer a complete interconnection application seeking authorization to construct and interconnect the Wind Energy Facility to the National Grid local electric distribution system within thirty (30) days of the Effective Date;

b. in the event that Seller has not submitted an application for a special permit for the Wind Energy Facility to the Planning Board of the Town of Scituate within ninety (90) days of the Effective Date;

c. in the event that the Interconnection Agreement, in form and substance satisfactory to Seller and Buyer, in each of its reasonable discretion, is not finalized and executed within two hundred ten (210) days of Buyer's submission of the interconnection application, provided, however, that the terminating Party shall give the other Party thirty (30) days prior written notice of its intent to terminate this Agreement if such Interconnection Agreement is not timely obtained, and such notice of termination shall be void if such Interconnection Agreement is obtained within thirty (30) days of the non-terminating Party's receipt of such notice;

d. in the event that Seller has not obtained financing sufficient to purchase, construct, commission, own and operate the Wind Energy Facility within twelve (12) months of the Effective Date, provided, however, Buyer (subject to the provisions of subsection (e) below) shall not have the right to terminate this Agreement at such time if any final Permit necessary for the construction, financing, or operation of the Wind Energy Facility has not been obtained due to a legal challenge, and Seller is using and continues to use Commercially Reasonable efforts to obtain such final, non-appealable Permits; or

e. except as set forth below, in the event that Seller has not entered into a binding purchase order for the Wind Energy Facility within forty-eight (48) months of the Effective Date.

In the case of termination pursuant to any of subsections (a) through (e) above, the terminating Party shall give the other Party thirty (30) days prior written notice of its intent to terminate within thirty (30) days after the occurrence of the applicable deadline. In the event that a Party fails to provide such notice, the Party shall be deemed to have waived its right to terminate under the applicable subsection in question. Notwithstanding any other provision of this Agreement, the Parties acknowledge and agree that the deadline set forth in subsection (e) above (i) shall be extended for a period equal to the number of days it takes Seller to obtain all final, non-appealable Permits under subsection (d) above which exceed one hundred eighty (180) days after

the date of submission of a full and complete application for each such Permit, provided that Seller used and continues to use good faith efforts to secure such Permits, and (y) shall not be extended or otherwise excused by *Force Majeure*.

ARTICLE 3
FACILITY OWNERSHIP, INSTALLATION, OPERATION, MAINTENANCE, AND REMOVAL

3.1 Title. Except as otherwise set forth in this Agreement or the Interconnection Agreement, as between the Parties during the Term of this Agreement, title to all equipment, Permits, authorizations, Energy, Environmental Attributes, and tax benefits associated with the Wind Energy Facility shall be with Seller.

3.2 Lease. Seller shall construct, operate, maintain, repair and remove the Wind Energy Facility on the Premises pursuant to and in conformance with the Lease.

3.3 Construction, Maintenance, and Monitoring of Wind Energy Facility. Seller, at its sole cost and expense:

a. design, finance and procure the Wind Energy Facility;

b. apply for, diligently pursue, and negotiate to final form the Interconnection Agreement;

c. design, construct, own, operate and maintain (except when otherwise expressly required by National Grid) the Metering Device, Net Metering Device, and other facilities or equipment, and procure and maintain all insurance, required by National Grid under the Interconnection Agreement or otherwise; *provided, however,* Seller shall not be obligated to assume or pay for any Host Customer Costs.

d. construct, own, operate, and maintain the Wind Energy Facility in good condition and repair, all in accordance with Applicable Legal Requirements and industry standards, applicable contractor, subcontractor and vendor warranties or guarantees, manufacturer's warranties, instruction and specifications, applicable requirements of the insurance policies maintained by Seller with respect to the Wind Energy Facility as set forth in the Lease, and the terms of this Agreement; and

e. monitor the Wind Energy Facility performance to ensure that any malfunction causing a material loss of Energy production will be promptly discovered and rectified in accordance with industry standards.

3.4 Operations Manual; Training. On the Full Operations Date, Seller shall deliver to Buyer an operations, maintenance and parts manual covering the Wind Energy Facility. In addition, Seller will train Buyer's representative(s) on business-as-usual maintenance and monitoring operations of the Wind Energy Facility and on emergency preparedness and response.

Notwithstanding the foregoing, Buyer shall have no right to perform any maintenance or repair on the Wind Energy Facility without Seller's prior written consent, except in the case of an emergency where immediate action on the part of Buyer is reasonably necessary for safety reasons or as otherwise permitted under the Lease, *provided, however*, Buyer's representatives shall at all times comply with all safety and other operating procedures reasonably established by Seller and all Applicable Legal Requirements.

3.5 Notice of Full Operations Date. Subject to the provisions of this Agreement, Seller shall notify Buyer when the Wind Energy Facility has achieved the Full Operations Date.

ARTICLE 4
PURCHASE AND SALE OF NET ENERGY

4.1 Sale and Purchase of Net Energy. Commencing on the Full Operations Date, Seller agrees to sell and deliver, and Buyer agrees to purchase and accept, at the Point of Delivery one hundred percent (100%) of the Net Energy generated by the Wind Energy Facility.

4.2 Price. Buyer shall pay Seller for the Net Energy sold and delivered, as metered at the Net Metering Device at or before the Point of Delivery, at the applicable Net Energy Price, as set forth in Exhibit C.

4.3 Title and Risk of Loss of Net Energy. Title to and risk of loss of the Net Energy will pass from Seller to Buyer at the Point of Delivery. Seller warrants that it will deliver the Net Energy to Buyer at the Point of Delivery free and clear of all liens, security interests, claims, and other encumbrances.

4.4 Governmental Charges.

a. Seller is responsible for local, state and federal income taxes attributable to Seller for income received under this Agreement.

b. Seller is responsible for any personal property taxes attributable to its ownership of the personal property associated with the Wind Energy Facility.

c. Seller is responsible for any Governmental Charges currently attributable to the sale of Net Energy to Buyer, irrespective of whether imposed before, upon or after the delivery of Net Energy to Buyer at the Point of Delivery. In the event that changes in law or regulation result in a change in the Governmental Charges attributable to the sale of Net Energy to Buyer, the Parties agree to negotiate in good faith a fair and equitable sharing of such charges, *provided, however,* Seller shall have no obligation for any Governmental Charges imposed by Buyer on the sale of Net Energy or the ownership and operation of renewable or distributed electrical energy facilities subsequent to the Effective Date.

d. Both Parties shall use reasonable efforts to administer this Agreement and implement its provisions so as to minimize Governmental Charges. In the event any of the sales of Net Energy hereunder are to be exempted from or not subject to one or more Governmental

Charges, the applicable Party shall, promptly upon the other Party's request therefore, provide the applicable Party with all necessary documentation to evidence such exemption or exclusion.

4.5 Guaranteed Annual Electric Output.

a. Seller guarantees that the Wind Energy Facility will produce the Guaranteed Annual Electric Output in each Contract Year.

b. In the event that a Production Shortfall exists in any Contract Year, unless excused by *Force Majeure*, Seller shall pay to Buyer, within thirty (30) days of the end of such Contract Year, the Production Shortfall Charge set forth in Exhibit C for each kWh of such Production Shortfall.

4.6 Environmental Credits and Value. The Agreement shall not include any rights, title or interest in any environmental offsets or allowances, renewable production or investment tax credits, or environmental attributes, value or credits of any kind or nature, earned by or attributable to (A) the Wind Energy Facility and (B) the Energy, including, without limitation, those resulting from or associated with the Federal Clean Air Act (including, but not limited to, Title IV of the Clean Air Act Amendments of 1990), renewable energy certificates ("***RECs***") (or associated GIS Certificates), or any other state or federal acts, laws or regulations that provide offsets, allowances, or credits related to energy or emissions (collectively, the "***Environmental Attributes***"). RECs represent the environmental and other non-energy attributes, value and credits of any kind and nature associated with one (1) megawatt hour (MWh) of generation eligible for compliance against the Renewable Energy Portfolio Standard, 225 CMR 14.00, including, but not limited to, any and all pollution offsets or allowances and regulatory compliance rights. Buyer may not, under the Agreement or otherwise, make any claim of title to any RECs or the corresponding energy in regards to a renewable portfolio standard, emission offset or other environmental disclosure or similar regulatory requirement. To the extent any tax, RECs, Environmental Attributes or other such credits are allocated to Buyer by operation of law or regulation, Buyer shall cooperate fully with Seller to disclaim any rights to such credits and attributes and to assign or allocate all such tax, RECs, Environmental Attributes or other such credits, and the value thereof to Seller, without cost to Seller.

4.7 Net Metering Credits. Except as otherwise set forth in this Agreement and the Tariff, all interest in and title to any and all Net Metering Credits generated or created during the Term in connection with the operation of the Wind Energy Facility and the delivery of Net Energy to Buyer, together with the right to allocate such Net Metering Credits or receive cash payments in connection with the surrender or transfer of such Net Metering Credits, shall rest solely with Buyer.

ARTICLE 5
METERING AND BILLING

5.1 Billing. On or before the tenth (10th) day of each month during the Term (or if such day is not a Business Day, the next succeeding Business Day), Seller shall calculate the amount due

and payable to Seller for the Net Energy produced and delivered to Buyer pursuant to Exhibit C, with respect to the immediately preceding month, and shall forward to Buyer an invoice, including such calculation, with sufficient detail for Buyer to verify the calculation and the total amount due and payable for the previous month. Adjustments to bills shall be made in accordance with ISO-NE rules, policies and procedures and other Applicable Legal Requirements.

5.2 Payment. On or before the fifth (5th) day of the month after Buyer receives an invoice from Seller, Buyer shall pay Seller any amounts due and payable hereunder for Net Energy delivered during the preceding month. All such invoices shall be paid by a mutually agreeable method to the account designated by Seller. Amounts due as a result of any billing adjustment made in accordance with ISO-NE rules, policies and procedures shall not be subject to any interest charge in favor of Buyer or Seller. Any payment not made within the time limits specified herein shall bear interest from the date on which such payment was required to have been made through and including the date such payment is actually received by Seller. Such interest shall accrue at an annual rate equal to the Interest Rate.

5.3 Metering Equipment. Seller shall provide, install, own, operate and maintain the Net Metering Device. Seller shall maintain and test the Net Metering Device generally in accordance with the same terms and conditions applicable to the Metering Device installed for the purpose of delivering Energy to National Grid and the calculation of Net Metering Credits, but in any event on no less than an annual basis.

a. Readings of the Net Metering Device shall be conclusive as to the amount of Net Energy delivered to Buyer; provided, that if the Net Metering Device is out of service, is discovered to be inaccurate, or registers inaccurately, measurement of Net Energy shall be determined in the following sequence: (i) by estimating by reference to quantities measured during periods of similar conditions when the Net Metering Device was registering accurately; or (ii) if no reliable information exists as to the period of time during which such Net Metering Device was registering inaccurately, it shall be assumed for correction purposes hereunder that the period of such inaccuracy for the purposes of the correction was equal to (x) if the period of inaccuracy can be determined, the actual period during which inaccurate measurements were made; or (y) if the period of inaccuracy cannot be determined, one-half of the period from the date of the last previous test of such Net Metering Device through the date of the adjustments, provided, however, that, in the case of clause (y), the period covered by the correction shall not exceed six months.

b. Each Party and its consultants and representatives shall have the right to witness each test conducted by or under the supervision of Seller to verify the accuracy of the measurements and recordings of the Net Metering Device. Seller shall provide at least twenty (20) days prior written notice to Buyer of the date upon which any such test is to occur. Seller shall prepare a written report setting forth the results of each such test, and shall provide Buyer with copies of such written report not later than thirty (30) days after completion of such test. Seller shall bear the cost of the annual testing of the Net Metering Device and the preparation of the Net Metering Device test reports.

c. The following steps shall be taken to resolve any disputes regarding the accuracy of the Net Metering Device:

i. If either Party disputes the accuracy or condition of any of the Net Metering Device, such Party shall so advise the other Party in writing.

ii. Seller shall, within fifteen (15) days after receiving such notice from Buyer, or Buyer shall, within such time after having received such notice from Seller, advise the other Party in writing as to its position concerning the accuracy of such Net Metering Device and state reasons for taking such position.

iii. If the Parties are unable to resolve the dispute through reasonable negotiations, then either Party may cause such Net Metering Device to be tested.

iv. If a Net Metering Device is found to be inaccurate by not more than 2%, any previous recordings of the Net Metering Device shall be deemed accurate, and the Party disputing the accuracy or condition of the Net Metering Device shall bear the cost of inspection and testing of the Net Metering Device.

v. If a Net Metering Device is found to be inaccurate by more than 2% or if such Net Metering Device is for any reason out of service or fails to register, then (a) Seller shall promptly cause the Net Metering Device found to be inaccurate to be adjusted to correct, to the extent practicable, such inaccuracy, (b) the Parties shall estimate the correct amounts of Net Energy delivered during the periods affected by such inaccuracy, service outage or failure to register, and (c) Seller shall bear the cost of inspection and testing of the Net Metering Device. If as a result of such adjustment the quantity of Electricity for any period is decreased (such quantity, the "***Net Energy Deficiency Quantity***"), Seller shall reimburse Buyer for the amount paid by Buyer in consideration for the Net Energy Deficiency Quantity. If as a result of such adjustment the quantity of Net Energy for any period is increased (such quantity, the "***Net Energy Surplus Quantity***"), Buyer shall pay for the Net Energy Surplus Quantity.

5.4 Records and Audits. Seller will keep, for a period of not less than two (2) years after the expiration or termination of any transaction, records sufficient to permit verification of the accuracy of billing statements, invoices, charges, computations and payments for such transaction. During such period Buyer may, at its sole cost and expense, and upon reasonable notice to Seller, examine Seller's records pertaining to such transactions during Seller's normal business hours.

5.5 Dispute.

a. If a Party, in good faith, disputes an invoice as provided in this Agreement, the disputing Party shall immediately notify the other Party of the basis for the dispute and pay the undisputed portion of such invoice no later than the due date. Upon resolution of the dispute, any required payment shall be made within seven (7) Business Days of such resolution along with the interest accrued at the Interest Rate per annum, from and including the due date through and including the date such payment is actually received by Seller. Any overpayments shall be

returned by the receiving Party upon request or deducted from subsequent payments with interest accrued at the Interest Rate per annum. The Parties shall only be entitled to dispute an invoice within twelve (12) calendar months from the date of issuance of such invoice. If the Parties are unable to resolve a payment dispute under this Section, the Parties shall follow the procedure set forth in Section 14.5.

b. In the event of a dispute with National Grid with regard to Buyer's monthly electrical bills or the calculation of Net Metering Credits, Buyer and Seller each agree to take all Commercially Reasonable measures with respect to which it has legal capacity to facilitate and expedite resolution of such a dispute and to act at all times during such review within its legal capacity.

ARTICLE 6
OBLIGATIONS OF THE PARTIES

6.1 Net Metering.

a. Each Party's obligations under this Agreement are subject to the Wind Energy Facility qualifying for Net Metering as a Wind Net Metering Facility, subject to the provisions of M.G.L. c. 164, §§138 – 140 and 220 C.M.R. §18.00 and the Tariff.

b. Subject to the provisions of this Agreement, each of Buyer and Seller agree to take all reasonable measures with respect to which it has legal capacity to facilitate and expedite the review of all approvals necessary for the Wind Energy Facility to be eligible for and participate in Net Metering.

c. So long as any such amendment will materially benefit a Party without material detriment to the other Party, the Parties commit to each other in good faith to make Commercially Reasonable efforts to fully cooperate and assist each other to amend this Agreement to conform to any rule(s) or regulation(s) regarding Net Metering and ensure that the Wind Energy Facility is eligible for Net Metering.

6.2 Seller's Obligations.

a. Commencing with the Full Operations Date, Seller shall procure and maintain in full force and effect a maintenance and repair agreement for the Wind Energy Facility with the Wind Energy Facility manufacturer for a period of at least two years, which agreement shall be subject to the approval of Buyer, such approval not to be unreasonably conditioned, withheld or delayed. Upon expiration of the maintenance and repair agreement for the Wind Energy Facility with the Wind Energy Facility manufacturer, Seller shall use maintain in full force and effect a maintenance and repair agreement for the Wind Energy Facility, either with a qualified third party or through the use of its own personnel, which agreement shall be subject to the approval of Buyer, such approval not to be unreasonably conditioned, withheld or delayed.

b. Seller shall maintain accurate operating and other records and all other data for the purposes of proper administration of this Agreement, including such records as may be

required of Seller (and in the form required) by any Governmental Authority, NEPOOL, ISO-NE, National Grid, or as may be reasonably required by Buyer.

c. Seller shall provide Buyer with a monthly e-mail report, as soon as practicable after the end of each month regarding the progress with respect to the permitting, financing, construction, and operations of the Wind Energy Facility or other data concerning the Wind Energy Facility as Buyer may, from time to time, reasonably request.

d. Commencing with the Full Operations Date, Seller shall notify Buyer as soon as practicable when Seller becomes aware that the Wind Energy Facility may be mechanically inoperable for more than a 24-hour period.

e. Seller shall perform its obligations under this Agreement in full compliance with the Applicable Legal Requirements, and construct, operate, maintain and decommission the Wind Energy Facility in full accordance with Applicable Legal Requirements.

f. Seller shall comply with the provisions of the Lease.

g. Seller shall comply, and shall require its employees to comply, with the Occupational Safety and Health Act, and the rules promulgated thereunder by the U.S. Department of Labor, and all applicable state statutes and regulations affecting job safety.

h. Seller shall use Commercially Reasonable efforts to obtain at its sole cost all approvals and agreements required for Seller's interconnection of the Wind Energy Facility to Buyer's equipment and to assist Buyer in obtaining the approvals and agreements necessary for Buyer to connect its equipment to the local electric distribution grid maintained by National Grid. Seller will promptly inform Buyer of all significant developments relating to such interconnection matters. Buyer will cooperate fully with Seller on all such matters and shall provide Seller with such information as Seller may reasonably request in connection with Seller's procurement of, and Seller's assistance in procurement of, such approvals and agreements. If any material changes in plans and/or specifications to the Wind Energy Facility or the interconnection of Buyer's facilities are required by the applicable electric distribution company, then Seller shall submit such changes, if any, to Buyer for its approval, which shall not be unreasonably conditioned, withheld or delayed.

6.3 Buyer's Obligations.

a. Buyer shall act as the Host Customer, as defined in 220 C.M.R. §18.02, for the Wind Energy Facility. To the extent that National Grid elects not to purchase Net Metering Credits from Buyer, Buyer shall be responsible for allocating Net Metering Credits to Buyer's designees. Except in the case of the termination of this Agreement on account of a default by Buyer, Seller shall have no claim on, or responsibility regarding, such Net Metering Credits.

b. Subject to the terms and conditions of this Agreement, Buyer shall, upon prior written request by Seller and at Seller's expense, execute a consent and agreement with respect to a collateral assignment hereof in favor of any Financier(s) in a form reasonably acceptable to

Buyer in its sole discretion, provided that Buyer's duty to make factual statements or representations in such consent and agreement shall be contingent upon the truthfulness and accuracy of such statements or representations at the time the consent and agreement is delivered.

c. Buyer acknowledges that the Financier(s) may have other or further requests with respect to the assignment of the Agreement (such as requests for legal opinions or certificates from Buyer) and may request that certain terms be incorporated into a consent and agreement or assignment agreement to be executed by Buyer. Buyer, at Seller's expense, will consider any such requests and will cooperate and negotiate any such consent and agreement or assignment in good faith.

d. Buyer shall perform its obligations under this Agreement in full compliance with the Applicable Legal Requirements.

e. Buyer shall comply with the provisions of the Lease.

f. Buyer shall reasonably cooperate with Seller so that Seller can meet its obligations under this Agreement and under the Lease. Buyer agrees to take all reasonable measures with respect to which it has legal capacity to facilitate and expedite the review of all local permits and approvals necessary for the design, construction, engineering, operations, maintenance and deconstruction of the Wind Energy Facility and to act at all times during such review within its legal capacity. This provision is not intended to and shall not be construed to imply that Buyer's Board of Selectmen has the authority to direct the outcome of any application submitted to any independent local permit issuing authority nor that Buyer's Board of Selectmen has the independent or concurrent authority to issue any permits or other such approvals for the Wind Energy Facility. The Parties agree that, in the event either Party is sued by a third-party in connection with the any Permit, approval or any other matter related to the Wind Energy Facility, this Agreement or the Lease, the defending Party will immediately notify and consult with the other Party. The Parties further agree that they will work together in good faith to expeditiously defend such action and shall coordinate their defense efforts subject to any restrictions imposed by Applicable Legal Requirements. In addition, Seller agrees that if reasonably requested by Buyer, Seller will reimburse Buyer for any direct third-party costs (including reasonable attorneys' fees) Buyer incurs in such defense, provided that such costs in the aggregate do not exceed twenty-five thousand dollars ($25,000.00); provided, further, however, that in the event that Buyer's direct third party costs exceed the amount of twenty-five thousand dollars ($25,000.00), Buyer's obligation to expeditiously defend such action and coordinate defense efforts with Seller shall only continue for as long as and to the extent that Seller agrees in advance to reimburse Buyer for its direct third party costs which exceed such amount.

g. Buyer shall pay any fee imposed by the Tariff in connection with the filing of the Interconnection Application. Seller shall reimburse Buyer for the amount of such fee at such time that a special permit for the Wind Energy Facility is issued by the Town of Scituate Planning Board.

ARTICLE 7
REPRESENTATIONS AND WARRANTIES

7.1 Representations and Warranties by Seller. As of the Effective Date, Seller represents and warrants to Buyer as follows.

a. Seller is a limited liability company, duly organized, validly existing, and in good standing under the laws of Massachusetts.

b. Seller has full legal capacity to enter into and perform this Agreement.

c. The execution of the Agreement has been duly authorized, and each person executing the Agreement on behalf of Seller has full authority to do so and to fully bind Seller.

d. To Seller's knowledge, there are no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting Seller or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of the Agreement or Seller's ability to carry out its obligations under this Agreement.

e. To Seller's knowledge, none of the documents or other written or other information furnished by or on behalf of Seller to Buyer or Buyer's agents pursuant to this Agreement contains any untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements contained herein or therein, in the light of the circumstances in which they were made, not misleading.

7.2 Representations and Warranties by Buyer. Buyer represents and warrants to Seller as follows.

a. Buyer is a municipal corporation having its principal office at 600 Chief Justice Cushing Highway, Scituate, Massachusetts.

b. Buyer has full legal capacity to enter into and perform this Agreement.

c. The execution of the Agreement has been duly authorized, and each person executing the Agreement on behalf of Buyer has full authority to do so and to fully bind Buyer.

d. To Buyer's knowledge, there are no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting Buyer or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of the Agreement or Buyer's ability to carry out its obligations under this Agreement.

e. None of the documents or other written or other information furnished by or on behalf of Buyer to Seller or Seller's agents pursuant to this Agreement contains any untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements contained herein or therein, in the light of the circumstances in which they were made, not misleading.

ARTICLE 8
TERMINATION/DEFAULT/REMEDIES

8.1 Events of Default by Buyer. The following shall each constitute an Event of Default by Buyer.

a. Buyer fails to make any material payment due under this Agreement within thirty (30) days after such payment is due unless the specific amount of the payment not made is being contested.

b. Buyer fails to perform or comply with any material covenant or agreement set forth in this Agreement and such failure continues for a period of thirty (30) days after receipt of written notice thereof from Seller to Buyer; provided that if Buyer proceeds with due diligence during such thirty (30) day period to cure such breach and is unable by reason of the nature of the work involved using Commercially Reasonable efforts to cure the same within the said thirty (30) days, Buyer's time to do so shall be extended by the time reasonably necessary to cure the same.

c. Fraud or intentional misrepresentation by Buyer with respect to any of the covenants or agreements of this Agreement.

d. Buyer has an Event of Default which results in termination under the Lease.

e. Buyer materially breaches its obligations under this Agreement.

8.2 Events of Default by Seller. The following shall each constitute an Event of Default by Seller.

a. Seller fails to make any material payment due under this Agreement within thirty (30) days after such payment is due unless the specific amount of the payment not made is being contested.

b. Seller fails to perform or comply with any material covenant or agreement set forth in this Agreement and such failure continues for a period of thirty (30) days after receipt of written notice thereof from Buyer to Seller; provided that if Seller proceeds with due diligence during such thirty (30) day period to cure such breach and is unable by reason of the nature of the work involved using Commercially Reasonable efforts to cure the same within the said thirty (30) days, Seller's time to do so shall be extended by the time reasonably necessary to cure the same.

c. Fraud or intentional misrepresentation by Seller with respect to any of the covenants or agreements of this Agreement.

d. Seller has an Event of Default which results in termination under the Lease.

e. Seller materially breaches its obligations under this Agreement.

f. For any reason other than an event of *Force Majeure*, Seller is unable to provide Net Energy to Buyer for sixty (60) consecutive days in any three hundred sixty-five (365) day period commencing on the Full Operations Date and prior to expiration of this Agreement.

g. Seller: (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails (or admits in writing its inability) generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) has instituted against it a proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditor's rights, or a petition is presented for its winding-up, reorganization or liquidation, which proceeding or petition is not dismissed, stayed or vacated within twenty (20) Business Days thereafter; (v) commences a voluntary proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditors' rights; (vi) seeks or consents to the appointment of an administrator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all of its assets; (vii) has a secured party take possession of all or substantially all of its assets, or has a distress, execution, attachment, sequestration or other legal process levied, enforced or sued on or against all or substantially all of its assets; (viii) causes or is subject to any event with respect to it which, under the applicable laws of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vii) inclusive; or (ix) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts.

8.3 *Force Majeure*.

a. Except as specifically provided herein, if by reason of *Force Majeure*, either Party is unable to carry out, either in whole or in part, any of its obligations herein contained, such Party shall not be deemed to be in default during the continuation of such inability, provided that: (i) the non-performing Party, within two (2) weeks after the occurrence of the *Force Majeure* event, gives the other Party hereto written notice describing the particulars of the occurrence and the anticipated period of delay; (ii) the suspension of performance be of no greater scope and of no longer duration than is required by the *Force Majeure* event; (iii) no obligations of the Party which were to be performed prior to the occurrence causing the suspension of performance shall be excused as a result of the occurrence; and (iv) the non-performing Party shall use Commercially Reasonable efforts to remedy with all reasonable dispatch the cause or causes preventing it from carrying out its obligations.

b. If an event of *Force Majeure* affecting either Party continues for a period of one hundred eighty (180) days or longer, the performing Party may treat such an event as an Event of Default and may terminate this Agreement.

8.4 Termination for Default.

a. Upon the occurrence of an Event of Default, the non-defaulting Party at any time thereafter may give written notice to the defaulting Party specifying such Event of Default and such notice may state that this Agreement and the Term shall expire and terminate on a date specified in such notice, which shall be at least five (5) Business Days after the giving of such notice, and upon any termination date specified in such notice, this Agreement shall terminate as though such date were the date originally set forth herein for the termination hereof.

b. In the event this Agreement is terminated as a result of an Event of Default of Seller:

i. Provided that Buyer has not provided Seller notice of a request for an Appraisal pursuant to Section 11.2, (x) Buyer shall have no further obligation to purchase Net Energy or to make any payment whatsoever under this Agreement, except for payments for obligations arising or accruing prior to the effective date of termination; and (y) Seller shall remove the Wind Energy Facility from the Premises in accordance with the provisions of the Lease.

ii. Provided that Buyer has provided Seller notice of a request for an Appraisal pursuant to Section 11.2, Buyer shall continue to purchase Net Energy and to make payments therefore under the Agreement until Buyer either exercises its right to purchase the Wind Energy Facility and related assets for the Purchase Price or notifies Seller that it will not provide Seller with an Exercise Notice pursuant to Section 11.7, in which case Seller shall thereafter remove the Wind Energy Facility from the Premises in accordance with the provisions of the Lease.

iii. Except in the case of termination due to an event of *Force Majeure*, Seller shall pay to Buyer, within thirty (30) days of the Termination Date, the Special Termination Damages amount (in lieu of any other damages related to purchasing replacement power, "cost of cover" damages, or Production Shortfall Charges) set forth in Exhibit C.

c. In the event this Agreement is terminated as a result of an Event of Default of Buyer:

i. Seller shall have no further obligation to sell and deliver Net Energy or to make any payment whatsoever under this Agreement, except for payments for obligations arising or accruing prior to the effective date of termination, and Buyer shall have no further obligation to purchase, receive or otherwise Net Meter any Net Energy from or on behalf of Seller; and

ii. Seller shall have the right, but not the obligation, to continue to maintain the Wind Energy Facility pursuant to the provisions of the Lease, and to enter into a power supply agreement with a third party, for the remainder of the then effective Term of the Lease.

Upon the expiration of such term, the provisions of the Lease, including but not limited to Section 3.1(c) thereof, shall apply with respect to any proposal to extend the term thereof. In the event that Seller elects to continue operations of the Wind Energy Facility pursuant to the preceding sentence, Buyer shall reasonably cooperate with Seller to allow Seller to interconnect directly with National Grid or another Host Customer, in Seller's sole discretion and at Seller's sole cost, and Buyer shall promptly transfer to Seller any Net Metering Credits that are generated after the effective date of termination and are paid or credited to Buyer by National Grid.

ARTICLE 9
REMEDIES AND LIMITATION OF LIABILITY

9.1 Remedies. Subject to the limitations set forth in this Agreement (including, but not limited to, Sections 4.5(b), 8.4(b)(iii), and 9.4), Buyer and Seller each reserve and shall have all rights and remedies available to it at law or in equity with respect to the performance or non-performance of the other Party hereto under this Agreement. Each Party agrees that it has a duty to mitigate damages that it may incur as a result of the other Party's non-performance under this Agreement.

9.2 Limitation of Liability. **NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES OF ANY CHARACTER, RESULTING FROM, ARISING OUT OF, IN CONNECTION WITH OR IN ANY WAY INCIDENT TO ANY ACT OR OMISSION OF EITHER PARTY RELATED TO THE PROVISIONS OF THIS AGREEMENT, IRRESPECTIVE OF WHETHER CLAIMS OR ACTIONS FOR SUCH DAMAGES ARE BASED UPON CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY AT LAW OR EQUITY.**

9.3 Waivers.

a. No Implied Waivers – Remedies Cumulative. No covenant or agreement under this Agreement shall be deemed to have been waived by Seller or Buyer, unless such waiver shall be in writing and signed by the Party against whom it is to be enforced or such Party's agent. Consent or approval of Seller or Buyer to any act or matter must be in writing and shall apply only with respect to the particular act or matter in which such consent or approval is given and shall not relieve the other Party from the obligation wherever required under this Agreement to obtain consent or approval for any other act or matter. Seller or Buyer may restrain any breach or threatened breach of any covenant or agreement herein contained, but the mention herein of any particular remedy shall not preclude either Seller or Buyer from any other remedy it might have, either in law or in equity. The failure of Seller or Buyer to insist upon the strict performance of any one of the covenants or agreements of this Agreement or to exercise any right, remedy or election herein contained or permitted by law shall not constitute or be construed as a waiver or relinquishment for the future of such covenant or agreement, right, remedy or election, but the same shall continue and remain in full force and effect. Any right or remedy of Seller or Buyer herein specified or any other right or remedy that Seller or Buyer may have at law, in equity or otherwise upon breach of any covenant or agreement herein contained

shall be a distinct, separate and cumulative right or remedy and no one of them, whether exercised or not, shall be deemed to be in exclusion of any other.

b. Acceptance of Payment. Neither receipt nor acceptance by Seller or Buyer of any payment due herein, nor payment of same by Buyer or Seller, shall be deemed to be a waiver of any default under the covenants or agreements of this Agreement, or of any right or defense that Seller or Buyer may be entitled to exercise hereunder.

c. Waiver of Termination for Convenience. Buyer hereby expressly waives any rights it may have to cancel this Agreement or discharge any of its obligations hereunder on the basis that there may be a right of termination for convenience (whether it be express, implied or constructive) in contracts with public entities.

9.4 Failure to Obtain Final Completion Certificate. In the event that Seller fails to obtain the Final Completion Certificate on or before eighteen (18) months after the issuance of a special permit for the Wind Energy Facility by the Town of Scituate Planning Board (except to the extent such failure is excused by an event of *Force Majeure,* an appeal of a Permit, or the inability to obtain the Interconnection Agreement within such time period, in which case, the eighteen months shall be extended for each day of *Force Majeure*, appeal, or inability) and unless this Agreement has not been terminated by Buyer or Seller pursuant to Section 2.2, Seller shall pay Buyer the amount of eight hundred fifty dollars ($850.00) per day, as liquidated damages and not as a penalty, until such Final Completion Certificate is issued.

ARTICLE 10
ASSIGNMENT, SUBLETTING, MORTGAGE

10.1 Prior Written Consent.

a. Seller shall not assign or in any manner transfer this Agreement or any part thereof without the prior written consent of Buyer, which consent may not be unreasonably conditioned, withheld or delayed, except that in connection with: (i) any assignment or transfer of this Agreement by Seller to an Affiliate of Seller (provided that such Affiliate's financial condition, creditworthiness and operational ability following the contemplated assignment or transfer are sufficient to permit Seller to satisfy its obligations under this Agreement, as reasonably determined by Buyer); and (ii) any assignment to any Financier(s) as collateral security for obligations under the financing documents entered into with such Financier(s), subject to the terms and conditions of this Agreement, no prior notice to or consent of Buyer is required, provided that Seller shall promptly notify Buyer after the date of assignment or transfer. Buyer shall consent to an assignment or other transfer if such assignee or transferee shall deliver evidence reasonably satisfactory to Buyer that assignee or transferee is sufficiently creditworthy and has adequate technical expertise to perform the obligations of Seller under this Agreement.

b. Notwithstanding the provisions of Section 10.1 above, Buyer shall have the right in its reasonable discretion to withhold consent to any transfer or assignment in the event that Solaya Energy LLC or the current members of Solaya Energy LLC do not, in the aggregate,

continue to hold at least a twenty five percent (25%) membership or equity interest in the managing member or general partner of such transferee or assignee.

10.2 Financing by Financier(s). Buyer acknowledges that Seller proposes to finance its interest in the Wind Energy Facility, and therefore specifically agrees without any further request for prior consent to permit Seller to mortgage, assign or transfer its interest in the Wind Energy Facility solely for the purpose of obtaining such financing, which may include equity and/or debt, subject to the following conditions.

a. The term of such mortgage, assignment or transfer shall not exceed the term of the Lease.

b. Seller shall give Buyer notice of the existence of such mortgage, assignment or transfer, together with the name and address of the mortgagee, assignee or transferee, and a copy of the mortgage, assignment or transfer document within thirty (30) days of the execution of such mortgage, assignment or transfer.

c. Solaya Energy LLC or the current members of Solaya Energy LLC shall continue to hold, in the aggregate, at least twenty five percent (25%) of the outstanding membership or equity interest in the managing member or general partner of the Person which owns the Wind Energy Facility.

10.3 Release of Seller. Seller shall be relieved from its obligations under this Agreement:

a. by any whole disposition of Seller's interest in this Agreement in compliance with Section 10.1, when coupled with a written instrument signed by the assignee or transferee of such interest in which said assignee or transferee accepts and agrees to be bound by the terms of this Agreement, unless the Parties agree otherwise, and except as otherwise provided by the terms of any assignment or transfer; and

b. in the event of any foreclosure by Financier(s), in which case Financier(s) shall substitute for Seller for purposes of this Agreement.

Absent express written consent of Buyer, the execution of a security interest in this Agreement or the Wind Energy Facility, or any assignment from a Financier to another Financier, shall not relieve Seller from its obligations under this Agreement.

10.4 Financier Provisions. Any person or entity that holds or is the beneficiary of a first position mortgage, deed of trust or other security interest in this Agreement or the Wind Energy Facility shall, for so long as its security is in existence and until the lien thereof has been extinguished, be entitled to the protections set forth in this Section. No such security interest shall encumber or affect in any way the interests or rights of Buyer under this Agreement.

a. Financier's Right to Possession, Right to Acquire and Right to Assign. Pursuant to the provisions of this Section, a Financier shall have the right: (i) to assign its security interest; (ii) to enforce its lien and acquire title to the Wind Energy Facility by any lawful means;

and (iii) to take possession of and operate the Wind Energy Facility or any portion thereof and to perform all obligations to be performed by Seller hereunder, or to cause a receiver to be appointed to do so, subject to the terms and conditions of this Agreement. Buyer's consent shall not be required for a Financier's acquisition of the encumbered interest created by this Agreement, whether by foreclosure or assignment in lieu of foreclosure.

b. Notice of Default; Opportunity to Cure. A Financier shall be entitled to receive notice of any default by Buyer, provided that such Financier shall have first delivered to Buyer a notice of its interest in this Agreement or in the Wind Energy Facility in the form and manner, if any, provided by state laws, rules, regulations, Seller's procedures, and the provisions of this Agreement. If any notice shall be given of the default of Seller and Seller has failed to cure or commence to cure such default within the cure period provided in this Agreement, then any such Financier, which has given notice as above provided, shall be entitled to receive an additional notice that Seller has failed to cure such default and such Financier shall have thirty (30) days after such additional notice to cure any such default or, if such default cannot be cured within thirty (30) days, to diligently commence curing within such time and diligently pursue such cure to completion within such time as Seller would have been allowed pursuant to this Agreement but as measured from the date of such additional notice. Financier(s) shall have priority over Buyer to cure any default by Seller pursuant to this Agreement or the Lease, or to take possession of the Wind Energy Facility and to operate the Wind Energy Facility, if necessary.

c. Cross-Default/Cross-Collateralization. Any security interest in this Agreement or the Wind Energy Facility shall not contain any cross-collateralization or cross-default provisions relating to other loans of Seller (or any subsidiary or affiliate of Seller) that are not incurred solely for the ownership, construction, maintenance, operation, repair or financing of the Wind Energy Facility.

ARTICLE 11
WIND ENERGY FACILITY PURCHASE AND SALE OPTIONS

11.1 Grant of Purchase Option. For and in consideration of the payments made by Buyer under this Agreement, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged by the Parties, Seller hereby grants Buyer the right and option to purchase all of Seller's right, title and interest in and to the Assets on the terms set forth in this Agreement (the "***Purchase Option***").

11.2 Buyer Request for Appraisal of Wind Energy Facility Value. Provided that Buyer is not in default under this Agreement, upon the earlier of (a) one hundred eighty (180) days prior to the end of the Initial Term or any Extension Term, or (b) an Event of Default of Seller, Buyer shall have the right to provide a notice to Seller requiring a determination of the Purchase Price as set forth below.

11.3 Selection of Independent Appraiser. Within fifteen (15) days of Seller's receipt of a notice provided under Section 11.2, Seller and Buyer shall each propose an Independent Appraiser. If Seller and Buyer do not agree upon the appointment of an Independent Appraiser within such fifteen (15) day period, then at the end of such fifteen (15) day period, two proposed

Independent Appraisers shall, within ten (10) days of each Party's notice, select a third Independent Appraiser (who may be one of the Independent Appraisers originally designated by the Parties or another Independent Appraiser) to perform the valuation and provide notice thereof to Seller and Buyer. Such selection shall be final and binding on Seller and Buyer.

11.4 Determination of Purchase Price.

a. The selected Independent Appraiser shall, within thirty (30) days of appointment, make a preliminary determination of the Appraised Value in accordance with Section 11.5 (the "***Preliminary Determination***").

b. Upon making such Preliminary Determination, the selected Independent Appraiser shall provide such Preliminary Determination to Seller and Buyer, together with all supporting documentation that details the calculation of the Preliminary Determination. Seller and Buyer shall each have the right to object to the Preliminary Determination within twenty (20) days of receiving such Preliminary Determination; provided that the objecting Party provides a written explanation documenting the reasons for its objection. Within fifteen (15) days after the expiration of such twenty (20) day period, the selected Independent Appraiser shall issue its final determination (the "***Final Determination***") to Seller and Buyer, which shall specifically address the objections received by the Independent Appraiser and whether such objections were taken into account in making the Final Determination. Except in the case of fraud or manifest error, the Final Determination of the selected Independent Appraiser shall be final and binding on the Parties.

11.5 Calculation of Purchase Price. The purchase price (the "***Purchase Price***") payable by Buyer for the Assets shall be equal to the Appraised Value as determined by the Independent Appraiser in its Final Determination.

11.6 Costs and Expenses of Independent Appraiser. Seller and Buyer shall each be responsible for payment of one half of the costs and expenses of the Independent Appraiser.

11.7 Exercise of Purchase Option.

a. Buyer shall have ninety (90) days from the date of the Final Determination (such period, the "***Exercise Period***"), to exercise the Purchase Option, at the Purchase Price set forth in the Final Determination. Buyer must exercise its Purchase Option during the Exercise Period by providing a notice (an "***Exercise Notice***") to Seller. Once Buyer delivers its Exercise Notice to Seller, such exercise shall be irrevocable.

b. Promptly following receipt of Buyer's notice pursuant to Section 11.2, Seller shall make the Assets, including records relating to the operations, maintenance, and warranty repairs, available to Buyer for its inspection during normal business hours.

11.8 Terms of Asset Purchase. On the Transfer Date (a) Seller shall surrender and transfer to Buyer all of Seller's right, title and interest in and to the Assets, and shall retain all liabilities arising from or related to the Assets prior to the Transfer Date, (b) Buyer shall pay the Purchase

Price, by certified check, bank draft or wire transfer and shall assume all liabilities arising from or related to the Assets from and after the Transfer Date, and (c) both Parties shall (i) execute and deliver a bill of sale and assignment of contract rights containing such representations, warranties, covenants and other terms and conditions as are usual and customary for a sale of assets similar to the Assets, together with such other conveyance and transaction documents as are reasonably required to fully transfer and vest title to the Assets in Buyer, and (ii) deliver ancillary documents, including releases, resolutions, certificates, third person consents and approvals and such similar documents as may be reasonably necessary to complete the sale of the Assets to Buyer.

11.9 Transfer Date. The closing of any sale of the Assets (the "***Transfer Date***") pursuant to this Section 11.9 will occur no later than thirty (30) days following the date of the Exercise Notice.

ARTICLE 12

INDEMNIFICATION

12.1 Indemnification of Buyer. Seller shall indemnify and save harmless Buyer and each of its officials, employees, agents, and assigns (the "***Buyer Indemnified Parties***") from and against all liabilities, losses, damages, penalties, costs, and expenses, including reasonable attorneys' fees, that may be imposed upon or incurred by or asserted against any Buyer Indemnified Party by reason of any of the following occurrences during the Term.

a. Any breach by Seller of its obligations, covenants, representations or warranties contained in this Agreement or made pursuant thereto.

b. Any negligence on the part of Seller or any of its agents, contractors, servants, employees, subtenants, licensees or invitees in connection with this Agreement or the Wind Energy Facility.

c. Any failure on the part of Seller or any of its agents, contractors, servants, employees, subtenants, licensees or invitees to fully comply with any Applicable Legal Requirements.

In case any action or proceeding is brought against any Buyer Indemnified Party by reason of any such claim, Seller, upon written notice from Buyer, shall defend such action or proceeding at Seller's expense to the reasonable satisfaction of Buyer.

ARTICLE 13
INSURANCE AND PAYMENT GUARANTEE

13.1 Insurance. The Insurance provisions in the Lease are hereby incorporated by reference.

ARTICLE 14
MISCELLANEOUS

14.1 Notices. All notices and other formal communications which either Party may give to the other under or in connection with this Agreement shall be in writing (except where expressly provided for otherwise), shall be effective upon receipt, and shall be sent by any of the following methods: hand delivery; reputable overnight courier; certified mail, return receipt requested; or facsimile transmission.

The communications shall be sent to the following addresses:

If to Buyer:

Patricia A. Vinchesi, Town Administrator
Town Hall
600 Chief Justice Cushing Way
Scituate, MA 02066
Tel: (781) 545-8741
Fax: (781) 545-8704
Email: pvinchesi@town.scituate.ma.us

with a copy to:

Mark C. Kalpin, Esq.
WilmerHale
60 State Street
Boston, MA 02109
Tel: (617) 526-6176
Fax: (617) 526-5000
Email: mark.kalpin@wilmerhale.com

If to Seller:

Charles Eisenberg, Manager
Scituate Wind LLC
56 Cummings Park
Woburn, MA 01801
Tel: (781) 935-5600
Fax: (781) 935-5655
Email: ceisenberg@solayaenergy.com

Gordon Deane, Manager
Scituate Wind LLC
c/o Palmer Management Corporation
13 Elm Street, Suite 200
Cohasset, MA 02025
Tel: (781) 383-3200
Fax: (781) 383-3205
Email: gdeane@palmcap.com

with a copy to:

Jeffrey M. Bernstein, Esq.
BCK Law, P.C.
One Gateway Center, Suite 851
Newton, MA 02458
Tel: (617) 244-9500
Fax: (617) 244-9550
Email: jbernstein@bck.com

Any Party may change its address and contact person for the purposes of this Section by giving notice thereof in the manner required herein.

14.2 Confidentiality. Except as provided in this Section 14.2, neither Party shall publish, disclose, or otherwise divulge Confidential Information to any person at any time during or after the term of this Agreement, without the other Party's prior express written consent.

a. Each Party shall permit knowledge of and access to Confidential Information only to those of its affiliates, attorneys, accountants, representatives, agents and employees who have a need to know related to this Agreement.

b. If required by any law, statute, ordinance, decision, order or regulation passed, adopted, issued or promulgated by a court, governmental agency or authority having jurisdiction over a Party, that Party may release Confidential Information, or a portion thereof, to the court, governmental agency or authority, as required by applicable law, statute, ordinance, decision, order or regulation, and a Party may disclose Confidential Information to accountants in connection with audits, provided however, to the extent permitted by law, such disclosing Party shall notify the other Party of the required disclosure, such that the other Party may attempt (if such Party so chooses) to cause that court, governmental agency, authority or accountant to treat such information in a confidential manner and to prevent such information from being disclosed or otherwise becoming part of the public domain.

c. In connection with the above, the Parties acknowledge that Buyer is a public entity that is subject to certain public records disclosure statutes and regulations.

14.3 Severability. If any article, section, phrase or portion of this Agreement is, for any reason, held or adjudged to be invalid, illegal or unenforceable by any court of competent jurisdiction, such article, section, phrase, or portion so adjudged will be deemed separate, severable and independent and the remainder of this Agreement will be and remain in full force and effect and will not be invalidated or rendered illegal or unenforceable or otherwise affected by such adjudication, provided the basic purpose of this Agreement and the benefits to the Parties are not substantially impaired. Provided further, that the Parties shall enter into negotiations concerning the terms affected by such decisions for the purpose of achieving conformity with requirements of any Applicable Legal Requirements and the intent of the Parties.

14.4 Governing Law. This Agreement and the rights and duties of the Parties hereunder shall be governed by and shall be construed, enforced and performed in accordance with the laws of the Commonwealth of Massachusetts without regard to principles of conflicts of law.

14.5 Dispute Resolution. Unless otherwise expressly provided for in this Agreement, the dispute resolution procedures of this Section 14.5 shall be the exclusive mechanism to resolve disputes arising under this Agreement. The Parties agree to use their respective best efforts to resolve any dispute(s) that may arise regarding this Agreement.

a. Any dispute that arises under or with respect to this Agreement that cannot be resolved shall in the first instance be the subject of informal negotiations between the Parties. The dispute shall be considered to have arisen when one Party sends the other Party a written notice of dispute. The period for informal negotiations shall be fourteen (14) days from receipt of the written notice of dispute unless such time period is modified by written agreement of the Parties.

b. In the event that the Parties cannot resolve a dispute by informal negotiations, the Parties agree to submit the dispute to mediation. Within fourteen (14) days following the expiration of the time period for informal negotiations, the Parties shall propose and agree upon a neutral and otherwise qualified mediator. In the event that the Parties fail to agree upon a mediator, the Parties shall request that the Boston, Massachusetts office of J*A*M*S appoint a mediator. The period for mediation shall commence upon the appointment of the mediator and shall not exceed sixty (60) days, unless such time period is modified by written agreement of the Parties. The decision to continue mediation shall be in the sole discretion of each Party. The Parties will bear their own costs of the mediation. The mediator's fees shall be shared equally by all Parties.

c. In the event that the Parties cannot resolve a dispute by informal negotiations or mediation, the sole venue for judicial enforcement shall be Plymouth County Superior Court, Massachusetts. Each Party hereby consents to the jurisdiction of such court, and to service of process in the Commonwealth of Massachusetts in respect of actions, suits or proceedings arising out of or in connection with this Agreement or the transactions contemplated by this Agreement.

d. Notwithstanding the foregoing, injunctive relief from such court may be sought without resorting to alternative dispute resolution to prevent irreparable harm that would be caused by a breach of this Agreement.

e. In any judicial action, the Prevailing Party (as defined below) shall be entitled to an award by the court of payment from the opposing Party of its reasonable costs and fees, including, but not limited to, attorneys' fees and travel expenses, arising from the civil action. As used herein, the phrase "***Prevailing Party***" shall mean the Party who, in the reasonable discretion of the finder of fact, most substantially prevails in its claims or defenses in the civil action.

14.6 Entire Agreement. This Agreement, together with its exhibits, contains the entire agreement between Seller and Buyer with respect to the subject matter hereof and, with the exception of the Lease to which Seller and Buyer are Parties, supersedes all other understandings or agreements, both written and oral, between the Parties relating to the subject matter hereof.

14.7 Headings and Captions. The headings and captions in this Agreement are intended for reference only, do not form a part of this Agreement, and will not be considered in construing this Agreement.

14.8 Singular and Plural, Gender. If two or more persons, firms, corporations or other entities constitute either Seller or Buyer, the word "Seller" or the word "Buyer" shall be construed as if it reads "Sellers" or "Buyers" and the pronouns "it," "he," and "him" appearing in this Agreement shall be construed to be the singular or plural, masculine, feminine, or neuter gender as the context in which it is used shall require.

14.9 Press Releases. Seller shall not issue a press release or make any public statement with respect to this Agreement or the Wind Energy Facility without the prior written agreement of Buyer with respect to the form, substance and timing thereof, except that Seller may make any such press release or public statement when the releasing Party is advised by its legal counsel that such a press release or public statement is required by law, regulation or stock exchange rules, provided however, in such event, the Parties shall use their reasonable good faith efforts to agree as to the form, substance and timing of such release or statement.

14.10 No Joint Venture. Each Party will perform all obligations under this Agreement as an independent contractor. Nothing herein contained shall be deemed to constitute any Party a partner, agent or legal representative of the other Party or to create a joint venture, partnership, agency or any relationship between the Parties. The obligations of Seller and Buyer hereunder are individual and neither collective nor joint in nature.

14.11 Joint Workproduct. This Agreement shall be considered the workproduct of both Parties hereto, and, therefore, no rule of strict construction shall be applied against either Party.

14.12 Expenses. Each Party hereto shall pay all expenses incurred by it in connection with its entering into this Agreement, including, without limitation, all attorneys' fees and expenses.

14.13 No Broker. Seller and Buyer each represents and warrants to the other that it has dealt with no broker in connection with the consummation of this Agreement, and in the event of any brokerage claims against Seller or Buyer predicated upon prior dealings with the other Party, the Party purported to have used the broker agrees to defend the same.

14.14 Amendments: Binding Effect. This Agreement may not be amended, changed, modified, or altered unless such amendment, change, modification, or alteration is in writing and signed by both of the Parties to this Agreement or their successor in interest. This Agreement inures to the benefit of and is binding upon the Parties and their respective successors and permitted assigns.

14.15 Nondiscrimination. Seller agrees that it shall not, because of race, color, national origin, ancestry, age, sex, religion, physical or mental handicap, or sexual orientation, (a) discriminate against any qualified employee, applicant for employment, subcontractor, or person or firm seeking to provide goods or services to Seller, or (b) deny any person access to the Wind Energy Facility or to any activities or programs carried out in connection with the Wind Energy Facility. Seller shall comply with all applicable federal and state statutes, rules, and regulations prohibiting discrimination in employment or public accommodation.

14.16 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original and all of which shall constitute one and the same agreement.

14.17 Further Assurances. From time to time and at any time at and after the execution of this Agreement, each Party shall execute, acknowledge and deliver such documents and assurances, reasonably requested by the other and shall take any other action consistent with the terms of the Agreement that may be reasonably requested by the other for the purpose of effecting or confirming any of the transactions contemplated by this Agreement. Neither Party shall unreasonably withhold, condition or delay its compliance with any reasonable request made pursuant to this Section.

14.18 Good Faith. All rights, duties and obligations established by this Agreement shall be exercised in good faith and in a Commercially Reasonable manner.

14.19 Site Lease. The Parties agree that this Agreement shall take effect and the obligations of the Parties shall arise only upon simultaneous execution by the Parties of the Lease of even date herewith.

14.20 Survival. The provisions of Sections 4.4 (Governmental Charges), 4.6 (Environmental Credits and Value), 5.4 (Records and Audits), 5.5 (Dispute), 9.1(Remedies), 9.2 (Limitation of Liability), and 9.3 (Waivers), and Articles 11 (Wind Energy Facility Purchase and Sale Options), 12 (Indemnification) and 14 (Miscellaneous), shall survive the expiration or earlier termination of this Agreement for a period of three (3) years, provided, however, Seller's rights and obligations under Sections 4.4 (Governmental Charges) and 4.6 (Environmental Credits and Value) shall terminate as of the Transfer Date if Buyer exercises its option to purchase the Assets.

14.21 Obligation to Modify Agreement Pursuant to Rules and Regulations under the Green Communities Act or other Actions by Governmental Authority. Upon implementation by the Massachusetts Department of Public Utilities, Massachusetts Department of Energy Resources or other Governmental Authority of any rule or regulation that may affect any provision of this Agreement, in particular any rule or regulation regarding the provision of or eligibility for Net Metering, the Parties shall negotiate in good faith, shall amend this Agreement to conform to such rule(s) and/or regulation(s) to the greatest extent possible, and shall use best efforts to conform such amendment to the original intent of this Agreement and to do so in a timely fashion.

14.22 No Limitation of Regulatory Authority. The Parties acknowledge and agree that Buyer is a municipal entity, and that nothing in this Agreement or the Lease shall be deemed to be an agreement by Buyer to issue or cause the issuance of any approval, authorization, or permit, or to limit or otherwise affect the ability of Buyer or the Commonwealth of Massachusetts to fulfill its regulatory mandate or execute its regulatory powers consistent with Applicable Legal Requirements.

14.23 No Third-Party Beneficiaries. This Agreement is intended solely for the benefit of the Parties hereto. Except as expressly set forth in this Agreement, nothing in this Agreement shall be construed to create any duty to or standard of care with reference to, or any liability to, or any benefit for, any person not a Party to this Agreement. This provision is not intended to limit the rights of a Leasehold Mortgagee under the Lease.

[*Signature page to follow.*]

IN WITNESS WHEREOF, the Parties have executed this Agreement under seal as of the Effective Date.

BUYER
Town of Scituate, Massachusetts

By: _____
Joseph P. Norton, Selectman

By: _____
Richard W. Murray, Selectman

By: _____
John F. Danehey, Selectman

By: _____
Shawn Harris, Selectman

By _____
Anthony V. Vegnani, Selectman

SELLER
Scituate Wind LLC

By: _____

Name: _____

Title: _____

Approved as to Form:

By: _____
Mark C. Kalpin, Esq.
Special Town Counsel

Agreement as to Procurement:

By: _____
Patricia A. Vinchesi
Town Administrator

List of Exhibits to Agreement

Exhibit A – Description of the Premises
Exhibit B – Description of Wind Energy Facility
Exhibit C – Net Energy Price and Terms

IN WITNESS WHEREOF, the Parties have executed this Agreement under seal as of the Effective Date.

BUYER
Town of Scituate, Massachusetts

By:_____
Joseph P. Norton, Selectman

By:_____
Richard W. Murray, Selectman

By:_____
John F. Danehey, Selectman

By:_____
Shawn Harris, Selectman

By:_____
Anthony V. Vegnani, Selectman

Approved as to Form:

By:_____
Mark C. Kalpin, Esq.
Special Town Counsel

Agreement as to Procurement:

By:_____
Patricia A. Vinchesi
Town Administrator

SELLER
Scituate Wind LLC

By:_____

Name: Charles S. Eisenberg

Title: Manager

List of Exhibits to Agreement

Exhibit A – Description of the Premises
Exhibit B – Description of Wind Energy Facility
Exhibit C – Net Energy Price and Terms

EXHIBIT A

DESCRIPTION OF THE PREMISES

Address:

161 Driftway, Scituate, Massachusetts 02066

Legal Description:

Town of Scituate Assessor's Map 59, Lot 1-2 more particularly described in a deed recorded in Book 3879, Page 703 at the Plymouth County Registry of Deeds of Massachusetts.

Description of the Premises (as further shown on the attached plan drawing):

A. A portion of the above described parcel not to exceed Fifteen Thousand (15,000) square feet located in the southern corner of the parcel, as approximately shown on the attached plan drawing, or such other location to be mutually agreed upon by the Parties (the "Lease Area").

B. An unrestricted access roadway from the Driftway to the portion described in paragraph A above as approximately shown on the attached plan drawing, or such other location and the dimensions of which to be mutually agreed upon by the Parties (the "Access Easement Area").

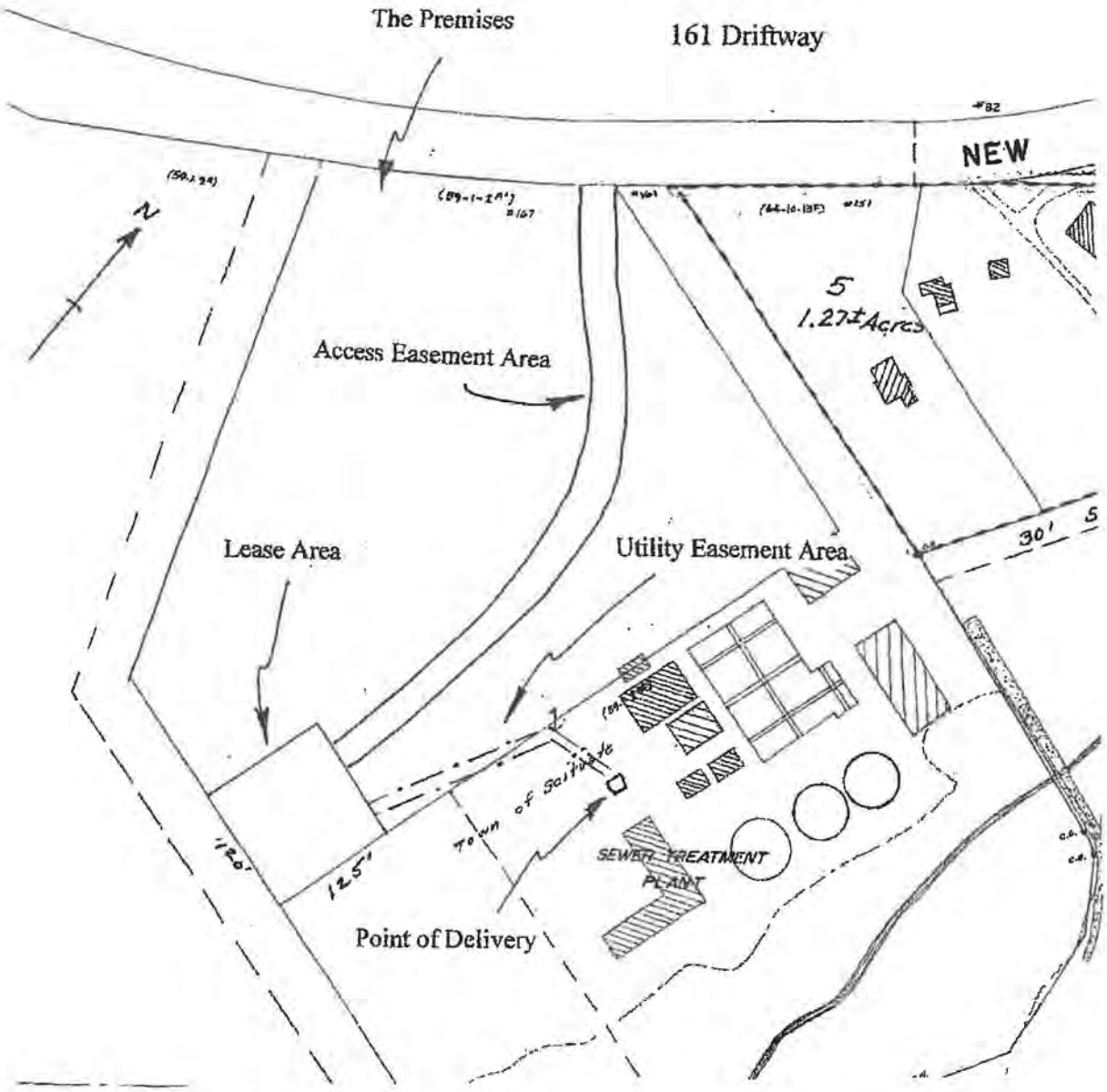
C. The use of a portion of the above described parcel not to exceed One Hundred, Forty-four Thousand (144,000) square feet located on the southern half of the property on a temporary basis as needed for the construction or decommissioning of the Wind Energy Facility, such location and the conditions of use to be mutually agreed upon by the Parties (the "Construction Easement Area").

D. A portion of the above described parcel from the Lease Area to the vicinity of the Sewer Treatment Plant as approximately shown on the attached plan drawing, or such other location and the dimensions of which to be mutually agreed upon by the Parties (the "Utility Easement Area").

Town of Scituate

Assessor's Map 59

161 Driftway



US1DOCS 7399669v4

EXHIBIT B

DESCRIPTION OF THE WIND ENERGY FACILITY

Wind Energy Facility Manufacturer	Sinovel Culture Building No.59 Zhongguancun Street Haidian,Beijing China 100872 Tel : +8610 62515566 Fax : +8610 82500072 Web : www.sinovel.com
Nameplate Capacity	1.5 MW
Estimated Annual Energy Production	4,187,617 kWh
Preliminary Specifications:	Type: SL1500/82 Wind Zone Class: IEC Ⅱ/Ⅲ Rated power(kW): 1500 Cut-in speed(m/s): 3 Cut-out speed(m/s): 20 Rated wind speed(m/s): 10.5 Survival wind speed(m/s): 52.5/59.5 Operational ambient temperature(C): Normal temperature -15~+45 Low temperature -30~+45 Survival ambient temperature(C): Normal temperature -25~+45 Low temperature -45~+45 Rotor diameter(m): 82.9 Blade length (m): 40.25 Num. of blades: 3 Two planetary stages + One spur gear stage Double-fed asynchronous, water cooling Rated output voltage(V): 690 Frequency(Hz): 60 Power factor: Capacitive 0.95 ~ Inductive 0.9 Electromechanical pitching Air brake: Blade independent pitching Mechanical brake: Active hydraulic disc brake PLC + Remote control Structure Steel tubular tower Hub height(m): 80
Appurtenant Facilities	Pad Mounted Transformer-type to be determined after further engineering studies

EXHIBIT C

NET ENERGY PRICE AND TERMS

GUARANTEED ANNUAL ELECTRIC OUTPUT	3,000,000 kWh/year	
NET ENERGY PRICE	Years 1 through 3	.089 $/kWh
	Years 4 through 6	.094 $/kWh
	Years 7 through 9	.099 $/kWh
	Years 10 through 12	.104 $/kWh
	Years 13 through 15	.109 $/kWh

In addition, for the first 3,000,000 kWh of Net Energy delivered to Buyer commencing on the beginning of the month after Seller's receipt of the annual property (real or personal) tax assessment issued by Buyer on account of the Wind Energy Facility and Seller's leasehold interest in the Premises, the Net Energy Price (on a per kWh basis) shall be increased by an amount that is equal to (a) the total amount (in dollars) of such annual assessment, *divided by* (b) 3,000,000 kWh; provided, however, that in the event such assessment subsequently is adjusted by Buyer, the Net Energy Price shall correspondingly be adjusted.

POINT OF DELIVERY	Buyer's side of the existing National Grid electric meter at Buyer's wastewater treatment facility located adjacent to the Premises, subject to the mutual agreement of the Patties and the provisions of the Interconnection Agreement.
PRODUCTION SHORTFALL CHARGE	The amount, on a per kWh basis, that is the sum of (a) the average Net Metering Credit that Buyer would have received for the Production Shortfall quantity during the Contract Year, minus, (b) the Net Energy Price for the Contract Year, provided, however, if the amount is negative, no payment by Seller (or refund by Buyer) shall be required.
SPECIAL TERMINATION DAMAGES	The amount determined by the product of (a) the Production Shortfall Charge as determined on the effective date of termination, *multiplied by* (b) 6,000,000 kWh.

AMENDED AND RESTATED
SITE LEASE AGREEMENT

This Amended and Restated Site Lease Agreement (this "***Lease***"), dated as of May 10, 2010, is by and between Scituate Wind LLC, a Massachusetts limited liability company with a principal place of business at 56 Cummings Park, Woburn, Massachusetts, as Lessee ("***Lessee***"), and the Town of Scituate, a municipal corporation having its principal office at 600 Chief Justice Cushing Highway, Scituate, Massachusetts, as Lessor ("***Lessor***"). In this Lease, Lessor and Lessee are sometimes referred to individually as a "***Party***" and collectively as the ***"Parties."***

RECITALS

WHEREAS, Lessor desires to purchase wind-generated electricity for use by Lessor, and proposes to lease a portion of real property located at 161 Driftway, Scituate, Massachusetts (the "***Premises***") to facilitate the development and operation of a wind power electric generation facility;

WHEREAS, Lessee is in the business of financing, developing, owning, operating and maintaining wind power electric generation facilities;

WHEREAS, Lessee proposes to finance, install, own, operate and maintain the Wind Energy Facility on the Premises; and

WHEREAS, Lessor proposes to lease the Premises to Lessee to allow Lessee to construct, operate, maintain and remove the Wind Energy Facility on the Premises.

WHEREAS, the Parties previously entered into a Site Lease Agreement on January 5, 2010, and have agreed to amend and restate herein that agreement in its entirety, to be effective as of January 5, 2010 (the ***"Effective Date"***).

NOW, THEREFORE, in consideration of the foregoing recitals, the mutual premises, representations, warranties, covenants, conditions herein contained, and the Exhibits attached hereto, Lessee and Lessor agree as follows.

ARTICLE I

DEFINITIONS

When used in this Lease, the following terms shall have the meanings given below, unless a different meaning is expressed or clearly indicated by the context. Words defined in this Article I which are capitalized shall be given their common and ordinary meanings when they appear without capitalization in the text. Words not defined herein shall be given their common and ordinary meanings, except that capitalized words that are used but not defined herein shall have the meanings ascribed to such terms as set forth in the Net Metering Sales Agreement.

"***Access Easement Area***" has the meaning set forth in Exhibit A.

"Additional Payment" means payments made by Lessee to Lessor that consist of the following: (a) an annual payment in an amount equal to five percent (5%) of all Sales Revenue received by Lessor during a Contract Year from the sale of Net Energy to any party other than Lessor, which payment will be made within thirty (30) days after the end of such Contract Year; and (b) an additional annual payment in an amount equal to fifteen percent (15%) of all Sales Revenue received by Lessee in a Contract Year from the sale of Net Energy to any party other than Lessor at a price equal or greater than $0.20 per kWh in such Contract Year, which payment will be made within thirty (30) days after the end of such Contract Year.

"***Annual Lease Payment***" has the meaning set forth in Section 4.1.

"Affiliate" means, with respect to Lessee, (i) each Person that, directly or indirectly, controls or is controlled by or is under common control with Lessee; (ii) any Person that beneficially owns or holds ten percent (10%) or more of any class or voting securities of Lessee or ten percent (10%) or more of the equity interest in Lessee; or (iii) any Person of which Lessee beneficially owns or holds ten percent (10%) or more of the equity interest. For the purposes of this definition, "control" (including, with correlative meanings, the terms "controlled by" and "under common control with"), as used with respect to any Person, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of Lessee, whether through the ownership of voting securities or by contract or otherwise.

"Applicable Legal Requirements" means any present and future law, act, rule, requirement, order, by-law, ordinance, regulation, judgment, decree, or injunction of or by any Governmental Authority, ordinary or extraordinary, foreseen or unforeseen, and all licenses, permits, and other governmental consents, which may at any time be applicable to a Party's rights and obligations hereunder, including, without limitation (i) the Premises or any part thereof or to any condition or use thereof, and (ii) the construction, operation, ownership, maintenance, repair, decommissioning and removal of the Wind Energy Facility.

"***Bond***" has the meaning set forth in Section 8.1.d.

"Business Day" means a day on which Federal Reserve member banks in Boston are open for business; and a Business Day shall open at 8:00 a.m. and close at 5:00 p.m. Eastern Prevailing Time.

"Commercially Reasonable" means any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known, or which in the exercise of due diligence, should have been known, at the time the decision was made, would have been expected to accomplish the desired result consistent with reliability, safety, expedition, project economics and applicable law and regulations in the southern New England region. The term "Commercially Reasonable" is not intended to be limited to consideration of any one practice, method or act, to the exclusion of all others, but rather, is intended to require the consideration of a spectrum of possible practices, methods or acts.

"***Confidential Information***" means all oral and written information exchanged between the Parties which contains proprietary business or confidential information of a Party, and is designated as "confidential" by such Party. The following exceptions, however, do not constitute Confidential Information for purposes of this Lease: (a) information that is or becomes generally available to the public other than as a result of a disclosure by either Party in violation of this Lease; (b) information that was already known by either Party on a non-confidential basis prior to this Lease; (c) information that becomes available to either Party on a non-confidential basis from a source other than the other Party if such source was not subject to any prohibition against disclosing the information to such Party; and (d) information a Party is required to disclose in connection with any administrative or regulatory approval or filing process in connection with the conduct of its business or in accordance with any statute or regulations. In connection with the above, the Parties acknowledge that notwithstanding the above, Lessor is a public entity which is subject to certain public records disclosure statutes and regulations.

"***Construction Easement Area***" has the meaning set forth in Exhibit A.

"***Energy***" means the amount of electricity either used or generated over a period of time, expressed in terms of kilowatt hour ("kWh") or megawatt hour ("MWh"). Energy shall not include capacity credits, credits for Environmental Attributes, or any investment or production tax credits under Section 45 of the Internal Revenue Code, or otherwise, to the extent that the Wind Energy Facility receives or is entitled to receive any such credits.

"***Effective Date***" is the date first set forth in the recital paragraphs of this Lease.

"***Environmental Attributes*** " means any environmental offsets or allowances, renewable production or investment tax credits, or environmental attributes, value or credits of any kind or nature, earned by or attributable to (A) the Wind Energy Facility and (B) the Energy, including, without limitation, those resulting from or associated with the Federal Clean Air Act (including, but not limited to, Title IV of the Clean Air Act Amendments of 1990), renewable energy certificates ("***RECs***") (or associated GIS Certificates), or any other state or federal acts, laws or regulations that provide offsets, allowances, or credits related to energy or emissions (collectively, the "***Environmental Attributes***").

"***Environmental Laws***" means all Applicable Legal Requirements regarding or related to the protection of the environment or human health and safety, including, but not limited to, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response Compensation and Liability Act of 1980, the Superfund Amendments and Reauthorization Act of 1986, the Federal Clean Water Act, the Federal Clean Air Act, the Toxic Substances Control Act, and all analogous and/or otherwise applicable state and local laws in each case as amended, and all rules, regulations, judgments, decrees, orders and licenses arising under all such laws.

"***Event of Default***" has the meaning set forth in Article XVI.

"***Final Completion Certificate***" means a certificate of final completion issued by the manufacturer of the wind turbine generator with respect to the construction and commissioning of the Wind Energy Facility.

"Final Decommissioning Certificate" has the meaning set forth in Section 8.1(e).

"***Financier***" means any individual or entity providing money or extending credit to Lessee for the purpose of procuring, constructing, owning, operating, maintaining, repairing, decommissioning or removing the Wind Energy Facility, including, but not limited to: (i) the construction, term or permanent financing of the Wind Energy Facility; or (ii) investment capital, working capital or other ordinary business requirements for the Wind Energy Facility (including the maintenance, repair, replacement or improvement of the Wind Energy Facility); or (iii) any development financing, bridge financing, credit support, credit enhancement or interest rate protection in connection with the Wind Energy Facility. Financier shall include any entity through which Lessee has a lien in connection with the Wind Energy Facility. "Financier" shall not include common trade creditors of Lessee.

"***Force Majeure***" means any cause not within the reasonable control of the affected Party which precludes that Party from carrying out, in whole or in part, its obligations under this Lease, including, but not limited to, Acts of God; high winds, hurricanes or tornados (but not the lack of wind); fires; epidemics; landslides; earthquakes; floods; other natural catastrophes; strikes; lock-outs or other industrial disturbances; acts of public enemies; acts, failures to act or orders of any kind of any Governmental Authority acting in its regulatory or judicial capacity, provided, however, that any such discretionary acts, failures to act or orders of any kind by Lessor may not be asserted as an event of *Force Majeure* by Lessor; insurrections; military action; war, whether or not it is declared; sabotage; riots; civil disturbances or explosions. A Party may not assert an event of *Force Majeure* to excuse it from performing due to any governmental act, failure to act, or order, where it was reasonably within such Party's power to prevent such act, failure to act, or order. Economic hardship of either Party shall not constitute an event of *Force Majeure*.

"***Full Operations Date***" means the date on which the Final Completion Certificate is issued.

"***Good Engineering Practice***" means any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known, or which in the exercise of due diligence, should have been known, at the time the decision was made, would have been expected to accomplish the desired result consistent with reliability, safety, expedition, project economics and applicable law and regulations in the southern New England region. Good Engineering Practice is not intended to be limited to consideration of any one practice, method or act, to the exclusion of all others, but rather, is intended to require the consideration of a spectrum of possible practices, methods or acts.

"***Governmental Authority***" means any national, state or local government, independent system operator, regional transmission owner or operator, any political subdivision thereof or any other governmental, judicial, regulatory, public or statutory instrumentality, authority, body, agency, department, bureau, or entity.

"***Hazardous Materials***" means those substances defined, classified, or otherwise denominated as a "hazardous substance," "toxic substance," "hazardous material," "hazardous

waste," "hazardous pollutant," "toxic pollutant" or oil in any Environmental Law or in any regulations promulgated pursuant to Environmental Laws.

"Interconnection Agreement" shall mean the Interconnection Service Agreement entered into with National Grid which authorizes the interconnection of the Wind Energy Facility with the local electric distribution system of National Grid, which confirms the eligibility of Wind Energy Facility for treatment as a Class III Municipal Wind Net Metering Facility, and which specifies whether any Net Excess Generation (as defined in the Tariff) shall be subject to allocation or cash-out.

"***Interest Rate***" means a fluctuating interest rate per annum equal to the sum of (i) the Prime Rate as stated in the "Bonds, Rates & Yields" section of The Wall Street Journal on the Effective Date and thereafter on the first day of every calendar month, plus (ii) two percentage points. (In the event that such rate is no longer published in The Wall Street Journal or such publication is no longer published, the Interest Rate shall be set using a comparable index or interest rate selected by Lessee and reasonably acceptable to Lessor.) The Interest Rate hereunder shall change on the first day of every calendar month. Interest shall be calculated daily on the basis of a year of three hundred sixty five (365) days and the actual number of days for which such interest is due.

"***kW***" means Kilowatt.

"***kWh***" means Kilowatt hour.

"***Lease***" has the meaning set forth in the introductory paragraph of this Lease.

"***Lease Area***" has the meaning set forth in Exhibit A.

"***Lessee***" has the meaning set forth in the introductory paragraph of this Lease.

"***Lessor***" has the meaning set forth in the introductory paragraph of this Lease.

"***MCP***" means, collectively, G.L. c. 21E ("***Chapter 21E***") and the Massachusetts Contingency Plan, 310 C.M.R. 40.000 *et seq*.

"Metering Device" means any and all revenue quality meters installed by Lessee or National Grid after the Point of Delivery necessary or appropriate for the delivery of Energy into the National Grid local electric distribution system and (except for the Net Metering Device) the calculation of Net Metering Credits.

"***MW***" means Megawatt.

"***MWh***" means Megawatt hour.

"***National Grid***" means National Grid USA, the local electric distribution company for Lessor, or its successor.

"***Net Energy***" means the actual and verifiable amount of Energy generated by the Wind Energy Facility and delivered to Lessor at the Point of Delivery in excess of any Energy consumed by the Wind Energy Facility, as metered in kilowatt-hours (kWh) at the Metering Device, and that conforms to Applicable Legal Requirements and the Tariff.

"***Net Metering***" means the process of measuring the difference between electricity delivered by a local electric distribution company and electricity generated by a net metering facility and fed back to the local electric distribution company, as set forth under M.G.L. c. 164, §§138 – 140 and 220 C.M.R. §18.00, as may be amended from time to time by a Governmental Authority.

"***Net Metering Credits***" shall have the meaning set forth in 220 C.M.R. § 18.00, as implemented by the Tariff.

"***Net Metering Device***" means any and all revenue quality meters installed by Lessee at or before the Point of Delivery necessary or appropriate for the registration, recording, and transmission of information regarding the amount of Net Energy generated by the Wind Energy Facility and delivered to the Point of Delivery for sale to Lessor.

"***Net Metering Sales Agreement***" means that certain Net Metering Power Sales Agreement executed between the Parties of even date herewith.

"***Parties***" means Lessor and Lessee, and their respective successors and permitted assignees.

"***Party***" means Lessor or Lessee, and their respective successors and permitted assignees.

"***Permits***" means all state, federal, and local authorizations, certificates, permits, licenses and approvals required by any Governmental Authority for the construction, operation and maintenance of the Wind Energy Facility, including, but not limited to, a special permit for a Wind Energy Conversion System under Scituate Zoning Bylaw 740 and construction related permits.

"***Permitted Improvements***" means the Wind Energy Facility that will be used to conduct the Permitted Use, together with accessory uses thereto, including, but not limited to, access roads and electric interconnection facilities, as further set forth in Article 9 and Exhibit B hereto.

"***Permitted Use***" means the use and occupation of the Premises solely and exclusively for the design, construction, operation, maintenance, repair and removal of the Permitted Improvements, which are designed and intended for the purpose of generating wind-generated electricity for sale within the New England power grid.

"***Person***" means an individual, partnership, corporation (including a business trust), limited liability company, joint stock company, trusts, unincorporated association, joint venture, or other business entity.

"***Point of Delivery***" means the point of delivery for Net Energy from Lessee to Lessor, as further set forth on Exhibit B.

"***Premises***" has the meaning set forth in Exhibit A, and shall include the Lease Area, the Access Easement Area, the Construction Easement Area, and the Utility Easement Area.

"***Release***" means any release, migration, seepage, discharge, disposal, leak or spill of Hazardous Materials, including, without limitation, as any of the foregoing may be defined in or pursuant to any Environmental Laws.

"***Sales Revenue***" means the price received by Lessee from the sale of Net Energy, as measured at the buss bar or Metering Device interconnecting the Wind Energy Facility to the National Grid electric power system, after deductions for any charges imposed by National Grid in connection with the sale or delivery of the Net Energy to any party other than Buyer.

"***Substantial Alteration***" has the meaning set forth in Section 9.8.

"***Tariff***" means the National Grid tariffs M.D.P.U. No. 1176 and M.D.P.U. No. 1177 for interconnection for distributed generation and net metering services, as approved in DPU Docket 09-72, and any subsequent amendments and approvals thereto.

"***Term***" has the meaning set forth in Section 3.1.

"***Termination Date***" means the earlier to occur of (i) the last day of the Term, (ii) the date of termination of this Lease as the result of an Event of Default, and (iii) the date of termination pursuant to Articles 13, 14 or 16.

"***Triggering Event***" has the meaning given to it in Section 7.1.

"Utility Easement Area" has the meaning set forth in Exhibit A.

"***Wind Energy Facility***" means the wind power electrical generation facility to be constructed owned, operated and maintained by Lessee, with specifications for an aggregate nameplate capacity of approximately one and one half (1.5) MW, together with all appurtenant facilities, including, but not limited to, the Metering Device, Net Metering Device, and any interconnection facilities, and transformers required to interconnect the Wind Energy Facility to the Point of Delivery and the National Grid local electric distribution system, and any and all Substantial Alterations, additions, replacements or modifications thereto, all to be located on or adjacent to the Premises and as further set forth in Exhibit B.

"***Wind Net Metering Facility***" shall have the meaning set forth in 220 C.M.R. § 18.00, as may be amended from time to time by a Governmental Authority.

"***Work***" has the meaning set forth in Section 13.1.

ARTICLE II

LEASE OF PREMISES

2.1 Premises. Lessor, for and in consideration of the rents, covenants, and agreements herein contained on the part of Lessee to be paid, kept, and performed, does hereby lease, rent, let, and demise unto Lessee, and Lessee does hereby take, accept, hire, and lease from Lessor, upon and subject to the conditions hereinafter expressed, the Premises (as described in and shown on Exhibit A) for the sole and exclusive purpose of conducting the Permitted Use and designing, constructing, operating, maintaining, repairing, and expanding the Permitted Improvements. Appurtenant to the Premises is the non-exclusive right, subject to the terms set forth herein, to investigate (including any subsurface geotechnical investigation), improve, modify, and use the access areas described in Exhibit A and Exhibit B, for pedestrian and vehicular access to and egress from the Premises plus the right to construct electric interconnection lines to connect the Wind Energy Facility (a) to the facilities of Lessor such that the Wind Energy Facility qualifies as a Wind Net Metering Facility, and (b) to National Grid or another Host Customer, in the event of (i) a termination of the Net Metering Sales Agreement due to default of Lessor, or (ii) Lessor elects to not extend the Net Metering Sales Agreement under Section 2.1(b) or (c) thereof and Lessee elects to exercise its rights under Section 2.1(c) thereof. The Premises, which shall include the Lease Area, Access Easement Area, Construction Easement Area, and Utility Easement Area, and the appurtenant rights are demised subject to the following:

a. any encumbrances shown on the survey of the Premises;

b. covenants, restrictions, easements, agreements, and reservations, as set forth in Exhibit A;

c. present and future zoning laws, ordinances, resolutions, and regulations of the municipality in which the land lies, and all present and future ordinances, laws, regulations, and orders of all boards, bureaus, commissions, and bodies of any municipal, county, state, or federal authority, now or hereafter having jurisdiction, so long as they permit or otherwise regulate the use of the Premises for the Permitted Use (provided that Lessor shall not restrict or encumber the Premises for the Permitted Use after the Effective Date);

d. the condition and state of repair of the Premises as the same may be on the Effective Date;

e. all water charges, electric charges, and sewer rents, accrued or unaccrued, fixed or not fixed, from and after the Effective Date arising as a result of the construction and operation of the Wind Energy Facility, the Permitted Improvements, or any other appurtenant facilities or improvements associated with the Permitted Use; and

f. full compliance by the Lessee with all Applicable Legal Requirements.

2.2 Net Lease. Lessor shall not be required to make any expenditure, incur any obligation, or incur any liability in connection with this Lease or the ownership, construction, operation, maintenance, or repair of the Permitted Improvements throughout the Term, except as otherwise provided in this Lease. Lessee hereby assumes the full and sole responsibility for the condition of the Premises as it may affect Lessee's construction, operation, repair, demolition,

maintenance, and management of the Permitted Improvements. Notwithstanding the above, the Parties agree that Lessee shall not be liable for any conditions on the Premises: (a) arising from or related to acts or omissions occurring prior to the Effective Date, except to the extent arising from or related to Lessee's negligence or willful misconduct; or (b) occurring after the Effective Date that arise from or are related to Lessor's negligence or willful misconduct.

2.3 Ownership of the Permitted Improvements. Except as otherwise expressly provided herein, Lessor shall have no ownership of or other interest in the Permitted Improvements.

2.4 Additional Use. Except with the prior express written consent of Lessor, Lessee shall not use the Premises for any use other than the Permitted Use.

ARTICLE III

TERM

3.1 Term.

a. The term of this Lease (the "***Term***") shall commence on the Effective Date, and shall end at the earlier of 11:59 PM on the day preceding the fifteenth (15th) anniversary of the Full Operations Date (the "***Termination Date***") or such date as of which this Lease may be earlier terminated pursuant to the provisions hereof.

b. In the event that the term of the Net Metering Sales Agreement is extended by mutual agreement of the parties thereto, the Parties shall extend the term of this Lease by an identical period of time.

c. In the event that the Lessee properly exercises its right under Section 2.1(c) of the Net Metering Sales Agreement to engage in the sale of Net Energy to a third party, or the Net Metering Sales Agreement is terminated pursuant to the provisions of Section 8.4(c)(ii) thereof, Lessee may (upon the expiration of the Term of this Lease) elect to extend this Lease for up to two additional consecutive terms of five (5) years; provided, however, in no event shall the length of the Term of this Lease, including any permitted extensions, exceed a total of twenty-five (25) years.

3.2. Early Termination. Either Party may terminate this Lease without penalty or any liability to the other Party prior to the achievement of the Full Operations Date as specified below:

a. in the event that Lessee has not prepared for submission to National Grid by Lessor a complete interconnection application seeking authorization to construct and interconnect the Wind Energy Facility to the National Grid local electric distribution system within thirty (30) days of the Effective Date;

b. in the event that Lessee has not submitted an application for a special permit for the Wind Energy Facility to the Planning Board of the Town of Scituate within ninety (90) days of the Effective Date;

c. in the event that the Interconnection Agreement, in form and substance satisfactory to Lessee and Lessor, in each of its reasonable discretion, is not finalized and executed within two hundred ten (210) days of Lessor's submission of the interconnection application, provided, however, that the terminating Party shall give the other Party thirty (30) days prior written notice of its intent to terminate this Lease if such Interconnection Agreement is not timely obtained, and such notice of termination shall be void if such Interconnection Agreement is obtained within thirty (30) days of the non-terminating Party's receipt of such notice;

d. in the event that Lessee has not obtained financing sufficient to purchase, construct, commission, own and operate the Wind Energy Facility within twelve (12) months of the Effective Date, provided, however, Lessor (subject to the provisions of subsection (e) below) shall not have the right to terminate this Lease at such time if any final Permit necessary for the construction, financing, or operation of the Wind Energy Facility has not been obtained due to a legal challenge, and Lessee is using and continues to use Commercially Reasonable efforts to obtain such final, non-appealable Permit; or

e. except as set forth below, in the event that Lessee has not entered into a binding purchase order for the Wind Energy Facility within forty-eight (48) months of the Effective Date.

In the case of termination pursuant to any of subsections (a) through (e) above, the terminating Party shall give the other Party thirty (30) days prior written notice of its intent to terminate within thirty (30) days after the occurrence of the applicable deadline. In the event that a Party fails to provide such notice, the Party shall be deemed to have waived its right to terminate under the applicable subsection in question. Notwithstanding any other provision of this Lease, the Parties acknowledge and agree that the deadline set forth in subsection (e) above (i) shall be extended for a period equal to the number of days it takes Lessee to obtain all final, non-appealable Permits under subsection (d) above which exceed one hundred eighty (180) days after the date of submission of a full and complete application for each such Permit, provided that Lessee used and continues to use good faith efforts to secure such Permits, and (y) shall not be extended or otherwise excused by *Force Majeure.*

3.3 Memorandum of Lease. Promptly after the Effective Date, the Parties shall execute a Memorandum of Lease in a form reasonably agreeable to both parties, and Lessee shall promptly thereafter record said Memorandum in the Plymouth County Registry of Deeds. Upon the termination of this Lease, Lessee agrees to execute an instrument releasing all of its rights granted herein except those rights which expressly survive the termination of this Lease, and to deliver the same to Lessor within ten (10) days after the Termination Date.

ARTICLE IV

RENT AND OTHER CONSIDERATION

4.1 Annual Lease Payment.

a. During the initial Term of this Lease, and any extension of the Term during which Lessee is selling Net Energy to Lessor, Lessee shall pay to Lessor, in advance, pursuant to

Lessor's written instructions, without notice or demand, an Annual Lease Payment of one dollar ($1.00) payable on the anniversary of the execution of this Lease.

b. During the initial Term of this Lease and any extension of the Term , Lessee shall pay all property (real or personal) taxes assessed by Lessor with respect to the Wind Turbine Facility or Lessee's leasehold interest in the Premises;

c. In the event that the Term is extended pursuant to the provisions of Section 3.1(c) above, Lessee shall make the Additional Payment to Lessor for the period of the extended Term; provided, however, that Lessee shall deduct from the Additional Payment for each Contract Year an amount equal to the property (real or personal) taxes paid by Lessee to Lessor on account of the Wind Turbine Facility and Lessee's leasehold interest in the Premises during such Contract Year.

ARTICLE V

INSURANCE

5.1 Public Liability and Property Damage Insurance. During the Term, and except to the extent otherwise required by Applicable Legal Requirements or by the Interconnection Agreement, Lessee at its cost shall maintain commercial general liability insurance on the Premises that is written on an occurrence basis insuring against all liability for personal injury and property damage arising out of and in connection with the Premises, the Permitted Use, the Permitted Improvements, or Lessee's use or occupancy of the Premises, in standard form with a general aggregate limit of not less than $5,000,000, a products-completed operations aggregate limit of not less than $2,000,000, and a per occurrence limit of not less than $2,000,000 for bodily injury and property damage, with a commercially-reasonable deductible, and which shall include operations and blanket contractual liability coverage which insures performance by Lessee of the indemnity provisions of this Lease.

5.2 Property Insurance – Personal Property. During the Term, Lessee at its cost shall maintain on all of its personal property on or about the Premises a policy of "all risk" or "special causes of loss" property insurance, with a commercially-reasonable deductible, and with vandalism and malicious mischief endorsements, to the extent of at least 100 percent of their full replacement value.

5.3 Property Insurance – Permitted Use. Lessee at its cost shall maintain on the Permitted Improvements that are part of the Premises a policy of "all risk" property insurance in an amount not less than 100 percent of the full replacement value of the Permitted Improvements, and with a commercially-reasonable deductible, and containing a replacement cost coverage endorsement, an agreed amount endorsement waiving all co-insurance provisions, and a "building ordinance coverage" endorsement. Such insurance shall also include, if applicable, flood and earthquake perils in such amounts and with such deductibles as are approved by Lessor, which approval shall not be unreasonably conditioned, withheld or delayed.

5.4 Workers' Compensation Insurance. If applicable, during the Term, Lessee shall at its cost maintain Workers' Compensation Insurance, subject to the statutory limits of the

Commonwealth of Massachusetts, an employer's liability insurance with a limit of at least $1,000,000 per accident and per employee.

5.5 Lessor's Insurance. During the Term, Lessor at its cost shall maintain insurance of the type and in the amount(s) customarily maintained by the Town against acts, omissions or negligence by Lessor or any of its tenants, agents, contractors, servants, employees, subtenants, licensees or invitees on the Premises that may affect the Permitted Improvements.

5.6 Insurance Companies. All insurance required under this Lease shall be issued by insurance companies authorized to do business in the Commonwealth of Massachusetts, with a claims paying ability rating of A- or better and a financial class of V or better, as rated in the most recent edition of Best's Insurance Reports.

5.7 Policy Delivery, Payment Evidence. Concurrently with the execution and delivery of this Lease and not less than thirty (30) days prior to the expiration dates of the expiring policies furnished pursuant to this Article 5, certificates of insurance bearing notations evidencing the payment of premiums or accompanied by other evidence satisfactory to the other Party of such payment shall be delivered by Lessee and Lessor to the other Party.

5.8 Notice of Cancellation. Each certificate of insurance delivered hereunder, to the extent obtainable, shall contain an agreement by the insurer that such policy shall not be cancelled or surrendered without at least thirty (30) days prior written notice to the other Party and to any mortgagee named in such policy.

ARTICLE VI

SURRENDER ON TERMINATION

6.1 Surrender and Removal of Property.

a. On the Termination Date, Lessee shall peaceably and quietly leave, surrender and yield up unto Lessor the Premises.

b. Notwithstanding the foregoing, Lessee shall be required, at Lessee's sole expense, within ninety (90) days after the Termination Date of this Lease to decommission the Wind Energy Facility, remove the Permitted Improvements from the Premises and appurtenant areas, and return the Premises and appurtenant areas to approximately their original condition, with the exception that (i) the foundations for the Wind Energy Facility may be left in place, provided that all bolts and other protrusions from such foundations are cut off at a minimum of three (3) feet below grade, (ii) roadway grading may remain in place provided that the roadway surfacing (if any) is removed and the remaining subgrade is de-compacted and revegetated, (iii) buried conduit may be left in place, (iv) any other components of the Permitted Improvements may be left in place, subject to the prior express written consent of Lessor, and (v) any other below ground components of the Permitted Improvements shall be left in place at the election of Lessor. Notwithstanding anything to the contrary contained elsewhere in this Lease, any waiver in whole or in part of the foregoing requirement to decommission and remove the Permitted Improvements shall require the written approval of the Lessor. Any property, improvements, or Permitted Improvements left on the Premises after the passage of ninety (90) days after the Termination Date may, at the option of Lessor, be deemed to have been abandoned, and either

may be retained by Lessor as its property, or may be disposed of in such manner as Lessor may see fit and at Lessee's sole cost; provided, however, that Lessor's election to retain all or any portion of the Permitted Improvements as its property shall relieve Lessee from any liability for its failure to remove such Permitted Improvements; and provided further, however, that the forgoing shall not apply to any property, improvements or Permitted Improvements of Lessee that are not timely removed if the failure to remove is caused by an event of *Force Majeure* or the negligent acts or omissions of Lessor (in which in either case the time period for removal shall be extended on a day for day basis).

6.2 Title. During the Term and prior to the date occurring ninety (90) days after the end thereof, title to the Permitted Improvements shall be in the Lessee. On the date, if any, occurring thereafter, that Lessor elects to retain any portion of the Permitted Improvements then existing on the Premises as Lessor's property, title to such portion of the Permitted Improvements shall automatically vest in Lessor without the necessity of any deed, conveyance or bill of sale thereon.

ARTICLE VII

LESSOR'S PERFORMANCE OF LESSEE'S OBLIGATIONS

7.1 Cures – Rights, Costs and Damages. If Lessee fails to make any payment required under this Lease beyond the expiration of all applicable notice and grace periods, or shall default in the performance of any material covenant, term, provision, limitation, or condition contained in this Lease beyond the expiration of all applicable notice and grace periods (hereafter, collectively, a "***Triggering Event***"), Lessor, without being under any obligation to do so and without waiving such default, may make such payment and/or remedy such other default for the account and at the expense of Lessee, immediately upon notice in the case of emergency or if necessary to protect public health or safety, or to avoid forfeiture of a material right, or in any other case only provided Lessee shall fail to make such payment within sixty (60) days or remedy such default within sixty (60) days, or such longer period as may be required due to the nature of such default (provided Lessee has commenced and is diligently prosecuting a cure), after Lessor notifies Lessee in writing of such default. Except in the case of an emergency or other event which requires an immediate response, Lessor's performance of Lessee's obligations in this Section 7.1 is subordinate to the right of any Leasehold Mortgagee to first cure such Lessee obligations, as provided in Section 15.4.b.

7.2 Step-in Rights/Step-out. If necessary to protect the public health and safety, regardless of whether Lessor exercises its rights pursuant to Section 7.1 of this Lease, Lessor shall have the right, but not the obligation, and to the extent permitted by Applicable Legal Requirements, to take possession of the Premises and the Permitted Improvements and to operate the Permitted Improvements, until Lessee demonstrates to the reasonable satisfaction of Lessor that the events giving rise to the endangerment of the public health and safety have been cured, and that Lessee has taken all reasonably necessary steps to ensure that such events shall not re-occur. Lessor shall not be liable to Lessee for any damages, losses or claims sustained by or made against Lessee as a result of Lessor's exercise of possession and operational control of the Permitted Improvements except to the extent such damages, losses or claims result from the negligence or willful misconduct of Lessor. Lessor's performance of Lessee's obligations in this Section 7.2 is subordinate to the right of any Leasehold Mortgagee to first cure such Lessee obligations, as

provided in Section 15.4.b. Lessor and Lessor's representatives shall at all times comply with all reasonable safety and other operating procedures established by Lessee, and with all Applicable Legal Requirements.

ARTICLE VIII
DUTY TO MAINTAIN

8.1 Lessee's Duty.

a. Maintenance; Repairs. Subject to Articles 13 and 14, Lessee shall take good care of the Premises and the Permitted Improvements, conduct all required maintenance and make all repairs thereto, interior and exterior, structural and non-structural, ordinary and extraordinary, foreseen and unforeseen, and shall maintain and keep the Premises in accordance with Good Engineering Practice, reasonable wear and tear excepted. Such obligations, in addition to Lessee's obligations to maintain and repair the Premises and the Permitted Improvements, shall include, but not be limited to, maintaining the Permitted Improvements in a condition of commercial operation, and taking all actions necessary or desirable to comply with the Applicable Legal Requirements.

b. Utilities. Lessee shall make all arrangements for and pay directly to the entity providing the service, before delinquent, all charges for all utilities and services furnished to or used by it, including, without limitation, gas, electricity, water, steam, telephone service, trash collection and connection charges.

c. Compliance With Laws. Lessee, at Lessee's expense, shall diligently and fully comply with all Applicable Legal Requirements.

d. Performance Payment Bond. On or before the commencement of any construction on the Premises, Lessee shall provide (or cause its contractor or other third party to provide) Lessor with and thereafter maintain in full force and effect a performance and labor and materials bond in the amount of one million dollars ($1,000,000.00) from an issuer with a Best's rating of not less than "A" and in a form reasonably acceptable to Lessor (the "***Bond***"), which shall secure Lessee's obligations with respect to the construction and commissioning of the Wind Energy Facility under this Lease. The Bond shall remain in effect until thirty (30) days after delivery by Lessee to Lessor of the Final Completion Certificate, unless (a) fully drawn upon earlier by Lessor, (b) Lessor provides the issuer of the Bond written notice authorizing the expiration of the Bond, or (c) this Lease is terminated prior to the issuance of the Final Completion Certificate.

e. Decommissioning Payment Bond. Concurrent with the delivery of the Final Completion Certificate to Lessor, Lessee shall provide (or cause a third party to provide) Lessor with either a cash deposit or a performance bond in the amount of one hundred fifty thousand dollars ($150,000.00), which shall secure Lessee's obligations with respect to the decommissioning and removal of the Wind Energy Facility from the Premises under this Lease. If a bond is provided, the issuer shall have a Best's rating of not less than "A" and the bond shall

be in a form reasonably acceptable to Lessor. If a cash deposit is provided, the amount shall be deposited into an interest bearing escrow account at a bank then used by Lessor and on such terms as the bank, Lessor and Lessee shall have agreed. Notwithstanding the foregoing, whether a bond agreement or an escrow agreement, such agreement shall provide that, in the event that Lessor as Buyer under the Net Metering Sales Agreement exercises it right to acquire the Assets of Lessee, the bond or escrow (together with all accrued interest) shall be released to Lessee as of the Transfer Date. Further, the escrow agreement shall require that all funds (including interest accrued thereon), net of any funds used by Lessor for decommissioning of the Permitted Improvements due to the breach of Lessee's removal and restoration obligations under Section 6.1, shall be returned to Lessee upon submission of a certification of decommission and removal of the Wind Energy Facility in full accordance with the provisions of Section 6.1 (the ***"Final Decommissioning Certificate"***).

ARTICLE IX

CONSTRUCTION AND OPERATION OF PERMITTED USE

9.1 General Description. Except as otherwise specified herein, the Permitted Improvements shall consist solely of the improvements described in Exhibit B.

9.2 Governmental Approval.

a. Except as otherwise specified herein or in the Net Metering Sales Agreement, if any, or otherwise obtained prior to the Effective Date, Lessee will obtain at its sole cost all Permits required for Lessee's use of the Premises, the Permitted Use, and the Permitted Improvements from any and all Governmental Authorities having jurisdiction in the matter. Lessee will promptly inform Lessor of all significant developments relating to the issuance of such Permits. If any changes in such plans and/or specifications are required by any Governmental Authority, then Lessee shall submit such changes, if any, to Lessor for its approval, which shall not be unreasonably conditioned, withheld or delayed.

b. Lessor shall reasonably cooperate with Lessee so that Lessee can meet its obligations under this Lease and under the Net Metering Sales Agreement. Lessor agrees to take all reasonable measures with respect to which it has legal capacity to facilitate and expedite the review of all local permits and approvals necessary for the design, construction, engineering, operations, maintenance and deconstruction of the Wind Energy Facility and to act at all times during such review within its legal capacity. This provision is not intended to and shall not be construed to imply that the Board of Selectmen of the Town of Scituate has the authority to direct the outcome of any application submitted to any independent local permit issuing authority nor that the Board of Selectmen of the Town of Scituate has the independent or concurrent authority to issue any permits or other such approvals for the Wind Energy Facility. The Parties agree that in the event either Party is sued by a third-party in connection with the any Permit, approval or any other matter related to the Wind Energy Facility or the Lease, the defending Party will immediately notify and consult with the other Party. The Parties further agree that they will work together in good faith to expeditiously defend such action and shall coordinate their defense efforts subject to any restrictions imposed by Applicable Legal Requirements. In addition, Lessee agrees that if reasonably requested by Lessor, Lessee will reimburse Lessor for any direct third-party costs (including reasonable attorneys' fees) Lessor incurs in such defense,

provided that such costs in the aggregate do not exceed twenty-five thousand dollars ($25,000.00); provided, further, however, that in the event that Lessor's direct third party costs exceed the amount of twenty-five thousand dollars ($25,000.00), Lessor's obligation to expeditiously defend such action and coordinate defense efforts with Lessee shall only continue for as long as and to the extent that Lessee agrees in advance to reimburse Lessor for its direct third party costs which exceed such amount.

9.3 Construction Commences Promptly. Lessee shall commence the necessary activities for the permitting and construction of the Permitted Improvements promptly following the Effective Date and will proceed diligently and continuously thereafter until completion, subject to only a event of *Force Majeure*.

9.4 Completion Requirements. Lessee will arrange for the construction of the Permitted Improvements in a good, careful, proper and workmanlike manner in accordance with Good Engineering Practice, the Net Metering Sales Agreement, and all Applicable Legal Requirements. The Permitted Improvements will, when completed, comply with all Applicable Legal Requirements, and upon such completion, Lessee will obtain and deliver to Lessor a copy of each temporary certificate of occupancy (if applicable) and of the final certificate of occupancy (if applicable) before the Permitted Improvements shall be occupied or operated by Lessee, except that, if a temporary certificate of occupancy shall be issued, Lessee may occupy or operate the Permitted Improvements, as the case may be, under the provisions of such certificate and, except further that, if a certificate for any part of the Permitted Improvements shall be issued, Lessee may occupy the part so certified under the provisions of such certificate.

9.5 Construction Insurance. During the course of construction of the Permitted Use, Lessee will carry or cause Lessee's contractor(s) to carry (and cause each such contractor to cause its subcontractors to carry) adequate workers' compensation insurance and such other insurance as is specified in Article 5.

9.6 Access to and Use of the Premises. Subject to Article 8, during construction and operation of the Permitted Improvements, including, but not limited to, all related pre-construction activities, Lessee and its contractors or agents shall have access to the Premises at all times.

9.7 As-built Plans. Within thirty (30) days following the issuance of the Final Completion Certificate, Lessee shall prepare and deliver to Lessor detailed as-built plans accurately depicting the Permitted Improvements including, without limitation, all underground structures.

9.8 Alterations. Lessee shall have the right from time to time both before and after the completion of the Permitted Improvements and at Lessee's sole cost and expense to make additions, alterations and changes, structural or otherwise in or to the Premises as is reasonably required to conduct the Permitted Use in compliance with the provisions of this Lease, subject, however, in all cases to the following:

a. Except as set forth herein, no alteration shall be made which would tend to (i) materially change the general design, use, character or structure of the Wind Energy Facility, or (ii) reduce or impair, to any material extent, the use of the Wind Energy Facility for the

generation of electricity, subject to applicable laws and safety standards (any such alteration, a "***Substantial Alteration***").

b. No Substantial Alteration shall be commenced except after prior written notice to and consent from Lessor, which consent shall not be unreasonably withheld by Lessor.

c. Substantial Alterations shall not include any repairs or replacement of parts to the Permitted Improvements, as set forth in Section 2.1 and Exhibit B.

d. Any Substantial Alteration shall be conducted under the supervision of a contractor, architect or engineer selected by Lessee and approved in writing by Lessor, which approval shall not be unreasonably conditioned, withheld or delayed, and no such Substantial Alteration shall be made except in accordance with detailed plans and specifications and cost estimates prepared and approved in writing by such contractor, architect or engineer and approved in writing by Lessor, which approval shall not be unreasonably conditioned, withheld or delayed.

e. Any alteration or Substantial Alteration shall be made with reasonable dispatch (*Force Majeure* events excepted) and in a good and workmanlike manner and in compliance with all applicable permits and authorizations and buildings and zoning laws, and with all other Applicable Legal Requirements.

f. At or prior to completion of any Substantial Alteration, Lessee will provide Lessor with complete copies of all final plans and specifications therefor not previously provided.

ARTICLE X

LIENS

10.1 No Liens on Premises or Permitted Use. Lessee shall not create, or suffer to be created or to remain, and shall promptly discharge, any mechanic's, laborer's or materialman's lien or any mortgage upon the Premises, and Lessee will not suffer any other matter or thing arising out of Lessee's use and occupancy of the Premises whereby the estate, rights and interests of Lessor in the Premises or any part thereof might be impaired, except in accordance with and subject to the provisions of this Lease, including, without limitation, Article 15 below.

10.2 Discharge. If any mechanic's, laborer's or materialman's lien, or any mortgage, shall at any time be filed against the Premises, Lessee, within ten (10) days after notice to Lessee of the filing thereof, shall cause such lien to be discharged of record by payment, deposit, bond, insurance, order of court of competent jurisdiction or otherwise. If Lessee shall fail to cause such lien to be discharged within the period aforesaid, then, in addition to any other right or remedy, Lessor may, but shall not be obligated to, discharge the same either by paying the amount claimed to be due or by procuring the discharge of such lien by deposit or by bonding. Any amount so paid by Lessor and costs and expenses reasonably incurred by Lessor in connection therewith, together with interest thereon at the Interest Rate from the respective dates of Lessor's making of the payment of the cost and expenses, shall be paid by Lessee to Lessor within ten (10) business days of Lessor's invoice therefor.

10.3 No Liens on Permitted Improvements. Lessor shall not create, or suffer to be created or to remain, and shall promptly discharge, any mechanic's, laborer's or materialman's lien upon the Permitted Improvements or the income therefrom, except in accordance with and subject to the provisions of this Lease.

ARTICLE XI

QUIET ENJOYMENT

11.1 Quiet Enjoyment. Lessor covenants that Lessee shall quietly have and enjoy the Premises throughout the Term and any extensions thereof. Lessor warrants and agrees that, throughout the Term and any extensions thereof:

a. any other uses of the Premises by Lessor or any third party shall not unreasonably interfere with the Permitted Use and the operational and wind requirements of the Permitted Improvements; and

b. Lessor shall, in good faith, use its best efforts to protect Lessee's quiet enjoyment of its rights hereunder.

Lessor's failure to carry out any of its obligations and duties under this provision shall be an Event of Default under Section 16.2 of this Lease, and Lessee shall be entitled to all of its rights and remedies with respect to such default as provided in this Lease. Lessor's exercise of self-help pursuant to Article 7 and rights of entry and inspection pursuant to Section 11.2 shall not be considered a breach of the covenant of quiet enjoyment. Subject to the specific provisions of this Lease permitting the same, Lessor shall have the right to enter upon the Premises at reasonable times for purposes reasonably related to the Permitted Use of this Lease and no such entry which complies with the provisions of this Lease permitting the same shall be considered a breach of the covenant of quiet enjoyment.

11.2 Inspection and Entry. During the course of construction and completion of the Permitted Improvements and any Substantial Alteration thereto, Lessee shall maintain all plans, shop drawings, and specifications relating to such construction which Lessor, its agents or contractors may examine at reasonable times upon reasonable prior notice for the purpose of determining whether the work conforms to the agreements contained or referenced in this Lease. Lessor may, upon reasonable prior notice to Lessee, enter upon the secured portion(s) of the Premises for the purpose of ascertaining their condition or whether Lessee is observing and performing the obligations assumed by it under this Lease, all without hindrance or molestation from Lessee, and to perform maintenance and services pursuant to Section 8.1. Lessor shall also have the right to enter upon the Premises, upon reasonable prior notice to Lessee, for the purpose of exercising its rights under Article 7. Lessor and Lessor's representatives shall at all times comply with all reasonable safety and other operating procedures established by Lessee, and with all Applicable Legal Requirements.

11.3 Limitation of Liability. Lessor may, during the progress of any work performed by Lessor pursuant to Article 7, Section 8.1 or Section 11.2, keep and store upon the Premises all necessary materials, tools, supplies and equipment, provided that Lessor shall use reasonable efforts to minimize the impact thereof on the normal operation of the Premises, and provided the

risk of loss of such materials, tools, supplies, and equipment is that of Lessor unless such loss results from the negligence or intentional misconduct of Lessee, or of Lessee's agent, employee, or contractor. Lessor agrees to promptly remove such materials, tools, supplies, and equipment from the Premises upon completion of Lessor's work.

ARTICLE XII

INDEMNIFICATION

12.1 Indemnification of Lessor. Lessee shall indemnify and save harmless Lessor and each of its officials, employees, agents, and assigns (the "***Lessor Indemnified Parties***") from and against all liabilities, losses, damages, penalties, costs, and expenses, including reasonable attorneys' fees, that may be imposed upon or incurred by or asserted against any Lessor Indemnified Party by reason of any of the following occurrences during the Term:

a. any breach by Lessee of its obligations, covenants, representations or warranties contained in this Lease or made pursuant thereto;

b. any negligence on the part of Lessee or any of its agents, contractors, servants, employees, subtenants, licensees or invitees in connection with the Permitted Use or Premises; and

c. any failure on the part of Lessee or any of its agents, contractors, servants, employees, subtenants, licensees or invitees to fully comply with any Applicable Legal Requirements.

In case any action or proceeding is brought against any Lessor Indemnified Party by reason of any such claim, Lessee, upon written notice from Lessor, shall defend such action or proceeding at Lessee's expense to the reasonable satisfaction of Lessor.

ARTICLE XIII

DAMAGE OR DESTRUCTION

13.1 Lessee Repair and Restoration. If, at any time during the Term, the Wind Energy Facility shall be substantially damaged or destroyed and rendered inoperable by fire or other occurrence of any kind, Lessee shall at its sole cost and expense either (a) repair or replace the Permitted Improvements, or (b) elect to terminate this Lease in which case Lessee shall decommission and remove the Permitted Improvements and promptly restore the Premises to substantially the same condition as existed prior to the Effective Date, except as otherwise specified in Section 6.1 of this Lease. Such removal, repair or replacement, including such changes and alterations as aforementioned and including temporary repairs, are referred to in this Article as the "***Work***."

13.2 Conditions of the Work. Except as otherwise provided in this Article 13, the conditions under which any Work is to be performed and the method of proceeding with and performing the same shall be governed by all of the provisions of this Lease.

13.3 Payment of Insurance Proceeds. All insurance money paid to Lessee on account of such damage or destruction under the policies of insurance provided for in Article 5, less the cost, if any, incurred in connection with the adjustment of the loss and the collection thereof (the

"***Insurance Proceeds***"), shall be applied by Lessee to the payment of the cost of the Work to the extent such Insurance Proceeds shall be sufficient for the purpose. If the Insurance Proceeds received by Lessee shall not be sufficient to pay the entire cost of the Work or if Lessee finds that the Work is otherwise not economically justified, Lessee may elect not to repair and replace the Permitted Improvements, and to terminate this Lease pursuant to Section 13.1.

13.4 Failure to Commence Repairs. If the Work shall not have been commenced within one hundred eighty (180) days of the date of the casualty or other occurrence, or such longer period as may be reasonably required to adjust the insurance, achieve final plans and obtain all necessary Permits, or if such Work after commencement shall not proceed with due diligence (any *Force Majeure* event excepted), Lessor may terminate this Lease pursuant to Article 16. On such termination, the Insurance Proceeds received by Lessee shall be used to the extent necessary to demolish and remove the Permitted Improvements and any other structures on the Premises and to restore the Premises, except as otherwise specified in Section 6.1 of this Lease. Upon the completion of such activities, Lessee shall have no further obligation to pay Lessor the Annual Lease Payment or any other amount under this Lease (other than payments due as of the effective date of termination and payments required by any provisions of this Lease that expressly survive termination).

ARTICLE XIV

REMEDIES AND LIMITATION OF LIABILITY

14.1 Remedies. Subject to the limitations set forth in this Lease, Lessor and Lessee each reserve and shall have all rights and remedies available to it at law or in equity with respect to the performance or non-performance of the other Party hereto under this Lease. Each Party agrees that it has a duty to mitigate damages that it may incur as a result of the other Party's non-performance under this Lease.

14.2 Limitation of Liability. **NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES OF ANY CHARACTER, RESULTING FROM, ARISING OUT OF, IN CONNECTION WITH OR IN ANY WAY INCIDENT TO ANY ACT OR OMISSION OF EITHER PARTY RELATED TO THE PROVISIONS OF THIS LEASE, IRRESPECTIVE OF WHETHER CLAIMS OR ACTIONS FOR SUCH DAMAGES ARE BASED UPON CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY AT LAW OR EQUITY.**

ARTICLE XV

ASSIGNMENT, SUBLETTING, MORTGAGE

15.1 Prior Written Consent.

a. Lessee shall not assign or in any manner transfer this Lease or any part thereof without the written consent of Lessor, which consent may not be unreasonably conditioned, withheld or delayed, except that in connection with: (i) an assignment or transfer to an Affiliate of Lessee (provided that such Affiliate's financial condition, creditworthiness and operational

ability following the contemplated assignment or transfer are sufficient to permit Lessee to satisfy its obligations under this Lease, as reasonably determined by Lessor; or (ii) the execution of a Leasehold Mortgage (as defined below) but not the subsequent assignment by a Leasehold Mortgagee to an entity other than another Leasehold Mortgagee, no prior notice to Lessor is required, provided that Lessee shall promptly notify Lessor after the date of assignment or transfer. Lessor shall consent to an assignment or other transfer if such assignee or transferee shall deliver evidence reasonably satisfactory to Lessor that assignee or transferee is sufficiently creditworthy and has adequate technical expertise to perform the obligations of Lessee under this Lease.

b. Notwithstanding the provisions of Section 15.1.a above, Lessor shall have the right in its reasonable discretion to withhold consent to any transfer or assignment in the event that Solaya Energy LLC or the current members of Solaya Energy LLC do not, in the aggregate, continue to hold at least a twenty five percent (25%) membership or equity interest in the managing member of general partner of the transferee or assignee.

15.2 Financing by Leasehold Mortgage. Lessor is cognizant of the need of Lessee to finance its leasehold interest in the Premises and the Permitted Improvements thereon, and therefore specifically agrees without any further request for prior consent to permit Lessee to mortgage, assign or transfer its leasehold interest in the Premises for the purpose of obtaining financing, which shall include equity and/or debt, provided:

a. the term of such mortgage, assignment or transfer shall not exceed the Term; and

b. Lessee shall give Lessor notice of the existence of such mortgage, assignment or transfer, together with the name and address of the mortgagee, assignee or transferee, and a copy of the mortgage, assignment or transfer document within thirty (30) days of the execution of such mortgage, assignment or transfer.

15.3 Release of Lessee. Lessee shall be relieved from its obligations under this Lease:

a. by any whole disposition of Lessee's interest in this Lease in compliance with Section 15.1, when coupled with a written instrument signed by the assignee or transferee of such interest in which said assignee or transferee accepts and agrees to be bound by the terms of this Lease, unless the Parties agree otherwise, and except as otherwise provided by the terms of any assignment or transfer; and

b. in the event of any foreclosure by a Leasehold Mortgagee, in which case the Leasehold Mortgagee shall substitute for the Lessee for purposes of this Lease.

Absent express written consent of Lessor, the execution of a Leasehold Mortgage or any assignment from a Leasehold Mortgagee to another Leasehold Mortgagee shall not relieve Lessee from its obligations under this Lease.

15.4 Mortgagee Provisions. Any person or entity that holds or is the beneficiary of a first position mortgage, deed of trust or other security interest in this Lease or in any Permitted Improvements located on the Premises (any such first position mortgage, deed of trust or other security interest is referred to herein as a "***Leasehold Mortgage***," and any such beneficiary a

"***Leasehold Mortgagee***") shall, for so long as its Leasehold Mortgage is in existence and until the lien thereof has been extinguished, be entitled to the protections set forth in this Section 15.5. No Leasehold Mortgage shall encumber or affect in any way the interest of Lessor or Lessor's fee interest in and to the Premises, or Lessor's rights under this Lease.

a. Leasehold Mortgagee's Right to Possession, Right to Acquire and Right to Assign. Pursuant to the provisions of this Section 15.4, a Leasehold Mortgagee shall have the right: (i) to assign its security interest; (ii) to enforce its lien and acquire title to the leasehold estate by any lawful means; and (iii) to take possession of and operate the Permitted Improvements or any portion thereof and to perform all obligations to be performed by Lessee hereunder, or to cause a receiver to be appointed to do so, subject to the terms and conditions of this Lease. Lessor's consent shall not be required for the Leasehold Mortgagee's acquisition of the encumbered leasehold estate created by this Lease, whether by foreclosure or assignment in lieu of foreclosure.

b. Notice of Default; Opportunity to Cure. The Leasehold Mortgagee shall be entitled to receive notice of any default by Lessee, provided that such Leasehold Mortgagee shall have first delivered to Lessor a notice of its interest in the Leasehold Mortgage in the form and manner, if any, provided by state laws, rules, regulations, Lessee's procedures, and the provisions of this Lease. If any notice shall be given of the default of Lessee and Lessee has failed to cure or commence to cure such default within the cure period provided in this Lease, then any such Leasehold Mortgagee, which has given notice as above provided, shall be entitled to receive an additional notice that Lessee has failed to cure such default and such Leasehold Mortgagee shall have thirty (30) days after such additional notice to cure any such default or, if such default cannot be cured within thirty (30) days, to diligently commence curing within such time and diligently pursue such cure to completion within such time as Lessee would have been allowed pursuant to Section 16.1 but as measured from the date of such additional notice. The Leasehold Mortgagee shall have priority over Lessor to cure any default by Lessee pursuant to Section 7.1, or to take possession of the Premises and the Permitted Improvements and to operate the Permitted Improvements if necessary to protect the public health and safety pursuant to Section 7.2, except in either case as specified in such sections.

c. Cross-Default/Cross-Collateralization. The Leasehold Mortgage shall not contain any cross-collateralization or cross-default provisions relating to other loans of Lessee (or any subsidiary or affiliate of Lessee) that are not incurred for the ownership, construction, maintenance, operation, repair or financing of the Permitted Improvements.

ARTICLE XVI

DEFAULT AND TERMINATION

16.1 Events of Default by Lessor. The following shall each constitute an Event of Default by Lessor.

a. Lessor fails to perform or comply with any material covenant or agreement set forth in this Lease and such failure continues for a period of thirty (30) days after written notice thereof from Lessee to Lessor; provided that if Lessor proceeds with due diligence during such thirty (30) day period to cure such breach and is unable by reason of the nature of the work

involved using Commercially Reasonable efforts to cure the same within the said thirty (30) days, Lessor's time to do so shall be extended by the time reasonably necessary to cure the same.

b. Fraud or intentional misrepresentation by Lessor with respect to any of the covenants or agreements of this Lease.

c. Lessor has an Event of Default which results in termination under the Net Metering Sales Agreement.

e. Lessor materially breaches its obligations under this Lease.

16.2 Events of Default by Lessee. The following shall each constitute an Event of Default by Lessee.

a. Lessee fails to make any material payment due under the Lease within thirty (30) days after such payment is due unless such payment is contested.

b. Lessee fails to perform or comply with any material covenant or agreement set forth in this Lease and such failure continues for a period of thirty (30) days after written notice thereof from Lessor to Lessee; provided that if Lessee proceeds with due diligence during such thirty (30) day period to cure such breach and is unable by reason of the nature of the work involved using Commercially Reasonable efforts to cure the same within the said thirty (30) days, Lessee's time to do so shall be extended by the time reasonably necessary to cure the same.

c. Fraud or intentional misrepresentation by Lessee with respect to any of the covenants or agreements of this Lease.

d. Lessee has an Event of Default which results in termination under the Net Metering Sales Agreement.

e. Lessee materially breaches its obligations under this Lease.

f. Lessee: (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails (or admits in writing its inability) generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) has instituted against it a proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditor's rights, or a petition is presented for its winding-up, reorganization or liquidation, which proceeding or petition is not dismissed, stayed or vacated within twenty (20) Business Days thereafter; (v) commences a voluntary proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency law or other similar law affecting creditors' rights; (vi) seeks or consents to the appointment of an administrator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all of its assets; (vii)

has a secured party take possession of all or substantially all of its assets, or has a distress, execution, attachment, sequestration or other legal process levied, enforced or sued on or against all or substantially all of its assets; (viii) causes or is subject to any event with respect to it which, under the applicable laws of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vii) inclusive; or (ix) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts.

16.3 *Force Majeure*.

a. If by reason of *Force Majeure*, either Party is unable to carry out, either in whole or in part, its obligations herein contained, such Party shall not be deemed to be in default during the continuation of such inability, provided that: (i) the non-performing Party, within two (2) weeks after the occurrence of the event of *Force Majeure*, gives the other Party hereto written notice describing the particulars of the occurrence and the anticipated period of delay; (ii) the suspension of performance be of no greater scope and of no longer duration than is required by the event of *Force Majeure*; (iii) no obligations of the Party which were to be performed prior to the occurrence causing the suspension of performance shall be excused as a result of the occurrence; and (iv) the non-performing Party shall use Commercially Reasonable efforts to remedy with all reasonable dispatch the cause or causes preventing it from carrying out its obligations.

b. If a *Force Majeure* event affecting a Party continues for a period of one hundred eighty (180) days or longer, the performing Party may treat such an event as an Event of Default and may terminate this Lease.

16.4 Termination for Default.

a. Upon the occurrence of an Event of Default, the non-defaulting Party at any time thereafter may give written notice to the defaulting Party specifying such Event of Default and such notice may state that this Lease and the Term shall expire and terminate on a date specified in such notice, which shall be at least five (5) Business Days after the giving of such notice, and upon any termination date specified in such notice, this Lease shall terminate as though such date were the date originally set forth herein for the termination hereof.

b. In the event this Lease is terminated as a result of an Event of Default by Lessee, Lessee shall remove the Wind Energy Facility from the Premises in accordance with the provisions of this Lease and the Net Metering Sales Agreement, provided that Lessor has not exercised its purchase option pursuant to Article 11 of such agreement.

16.5 Lessee Liability Upon Termination. Except as set forth in provisions surviving the termination of this Lease, as provided in Section 21.16, and except with respect to any amounts owed and due by Lessee prior to the date of termination, the termination of this Lease shall relieve Lessee of its liability and obligations under this Lease.

16.6 Additional Damages. If this Lease shall terminate as provided in Section 16.2, Lessor, in addition to any other rights under this Article 16, shall be entitled to recover as damages (i) the cost of performing any work required to be (but not) done by Lessee under this Lease, and (ii)

the cost of placing the Premises in substantially the same condition as Lessee is required to surrender them hereunder.

ARTICLE XVII

LESSEE REPRESENTATIONS, WARRANTIES, AND COVENANTS

17.1 Lessee Representations and Warranties. As of the date of this Lease, Lessee represents and warrants to Lessor as follows.

a. Lessee is a limited liability company, duly organized, validly existing, and in good standing under the laws of Massachusetts.

b. Lessee has full legal capacity to enter into and perform this Lease.

c. The execution of this Lease has been duly authorized, and each person executing this Lease on behalf of Lessee has full authority to do so and to fully bind Lessee.

d. To Lessee's knowledge, there is no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting Lessee or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of this Lease or Lessee's ability to carry out its obligations under this Lease.

e. To Lessee's knowledge, none of the documents or other written or other information furnished by or on behalf of Lessee to Lessor or Lessor's agents pursuant to this Lease contains any untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements contained herein or therein, in the light of the circumstances in which they were made, not misleading.

17.2 Lessee Payment of Cost Covenants. Lessee covenants to Lessor that Lessee shall be responsible for all costs related to capital improvements to the Premises, including, without limitation, those costs necessary to construct, operate, maintain, repair, remove, and expand the Permitted Improvements.

17.3 Lessee Additional Covenants. Lessee makes the following additional covenants to Lessor.

a. Lessee shall promptly inform Lessor of the occurrence of any event that materially affects the operation of the Wind Energy Facility or the performance of Lessee's obligations under this Lease (including, but not limited to, any notices of default under any third party contract and the occurrence of any event that may result in the imposition of material liability or obligations on Lessee or Lessor under any Environmental Law).

b. Lessee shall provide Lessor such other information as Lessor may reasonably request in order to review Lessee's compliance with the terms of this Lease.

ARTICLE XVIII

LESSOR REPRESENTATIONS, WARRANTIES AND COVENANTS

18.1 Lessor Representations and Warranties. As of the date of this Lease, Lessor represents and warrants the following to Lessee.

a. Lessor is a municipal corporation having its principal office at 600 Chief Justice Cushing Highway, Scituate, Massachusetts.

b. Lessor has full legal capacity to enter into and perform this Lease.

c. The execution of this Lease has been duly authorized, and each person executing this Lease on behalf of Lessor has full authority to do so and to fully bind Lessor.

d. To Lessor's knowledge, there is no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting Lessor or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of this Lease or Lessor's ability to carry out its obligations under this Lease.

e. To Lessor's knowledge, none of the documents or other written or other information furnished by or on behalf of Lessor to Lessee or Lessee's agents pursuant to this Lease contains any untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements contained herein or therein, in the light of the circumstances in which they were made, not misleading.

18.2 Lessor Covenants. Lessor makes the following covenants to Lessee.

a. Throughout the Term and any extensions thereof, Lessor and its officers, employees, contractors, agents, tenants, subtenants, servants, licensees and invitees shall not interfere or allow a third party to interfere with the wind patterns affecting the Permitted Improvements.

b. Throughout the Term and any extensions thereof, Lessor shall not build or allow to be built any new structure within the fall zone of the Permitted Improvements.

c. Throughout the Term and any extensions thereof, as provided in Section 11.1, Lessor shall protect Lessee's rights of quiet enjoyment.

d. Lessor shall promptly inform Lessee of the occurrence of any event that materially affects the operation of the Wind Energy Facility or the performance of Lessor's obligations under this Lease (including, but not limited to, any notices of default under any third party contract and the occurrence of any event that may result in the imposition of material liability or obligations on Lessee or Lessor under any Environmental Law).

b. Lessor shall provide Lessee such other information as Lessee may reasonably request in order to review Lessor's compliance with the terms of this Lease.

ARTICLE XIX

NO WAIVERS

19.1 No Implied Waivers – Remedies Cumulative. No covenant or agreement of this Lease shall be deemed to have been waived by Lessor or Lessee, unless such waiver shall be in writing and signed by the Party against whom it is to be enforced or such Party's agent. Consent or approval of Lessor or Lessee to any act or matter must be in writing and shall apply only with respect to the particular act or matter in which such consent or approval is given and shall not relieve the other Party from the obligation wherever required under this Lease to obtain consent or approval for any other act or matter. Lessor or Lessee may restrain any breach or threatened breach of any covenant or agreement herein contained, but the mention herein of any particular remedy shall not preclude either Lessor or Lessee from any other remedy it might have, either in law or in equity. The failure of Lessor or Lessee to insist upon the strict performance of any one of the covenants or agreements of this Lease or to exercise any right, remedy or election herein contained or permitted by law shall not constitute or be construed as a waiver or relinquishment for the future of such covenant or agreement, right, remedy or election, but the same shall continue and remain in full force and effect. Any right or remedy of Lessor or Lessee herein specified or any other right or remedy that Lessor or Lessee may have at law, in equity or otherwise upon breach of any covenant or agreement herein contained shall be a distinct, separate and cumulative right or remedy and no one of them, whether exercised or not, shall be deemed to be in exclusion of any other.

19.2 Acceptance of Payment. Neither receipt nor acceptance by Lessor of any payment due herein, nor payment of same by Lessee, shall be deemed to be a waiver of any default under the covenants or agreements of this Lease, or of any right or defense that Lessor or Lessee may be entitled to exercise hereunder.

19.3 Waiver of Termination for Convenience. Lessor hereby expressly waives any rights it may have to cancel this Lease or discharge any of its obligations hereunder on the basis that there may be a right of termination for convenience (whether it be express, implied or constructive) in contracts with public entities.

ARTICLE XX

ENVIRONMENTAL MATTERS

20.1 Lessor's Environmental Representations and Warranties. Lessor represents and warrants to Lessee the following, which representations and warranties are true as of the Effective Date:

a. to the knowledge of Lessor, there are not now nor have there ever been any underground storage tanks containing Hazardous Materials located at, on or under the Premises;

b. to the knowledge of Lessor, all Hazardous Materials located at, in, on or under the Premises are being and will continue to be used, stored, handled, treated, transported and disposed of by Lessor in material compliance with all Environmental Laws until Lessor surrenders possession of the Premises to Lessee;

c. to the knowledge of the Lessor, there have been no Releases of Hazardous Materials at, on or under the Premises, nor any violation of Environmental Laws involving the Premises; and

d. to the knowledge of the Lessor, no notice, order, directive, complaint, request for information or other communication has been made or issued by any governmental agency or other person with respect to any alleged violation of any Environmental Laws in connection with the Premises.

20.2 Lessee's Obligations With Respect to Hazardous Materials.

a. Lessee shall not cause, suffer or allow any Hazardous Materials to be used, generated or stored on, under or at the Premises without first receiving Lessor's written consent, which may be withheld in Lessor's reasonable discretion, provided, however, that Lessee may store and use at the Premises such Hazardous Materials as are customarily used to construct and maintain the Permitted Improvements, so long as the same are stored, used and disposed of in strict accordance with Applicable Legal Requirements and the location of any such storage is approved by Lessor, such approval not to be unreasonably conditioned, withheld or delayed.

b. Lessee shall exercise best efforts to minimize any risks from the Premises, the Permitted Use, and the Permitted Improvements to the environment.

c. Storage of all oil and Hazardous Materials shall be in strict accordance with Environmental Laws. No underground storage tanks may be installed without Lessor's consent, which may be withheld in its sole discretion. If there is aboveground storage in tanks, there shall be a spill prevention and countermeasure plan prepared and implemented in strict accordance with all Applicable Legal Requirements.

20.3 Notices of Release of Hazardous Materials. Lessee shall immediately notify Lessor of all Releases of Hazardous Materials on the Premises (such oral notification to promptly be followed with a written notification), including, without limitation, all Releases of Hazardous Materials for which Lessee has an obligation to report under the MCP and all material notices, orders, fines, or communications of any kind received by Lessee from any Governmental Authority or third party concerning the presence or potential presence of Hazardous Materials on the Premises, the migration or suspected migration of Hazardous Materials from the Premises to other property, or the migration or suspected migration of Hazardous Materials from other property to the Premises.

20.4 Lessor Right to Inspect. Subject to Section 11, Lessor and its officers, employees, contractors and agents shall have the right, but not the duty, to inspect areas of the Premises to determine whether Lessee is fully complying with Applicable Legal Requirements, and, if Lessor finds or reasonably suspects non-compliance by Lessee, Lessor shall promptly notify Lessee, and Lessee shall promptly take actions necessary or desirable to achieve or confirm such compliance.

ARTICLE XXI
MISCELLANEOUS

21.1 Notices. All notices and other formal communications which either Party may give to the other under or in connection with this Lease shall be in writing (except where expressly provided for otherwise), shall be effective upon receipt, and shall be sent by any of the following methods: hand delivery; reputable overnight courier; certified mail, return receipt requested; or facsimile transmission.

The communications shall be sent to the following addresses:

If to Lessor:

Patricia A. Vinchesi, Town Administrator
Town Hall
600 Chief Justice Cushing Way
Scituate, MA 02066
Tel: (781) 545-8741
Fax: (781) 545-8704
Email: pvinchesi@town.scituate.ma.us

with a copy to:

Mark C. Kalpin, Esq.
WilmerHale
60 State Street
Boston, MA 02109
Tel: (617) 526-6176
Fax: (617) 526-5000
Email: mark.kalpin@wilmerhale.com

If to Lessee:

Charles Eisenberg, Manager
Scituate Wind LLC
56 Cummings Park
Woburn, MA 01801
Tel: (781) 935-5600
Fax: (781) 935-5655
Email: ceisenberg@solayaenergy.com

Gordon Deane, Manager
Scituate Wind LLC
c/o Palmer Management Corporation
13 Elm Street, Suite 200
Cohasset, MA 02025

Tel: (781) 383-3200
Fax: (781) 383-3205
Email: gdeane@palmcap.com

with a copy to:

Jeffrey M. Bernstein, Esq.
BCK Law, P.C.
One Gateway Center, Suite 851
Newton, MA 02458
Tel: (617) 244-9500
Fax: (617) 244-9550
Email: jbernstein@bck.com

Any Party may change its address and contact person for the purposes of this Section by giving notice thereof in the manner required herein.

21.2 Confidentiality. Except as provided in this Section 21.2, neither Party shall publish, disclose, or otherwise divulge Confidential Information to any person at any time during or after the term of this Lease, without the other Party's prior express written consent.

a. Each Party shall permit knowledge of and access to Confidential Information only to those of its affiliates, attorneys, accountants, representatives, agents and employees who have a need to know related to this Lease.

b. If required by any law, statute, ordinance, decision, order or regulation passed, adopted, issued or promulgated by a court, governmental agency or authority having jurisdiction over a Party, that Party may release Confidential Information, or a portion thereof, to the court, governmental agency or authority, as required by applicable law, statute, ordinance, decision, order or regulation, and a Party may disclose Confidential Information to accountants in connection with audits, provided however, to the extent permitted by law, such disclosing Party shall notify the other Party of the required disclosure, such that the other Party may attempt (if such Party so chooses) to cause that court, governmental agency, authority or accountant to treat such information in a confidential manner and to prevent such information from being disclosed or otherwise becoming part of the public domain.

c. In connection with the above, the Parties acknowledge that Lessor is a public entity that is subject to certain public records disclosure statutes and regulations.

21.3 Severability. If any article, section, phrase or portion of this Lease is, for any reason, held or adjudged to be invalid, illegal or unenforceable by any court of competent jurisdiction, such article, section, phrase, or portion so adjudged will be deemed separate, severable and independent and the remainder of this Lease will be and remain in full force and effect and will not be invalidated or rendered illegal or unenforceable or otherwise affected by such adjudication, provided the basic purpose of this Lease and the benefits to the Parties are not substantially impaired. Provided further, that the Parties shall enter into negotiations concerning

the terms affected by such decisions for the purpose of achieving conformity with requirements of any Applicable Legal Requirements and the intent of the Parties.

21.4 Governing Law. This Lease and the rights and duties of the Parties hereunder shall be governed by and shall be construed, enforced and performed in accordance with the laws of the Commonwealth of Massachusetts without regard to principles of conflicts of law.

21.5 Dispute Resolution. Unless otherwise expressly provided for in this Lease, the dispute resolution procedures of this Section 21.5 shall be the exclusive mechanism to resolve disputes arising under this Lease. The Parties agree to use their respective best efforts to resolve any dispute(s) that may arise regarding this Lease.

a. Any dispute that arises under or with respect to this Lease that cannot be resolved shall in the first instance be the subject of informal negotiations between the Parties. The dispute shall be considered to have arisen when one Party sends the other Party a written notice of dispute. The period for informal negotiations shall be fourteen (14) days from receipt of the written notice of dispute unless such time period is modified by written agreement of the Parties.

b. In the event that the Parties cannot resolve a dispute by informal negotiations, the Parties agree to submit the dispute to mediation. Within fourteen (14) days following the expiration of the time period for informal negotiations, the Parties shall propose and agree upon a neutral and otherwise qualified mediator. In the event that the Parties fail to agree upon a mediator, the Parties shall request that the Boston, Massachusetts office of J*A*M*S appoint a mediator. The period for mediation shall commence upon the appointment of the mediator and shall not exceed sixty (60) days, unless such time period is modified by written agreement of the Parties. The decision to continue mediation shall be in the sole discretion of each Party. The Parties will bear their own costs of the mediation. The mediator's fees shall be shared equally by all Parties.

c. In the event that the Parties cannot resolve a dispute by informal negotiations or mediation, the sole venue for judicial enforcement shall be Plymouth County Superior Court, Massachusetts. Each Party hereby consents to the jurisdiction of such court, and to service of process in the Commonwealth of Massachusetts in respect of actions, suits or proceedings arising out of or in connection with this Lease or the transactions contemplated by this Lease.

d. Notwithstanding the foregoing, injunctive relief from such court may be sought without resorting to alternative dispute resolution to prevent irreparable harm that would be caused by a breach of this Lease.

e. In any judicial action, the Prevailing Party (as defined below) shall be entitled to an award by the court of payment from the opposing Party of its reasonable costs and fees, including, but not limited to, attorneys' fees and travel expenses, arising from the civil action. As used herein, the phrase "***Prevailing Party***" shall mean the Party who, in the reasonable discretion of the finder of fact, most substantially prevails in its claims or defenses in the civil action.

21.6 Entire Agreement. This Lease, together with its exhibits, contains the entire agreement between Lessee and Lessor with respect to the subject matter hereof and, with the exception of the Net Metering Sales Agreement to which Lessee and Lessor are Parties, supersedes all other understandings or agreements, both written and oral, between the Parties relating to the subject matter hereof.

21.7 Headings and Captions. The headings and captions in this Lease are intended for reference only, do not form a part of this Lease, and will not be considered in construing this Lease.

21.8 Singular and Plural, Gender. If two or more persons, firms, corporations or other entities constitute either Lessee or Lessor, the word "Lessee" or the word "Lessor" shall be construed as if it reads "Lessees" or "Lessors" and the pronouns "it," "he," and "him" appearing in this Lease shall be construed to be the singular or plural, masculine, feminine, or neuter gender as the context in which it is used shall require.

21.9 Press Releases. Lessee shall not issue a press release or make any public statement with respect to this Lease or the Wind Energy Facility without the prior written agreement of Lessor with respect to the form, substance and timing thereof, except that Lessee may make any such press release or public statement when the releasing Party is advised by its legal counsel that such a press release or public statement is required by law, regulation or stock exchange rules, provided however, in such event, the Parties shall use their reasonable good faith efforts to agree as to the form, substance and timing of such release or statement.

21.10 No Joint Venture. Each Party will perform all obligations under this Lease as an independent contractor. Nothing herein contained shall be deemed to constitute any Party a partner, agent or legal representative of the other Party or to create a joint venture, partnership, agency or any relationship between the Parties. The obligations of the Lessee and Lessor hereunder are individual and neither collective nor joint in nature.

21.11 Joint Workproduct. This Lease shall be considered the workproduct of both Parties hereto, and, therefore, no rule of strict construction shall be applied against either Party.

21.12 Expenses. Each Party hereto shall pay all expenses incurred by it in connection with its entering into this Lease, including, without limitation, all attorneys' fees and expenses.

21.13 No Broker. Lessee and Lessor each represents and warrants to the other that it has dealt with no broker in connection with the consummation of this Lease, and in the event of any brokerage claims against Lessee or Lessor predicated upon prior dealings with the other Party, the Party purported to have used the broker agrees to defend the same.

21.14 Amendments; Binding Effect. This Lease may not be amended, changed, modified, or altered unless such amendment, change, modification, or alteration is in writing and signed by both of the Parties to this Lease or their successor in interest. This Lease inures to the benefit of and is binding upon the Parties and their respective successors and permitted assigns.

21.15 Nondiscrimination. Lessee agrees that it shall not, because of race, color, national origin, ancestry, age, sex, religion, physical or mental handicap, or sexual orientation, either (a) discriminate against any qualified employee, applicant for employment, subcontractor, or person or firm seeking to provide goods or services to Lessee, or (b) deny any person access to the Wind Energy Facility or to any activities or programs carried out in connection with the Wind Energy Facility. Lessee shall comply with all applicable federal and state statutes, rules, and regulations prohibiting discrimination in employment or public accommodation.

21.16 Survival. The provisions of Sections 6.1 (Surrender and Removal of Property), 6.2 (Title), 8.1 (Lessee's Duty), 13.4 (Failure to Commence Repairs), 14.1 (Remedies), 14.2 (Limitation of Liability), 16.5 (Lessee Liability Upon Termination), 16.6 (Additional Damages), 20.1 (Lessor's Environmental Representations and Warranties), 20.2 (Lessee's Obligations With Respect to Hazardous Materials), 20.3 (Notices of Release of Hazardous Materials), and Articles 12 (Indemnification) and 21 (Miscellaneous) shall survive the expiration or termination of this Lease for a period of three years; provided, however, the Lessee shall have no obligations under Section 8.1 (Lessee's Duty) after the receipt by Lessor of the Final Decommissioning Certificate.

21.17 Counterparts. This Lease may be executed in counterparts, each of which shall be deemed an original and all of which shall constitute one and the same agreement.

21.18 No Third-Party Beneficiaries. This Lease is intended solely for the benefit of the Parties hereto. Except as expressly set forth in this Lease, nothing in this Lease shall be construed to create any duty to or standard of care with reference to, or any liability to, or any benefit for, any person not a Party to this Lease.

21.19 Further Assurances. From time to time and at any time at and after the execution of the Lease, each Party shall execute, acknowledge and deliver such documents and assurances, reasonably requested by the other and shall take any other action consistent with the terms of the Lease that may be reasonably requested by the other for the purpose of effecting or confirming any of the transactions contemplated by the Lease. Neither Party shall unreasonably withhold, condition or delay its compliance with any reasonable request made pursuant to this Section.

21.20 Good Faith. All rights, duties and obligations established by this Lease shall be exercised in good faith and in a commercially reasonable manner.

21.21 Site Lease. The Parties agree that this Lease shall take effect and the obligations of the Parties shall arise only upon simultaneous execution by the Parties of the Lease of even date herewith.

21.22 Obligation to Modify Agreement Pursuant to Rules and Regulations under the Green Communities Act or other Actions by Governmental Authority. Upon implementation by the Massachusetts Department of Public Utilities, Massachusetts Department of Energy Resources or other Governmental Authority of any rule or regulation that may affect any provision of this Lease, in particular any rule or regulation regarding the provision of or eligibility for Net Metering, the Parties shall negotiate in good faith, shall amend this Lease to conform to such

rule(s) and/or regulation(s) to the greatest extent possible, and shall use best efforts to conform such amendment to the original intent of this Lease and to do so in a timely fashion.

21.23 No Limitation of Regulatory Authority. The Parties acknowledge and agree that Lessor is a municipal entity, and that nothing in this Lease shall be deemed to be an agreement by Lessor to issue or cause the issuance of any approval, authorization, or permit, or to limit or otherwise affect the ability of Lessor or the Commonwealth of Massachusetts to fulfill its regulatory mandate or execute its regulatory powers consistent with Applicable Legal Requirements.

[*Signature page to follow.*]

IN WITNESS WHEREOF, the Parties have executed this Lease under seal as of the Effective Date.

LESSOR
Town of Scituate, Massachusetts

By:_____
Joseph P. Norton, Selectman

By:_____
Richard W. Murray, Selectman

By:_____
John F. Danehey, Selectman

By:_____
Shawn Harris, Selectman

By:_____
Anthony V. Vegnani, Selectman

Approved as to Form:

By:_____
Mark C. Kalpin, Esq.
Special Town Counsel

Agreement as to Procurement:

By:_____
Patricia A. Vinchesi
Town Administrator

LESSEE
Scituate Wind LLC

By:_____

Name: Charles S. Eisenberg

Title: Manager

List of Exhibits to Lease

Exhibit A – The Premises
Exhibit B – Permitted Improvements

EXHIBIT A

DESCRIPTION OF THE PREMISES

Address:

161 Driftway, Scituate, Massachusetts 02066

Legal Description:

Town of Scituate Assessor's Map 59, Lot 1-2 more particularly described in a deed recorded in Book 3879, Page 703 at the Plymouth County Registry of Deeds of Massachusetts.

Description of the Premises (as further shown on the attached plan drawing):

A. A portion of the above described parcel not to exceed Fifteen Thousand (15,000) square feet located in the southern corner of the parcel, as approximately shown on the attached plan drawing, or such other location to be mutually agreed upon by the Parties (the "Lease Area").

B. An unrestricted access roadway from the Driftway to the portion described in paragraph A above as approximately shown on the attached plan drawing, or such other location and the dimensions of which to be mutually agreed upon by the Parties (the "Access Easement Area").

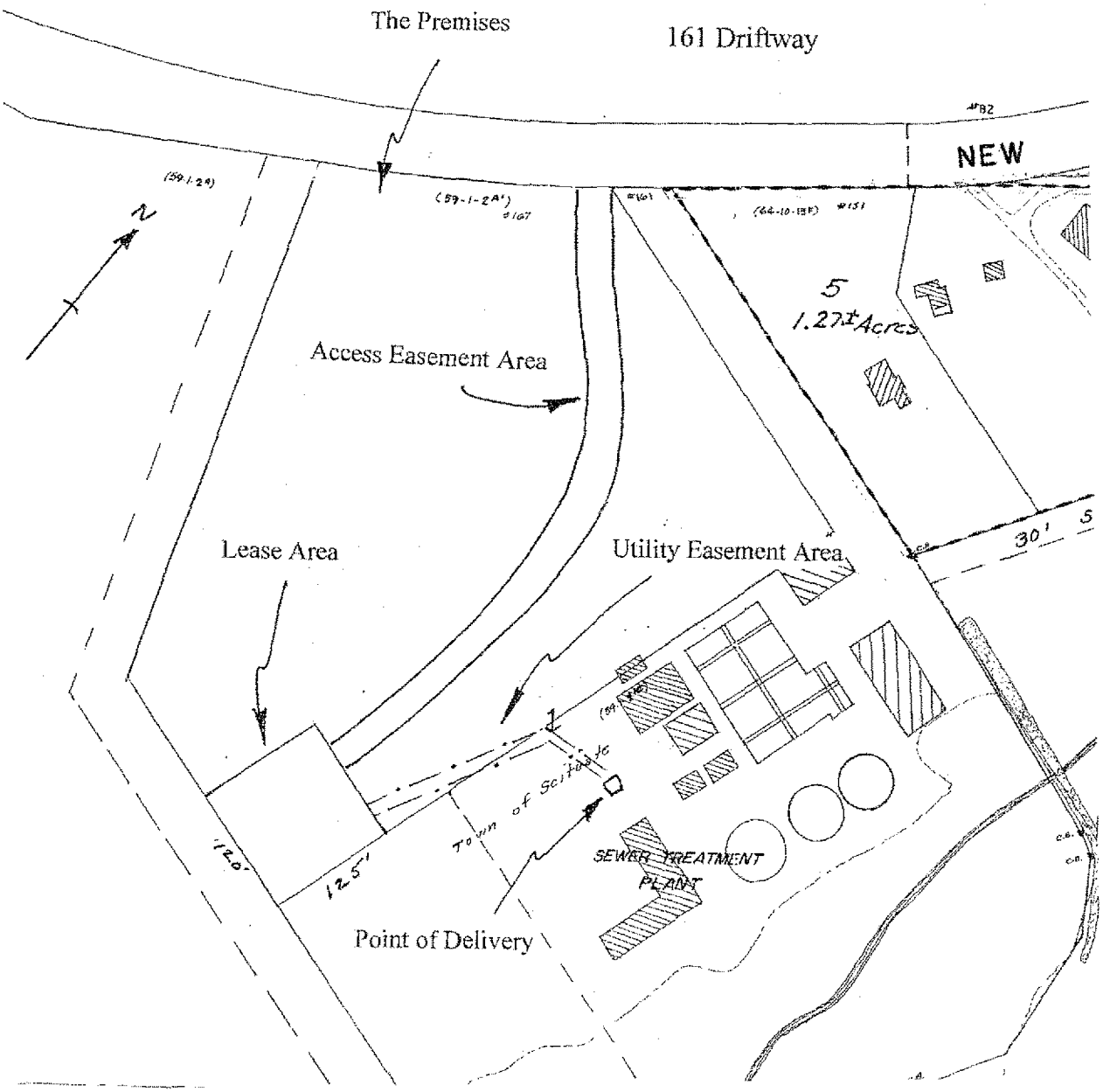
C. The use of a portion of the above described parcel not to exceed One Hundred, Forty-four Thousand (144,000) square feet located on the southern half of the property on a temporary basis as needed for the construction or decommissioning of the Wind Energy Facility, such location and the conditions of use to be mutually agreed upon by the Parties (the "Construction Easement Area").

D. A portion of the above described parcel from the Lease Area to the vicinity of the Sewer Treatment Plant as approximately shown on the attached plan drawing, or such other location and the dimensions of which to be mutually agreed upon by the Parties (the "Utility Easement Area").

Town of Scituate

Assessor's Map 59

161 Driftway



US1DOCS 7399817v4

EXHIBIT B

DESCRIPTION OF THE PERMITTED IMPROVEMENTS

Wind Energy Facility Manufacturer	Sinovel Culture Building No.59 Zhongguancun Street Haidian,Beijing China 100872 Tel : +8610 62515566 Fax : +8610 82500072 Web : www.sinovel.com
Nameplate Capacity	1.5 MW
Estimated Annual Energy Production	4,187,617 kWh
Preliminary Specifications:	Type: SL1500/82 Wind Zone Class: IEC Ⅱ/Ⅲ Rated power(kW): 1500 Cut-in speed(m/s): 3 Cut-out speed(m/s): 20 Rated wind speed(m/s): 10.5 Survival wind speed(m/s): 52.5/59.5 Operational ambient temperature(C): Normal temperature -15~+45 Low temperature -30~+45 Survival ambient temperature(C): Normal temperature -25~+45 Low temperature -45~+45 Rotor diameter(m): 82.9 Blade length (m): 40.25 Num. of blades: 3 Two planetary stages + One spur gear stage Double-fed asynchronous, water cooling Rated output voltage(V): 690 Frequency(Hz): 60 Power factor: Capacitive 0.95 ~ Inductive 0.9 Electromechanical pitching Air brake: Blade independent pitching Mechanical brake: Active hydraulic disc brake PLC + Remote control Structure Steel tubular tower Hub height(m): 80
Appurtenant Facilities	Pad Mounted Transformer-type to be determined after further engineering studies

MEETING OF THE BOARD OF SELECTMEN

TUESDAY, JANUARY 7, 2014

SELECTMEN'S CHAMBERS – TOWN HALL

5:30 PM

1. **5:30 PM/ MEETING CALLED TO ORDER**

2. **ACCEPTANCE OF AGENDA**

3. **MEET NEW COUNCIL ON AGING DIRECTOR/ Linda P. Hayes**

4. **RECOGNITION/ SCITUATE FIREFIGHTERS – Elliot, Sanborn, McDonough, Norlin and Bulman**

5. **PRESENTATION/ Wind Turbine "Flicker Study"/ A. Bangert**

6. **DISCUSSION/ VOTE/ Building Permit Fee for Solar Array**

7. **DISCUSSION/ VOTE/ Interfund Borrowing for School Department/ P. Avitabile**

8. **AWARD CONTRACT/ Water Pipes & Fittings/ #13-WA-66/ K. Cafferty**

9. **UPDATE/ Market & Economic Development Study/ L. Harbottle**

10. **DISCUSSION/ VOTE/ EXECUTE/ Contract Authorization & Agreement for State Library Construction Grant**

11. **FY15 OPERATING & CAPITAL BUDGET OVERVIEW/ T. Administrator**

12. **DISCUSSION/ FY15 BUDGET HEARINGS**
    - **610 Library**
    - **141 Assessors**
    - **161 Town Clerk**
    - **241 Inspections**
    - **176 Zoning Board of Appeals**
    - **61 Widow's Walk**
    - **135 Finance Director/Town Accountant**

13. **WALK-IN PERIOD**

14. REPORT & "The Week Ahead" / Town Administrator

15. AWARD CONTRACT/ Golf Course Maintenance / T. Administrator

16. AWARD CONTRACT/Schematic Design/Public Safety Complex T. Administrator

17. DISCUSSION/ RE-VOTE/ Donation of Land/ Larsen / Shadwell Road

18. APPOINTMENTS/Public Building Commission/User Members/Library Project

19. OTHER BUSINESS – Correspondence, Regular Session Minutes 12/17/14, Executive Session Minutes(no release), 1/22/13, 6/18/13, 7/23/13, 8/21/13, 12/17/13

20. ADJOURNMENT & SIGNING OF DOCUMENTS

_____

Shawn Harris, Chairman

MINUTES OF MEETING

BOARD OF SELECTMEN

JANUARY 7, 2014

Present: Harris, O'Toole, Danehey, Vegnani

Patricia A. Vinchesi, Town Administrator

1. The meeting was called to order at 5:30 PM.

2. ACCEPTANCE OF AGENDA
   Danehey. Seconded O'Toole. 4-0

3. COA Director/ Linda Hayes

Shawn welcomed Ms. Hayes. O'Toole the liaison. Was asst. director in Duxbury, activities coordinator – great experience – thrilled to be here. Slightly smaller senior population there – 5,000. Danehey – great opportunity – Town in transition – in the midst of it and you can have a huge impact – thank you for coming aboard. Veg – a priority of the Board to get that going – please don't hesitate to come and see us. She thanked the Board.

4. Recognition of Scituate Firefighters – Elliot Sanborn and Norlin, Chief Judge.

Read by O'Toole. And Chief handed out proclamations from the State – Representations & the Senate. Very proud of these guys. At the MIT ceremony – very wonderful event.

5. Presentation/ Wind Turbine – "Flicker Study"/ A. Bangert

Al – introduced people from Vermont – 2010 – Town and Scituate Wind LLC – permit to erect turbine next to the plant for renewable energy. Study of shadow flicker was part of application. Hired Atlantic Design Engineers – out of Cape Cod – mathematics of the sun through the sky, blades. Flicker impact at 151 Driftway – 51 hours per year – late fall and early spring. Mitigation - $20,000 cash and fir trees. 151 Driftway resident – greater flicker than predicted – spoke at Town Meeting – 3 hours per day. Mass. Clean energy comm. – EAPC Energy services – Norwich, VT. to determine if things had changed since earlier study. Eliz. King and Chester Harvey from EAPC> Nils Bulgin – Mass. Clean Energy Ctr. Found folks and paid for study. Seth Pickering.... (ask Al),

Chester – rotating blades cast a shadow – pulsing. Power Point presentation. 683 receptors – every parcel within a 1.5 kl radius of turbine. 580 residential receptors. 6 residences within the 500 meters of the turbine. 10 receptors showing more than 10 hrs. of flicker per year and 3 receptors showing more than 30 hours of flicker per year. Chester – hours of flicker really fall off quickly. Veg – model does not take trees or homes into effect. "Line of Sight Survey".

Summary 700 receptors – 10 buildings are experiencing more than 10 hours of shadow flicker per year. Bangert – size of receptors were different between studies. Also a difference in assumption of hours operating (this one 23 hours/day) the other study had 20 hours/day) Model is wind speeds for an entire year – Chester. Used times it was hypothetically operational. Al – because there is a difference between 51 (optimal) and what this group found – 69 and are we are looking at mitigating ideas – large walls – like on highway. Scituate Wind and DPW are working on that specifically for 151. Danehey – how about window – special awnings or blinds. Al – yes – funds were provided to the homeowner when it was known there would be some flicker and we are looking for something additional. O'Toole – wind farm trying to block flicker – netting like golf course – very high – does not allow light, but allows wind through. Veg – have we put trees on Town property as well as theirs? Yes (and a berm on T. property). Board thanked them for traveling.

- **REPORT FROM TA AND CHIEF JUDGE – storm report**

Chief Judge – 4 high tide cycles that flooded – progressively got worse. Best response that we had from the residents – not one call for an evacuation from this storm. Thanked residents. Flooding in the usual spots. DPW and public grounds did quick work to get the roads open. Police and Fire – residents made our job easy and staying off the roads was big, too. Blizzard conditions out there. Plowing people kept up with it. Had to clean beach roads afterwards to get stones and sand off. TA – Glades is completely undermined again – hit hard. 51 calls for service – Police – 38 were officer iniated – compared – last year – 157 calls. High tide flooding was 2' less. Harbor building – wet carpet. Scituate maritime center was fine. 6 photos. DPW has been inventorying the infrastructures. East side of Mushicut pond – a good portion of the berm is gone – CZM coming out for field site tomorrow – very costly to repair. Deck pieces floating down Oceanside and Surfside – clogs catch basins. Seawall at 100 and 110 Oceanside – top portion severed from a solid base. Another item for repair. West end of 4th cliff where army base is – brought to the attention about the erosion – yesterday – eroded further – the roadway has caved in. TA thanked Police, Fire, DPW started a 3AM the night of the storm and have not stopped, Mike Breen and crew, Kevin Cafferty, contingency plans for various areas, the frequency of our storms are escalating over the last couple of years. Thanked John Roser and Bill Sheehan posting storm advisories. Twitter account and PAV tweeted storm advisories. Even if cable is down tweeting allows for updates. Cantwell, Bradley, Markey and Governor were all heard from. Utilities – heard from every company this storm and able to post them. National grid was in Town. Veg – thanked PAV and stayed here 48 hours and saw Chief in building and put in a ton of hours.

6. Solar Array Permit Fee

Harris – 1% for $86,000 for building permit – here to discuss. Al & Derek Dejou from NYC with Scituate Solar LLC for our Solar Array. Building Fee based upon 1% cost of constructing a house. ($250,000 or a $2,500 building fee). They paid $86,147 for a building fee – doesn't really represent the amount of work the Town had to do in terms of inspecting it. Fees vs. taxes. Has asked that Building Permit be abated by 50% down to a $43,000 fee – still exceeds our costs by a lot and we would refund the balance. This subject would have been brought up a while ago,

AMENDED AGENDA

MEETING OF THE BOARD OF SELECTMEN
TUESDAY, AUGUST 5, 2014
SELECTMEN'S CHAMBERS – TOWN HALL
7:00 P.M.

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**

WALK INS

REPORT OF THE TOWN ADMINISTRATOR

SCHEDULED ITEMS:

7:10 **MEET AND GREET** Natalie Quinn - School Resource Officer

7:20 **DISCUSS/VOTE** Outdoor Entertainment Permit Peggotty Beach

7:25 **PUBLIC HEARING** Transfer Liquor License JW Burger Bar – Kara Tondorf

7:30 **DISCUSS/INTERVIEW** FY 2015 Board & Committee Applicants

7:40 **DISCUSSION** Wind Turbine – Scituate Wind LLC, Gordon Deane
1. Noise Testing Update
2. Turbine Update

7:50 **DISCUSS/VOTE** Eastern Minerals Contract – Kevin Cafferty

8:00 **DISCUSS/VOTE** Architectural Contract Scituate Public Library

NEW BUSINESS

1. **DISCUSS/VOTE** One Day Liquor Licenses for the following:
   - Front Street Gourmet – August 8 SHCB 5 pm-9 pm
   - Ellen MacKenzie Catering – August 15 SMC 5 pm-9 pm
   - Silent Chef – August 16 SMC 6 pm-10 pm
   - Hospitable Hostess – 2 events
     - August 24 SMC 6 pm-10 pm
     - September 21 SHCB 2 pm-6 pm
   - Riva – 4 events
     - August 17 SMC 11 am - 2 pm
     - August 29 SMC 6 pm – 9 pm
     - September 6 SHCB 6 pm – 10 pm
     - September 20 SMC 4 pm – 8 pm
2. **DISCUSS/VOTE** State Primary Polling Hours, September 9, 2014, SHS Gym

3. **DISCUSS** Board of Selectmen Vacancy
4. **DISCUSS** August 19, 2014 Board of Selectmen Meeting
5. **VOTE APPOINTMENTS**
    - Board/Committee Appointments
    - Liaison Positions

OTHER BUSINESS:

1. Correspondence
2. Adjournment and Signing of Documents

EXECUTIVE SESSION

1. To consider the purchase, exchange, lease or value of real property if the chair declares that an open meeting may have a detrimental effect on the negotiating position of the public body.

Gordon-

We performed the third round of sound sampling on Tuesday, June 3rd. After reviewing the latest surface and 80 meter wind forecasts and power production information with Sumul, we decided to proceed with the sound sampling even though the forecast called for the winds to decrease later in the early morning hours. Winds were from the south-southwest and steadily increasing during the evening. By the time we started the sampling at midnight, power production was around 1,000 kW. It appeared to be an excellent night to capture this mid-range power production and maximum sound levels, with light winds at the surface and good hub height wind speeds of 8 m/s or greater. A review of upper air sounding data from Chatham, MA showed an inversion condition was occurring (i.e., the condition under which the neighbors wanted the sampling to occur).

Ryan began sampling at 127 Gilson Road and for the first 3 monitoring locations power production and hub height wind speeds were good, but they were declining over time. Once Ryan had gotten to 151 Driftway (McKeever) around 2:00 a.m., average power production was below 300 kW and the average hub height wind speed was 5 m/s. Although power production and wind speeds were continuing to decrease, Ryan decided it made sense to continue the monitoring at 151 Driftway since it was possible power production and wind speeds could improve. Upon completing the sampling at 151 Driftway, power production and hub height wind speeds were continuing to drop. However, Ryan decided to finish the sampling round at the last location (56 Moorland Road) to collect a complete sampling round.

Table 1 presents the Lmax to L90 comparison. The sound level increases ranged from 3.8 dBA at 56 Moorland Road to 6.5 dBA at 149 Gilson Road. Table 2 presents the L90 to L90 comparison. The sound level increases ranged from 1.2 dBA at 56 Moorland Road to 3.9 dBA at 149 Gilson Road.

According to your March 24th email, the "Board left the SW sampling in place with a goal of getting wind speeds between the August and the March readings. The statement was between 5-11 m/s." [See Table 3.] ...

If you have any questions, or would like to discuss further, please let me know.

-Marc

Marc C. Wallace, QEP
Principal
TECH ENVIRONMENTAL
Focused Knowledge. Real Solutions.
Hobbs Brook Office Park
303 Wyman Street, Ste. 295
Waltham, MA 02451

ph: (781) 890-2220 x30
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email: mWallace@TechEnv.com
web: www.TechEnv.com

LISTING OF ACOUSTIC SAMPLING FOR THE SCITUATE WIND PROJECT (dBA)

	August 14-15, 2013 Sampling			March 15, 2014 Sampling			June 3, 2014 Sampling			SUMMARY	
										Combined Ranges	
Hub Height Wind Speed Range	3.8 to 5.8 m/s (8.5-12.9 mph)			5.1 to 18.6 m/s (11.4 to 41.5 mph)			2.5 to 10.3 m/s (5.6 to 23 mph)			2.5-18.6 m/s (5.6 to 41.5 mph)	
10 Meter Wind Speed Range	0 to 1.3 m/s (0 to 3 mph)			3.6 to 6.7 m/s (8 to 15 mph)			0 to 1.6 m/s (0 to 3.5 mph)			0 to 6.7 m/s (0 to 15 mph)	
Wind Direction	Westerly[1]			South-Southwesterly[2]			South-Southwesterly[2]			West & South-Southwesterly	
Tide	Low			High			Intermediate			Low, High, Intermediate	
Turbine Production	158-455 kW; average 320 kW			767-1565 kW; average 1489 kW			105-1165 kW; average 561 kW			158-1565 kW	
L_{max} to L_{90} COMPARISON											
Residential Location	5-Minute Ambient L_{90} Level (Turbine OFF)	1-Second L_{max} Level (Turbine ON)	Net Increase	5-Minute Ambient L_{90} Level (Turbine OFF)	1-Second L_{max} Level (Turbine ON)	Net Increase	5-Minute Ambient L_{90} Level (Turbine OFF)	1-Second L_{max} Level (Turbine ON)	Net Increase	Minimum Net Increase	Maximum Net Increase
#151 Driftway	49.0	50.5	1.5	44.8	51.8	7.0	41.2	47.0	5.8	1.5	7.0
#56 Moorland Road	34.8	38.7	3.9	47.3	NA	NA	36.8	40.6	3.8	NA	3.9
#149 Gilson Road	33.6	35.2	1.6	40.5	45.9	5.4	36.0	42.5	6.5	1.6	6.5
#122 Gilson Road	31.2	34.5	3.3	41.7	43.9	2.2	37.1	42.7	5.6	2.2	5.6
#127 Gilson Road	35.3	36.4	1.1	38.0	43.0	5.0	38.4	42.5	4.1	1.1	5.0
L_{90} to L_{90} COMPARISON											
Residential Location	5-Minute Ambient L_{90} Level (Turbine OFF)	5-Minute L_{90} Level (Turbine ON)	Net Increase	5-Minute Ambient L_{90} Level (Turbine OFF)	5-Minute L_{90} Level (Turbine ON)	Net Increase	5-Minute Ambient L_{90} Level (Turbine OFF)	5-Minute L_{90} Level (Turbine ON)	Net Increase	Minimum Net Increase	Maximum Net Increase
#151 Driftway	49.0	49.9	0.9	44.8	50.9	6.1	41.2	44.9	3.7	0.9	6.1
#56 Moorland Road	34.8	37.6	2.8	47.3	48.0	0.7	36.8	38.0	1.2	0.7	2.8
#149 Gilson Road	33.6	35.2	1.6	40.5	43.7	3.2	36.0	39.9	3.9	1.6	3.9
#122 Gilson Road	31.2	33.0	1.8	41.7	42.2	0.5	37.1	40.6	3.5	0.5	3.5
#127 Gilson Road	35.3	35.9	0.6	38.0	42.0	4.0	38.4	41.7	3.3	0.6	4.0

[1] 10 meter wind speed and direction from Marshfield Airport

[2] 10 meter wind speed and direction from NWS Plymouth Airport as Marshfield Airport data not available

TABLE 1

L_{max} to L_{90} COMPARISON FOR THE SCITUATE WIND PROJECT (dBA) JUNE 3, 2014

Residential Location	5-Minute Ambient L_{90} Level (Turbine OFF)	1-Second L_{max} Level (Turbine ON)	Net Increase
#151 Driftway	41.2	47.0	5.8
#56 Moorland Road	36.8	40.6	3.8
#149 Gilson Road	36.0	42.5	6.5
#122 Gilson Road	37.1	42.7	5.6
#127 Gilson Road	38.4	42.5	4.1

Note: DEP Noise Policy limits the increase in the ambient level to 10 dBA.

1. During these compliance tests, three 5-minute samples were taken with the turbines on, and three 5-minute samples were taken with the turbines off. In Tables 1 and 2, the "Turbine Off" value is the lowest of the three 5-minute L_{90} levels, and the "Turbine On" value is the average of the three highest one-second L_{max} levels.

2. Hub height wind speeds ranged from 2.5 to 10.3 m/s (5.6 to 23 mph) from a south-southwest direction.

3. Hourly 10-meter wind speeds ranged from 0 to 1.6 m/s (0 to 3.5 mph) from a south-southwesterly direction based on NWS Plymouth Airport wind data. Marshfield Airport wind data is unavailable.

4. Sampling was performed during an intermediate-tide event.

TABLE 2

L_{90} to L_{90} COMPARISON FOR THE SCITUATE WIND PROJECT (dBA) JUNE 3, 2014

Residential Location	5-Minute Ambient L_{90} Level (Turbine OFF)	5-Minute L_{90} Level (Turbine ON)	Net Increase
#151 Driftway	41.2	44.9	3.7
#56 Moorland Road	36.8	38.0	1.2
#149 Gilson Road	36.0	39.9	3.9
#122 Gilson Road	37.1	40.6	3.5
#127 Gilson Road	38.4	41.7	3.3

Note: DEP Noise Policy limits the increase in the ambient level to 10 dBA.

1. During these compliance tests, three 5-minute samples were taken with the turbines on, and three 5-minute samples were taken with the turbines off. In Tables 1 and 2, the "Turbine Off" value is the lowest of the three 5-minute L_{90} levels, and the "Turbine On" value is the average of the three 5-minute L_{90} levels.

2. Hub height wind speeds ranged from 2.5 to 10.3 m/s (5.6 to 23 mph) from a south-southwest direction.

3. Hourly 10-meter wind speeds ranged from 0 to 1.6 m/s (0 to 3.5 mph) from a south-southwesterly direction based on NWS Plymouth Airport wind data. Marshfield Airport wind data is unavailable.

4. Sampling was performed during an intermediate-tide event.

TABLE 3

POWER PRODUCTION AND WIND SPEED SUMMARY
FOR THE SCITUATE WIND PROJECT
JUNE 3, 2014

Residential Location	Sampling Time (hrs, min, sec) (Turbine ON)	Average Power Production (kW) (Turbine ON)	Average Hub Height Wind Speed (m/s) (Turbine ON)
#151 Driftway	02:10:55 – 02:26:39	285.2	5.0
#56 Moorland Road	03:11:56 – 03:27:39	157.6	3.8
#149 Gilson Road	01:18:09 – 01:34:17	621.5	6.5
#122 Gilson Road	00:57:08 – 01:13:03	784.0	7.2
#127 Gilson Road	00:01:14 – 00:17:15	950.2	7.8

the summer. The cost of salt is expected to increase by at least $10.00 per ton. By having the new salt shed the Town is expected to save $25,000.00.

Mr. Vegnani made a MOTION that the Board of Selectmen approve the contract for the supply of road salt to Eastern Salt for $50.52 per ton up to 2500 tons. SECONDED by Mr. O'Toole. Unanimous vote (4-0).

NEW BUSINESS:

2. Discussion/Vote State Primary Polling Hours, September 9, 2014, SHS Gym. The Town Clerk was present for this discussion. She explained that the polling hours are dictated by the State and this vote by the Board to set the hours was a formality.

Mr. O'Toole made a MOTION that the Board of Selectmen vote to approve the polling hours from 7 AM to 8 PM for the State Primary Mr. Vegnani SECONDED. All in favor. Unanimous vote (4-0).

SCHEDULED ITEMS

7:25 PM Public Hearing Transfer Liquor License JW Burger Bar. Kara Tondorf and Michael Tondorf were present for this application. She and Michael are the current owners of Riva's and will be purchasing JW Burger Bar. There are no changes planned at this time. Keeping the operation as it is for the present.

Mr. O'Toole made a MOTION to approve the transfer of JW's Burger Bar to Grateful Haven LLC. SECONDED by Mr. Vegnani. All in favor. Unanimous vote (3-0). Mr. Danehey recused himself from voting on this application.

7:30 PM FY 15 Board & Committee Appointments

Mr. Joseph Hannon was present to discuss his application for Conservation Commission, ZBA or North River Commission. He is a Registered Professional Engineer. He is a coach. He likes to be involved, and he felt his skills in engineering would be an asset to the Town. He stated that he felt the schedule of ZBA would be better for him. The Chairman asked him to contact both committees to get a better understanding of their work, and he thanked him for applying and coming to the meeting

Ms. Mary Tennaro was present to discuss her application for the Beautification Committee. She has been a volunteer for eight years, doing three gardens. The Chairman of Beautification, Donna Bangert, asked her to become a member and she agreed to apply. Mr. Danehey thanked her for her attendance and informed her that their vote would take place at the end of the meeting.

7:40 PM Discussion Wind Turbine: Noise Testing Update and Turbine Update. Present for this discussion is Gordon Deane and Sumul Shah of Scituate Wind LLC.

Mr. Deane explained that the DEP requirement is the noise from the turbine cannot be more than 10 decibels over ambient noise. Their testing (three rounds of testing at five locations east of the turbine) has determined that the levels are no higher than 7 decibels. One final round of testing remains.

Turbine update: the problem seems to be synchronizing with the grid. Apparently a faulty converter unit. They will be removing the converter and putting in a new one. All signs point to this being the issue. They are working nights to correct this problem. A lightning strike could have caused the damage to the unit. Mr. Bangert explained that it is written into the contract with Scituate Wind LLC that the Town is compensated for any loss credit. In other words, the Town is being made whole through the contract we have in place.

8 PM Discussion/Vote Architectural Contract/Scituate Public Library

OPM Mr. Joe Sullivan of Dadealus Projects was present to discuss the award of the Architectural Contract for the Library.

Mr. Harris made a MOTION that the Board award the contract for architectural services for the Scituate Public Library to Oudens Ello Architecture of Boston, MA for a sum not to exceed $820,000. SECONDED by Mr. Vegnani. All in favor. Unanimous vote (4-0).

New Business:

1. Discuss/Vote One Day Liquor Licenses for the following:

Front Street Gourmet – August 8 SHCB 5 pm-9 pm
Ellen MacKenzie Catering – August 15 SMC 5 pm-9 pm
Silent Chef – August 16 SMC 6 pm-10 pm
Hospitable Hostess – 2 events
- August 24 SMC 6 pm-10 pm
- September 21 SHCB 2 pm-6 pm

Riva – 4 events
- August 17 SMC 11 am - 2 pm
- August 29 SMC 6 pm – 9 pm
- September 6 SHCB 6 pm – 10 pm
- September 20 SMC 4 pm – 8 pm

The Board of Selectmen voted unanimously to approve all of the above one day liquor licenses. (4-0)

3. Discuss Board of Selectmen Vacancy. The Town Clerk was present to discuss the various options for an election to fill the vacancy created by Mr. Murray. The Board felt that this seat should be filled and not left empty until the spring election. The best solution would be to piggy-back on the November State election. The Board will vote to hold the election for this seat on the same date as the State Election at their next scheduled meeting of the 19th of August.

5. Vote Appointments.

Mr. Harris made a MOTION to appoint Mary Tennaro to the Beautification Commission . SECONDED by Mr. Vegnani. All in favor. Unanimous vote (4-0).

AGENDA REVISION II
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, OCTOBER 4, 2016 7:00 P.M.
SELECTMEN'S CHAMBERS – TOWN HALL

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**

WALK INS

7:05 **REPORT OF THE TOWN ADMINISTRATOR**

1. Water Update - Sean Anderson, Water Superintendent and Kevin Cafferty, DPW Superintendent
2. DPW Project Updates – Kevin Cafferty, DPW Superintendent
3. **DISCUSS/VOTE** – Cushing Road
4. Other Items

SCHEDULED ITEMS:

7:25 **DISCUSS/VOTE** Special Event Application, Scituate Wind Turbine Tour, Larry Chretien, Mass Energy Consumer Alliance

7:35 **INTERVIEW** Board & Committee Applicant Beach Commission

7:40 **DISCUSS/VOTE** Building Move, Union Street – Old Country Way, Chick Fagan

7:50 **DISCUSS/VOTE** Cranberry Vine Catering & Events, Kathryn Hackett, Christie Edgren

8:00 **DISCUSS/VOTE** 10/19/16 Special Town Meeting Warrant, Patricia Vinchesi, Town Administrator, John McCarthy, Superintendent of Schools, Kevin Cafferty, DPW Superintendent, Nancy Durfee, Coastal Resource Officer, Stephen Mone, Harbormaster, Patricia Lambert and Andrea Hunt, Citizen Petition

a) **DISCUSS/VOTE** Surplus Land Greenbush and Change from Original Purpose

8:30 **DISCUSS/VOTE** Town Counsel Appointment

8:45 **DISCUSS/VOTE** GATRA Update & Service, Frank Gay, Regional Administrator

9:00 **DISCUSS/VOTE** Phase 1 Wayfinding Sign Locations, Laura Harbottle, Town Planner, & Colin McNeice, Economic Development Commission

9:20 **DISCUSS** Sale of Land – Greenbush Development, Mike Travaline, JLL

NEW BUSINESS:

1. **DISCUSS/VOTE** – Board & Committee Appointment Beach Commission
2. **DISCUSS/VOTE** One Day Wine & Malt Licenses
   a. Hospitable Hostess @ SMC 10/9/16, 1:00-5:00 p.m. for baptism reception
   b. Hospitable Hostess @ Scituate Beach Association 10/14/16, 6:30-10:30 p.m. for Wampatuck PTO event
   c. Hospitable Hostess @ Lucky Finn, 10/29/16, 5:00-9:00 p.m. for bridal shower
   d. Silent Chef @ SMC 10/18/16, 4:00-10:00 p.m. for business event

OTHER BUSINESS:

1. Correspondence

2. Approval of Meeting Minutes
3. Adjournment and Signing of Documents

EXECUTIVE SESSION:

9: 45 EXECUTIVE SESSION

To consider the purchase, exchange, lease or value of real property. - Greenbush

RECONVENE IN OPEN SESSION
DISCUSS/VOTE Sale of Land – Greenbush Development, Mike Travaline, JLL

EXECUTIVE ACTION REQUEST
Board of Selectmen

REQUESTED BY: Anna Vanderspek with Mass Energy Consumers Alliance

ON: 9/20/16

TITLE: Approval for the Scituate Wind Turbine Tour

INDIVIDUALS INVITED BY PROPONENT TO BE PRESENT: None needed

BACKGROUND INFORMATION SUBMITTED:

A Special Events Permit Application has been submitted by Anna Vanderspek with Mass Energy Consumers Alliance:

- Mass Energy Consumers Alliance is requesting an event on 10/15/16 from 11:00am to 1:00pm to celebrate Scituate turbine with Mass Energy members. A brief talk and refreshments will be served, followed by a walk along the Driftway to GoGreen to see the wind turbine

ACTION SOUGHT: Move to approve the Scituate Wind Turbine Tour

---

SUGGESTED MOTION:

- Move to approve the Scituate Wind Turbine tour located along the Driftway on 10/15/16, 11:00am – 1:00pm

---

Chairman: Martin J. O'Toole

Scheduled for meeting on: October 4, 2016

EXECUTIVE ACTION REQUEST
Board of Selectmen

REQUESTED BY: Anna Vanderspek with Mass Energy Consumers Alliance

ON: 9/20/16

TITLE: Approval for the Scituate Wind Turbine Tour

INDIVIDUALS INVITED BY PROPONENT TO BE PRESENT: None needed

BACKGROUND INFORMATION SUBMITTED:

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ACTION SOUGHT: Move to approve the Scituate Wind Turbine Tour

---

SUGGESTED MOTION:

- Move to approve the Scituate Wind Turbine tour located along the Driftway on 10/15/16, 11:00am – 1:00pm

---

Chairman: Martin J. O'Toole

Scheduled for meeting on: October 4, 2016

SPECIAL EVENT PERMIT

Event: **Scituate Wind Turbine Tour**
Date: **October 15, 2016**

POLICE:
I do not see any issues with this event. Please contact me if you have any further questions.

FIRE:
Ok with fire

DPW:
I do not see any issues

BUILDING:
Certainly sounds like a worthwhile event. No direct effect on this department. Bob Vogel

HEALTH:
Jennifer: They need to apply for a temporary food permit. The application and checklist are on our website.
Antonetta forwarded Jennifer's email to Anna Vanderspek.

RECREATION:
Ok with Rec

FACILITIES:
OK with KK

HARBORMASTER:
Harbormaster has no issue

SELECTMEN or TOWN ADMINISTRATOR:

Approval _____ Denial _____

Comments:

SPECIAL EVENTS PERMIT APPLICATION

The application, together with any supplementary information and fees as may be required by the Town of Scituate, must be submitted to the Town Administrator's Office at 600 Chief Justice Cushing Highway, Scituate, MA 02066, not less than thirty (30) business days prior to the special event date to insure proper processing.

Please answer all questions. If they do not apply, put N/A. Thank you.

APPLICANT INFORMATION

Applicant's Name : Anna Vanderspek

Company/Organization: Mass Energy Consumers Alliance

Mailing Address: 284 Amory St., Boston, MA 02130

Telephone: 617-524-3950 ext. 152 **Cell Phone:** 617-460-5726

Email: anna@massenergy.org **Fax:** 617-524-0776

EVENT INFORMATION

Name of Event: Scituate Wind Turbine Tour

Event Date/s: 10/15/16 **Time/s:** 11:00 am - ~~12:30~~ pm 1:00 pm

Set up Date/Time: 10/15/16, 10:30 am **Take Down Date/Time:** 10/15/16, ~~1:00~~ pm 12:30 pm per Anna 9-20-16

Event Location: Conservation Park (on the Driftway)

Facilities Requested (check as many as applicable)

Park: Yes **Street:** No **Sidewalk/Trail:** Just for walking

Public: Yes **Private:** **Other:**

Purpose & Description of Event: Event to celebrate Scituate turbine with Mass Energy members. Brief talk and refreshments (1 table) on grassy area, followed by walk along Driftway to GoGreen to see wind turbine. (Permission already granted from GoGreen)

ATTENDANCE

Estimated Total Attendance: 50 (max) **Registered Participants:** Reg. not yet open.

Volunteers: 0 **Staff:** 6

SEP 20 PM 1:00

Revised 11/15

EVENT SITE PLAN

Attach event map and site plan with the following indicated:

- ✓ Detailed event layout/route with directional arrows, street names
- ✓ Placement and collection of signage, traffic control device, barricades
- ✓ Location of event staff, volunteers, traffic certified flaggers/monitors, and where police officers are needed

Transportation and parking plans: Parking in Conservation Park parking lot. Overflow parking (if needed) at Widow's Walk Golf Course (am speaking with Bob) or MBTA lot down the street.

Plans for security/crowd control, first aid/medical assistance, and traffic route/intersection control: We have cones and signs for parking and will also dedicate 2 staff to help attendees arrive. We host many events for our members and will have 5-6 Mass Energy staff to make sure attendees are secure and safe.

Plans for portable toilets, garbage, sanitation and clean-up: Portable toilet already at Conservation Park. We will bring bins for any trash/recycling produced at event
Park. We will bring bins for any trash/recycling produced at event

Plans for notifying all agencies, businesses, and residents impacted by your event: Already in contact with Bob from Widow's Walk Golf Course, GoGreen, and Lindsay Dean-Mayer and Sumul Shah (responsible for turbine).

Will food and/or liquor be distributed/sold at event: No ☐ Yes ☑ (please explain plans)
We will have free light refreshments for attendees (most likely baked goods and cider).

Will there by signage? No ☑ Yes ☐

In accordance with section 710.6 of the Scituate zoning bylaw, permission to erect temporary event signs shall be given only by consent of the Building Commissioner

INSURANCE REQUIREMENT

For special events involving the use of Town facilities or public right-of-way, proof of liability insurance with coverage in the amount of $1,000,000.00 per occurrence, unless an additional amount is required for the activity by the Town Administrator.

The Town Administrator may allow a lower amount or waive this requirement when the event is not open to the general public and the risks presented by the request justify a lower amount.

Revised 11/15

Said general liability insurance for bodily injury and property damage shall include the Town of Scituate, 600 Chief Justice Cushing Highway, Scituate, MA 02066 as an additional named insured on the policy of insurance which shall include a provision prohibiting cancellation of said policy except upon at least 30 days' prior written notice to the Town.

HOLD HARMLESS

The applicant agrees to defend, indemnity, and hold harmless the Town of Scituate, its appointed and elective officers and employees, from and against all loss of expense, including but not limited to judgments, settlements, attorney's fees and costs by reason of any and all claims and demands upon the Town of Scituate, its elected or appointed officials or employees directly or indirectly arising out of the permit issued hereunder for the event scheduled. Said individual also assumes all legal responsibility for their own negligence or omissions in regards to other participants in this event.

FEDERAL, STATE & LOCAL LAWS, ORDINANCES & CODES

All terms, conditions and provisions of current law, including but not limited to Town of Scituate Code shall remain in full force and effect and shall not be altered by this permit. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other State or local law regulating use of public property.

The Town Administrator or appointee, may revoke or terminate this application/permit if applicant fails to comply with any or all of its provisions, requirements or regulations as herein set forth or through willful or unreasonable neglect fails to heed or comply with notices given him/her.

The applicant certified that he/she has read and examined this application and know the same to be true and correct and agrees to comply with the terms and conditions contained herein.

Anna Vanderspek Digitally signed by Anna Vanderspek Date: 2016.09.20 12:31:38 -04'00'

Signature of Applicant

9/20/16

Date

For Use By Town Staff Only

Department Approvals:

Administration: _____ BOS: _____ Police Dept: _____

Fire Dept: _____ DPW/Highway: _____ DPW/PG: _____

Board of Health: _____ Building/Inspections: _____ Harbormaster _____

Recreation Director: _____

Please note any additional conditions of approval by your department:

Revised 11/15

COMMUNITY IMPACT

TOWN STREETS

- [ ] Blocked (Barriers, or blockage of more than one hour)
- [ ] Blocked (Less than one hour)

Explanation: _____

- [ ] Parade (Route, etc.) *Please provide a map of the planned route*
- [ ] Other *(please explain)* _____

_____

PUBLIC FACILITIES

- [✓] Park
- [ ] Buildings
- [ ] Docks, Piers, Floats
- [ ] Other

TOWN PERSONNEL IMPACT

- [ ] Police Dept. – Estimated hours
- [ ] DPW - Estimated hours
- [ ] Fire Dept. – Estimated hours
- [ ] Other (*please explain*) _____

_____

OTHER

- [ ] Local Merchants
- [ ] Town Equipment
- [ ] Will event include food venues? Yes ____ No ____
- [ ] Coordinate recycling container distribution and pickup with DPW

This application will be reviewed by the Town of Scituate. Prior to approval or denial, a meeting with the applicant may be held to discuss concerns of any of the parties. Additional information which may help the Town make an informed decision should be attached to this completed form.

Requests for a Special Event must be requested at least 45 days in advance. A completed application does not constitute approval. All approvals must be voted by the Board of Selectmen.

Anna Vanderspek Digitally signed by Anna Vanderspek Date: 2016.09.20 12:32:26 -04'00' 9/20/16

Applicant Signature Date

Revised 11/15

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

Date (MM/DD/YYYY)
09/26/16

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER		
Aon/Albert G. Ruben Co. of NY, Inc. 171 Madison Avenue, Suite 401 New York, NY 10016	Contact Name: James Pedrick Phone: 212-337-4356	Laura Comerford 212-337-4354
	Insurer's Affording Coverage	NAIC #
INSURED	INSURER A: Great Divide Insurance Company	
7Beyond Media Rights & Beyond Productions, Inc. 10555 Jefferson Ave. Suite A Culver City, CA 90232	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. LIMITS SHOWN ARE AS REQUESTED.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY			CNA 2011846	06/01/15 06/01/16	06/01/16 06/01/17	EACH OCCURRENCE	$1,000,000
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	Excluded *
	CLAIMS MADE [X] OCCUR	X					PERSONAL & ADV INJURY	$1,000,000
							GENERAL AGGREGATE	$2,000,000
							PRODUCTS – COMP/OP AGG	$1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER: POLICY [X] PROJECT [ ]						MEDICAL EXPENSE	EXCLUDED
A	AUTOMOBILE LIABILITY			CNA 2011846	06/01/15 06/01/16	06/01/16 06/01/17	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS	X		**AUTO PHYSICAL DAMAGE DEDUCTIBLE: $2,500			BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY / X NON-OWNED AUOTS ONLY						PROPERTY DAMAGE (Per accident)	$
	X AUTO PHYS. DAM. **						AUTO PHYSICAL DAMAGE	Incl. in Miscellaneous Equipment
A	X Umbrella Liab / X OCCUR			CUA 2011847	06/01/15 06/01/16	06/01/16 06/01/17	EACH OCCURRENCE	$10,000,000
	Excess Liab / CLAIMS-MADE	X					AGGREGATE	$10,000,000
	DEDUCTIBLE							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						WC Statutory Limits / Other	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y / N	N/A		NOT COVERED HEREUNDER			E.L. Each Accident	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. Disease – EA Employee	$
							E.L. Disease – Policy Limit	$
A	WORLDWIDE PRODUCTION PACKAGE			CNA 2011846	06/01/15 06/01/16	06/01/16 06/01/17	LIMIT	DEDUCTIBLE
	MISCELLANEOUS EQUIPMENT**						$3,000,000	$3,500
	PROPERTY OF OTHERS *						$5,000,000	$2,500
	PROPS, SETS & WARDROBE						$1,000,000	$2,500

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Scripps Networks Interactive – Home & Garden Television - My Lottery Dream Home 200

Certificate Holder is Additional Insured (by "Blanket" Endorsement) under General/Auto Liability but only with regard to claims arising from the negligence of Named Insured and as required by written contract. Certificate Holder is Loss Payee with regard to Production Package. All coverage is subject to terms and conditions of policies of insurance. This Certificate does not amend, extend or alter the coverage afforded by the policies above.

CERTIFICATE HOLDER	Cancellation
Town of Scituate 600 Chief Justice Cushing Highway Scituate, MA 02066	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Aon/Albert G. Ruben Insurance Services, Inc.

SCHEDULED ITEMS:

Special Event Application, Scituate Wind Turbine Tour, Larry Chretien, Mass Energy Consumer Alliance

Mr. Chretien reviewed the special event application with the Board of Selectmen.

> **Move to approve the Scituate Wind Turbine tour located along the Driftway on 10/15/16, 11:00 a.m. – 1:00 p.m. Motion by Mr. Danehey second by Mr. Vegnani Unanimous Vote (5-0)**

Board & Committee Applicant Beach Commission

Anne McCracken, 6 Greenfield Lane, new resident and is passionate about the ocean and would like to get involved and help in any way she can. Ms. McCracken would like to be considered for the Scituate Beach Commission. The Selectmen will vote later in the meeting.

Building Move, Union Street – Old Country Way, Chick Fagan

Mr. Danehey recused himself from the discussion at 7:38 p.m. because it is across the street from his office. This building will become the microbrewery and the house behind (42x100) it will get torn down. There will be another building behind that which will house the brewery. There will be a glass vestibule between the two.

> **Move that the Board of Selectmen approve a building move from 6 Union Street to 6 Country Way by November 15, 2016 contingent on all department requirements. Motion by Mr. Vegnani second by Ms. Curran Vote in favor (4-0) Mr. Danehey abstained.**

Cranberry Vine Catering & Events, Kathryn Hackett, Christie Edgren

Kathryn Hackett attended the meeting and will be catering a memorial service. All references were checked and proper documentation is on file.

> **Move to approve a one day wine and malt license for Cranberry Vine Catering & Events for a memorial service held at the Scituate Maritime Center located at 119 Edward Foster Road on 10/15/16, 12pm - 6:00pm. Motion by Mr. Harris second by Mr. Danehey Unanimous Vote (5-0)**

10/19/16 Special Town Meeting Warrant, Patricia Vinchesi, Town Administrator, John McCarthy, Superintendent of Schools, Kevin Cafferty, DPW Superintendent, Nancy Durfee, Coastal Resource Officer, Stephen Mone, Harbormaster, Patricia Lambert and Andrea Hunt, Citizen Petition

Ms. Vinchesi said this is the warrant that will be published tomorrow. The Moderators meeting will be October 10th. The board reviewed **Article 1**. **Article 2** language is different than what may be expected. Mr. Vegnani said if this article is not passed flood insurance rates will significantly increase. Article 3 is the high school foyer and article 4 is the well for Cushing and High School Fields irrigation. The school was going to put in two storage tanks that were $20,000 each so those were removed from the estimate. The bid came in lower for the well so Superintendent McCarthy was able to lower the

AGENDA REVISION II
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, OCTOBER 18, 2016 7:00 P.M.
SELECTMEN'S CHAMBERS – TOWN HALL

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**

WALK INS

7:05 **REPORT OF THE TOWN ADMINISTRATOR**

1. Water Update - Sean Anderson, Water Superintendent
2. Public Facilities Update
    a. Middle School Change Order
    b. Library Project Contingency – Joe Sullivan, OPM, Daedalus
3. Update on FY 18 Health Insurance Coverage and Impacts
4. Other Items

SCHEDULED ITEMS:

7:25 **DISCUSS/VOTE** GATRA Update & Service, Joanne Laferrara, GATRA Community Outreach

7:50 **DISCUSS/VOTE** Fresh Feast Common Victualler License, Julia Lisinski

8:00 **DISCUSS/VOTE** Wind Turbine, Al Bangert, Special Projects Director, Jennifer Keefe, Director of Public Health

8:15 **DISCUSS/VOTE** 10/19/16 Special Town Meeting Preparation, Patricia Vinchesi, Town Administrator

8:30 **DISCUSS** Coastal Update, Nancy Durfee, Coastal Resource Officer, John Ramsey, Coastal Engineer, Applied Coastal Inc.

1. Beach Nourishment Minot
2. Final Report Coastal Resiliency Plan

9:15 **REVIEW** Projected Sewer Use, Laura Harbottle, Town Planner

NEW BUSINESS:

1. **DISCUSS/VOTE** – Board & Committee Appointment
    a. Zoning Board
    b. Scituate Harbor Cultural District
2. **DISCUSS/VOTE** One Day Wine & Malt Licenses
    a. Hospitable Hostess @ SMC 11/6/16, 1:00-5:00 p.m. for baptism
    b. Hospitable Hostess @ GAR Hall 10/22/16, 6:00-10:00 p.m. for birthday party
    c. Silent Chef @ SMC 10/28/16, 4:00 – 10:00 p.m. for private event
    d. Taylor Made Bartending @ St. Mary's Parish Center 10/28/16, 6:30-10:30 for FOSS Reception
3. **DISCUSS/VOTE** Retiree Representative Appointment to the Insurance Advisory Committee – Paul Scott

BOS Meeting October 18,2016

TOPIC: Wind Turbine Noise Mitigation

This summarizes the results of a pilot program the Town implemented to mitigate low level noise generated by the wind turbine that causes disturbance to some residents.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- A handful of residents have complained of a low level 'whooshing' sound that disturbs them during certain wind conditions. They report that the disturbance primarily occurs in late spring, summer, and early fall night-time hours.

DISCUSSION

- In September of 2014 the Board of Health started tracking noise complaints vs. various wind speed/direction conditions. Based upon an analysis of 20 months of data, it was determined that most complaints occurred during the summer with the wind coming from the southwest at less than 10 mph[1].
- In June of 2016, at the direction of the Board of Selectmen, Scituate Wind and the Town launched a pilot program to power off the turbine under the following conditions: between 11pm and 6am when the wind was coming from the southwest at speeds below 10 mph.
- During the four and one-half month test period, complaints from areas where disturbances were reported dropped from 25 incident-days (2015) to 9 incident-days (2016), **a 65% reduction**.

COST

- The Town sees a reduction in turbine revenue if it directs Scituate Wind to stop operating at certain times. It also results in lost payments to the Town from National Grid for electricity purchase. The lost revenue and out-of-pocket costs to implement the pilot abatement program was $1,940. The annual cost of continuing the program is projected to be $1,000 - 2,000, depending upon weather conditions.

RECOMMENDATION

Based upon the ability to significantly reduce nighttime noise disturbances during the test period, we recommend that the Town authorize Scituate Wind to abate the operation of the turbine during the specific conditions described above in order to reduce incidents of low-level noise disturbances during the summer evening hours.

SUGGESTED MOTION

Move that the Board of Selectmen vote to authorize Scituate Wind LLC to program the wind turbine to cease operation during occurrences of southwest winds of less than 10 miles-per-hour during the hours of 11pm and 6am from June 1st to October 15th.

Jennifer Keefe
Albert Bangert

[1] Based upon data obtained from the meteorological station at the Marshfield Airport.

SCHEDULED ITEMS:

GATRA Update & Service, Joanne Laferrara, GATRA Community Outreach

Ms. Laferrara updated the Board of Selectmen on the current ridership. In FY16 to date ridership was 6931. Ridership for July was 824 and August was 872, the trend is up. There is a proposal to change the Scituate route and to expand to North Scituate. The proposal is to extend the service to North Scituate to Lincoln Park on an hourly route. This would be a community service route and deviate if people call 2 hours in advance and bring it back to the route. It is very successful in rural towns. This would be limited to four deviations per hour. Council on Aging provides rides to Shaw's on certain days of the week. With this revised proposal hours would change during the week from 6:25 a.m. to 8:00 p.m. to 8 a.m. to 5:00 p.m. and on the weekends from 9 a.m. to 6 p.m. to 9 a.m. to 4 p.m. The Selectmen would like to see the hourly ridership through the week and weekends. It will take a few months to get this up and running. There is a half hour 40 minute loop currently and this will change to an hour long loop.

Ms. Curran made a motion to amend the GATRA public route extending to North Scituate for 12 month duration. Second by Mr. Harris Unanimous Vote (5-0)

Mr. Vegnani asked Ms. Laferrara to email the daily ridership numbers by the hour to the Selectmen for review.

Fresh Feast Common Victualler License, Julia Lisinski

Ms. Lisinski is working with the Board of Health to insure she meets all the Board of Health regulations. There is quite a bit of work to do before she opens. Mr. Vegnani asked for an explanation of what she is doing. She opened in Cohasset in 2012. She would like to expand to North Scituate. Mr. Vegnani asked what she is selling. Ms. Lisinski said she will sell premade sandwiches and dinners. No breakfast or coffee will be served.

Move that the Board of Selectmen approve a Common Victualler License for The Fresh Feast, 776 Country Way located in Stillwaters Wine & Gourmet pending final Board of Health inspection and approval. Motion by Mr. Danehey second by Mr. Vegnani Unanimous Vote (5-0)

Wind Turbine, Al Bangert, Special Projects Director, Jennifer Keefe, Director of Public Health

In September, 2014 the Board of Health began tracking weather conditions with correspondence and complaints from residents regarding the wind turbine. Analysis of 20 months of data suggested that the majority of concerns were associated when the wind was coming from the southwest at less than 10 mph. Based on this information the town and Scituate Wind conducted a pilot program where the turbine was shut off between the hours of 11 pm and 6 am when the winds were from the southwest at less than 10 mph. During this pilot program correspondence

and concerns from the residents decreased by 65%. The cost of the pilot program was $1,940. The projected cost to continue this program next year would be approximately $2,000. We had 25 incident days and this was reduced to 9 this summer. There were some slightly different conditions and we missed a couple of days that account for the other 9 incidents. The cost associated is the lost revenue to the Town and the company for the time the turbine is shut down during these weather conditions. Low level winds cause the impact and the whooshing sound is not disturbed by other wind. The whooshing sound is real and has a real impact on people during low wind days and times. Last summer the turbine was down most of July and not running. June through October is the highest rate of complaints by residents.

Dave Dardi, 122 Gilson Road thanked Mr. Bangert and Ms. Keefe for the work and analysis that is being done to isolate the issues. Mr. Danehey said we are trying to make it work for everybody and rectify, remedy and improve the situation. Mr. Dardi said the action is indicative of the inadequacy of the DEP/EPA regulations. The best guide is the human beings that are impacted. Ellen Casper, 120 Gilson Road has been before the Selectmen about the problem. Residents have given up and stopped reporting the issues. No one got back to the residents to let them know we were studying and working on the situation. She appreciates the work the town is doing to look into this. Mr. Bangert said the accounting is not the # of complaints but the dates and times the incidents came into the office count as one incident day. Ms. Keefe said on August 17th she heard from four people on that day and that was counted as an incident. Stephen Bjorklund, 38 Ladds Way said he has never heard the windmill or been disturbed by it at all. Ms. Vinchesi said we will continue to work and refine it to improve the situation for residents. The Town will continue to see how it is going and capture the incident reports.

Move that the Board of Selectmen vote to authorize Scituate Wind LLC to program the wind turbine to cease operation during occurrences of southwest winds of less than 10 miles-per-hour during the hours of 11pm and 6am from June 1st to October 15th. Motion by Mr. Vegnani second by Ms. Curran Unanimous Vote (5-0)

10/19/16 Special Town Meeting Preparation, Patricia Vinchesi, Town Administrator
Ms. Vinchesi urged residents to attend the Special Town Meeting tomorrow evening at 7 p.m. Residents on Edward Foster Road have contacted the Town Administrators office and would like to purchase the property. The Town has a binding agreement with the current property owner. Mr. Vegnani encouraged residents to come down and attend the special town meeting.

Coastal Update, Nancy Durfee, Coastal Resource Officer, John Ramsey, Coastal Engineer, and Applied Coastal Inc. and Rebecca Haney, Coastal Geologist, Coastal Zone Management (CZM)

Ms. Durfee provided the completed Coastal report to all of the Selectmen a few weeks ago. She is here tonight to review the highlights of the plan. Ms. Durfee said the town wide priority plan will help us with short and long term planning for the Town of Scituate. It is an extremely technical guide and there are a lot of costs. Science and Engineering were used to make these decisions. It is not an emotional plan. The recommendations were prioritized based on science

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, OCTOBER 3, 2017 7:00 P.M.
SELECTMEN'S CHAMBERS – TOWN HALL

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
WALK INS
REPORT OF THE ACTING TOWN ADMINISTRATOR

- Grant Update
- South Shore Regional School District open house on 10/14 10 am – 1 pm
- Other

SCHEDULED ITEMS:

7:15 **DISCUSS/VOTE** Scituate Library Foundation, Ginny Ayers, President

- Update on progress and activity
- Donation Update
- Donations with Naming Rights

7:25 **REVIEW/DISCUSS/VOTE** Town Administrator Finalists

7:35 **DISCUSS/VOTE** DPW, Kevin Cafferty, DPW Superintendent

1. Acceptance of Easement for seawall at 68 Oceanside Drive
2. Water Department Utility Truck & Plow Replacement Contract for $39,680.88
3. GE Betz Inc. Wastewater Treatment Plant MetClear Contract for $30,000

7:50 **REVIEW/DISCUSS/VOTE** Wind Turbine Analysis and Results, Jennifer Keefe, Board of Health Director

OLD BUSINESS:

1. **DISCUSS/VOTE** Continuance of Humarock Seafood Liquor License Application Public Hearing to November 7, 2017

NEW BUSINESS:

1. **DISCUSS/VOTE** Close November 14, 2017 Special Town Meeting Warrant
   a. Review list of Town Meeting Articles
2. **REVIEW & REASSIGN** Selectmen Liaison Positions
3. **DISCUSS/VOTE** One Day Liquor Licenses
   a. Taylor Made Bartending @ SMC 10/20 from 6-10 p.m.
   b. Kates Table @ SMC 10/18 from 6-10 p.m.

OTHER BUSINESS:

1. Correspondence
2. Approval of Meeting Minutes
3. Release of Executive Session Minutes

TOPIC: Wind Turbine Noise Mitigation

This summarizes the results of data collected subsequent to the pilot program the Town implemented in the summer of 2016 to mitigate low level noise generated by the wind turbine that causes disturbance to some residents.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- A handful of residents have complained of a low level 'whooshing' sound that disturbs them during certain wind conditions. They reported that the disturbance primarily occurs in late spring, summer, and early fall night-time hours.
- In September of 2014, the Board of Health (BOH) started tracking noise complaints vs. various wind speed/direction conditions. Based upon an analysis of 20 months of data, it was determined that most complaints occurred during the summer with the wind coming from the southwest at less than 10 miles per hour (mph).
- In June of 2016, at the direction of the Board of Selectmen, Scituate Wind and the Town launched a pilot program to power off the turbine under the following conditions: between 11pm and 6am when the wind was coming from the southwest at speeds below 10 mph.
- During the 4.5 month test period, complaints from areas where disturbances were reported dropped from 25 incident-days (2015) to 9 incident-days (2016), a 65% reduction.
- After review of the data, the Board of Selectman voted unanimously at their meeting on October 18, 2016 to authorize Scituate Wind LLC to program the wind turbine to cease operation during occurrences of southwest winds of less than 10 mph during the hours of 11pm and 6am from June 1st to October 15th.

SUMMARY OF DATA COLLECTED FOLLOWING THE END OF THE SEASONAL MITIGATION PROGRAM

Data Collected Between October 16, 2016 and May 31, 2017

- The BOH continued to collect and track data following the conclusion of seasonal mitigation program between October 16, 2016 and May 31, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.
- The BOH received correspondences about the turbine from 9 individuals.
- During that time, the BOH registered complaints on 16 incident-days, which is defined as a day (night) in which one or more complaints were received about noise from the turbine. This includes one event recorded during the day that would not be subject to overnight mitigation.
- Based upon an analysis of 7.5 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west northwest and northwest, followed by west southwest and west. The wind speed was less than 28 mph.
- Cost Analysis for these conditions if the turbine was off during this timeframe with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6AM during

[1] The turbine reads the wind speed and direction from metering equipment located on the turbine at hub height.

the months of October 16 to May 31, wind from the WNW and NW as measured at the turbine with a margin of 22 degrees, and speed of up to 28 mph.
    - Approximate lost production (kWh): 535,000
    - Approximate projected lost revenue to Scituate Wind: $63,665
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $48,150
    - Approximate total cost to the Town: $111,815
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 81% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Data Collected Between June 1, 2017 and August 29, 2017

- The BOH collected data during the first full summer mitigation program, during which the turbine ceased to operate during occurrences of southwest winds of less than 10 mph between the hours of 11pm and 6am beginning on June 1st. The data set includes data collected from residents through August 29, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.
- The BOH received correspondences about the turbine from 5 individuals.
- The turbine has ceased operation on 8 occasions within that timeframe, when the conditions of the mitigation plan were met.
- As of August 29, 2017, the BOH registered complaints on 18 incident-days, defined as a day (night) in which one or more complaints were received about noise from the turbine.
- Based upon an analysis of 3 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west and west northwest followed by northwest. The wind speed was less than 22 mph.
- Cost Analysis for these conditions if the turbine was off this summer with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6 AM during the months of June 1 to October 15, wind from the SW to NW as measured at the turbine with a margin of 22 degrees, and speed of up to 22 mph.
    - Approximate lost production (kWh): 240,000
    - Approximate projected lost revenue to Scituate Wind: $29,760
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $21,600
    - Approximate total cost to the Town: $51,360
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 100% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Jennifer Keefe
Albert Bangert

[1] The turbine reads the wind speed and direction from metering equipment located on the turbine at hub height.

FILE MEMO

16 October 2017

At the October 3rd BOS meeting, the Board asked for information concerning the projected cost of ceasing turbine operations under certain conditions.

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Question asked: *What would be the cost to the taxpayer of shutting down the wind turbine operation from 11PM to 6AM during the period April 15th through October 15th?*

- The cost to the taxpayer over the past summer would have been $162,885. Over the past five years the annual cost would have been be $150,000 +/- $25,000 per year depending on wind and energy prices.[1]

Follow-up question: *What percentage of the Town's revenue from the turbine does this represent?*

- This represents approximately two-thirds of the net taxpayer benefit received from the turbine operation in an average year.

Follow-up question: *How did you calculate the cost to the taxpayer?*

- Based upon 5 years of data, the production of energy by the turbine during the 6-month period of April through September averaged 1,300,000 +/- 250,000 kilowatt-hours (kWh).
- In the most recent 6-month period covering April 15 to October 15, production was higher than average, slightly exceeding 1.9 million kWh of which nighttime production between 11PM and 6AM was 571,126 kWh, or 30% of the production.
- If the increased curtailment were in place for the past 6 months, the Town would have owed Scituate Wind $67,964 based on the lost production.[2]
- Additionally, over this same period, the rebate paid to the Town by National Grid was 16.62 cents per kWh or $94,921.
- The total cost to the taxpayer this summer would have been $162,885[3]. This represents 64% of the past 12 months of net taxpayer benefit due to increased curtailment.

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Second question asked: *What if the turbine was shut down only under conditions when the wind blows from the west (i.e., from SSW thru NNW)?*

- During this past 6-month period, the wind blew from SSW to NNW between the hours of 11 pm and 6 am approximately 68% of the time. Hence, the cost to the taxpayers would have been $110,762, or 46.5% of the past 12-months net benefits to the Town.

A. G. Bangert

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[1] This estimate does not include the cost to implement the programming and is estimated using today's power rates, which are expected to increase over time. It also excludes additional maintenance spending required to protect the equipment during extended downtime and administrative costs to track the wind speed and project lost revenue every evening.

[2] The lost revenue is what the Town pays for power (9.4 cents/kWh, escalating to 9.9 cents/kWh next year) plus the lost value of Renewable Energy Credits (2.5 cents/kWh).

[3] $67,964 payment for lost production plus $94,921 in lost rebates from NG.

MEETING MINUTES
BOARD OF SELECTMEN
October 3, 2017

Present: Maura C. Curran, Chairman, Anthony V. Vegnani, Vice Chairman, Shawn Harris, John Danehey, Karen Canfield

Al Bangert, Acting Town Administrator

The Meeting was called to order at 7:04 p.m.

Acceptance of Agenda
Mr. Danehey made a motion to accept the agenda for October 3, 2017
Second by Mr. Vegnani, all in favor. Unanimous vote (5-0)

Ms. Curran said the board is thinking of the citizens of Puerto Rico.

WALK IN
David Dardi, 122 Gilson Road is here this evening to review the article in the Patriot Ledger. There was a statement that said the turbine is completely in compliance with regulations. Mr. Dardi said the regulations do not properly address the unique sounds of the wind turbines. Mr. Dardi read a quote in the article that said the sound of wind turbines was not considered. Mr. Dardi believes the testing that was done may or may not be valid. The DEP called for a conference in 2013 to solicit the opinions of many experts. The group came up with recommendations and some good ideas but to date they are not incorporated in the law. Mr. Dardi feels we have nothing relative to testing. He said the DEP feels if there are complaints for noise it should be addressed. Mr. Dardi prepared a model turbine to educate the board regarding wind and sound.

REPORT OF THE ACTING TOWN ADMINISTRATOR

- Grant Update
  - The Town has received two grants. We received a grant for $125,000 in support of the Scituate FACTS Coalition. The second grant was from Governor Baker and the EPA for recycling for $213,000 for the DPW and transfer station.
- South Shore Regional School District open house on 10/14 10 am – 1 pm
- Other
  - Facilities Kevin Kelly who is now a 5 year employee he has helped with getting a public safety building built a middle school and the library. He has also brought together the school custodian staff and town. He is recognized as the go to guy in the town.
  - Senior Center Meeting has been scheduled for next Tuesday night from 5 pm on at the Center for Performing Arts at Scituate High School.
  - SHCB is now available for rental as it was prior to the temporary library.

- Land is being reviewed for the 7.1 acres to put into conservation. We will make a recommendation at the next Selectmen meeting.
- The Chief of Police is monitoring the school access for the start of the day and dismissal of students.

Mr. Vegnani wanted to thank Annmarie Galvin for the grant for FACTS.

SCHEDULED ITEMS:

Scituate Library Foundation, Ginny Ayers, President and Storme Eckelhofer, Treasurer

- Update on progress and activity
  - Les Ball has retired from the Scituate Library Foundation
  - All other members have stayed on the Library Foundation and new officers were elected. Virginia Ayers, President, Don Nelson, Vice President and Mike Cuneo, Clerk
- Donations with Naming Rights
  - Current Donations over $2,500
    - Kevin Malloy, family & friends in memory of Mary Malloy
    - Ralph Castagna and Castagna Construction
    - Anne and Anthony Jones
    - Jackie & Richard Leach
- Permanent signage should be going up soon. These will be ordered through the library. Foundation paying for all the signage
- Over $50,000 was raised at the Library Foundation gala event. The chairs for the event were Emily Anderson and Amy Linell and we thank them for the great job they did. It was great to have it in the new library and it was all hands on deck with so much help. Everyone who helped out was truly appreciated.
- Donation Update
  To date $1.5M has been committed to the library including pledges. On June 30th a $50,000 check was given to the Town and tonight two checks totaling $100,000 will be given to the town. The total paid to date is $1M. New members were introduced to the board.

The Selectmen thanked the Library Foundation members for all their hard work and it is unbelievable that over $1M has been raised. The Selectmen expressed their gratitude on behalf of the town.

Town Administrator Finalists

Ms. Curran said we had three very strong candidates and interviews were held last week. Mr. Marino, Mr. Sweet and Mr. Boudreau. The board has done their due diligence to solicit feedback regarding these candidates and they want to choose someone who is the right fit for our residents and our staff. The board wants someone who can take us to the next level. Ms. Curran feels Kevin and Jim are both very strong candidates and would be good fits for Scituate. Kevin

Sweet brings a fresh perspective, he is young, highly educated, a steady manager with clear direction, engaging, nice public outreach and he took the time to educate himself about Scituate. Jim Boudreau brings an enormous amount of experience and has an open door policy. He works well and collaborates with staff and has an open door policy with residents. He also has the fiscal acumen that we need. Mr. Sweet has also managed a budget in his community.

Mr. Harris thanked Ms. Curran and Mr. Vegnani for their work on the Selection Committee. Mr. Harris wanted to thank the staff and members of the public for attending the interviews. We all want what is best for the town. Mr. Harris felt we have done a lot in the last ten years. The candidates answered quite well and Mr. Harris feels Jim having served in Norwell for 17 years brings a lot of experience and is familiar with the area. Mr. Harris is leaning toward Jim Boudreau. Mr. Danehey concurs with Shawn's thoughts regarding the staff who were involved and the selection committee. Mr. Danehey said this is the toughest decision as a Selectmen because of the long term impact. Mr. Danehey feels the best fit is either Kevin Sweet or Jim Boudreau. They both have different experience and knowledge with different strengths and capabilities. They want the staff to have the flexibility they need to do their job. The person has to have an acute eye on the budget. How will they conduct themselves with the residents? Mr. Danehey thinks that Jim Boudreau was the Norwell Town Administrator for 17 years and would be committed to the Town of Scituate. Ms. Canfield again thanked the selection committee. Mr. Sweet and Mr. Boudreau are the two finalists in her mind. Mr. Sweet had a lot of enthusiasm and has innovative ideas and that appealed to her. She appreciated Mr. Boudreau's steady hand. She reached out to the towns they work in now and had worked in over the years. Ms. Canfield's said the people she spoke with thought we would be lucky to have either of them. Mr. Sweet being that far away is a concern but it can be done. We can't make a bad decision because they are both great candidates. Mr. Vegnani said Tony Marino was a very strong candidate but was up against two candidates who have more experience. Choosing either Mr. Sweet or Mr. Boudreau we can't go wrong. He liked Mr. Boudreau's solid experience, management style and contacts were very strong. He liked the youth of Mr. Sweet and he was very engaged with his staff and that was intriguing. His background in emergency management was great for our community. Kevin Sweet sent the board an outline of his significant achievements after his interview and Mr. Vegnani felt that it sounded a lot like Scituate. Either of the two candidates will do a good job. He hasn't heard anything negative about either of the candidates. Ms. Curran said Kevin Sweet is a rising star. Some comments she received regarding Mr. Sweet include: Confident and strives for excellence in everything he does. He spends time developing his people. Ms. Curran says we have a lot of projects ahead and need some tight fiscal management and for these reasons she would choose Jim Boudreau. This is a great problem to have. Ms. Canfield said he did invest in long term technology in addition to his listed accomplishments. Comments regarding Jim Boudreau said he would have a solution before we even knew there was a problem. It's a tough decision. Mr. Harris had a comment regarding Kevin Sweet that someone said he was great and we hope Scituate does not hire him so they do

not lose him. Mr. Harris received great comments about Jim Boudreau as well. Mr. Vegnani liked that they both worked very well with their school districts. Ms. Curran asked if anyone from the audience has input. Phyllis Karlberg, 26 Hughes Road had the opportunity to speak with them in the parking lot. From a resident point of view she felt they were both highly qualified. In speaking with both of them she received a different feeling from each of them. One she felt would not work as well with the residents than the other. Mr. Harris said he called and asked the same question about approachability to residents and received great feedback regarding both candidates. Mr. Vegnani said he never got the impression that either candidate could care less about residents. Straight shooter and open door policy is what Ms. Curran was told regarding Mr. Boudreau. Tom Thompson 149 Gilson Road said he thinks a lot of folks in town did not feel that the former town administrator was approachable to residents. Mr. Thompson feels there were some discussions before tonight's meeting. Ms. Curran said absolutely not and we were not predetermined in our selection before this evening. Ms. Curran stated that is why we are each speaking openly about it tonight publicly. Ms. Curran wants to know she did right by the citizens and the employees. Mr. Thompson said he did not mean to disparage any work that was done by the selection committee or the Board of Selectmen. Mr. Thompson said there are a lot of comments that the staff is on board with the process and the next challenge is to get the same support from the residents of the town. Ms. Canfield said she reached out to residents in the communities these people have worked in and received great feedback from people who had experience with them.

Mr. Danehey moves to nominate Mr. James Boudreau as the next Town Administrator subject to negotiations as a mutually agreed upon employment contract second by Mr. Harris vote in favor Danehey, Vegnani, Curran, Harris Ms. Canfield votes against (4-1) Motion passes.

Ms. Canfield moves the Board of Selectmen support unanimously Mr. Boudreau's as the Scituate Town Administrator second by Mr. Vegnani Unanimous Vote (5-0)

Congratulations to Jim Boudreau for being the finalist. Congratulations to Kevin Sweet who is a fine candidate and is a rising star. Mr. Harris said they were are all good and it was a difficult decision. Mr. Vegnani said next steps are to speak in executive session regarding the financial aspect of the contract.

DPW, Kevin Cafferty, DPW Superintendent

1. Acceptance of Easement for seawall at 68 Oceanside Drive

Move that the Board of Selectmen vote to accept the Grant of

Easement as a gift and for consideration of less than One Hundred ($100.00) Dollars for the property located at 68 Oceanside drive. Motion by Mr. Danehey second by Mr. Harris Unanimous Vote (5-0)

2. Water Department Utility Truck & Plow Replacement Contract for $39,680.88
This replaces a truck with a broken frame for the water department. The old truck will either be auctioned or scrapped.

Move that the Board of Selectmen award the contract to purchase a 2018 Ram 2500 Utility Body to Central Chrysler Jeep Dodge Ram for $39,680.88. Motion by Mr. Vegnani second by Ms. Canfield Unanimous Vote (5-0)

3. GE Betz Inc. Wastewater Treatment Plant MetClear Contract for $30,000
This is to treat the copper coming out of the waste water treatment plant. This is part of the pilot program to make sure this works. They met with the DEP and EAP to pursue this measure. This is part of the plan to get this accepted. Once we see the results we will go from there.

Move that the Board of Selectmen award the contract to supply MetClear 2405 to the Scituate Wastewater Treatment Plant to GE Betz Inc. for a not to exceed amount of $30,000.00. Motion by Mr. Vegnani second by Mr. Danehey Unanimous Vote (5-0)

Wind Turbine Analysis and Results, Jennifer Keefe, Board of Health Director
This summarizes the results of data collected subsequent to the pilot program the Town implemented in the summer of 2016 to mitigate low level noise generated by the wind turbine that causes disturbance to some residents.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- A handful of residents have complained of a low level 'whooshing' sound that disturbs them during certain wind conditions. They reported that the disturbance primarily occurs in late spring, summer, and early fall night-time hours.
- In September of 2014, the Board of Health (BOH) started tracking noise complaints vs. various wind speed/direction conditions. Based upon an analysis of 20 months of data, it was determined that most complaints occurred during the summer with the wind coming from the southwest at less than 10 miles per hour (mph).
- In June of 2016, at the direction of the Board of Selectmen, Scituate Wind and the Town launched a pilot program to power off the turbine under the following conditions: between 11pm and 6am when the wind was coming from the southwest at speeds below 10 mph.

- During the 4.5 month test period, complaints from areas where disturbances were reported dropped from 25 incident-days (2015) to 9 incident-days (2016), a 65% reduction.
- After review of the data, the Board of Selectman voted unanimously at their meeting on October 18, 2016 to authorize Scituate Wind LLC to program the wind turbine to cease operation during occurrences of southwest winds of less than 10 mph during the hours of 11pm and 6am from June 1st to October 15th.

SUMMARY OF DATA COLLECTED FOLLOWING THE END OF THE SEASONAL MITIGATION PROGRAM

Data Collected Between October 16, 2016 and May 31, 2017 non shutdown period

- The BOH continued to collect and track data following the conclusion of seasonal mitigation program between October 16, 2016 and May 31, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.
- The BOH received correspondences about the turbine from 9 individuals.
- During that time, the BOH registered complaints on 16 incident-days, which is defined as a day (night) in which one or more complaints were received about noise from the turbine. This includes one event recorded during the day that would not be subject to overnight mitigation.
- Based upon an analysis of 7.5 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west northwest and northwest, followed by west southwest and west. The wind speed was less than 28 mph.
- Cost Analysis for these conditions if the turbine was off during this timeframe with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6AM during the months of October 16 to May 31, wind from the WNW and NW as measured at the turbine with a margin of 22 degrees, and speed of up to 28 mph.
    - Approximate lost production (kWh): 535,000
    - Approximate projected lost revenue to Scituate Wind: $63,665
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $48,150
    - Approximate total cost to the Town: $111,815
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 81% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Data Collected Between June 1, 2017 and August 29, 2017 shutdown period

- The BOH collected data during the first full summer mitigation program, during which the turbine ceased to operate during occurrences of southwest winds of less than 10 mph between the hours of 11pm and 6am beginning on June 1st. The data set includes data

collected from residents through August 29, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.

- The BOH received correspondences about the turbine from 5 individuals.
- The turbine has ceased operation on 8 occasions within that timeframe, when the conditions of the mitigation plan were met.
- As of August 29, 2017, the BOH registered complaints on 18 incident-days, defined as a day (night) in which one or more complaints were received about noise from the turbine.
- Based upon an analysis of 3 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west and west northwest followed by northwest. The wind speed was less than 22 mph.
- Cost Analysis for these conditions if the turbine was off this summer with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6 AM during the months of June 1 to October 15, wind from the SW to NW as measured at the turbine with a margin of 22 degrees, and speed of up to 22 mph.
    - Approximate lost production (kWh): 240,000
    - Approximate projected lost revenue to Scituate Wind: $29,760
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $21,600
    - Approximate total cost to the Town: $51,360
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 100% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Since this analysis, Ms. Keefe received 16 additional complaints from six residents over ten nights. Mr. Vegnani asked if it was an additional $51,360. Ms. Keefe said yes this is an additional $51,360. It would be $163,000 and we make about $250,000 annually. Ms. Curran asked if we had analysis on how much we make when it is up and running during the day vs. the evening. Mr. Bangert said with the exception of maintenance or a failure it is generating and meeting the contract operations. You tend to have stronger winds in the winter in the evenings. Ms. Canfield asked if these were all evening complaints. Ms. Keefe said yes they are evening complaints. There have only been two or three complaints outside of the evening. Mr. Bangert said we sell excess energy from the solar array. The turbine is one year under produced and we were paid for that. Now it is producing as expected. Mr. Harris asked who tested it and what the results were. Mr. Bangert said the developer had to demonstrate that the project would operate within the limits. The contract included post construction acoustical testing. The Board of Health is responsible and they went to the DEP to determine what testing agencies were authorized. The Board of Health hired the testing agency. The testing agency tested it and this was reviewed by the DEP. Residents also hired a company to test and that took 18 months. The

results were within the state limits as well. The testing can be done again if the board feels it needs to be done again. Mr. Vegnani said regardless of the testing there are some individuals who are bothered by the noise. He said this is a new science and nobody really knows. Mr. Vegnani asked what it would take to have Scituate Wind incur some of the expenses to resolve this problem. Mr. Bangert said there is a clause in the contract but they sought all the appropriate permits and follow all state regulations. Mr. Bangert said they will agree to do what we ask but the Town has to pay for it. Ms. Canfield reviewed the contract and as long as they are in compliance the Town is responsible to pay for it. Mr. Bangert said the Town is responsible to pay for it and reviewed how this works. Our net gain for the year is $250,000. Mr. Bangert said you cannot turn it off and on. Ms. Keefe reviewed the dates of complaints with the Board of Selectmen. We received more complaints this summer than we did in the two previous summers. Mr. Tom Thompson 149 Gilson Road said the summer months are the most impactful with winds less than 10 mph. It's not the noise it's an acoustical strobe sound. When it is cool folks have their windows closed. Mr. Thompson said maybe there is a way to negotiate this. Mr. Danehey asked how many complaints in April, May, and October. Ms. Keefe said there were 5 complaints in April, none in May, October 5 complaints. Mr. Danehey asked what the revenue is from April to October. Mr. Bangert said it is about 1/3 of the revenue. Mr. Bangert said Mr. Thompson is absolutely correct. This is what we knew two years ago and we shut it down under those conditions. Comments were received from the residents and the residents thought it was broken because they couldn't hear it. The Town has already accounted for that. Now this is a new wind direction at a higher speed. Jenn Keefe said since August 29th we received 16 complaints from 6 residents over 10 nights. Mr. Dardi said a good number of complaints come from his house. The other residents had given up. The fact remains it still turns and still wakes him up. Mr. Dardi said the health of the residents is more important than the town making money. Mr. Dardi said the Board of Health hired a company to test the noise but things have changed since those tests. Ms. Curran said we agree it is a real problem. Ms. Canfield said in the summer months is where we are having the most impact. Mr. Vegnani asked if the wind turbine is shutting off when it is supposed to. Mr. Bangert said it is. The turbine knows what the weather is at the turbine. Ms. Keefe said she started tracking the data at the Marshfield airport. In order to understand what the turbine was seeing we need to measure from the turbine in comparison with the Marshfield data. Valarie Vitali, 34 Driftway, has contacted Mr. Bangert and the Board of Health with her complaints. Ms. Vitali said she has written letters to the Board of Health but has never received a response. They have been living with this problem from the start. There is also a problem in the winter. It sounds like a plane circling that never lands. It is the sound of the turbine. She does not want to live her life yelling at the Board of Selectmen and she would have liked to have known that data was being collected and analyzed. Mr. Danehey asked what the cost is if it shut down from mid-April to mid-October and the cost if it is shut down from North to South. Mr. Harris asked if we can look at it to see if it is making more noise. Mr. Dardi said he has other options for the board. Mr. Thompson offered a thank you and is very encouraged with the conversation and work being done by the

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, OCTOBER 17, 2017 7:00 P.M.
SELECTMEN'S CHAMBERS – TOWN HALL

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
WALK INS
REPORT OF THE ACTING TOWN ADMINISTRATOR

SCHEDULED ITEMS:

7:15 **RECOGNITION** 25 Year Service Awards, John Murphy

7:20 **DISCUSS/VOTE** Tootsie Roll Drive, Mark Sullivan, Knights of Columbus

7:25 **DISCUSS/VOTE** Liquor License Change of DBA Kansha Restaurant Group, DBA PJ's, Kara Tondorf

7:30 **DISCUSS/VOTE** Special Event Seaside Kitchen Tour, Susannah Adams, Scituate Education Foundation

7:40 **DISCUSS/VOTE** North Scituate Playground, Maura Glancy, Recreation Director
1. Acceptance of Donation
2. Naming of Playground

7:50 **DISCUSS/VOTE** Non-Emergency Tow Policy, Stephen Mone, Harbormaster

8:00 **REVIEW/DISCUSS** Verizon Small Cell Pole Attachment, Brad Washburn, Director of Planning & Development

8:10 **DISCUSS/VOTE** Widows Walk Golf Course Management Contract with IGM, Nancy Holt, Town Accountant/Finance Director

8:20 **DISCUSS/VOTE** CPC Applications, Karen Connolly, Chair, CPC

8:45 **DISCUSS/VOTE** Warrant Articles for November 14, 2017 Special Town Meeting

9:15 **DISCUSS/VOTE** MA State Lottery KENO Monitor 7-Eleven 337 Gannett Road

OLD BUSINESS:

1. **DISCUSS/VOTE** Approval of ADA Notice for Selectmen Policy
2. **DISCUSS/VOTE** Wind Turbine Analysis and Results

NEW BUSINESS:

1. **DISCUSS/VOTE** Addition of Selectmen Library Trustee Liaison position
2. **DISCUSS/VOTE** Drain Layers License Renewal
3. **DISCUSS/VOTE** One Day Liquor Licenses
   a. Silent Chef @ SMC 10/28 from 7-11 p.m.

OTHER BUSINESS:

1. Correspondence
2. Approval of Meeting Minutes

EXECUTIVE SESSION:

1. To conduct contract negotiations with non-union personnel—Town Administrator

OTHER BUSINESS CONTINUED:

1. **DISCUSS/VOTE** Town Administrator Contract
2. Adjournment and signing of documents

FILE MEMO

13 October 2017

At the October 3rd BOS meeting, the Board asked for information concerning the projected cost of ceasing turbine operations under certain conditions.

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Question asked: *What would be the cost to the taxpayer of shutting down the wind turbine operation from 11PM to 6AM during the period April 15th through October 15th?*

- The cost to the taxpayer would be $80,252 per year[1]

Follow-up question: *What percentage of the Town's revenue from the turbine does this represent?*

- This represents 33% of the net revenue received from the turbines operation.[2]

Follow-up question: *How did you calculate the cost to the taxpayer?*

- Based upon 5 years of data, the production of energy by the turbine during the mid-April to mid-October period averaged 1,253,940 kWh.
- Nighttime production between 11PM and 6AM is 32% of daily production or 401,261 kWh for the 6-month period.
- Lost benefit of selling power to NG at 8-cents per kWh = $32,101
- Compensation to Scituate Wind for lost production at 12-cents per kWh = $48,151
- Total cost to the taxpayer = $80,252

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Second question asked: *What if the turbine was shut down only under conditions when the wind blows from the west (i.e., from SSW thru NNW)?*

- About the same since these are the predominant winds during summer evenings (+/- $80k.)

A. G. Bangert

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[1] with +/- accuracy in a range of $72,000 to $88,000

[2] 5-year average

TOPIC: Wind Turbine Noise Mitigation

This summarizes the results of data collected subsequent to the pilot program the Town implemented in the summer of 2016 to mitigate low level noise generated by the wind turbine that causes disturbance to some residents.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- A handful of residents have complained of a low level 'whooshing' sound that disturbs them during certain wind conditions. They reported that the disturbance primarily occurs in late spring, summer, and early fall night-time hours.
- In September of 2014, the Board of Health (BOH) started tracking noise complaints vs. various wind speed/direction conditions. Based upon an analysis of 20 months of data, it was determined that most complaints occurred during the summer with the wind coming from the southwest at less than 10 miles per hour (mph).
- In June of 2016, at the direction of the Board of Selectmen, Scituate Wind and the Town launched a pilot program to power off the turbine under the following conditions: between 11pm and 6am when the wind was coming from the southwest at speeds below 10 mph.
- During the 4.5 month test period, complaints from areas where disturbances were reported dropped from 25 incident-days (2015) to 9 incident-days (2016), a 65% reduction.
- After review of the data, the Board of Selectman voted unanimously at their meeting on October 18, 2016 to authorize Scituate Wind LLC to program the wind turbine to cease operation during occurrences of southwest winds of less than 10 mph during the hours of 11pm and 6am from June 1st to October 15th.

SUMMARY OF DATA COLLECTED FOLLOWING THE END OF THE SEASONAL MITIGATION PROGRAM

Data Collected Between October 16, 2016 and May 31, 2017

- The BOH continued to collect and track data following the conclusion of seasonal mitigation program between October 16, 2016 and May 31, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.
- The BOH received correspondences about the turbine from 9 individuals.
- During that time, the BOH registered complaints on 16 incident-days, which is defined as a day (night) in which one or more complaints were received about noise from the turbine. This includes one event recorded during the day that would not be subject to overnight mitigation.
- Based upon an analysis of 7.5 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west northwest and northwest, followed by west southwest and west. The wind speed was less than 28 mph.
- Cost Analysis for these conditions if the turbine was off during this timeframe with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6AM during

[1] The turbine reads the wind speed and direction from metering equipment located on the turbine at hub height.

the months of October 16 to May 31, wind from the WNW and NW as measured at the turbine with a margin of 22 degrees, and speed of up to 28 mph.
    - Approximate lost production (kWh): 535,000
    - Approximate projected lost revenue to Scituate Wind: $63,665
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $48,150
    - Approximate total cost to the Town: $111,815
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 81% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Data Collected Between June 1, 2017 and August 29, 2017

- The BOH collected data during the first full summer mitigation program, during which the turbine ceased to operate during occurrences of southwest winds of less than 10 mph between the hours of 11pm and 6am beginning on June 1st. The data set includes data collected from residents through August 29, 2017. These data included the date and time of the complaint, if provided; the wind speed and direction; and tides.
- The BOH received correspondences about the turbine from 5 individuals.
- The turbine has ceased operation on 8 occasions within that timeframe, when the conditions of the mitigation plan were met.
- As of August 29, 2017, the BOH registered complaints on 18 incident-days, defined as a day (night) in which one or more complaints were received about noise from the turbine.
- Based upon an analysis of 3 months of data, the wind conditions[1] during these events indicated that the winds were primarily from the west and west northwest followed by northwest. The wind speed was less than 22 mph.
- Cost Analysis for these conditions if the turbine was off this summer with the adjusted parameters below:
    - Wind turbine will be at maximum output at 25 mph and turning the turbine on/off within the conditions requested may lead to damage to the turbine and may increase noise. Therefore, the cost analysis assumes NO operation based on this past year's operation when the conditions are as follows: nightly between 11PM and 6 AM during the months of June 1 to October 15, wind from the SW to NW as measured at the turbine with a margin of 22 degrees, and speed of up to 22 mph.
    - Approximate lost production (kWh): 240,000
    - Approximate projected lost revenue to Scituate Wind: $29,760
    - Approximate projected lost net revenue to Town of Scituate (kWh x $0.09): $21,600
    - Approximate total cost to the Town: $51,360
    - Approximate additional costs: $1,100 for re-programming the turbine
- When the 22 degree margins on either side of the stated directions are included, approximately 100% of the incident-days identified would be addressed by turning off the turbine during these conditions.

Jennifer Keefe
Albert Bangert

[1] The turbine reads the wind speed and direction from metering equipment located on the turbine at hub height.

Move that the Board of Selectmen approve the warrant for the November 14, 2017 Special Town Meeting contingent upon any further changes by Town Counsel and/or the Town Administrator. Motion by Mr. Danehey second by Mr. Harris Unanimous Vote (5-0)

The board will take a short break at 9:29 p.m.
The board reconvened at 9:41 p.m.

MA State Lottery KENO Monitor 7-Eleven 337 Gannett Road
Mr. Bangert explained that the Lottery sent us a letter that they plan to install a KENO monitor at 7-Eleven at 337 Gannett Road.

The Board of Selectmen opted to not take any action on the KENO monitor.

OLD BUSINESS:

1. Approval of ADA Notice for Selectmen Policy
All public entities must provide information to the public, program participants, program beneficiaries, applicants and employees about the ADA and how it applies to the public entity. This notice will be posted in Town Hall, and on the website.

Move that the Board of Selectmen approve the ADA Notice to accompany the Town of Scituate Grievance Procedure Operational Policy #61-17 Motion by Mr. Vegnani Second by Mr. Danehey

2. Wind Turbine Analysis and Results
At the last meeting the Selectmen asked Mr. Bangert to put together some additional cost information. Ms. Curran said we have received good input from all sides. Mr. Bangert reviewed the costs with the Board of Selectmen.

At the October 3rd BOS meeting, the Board asked for information concerning the projected cost of ceasing turbine operations under certain conditions.

Question asked: *What would be the cost to the taxpayer of shutting down the wind turbine operation from 11PM to 6AM during the period April 15th through October 15th?*

- The cost to the taxpayer over the past summer would have been $162,885. Over the past five years the annual cost would have been be $150,000 +/- $25,000 per year depending on wind and energy prices.[1]

Follow-up question: *What percentage of the Town's revenue from the turbine does this represent?*

- This represents approximately two-thirds of the net taxpayer benefit received from the turbine operation in an average year.

Follow-up question: *How did you calculate the cost to the taxpayer?*

- Based upon 5 years of data, the production of energy by the turbine during the 6-month period of April through September averaged 1,300,000 +/- 250,000 kilowatt-hours (kWh).
- In the most recent 6-month period covering April 15 to October 15, production was higher than average, slightly exceeding 1.9 million kWh of which nighttime production between 11PM and 6AM was 571,126 kWh, or 30% of the production.
- If the increased curtailment were in place for the past 6 months, the Town would have owed Scituate Wind $67,964 based on the lost production.[2]
- Additionally, over this same period, the rebate paid to the Town by National Grid was 16.62 cents per kWh or $94,921.
- The total cost to the taxpayer this summer would have been $162,885[3]. This represents 64% of the past 12 months of net taxpayer benefit due to increased curtailment.

Second question asked: *What if the turbine was shut down only under conditions when the wind blows from the west (i.e., from SSW thru NNW)?*

- During this past 6-month period, the wind blew from SSW to NNW between the hours of 11 pm and 6 am approximately 68% of the time. Hence, the cost to the taxpayers would have been $110,762, or 46.5% of the past 12-months net benefits to the Town.

- After Mr. Bangert presented these facts Mr. Vegnani asked what we put in the fund and it is the net revenue minus the expense. Ms. Holt said a concern is there enough money to

[1] This estimate does not include the cost to implement the programming and is estimated using today's power rates, which are expected to increase over time. It also excludes additional maintenance spending required to protect the equipment during extended downtime and administrative costs to track the wind speed and project lost revenue every evening.

[2] The lost revenue is what the Town pays for power (9.4 cents/kWh, escalating to 9.9 cents/kWh next year) plus the lost value of Renewable Energy Credits (2.5 cents/kWh).

[3] $67,964 payment for lost production plus $94,921 in lost rebates from NG.

offset the debt exclusion. The turbine contract is for 15 years and the debt is for 25 years. There are clauses to extend the contract by two five year periods. If we don't extend the contracts they could go out and sell the power to somebody else. At the end of 15 years we could negotiate lease payments. We are 6 years in as of right now. Ms. Holt said the solar array does not bring in as much money as the wind turbine. Ms. Curran said this is a tough discussion because Town Meeting approved the windmill. It is not easy because the Selectmen are trying to balance the needs of the Town and the health and well-being of the residents. Ms. Curran said we made some adjustments but they are not enough. Ms. Curran supports during this past 6-month period, the wind blew from SSW to NNW between the hours of 11 pm and 6 am approximately 68% of the time. Hence, the cost to the taxpayers would have been $110,762, or 46.5% of the past 12-months net benefits to the Town. Mr. Harris suggests we have another test done by an independent company for wind speed, direction and noise. Ms. Canfield thinks given the financial impact of this we curtail the use from 11 pm to 6 am in the summertime. Mr. Vegnani is not opposed to this at all. We are a green community and it does what it is supposed to do. The noise is a very difficult situation. Mr. Vegnani said it is minimal the sound and he knows many people that live in that area that are not impacted but clearly some are impacted. Mr. Vegnani is all for finding the right period of time so people are not impacted and he supports that. If the testing comes back and we are still under the state minimum. Mr. Vegnani said if you shut it off there will not be any complaints. Mr. Vegnani said we are not going to shut it off completely. There is no easy solution but he is in support of tweaking it and trying to find out what to do. Mr. Bangert said the testing was done a year after construction and it was well below the state level. If it's in compliance we have the issue. Whether the state regulation is right or wrong is not our determination. It is no louder now than it was five years ago. Mr. Harris suggests another option may be mitigation. The windows for example in the homes by those being affected. Ms. Canfield said we should not delay relief to the residents that are affected by this while we do the research. Phyllis Karlsberg, 26 Hughes Road, asked when the testing was done there were big boxes at Widows Walk. The windmill is up high and the windmill is down low and she feels it does not make sense how the testing was done. Mr. Bangert said the Board of Health went to the DEP to determine the appropriate firm to do the testing. One of the firms was hired and the firm filed their protocol for testing that was reviewed by the DEP. The testing was done on the ground up at third cliff in the neighborhood that had an issue at night. The protocol was blessed by the State. Keith Walo, Country Way said there were some flaws in the testing and it needs to be done by an impartial group. Mr. Walo thinks there was a lawyer on the team who worked for the turbine people and he feels this is muddying the waters. Mr. Vegnani said sure send it along for the Selectmen to look at. Mr. Dardi said the DEP testing protocols should be 30 feet above the ground. It is difficult to have someone test with all the varied issues. Their tests don't take into account the whooshing noise. These complaints are real from himself and his neighbors. All showing non-compliance will do is get the Town off the hook financially. We have problems whether we are in compliance or not in compliance. Mr. Danehey said the money has been earmarked to help with electricity costs and offset the debt. $100K has to be earmarked for the debt. The only problem with mitigation is

that every homeowner has a right to take their issue against the turbine company and this would be a very costly proposition. Mr. Harris wonders if the method of testing has changed in six years. Mr Bangert said the only thing testing would do is to say it is not our problem. He feels we are kicking the can down the road and it will not come back with a solution. Mr. Vegnani said the whooshing noise is never going to go away. Mr. Dardi said Mr. Bangert is well aware that the wind turbine testing does not take into account amplitude modulation (the whooshing sound). Mr. Bangert said the test was designed for noise of factories and does not take into account wind turbines. Ms. Curran asked if the board is inclined to see if testing can be done. Gerry Kelly, 56 Moreland Road is an abutter to the wind turbine and is hearing challenged but can hear it regularly. He supports the testing. He asks the board to look to towns like Falmouth did to do the testing. He wants an independent company to do the testing. The manufacturer of the wind turbine is now bankrupt and they are not doing any work on noise mitigation. Mr.Walo agrees with John Danehey and there is a family that stays at school to do their homework because it is so bad.

Motion to hire an independent consultant to test the noise generated from the wind turbine. Motion by Mr. Vegnani second by Mr. Danehey Unanimous Vote (5-0)

NEW BUSINESS:

1. Addition of Selectmen Library Trustee Liaison position

Move that the Board of Selectmen add the Library Trustee Liaison position to the Committee List. Motion by Mr. Danehey second by Mr. Harris Unanimous Vote (5-0)

Move to appoint a Selectman Karen Canfield as the Library Trustee Liaison. Motion by Mr. Danehey second by Mr. Harris Vote in Favor Curran, Vegnani, Danehey and Harris Ms. Canfield Abstained Motion passes (4-0)

2. Drain Layers License Renewal

Move that the Board of Selectmen approve a renewal of a Drain Layers License to Cobra Enterprises Inc. Motion by Mr. Danehey second by Ms. Canfield Unanimous Vote (5-0)

3. One Day Liquor Licenses
   a. Silent Chef @ SMC 10/28 from 7-11 p.m.

Move that the Board of Selectmen approve a One Day Wine & Malt license at the Scituate Maritime Center located at 119 Edward Foster Road for the the Silent Chef on Saturday, October 28, 2017 from 7:00 p.m. to 11:00 p.m. Motion by Mr. Danehey second by Mr. Vegnani Unaniomus Vote (5-0)

Lorraine Devin

From:	Al Bangert
Sent:	Tuesday, October 17, 2017 1:30 PM
To:	Maura Curran; Vegnani Tony; Danehey John; Lorraine Devin; Harris Shawn; Karen Canfield
Cc:	Jennifer Keefe
Subject:	Cost to curtain turbine in summer evenings
Attachments:	Cost to shutdown in summer evenings-revised.docx

BOS-
Attached is a revised copy of the FILE MEMO detailing the cost to shut down the turbine during April 15th through October 15th from 11PM to 6AM.

Essentially,

To curtail operations for 6-months from 11pm-6am this summer would have cost taxpayers a total of $163,000 ($68k we would owe Scituate Wind plus $95k in lost revenue from National Grid).

To curtail during this same period and time, but only when winds are from the westerly direction (north-north-west to south-south-west) would have cost $110,000.

More detail is in the attached write-up. These are numbers are based upon real data.

AGB

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, MAY 29, 2018 7 P.M.
SELECTMEN'S CHAMBERS – TOWN HALL

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
7:01 **REORGANIZATION OF THE BOARD OF SELECTMEN**
7:10 **WALK INS**
7:15 **REPORT OF THE TOWN ADMINISTRATOR**

SCHEDULED ITEMS:

7:20 **DISCUSS/VOTE** Donations to Scituate Fire Department, John Murphy
7:25 **DISCUSS/VOTE** Library Foundation Update, Ginny Ayers, Chairman
7:30 **DISCUSS/VOTE** Outdoor Entertainment Permit, Jessi Finnie, Director, Scituate Town Library
7:35 **DISCUSS/VOTE** Outdoor Entertainment Permit, A. Vegnani
7:40 **DISCUSS/VOTE** Contract Wind Turbine Acoustical Study, A. Bangert, Special Projects
7:50 **DISCUSSION** Old Gates School, Doug Smith, Chairman, Historic Commission
8:10 **DPW CONTRACTS**, Kevin Cafferty, DPW Superintendent & Sean McCarthy, Town Engineer
1. **DISCUSS/VOTE** First Herring Brook Reservoir Dam Phase III
2. **DISCUSS/VOTE** Highway Department MAC Truck

8:15 **DISCUSS/VOTE** Senior Center Logo, Linda Hayes, Director, Council on Aging
8:25 **DISCUSS/VOTE** Widows Walk HVAC Contract, Nancy Holt, Finance Director/Town Accountant
8:30 **DISCUSS/VOTE** Abatement of Ambulance Charges, Nancy Holt, Finance Director/Town Accountant
8:40 **DISCUSS/VOTE** Scituate Recreation Employee Disclosures, N. Holt, Finance Director/Town Accountant

NEW BUSINESS:

1. **DISCUSS/VOTE** One Day Liquor Licenses
   a. Silent Chef @ SMC on 6/30 from 11 am – 3 pm
   b. Riva @ SMC on 6/1 from 6-10 pm
   c. Scituate Knights of Columbus @ K of C on 6/16 from 7-11 pm, 8/3 from 2-6 pm and 8/4 from 3-7 pm for Knights of Columbus Events

2. **DISCUSS/VOTE** Board & Committee Appointments
   - Agent of Veterans Benefits
   - Archivist
   - Assistant Town Accountant
   - Custodian of Tax Title Property
   - Custodian of Veterans Graves

BOS Meeting May 29, 2018

TOPIC: Wind Turbine Acoustical Study

This requests that the Board of Selectmen award the contract for conducting an acoustical study of wind turbine noise to Epsilon Associates of Maynard, MA.

BACKGROUND:

- In October the Board of Selectmen asked that an acoustical study be commissioned to determine if the wind turbine was operating in compliance with the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10).
- After consultation with the DEP a Request for Proposals was developed, posted and advertised in January 2018. Copies of the RFP were sent to eleven firms. Three responses were received by the due date of March 6. Of these, two were incomplete and the third was defective. Several other firms indicated that they did not respond because other priorities would prevent them from meeting the timeline in the RFP.
- A second RFP was issued in March and four responses were received in late April.

DISCUSSION

- The four responses were evaluated versus the following criteria:
  - Experience with field testing
  - Familiarity with Massachusetts DEP testing protocol
  - Methodology for monitoring wind conditions
  - Task understanding
  - Qualifications of staff
- Two firms were assessed to be acceptable:
  - Epsilon Associates (rated Superior) - $50,000
  - ACENTECH (rated Adequate) - $52,650

FUNDING

Payment for the study would be provided by the Wind Turbine Revolving Account, which is funded exclusively by revenue from the turbine's operation.

RECOMMENDATION

If the Board would like to move forward with this acoustical study I recommend that the contract be awarded to Epsilon Associates. This recommendation has been reviewed with the DEP, Scituate Wind and Third Cliff resident David Dardi.

SUGGESTED MOTION

Move that the Board of Selectmen vote to award the contract for the Wind Turbine Acoustical Study (Contract 18-WT-01) to Epsilon Associates of Maynard, MA in the amount of $50,000 for the scope of work as specified in their Response to Request proposal dated April 25, 2018.

Albert Bangert
Special Projects Director

neighbor's homes. The library building is selling itself these days since people like it so much. Ms. Canfield asked if it has been six years and stated that the core group of people who have worked these fundraisers are extraordinary.

Mr. Vegnani asked what the status is of the HVAC system problem. Mr. Boudreau and Mr. Harris said they are discussing this issue at the PBC meeting tonight. Mr. Danehey asked if someone could attend the next Selectmen meeting with an update. Ms. Devin will follow up to schedule this for the next meeting.

Outdoor Entertainment Permit, Jessi Finnie, Director, Scituate Town Library
Ms. Finnie explained the outdoor concert series. Ms. Curran asked where this will be held and Ms. Finnie said under the porches. Mr. Danehey said he liked the idea and hopes it is successful.

> **Move to grant an outdoor entertainment permit to the Scituate Town Library Director Jessi Finnie for Wednesday evenings June 27th, July 11th, July 18th, July 25th, August 1st, and August 8th, 2018 from 6-7:30 p.m. Motion by Ms. Canfield second by Mr. Vegnani Unanimous Vote (5-0)**

Mr. Vegnani recused himself from the meeting for his families permit request at 7:43 p.m.

Outdoor Entertainment Permit, A. Vegnani
Mrs. Anne Vegnani explained the request to the Selectmen and she has notified the abutters.

> **Move to grant an outdoor entertainment permit to Anthony and Anne Vegnani for an acoustic guitar at a private event on 6/23/18 at 98 Chief Justice Cushing Highway from 4 pm to 6 pm. Motion by Ms. Curran second by Ms. Canfield Unanimous Vote (4-0) Mr. Vegnani recused himself for this vote.**

Mr. Vegnani returned to the meeting at 7:45 p.m.

Contract Wind Turbine Acoustical Study, A. Bangert, Special Projects
Mr. Bangert said resuming this summer will be the mitigation of the wind conditions. This is underway. In October the Board of Selectmen asked that an acoustical study be commissioned to determine if the wind turbine was operating in compliance with the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10).

After consultation with the DEP a Request for Proposals was developed, posted and advertised in January 2018. Copies of the RFP were sent to eleven firms. Three responses were received by the due date of March 6. Of these, two were incomplete and the third was defective. Several other firms indicated that they did not respond because other priorities would prevent them from meeting the timeline in the RFP.

A second RFP was issued in March and four responses were received in late April.

- The four responses were evaluated versus the following criteria:
  - Experience with field testing
  - Familiarity with Massachusetts DEP testing protocol
  - Methodology for monitoring wind conditions
  - Task understanding
  - Qualifications of staff
- Two firms were assessed to be acceptable:
  - Epsilon Associates (rated Superior) - $50,000
  - ACENTECH (rated Adequate) - $52,650

Ms. Canfield asked Mr. Dardi if he was satisfied. Mr. Dardi said he preferred ACENTECH and Mr. Bangert selected Epsilon Associates.

Mr. Bangert said the testing could take all summer long. Mr. Danehey said would the turbine shut down impact the testing. Mr. Danehey asked if October and November would be better to test since the wind turbine is not shut down. Ms. Curran wants to make sure the neighbors are aware the turbine may be on due to testing when we previously agreed to shut down during certain hours. Mr. Vegnani asked how many samples and Mr. Bangert said four nights will be included. Mr. Danehey asked what the optimal time is for the noise issues. Mr. Bangert said it is broader than just southwest winds. Mr. Bangert said the time of year the most incidents occurred was in the summer. Mr. Harris asked if the company is available 24 hours. Mr. Bangert said yes they are available.

Payment for the study would be provided by the Wind Turbine Revolving Account, which is funded exclusively by revenue from the turbine's operation.

If the Board would like to move forward with this acoustical study Mr. Bangert recommends that the contract be awarded to Epsilon Associates. This recommendation has been reviewed with the DEP, Scituate Wind and Third Cliff resident David Dardi.

Mr. Danehey asked if members of the audience would like input. Phyllis Karlberg, 26 Hughes Road said she would like to make sure one of the monitors is on her home. Mr. Dardi said the wind affects a person who lives down wind of it. People on Collier Road get affected from a different wind direction. Mr. Dardi said both principals of the two company finalists are funded from the money that comes from the electric bills. They give money to wind turbine operators and Robert O'Neill is very much in tune to that group and has a vast amount of experience. Epsilon has not found any problems with wind whereas the other company points out the problems. Mr. O'Neill seems to have a pre conceived notion. Mr. Danehey said there has to be a trust factor. Mr. Dardi said the community group likes the other company better. Epsilon has experience in many different states across the country. Both are registered engineering firms. Neither is bias and they have a fiduciary responsibility to us. ACENTECH has more experience with submarines and less with wind turbines. Mr. Vegnani hopes that there is a violation found because we know people that have no problem with the wind turbine. We have to take these

firms at their professional integrity and hopefully we'll get some resolution. Mr. Dardi said Mr. Vegnani said if we find things out of compliance the wind turbine operator will try to mitigate the problem and he should not expect too much. Mr. Dardi said Epsilon Associates likes to average the information while ACENTECH does not. Mr. Dardi would like to see the data. Mr. Danehey said that is a reasonable expectation.

Move that the Board of Selectmen vote to award the contract for the Wind Turbine Acoustical Study (Contract 18-WT-01) to Epsilon Associates of Maynard, MA in the amount of $50,000 for the scope of work as specified in their Response to Request proposal dated April 25, 2018. Motion by Mr. Harris second by Ms. Curran Unanimous Vote (5-0)

Mr. Bangert said he would like for one of the Selectmen to be the liaison to the wind study project.

Old Gates School, Doug Smith, Chairman, Historic Commission
This was requested by Ms. Curran to determine the historical significance of the Old Gates School. Mr. Smith said the Scituate Historical Commission was asked in 2010/2011 to determine the historical significance of the old Gates School Building for purposes of a Community Preservation Committee application. The Gates School was constructed in three phases. The first section – now known as the A wing was constructed in 1917, with the angular roof, spire and auditorium built in 1931. The B wing (where the gym is) was constructed in the late 1940's and the C wing (far area to the right if facing the building) was in the late 1950's. The section of most historical significance is the A wing area. The Gates School has also experienced (what is known in historic preservation as) "muddling." Muddling is when a historic structure goes through *renovation* rather than *restoration*. The Gates School went through various additions and renovations to accommodate the educational use needed at the time of such activities. Muddling can negatively affect the historical significance of a property. It would take the skill set of a historic preservation architect to fully evaluate what components of the existing building can be preserved or could be "unmuddled." It is hard to determine what parts are historical. It is a common misconception that National Register listing protects property from demolition. This is not the case.

A key consideration in evaluating historic resources is setting. The Gates School is located near several historic resources in Scituate – Cudworth House, Lawson Tower, Little Red School House, Cudworth Cemetery, Lawson Common and the Unitarian Universalist Church. The setting alone adds to the historical significance of the building. The key historical component is the main original section of the building. The architects are noted and constructed similar buildings to the Gates School (Colonial Revival) that are now listed on the National Register.

This is a historically significant area/section of town. Ms. Curran asked if CPC funds could be used for this project. Mr. Smith said restoration expenses are much higher than renovation

***REVISED AGENDA II**
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, JUNE 25, 2019 7:00 PM
SELECTMEN HEARING ROOM

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
7:05 **WALK INS**
7:10 **REPORT OF THE TOWN ADMINISTRATOR**

SCHEDULED ITEMS:

7:20 **RECOGNITION** First Responders from Boat Fire, Chief Murphy, Stephen Mone, Harbormaster
7:30 **DISCUSS/VOTE** Cudworth Cemetery Project - Award Contract, Al Bangert Special Projects, Sean McCarthy, Engineer
7:40 **UPDATE** Wind Turbine, Al Bangert
8:00 **DISCUSS/VOTE** Outdoor Entertainment Permits
1. June 29, 2019 61 Seaside Rd. Paul and Bonnie Turcotte
2. July 6, 2019, 655 Chief Justice Cushing Highway, Colleen Burke/Molly Gould
3. August 17, 2019, 125 Mann Lot Rd. Scituate Community Christmas, Kim Stewart
4. August 22, 2019, 20 Jericho Rd. Mike Bulman
5. * Scituate Harbor Yacht Club Events, Maureen Ray

8:25 **ACCEPTANCE** Library Foundation Donation, Ginny Ayers, Chair
8:40 **DISCUSSION** July 4th Holiday Plans, Chief of Police, Michael Stewart
8:55 * **DISCUSS/VOTE** Common Victualler License, Gunther Tooties, Tony Chen

NEW BUSINESS:

DISCUSS/ VOTE Drainlayers License
1. New Drainlayer License: Silverado Contructions Inc.
2. Drainlayer Renewal: Pond Corporation

DISCUSS/VOTE Republican Election Workers
DISCUSS/VOTE One Day Wine & Malt Licenses
1. Taylor Made Bartenders at SMC 6/28/19 6:00-10:00 PM
2. Riva at SMC, 6/29/19 4:00 – 8:00 PM
3. * Taylor Made Bartenders, 6/29/19 at Kennedy Country Gardens 5:00 – 9:00 PM
4. Taylor Made Bartenders at SHCB 6/29/19 6:00 – 10:00 PM

DISCUSS/ASSIGN Selectmen Liaison Positions

OTHER BUSINESS:

1. Liaison Reports
2. Correspondence
3. Approval of Meeting Minutes
4. Adjournment and Signing of Documents

BOS Meeting June 25, 2019

TOPIC: Wind Turbine Update

This provides the Board of Selectmen with an update on the wind turbine acoustical study.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- A handful of residents complained of a 'whooshing' sound that disturbs them during certain wind conditions. The complaints primarily occurred in late spring, summer, and early fall night-time hours.
- After a study to determine wind conditions that generated the annoyance, the BOS asked Scituate Wind to implement a mitigation program in 2017 that would shut down the turbine when those conditions existed between 11pm and 6pm from June 1st to October 15th.[1]
- In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test.
- Epsilon worked with the DEP to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving 4 Scituate locations[2] during 4 weeknights when specified wind conditions were met.

DISCUSSION

- In April wind conditions were met and Epsilon conducted noise compliance testing. The engineers reported that the wind turbine sound was "audible" at 3 of the 4 locations.
- Epsilon continues to monitor and record wind conditions daily and is looking for an opportunity to conduct the remaining 3 tests. Once this has been completed, they will analyze the results and provide us with a complete report.

Albert Bangert

[1] This program was implemented again this year on June 1st.

[2] McKeever residence, Dardi residence, Karlsberg residence, Vitali residence.

DISCUSS/VOTE Cudworth Cemetery Project - Award Contract, Al Bangert Special Projects, Sean McCarthy, Engineer

Mr. Bangert said that Cudworth is quite full and almost out of direct burial locations. We created a cremation garden in 2015 which accommodates up to 62 urns. DPW wanted to explore alternatives to expand burial space. After looking at options, we looked at pre-burying vaults which would make things easier in the winter. This project will be built along the Little League Field which is currently brush. We will remove the stone wall, put in a decorative fence, and add landscape plantings. Nothing will be taken away from the baseball field. We will install 77 new burial vaults and we will install an above ground concrete structure (columbarium) to hold ashes. This project doesn't include the columbarium, however, we have a resident who wishes to make a donation for the columbarium structure. Six bids were received and we chose Dandel Construction of Hanson. We have $297,000 available for this project. It will be managed by DPW and Paul Scott as the hands on person to assist DPW. Ms. Canfield asked for clarification on the pathway – Mr. Bangert said it will be a new black top driveway. Mr. Bangert confirmed the landscaping is included. Ms. Connolly asked how long this will cover our needs. Mr. Bangert feels it will meet our needs for about 10 years. We should start in July and be done in the fall. Ms. Curran asked why the prices were very staggered - Mr. Bangert said it's a sign of the times. She asked about the fencing – it will be a 5' iron fence. Mr. Vegnani asked if this will put this property at capacity. Ten years from now we will have to expand to another location.

Move that the Board of Selectmen award the contract for the Cudworth Cemetery Improvements project (Contract 15-PG-93-2) to Dandel Construction, Incorporated of Hanson, MA in the amount of $ 212,874 as specified in their bid response dated May 22, 2019.

Motion By: Ms. Curran **Second By: Mr. Harris** **Unanimous (5-0)**

UPDATE Wind Turbine, Al Bangert

The Turbine was put in operation in March 2012. In 2014 we began to hear comments of whooshing sound. We did a study and determined some conditions that generated annoyances. The Board elected in 2017 to shut down the turbine in those conditions form 11 PM – 6 AM from June 1 – October 15th. In May of 2019 the Board awarded a $50,000 contract to Epsilon Associates to do a wind turbine compliance study. Epsilon worked with the DEP to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving 4 Scituate locations during 4 weeknights when specified wind conditions were met.

Epsilon will continue to do testing, they monitor daily, and have 3 tests yet to do. They have to test when the wind conditions are met. We were billed $14,000 for that one night of testing. Ms. Connolly asked for clarification from Mr. Bangert on when the testing is done. Ms. Curran asked how we determine the conditions. One summer we logged all the complaints and we did correlate complaints to something measurable. This is how we determined the first set of conditions that we now use to shut down the turbine. Ms. Curran asked the locations that are affected– McKeever, Dardi, Karlsberg, and Vitalli residences. Mr. Harris asked if we have learned anything new if we were to build today. DEP convened a task force in 2012-2013 met and they concluded that there

are some changes needed at some point. Nothing has come from it as of yet. Mr. Vegnani noted how many turbines are in Ireland – they don't mitigate anything but said people can hear it. The goal is to have some conclusive results from Epsilon. The frustration is the time that it takes to perform the testing. Mr. Bangert said we could change the contract and go out and do four different conditions rather than wait for the ideal. Mr. Vegnani noted that it was unanimously supported at town meeting and the town wanted a green energy source. Hopefully we can come to some conclusion.

Mr. Dardi, 122 Gilson Rd. DEP regulation is the only controlling factor – it was never written to take into consideration the sound from wind turbines. Lauren Carlson with DEP came out with a conclusion that meters should be changed. DEP's regulations do find violations when it's a gross problem. Now because some towns have found violations, the DEP regulations have been modified which he feels are ineffective. They are averaging data which is ineffective. He doubts that a violation will be found here in Scituate under the current regulations. Mr. Dardi has not been able to talk with DEP. Mr. Bangert said we had shut down the turbine in certain situations but it stopped working. He feels it affects people and should not continue. He asks that we shut it down at night during the summer. Mr. Vegnani asked Mr. Dardi to report extreme noise so that we can go to Wind Turbine to ask for data. Mr. Bangert will look into last week's conditions that woke up Mr. Dardi. Ms. Connolly asked Mr. Dardi if there are any hearings being held at the State level? Mr. Bangert thanked Mr. Dardi for helping the team and coordinating with neighbors – he's done a great job and thanks him for his help.

DISCUSS/VOTE Outdoor Entertainment Permits

1. June 29, 2019 61 Seaside Rd. Paul and Bonnie Turcotte

   They are new to town and built a new house. They wish to host a party to celebrate the new home. They will have a trio of players, acoustic instruments with slight amplification. There should be about 40 people in attendance. Mr. Turcotte asked about parking at Egypt Beach – Chief Stewart will talk to him about that.

   Move to grant an outdoor entertainment permit to Paul and Bonnie Turcotte, 61 Seaside R. for a private party with live music on 6/29/19 from 3:00 – 8:00 PM.
   Motion By: Ms. Canfield Second By: Mr. Harris Unanimous (5-0)

2. July 6, 2019, 655 Chief Justice Cushing Highway, Colleen Burke/Molly Gould

   Steven Cronin, Marion Rd. and Molly Gould, 655 Chief Justice Cushing Highway
   Ms. Burke had to work and Mr. Cronin came to help Molly Gould (his daughter is her best friend). They will have two bands scheduled to end by 9 pm and they have police detail and

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, SEPTEMBER 17, 2019 7:00 PM
SCITUATE TOWN HALL, 600 CHIEF JUSTICE CUSHING HIGHWAY

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
7:03 **WALK INS**
7:05 **REPORT OF THE TOWN ADMINISTRATOR**

SCHEDULED ITEMS:

7:10 **PROCLAMATION** National Recovery Month, Annmarie Galvin, FACTS
7:15 **DONATION** Scituate Fire Department, John Murphy, Fire Chief
7:20 **INTERVIEW** Board & Committee Applicant
- Sheila McCourt, Recreation Commission

7:25 **DISCUSS/VOTE** Interfund Borrowing, Pam Avitabile, Treasurer/Collector
7:30 **DISCUSS/VOTE** 2020 Annual Town Election Date Change, Kathy Gardner, Town Clerk
7:35 **DISCUSS/VOTE** Council on Aging By-Law Changes, Linda Hayes, Director
7:40 **DISCUSS/VOTE** DPW, Kevin Cafferty, DPW Director
a. Road Salt Contract to Eastern Salt Company
b. Sewer Plant Septage Receiving Station Upgrade $142,100
7:50 **DISCUSS/VOTE** DPW Rates for Water, Sewer and Transfer Station, Nancy Holt, Town Accountant/Finance Director and Kevin Cafferty, DPW Director
8:15 **DISCUSS/VOTE** Water Filter Policy Kevin Cafferty, DPW Director, Jim Boudreau, Town Administrator
8:20 **PRESENTATION/UPDATE** Scituate Beach Commission, Steven Tripp, Chair
8:40 **PRESENTATION/UPDATE** Coastal Advisory Commission, Louise Pfund Villani, Chair and Kyle Boyd, Coastal Resource Manager
9:10 **DISCUSS/VOTE** Execution of Global Participation Agreement for MassDocs Program, Jim Boudreau, Town Administrator
9:15 **DISCUSS/VOTE** Toll Brothers Performance Bond Release Ballpark Project, Jim Boudreau, Town Administrator
9:20 **DISCUSS/VOTE** Charter Review Commission Charge, Jim Boudreau, Town Administrator
9:30 **DISCUSS/VOTE** Veterans Services Advisory Council Charge Update, Lorraine Devin, Executive Assistant
9:40 **DISCUSS/VOTE** Hatherly Road Fence, Jim Boudreau, Town Administrator

OLD BUSINESS:

9:50 **DISCUSS/VOTE** Lawson Green Water & Sewer Connection Fees, Jim Boudreau, Town Administrator

NEW BUSINESS:

1. **DISCUSS/VOTE** One Day Wine & Malt Licenses
   a. Taylor Made Bartenders @ SHCB on 9/21 7-11 p.m.
   b. Taylor Made Bartenders @ SMC on 9/21 1-4 p.m.
   c. Ellen MacKenzie @ SMC on 9/27 6-10 p.m.
   d. Riva @ SMC on 10/4 6-10 p.m.
   e. Taylor Made Bartenders @ SHCB on 10/6 5-9 p.m.
2. **DISCUSS/VOTE** Board & Committee Appointments
   a. Cable Television Committee
   b. Conservation
   c. Council on Aging

Turbine Noise Compliance Testing Update - 9/17/2019

Background:

- In October 2017 the BOS requested that a wind turbine noise test be conducted to determine if the turbine was operating in compliance with the DEP noise regulation.
- An RFP was issued in January 2018, but no responses were received. After discussions with several firms, a second RFP was issued and three responses were received. The BOS awarded a $50k contract to Epsilon Associates on April 29, 2018.
- Epsilon worked with the Town, the DEP, Scituate Wind and several residents to get an agreed upon test protocol that would meet the DEP requirements for compliance testing. After lengthy delays the DEP gave approval to the test plan in late October. However, in November the DEP requested additional changes.

Testing:

- Final test protocol approval was received January 8, 2019 and monitoring for the desired wind conditions commenced.
- During February and March turbine operational problems[1] prevented testing for noise compliance.
- The first noise compliance test was conducted at 4 locations on April 19th; a second test was conducted on July 31st. During both tests the engineers reported that the turbine was 'audible.'
- One recent test opportunity was missed because Epsilon's test team and equipment was deployed elsewhere.
- Epsilon continues to monitor for the specified nighttime wind conditions.[2]
- Once the third test is completed, Epsilon will analyze all three sets of data vs the DEP regulation.

Options:

- We have several options at this point:
    a. Let Epsilon continue monitoring and wait for test results.
        i. Pro: we get a full set of data. / Con: will take more time.
    b. Tell Epsilon to go out some evening and gather a third random set of data.
        i. Pro: we get the testing completed. / Con: the third set might be worthless.
    c. Tell Epsilon to stop looking for the third set of data and simply analyze the two existing sets for compliance.
        i. Pro: we get the testing completed and we probably save $9k. / Con: we lose the value of having three sets of data.
    d. Tell Epsilon to keep monitoring and conduct the third test but analyze the first two sets now and the third set later.
        i. Pro: we get the test results sooner / Con: we will need to negotiate an extra payment for this work. Probably in the range of $8-10k.

Recommendation:

- Option A - Remain with current plan or Option C - cut off the testing with two results.

Al Bangert (Call me at 781-424-4399 if you want to discuss)

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[1] The problem caused the turbine to shut down unexpectedly. We were concerned that if this happened during an evening of testing, we would waste $9k on a failed test.

[2] Testing is to occur when the following conditions are present during the night: 20mph winds coming from the southwest +/- 45 degrees.

MEETING MINUTES
BOARD OF SELECTMEN
September 17, 2019

Present: Anthony Vegnani, Chairman, Shawn Harris, Vice Chairman, Karen Canfield, Clerk, Karen Connolly, Maura Curran

Also present: James Boudreau, Town Administrator

The Meeting was called to order at 7:03 p.m.

Acceptance of Agenda
Ms. Canfield made a motion to accept the agenda for September 17, 2019
Second by Mr. Harris Unanimous vote (5-0)

WALK INS – none

REPORT OF THE TOWN ADMINISTRATOR –

1. Water. Mr. Boudreau provided the Board with an update on the water construction projects that you received two (2) weeks ago. The big news from that is that the replacement for the gate valve and water main from the tank which necessitated the shutdown of the tank was completed last Monday. The contractor and water department employees were on site until past 1:00 am to make sure that the work was completed and safe. Mark Cloud, Marc Saccocia, Jim Hottleman and Phil O'Neil were on site and Mike Kwiecien was operating the plant all night to maintain pressure in the system. The work on the water pipe on Mann lot is progressing. Since then, the employees of the water department have been aggressively flushing the system from the tank outward, following our uni-directional flushing program. This simply means that we are always pulling clean water to flush areas with sedimentation to prevent bringing the sediments back into already flushed areas. Results have been very good and we are pleased with the progress. Our goal is to have the entire town flushed before the busy season next year. We will post videos on Facebook of the flushing.
2. Athletic fields. On time and on budget so far. You can really see the outline of where the stadium field is going to be. The concrete for the retaining wall for the home stands has been poured and the wall for the visitors section is being poured this week. Light poles for the track and field are also scheduled for installation this week. Next week the paving for the track is scheduled to commence. This must cure for at least 30 days before the track surface itself can be put down. The following week, the field installation on the stadium field is scheduled to commence. Mr. Vegnani asked for the specifics of the concession building to review.
3. The bid opening for the Town wide facilities study is scheduled for tomorrow. This is an item on the warrant for the special town meeting for funding. The purpose of the study is to do a comprehensive look at all of the town buildings that have not been recently evaluated, including all mechanical systems, roofs, etc, provide us with the condition of those assets and a twenty year capital plan for repair/replacement and maintenance.
4. Dredging. We have finished phase one of the dredge project and will be commencing phase 2 with our remaining funds. The Towns of Scituate and Marshfield have extended contract for the dredging of the South River to include Area B. Area B is being located approximately 600' South and 200' east of the recently completed project. In order to take advantage of the tides and favorable weather conditions, the contractor, Burnham Associates, Inc. of Salem, MA, the hours of operation are extended to 5:00 am to 10:00 pm. It is anticipated that work will be performed

through September 30, 2019 within this additional area. The contractor will be utilizing 2 barges and working with the tides for loading of barges and exiting the project area. This will complete the dredging of the section of the South River and provide safe navigation for all the boating public. We will be doing a call to Humarock residents informing them of the change.

5. Dog Park. Although the dog park is not officially opened, people have begun using it. The final installation of the amenities should be completed this week. The contractor was on site last week making additional improvements to the drainage. The official opening/ribbon cutting will take place of Saturday, September 28 at 10:00 am and the Board is invited to attend.
6. Work on Beaver Dam road is continuing. The contractor is removing the old granite and installing new curbing this week, and then a new sidewalk will be poured.
7. Wind Turbine. We have completed 2 out of the 3 specified tests on 4/19 and 7/31. We are awaiting the correct conditions to complete the 3rd test. At this point, we can continue to try and get the 3rd round of data so we have a complete testing regime, or we can have them analyze and present the data that we already have. Or we can just randomly test a 3rd time, with the result that we get poor data. I recommend we complete the study, but I can add this to a future agenda and ask Mr. Bangert to come in and discuss.

SCHEDULED ITEMS:

PROCLAMATION National Recovery Month, Annmarie Galvin, FACTS

John Kimmett from South Shore Peer Recovery accompanied Annmarie. Ms. Canfield read the proclamation in honor of National Recovery Month. Mr. Vegnani said the work that this group does is a leader in the community, the State of MA and the nation. Ms. Galvin said she has prepared a brochure highlighting some of the accomplishments in our battle against drugs and alcohol. Ms. Galvin said we poll the students every year in Scituate to allow us to change interventions. Since 2012 reductions across the board in alcohol reduced by 30% binge drinking reduced by 39%, marijuana use down 25% the real risk behavior that has gone up is vaping and they are working hard on this issue as well.

DONATION Scituate Fire Department, John Murphy, Fire Chief

The Madia family gave a donation to the Scituate Fire Department for their assistance.
Mr. Vegnani thanked the fire department and Ms. Curran thanked the Madia family. The Board gave Chief Murphy condolences for the loss of his mother last week.

Move that the Board of Selectmen accept a donation in the amount of $1,000 from Mr. & Mrs. John & Kathryn Madia to the Scituate Fire Department in recognition of the excellent service provided by the Scituate Fire Department. Motion by Ms. Curran second by Mr. Harris Unanimous Vote (5-0)

INTERVIEW Board & Committee Applicant

Sheila McCourt, Recreation Commission

Ms. McCourt works at South Shore Peer Recovery and she was born and raised here. It is an awesome town and she feels the recreation department would be a great way to help out. She read the minutes but has not attended any meetings recently. She sees an opportunity for older children and some additional programs would be helpful. She feels that art programs could be added. We could get some guidance from Boys & Girls Club programs after school that could be added. Her children have participated in the recreation programs throughout the years and she would like to get involved.

Move to appoint Sheila McCourts to the Recreation Commission for a term of three years or

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, OCTOBER 29, 2019 7:00 PM
SCITUATE TOWN HALL, 600 CHIEF JUSTICE CUSHING HIGHWAY

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
7:05 **WALK INS**
7:10 **REPORT OF THE TOWN ADMINISTRATOR**

SCHEDULED ITEMS:
7:15 **UPDATE** Wind Turbine, Al Bangert
7:25 **DISCUSS/VOTE** Surplus Auction, Jim Boudreau, Town Administrator
7:35 **UPDATE** Resolution to Notice of Non-Compliance Turbidity Violation, Sean Anderson, Water Superintendent & Kevin Cafferty, DPW Director
7:45 **DISCUSS/VOTE** Shellfish Aquaculture Regulations
1. Waterways Commission, Brian Kelly, Chair
2. Shellfish Advisory Committee, Susan Harrison, Chair
3. Tom Shields, South Shore Regional Supervisor, MA Division of Marine Fisheries

NEW BUSINESS:
1. **DISCUSS/VOTE** One Day Wine & Malt Applications
   a. Ellen MacKenzie @ Out of the Blue on 11/1 5-9 p.m.

OTHER BUSINESS:
1. Liaison Reports
2. Correspondence
3. Approval of Meeting Minutes
4. Adjournment and Signing of Documents

BOS Meeting October 29, 2019

TOPIC: Wind Turbine Noise Compliance Update

This provides the Board of Selectmen with an update on the wind turbine acoustical study.

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- Several residents have complained that the turbine makes sounds that disturbs them under certain wind conditions. The complaints occur primarily during late spring, summer, and early fall nights.
- After a study to determine wind conditions that generated the annoyance, the BOS asked Scituate Wind to implement a mitigation program in 2017 that would shut down the turbine when those conditions existed between 11pm and 6pm from June 1st to October 15th.[1]
- In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test. Epsilon worked with the DEP to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving 4 Scituate locations[2] and specific wind conditions. Monitoring for wind conditions commenced in March 2019.

DISCUSSION

- Epsilon has completed 3 of the 4 evening noise tests[3] generating 12 pieces of data. Once the 4th evening of data gathering has been completed, they will analyze all 16 pieces versus DEP regulations and supply the Town with a full report.
- Currently testing is at a standstill since the turbine has been out-of-service for repairs. It is not expected to be back in service for several more weeks.
- At this point we may have enough data to complete the analysis. I conferred with the folks at Epsilon who believe they can get the 4th set of data yet this fall once the turbine returns to normal operation. They suggest that we stay the course through December and decide to abort if they cannot get this last data set by 12/31. They have set aside time in January to complete the tedious data analysis and can deliver a final report in early February.

RECOMMENDATION

- Continue to monitor for wind conditions and complete the 4th set of data. If this cannot be accomplished by December 31st, instruct Epsilon Associates to discontinue testing, conduct the data analysis, and deliver a final report concerning turbine compliance/non-compliance by early February 2020.

Albert Bangert

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[1] This mitigation program has been implemented every summer since then.

[2] McKeever residence, Dardi residence, Karlsberg residence, Vitali residence.

[3] 4/18/19, 7/31/19 and 10/1/19.

are pleased with the results that we have gotten thus far from the ice pigging and the flushing. We will evaluate our progress in the spring and determine if more ice pigging is needed.

5. Budgets have been submitted by the Town Departments to the finance office for review. Nancy and I are in the process of reviewing 48 department budgets totaling $56.9 m in requests (does not include the school budget). This week we will be meeting with 26 members of the staff (department heads etc.) to review their budgets with a tentative presentation date of 11/19/19 to the BOS. That is also the date for the BOS to hold our tax classification hearing.
6. The Town received two reimbursements from FEMA for Storm Riley of March 2018 last week. $86,663.01 reimbursement for emergency seawall and sidewalk repairs and $6,457.50 for fence and stone wall repairs. We have filed 21 claims for Storm Riley with FEMA totaling $5.1. Those claims are in various stages of approval.
7. Regional Sewer meeting next week. Will get an update at that time.

SCHEDULED ITEMS:

Wind Turbine, Al Bangert

BACKGROUND

- The Scituate wind turbine was put into operation on March 29, 2012.
- Several residents have complained that the turbine makes sounds that disturb them under certain wind conditions. The complaints occur primarily during late spring, summer, and early fall nights.
- After a study to determine wind conditions that generated the annoyance, the BOS asked Scituate Wind to implement a mitigation program in 2017 that would shut down the turbine when those conditions existed between 11pm and 6pm from June 1st to October 15th.[1]
- In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test. Epsilon worked with the DEP to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving 4 Scituate locations[2] and specific wind conditions. Monitoring for wind conditions commenced in March 2019.

DISCUSSION

- Epsilon has completed 3 of the 4 evening noise tests[3] generating 12 pieces of data. Once the 4th evening of data gathering has been completed, they will analyze all 16 pieces versus DEP regulations and supply the Town with a full report.
- Currently testing is at a standstill since the turbine has been out-of-service for repairs. It is not expected to be back in service for several more weeks.
- At this point we may have enough data to complete the analysis. I conferred with the folks at Epsilon who believe they can get the 4th set of data yet this fall once the turbine returns to normal operation. They suggest that we stay the course through December and decide to abort if they cannot get this last data set by 12/31. They have set aside time in January to complete the tedious data analysis and can deliver a final report in early February.

RECOMMENDATION

- Continue to monitor for wind conditions and complete the 4th set of data. If this cannot be accomplished by December 31st, instruct Epsilon Associates to discontinue testing, conduct the data analysis, and deliver a final report concerning turbine compliance/non-compliance by early February 2020.

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[1] This mitigation program has been implemented every summer since then.

[2] McKeever residence, Dardi residence, Karlsberg residence, Vitali residence.

[3] 4/18/19, 7/31/19 and 10/1/19.

Ms. Connolly is confused about the conditions needed for testing. Mr. Bangert said in 2017, the Board of Health tracked all reports and correlated the complaints to the conditions while complaints were occurring. The DEP developed the test protocol that is being tested with the wind turbine company. The wind conditions necessary to test are the wind conditions at the top of the turbine. Ms. Curran finds it difficult to understand why it has taken over a year to obtain the data. Mr. Bangert said they have to predict what the conditions will be and get the team together to get the testing. Mr. Bangert said our contract protects us for compensation if the wind turbine falls short. Ms. Canfield asked if we would get all the data. Mr. Bangert said yes, we will get all the data. Ms. Canfield asked what is the mechanical problem. Mr. Bangert said there is a piece of equipment in the turbine that is indicating an overheating condition and the turbine shuts off automatically. It has been a problem for 18 months. The experts are in Austria and Romania. They are getting closer to finding the problem. Mr. Vegnani said everyone is frustrated that it has taken so long to get the testing done. Ms. Connolly asked if the company has the data to date. Mr. Bangert said we have millions of pieces of data that is put into an algorithm and there is an $8000 cost to determine the test results. Mr. Bangert said the other option is to analyze what we have and provide additional funding to analyze the final result.

Surplus Auction, Jim Boudreau, Town Administrator
Mr. Boudreau said the Town has accumulated surplus items, vehicles, and old school equipment and would like to hold an auction. The Selectmen were provided with a copy of the Department Inventory of auction items. Bids were sent out and an online auctioneer has been identified to use at no cost to the town. The funds go back into the general fund.

Move to approve a surplus auction to dispose of obsolete items. Motion by Ms. Canfield second by Mr. Harris Unanimous Vote (5-0)

Rick Murray 16 Colier Road asked if the boats were initially purchased with enterprise funds and if so can the proceeds from the auction be returned to the enterprise fund. Mr. Boudreau said yes the money for anything purchased from the enterprise fund would be returned to the enterprise fund.

Resolution to Notice of Non-Compliance Turbidity Violation, Sean Anderson, Water Superintendent & Kevin Cafferty, DPW Director

Last September the Water Department was in to see the Selectmen regarding the violation of the clarity of the water. The plan was to shut down the plant and complete all the work to fix the problem. This work was completed. The letter was just issued this October regarding the issue 13 months ago. Jim McLaughlin from the DEP (Department of Environmental Protection) stated in a letter to Sean McCarthy, DPW Water Superintendent "We received your response to the turbidity NON-CSA today and that action has been closed out in our database. Thank you very much for your rapid response to resolve this situation. I also applaud the entire Scituate Department of Public Works for your work this year to overcome serious challenges with your water system. Although many of your customers are still frustrated, you are taking the proper managerial, financial and planning steps necessary to repair your aged infrastructure." This is very positive feedback from the DEP and Mr. Boudreau wanted to share this with the Board of Selectmen. Mr. Vegnani asked Mr. McCarthy and Mr. Boudreau to pass along their thanks to the Water Department.

MassWorks Contract Amendment Request to change type of system and length of contract for Cedar Point, Jim Boudreau, Town Administrator

AGENDA
MEETING OF THE BOARD OF SELECTMEN
TUESDAY, MARCH 24, 2020, 7:00 p.m.
FACILITATED @ SCITUATE TOWN HALL, 600 CHIEF JUSTICE CUSHING HIGHWAY
VIA REMOTE PARTICIPATION Due to COVID-19

In response to Governor Baker's declaration of a public health emergency and the related Emergency Executive Order dated March 12, 2020, Town of Scituate public meetings shall meet remotely until further notice. This meeting will be recorded by Scituate Community Television, can be viewed live on cable television channel 9 and will be posted on our website the next day. Participation by the public for the Public Hearing and Wind Turbine Report will be available by audio conference bridge.

If you wish to participate on the topics of 7:15 Public Hearing Hibernian Tavern New Liquor License Application and 7:30 Wind Turbine Sound Level Compliance Testing Results for this meeting the audio conference call in can be accessed via any of these three numbers and if the line is busy keep trying:

Dial any number (US) to join:	(425) 436-6308
Long distance charges could apply	(425) 436-6338
depending on your calling plan	(425) 436-6300

Access Code: 817651#
Follow the directions for the calling service. You can listen to the audio and your phone line will be muted. You will be allowed to ask questions or comment during the moderated Q&A period by following the audio directions.

7:00 **MEETING CALLED TO ORDER/ACCEPTANCE OF AGENDA**
7:03 **REPORT OF THE TOWN ADMINISTRATOR**

SCHEDULED ITEMS:
7:10 **DISCUSS/VOTE** Acceptance of Donation Beautification Commission, Leslie Dienel
7:15 **PUBLIC HEARING/DISCUSS/VOTE** Hibernian Tavern New Liquor License Application, Michael Carlyle & Areline McClay
7:30 **REVIEW/DISCUSS/VOTE** Wind Turbine Sound Level Compliance Testing Results, Al Bangert
8:00 **DISCUSS/VOTE** Consultant Contract Storm Tide Pathways $112,668, Kyle Boyd, Coastal Resource Manager
8:10 **DISCUSS/VOTE** Request to build Osprey Nest @ Bailey's Causeway Marsh, Joseph Sammartino
8:20 **RECOMMENDATION/DISCUSSION** Appointment of Police Chief, Jim Boudreau, Town Administrator
8:30 **ASSIGN** Town Meeting Warrant Articles to Selectmen

OTHER BUSINESS:
1. Liaison Reports
2. Correspondence
3. Approval of Meeting Minutes
4. Adjournment and Signing of Documents

BOS Meeting March 24, 2020

TOPIC: Wind Turbine Sound Level Compliance Testing Results

This provides the Board of Selectmen with a summary of the final report on the wind turbine sound level compliance testing. The full report is attached.

BACKGROUND

- In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test.
- Epsilon worked with the MassDEP over the course of five months to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving four Scituate locations[1] and specific wind conditions[2][3]. Final agreement with the DEP was reached 11/27/19.
- Epsilon began monitoring wind conditions and completed the first on April 19, 2019.
- Sound level testing consists of measuring the "L-max" or maximum sound emitted by the turbine when running versus the "L-90" or lowest sound level with the turbine shutdown. Sound is quantified using the logarithmic decibel scale as dBA[3].

DISCUSSION

- Epsilon completed all of the evening noise tests between 1am and 4am[4] generating 16 data sets incorporating several hundred direct measurements of ambient and turbine sound levels. Scituate Wind LLC cooperated fully with Epsilon throughout the overnight testing periods.
- The results of the testing program show that sound levels due to the wind turbine operating during wind conditions producing maximum power and during wind conditions identified by resident noise complaints comply with the MassDEP Noise Policy[4] with the exception of one night at one location.
- This table summarizes the difference in decibels between maximum sound levels with the turbine running versus the lowest ambient noise level. Compliance requires this difference to be less than 10 dBA.

Test Date	**4/19/19**		**7/31/19**		**10/2/19**		**12/6/19**	
Wind Conditions	**> 20 mph**		**11-22 mph**		**> 20 mph**		**11-22 mph**	
151 Driftway	7 dBA	yes	13 dBA	no	3 dBA	yes	9 dBA	yes
26 Hewes	negligible	yes	8 dBA	yes	1 dBA	yes	9 dBA	yes
122 Gilson	5 dBA	yes	3 dBA	yes	2 dBA	yes	9 dBA	yes
34 Driftway	1 dBA	yes	4 dBA	yes	2 dBA	yes	9 dBA	yes

- In order to further understand the apparent non-compliance that occurred at 151 Driftway on 7/31/19, Epsilon analyzed the L-90 sound level differences between turbine on and turbine off.

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[1] McKeever residence, Karlsberg residence, Dardi residence, Vitali residence.

[2] Winds from the West-Southwest (+/- 45 degrees) at speeds above 20mph and at speeds between 11-22mph. [3] These terms are more fully explained by Epsilon in Section 3 of the attached report.

[3] /19/19, 7/31/19, 10/2/19 and 12/6/19.

[4] The MassDEP regulations are explained in Section 4 of the attached report.

The property is adjacent to the turbine and the sewage treatment plant, and the turbine is more audible at this location than at the other three locations by 1 to 3 dBA. However, on July 31st this difference jumped to 9 dBA suggesting that something else may have influenced the sound levels besides the wind turbine on this evening (pages 6-20 and 6-21 of the report.)

Respectfully submitted, Albert
Bangert

Ms. Connolly yes
Ms. Curran yes

Move to approve an annual indoor entertainment license with windows closed to Hibernian Tavern, Inc. located at 111 Front Street, Scituate, MA, Monday through Thursday 12 noon – 10 p.m. Friday & Saturday 10 a.m. – 12 a.m. and Sunday 10:00 a.m. – 10:00 p.m. Motion by Ms. Curran second by Mr. Harris Unanimous Vote (5-0)

Roll Call Vote:
Mr. Vegnani yes
Mr. Harris yes
Ms. Canfield yes
Ms. Connolly yes
Ms. Curran yes

Wind Turbine Sound Level Compliance Testing Results, Al Bangert
Mr. Bangert summarized the results of the wind turbine sound level compliance testing.

BACKGROUND
□ In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test.
□ Epsilon worked with the MassDEP over the course of five months to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving four Scituate locations[1] and specific wind conditions[2]. Final agreement with the DEP was reached 11/27/19.
□ Epsilon began monitoring wind conditions and completed the first on April 19, 2019.
□ Sound level testing consists of measuring the "L-max" or maximum sound emitted by the turbine when running versus the "L-90" or lowest sound level with the turbine shutdown. Sound is quantified using the logarithmic decibel scale as dBA[3].

DISCUSSION
□ Epsilon completed all of the evening noise tests between 1am and 4am[4] generating 16 data sets incorporating several hundred direct measurements of ambient and turbine sound levels. Scituate Wind LLC cooperated fully with Epsilon throughout the overnight testing periods.
□ The results of the testing program show that sound levels due to the wind turbine operating during wind conditions producing maximum power and during wind conditions identified by resident noise complaints comply with the MassDEP Noise Policy[5] with the exception of one night at one location.
□ This table summarizes the difference in decibels between maximum sound levels with the turbine running versus the lowest ambient noise level. Compliance requires this difference to be less than 10 dBA.

Test Date	**4/19/19**	**7/31/19**	**10/2/19**	**12/6/19**
Wind Conditions	**> 20 mph**	**11-22 mph**	**> 20 mph**	**11-22 mph**
151 Driftway	7 dBA yes	13 dBA no	3 dBA yes	9 dBA yes
26 Hewes	negligible yes	8 dBA yes	1 dBA yes	9 dBA yes
122 Gilson	5 dBA yes	3 dBA yes	2 dBA yes	9 dBA yes
34 Driftway	1 dBA yes	4 dBA yes	2 dBA yes	9 dBA yes

In order to further understand the apparent non-compliance that occurred at 151 Driftway on 7/31/19, Epsilon analyzed the L-90 sound level differences between turbine on and turbine off. The property is adjacent to the turbine and the sewage treatment plant, and the turbine is more audible at this location than at the other three locations by 1 to 3 dBA. However, on July 31st this difference jumped to 9 dBA suggesting that something else may have influenced the sound levels besides the wind turbine on this evening (pages 6-20 and 6-21 of the report.)

David Dardi, 122 Gilson Road is glad to see that Epsilon took great efforts to see the one night and what happened. Mr. Dardi has reviewed the report and said it is inconclusive and incomplete. Mr. Vegnani asked for the raw data and Mr. Bangert said he will ask Epsilon for the raw data.

Ellen Kasper 120 Gilson Road is happy no decisions will be made tonight. This is a problem for many years. On April 19th the testing was not done on an evening that typically does not cause problems. People do not believe the residents are having problems even when it is not more than a level 10. Mr. Bangert said the testing has to be done at full energy as well as a data point. Mr. Vegnani said there is nobody on the board that doesn't believe there are residents that are bothered by this. There will be another meeting where everyone can evaluate this.

Joanne Levesque is a Duxbury resident and has been an advocate for Scituate residents since 2012. There is a document and the protocol for the acoustic monitoring was provided to MASS DEP. MASS DEP Southeast regional office has reviewed and the first comment is they did not formally approve the protocol. Ms. Levesque pointed out other concerns with the report asking where the raw data and scada data was and the technician field notes. Also, where are the audio tapes for this testing. Mr. Bangert said we have hired professional engineers to review this data and provide analysis on this testing. The information that Ms. Levesque is requesting was available to the engineers. Ms. Levesque said a peer review is incredibly important with this testing. Mr. Vegnani asked Ms. Levesque what her background is. She served on the wind advisory committee in Duxbury. Other community residents ask her for advice. Mr. Vegnani said she is concerned for the residents but not a professional. Mr. Vegnani said we all acknowledge that something is going on but we do not believe the test was rigged. Mr. Vegnani said the Board just wanted truthful data. Ms. Levesque said if only four tests are done it needs to be done when it impacts neighbors and the April 19th test were not those conditions.

Mark McKeever, 151 Driftway said the residents are suffering. Mr. Vegnani said the Board received a letter from the McKeever family and thanked them for their input.

David Dardi, 122 Gilson Road said he is not sure the DEP needed a full power test but 60%. DEP advice on the protocols got twisted.

Ms. Canfield said we all wish Mr. Dardi a healthy return. When we received notice this was on the agenda she alerted Senator O'Connor this was on the agenda. While we review this data we will be reaching out to the State Representatives.

The report will be made public and put on the Town of Scituate website. Mr. Vegnani thanked Mr. Bangert for his work on this project it is appreciated.

VOTED to authorize the Selectmen to lease a portion of the Scituate Wastewater Treatment Plant Property for up to twenty-five years for the purpose of operating a private commercial yard waste business.
TWO-THIRDS VOICE VOTE.

ARTICLE 23
LEASE – "APPLETON" PROPERTY

To see if the Town will vote to authorize the Conservation Commission to lease a portion of the so called "Appleton Property" for up to five years for the purpose of farming including the raising of pigs; or take any other action relative thereto.

Sponsored By: Board of Selectmen

Moved to indefinitely postpone.
UNANIMOUS VOTE.

ARTICLE 24
BEACH PROTECTION PLAN MANN HILL

To see if the Town will vote to transfer a sum of money to develop a beach protection plan for the Mann Hill Road area; or take any other action relative thereto.

Sponsored by: Board of Selectmen

VOTED to transfer a sum of money to develop a beach protection plan for the Mann Hill Road area.
UNANIMOUS VOTE.

ARTICLE 25
ZONING BYLAW - WIND ENERGY CONVERSION SYSTEMS BY-LAW 740

To see if the Town will vote to amend Scituate Zoning Bylaw Section 740, Wind Energy Conversion Systems, by deleting the existing language of Section 740.6, Noise Level Standards and substituting the following new language:

740.6 Noise Level Standards. The wind facility and associated equipment shall conform to the provisions of the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10). An analysis prepared by the registered qualified engineer will be required to demonstrate compliance with the above standards.

Sponsored By: Planning Board

VOTED to amend Scituate Zoning Bylaw Section 740, Wind Energy Conversion Systems, by deleting the existing language of Section 740.6, Noise Level Standards and substituting the following new language:

ATM March 29, 2008

740.6 Noise Level Standards. The wind facility and associated equipment shall conform to the provisions of the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10). An analysis prepared by the registered qualified engineer will be required to demonstrate compliance with the above standards.
UNANIMOUS TWO-THIRDS VOICE VOTE.

ARTICLE 26
ZONING BYLAW - HUMAROCK OVERLAY DISTRICT

To see if the Town will vote to amend the Zoning Bylaw by adding the following new Section 570, Humarock Village Residential Overlay District:

SECTION 570 HUMAROCK VILLAGE RESIDENTIAL OVERLAY DISTRICT

570.1 Purpose. This zoning overlay district is hereby adopted to regulate, condition and protect the village center of the small ocean-front community of Humarock, which lies on an environmentally sensitive barrier beach; to encourage redevelopment of parcels containing outdated uses; and to allow alternative forms of residential development at an appropriate scale for the land. Paramount goals are to promote development which is harmonious with the natural features of the peninsula which constitutes the Humarock area; to beautify and protect the adjacent resource areas; and to enhance the entrance to the Humarock Public Beach. The provisions of the underlying zoning shall remain in full force and effect, applicable to the land, except and to the extent an applicant elects to utilize the provisions of this Section 570 and obtain all required relief pursuant to this Section 570.

2.2 Permitted Uses.
In the Humarock Village Residential Overlay District, all of the uses permitted in the underlying Zoning District(s) as of right shall be permitted as of right.

3.3 Uses Permissible by Special Permit.
The following uses may be permitted by Special Permit in the Humarock Village Residential Overlay District:

A. Any use permitted by Special Permit in the underlying Zoning District in accordance with the provisions of that district.
B. A multi-family development on a parcel containing a minimum of 30,000 sq. ft. of lot area as defined by Section 610.1 of this bylaw in single ownership provided that a Special Permit is obtained from the Planning Board in accordance with the provisions of Section 570 of this bylaw. °A multi-family development shall consist of residential dwelling units, except that in those portions of the overlay on Marshfield Ave., and on Central Ave. south of Webster Street, for which the underlying zone is General Business District, any use allowed in the General Business District may be permitted on the first floor with the approval of the Planning Board.

29 March 2008 To. 4

VOTED to authorize the Board of Selectmen to acquire by eminent domain, or purchase a parcel of land consisting of approximately .92 acres located off Bates Lane and shown as Lot E on a plan entitled "The Glen" dated August 4, 2008 and on file in the Scituate Planning Board.
TWO-THIRDS VOICE VOTE - YES

ARTICLE 4
Easement

To see if the Town will vote to authorize the Board of Selectmen to acquire a permanent easement by gift, purchase, eminent domain, or otherwise, located at #6 Old Country Way and as shown on a plan entitled "Easement Plan of Land for 6 Old Country Way in Scituate, Ma", dated February 12, 2009, a copy of which is on file in the Town Clerks Office for the purpose of constructing a sidewalk, and maintaining said sidewalk, existing drainage structures and all other appurtenances thereto, or take any other action relative thereto.

Sponsored By: Board of Selectmen

VOTED to authorize the Board of Selectmen to acquire a permanent easement by gift, purchase, eminent domain, or otherwise, located at #6 Old Country Way and as shown on a plan entitled "Easement Plan of Land for 6 Old Country Way in Scituate, Ma", dated February 12, 2009, a copy of which is on file in the Town Clerks Office for the purpose of constructing a sidewalk, and maintaining said sidewalk, existing drainage structures and all other appurtenances thereto, or take any other action relative thereto.
MAJORITY VOICE VOTE - YES

ARTICLE 5
Lease of Land

To see if the Town will vote to authorize the Board of Selectmen to lease a portion of the Scituate Wastewater Treatment Plant property for up to twenty five years for the purpose of constructing and operating a wind turbine, or take any other action relative thereto.

Sponsored By: Board of Selectmen

VOTED to authorize the Board of Selectmen to lease a portion of the Scituate Wastewater Treatment Plant property for up to twenty-five years for the purpose of constructing and operating a wind turbine, or take any other action relative thereto.
TWO-THIRDS VOICE VOTE – YES

I HEREBY CERTIFY THE FOREGOING TO BE A TRUE COPY ATTEST.
Bernice R. Brown
Bernice R. Brown

ARTICLE 28. Rescission of Special Permit Grant to Scituate Wind LLC – BY PETITION

WARRANT

To see if the Town will vote to rescind the Special Permit granted to Scituate Wind LLC

PURPOSE AND JUSTIFICATION
This article will allow the appropriate town officials to exercise its authority and responsibility to protect the health and safety of the residents of the Town of Scituate. Areas of concern include excessive noise, shadow flicker and the resulting adverse health impact experience by the residents.

MOTION

ARTICLE 28. Rescission of Special Permit Grant to Scituate Wind LLC – BY PETITION
(Murray)

Mr. Moderator,

I move that the Town rescind the Special Permit granted to Scituate Wind LLC

PURPOSE AND JUSTIFICATION
This article will allow the appropriate town officials to exercise its authority and responsibility to protect the health and safety of the residents of the Town of Scituate. Areas of concern include excessive noise, shadow flicker and the resulting adverse health impact experience by the residents.
Quantum of vote:Majority

MOTION FAILED-CARD VOTE-MAJORITY
118-YES
132-NO

ARTICLE 29. Petition to contact U.S. Congress to pass and send to the States an amendment to the U.S. Constitution – BY PETITION

WARRANT

WHEREAS, the United State Supreme Court has compromised democratically enacted local, state, and federal legislation that protects our health, safety, the environment, and the integrity of our elections on the presumption that corporations have the same constitutional rights as people and that unlimited political spending in elections does not give rise to corruption or the appearance of corruption; and
WHEREAS, the expenditure of unlimited money in elections threatens to overwhelm our individual voices in the democratic process and to facilitate the undue influence of large political donors with elected officials who benefit from them;
NOW, THEREFORE, BE IT RESOLVED that we the citizens of Scituate, Massachusetts, petition the U.S. Congress to pass and send to the States and amendment to the U.S. constitution that would affirm that corporations are not entitled to the constitutional rights of human beings, and that Congress, and state and local governments may place limits on political contributions and expenditures from any source.

MOTION

ARTICLE 29. Petition to contact U.S. Congress to pass and send to the States an amendment to the U.S. Constitution – BY PETITION **Ms. Svenning**
(Danehey)

Mr. Moderator,

I move that:

WHEREAS, the United State Supreme Court has compromised democratically enacted local, state, and federal legislation that protects our health, safety, the environment, and the integrity of our elections on the presumption that corporations have the same constitutional rights as people and that unlimited political spending in elections does not give rise to corruption or the appearance of corruption; and
WHEREAS, the expenditure of unlimited money in elections threatens to overwhelm our individual voices in the democratic process and to facilitate the undue influence of large political donors with elected officials who benefit from them;
NOW, THEREFORE, BE IT RESOLVED that we the citizens of Scituate, Massachusetts, petition the U.S. Congress to pass and send to the States and amendment to the U.S. constitution that would affirm that corporations are not entitled to the constitutional rights of human beings, and that Congress, and state and local governments may place limits on political contributions and expenditures from any source.

VOTED

WHEREAS, the United State Supreme Court has compromised democratically enacted local, state, and federal legislation that protects our health, safety, the environment, and the integrity of our elections on the presumption that corporations have the same constitutional rights as people and that unlimited political spending in elections does not give rise to corruption or the appearance of corruption; and
WHEREAS, the expenditure of unlimited money in elections threatens to overwhelm our individual voices in the democratic process and to facilitate the undue influence of large political donors with elected officials who benefit from them;

9 Apr 2013
Town Meeting

ACOUSTIC STUDY OF THREE WIND TURBINES

SCITUATE, MASSACHUSETTS

April 2008

TECH ENVIRONMENTAL
Air Quality, Odor Control, and Noise Solutions

ACOUSTIC STUDY OF THREE WIND TURBINES SCITUATE, MASSACHUSETTS

Prepared for:
Town of Scituate
Scituate Town Hall
600 Chief Justice Cushing Highway
Scituate, Massachusetts 02066

and

Massachusetts Technology Collaborative
75 North Drive
Westborough, MA 01581

Prepared by:

Tech Environmental, Inc.
1601 Trapelo Road
Waltham, MA 02451

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1.0 EXECUTIVE SUMMARY

The town proposes to locate a wind turbine near the Scituate wastewater treatment plant. A study of the noise effects from three potential makes of a wind turbine (General Electric, Fuhrlander, Gamesa) on nearby areas was performed. Two potential turbine locations were modeled at the plant site. Acoustic modeling was done for design wind speed operating conditions for the sound power levels of each potential turbine, which produces the loudest sound levels at the site. The "design wind speed condition" in this study refers to the lowest wind speed at which the maximum sound power level is first produced. Existing sound levels on the site and in nearby residential areas were measured over the period of 18 February 2008 through 22 February 2008.

The study's conclusions are as follows:

- The wind turbine Project complies with the Massachusetts DEP and Town of Scituate Noise Policies concerning the increases in total sound level at all nearby residential properties for all turbine makes.
- The wind turbine Project complies with the Massachusetts DEP Noise Policy concerning pure tones for one of the turbines (Gamesa). It is anticipated that it will comply for the other two; however it could not be verified due to the unavailability of octave band sound power data. (It could not be obtained from the manufacturers.)
- A project at Location 2 is expected to produce lower sound levels at the nearby residential locations than Location 1 for all turbines, by about 4-5 decibels. However, areas to the west would experience higher sound levels by about 4 decibels.
- The Project would increase the ambient L_{90} sound level[1] by 0 dBA to 9 dBA at the nearest residences, depending on turbine type and location. The GE turbine would increase L_{90} sound levels 0 to 6 dBA, the Fuhrlander turbine would increase L_{90} levels 0 to 1 dBA, and the Gamesa would increase L_{90} levels 0 to 9 dBA.
- The Project will be audible at certain times in the closest areas to the east of the turbine towers for certain turbine types and locations. When three conditions all occur: 1) residents in these abutting areas are downwind, 2) ambient sound levels are low, and 3) wind speeds are high enough for wind turbine operation, then the "swishing" sound characteristic of wind turbine will be audible outdoors for certain locations and turbine types. Project sounds should not be audible indoors anywhere.

[1] The L_{90} sound level represents the quietest 10 percent of any time period.

2.0 COMMON MEASURES OF COMMUNITY SOUND

All sounds originate with a source – a human voice, vehicles on a roadway, or an airplane overhead. The sound energy moves from the source to a person's ears as sound waves, which are minute variations in air pressure. The loudness of a sound depends on the sound pressure level, defined as the ratio of two pressures: the measured sound pressure from the source divided by a reference pressure (the quietest sound we can hear). The unit of sound pressure is the decibel (dB). The decibel scale is logarithmic to accommodate the wide range of sound intensities to which the human ear is subjected. On this scale, the quietest sound we can hear is 0 dB, while the loudest is 120 dB. Most sounds we hear in our daily lives have sound pressure levels in the range of 30 dB to 100 dB.

A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (or 73 dB), not a doubling to 140 dB. In terms of the human perception of sound, a halving or doubling of loudness requires changes in the sound pressure level of about 10 dB; 3 dB is the minimum perceptible change for broadband sounds, i.e. sounds that include all frequencies. Typical sound levels associated with various activities and environments are presented in Table 1. The distance to a major road often determines the acoustic environment in a rural area such as the Scituate site, as roadway traffic establishes the background sound levels.

Sound exposure in a community is commonly expressed in terms of the A-weighted sound level (dBA); A-weighting approximates the frequency response of the human ear. Levels of many sounds change from moment to moment. Some are sharp impulses lasting one second or less, while others rise and fall over much longer periods of time. There are various measures of sound pressure designed for different purposes. To establish the background ambient sound level in an area, the $\mathbf{L_{90}}$ metric, which is the sound level exceeded 90 percent of the time, is typically used. The $\mathbf{L_{90}}$ can also be thought of as the level representing the quietest 10 percent of any time period and is a broadband sound pressure measure. The $\mathbf{L_{eq}}$, or equivalent sound level, is the steady-state sound level over a period of time that has the same acoustic energy as the fluctuating sounds that actually occurred during that same period. It is commonly referred to as the average sound level. Sound level measurements typically include an analysis of the sound spectrum into its various frequency components to determine tonal

characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis examines eleven octave bands from 16 to 16,000 Hz.

TABLE 1

VARIOUS INDOOR AND OUTDOOR SOUND LEVELS

Outdoor Sound Levels	Sound Pressure (μPa)		Sound Level (dBA)	Indoor Sound Levels
	6,324,555	-	110	Rock Band at 5 m
Jet Over-Flight at 300 m		-	105	
	2,000,000	-	100	Inside New York Subway Train
Gas Lawn Mower at 1 m		-	95	
	632,456	-	90	Food Blender at 1 m
Diesel Truck at 15 m		-	85	
Noisy Urban Area--Daytime	200,000	-	80	Garbage Disposal at 1 m
		-	75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	-	70	Vacuum Cleaner at 3 m
Suburban Commercial Area		-	65	Normal Speech at 1 m
Quiet Urban Area -- Daytime	20,000	-	60	
		-	55	Quiet Conversation at 1m
Quiet Urban Area--Nighttime	6,325	-	50	Dishwasher Next Room
		-	45	
Suburban Area--Nighttime	2,000	-	40	Empty Theater or Library
		-	35	
Rural Area--Nighttime	632	-	30	Quiet Bedroom at Night
		-	25	Empty Concert Hall
Rustling Leaves	200	-	20	Average Whisper
		-	15	Broadcast and Recording Studios
	63	-	10	
		-	5	Human Breathing
Reference Pressure Level	20	-	0	Threshold of Hearing

Notes:
μPa - Micropascals describe sound pressure levels (force/area).
dBA - A-weighted decibels describe sound pressure on a logarithmic scale with respect to 20 μPa.

3.0 NOISE REGULATIONS AND CRITERIA

3.1 Massachusetts DEP Noise Policy

The Department of Environmental Protection (DEP) regulates noise through 310 CMR 7.10, "Air Pollution Control". The regulations are included in Appendix A. In these regulations "air contaminant" is defined to include noise and a condition of "air pollution" includes the presence of an air contaminant in such concentration and duration as to "cause a nuisance" or "unreasonably interfere with the comfortable enjoyment of life and property". Regulation 7.10 prohibits "unnecessary emissions" of noise. The DEP Noise Policy (Policy Statement 90-001, February 1, 1990) interprets a violation of this noise regulation to have occurred if the sound source causes either:

1) An increase in the broadband sound pressure level of more than 10 dBA above the ambient, or

2) A "pure tone" condition.[2]

The ambient background level is defined by DEP as the lowest L_{90} level measured during equipment operating hours.

For the wind turbines examined in this report, operation occurs whenever the wind speed at the reference hub height is greater than the turbine cut-in wind speed, which is usually about 4-5 m/sec. The design wind speed is usually a hub height wind speed of 8 m/s or greater, as specified by the manufacturer. This is also the wind speed at which the turbine sound usually most greatly exceeds the background sound level, and is therefore most appropriate for sound impact evaluation. Cut-in wind speed data for each turbine were not available; however, design wind speed data were obtained from manufacturers for each of the three turbines to be modeled. The Gamesa G87 wind turbine produces a maximum sound power level of 105 dBA at a wind speed of 10 m/sec.; the Fuhrlander FL 600 turbine produces a maximum sound power level of 93 dBA at a wind speed of 11 m/sec; and the GE 1.5 SLE produces a maximum sound power level of 104 dBA at a wind speed of 8 m/sec. The Gamesa and Fuhrlander power levels were conservatively assumed to first occur at 8 m/sec hub height wind speed.

[2] A "pure tone" condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more.

3.2 Town of Scituate Noise By Law

The town of Scituate has recently amended their By-Law, Section 740.6 Noise Level Standards. It is now identical to the MADEP regulations, and is given below:

"The wind facility and associated equipment shall conform with the provisions of the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10). An analysis prepared by a registered qualified engineer will be required to demonstrate compliance with the above standards; or take any other action relative thereto."

4.0 AMBIENT SOUND LEVEL AND WIND MEASUREMENTS

The Scituate wind turbine will be located on town land near the existing wastewater treatment plant. Figure 1 presents the potential turbine tower locations (T1 and T2), the short term sound monitoring locations (S1-S3), the long term monitoring location (L), and the meteorological tower (M). Turbine Location T1 is about 300 feet west of the wastewater treatment plant and about 300 feet south of Driftway Road. Turbine Location T2 is about 500 feet south of Driftway Road near the center of the sand pit area. The closest residences are east of the project site along Driftway Road. A golf course abuts the site to the north and southeast; to the west, a park is located along Driftway Road.

The DEP Noise Policy defines the ambient sound level as the lowest L_{90} level measured during hours when the new source (wind turbine in this case) could "unreasonably interfere with enjoyment of life and property". At residential areas, this could include any time of day, and would especially include late at night when sound background levels are usually at their lowest. At non-residential areas, this would correspond to times when the area under study was in normal use.

Wind measurements were made on-site during the entire measurement period. A 10-meter tower with a wind vane anemometer (R.M. Young Co. Model 3002) was used to record wind speed and direction at the long-term monitoring site, and one-hour averages were recorded by a data logger (R.M. Young Model 26700). The meteorological station was set up on an open location at the wastewater treatment plant, as shown in Figure 1. The measured on-site wind data are included in Appendix B.

To estimate when the wind would be blowing and at what speed, the measured on-site wind speed at the tower above a ground elevation of 15 feet M.S.L. was extrapolated to the average wind turbine hub height for the three potential turbines of 63 meters (207 feet) above a ground elevation of 15 feet M.S.L. using a reference roughness length of 0.3, corresponding to a wooded area.[3] The result of this calculation states that wind speeds at the average hub height are about 1.5 times greater than the 10-meter wind speeds measured on-site.

[3] International Electrotechnical Commission, International Standard IEC 61400-11, "Wind turbine generator systems-Part 11: Acoustic sound measurements techniques," 2006, page 20.

The long-term sound monitoring station was placed at the nearest residence to the east along Driftway Road, at Latitude 42^0 10' 36.3", Longitude 70^0 43' 35.9" Long-term sound level monitoring was performed from 5:00 P.M. February 18, 2008 to 12:00 P.M., February 22, 2008 to document L_{90} and L_{eq} hourly sound levels, day and night, over a range of wind conditions. When the long-term sound monitoring station was set up, skies were partly cloudy, the temperature was about 40^0 F and the winds were gusty (5-10 mph from the southwest), and there was little snow cover. The audible sounds in the residential areas were the wastewater treatment plant, traffic on Driftway Road, wind in the trees, and small aircraft (the mulching plant was not audible).

Supplemental short-term (30 minute) sound monitoring, day and night, was done in the areas surrounding the plant on February 18-19, 2008. This was done during winds of about 5-20 mph, during the day, and under similar wind levels, about 5-20 mph at night. The short-term monitoring locations are labeled #S1 through #S3 on Figure 1, and are listed below in Table 2. Note that the expected uses are different at each location; Receptors S1 and S2 have daytime use only, while receptor S3 is near a residential area with 24 hour usage.

TABLE 3
SHORT TERM MEASUREMENT LOCATION SUMMARY

Residential Location	Receptor #
Park Along Driftway Road	S1
Golf Course to North of Site	S2
Property Line Southeast, North of Clubhouse	S3

All sound level measurements were taken with Larson Davis Model 824 and CEL Model 593 real-time sound level analyzers, which are equipped with precision condenser microphones having an operating range of 5 dB to 140 dB, and an overall frequency range of 3.5 to 20,000 Hz. These meters meet or exceed all requirements set forth in the American National Standards Institute (ANSI) Standards for Type 1 for quality and accuracy. Prior to and immediately following both measurement sessions, the sound analyzers were calibrated (no level adjustment was required) with an ANSI Type 1 calibrator which has an accuracy traceable to the National Institute of Standards and Technology (NIST). All instrumentation was laboratory calibrated per ANSI recommendations. For all measurement sessions,

Figure 1.
Site View Showing Turbine Locations (T1 and T2), Long Term Monitoring Location (L), Short Term Monitoring Locations (S1-S3), and Wind Speed Gauge Location (WS)

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the microphone was fitted with an environmental windscreen to negate the effect of air movement and tripod- mounted at the height of 1.3 meters above grade, and measurements were made away from any vertical reflecting surfaces in compliance with ANSI Standard S12.9.[4] All data were downloaded to a computer following the measurement session. The sound data are summarized in Appendix B.

Appendix B-1 summarizes the hourly measurements of L_{90} sound levels at the long-term monitoring station and the estimated hourly average wind speed at hub height. The values that are in bold text correspond to hours when the wind turbines would likely be operating (hub height wind speeds of 4 m/s or greater). The values that are in bold and italic text correspond to hours when the wind turbines would be near the design wind speed (hub height wind speeds of about 8 m/s or greater). The data in Appendix B-1 reveal 1-hour L_{90} sound levels as low as 35 dBA and as high as 52 dBA, with sound levels in the 36-45 dBA range most of the time. These measured levels are typical for a rural area.

During times when the winds were calm (less than 1 mph), the measured L_{90} levels ranged from 37 to 38 dBA. During the measurement period, there were 35 hours when hub height winds were above the typical cut-in wind speed of 4 m/sec and the wind turbines could have been operating. Hub height winds were in the range of 4-10 m/s and averaged 6.4 m/sec for these hours; the corresponding L_{90} levels averaged 41 dBA, with the lowest L_{90} being 35 dBA. Winds were measured at or above the typical design wind condition of 8 m/s at hub height for about 3.5 hours; the L_{90} sound level was 41 dBA, or 2 dBA higher than under the typical cut-in wind speed condition during this time. Nighttime L_{90} levels (between midnight and 6:00 A.M.) averaged about 36 dBA when the wind was blowing above the cut-in speed; it averaged about 6 m/sec during this time. This is the level which will be used for the DEP compliance verification at the nearest residences. It is conservative, as it includes the quietest nighttime hours and hours when the turbines would be operating below the design speed.

For the purpose of the DEP Noise Policy compliance demonstration at other locations, the wind levels were about 5-20 mph for most of the daytime measurements and nighttime measurements. Short-term measurements made in the residential areas established that L_{90} sound levels in the residential areas are comparable to those at the long-term monitoring station (the minimum measured L_{90} level in the residential area of 40 dBA compares to 36 dBA at the long-term station).

[4] Acoustical Society of America, ANSI Standard S12.9-1992/Part 2, "Quantities and Procedures for Description and Measurement of Environmental Sound. Part 2: Measurement of Long-Term Wind-Area Sound."

5.0 CALCULATED FUTURE SOUND LEVELS

5.1 Methodology

Future sound level effects from the three potential Scituate wind turbines on nearby residences were calculated with the Cadna/A acoustic model. Cadna/A is a sophisticated 3-D model for sound propagation and attenuation based on International Standard ISO 9613[5]. Atmospheric absorption, the process by which sound energy is absorbed by the air, was calculated using ANSI S1.26-1995.[6] Absorption of sound assumed standard day conditions and is significant at large distances. Ground surfaces were assumed to be soft surfaces, typical of grass and wooded areas, resulting in absorption of most sound waves.[7] This is a reasonable assumption for the model predictions at the closest residences, as the land between the turbine towers and those homes is undeveloped and has a soft ground surface. Digital terrain heights were extracted from MassGIS. The model assumes favorable sound propagation, as occurs under downwind conditions or a ground-based temperature inversion, such as might occur on a clear night. At other times, atmospheric turbulence and wind shadow effects will reduce sound levels by 5 to 20 dBA from those presented below.

5.2 Results and Conclusions

Figures 2 – 7 show color-coded decibel contours (5 feet above ground level) for the operation of the Scituate wind turbines and their sound effects on nearby property. The first set of contours is for the GE turbine; the second is for the Fuhrlander; the third is for the Gamesa. The GE turbine is at a hub height of 62 meters; the Fuhrlander at a hub height of 50 meters, and the Gamesa at a hub height of 80 meters. Both potential turbine locations are shown. The turbine sound will be audible to nearby residents in areas with low sound background for some turbines and site locations. Note that Figures 2 through 7 assume the sound receiving location is always downwind of the wind turbine, and the figures present a composite worst-case in which all locations are simultaneously downwind of the wind turbine.

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[5] International Standard, ISO 9613-2, Acoustics – Attenuation of Sound During Propagation Outdoors, -- Part 2 General Method of Calculation.

[6] American National Standards Institute, ANSI S1.26-1995, American National Standard Method for the Calculation of the Absorption of Sound by the Atmosphere, 1995.

[7] Ground absorption factor G set equal to 1.0 in Cadna-A.

The acoustic modeling results in Figures 2-7 and in Tables 4-9 reveal that the Scituate wind turbines will comply with the DEP and Town of Scituate Noise Policies regarding the increase in total broadband sound level at all locations. The project will increase background L_{90} sound levels by 0-9 dBA in the nearest residential areas at the design wind speed condition. If the single lowest L_{90} level of 35 dBA measured at the long-term monitoring station for winds at or above 4 m/sec is used as the "ambient L_{90} level" in Table 3, the increase from project operations would still be below 10 dBA, again in compliance with the DEP Noise Policy.

Although all of the turbines would be in compliance with the DEP noise policy regarding the total sound level increase, it should be noted that the perceived loudness would vary depending on turbine type or location. The Fuhrlander would be almost inaudible at most residential receptors when placed at either turbine location. By contrast, the GE and Gamesa turbines would both be clearly audible above background at night at Location 1. Although the Gamesa appears to meet the DEP noise policy limits at Location 1, if this location and turbine are selected an additional noise analysis will be needed after final design parameters have been determined, because of the projected 9 dBA increase.

Sound from turbine Location 2 will be considerably lower at the nearby residences for both the GE and Gamesa units. At Location 2, the Gamesa turbine would also be clearly audible under most conditions; however, the GE would not be as noticeable. Sound levels from all turbines will be higher on the golf course to the north and also at the park on the water for Location 2; however, they will not be significantly higher than existing levels at these receptors.

Octave band data were not available for either the Fuhrlander or the GE turbines. An examination of data from the Gamesa turbine reveals that it complies with the DEP octave band requirement; however, it has distinctly higher sound levels at about a thousand cycles per second (1000 Hz.). Compliance of the GE 1.5 SLE and Fuhrlander turbines could not be directly verified. It would appear that the generally low sound levels from the Fuhrlander would make it very unlikely that a pure tone would be measureable at any relevant location from this turbine. No definite statement regarding octave band sound from the GE turbine can be made; however, since it is quieter than the Gamesa, it would probably also comply with the pure tone regulation.

TABLE 4

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE GE 1.5 SLE AT LOCATION 1 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	33	48	0
Golf Course to North of Site	52	38	52	0
Property Line South, North of Clubhouse	40	39	43	3
Closest Residence on Driftway	36	40	42	6

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

TABLE 5

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE GE 1.5 SLE AT LOCATION 2 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	37	48	0
Golf Course to North of Site	52	42	53	1
Property Line South, North of Clubhouse	40	34	41	1
Closest Residence on Driftway	36	36	39	3

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

TABLE 6

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE FUHRLANDER FL 600 AT LOCATION 1 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	22	48	0
Golf Course to North of Site	52	27	52	0
Property Line South, North of Clubhouse	40	28	40	0
Closest Residence on Driftway	36	29	37	1

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

TABLE 7

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE FUHRLANDER FL 600 AT LOCATION 2 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	26	48	0
Golf Course to North of Site	52	31	52	0
Property Line South, North of Clubhouse	40	23	40	0
Closest Residence on Driftway	36	25	36	0

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

TABLE 8

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE GAMESA G87 AT LOCATION 1 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	37	48	0
Golf Course to North of Site	52	42	52	0
Property Line South, North of Clubhouse	40	42	44	4
Closest Residence on Driftway	36	44	45	9

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

TABLE 9

DEP NOISE POLICY COMPLIANCE SUMMARY FOR THE GAMESA G87 AT LOCATION 2 UNDER DESIGN WIND SPEED OPERATIONS (dBA)

Residential Location	Ambient L_{90} Level	Maximum Project Sound	Combined Sound Level	Net Increase
Park Along Driftway Road	48	41	49	1
Golf Course to North of Site	52	46	53	1
Property Line South, North of Clubhouse	40	37	42	2
Closest Residence on Driftway	36	39	41	5

Note: DEP Noise policy limits the increase in the ambient level to 10 dBA.

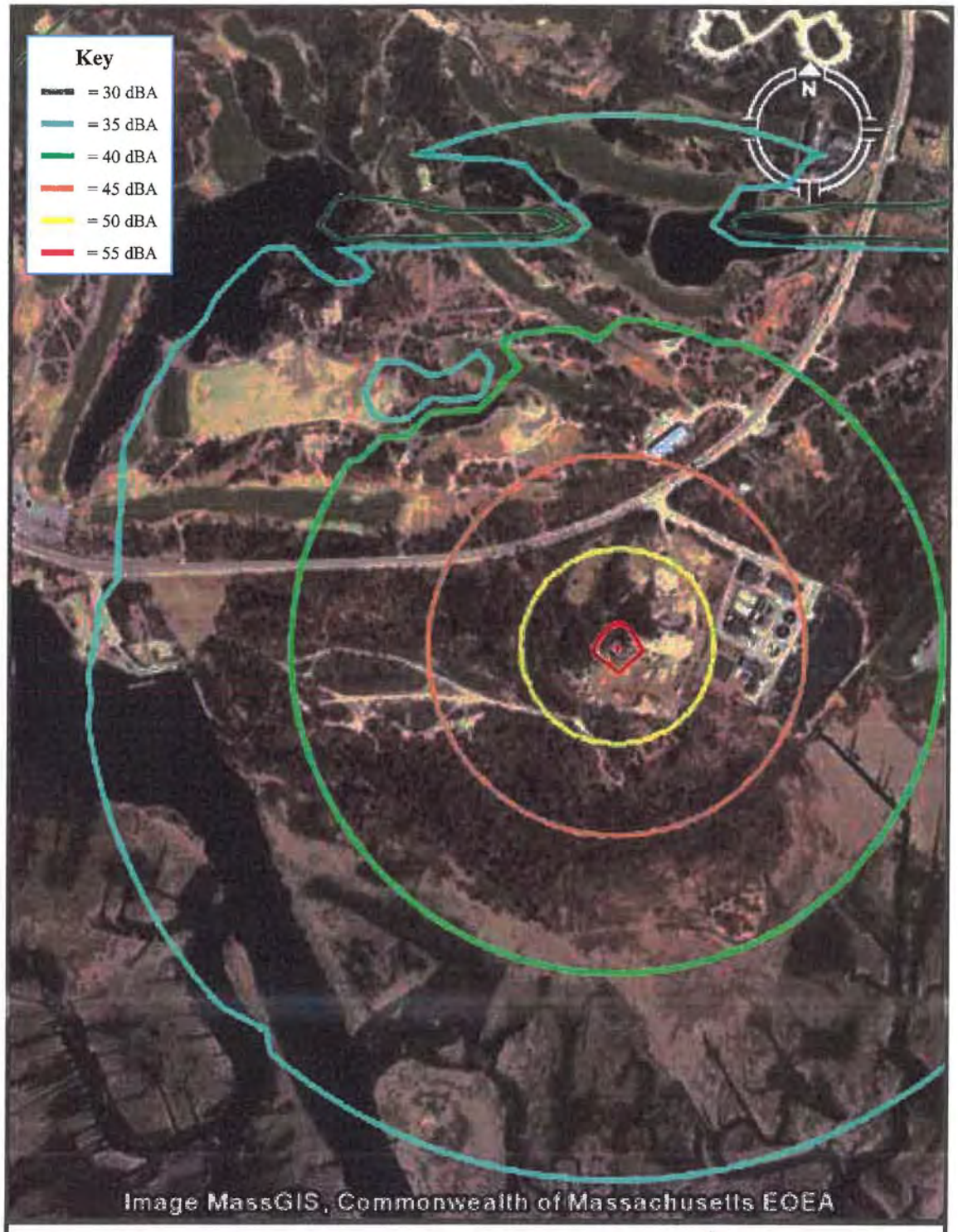

Figure 2.
GE 1.5 SLE Turbine Noise Contours – Location 1

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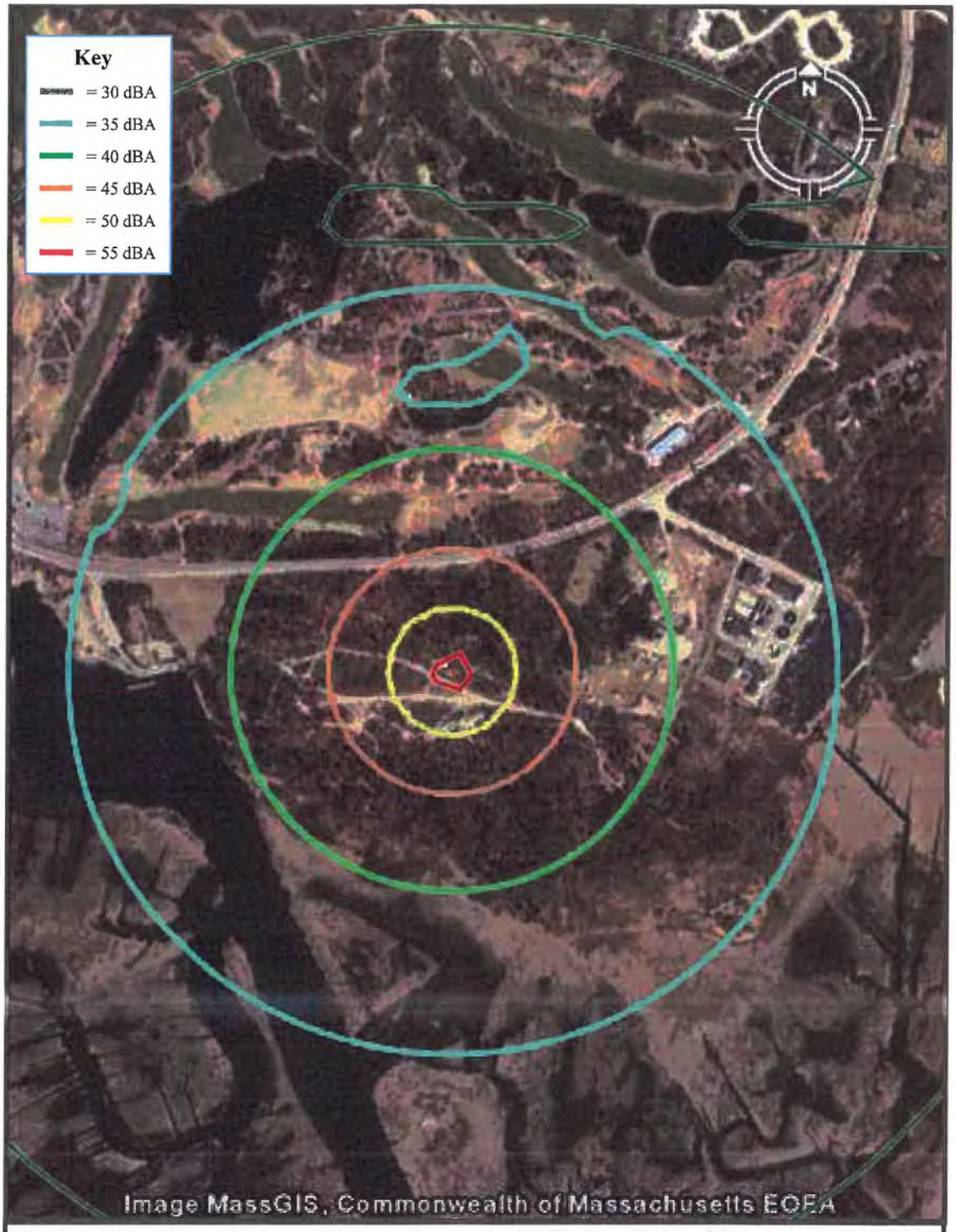

Figure 3.
GE 1.5 SLE Turbine Noise Contours– Location 2

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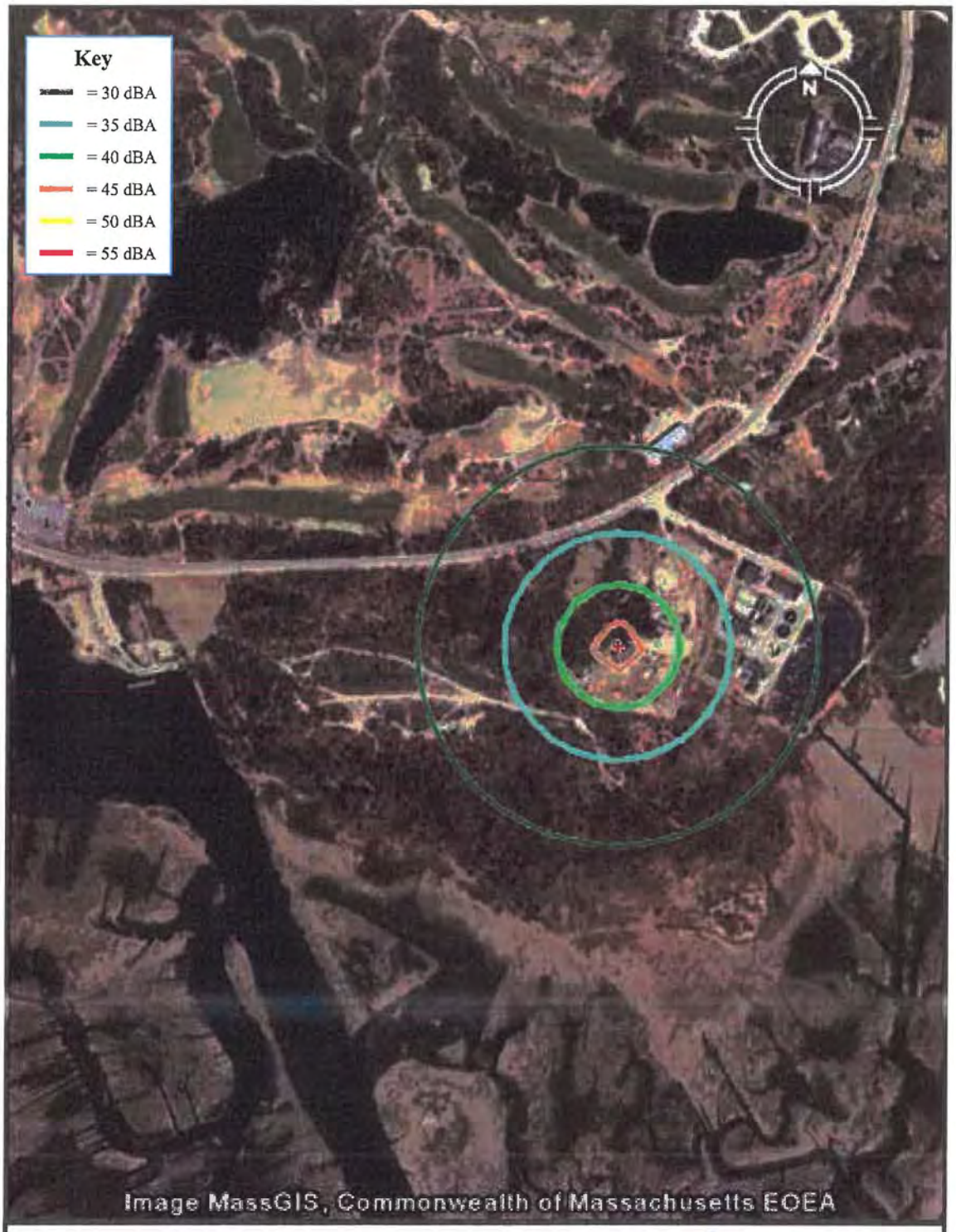

Figure 4.
Fuhrlander FL 600 Noise Contours - Location 1

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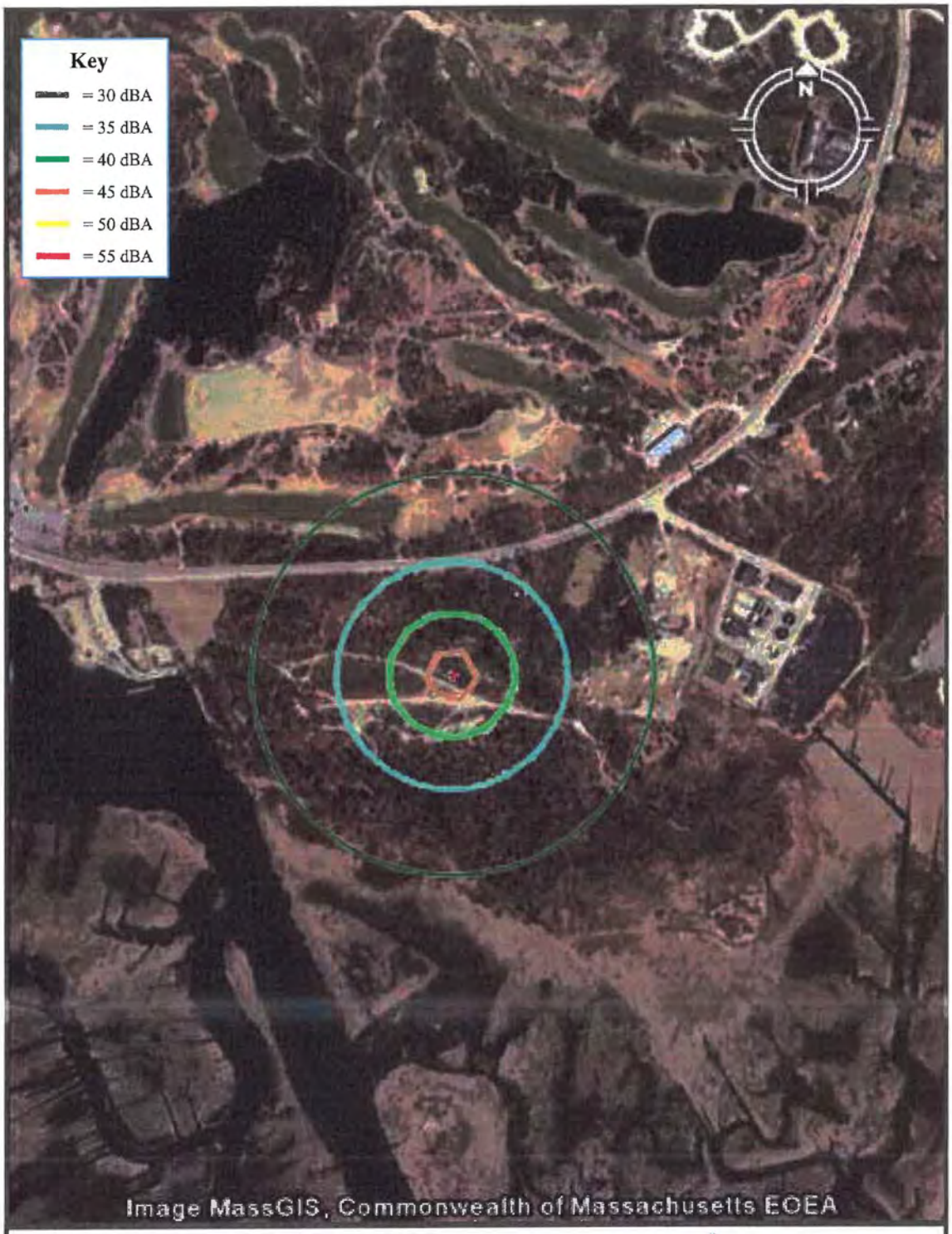

Figure 5.
Fuhrlander FL 600 Noise Contours -Location 2

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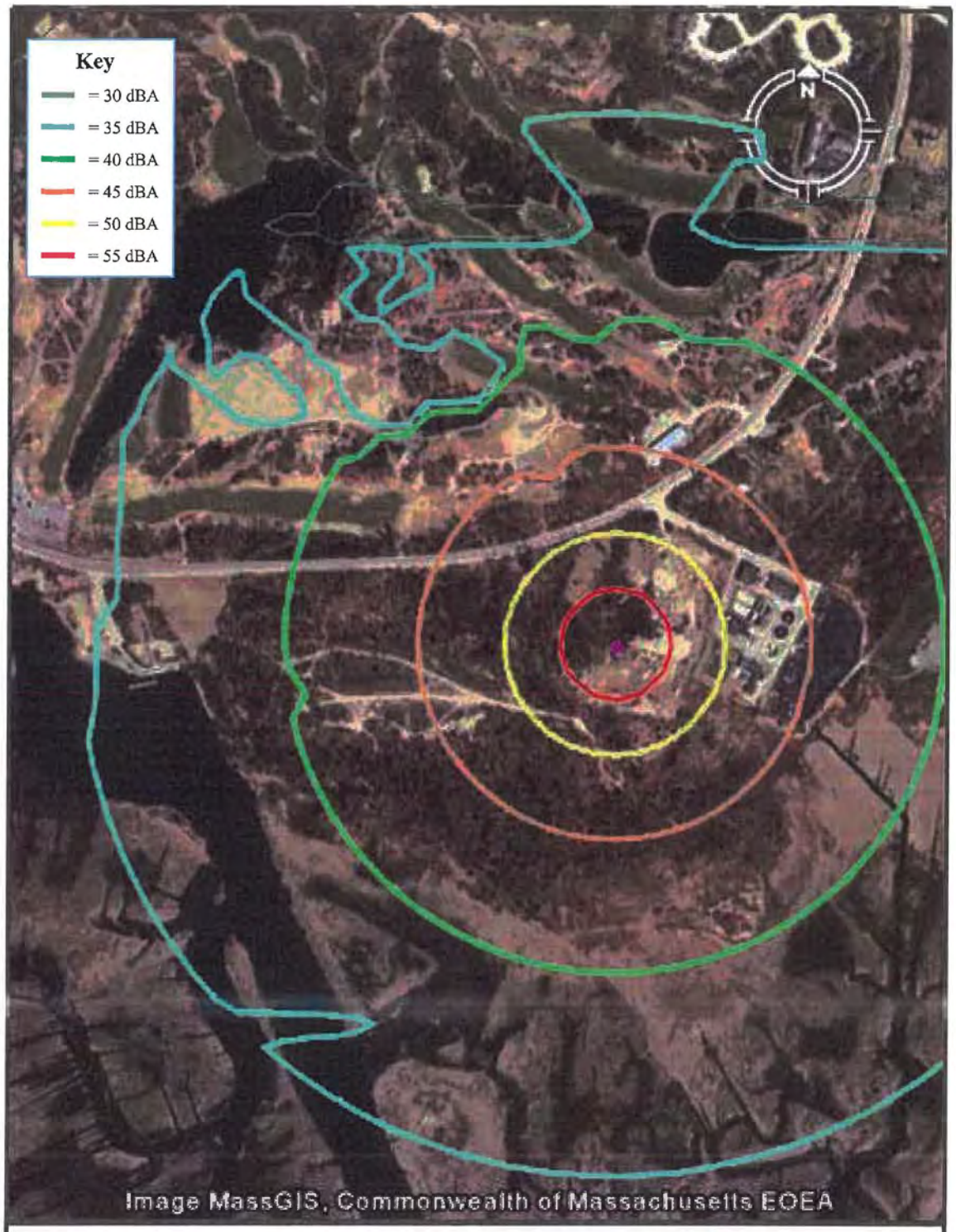

Figure 6.
Gamesa G87 Noise Contours - Location 1

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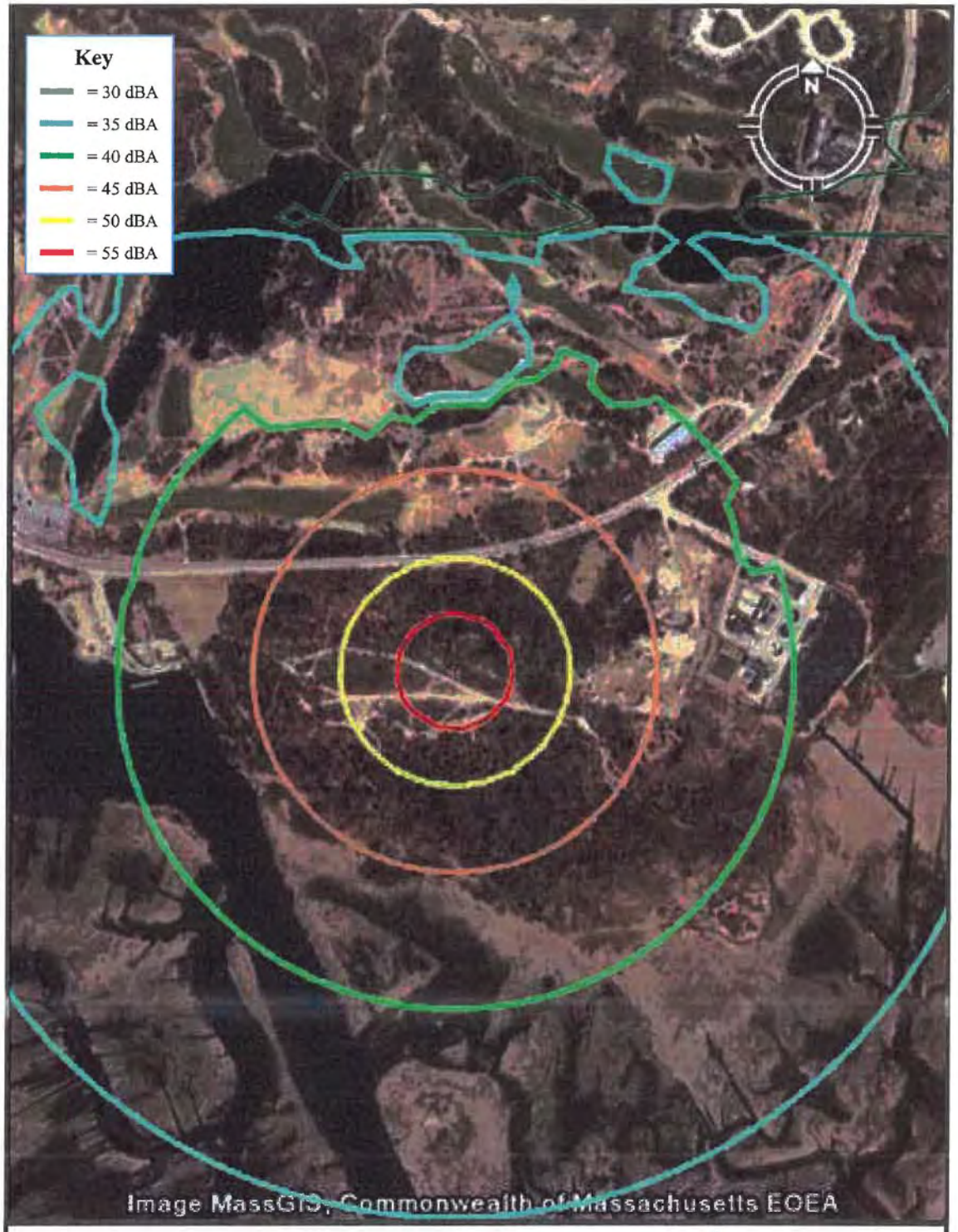

Figure 7.
Gamesa G87 Noise Contours - Location 2

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APPENDIX A

MASSACHUSETTS DEP NOISE POLICY

MADEP NOISE POLICY

Sound

Background

Sound is a type of air pollution that results from sounds that cause a nuisance, are or could injure public health, or unreasonably interfere with the comfortable enjoyment of life, property, or the conduct of business. Types of sounds that may cause sound include:

- "Loud" continuous sounds from industrial or commercial activity,demolition, or highly amplified music;
- Sounds in narrow frequency ranges such as "squealing" fans or other rotary equipment; and
- Intermittent or "impact" sounds such as those from pile drivers, jackhammers, slamming truck tailgates, public address systems, etc.

Policy

A sound source will be considered to be violating the Department's sound regulation (310 CMR 7.10) if the source:

1. Increases the broadband sound level by more than 10 dB(A) above ambient,

   or

2. Produce a "pure tone" condition – when any 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 residence. "Ambient" is defined as the background A-weighted sound level that is exceeded 90% of the time, measured during equipment operating hours. "Ambient" may also be established by other means with consent of the Department.

For more information:
For complaints about specific sound sources, call the Board of Health for the municipality in which the sound source is located. To learn more about responding to sound, odor and dust complaints or to request state assistance or support, please contact the service center in the nearest DEP regional office.

- Central Region, Worcester: (508) 792-7683
- Northeast Region, Wilmington: (978) 661-7677
- Southeast Region, Lakeville: (508) 946-2714
- Western Region, Springfield: (413) 755-2214

This Policy was originally adopted by the MA Department of Public Health in the early 1970's. It was reaffirmed by DEP's Division of Air Quality Control on February 1, 1990, and has remained in effect.

APPENDIX B

MEASURED SOUND LEVEL AND WIND DATA

APPENDIX B-1

MEASURED AMBIENT SOUND LEVELS AND MEASURED WIND SPEEDS NEAR SCITUATE WIND TURBINE SITES

Date	Starting-Time for Hour (EDT)	1-Hour L_{90} Sound Level (dBA)	Hourly Average Wind Speed at 63m Hub Height (m/s)
2/19/2008	***17:00***	***43***	***8.0***
2/19/2008	***18:00***	***43***	***7.7***
2/19/2008	***19:00***	***42***	***8.6***
2/19/2008	**20:00**	**39**	**5.5**
2/19/2008	21:00	39	2.3
2/19/2008	22:00	38	2.0
2/19/2008	**23:00**	**38**	**4.8**
2/20/2008	**0:00**	**38**	**7.3**
2/20/2008	**1:00**	**37**	**6.4**
2/20/2008	**2:00**	**36**	**6.5**
2/20/2008	**3:00**	**35**	**6.1**
2/20/2008	**4:00**	**36**	**5.2**
2/20/2008	**5:00**	**37**	**4.2**
2/20/2008	**6:00**	**40**	**5.0**
2/20/2008	**7:00**	**42**	**5.9**
2/20/2008	**8:00**	**47**	**6.9**
2/20/2008	**9:00**	**52**	**6.1**
2/20/2008	**10:00**	**46**	**6.2**
2/20/2008	**11:00**	**41**	**6.5**
2/20/2008	**12:00**	**43**	**7.0**
2/20/2008	***13:00***	***43***	***7.6***
2/20/2008	***14:00***	***43***	***7.8***
2/20/2008	**15:00**	**42**	**6.7**
2/20/2008	**16:00**	**42**	**5.1**
2/20/2008	17:00	41	3.1
2/20/2008	18:00	40	2.4
2/20/2008	19:00	39	3.7
2/20/2008	**20:00**	**39**	**4.1**
2/20/2008	21:00	38	3.1
2/20/2008	22:00	37	3.9
2/20/2008	23:00	36	3.5
2/21/2008	0:00	36	3.1
2/21/2008	1:00	36	3.1
2/21/2008	2:00	36	3.1
2/21/2008	3:00	36	3.0

Date	Starting-Time for Hour (EDT)	1-Hour L_{90} Sound Level (dBA)	Hourly Average Wind Speed at 63m Hub Height (m/s)
2/21/2008	4:00	36	3.5
2/21/2008	**5:00**	**36**	**4.3**
2/21/2008	6:00	44	2.4
2/21/2008	7:00	41	3.0
2/21/2008	**8:00**	**42**	**4.6**
2/21/2008	**9:00**	**42**	**6.3**
2/21/2008	**10:00**	**43**	**6.1**
2/21/2008	**11:00**	**42**	**5.7**
2/21/2008	**12:00**	**42**	**6.1**
2/21/2008	**13:00**	**41**	**6.0**
2/21/2008	**14:00**	**41**	**5.8**
2/21/2008	**15:00**	**40**	**5.1**
2/21/2008	**16:00**	**40**	**5.0**
2/21/2008	17:00	40	3.7
2/21/2008	18:00	39	2.6
2/21/2008	19:00	39	2.0
2/21/2008	20:00	39	2.3
2/21/2008	21:00	39	1.8
2/21/2008	22:00	39	1.5
2/21/2008	23:00	38	1.5
2/22/2008	0:00	38	1.7
2/22/2008	1:00	36	1.9
2/22/2008	2:00	35	2.2
2/22/2008	3:00	36	1.1
2/22/2008	4:00	36	1.0
2/22/2008	5:00	37	.4
2/22/2008	6:00	38	.4
2/22/2008	7:00	41	2.9
2/22/2008	8:00	42	2.3
2/22/2008	9:00	42	2.7
2/22/2008	**10:00**	**43**	**4.8**
2/22/2008	**11:00**	**43**	**6.1**

Note: Values in bold text correspond to hours when wind turbine would likely be operating (hub height wind speeds near or above 4 m/s

APPENDIX B-2

MEASURED SHORT TERM AMBIENT SOUND LEVELS AT LOCATIONS NEAR SCITUATE WIND TURBINE SITES

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008

Daytime Measurements

LOCATION #1
Park at Driftway Pier

Run Start	**Run End**
2:30 PM	3:00 PM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
45°F	36%	10-20 mph W/SW	Partly Cloudy

SOUND:

Source

- Wind (dominated sound environment)
- Cars on Driftway
- People walking through park
- Seagulls

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
53.9	48	52	57

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008

Daytime Measurements

LOCATION #2
Near Driftway (15 feet from the road)

Run Start	**Run End**
3:07 PM	3:37 PM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
43°F	35%	5-20 mph W/SW	Partly Cloudy

SOUND:

Source

- Traffic on Driftway (light to moderate)
- Wind
- Trees in wind

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
69.5	52	64	74

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008

Daytime Measurements

LOCATION #3
Eastern property of WTF

Run Start	**Run End**
5:21 PM	5:51 PM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
39°F	30%	6-15 mph W/SW	Partly Cloudy

SOUND:

Source

- Water treatment facility (aeration tanks)
- Wind
- Beach grass on golf course in wind
- Larger trucks on Driftway

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
47	44	46	49

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008
Nighttime Measurements

LOCATION #1
Park at Driftway Pier

Run Start	**Run End**
11:30 PM	12:00 AM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
29°F	73%	10-25 mph W/SW	Snowing Heavily

SOUND:

Source

- Wind
- Trees in wind
- Traffic on Driftway
- Water hitting the shore

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
41.7	32	38	45

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008
Nighttime Measurements

LOCATION #2
Next to Driftway

Run Start	**Run End**
12:07 AM	12:37 AM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
26°F	80%	5-20 mph W/SW	Partly Cloudy

SOUND:

Source

- Wind
- Trees in wind
- Traffic on Driftway (very light)

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
51.9	29	40	50

Scituate Sound Monitoring Notes – Scituate, MA – February 19, 2008
Nighttime Measurements

LOCATION #3
Eastern property line of WTF

Run Start	**Run End**
1:15 AM	1:45 AM

WEATHER:			
Temperature	**Humidity**	**Wind**	**Sky**
24°F	66%	10-20 mph W/SW	Clear

SOUND:

Source

- Wind
- Water treatment facility
- Beach grass in wind
- Ducks

RESULTS:			
L_{eq} (dBA)	**L_{90} (dBA)**	**L_{50} (dBA)**	**L_{10} (dBA)**
42.4	40	41	44

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www.umass.edu/windenergy

To: Sonya Mitchell

From: Charles E. McClelland and Mary Knipe

Date: April 23, 2009

Re: Scituate, MA: Shadow Flicker Analysis

Page: Page 1 of 19

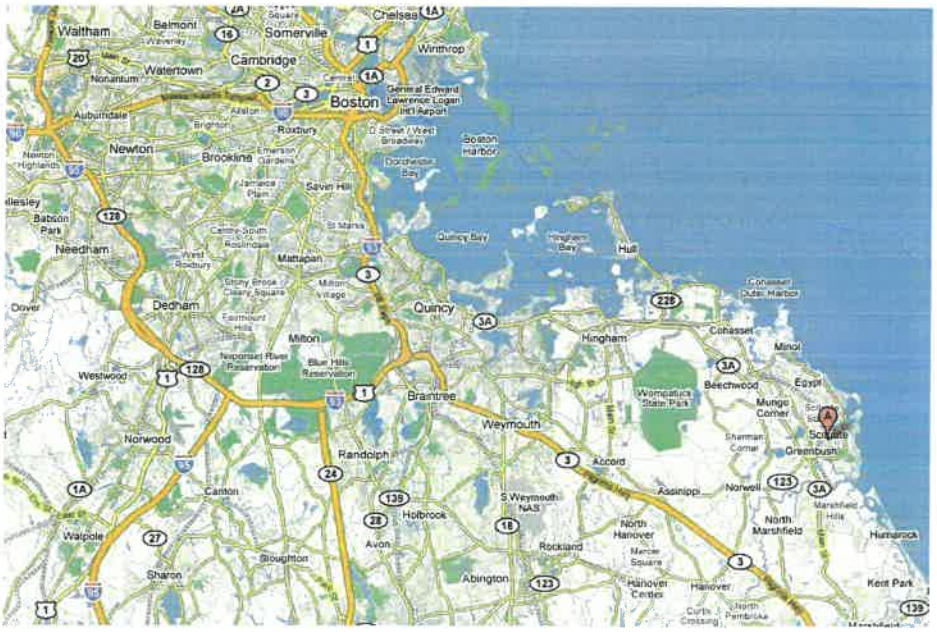
I. Executive Summary

The University of Massachusetts Wind Energy Center performed a shadow flicker analysis for a proposed single-turbine wind power installation at the Scituate Wastewater Treatment Plant. A shadow flicker analysis uses geometry and site-specific data inputs to determine an estimated number of hours per year that a flickering shadow can be cast on a given window or viewing area. The estimates provided by this report are conservative; the actual annual duration of shadow flicker will often be shorter.

The flicker impacts at fifteen locations around the proposed sites have been estimated for three different wind turbine models. Shadow flicker maps, which provide a graphical illustration of the impacted area around a turbine site, have been generated using a software tool and are contained in this report.

Shadow calendars, which illustrate the season and time and of day flicker can be expected, are also provided in the appendix. The Town of Scituate is labeled with a red balloon on the map below.

Figure 1: Location of proposed wind turbine site (map courtesy of GoogleMaps)



For more background information

This report assumes some familiarity with wind power technology. For more information, please refer to these websites:

- Wind Energy Center's Community Wind Fact Sheets, www.ceere.org/rerl/about_wind/
- American Wind Energy Association, www.awea.org
- Danish Wind Industry Association, www.windpower.org

II. An Introduction to Shadow Flicker

About shadow flicker in general

Shadow flicker is a periodic obstruction of light. It is the term used to describe what happens when rotating turbine blades come between the viewer and the sun, causing a moving shadow. An example of shadow flicker with which many people are familiar with occurs while driving past regularly spaced trees late in the day with the sun behind the trees[1].

Modern utility-scale wind turbines (600 – 3,000 kW) are typically three-bladed machines that rotate at rates between 12 and 24 revolutions per minute (RPM). If, for example, sunlight passes through the rotor of a three-bladed wind turbine rotating at 20 RPM, then the light will flicker at a rate of 3x20=60 shadows per minute, i.e. 1 per second, or 1 Hertz (Hz). Such low frequencies are harmless in terms of health and safety[2], but under certain circumstances can be annoying, especially when trying to read or watch television.

About quantifying flicker

Shadow flicker is usually quantified by the number of hours per year during which a location would be exposed to flickering from nearby wind turbines. While this is primarily a matter of geometry, other factors must be considered. Even at times when the sun is lined up geometrically with the turbine and the receptor, various factors may prevent flicker. For instance, it is not possible for shadow flicker to occur when the sun is not visible, such as on cloudy or foggy days, or if the turbine's rotor is still. Obstacles located between a wind turbine and the viewer, such as trees, hills, and buildings, will reduce or eliminate the duration and/or intensity of shadow flicker.

This report considers flicker at distances of up to about 1500 meters[3] from the proposed wind site. However, at distances greater than approximately one kilometer (0.6 miles), light is sufficiently dispersed by particles in the air that the blades no longer produce distinct shadows. As a result, flicker is generally negligible at these distances and beyond.

Flicker is only considered an issue during times when people are home and awake, window coverings are open, and a wind turbine is in view. If a wind turbine is not in view during the hours of estimated shadow flicker, then the flicker will go unnoticed. While there is no U.S. standard regulating the impact of shadow flicker, a tolerance of 30 hours of actual shadow flicker[5] has been established by the German judiciary. Included in these 30 hours are only times when the property is in use and people are awake.

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[1] For instance, driving 20 mph past regularly spaced trees 15 feet apart produces flicker at 2 Hz.

[2] Shedding Light on Photosensitivity, www.epilepsy.com/articles/ar_1141663451.html. Note that while flickering light in the ranges of about 5–30 Hz can cause seizures in sensitive individuals, rates of less than 2 Hz such as those associated with wind turbines do not.

[3] Shadow Variations from Wind Turbines, www.windpower.org/en/tour/env/shadow/shadow2.htm

[5] Shadow Casting from Wind Turbines, www.windpower.org/en/tour/env/shadow/index.htm

How shadow flicker is estimated

The estimated impact of shadow flicker caused by a wind turbine is dependent upon several factors, including the:

- Location of the sun in the sky[6]
- Times and duration of turbine operation
- Direction of the wind (determines the direction the rotor will face)
- Likelihood of sunshine
- Terrain and landscape of an area
- Obstacles, such as trees and buildings, in the line of sight, and
- Size and location of a viewing area, such as a window or patio

The UMass Wind Energy Center employs WindPRO software for the calculation of "real expected values" of shadow flicker effects in terms of hours per year during which a location would be exposed to flickering from nearby wind turbines. WindPRO simulates the path of the sun throughout a whole year; it uses the following inputs:

- Locations of wind turbines
- Wind turbine rotor diameter and hub height
- Wind profiles to determine wind turbine operating hours and yaw directions
- Probabilities of sunshine by month
- Viewing areas & orientation of receptors (nearby houses)
- Geography: elevations, latitude & longitude

The software produces the following outputs:

- Duration of flicker for each receptor
- A calendar showing the time and date of all the hours of flicker for each receptor
- A map showing the extent of flicker impacts in the region

The following assumptions were employed with the goal of providing the maximum duration and intensity of shadow flicker possible at selected surrounding locations.

- Turbines are always rotating
- Beyond terrain, a clear line of site exists between the turbine and the receptor (no obstructions such as trees, buildings, etc. taken into consideration)
- Shadow receptors (windows) are oriented orthogonal to (i.e. directly at) the turbine

[6] German guidelines define flicker as occurring when: (a) the angle of the sun is at least 3 degrees over the horizon, and (b) the rotating blade of the WTG covers at least 20% of the sun.

III. Shadow Flicker Analysis

This section presents the input data and assumptions that were used to estimate the potential flicker impacts of a proposed single-turbine wind project in Scituate, MA. The proposed site, depicted on maps in the appendix, is located at 42°10'30.61"N, 70°43'42.64"W. Three different turbines models, representing a range of rated capacities, are considered in this report; details related to each of these turbines are listed in the table below.

Table 1: Technical Specifications for Various Proposed Turbines

Model	Fl 600	GE 1.5 sl	V-90
Manufacturer	Fuhrländer	General Electric	Vestas
Rated Power	600 kW	1500 kW	2000 kW
Nominal rpm	23	20	14.9
Hub Height	50 meters	61.4 meters	80 meters
Rotor Diameter	50 meters	77 meters	90 meters
Blade Tip Height	75 meters	99.9 meters	125 meters

This shadow flicker analysis assumes full exposure of the viewing areas; that is, obstacles such as trees or buildings in the line of sight (other than the shape of the geography) are not considered. Shadow flicker was calculated only when more than 20% of the sun was covered by the wind turbine rotor.

Each shadow receptor is assigned a dimension, or a "viewing area." Typically a single window or a patio is considered a viewing area. A larger area increases the duration of expected flicker. For simplicity, each receptor was assumed to be a 1m x 1m window oriented orthogonal to the wind turbine. If windows are smaller or oriented slightly off the line of sight, then the impact of flicker would be reduced.

All modern utility-scale wind turbines are yaw-controlled; that is, the turbine rotor plane orients itself in the direction of the oncoming wind. As a result, sometimes the turbine's rotor plane will be turned at an angle such that shadow flicker effect at a particular location is minimized. Wind data collected in Lynn, MA by the UMass Wind Energy Center from September 2004 through August 2005 were used to approximate the number of hours a turbine at the proposed site would be facing a particular direction.[7] The probabilities of sunshine for each month were assumed to follow data provided by City-Data.Com for the town of Scituate, MA.[8]

Table 2: Monthly Sunshine Probabilities for Scituate, Massachusetts

MONTH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Probability	51%	55%	55%	55%	58%	62%	63%	64%	63%	60%	53%	52%

Fifteen "shadow receptors" are marked on the map below by green circles, which represent the viewing areas at selected locations within the viewshed of the proposed site.

Figure 2: Orthophotograph of proposed wind turbine installation in Scituate. Shadow receptors are denoted by green circles, the proposed turbine site by the blue and white triangle. ***Orthophotograph courtesy of MassGIS***

Scituate, MA: Proposed Turbine Site and Shadow Receptor Locations

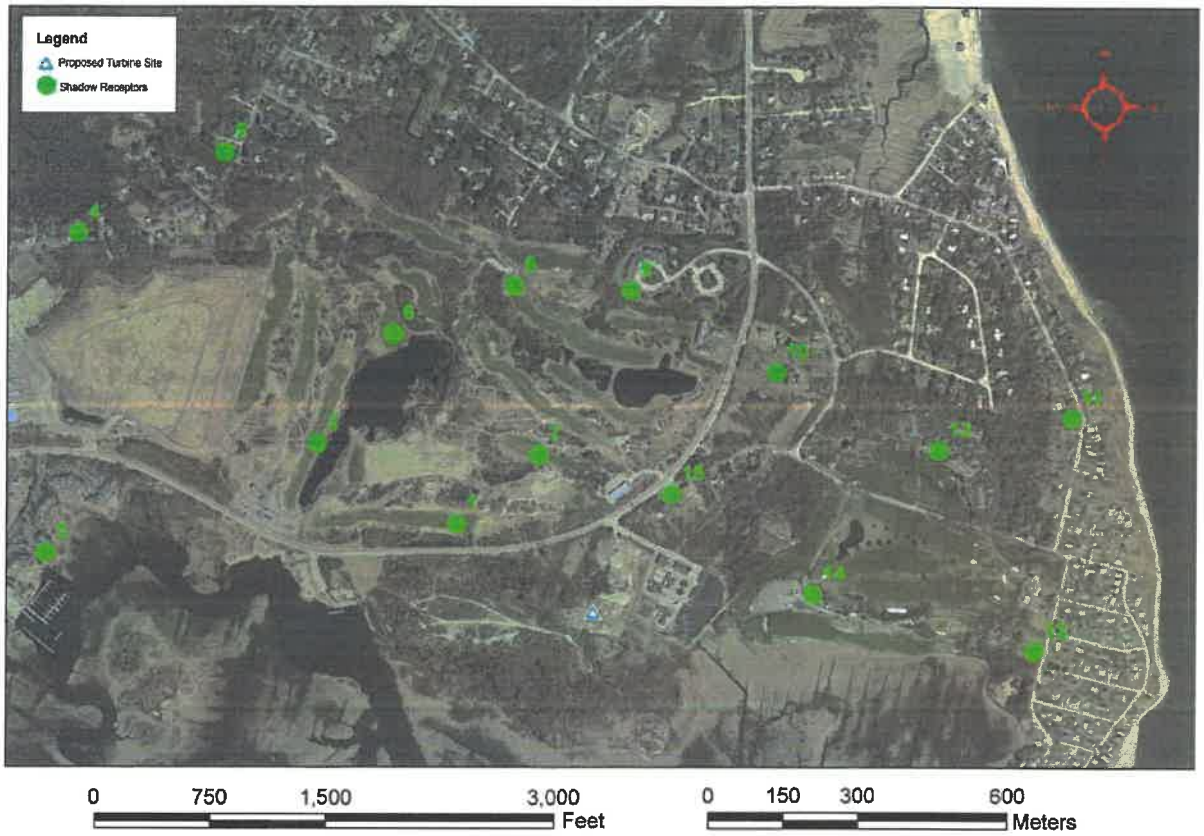

Table 3 - Latitude and longitude of shadow receptors (WGS84 datum).

Shadow Receptor	Latitude (N)	Longitude (W)	Distance to turbine (m)	Description
1	42°10'35.91"N	70°43'54.83"W	320	Widows Walk Golf Course
2	42°10'41.09"N	70°44'7.15"W	650	Widows Walk Golf Course
3	42°10'33.10"N	70°44'29.55"W	1080	Residence: Ladds Way
4	42°10'54.09"N	70°44'27.45"W	1250	Residence: Stockbridge Road
5	42°10'59.85"N	70°44'14.73"W	1160	Residence: Stockbridge Road
6	42°10'47.82"N	70°44'0.38"W	660	Widows Walk Golf Course
7	42°10'40.40"N	70°43'47.92"W	320	Widows Walk Golf Course
8	42°10'51.59"N	70°43'50.22"W	660	Widows Walk Golf Course
9	42°10'50.92"N	70°43'39.79"W	630	Residence: North River Road
10	42°10'46.35"N	70°43'26.97"W	610	Residence: Kent Street
11	42°10'43.02"N	70°43'1.19"W	1020	Residence: Gilson Road
12	42°10'41.41"N	70°43'13.13"W	750	Residence: Driftway
13	42°10'28.20"N	70°43'3.69"W	890	Residence: Moorland Road
14	42°10'31.61"N	70°43'23.63"W	430	Scituate Country Club, Clubhouse
15	42°10'37.89"N	70°43'35.46"W	270	Residence: Driftway

IV. Results

Results for each turbine scenario are presented in tables below, which summarize flicker impacts at each of the fifteen shadow receptor sites.

Descriptions of data appearing in each column:

- **A.** Shadow Receptor Number
- **B.** The number of days per year that flicker will occur at a particular receptor.
- **C.** The maximum number of hours of flicker that could be expected in a single day at a particular receptor.
- **D.** The total number of shadow hours per year, corresponding to the "worst case" scenario.
- **E.** The total expected values of shadow hours per year.

The time of the day and year when shadow flicker is possible has also been calculated; these results are presented in the appendix.

The assumptions employed in calculation were chosen in order to arrive at conservative estimates (over approximation) of shadow flicker duration for surrounding areas. Actual durations are likely to be shorter than both the "worst case" (**column D**) and total expected values (**column E**).

Table 4: Fuhrländer 600 – Estimated duration of shadow flicker per year at each shadow receptor, disregarding obstacles.

Fl 600 (600 kW)				
A	**B**	**C**	**D**	**E**
Shadow Receptor	**Shadow days/year**	**Max Shadow hrs/day (hours : minutes)**	**Shadow hrs/year (hours : minutes)**	**Expected Shadow hrs/year (hours : minutes)**
1	76	0:38	33:37	11:48
2	32	0:19	7:50	2:46
3	0	0:00	0:00	0:00
4	0	0:00	0:00	0:00
5	0	0:00	0:00	0:00
6	0	0:00	0:00	0:00
7	0	0:00	0:00	0:00
8	0	0:00	0:00	0:00
9	0	0:00	0:00	0:00
10	0	0:00	0:00	0:00
11	0	0:00	0:00	0:00
12	22	0:10	2:15	0:45
13	0	0:00	0:00	0:00
14	0	0:00	0:00	0:00
15	0	0:00	0:00	0:00

Table 5: GE 1.5 sl – Estimated duration of shadow flicker per year at each shadow receptor, disregarding obstacles.

GE 1.5 sl (1.5 MW)				
A	B	C	D	E
Shadow Receptor	Shadow days/year	Max Shadow hrs/day (hours : minutes)	Shadow hrs/year (hours : minutes)	Expected Shadow hrs/year (hours : minutes)
1	125	0:57	73:24	26:15
2	48	0:29	17:42	6:19
3	0	0:00	0:00	0:00
4	0	0:00	0:00	0:00
5	0	0:00	0:00	0:00
6	0	0:00	0:00	0:00
7	0	0:00	0:00	0:00
8	0	0:00	0:00	0:00
9	0	0:00	0:00	0:00
10	0	0:00	0:00	0:00
11	0	0:00	0:00	0:00
12	38	0:20	7:47	2:38
13	0	0:00	0:00	0:00
14	0	0:00	0:00	0:00
15	0	0:00	0:00	0:00

Table 6: V90 – Estimated duration of shadow flicker per year at each shadow receptor, disregarding obstacles.

V90 (2.0 MW)				
A	B	C	D	E
Shadow Receptor	Shadow days/year	Max Shadow hrs/day (hours : minutes)	Shadow hrs/year (hours : minutes)	Expected Shadow hrs/year (hours : minutes)
1	109	1:05	87:55	32:05
2	54	0:33	22:10	8:04
3	0	0:00	0:00	0:00
4	0	0:00	0:00	0:00
5	0	0:00	0:00	0:00
6	0	0:00	0:00	0:00
7	40	0:44	23:39	7:49
8	0	0:00	0:00	0:00
9	0	0:00	0:00	0:00
10	0	0:00	0:00	0:00
11	0	0:00	0:00	0:00
12	46	0:28	14:03	4:50
13	0	0:00	0:00	0:00
14	0	0:00	0:00	0:00
15	0	0:00	0:00	0:00

Scituate, MA: Flicker Envelope (Fuhrländer 600 kW)

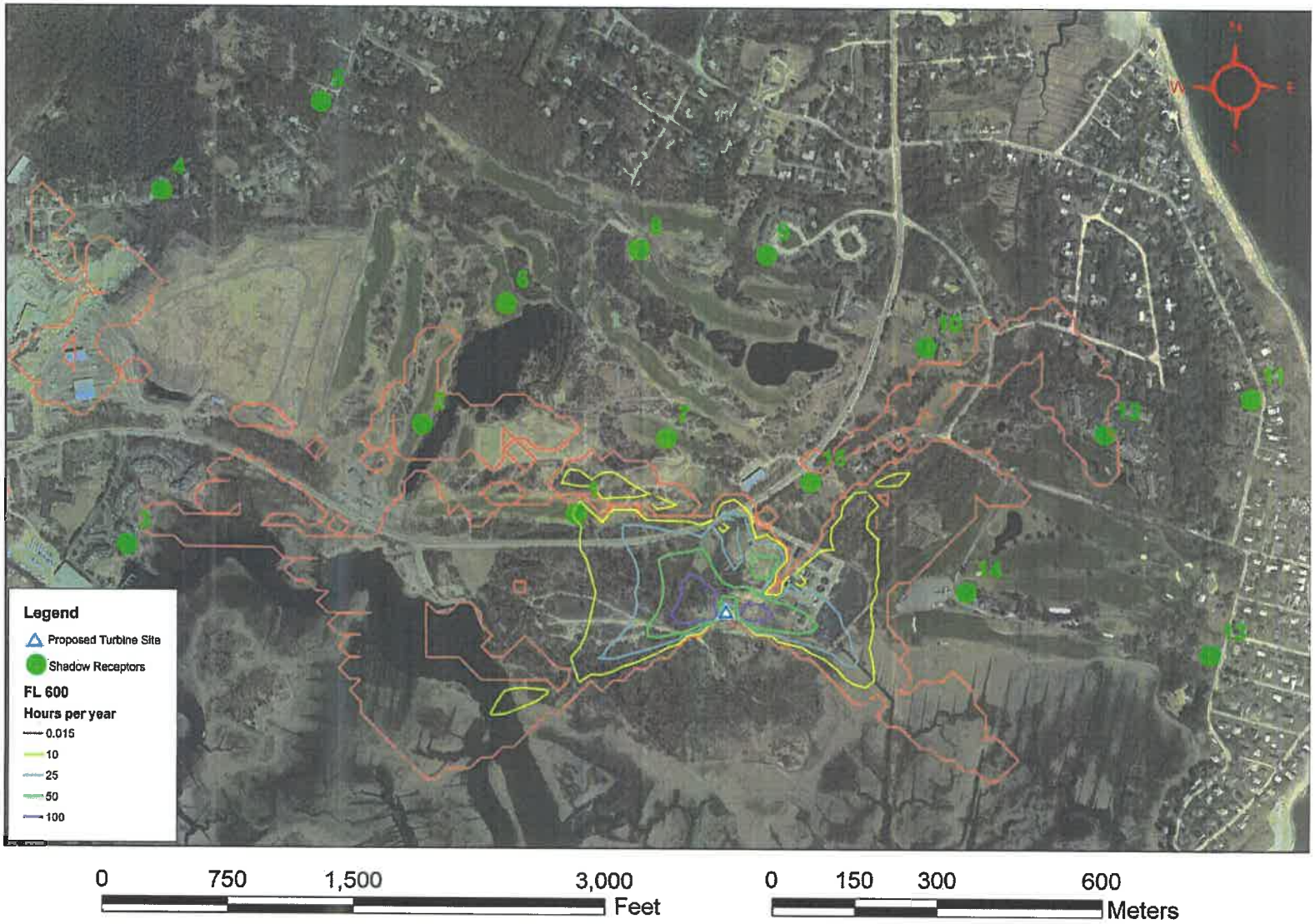

Figure 3: Orthophotograph of Scituate with isolines showing estimated shadow flicker in hours/year for a Fuhrländer 600 kW turbine at the proposed site. Regions inside the yellow line feature annual expected shadow flicker durations of at least 10 hour per year.

Scituate, MA: Flicker Envelope (Fuhrländer 600 kW)

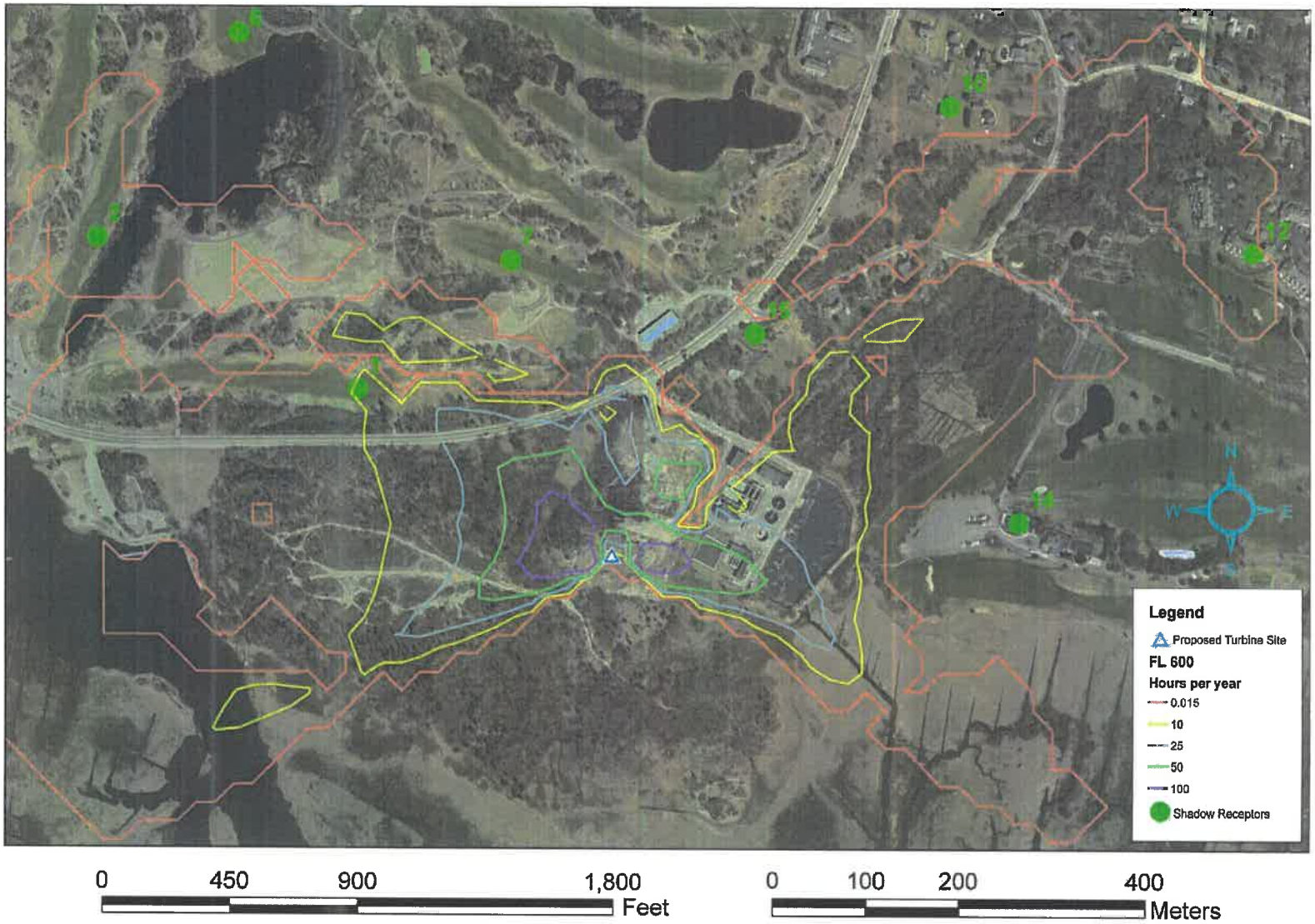

Figure 4: Close-up view of Figure 3. Few houses would fall inside the flicker-envelope of an Fl 600.

Scituate, MA: Flicker Envelope (GE 1.5 MW)

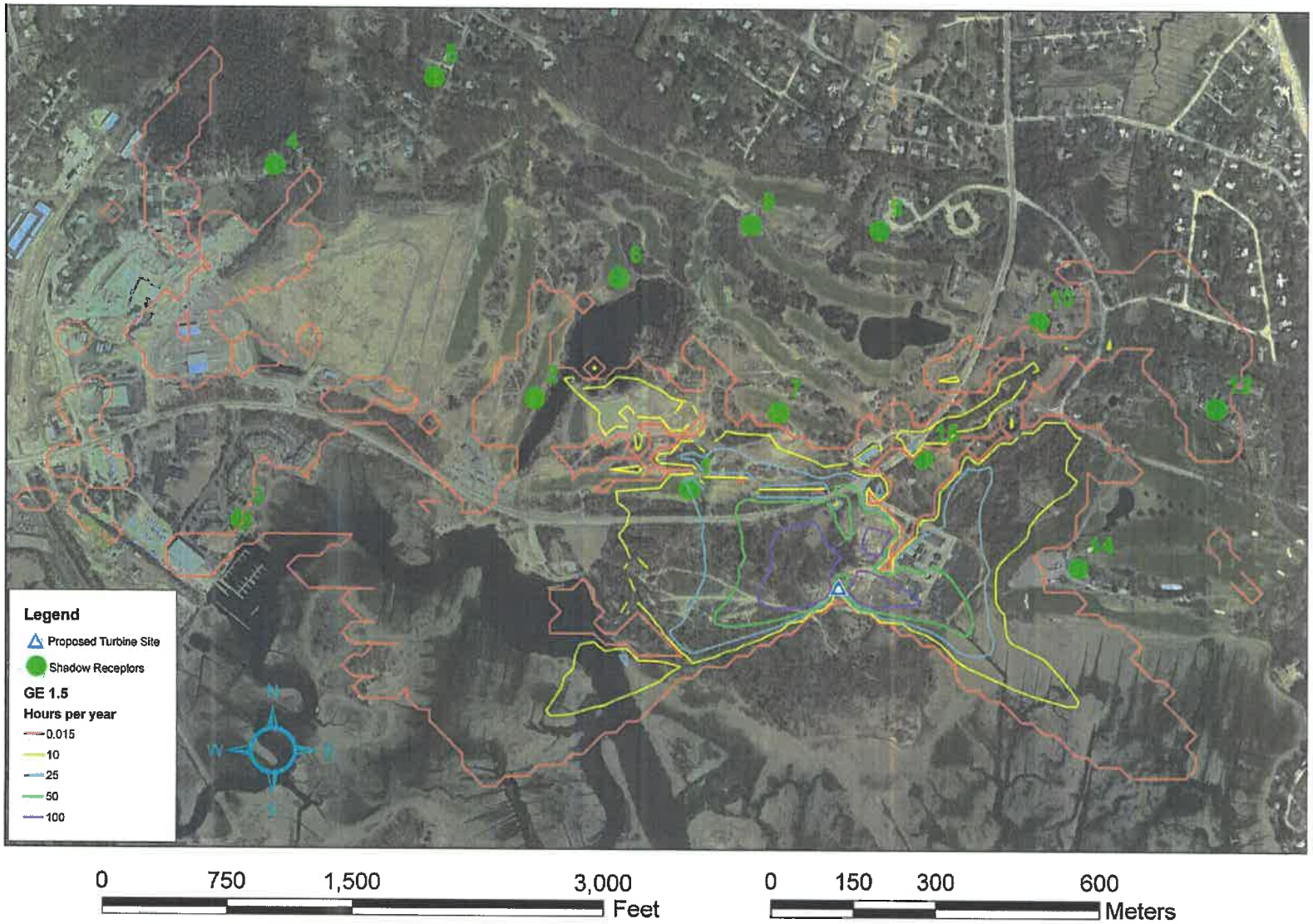

Figure 5: Orthophotograph of Scituate with isolines showing estimated shadow flicker in hours/year for a GE 1.5 MW turbine at the proposed site. There are no houses inside the green and purple isoline. Areas closest to the turbine generally experience the highest number of shadow flicker hours per year.

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Scituate, MA: Flicker Envelope (GE 1.5 MW)

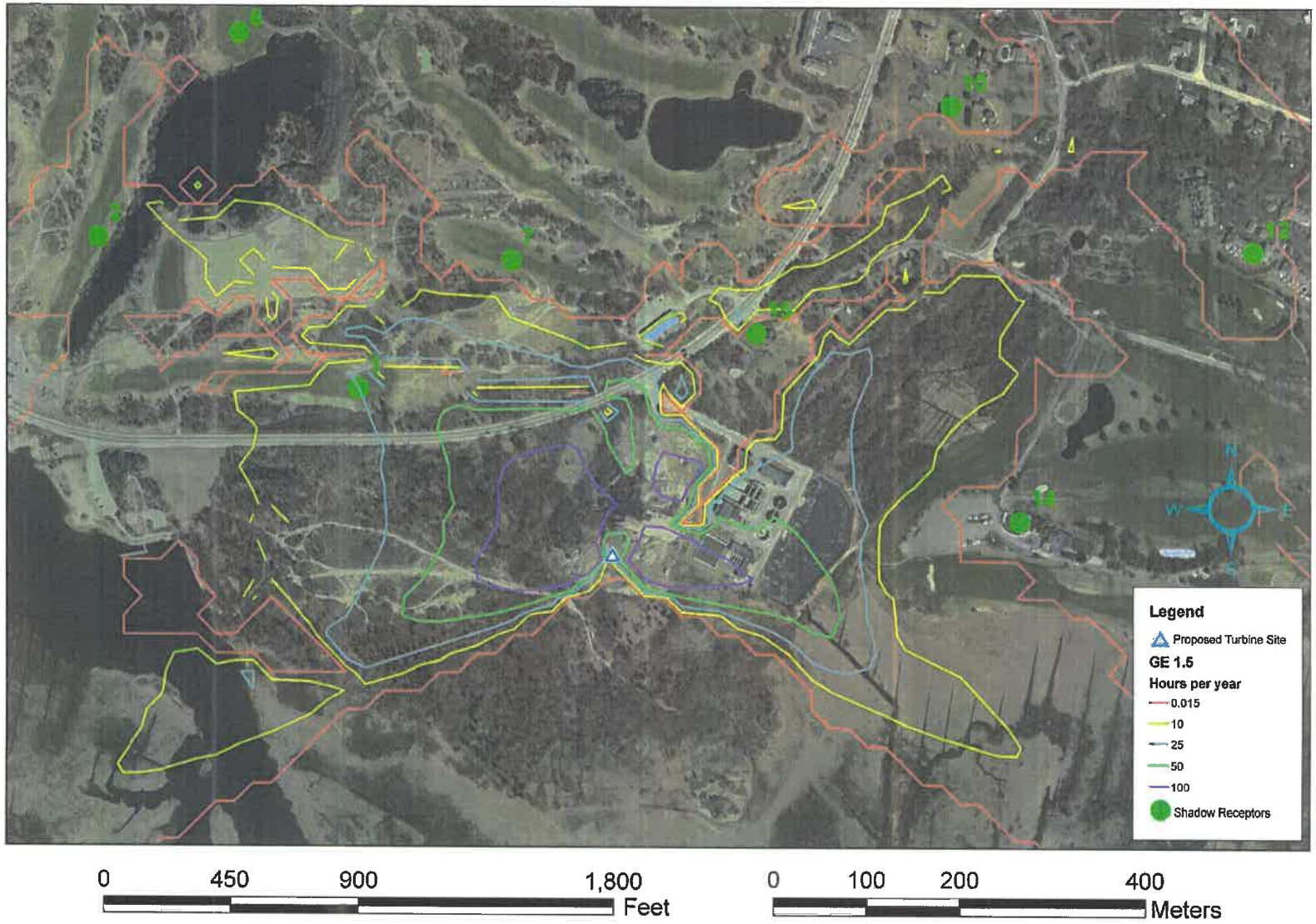

Figure 6: Close-up view of Figure 5. The majority of receptors would experience fewer than 10 hours of shadow flicker per year.

Scituate, MA: Flicker Envelope (V-90 2.0 MW)

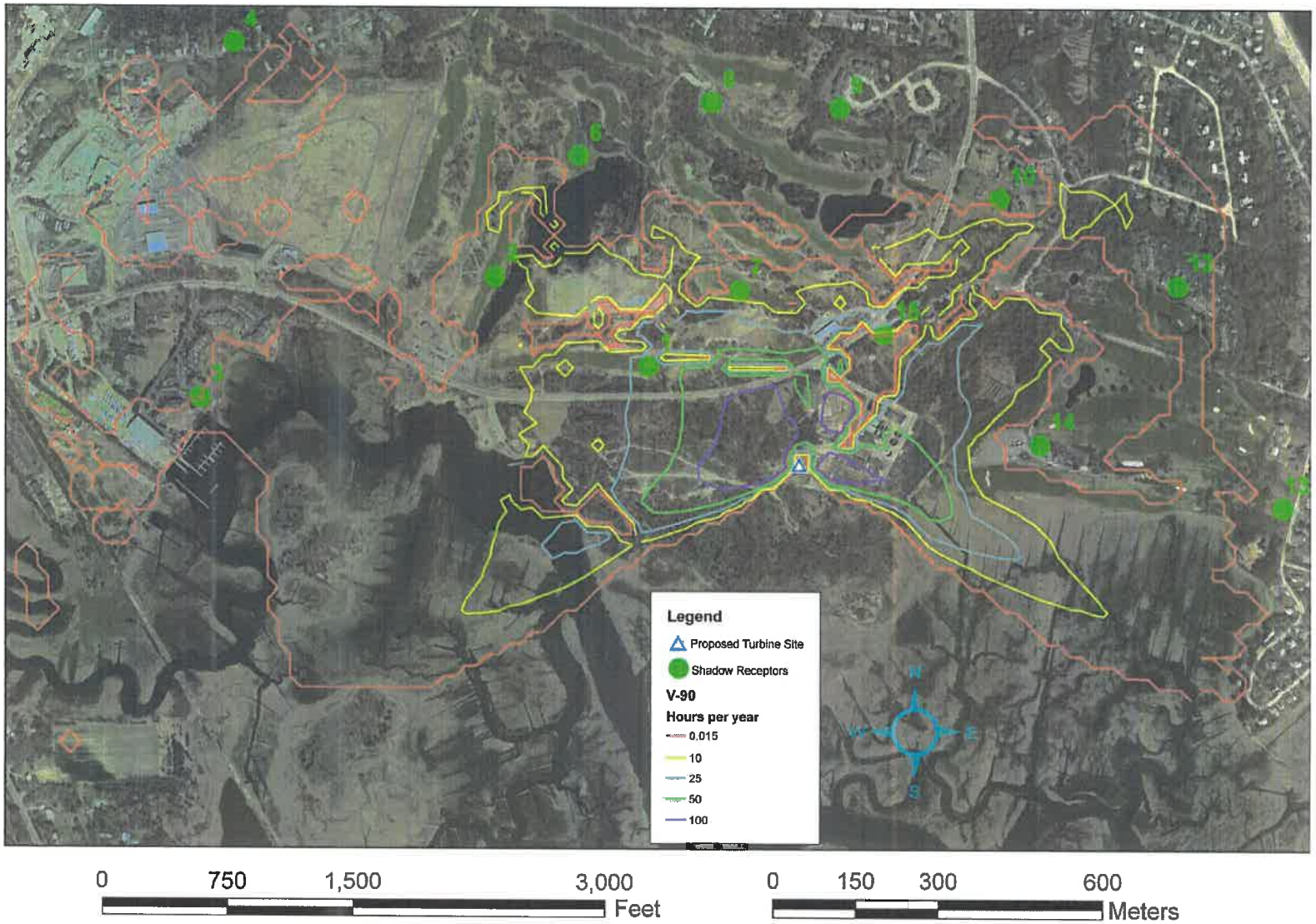

Figure 7: Orthophotograph of Scituate with isolines showing estimated shadow flicker in hours/year for a V-90 2.0 MW turbine at the proposed site. The V-90 would have the largest flicker envelope of the three turbines under consideration due to a larger rotor diameter than the GE and Fuhrländer models.

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Scituate, MA: Flicker Envelope (V-90 2.0 MW)

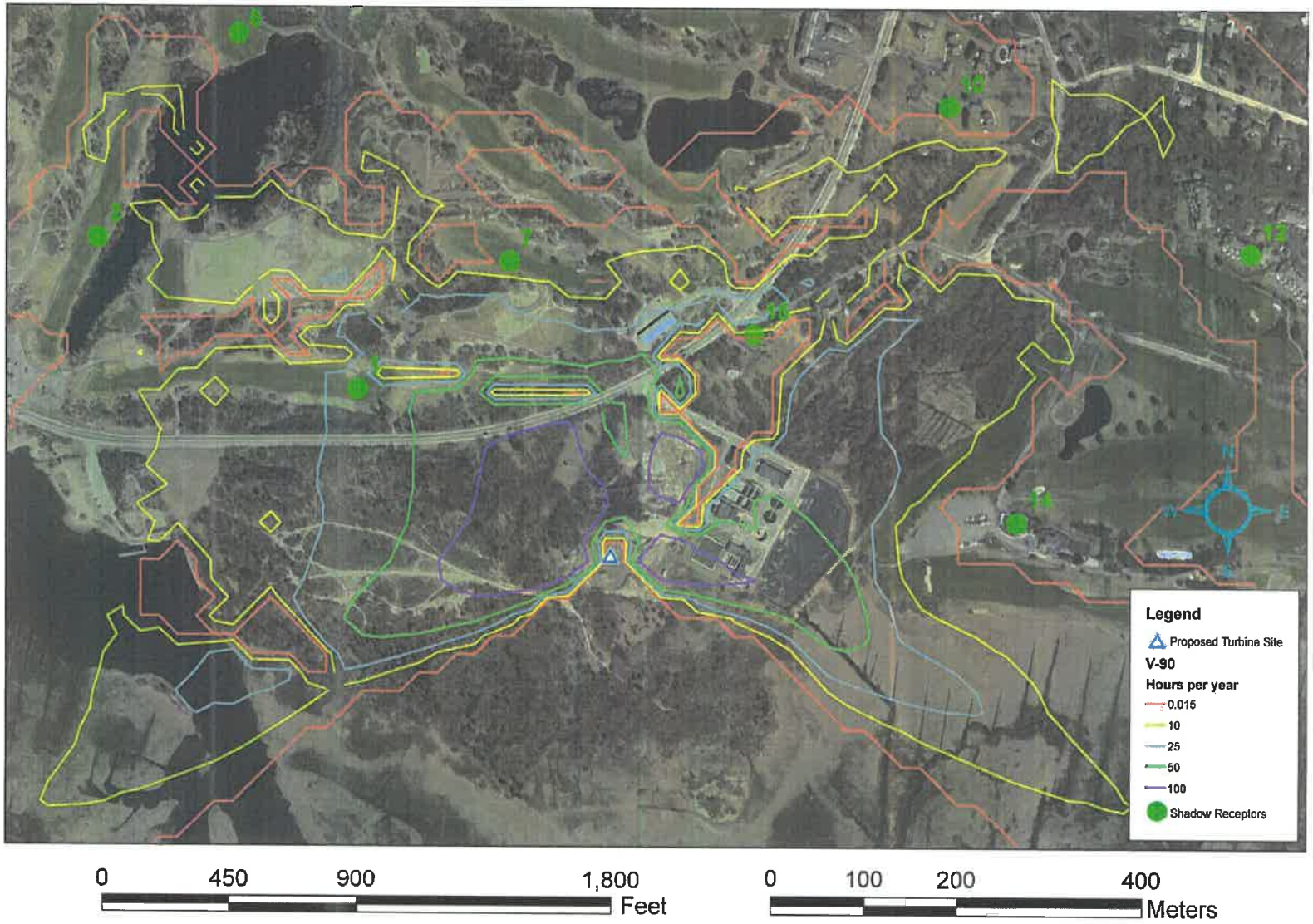

Figure 8: Close-up view of Figure 7. There may be newly developed houses within the flicker envelopes of the three proposed turbines that the WEC was not aware of at the time of this report.

IV. Conclusions

The shadow flicker impacts of three selected turbines have been estimated by computer simulations for fifteen viewing areas (shadow receptors) nearby the Wastewater Treatment Plant in Scituate, MA. Shadow flicker maps for these areas were generated, and estimated flicker durations at each receptor site have been tabulated. Shadow receptors were selected in order to provide a representative sample of locations nearby the proposed turbine site; however, there may be newly developed houses in this area that the Wind Energy Center was not aware of at the time of this report. The results of this analysis are conservative; the actual number of shadow hours would likely be less than estimates presented in this report.

Case 1: Single Fl 600 (1 x 600 kW turbine) located at the Wastewater Treatment Plant

Of the three turbines considered in this analysis, the Fl 600 model would cause the least amount of impact due to its smaller rotor diameter relative to the other two models. Only three of the fifteen receptor locations considered are likely to experience any flicker impact (sites 1, 2, and 12). Site 12 is a residence located on Driftway at a distance of approximately 750 meters from the proposed site, and is situated in a housing development. Houses in this area could typically expect to experience a total of 45 minutes of shadow flicker per year for this case.

Case 2: Single GE 1.5 sl (1 x 1.5 MW turbine) located at the Wastewater Treatment Plant

A GE 1.5 MW turbine would likely cause a flicker impact in the same areas as an Fl 600, however for a slightly longer duration. Results for site 12 on Driftway suggest an annual shadow flicker duration at this location of two and a half hours. About twenty-six hours could be expected at receptor 1, which is located on the Widows Walk Golf Course adjacent to the site. However, expected flicker impacts drop off dramatically with increasing distance from the turbine site. Receptor 2, which is also located on the Widows Walk Golf Course, would likely experience less than six and a half hours of flicker per year for this case.

Case 3: Single V90 (1 x 2.0 MW turbine) located at the Wastewater Treatment Plant

The flicker impact resulting from a V90 turbine would impact the largest number of houses in relation to other turbines considered in this report, with the majority of these residences located to the northeast of the proposed site. A total of four of the sites considered would likely experience any flicker. These include, in addition to the three sites impacted by the Fuhrländer and GE models, a fourth site (receptor 7) located at the Widows Walk Golf Course, which could expect to experience about 7 hours of flicker annually for this case. Other areas of the Widows Walk Golf Course may experience shadow flicker in excess of 30 hours per year.

In summary, there will be some flicker impact resulting from the installation of any of the three proposed turbine models at the Scituate Wastewater Treatment Plant. The greatest impact would occur at sites located on the Widows Walk Golf Course, though only one receptor site for the largest turbine model would likely experience more than 30 hours of flicker per year. Due to the proposed turbine site's location relative to natural and man-made boundaries, very few residences would likely experience any flicker as a result of the installation of any of the three turbine models considered. Where shadow flicker is deemed unacceptable at any of the potentially impacted locations, planting new trees and/or shrubbery could be considered as a possible mitigation strategy.

Appendix: Shadow Receptor Details and Graphical Results

Shadow receptor calendars for the three selected turbine models have been generated and are presented below. These figures illustrate the month and time of day during which flicker can be expected to occur. The flicker impacts are color coded according to each receptor's location.

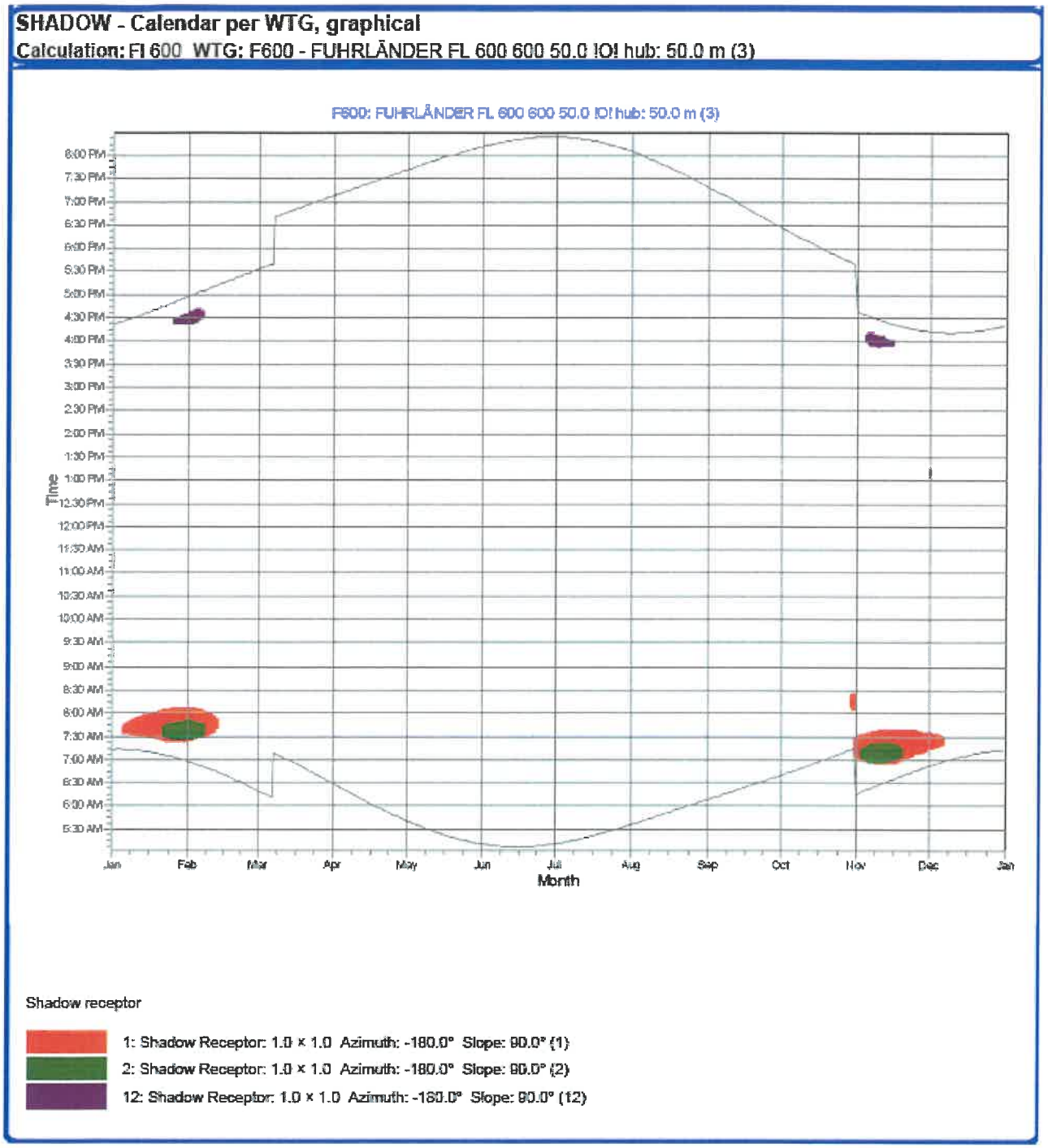

Figure 9: This graph displays the expected flicker impact at various shadow receptor locations. Typically, the vast majority of flicker occurs during the spring, winter, and fall seasons. For locations of shadow receptors, see **figure 2** on page 6 of this report.

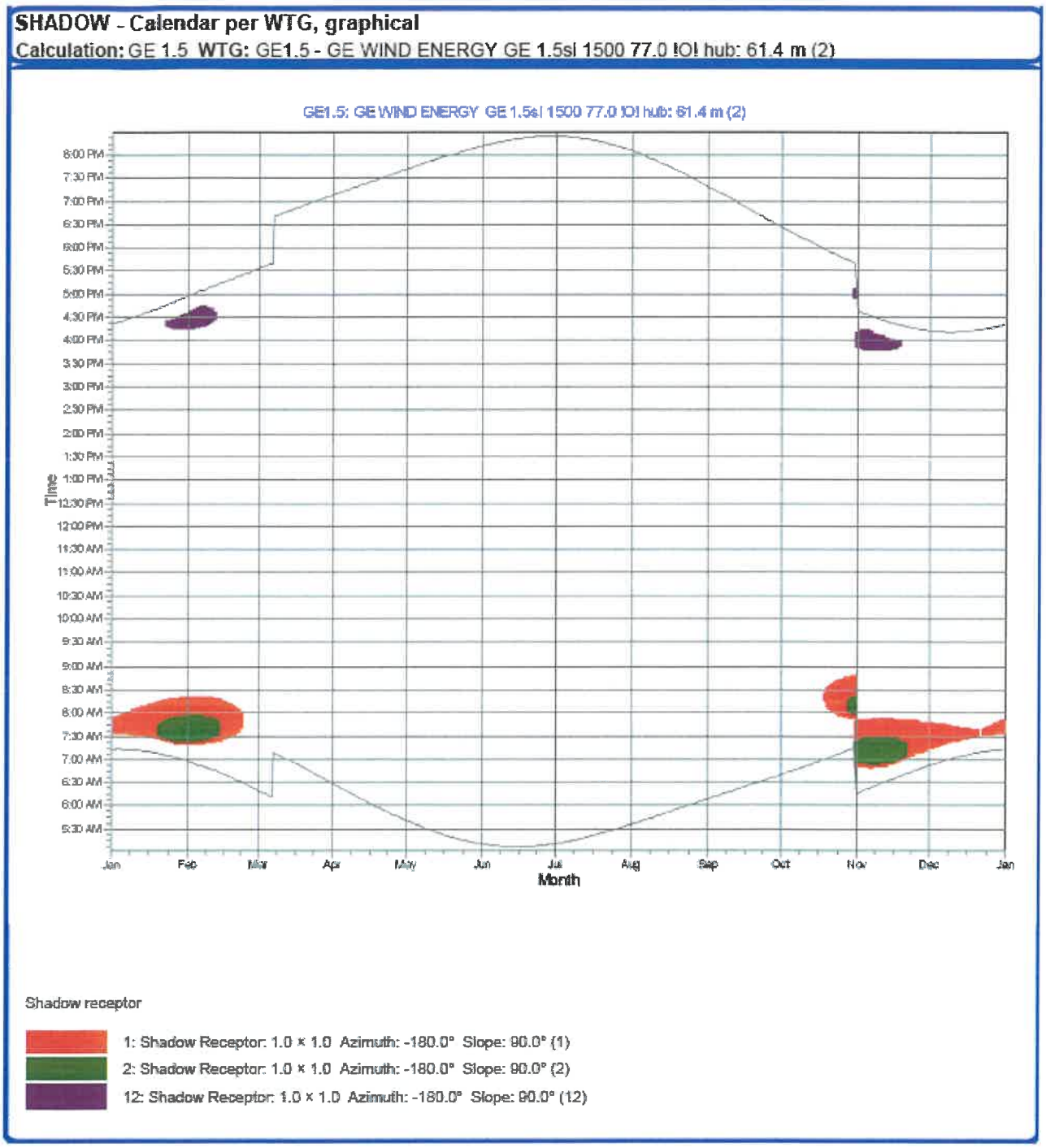

Figure 10: The graphical offset apparent in November (receptors 1 and 2) can be attributed to adjustments for daylight saving time (DST). For locations of shadow receptors, see **figure 2** on page 6 of this report.

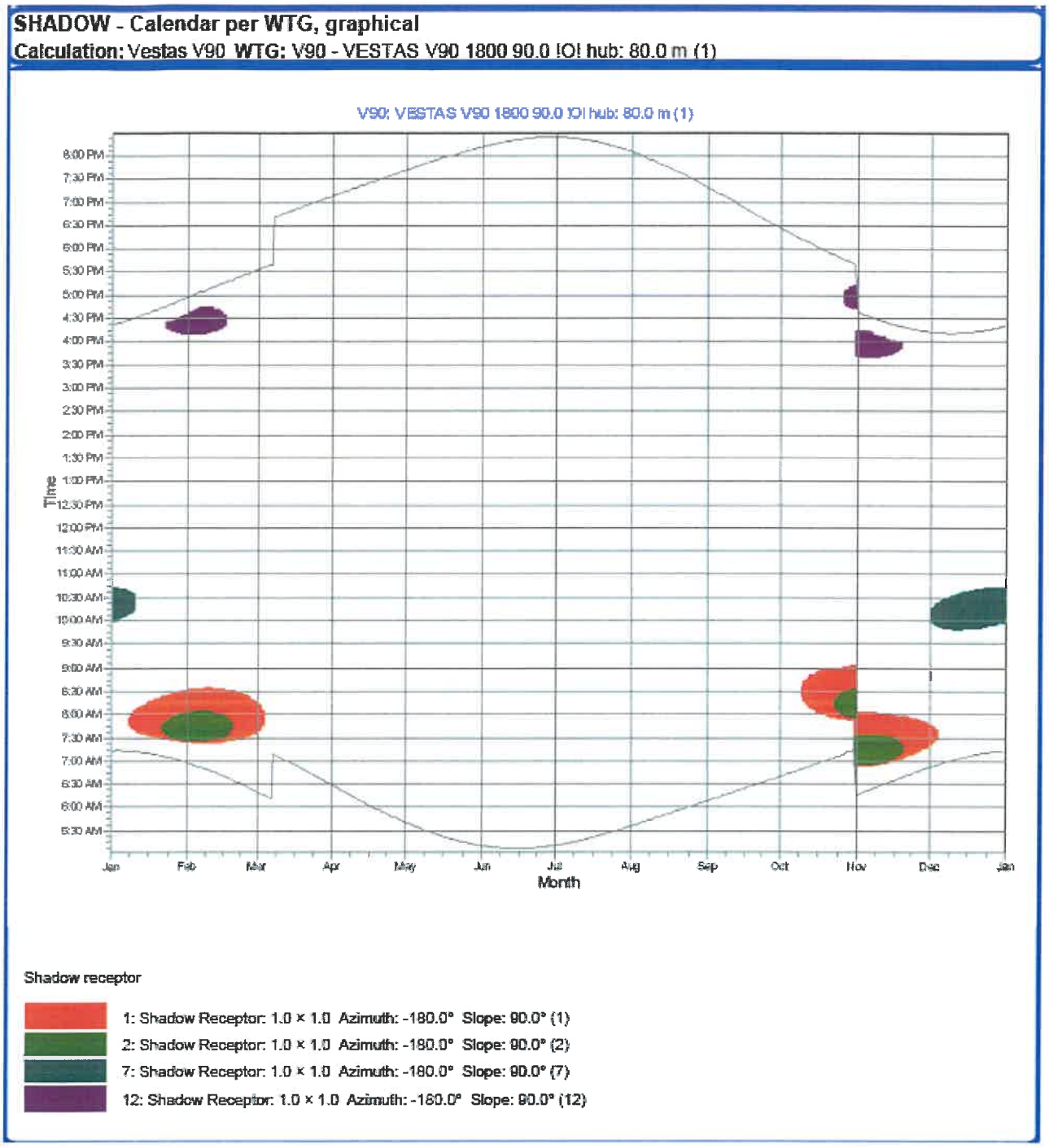

Figure 11: A Vestas V90 2.0 MW turbine would affect the greatest number of shadow receptors chosen for this analysis. Only receptor 1, located on the adjacent golf course, would likely experience more than 30 hours of shadow flicker per year.

Wind Turbine Health Impact Study:

Report of Independent Expert Panel

January 2012

Prepared for:

Massachusetts Department of Environmental Protection

Massachusetts Department of Public Health

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The Panel Charge

The Expert Panel was given the following charge by the Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH):

1. Identify and characterize attributes of concern (e.g., noise, infrasound, vibration, and light flicker) and identify any scientifically documented or potential connection between health impacts associated with wind energy turbines located on land or coastal tidelands that can impact land-based human receptors.
2. Evaluate and discuss information from peer-reviewed scientific studies, other reports, popular media, and public comments received by the MassDEP and/or in response to the *Environmental Monitor Notice* and/or by the MDPH on the nature and type of health complaints commonly reported by individuals who reside near existing wind farms.
3. Assess the magnitude and frequency of any potential impacts and risks to human health associated with the design and operation of wind energy turbines based on existing data.
4. For the attributes of concern, identify documented best practices that could reduce potential human health impacts. Include examples of such best practices (design, operation, maintenance, and management from published articles). The best practices could be used to inform public policy decisions by state, local, or regional governments concerning the siting of turbines.
5. Issue a report within 3 months of the evaluation, summarizing its findings.

   To meet its charge, the Panel conducted a literature review and met as a group a total of three times. In addition, calls were also held with Panel members to further clarify points of discussion.

Executive Summary

The Massachusetts Department of Environmental Protection (MassDEP) in collaboration with the Massachusetts Department of Public Health (MDPH) convened a panel of independent experts to identify any documented or potential health impacts of risks that may be associated with exposure to wind turbines, and, specifically, to facilitate discussion of wind turbines and public health based on scientific findings.

While the Commonwealth of Massachusetts has goals for increasing the use of wind energy from the current 40 MW to 2000 MW by the year 2020, MassDEP recognizes there are questions and concerns arising from harnessing wind energy. The scope of the Panel's effort was focused on health impacts of wind turbines *per se*. The panel was *not* charged with considering any possible benefits of avoiding adverse effects of other energy sources such as coal, oil, and natural gas as a result of switching to energy from wind turbines.

Currently, "regulation" of wind turbines is done at the local level through local boards of health and zoning boards. Some members of the public have raised concerns that wind turbines may have health impacts related to noise, infrasound, vibrations, or shadow flickering generated by the turbines. The goal of the Panel's evaluation and report is to provide a review of the science that explores these concerns and provides useful information to MassDEP and MDPH and to local agencies that are often asked to respond to such concerns. The Panel consists of seven individuals with backgrounds in public health, epidemiology, toxicology, neurology and sleep medicine, neuroscience, and mechanical engineering. All of the Panel members are considered independent experts from academic institutions.

In conducting their evaluation, the Panel conducted an extensive literature review of the scientific literature as well as other reports, popular media, and the public comments received by the MassDEP.

ES 1. Panel Charge

1. Identify and characterize attributes of concern (e.g., noise, infrasound, vibration, and light flicker) and identify any scientifically documented or potential connection between health impacts associated with wind turbines located on land or coastal tidelands that can impact land-based human receptors.
2. Evaluate and discuss information from peer reviewed scientific studies, other reports, popular media, and public comments received by the MassDEP and/or in response to the *Environmental Monitor Notice* and/or by the MDPH on the nature and type of health complaints commonly reported by individuals who reside near existing wind farms.
3. Assess the magnitude and frequency of any potential impacts and risks to human health associated with the design and operation of wind energy turbines based on existing data.
4. For the attributes of concern, identify documented best practices that could reduce potential human health impacts. Include examples of such best practices (design, operation, maintenance, and management from published articles). The best practices could be used to inform public policy decisions by state, local, or regional governments concerning the siting of turbines.
5. Issue a report within 3 months of the evaluation, summarizing its findings.

ES 2. Process

To meet its charge, the Panel conducted an extensive literature review and met as a group a total of three times. In addition, calls were also held with Panel members to further clarify points of discussion. An independent facilitator supported the Panel's deliberations. Each Panel member provided written text based on the literature reviews and analyses. Draft versions of the report were reviewed by each Panel member and the Panel reached consensus for the final text and its findings.

ES 3. Report Introduction and Description

Many countries have turned to wind power as a clean energy source because it relies on the wind, which is indefinitely renewable; it is generated "locally," thereby providing a measure of energy independence; and it produces no carbon dioxide emissions when operating. There is interest in pursuing wind energy both on-land and offshore. For this report, however, the focus is on land-based installations and all comments are focused on this technology. Land-based

wind turbines currently range from 100 kW to 3 MW (3000 kW). In Massachusetts, the largest turbine is currently 1.8 MW.

The development of modern wind turbines has been an evolutionary design process, applying optimization at many levels. An overview of the characteristics of wind turbines, noise, and vibration is presented in Chapter 2 of the report. Acoustic and seismic measurements of noise and vibration from wind turbines provide a context for comparing measurements from epidemiological studies and for claims purported to be due to emissions from wind turbines. Appendices provide detailed descriptions and equations that allow a more in-depth understanding of wind energy, the structure of the turbines, wind turbine aerodynamics, installation, energy production, shadow flicker, ice throws, wind turbine noise, noise propagation, infrasound, and stall vs. pitch controlled turbines.

Extensive literature searches and reviews were conducted to identify studies that specifically evaluate human population responses to turbines, as well as population and individual responses to the three primary characteristics or attributes of wind turbine operation: noise, vibration, and flicker. An emphasis of the Panel's efforts was to examine the biological plausibility or basis for health effects of turbines (noise, vibration, and flicker). Beyond traditional forms of scientific publications, the Panel also took great care to review other non-peer reviewed materials regarding the potential for health effects including information related to "Wind Turbine Syndrome" and provides a rigorous analysis as to whether there is scientific basis for it. Since the most commonly reported complaint by people living near turbines is sleep disruption, the Panel provides a robust review of the relationship between noise, vibration, and annoyance as well as sleep disturbance from noises and the potential impacts of the resulting sleep deprivation.

In assessing the state of the evidence for health effects of wind turbines, the Panel followed accepted scientific principles and relied on several different types of studies. It considered human studies of the most important or primary value. These were either human epidemiological studies specifically relating to exposure to wind turbines or, where specific exposures resulting from wind turbines could be defined, the panel also considered human experimental data. Animal studies are critical to exploring biological plausibility and understanding potential biological mechanisms of different exposures, and for providing information about possible health effects when experimental research in humans is not ethically

or practically possible. As such, this literature was also reviewed with respect to wind turbine exposures. The non-peer reviewed material was considered part of the weight of evidence. In all cases, data quality was considered; at times, some studies were rejected because of lack of rigor or the interpretations were inconsistent with the scientific evidence.

ES 4. Findings

The findings in Chapter 4 are repeated here.

Based on the detailed review of the scientific literature and other available reports and consideration of the strength of scientific evidence, the Panel presents findings relative to three factors associated with the operation of wind turbines: noise and vibration, shadow flicker, and ice throw. The findings that follow address specifics in each of these three areas.

ES 4.1 Noise

ES 4.1.a Production of Noise and Vibration by Wind Turbines

1. Wind turbines can produce unwanted sound (referred to as noise) during operation. The nature of the sound depends on the design of the wind turbine. Propagation of the sound is primarily a function of distance, but it can also be affected by the placement of the turbine, surrounding terrain, and atmospheric conditions.
    a. Upwind and downwind turbines have different sound characteristics, primarily due to the interaction of the blades with the zone of reduced wind speed behind the tower in the case of downwind turbines.
    b. Stall regulated and pitch controlled turbines exhibit differences in their dependence of noise generation on the wind speed
    c. Propagation of sound is affected by refraction of sound due to temperature gradients, reflection from hillsides, and atmospheric absorption. Propagation effects have been shown to lead to different experiences of noise by neighbors.
    d. The audible, amplitude-modulated noise from wind turbines ("whooshing") is perceived to increase in intensity at night (and sometimes becomes more of a "thumping") due to multiple effects: i) a stable atmosphere will have larger wind gradients, ii) a stable atmosphere may refract the sound downwards instead of upwards, iii) the ambient noise near the ground is lower both because of the stable atmosphere and because human generated noise is often lower at night.

2. The sound power level of a typical modern utility scale wind turbine is on the order of 103 dB(A), but can be somewhat higher or lower depending on the details of the design and the rated power of the turbine. The perceived sound decreases rapidly with the distance from the wind turbines. Typically, at distances larger than 400 m, sound pressure levels for modern wind turbines are less than 40 dB(A), which is below the level associated with annoyance in the epidemiological studies reviewed.
3. Infrasound refers to vibrations with frequencies below 20 Hz. Infrasound at amplitudes over 100–110 dB can be heard and felt. Research has shown that vibrations below these amplitudes are not felt. The highest infrasound levels that have been measured near turbines and reported in the literature near turbines are under 90 dB at 5 Hz and lower at higher frequencies for locations as close as 100 m.
4. Infrasound from wind turbines is not related to nor does it cause a "continuous whooshing."
5. Pressure waves at any frequency (audible or infrasonic) can cause vibration in another structure or substance. In order for vibration to occur, the amplitude (height) of the wave has to be high enough, and only structures or substances that have the ability to receive the wave (resonant frequency) will vibrate.

ES 4.1.b Health Impacts of Noise and Vibration

1. Most epidemiologic literature on human response to wind turbines relates to self-reported "annoyance," and this response appears to be a function of some combination of the sound itself, the sight of the turbine, and attitude towards the wind turbine project.
   a. There is limited epidemiologic evidence suggesting an association between exposure to wind turbines and annoyance.
   b. There is insufficient epidemiologic evidence to determine whether there is an association between noise from wind turbines and annoyance independent from the effects of seeing a wind turbine and vice versa.

2. There is limited evidence from epidemiologic studies suggesting an association between noise from wind turbines and sleep disruption. In other words, it is possible that noise from some wind turbines can cause sleep disruption.
3. A very loud wind turbine could cause disrupted sleep, particularly in vulnerable populations, at a certain distance, while a very quiet wind turbine would not likely disrupt even the lightest of sleepers at that same distance. But there is not enough evidence to provide particular sound-pressure thresholds at which wind turbines cause sleep disruption. Further study would provide these levels.
4. Whether annoyance from wind turbines leads to sleep issues or stress has not been sufficiently quantified. While not based on evidence of wind turbines, there is evidence that sleep disruption can adversely affect mood, cognitive functioning, and overall sense of health and well-being.
5. There is insufficient evidence that the noise from wind turbines is *directly (i.e., independent from an effect on annoyance or sleep)* causing health problems or disease.
6. Claims that infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system.
   a. The measured levels of infrasound produced by modern upwind wind turbines at distances as close as 68 m are well below that required for non-auditory perception (feeling of vibration in parts of the body, pressure in the chest, etc.).
   b. If infrasound couples into structures, then people inside the structure could feel a vibration. Such structural vibrations have been shown in other applications to lead to feelings of uneasiness and general annoyance. The measurements have shown no evidence of such coupling from modern upwind turbines.
   c. Seismic (ground-carried) measurements recorded near wind turbines and wind turbine farms are unlikely to couple into structures.
   d. A possible coupling mechanism between infrasound and the vestibular system (via the Outer Hair Cells (OHC) in the inner ear) has been proposed but is not yet fully understood or sufficiently explained. Levels of infrasound near wind turbines have been shown to be high enough to be sensed by the OHC. However, evidence does not

exist to demonstrate the influence of wind turbine-generated infrasound on vestibular-mediated effects in the brain.

e. Limited evidence from rodent (rat) laboratory studies identifies short-lived biochemical alterations in cardiac and brain cells in response to short exposures to emissions at 16 Hz and 130 dB. These levels exceed measured infrasound levels from modern turbines by over 35 dB.

7. There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome."
8. The strongest epidemiological study suggests that there is not an association between noise from wind turbines and measures of psychological distress or mental health problems. There were two smaller, weaker, studies: one did note an association, one did not. Therefore, we conclude the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems.
9. None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine.

ES 4.2 Shadow Flicker

ES 4.2.a Production of Shadow Flicker

Shadow flicker results from the passage of the blades of a rotating wind turbine between the sun and the observer.

1. The occurrence of shadow flicker depends on the location of the observer relative to the turbine and the time of day and year.
2. Frequencies of shadow flicker elicited from turbines is proportional to the rotational speed of the rotor times the number of blades and is generally between 0.5 and 1.1 Hz for typical larger turbines.
3. Shadow flicker is only present at distances of less than 1400 m from the turbine.

ES 4.2.b Health Impacts of Shadow Flicker

1. Scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizures as a result of photic stimulation.

2. There is limited scientific evidence of an association between annoyance from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects.

ES 4.3 Ice Throw

ES 4.3.a Production of Ice Throw

Ice can fall or be thrown from a wind turbine during or after an event when ice forms or accumulates on the blades.

1. The distance that a piece of ice may travel from the turbine is a function of the wind speed, the operating conditions, and the shape of the ice.
2. In most cases, ice falls within a distance from the turbine equal to the tower height, and in any case, very seldom does the distance exceed twice the total height of the turbine (tower height plus blade length).

ES 4.3.b Health Impacts of Ice Throw

1. There is sufficient evidence that falling ice is physically harmful and measures should be taken to ensure that the public is not likely to encounter such ice.

ES 4.4 Other Considerations

In addition to the specific findings stated above for noise and vibration, shadow flicker and ice throw, the Panel concludes the following:

1. Effective public participation in and direct benefits from wind energy projects (such as receiving electricity from the neighboring wind turbines) have been shown to result in less annoyance in general and better public acceptance overall.

ES 5. Best Practices Regarding Human Health Effects of Wind Turbines

The best practices presented in Chapter 5 are repeated here.

Broadly speaking, the term "best practice" refers to policies, guidelines, or recommendations that have been developed for a specific situation. Implicit in the term is that the practice is based on the best information available at the time of its institution. A best practice may be refined as more information and studies become available. The panel recognizes that in countries which are dependent on wind energy and are protective of public health, best practices have been developed and adopted.

In some cases, the weight of evidence for a specific practice is stronger than it is in other cases. Accordingly, best practice* may be categorized in terms of the evidence available, as follows:

Descriptions of Three Best Practice Categories

Category	Name	Description
1	Research Validated Best Practice	A program, activity, or strategy that has the highest degree of proven effectiveness supported by objective and comprehensive research and evaluation.
2	Field Tested Best Practice	A program, activity, or strategy that has been shown to work effectively and produce successful outcomes and is supported to some degree by subjective and objective data sources.
3	Promising Practice	A program, activity, or strategy that has worked within one organization and shows promise during its early stages for becoming a best practice with long-term sustainable impact. A promising practice must have some objective basis for claiming effectiveness and must have the potential for replication among other organizations.

**These categories are based on those suggested in "Identifying and Promoting Promising Practices." Federal Register, Vol. 68. No 131. 131. July 2003.*
www.acf.hhs.gov/programs/ccf/about_ccf/ebk_pdf/pp_ebk.pdf

ES 5.1 Noise

Evidence regarding wind turbine noise and human health is limited. There is limited evidence of an association between wind turbine noise and both annoyance and sleep disruption, depending on the sound pressure level at the location of concern. However, there are no research-based sound pressure levels that correspond to human responses to noise. A number of countries that have more experience with wind energy and are protective of public health have developed guidelines to minimize the possible adverse effects of noise. These guidelines consider time of day, land use, and ambient wind speed. The table below summarizes the guidelines of Germany (in the categories of industrial, commercial and villages) and Denmark (in the categories of sparsely populated and residential). The sound levels shown in the table are

for nighttime and are assumed to be taken immediately outside of the residence or building of concern. In addition, the World Health Organization recommends a maximum nighttime sound pressure level of 40 dB(A) in residential areas. Recommended setbacks corresponding to these values may be calculated by software such as WindPro or similar software. Such calculations are normally to be done as part of feasibility studies. The Panel considers the guidelines shown below to be Promising Practices (Category 3) but to embody some aspects of Field Tested Best Practices (Category 2) as well.

Promising Practices for Nighttime Sound Pressure Levels by Land Use Type

Land Use	**Sound Pressure Level, dB(A) Nighttime Limits**
Industrial	70
Commercial	50
Villages, mixed usage	45
Sparsely populated areas, 8 m/s wind*	44
Sparsely populated areas, 6 m/s wind*	42
Residential areas, 8 m/s wind*	39
Residential areas, 6 m/s wind*	37

**measured at 10 m above ground, outside of residence or location of concern*

The time period over which these noise limits are measured or calculated also makes a difference. For instance, the often-cited World Health Organization recommended nighttime noise cap of 40 dB(A) is averaged over one year (and does not refer specifically to wind turbine noise). Denmark's noise limits in the table above are calculated over a 10-minute period. These limits are in line with the noise levels that the epidemiological studies connect with insignificant reports of annoyance.

The Panel recommends that noise limits such as those presented in the table above be included as part of a statewide policy regarding new wind turbine installations. In addition, suitable ranges and procedures for cases when the noise levels may be greater than those values should also be considered. The considerations should take into account trade-offs between

environmental and health impacts of different energy sources, national and state goals for energy independence, potential extent of impacts, etc.

The Panel also recommends that those involved in a wind turbine purchase become familiar with the noise specifications for the turbine and factors that affect noise production and noise control. Stall and pitch regulated turbines have different noise characteristics, especially in high winds. For certain turbines, it is possible to decrease noise at night through suitable control measures (e.g., reducing the rotational speed of the rotor). If noise control measures are to be considered, the wind turbine manufacturer must be able to demonstrate that such control is possible.

The Panel recommends an ongoing program of monitoring and evaluating the sound produced by wind turbines that are installed in the Commonwealth. IEC 61400-11 provides the standard for making noise measurements of wind turbines (International Electrotechnical Commission, 2002). In general, more comprehensive assessment of wind turbine noise in populated areas is recommended. These assessments should be done with reference to the broader ongoing research in wind turbine noise production and its effects, which is taking place internationally. Such assessments would be useful for refining siting guidelines and for developing best practices of a higher category. Closer investigation near homes where outdoor measurements show A and C weighting differences of greater than 15 dB is recommended.

ES 5.2 Shadow Flicker

Based on the scientific evidence and field experience related to shadow flicker, Germany has adopted guidelines that specify the following:

1. Shadow flicker should be calculated based on the astronomical maximum values (i.e., not considering the effect of cloud cover, etc.).
2. Commercial software such as WindPro or similar software may be used for these calculations. Such calculations should be done as part of feasibility studies for new wind turbines.
3. Shadow flicker should not occur more than 30 minutes per day and not more than 30 hours per year at the point of concern (e.g., residences).
4. Shadow flicker can be kept to acceptable levels either by setback or by control of the wind turbine. In the latter case, the wind turbine manufacturer must be able to demonstrate that such control is possible.

The guidelines summarized above may be considered to be a Field Tested Best Practice (Category 2). Additional studies could be performed, specifically regarding the number of hours per year that shadow flicker should be allowed, that would allow them to be placed in Research Validated (Category 1) Best Practices.

ES 5.3 Ice Throw

Ice falling from a wind turbine could pose a danger to human health. It is also clear that the danger is limited to those times when icing occurs and is limited to relatively close proximity to the wind turbine. Accordingly, the following should be considered Category 1 Best Practices.

1. In areas where icing events are possible, warnings should be posted so that no one passes underneath a wind turbine during an icing event and until the ice has been shed.
2. Activities in the vicinity of a wind turbine should be restricted during and immediately after icing events in consideration of the following two limits (in meters).

For a turbine that may not have ice control measures, it may be assumed that ice could fall within the following limit:

$$x_{\max,throw} = 1.5(2R + H)$$

Where: R = rotor radius (m), H = hub height (m)

For ice falling from a stationary turbine, the following limit should be used:

$$x_{\max,fall} = U(R + H)/15$$

Where: U = maximum likely wind speed (m/s)

The choice of maximum likely wind speed should be the expected one-year return maximum, found in accordance to the International Electrotechnical Commission's design standard for wind turbines, IEC 61400-1.

Danger from falling ice may also be limited by ice control measures. If ice control measures are to be considered, the wind turbine manufacturer must be able to demonstrate that such control is possible.

ES 5.4 Public Participation/Annoyance

There is some evidence of an association between participation, economic or otherwise, in a wind turbine project and the annoyance (or lack thereof) that affected individuals may express. Accordingly, measures taken to directly involve residents who live in close proximity

to a wind turbine project may also serve to reduce the level of annoyance. Such measures may be considered to be a Promising Practice (Category 3).

ES 5.5 Regulations/Incentives/Public Education

The evidence indicates that in those parts of the world where there are a significant number of wind turbines in relatively close proximity to where people live, there is a close coupling between the development of guidelines, provision of incentives, and educating the public. The Panel suggests that the public be engaged through such strategies as education, incentives for community-owned wind developments, compensations to those experiencing documented loss of property values, comprehensive setback guidelines, and public education related to renewable energy. These multi-faceted approaches may be considered to be a Promising Practice (Category 3).

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Executive Summary of this 30 page report
Shadow Flicker Assessment October 21,2013
Full report can be emailed if needed.

EAPC
WIND ENERGY

Shadow Flicker Assessment for the Scituate, MA Wind Turbine

October 21,

2013

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Report Update

EAPC bears no responsibility to update this report for any changes occurring subsequent to the final issuance of this report.

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Executive Summary

EAPC was asked to study the shadow flicker occurrence in the area near a wind turbine operating at the wastewater treatment plant in Scituate, Massachusetts. A single Sinovel 1.5 Megawatt (MW) wind turbine with an 82-meter (m) rotor diameter on an 80 m tower was installed in March 2012. This study was conducted using computer modeling combined with on-the-ground line-of-sight verification, from public streets, to determine whether the turbine can be seen from these areas.

EAPC identified 683 locations of interest that consist of existing buildings and developable parcels within 1,500 m (4,900 ft), a common distance value used in modeling shadow flicker. Shadow flicker receptors (a structure or central point on an undeveloped parcel) modeled at locations greater than 450 m (1,500 ft) from the turbine were conservatively assumed to be a standardized large house with dimensions of 20 m in width and 10 m in height. For receptors within a 450 m radius, actual structure measurements from assessor's records and aerial photography were used to estimate the length of exterior walls facing the wind turbine.

The shadow flicker model identified 277 receptors that could potentially be affected by shadow flicker without accounting for tree cover, neighboring buildings or any other man-made obstacles. Of those 277 receptors, 10 receptors are expected to realistically (i.e. after accounting for cloud cover and turbine operational statistics) receive greater than 10 flicker hours per year and three of those receptors are expected to realistically receive greater than 30 flicker hours per year.

EAPC also analyzed how many hours the wind turbine would likely need to be curtailed to reduce shadow flicker for three hypothetical cases:

- To limit realistic flicker probability to 50.43 hours per year at 151 Driftway (a limitation set forth in the Special Permit issued by the Scituate Planning Board) would require approximately 19 hours a year of curtailment.
- To limit realistic flicker probability to 30 hours per year at all existing residential structures would require approximately 59 hours a year of curtailment.
- To limit realistic flicker probability to 10 hours per year at all existing residential structures would require approximately 65 hours a year of curtailment.

MEETING OF THE BOARD OF SELECTMEN

TUESDAY, JANUARY 7, 2014

SELECTMEN'S CHAMBERS – TOWN HALL

5:30 PM

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1. **5:30 PM/ MEETING CALLED TO ORDER**

2. **ACCEPTANCE OF AGENDA**

3. **MEET NEW COUNCIL ON AGING DIRECTOR/ Linda P. Hayes**

4. **RECOGNITION/ SCITUATE FIREFIGHTERS – Elliot, Sanborn, McDonough, Norlin and Bulman**

5. **PRESENTATION/ Wind Turbine "Flicker Study"/ A. Bangert**

6. **DISCUSSION/ VOTE/ Building Permit Fee for Solar Array**

7. **DISCUSSION/ VOTE/ Interfund Borrowing for School Department/ P. Avitabile**

8. **AWARD CONTRACT/ Water Pipes & Fittings/ #13-WA-66/ K. Cafferty**

9. **UPDATE/ Market & Economic Development Study/ L. Harbottle**

10. **DISCUSSION/ VOTE/ EXECUTE/ Contract Authorization & Agreement for State Library Construction Grant**

11. **FY15 OPERATING & CAPITAL BUDGET OVERVIEW/ T. Administrator**

12. **DISCUSSION/ FY15 BUDGET HEARINGS**
    - **610 Library**
    - **141 Assessors**
    - **161 Town Clerk**
    - **241 Inspections**
    - **176 Zoning Board of Appeals**
    - **61 Widow's Walk**
    - **135 Finance Director/Town Accountant**

13. **WALK-IN PERIOD**

14. REPORT & "The Week Ahead" / Town Administrator

15. AWARD CONTRACT/ Golf Course Maintenance / T. Administrator

16. AWARD CONTRACT/Schematic Design/Public Safety Complex T. Administrator

17. DISCUSSION/ RE-VOTE/ Donation of Land/ Larsen / Shadwell Road

18. APPOINTMENTS/Public Building Commission/User Members/Library Project

19. OTHER BUSINESS – Correspondence, Regular Session Minutes 12/17/14, Executive Session Minutes(no release), 1/22/13, 6/18/13, 7/23/13, 8/21/13, 12/17/13

20. ADJOURNMENT & SIGNING OF DOCUMENTS

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Shawn Harris, Chairman

Scituate, MA
Shadow Flicker Study

Presentation to the
Scituate Board of Selectmen
January 7, 2014

EAPC
WIND ENERGY

Elizabeth King Wind Analyst
Chester Harvey GIS Specialist

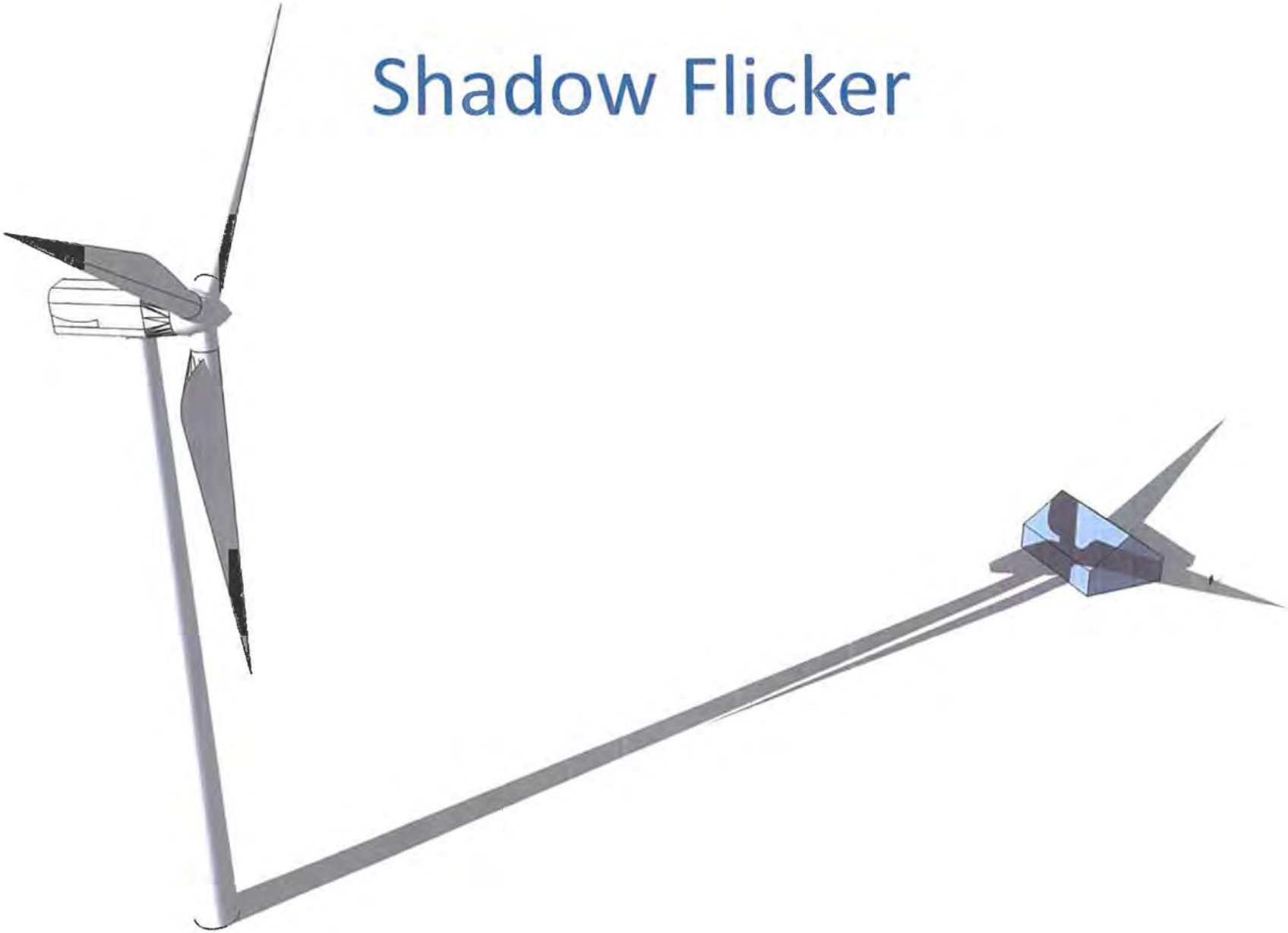
256 Farrell Farm Rd.
Norwich, VT 05055
Ph: 802.649.1511

Shadow Flicker

Shadow flicker occurs when rotating wind turbine blades cast a pulsating shadow on an observer or their immediate environment, such as a room or outdoor space.

Shadow flicker is similar to the experience of driving along a tree-lined road when low-angle sun is casting shadows through the trees and across the moving car, but at a lower frequency.

Shadow Flicker



Goals

1. Estimate shadow flicker time by location

2. Document areas with line-of-sight to turbine

Site Overview

- 1 Wind Turbine
  - Scituate Wind, LLC
  - Sinovel SL 1500
  - 80 meter hub height
- 683 Receptors within 1.5 km of turbine

Methodology

1. Desktop estimate of shadow flicker exposure
   - Shadow flicker modeled using WindPRO

     Incorporates GIS terrain model, daily sun paths based on latitude, local weather data and wind data
   - Receptors identified using aerial images & GIS data
   - No tree or building obstacles are accounted for
2. Field documentation of line-of-sight
   - Assessed by car from public streets

Flicker Modeling

Theoretical Worst Case

- Maximum possible shadow hours for a given location
- Sun always shining; wind turbines always operating
- Is a step in process for deriving *realistic case* estimates

Realistic Case

- Incorporates sunshine probability and likely wind turbine operational hours

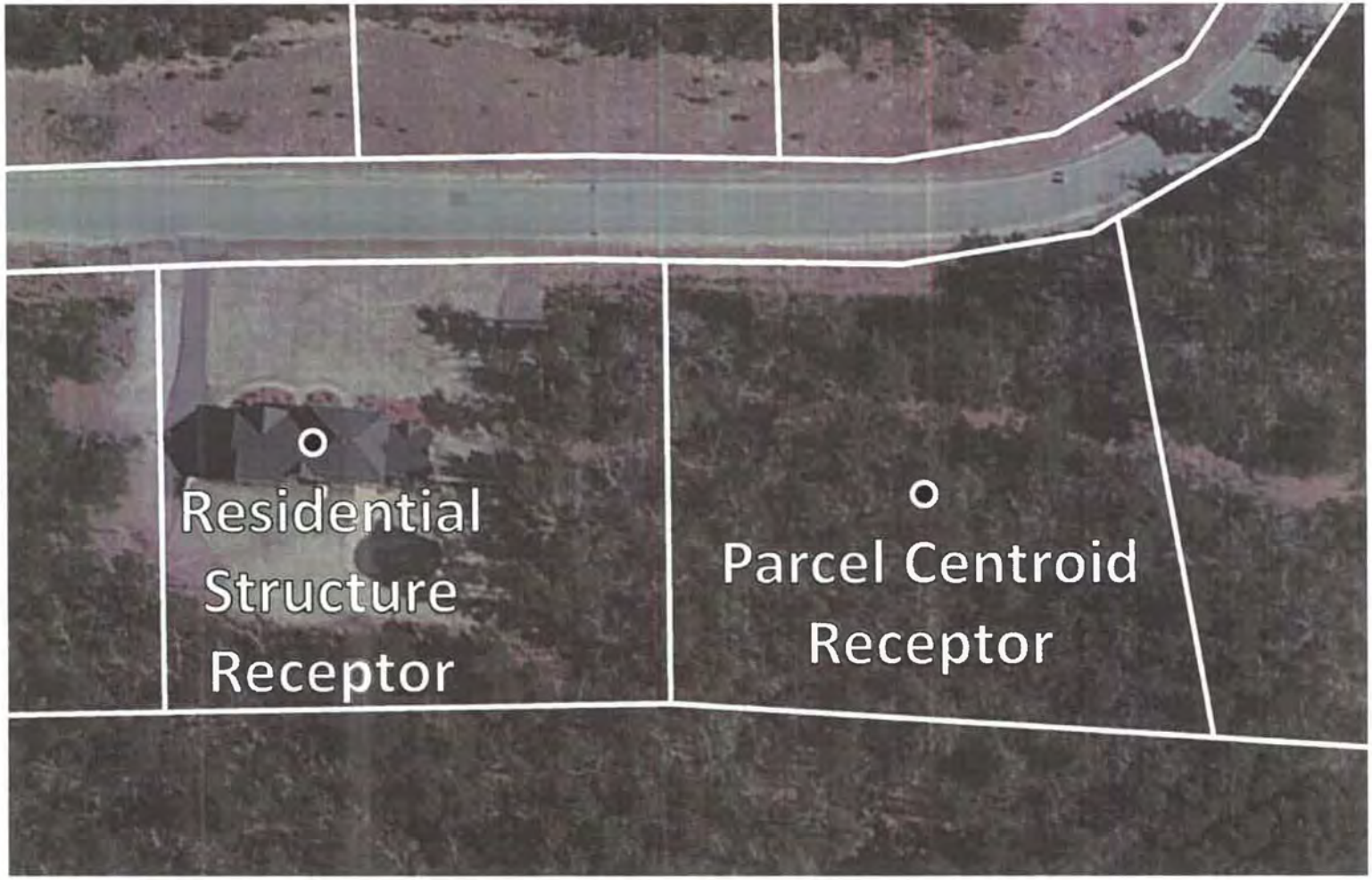
  Sunshine data, 61 years, Boston, MA (National Climatic Data Center)

  On-Site Wind data, 1 year (June 2006 – August 2007), Scituate, MA (UMass Amherst), Normalized for long term seasonal variation

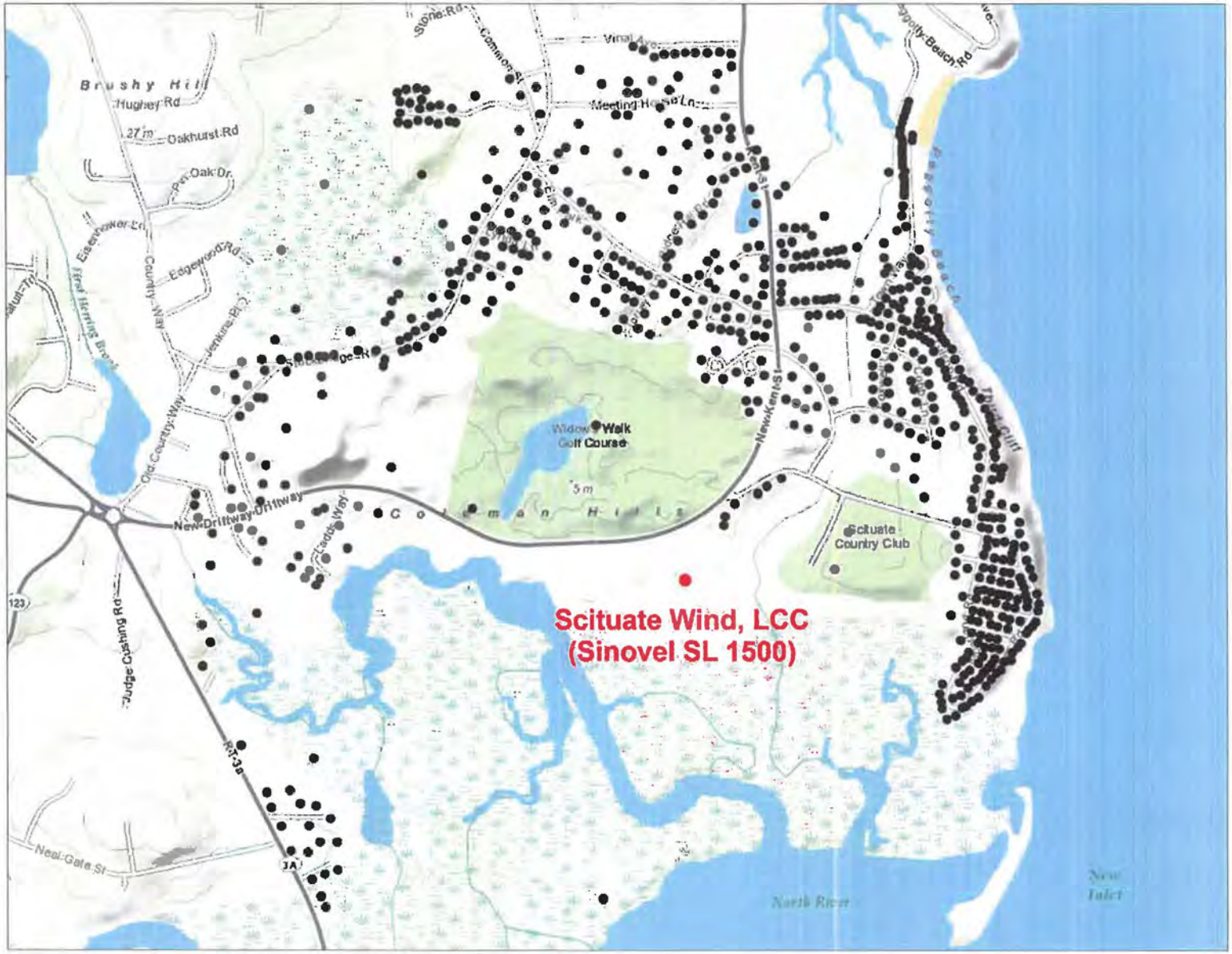
Receptor Identification

- Generally 1 Receptor per parcel
- All receptors are within 1.5 km (0.9 mi) of turbine

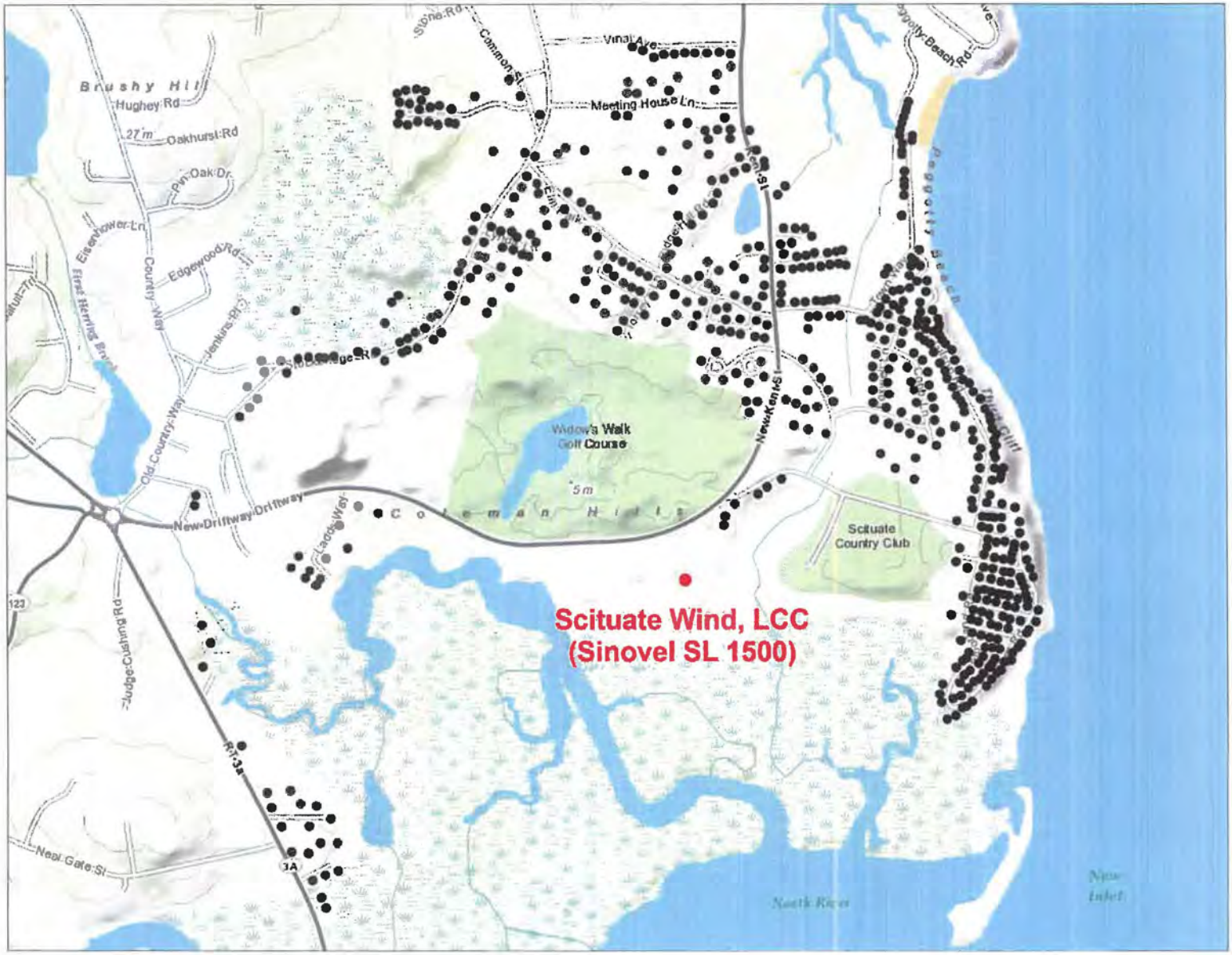
Receptor Identification



All Receptors - 683



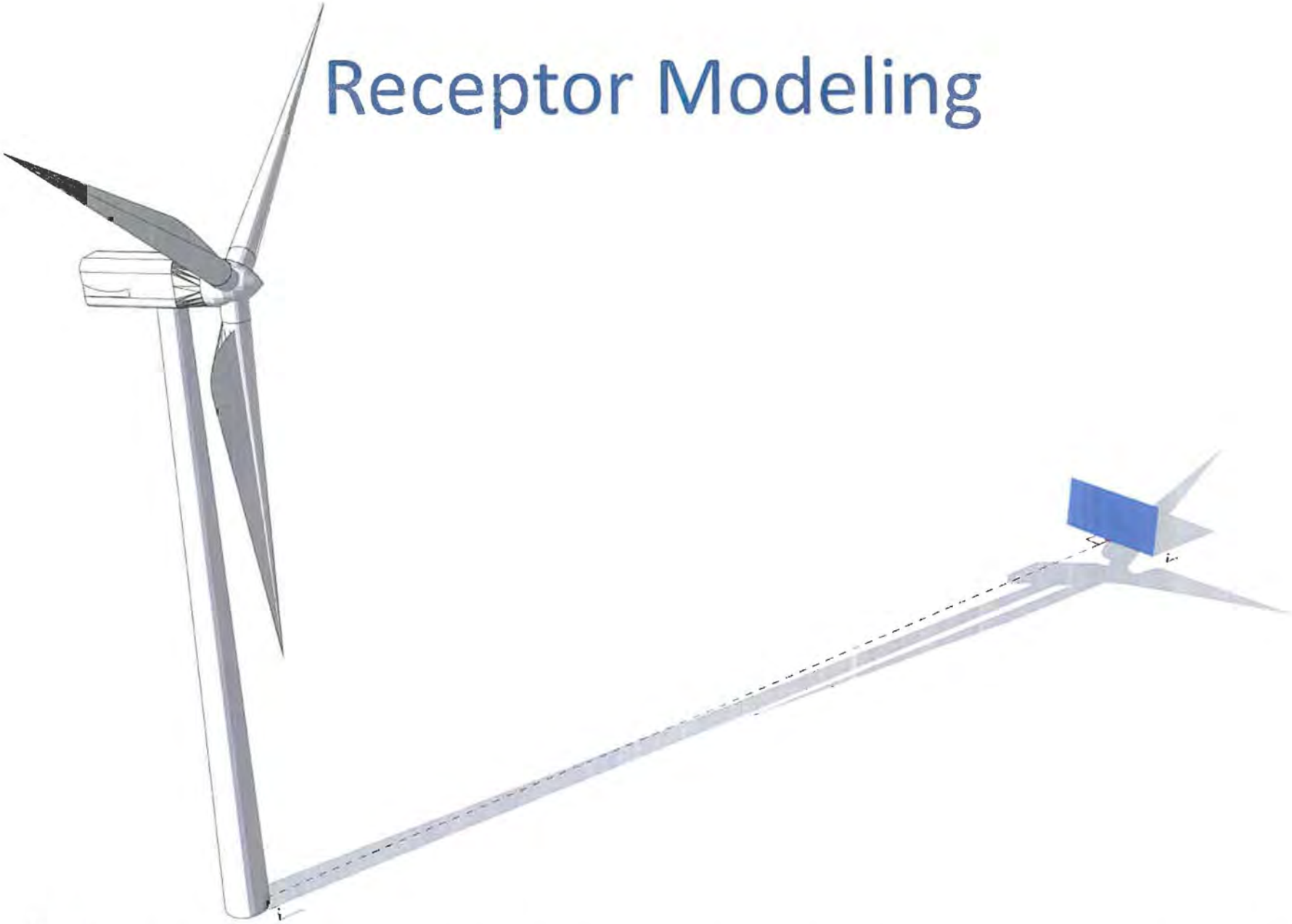
Residential Structure Receptors - 580



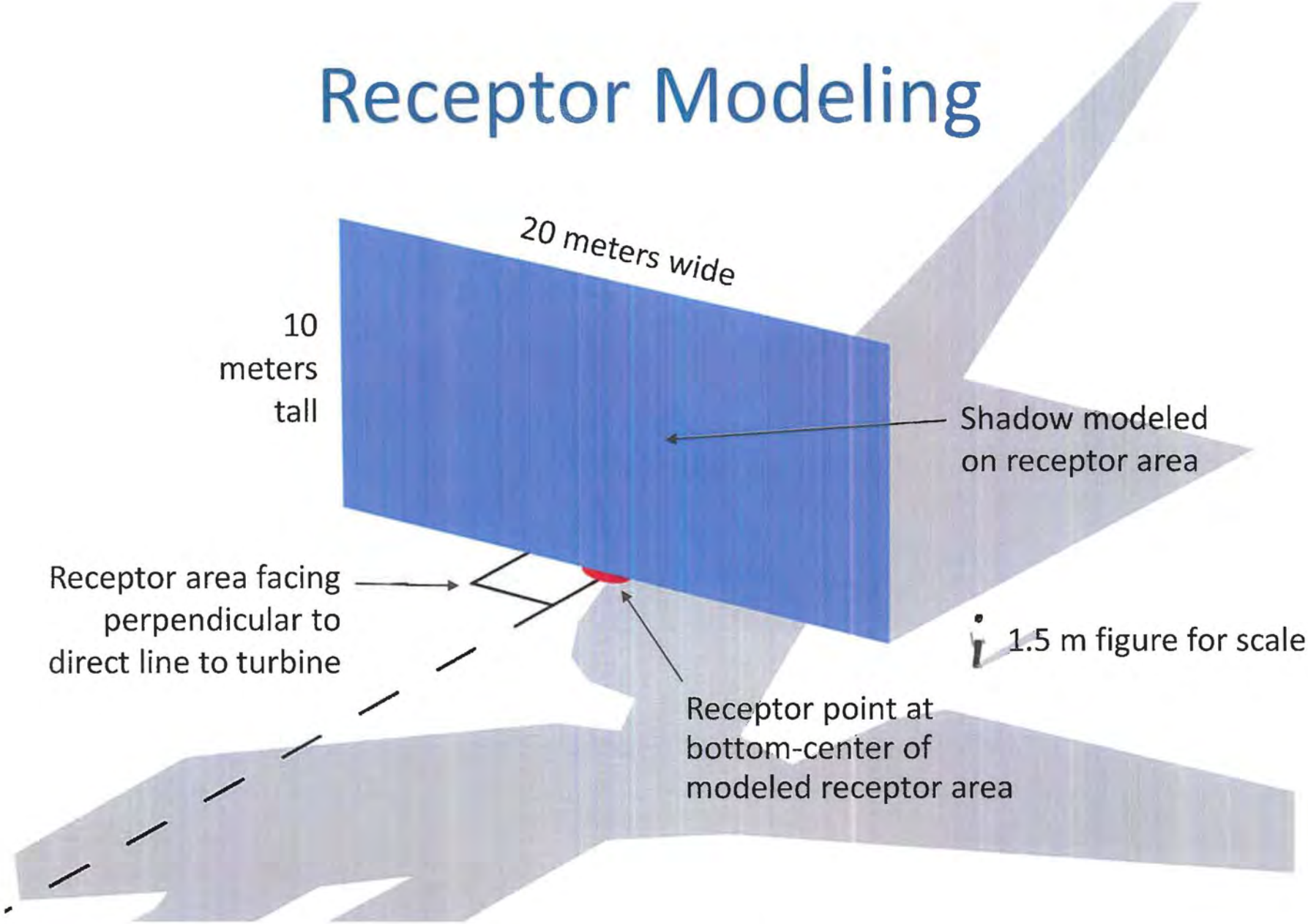
Receptor Modeling

- 6 residences within 500 m of turbine
  - Actual dimensions estimated from tax records
- All other receptors:
  - 20 meters wide x 10 meters tall
  - Intended to simulate the façade of a single family home
- Each receptor modeled so it directly faces the wind turbine (*Greenhouse Mode*)

Receptor Modeling



Receptor Modeling



Receptor Modeling

- Receptor size intended to represent the height and width of a large house.
- A smaller receptor (such as a window) would produce a lower shadow flicker estimate.

Flicker Results

Receptors Within Example Thresholds

	Realistic Case	
	More Than 10 Hours per Year of Flicker	More Than 30 Hours per Year of Flicker
Number of Receptors Affected	10	3

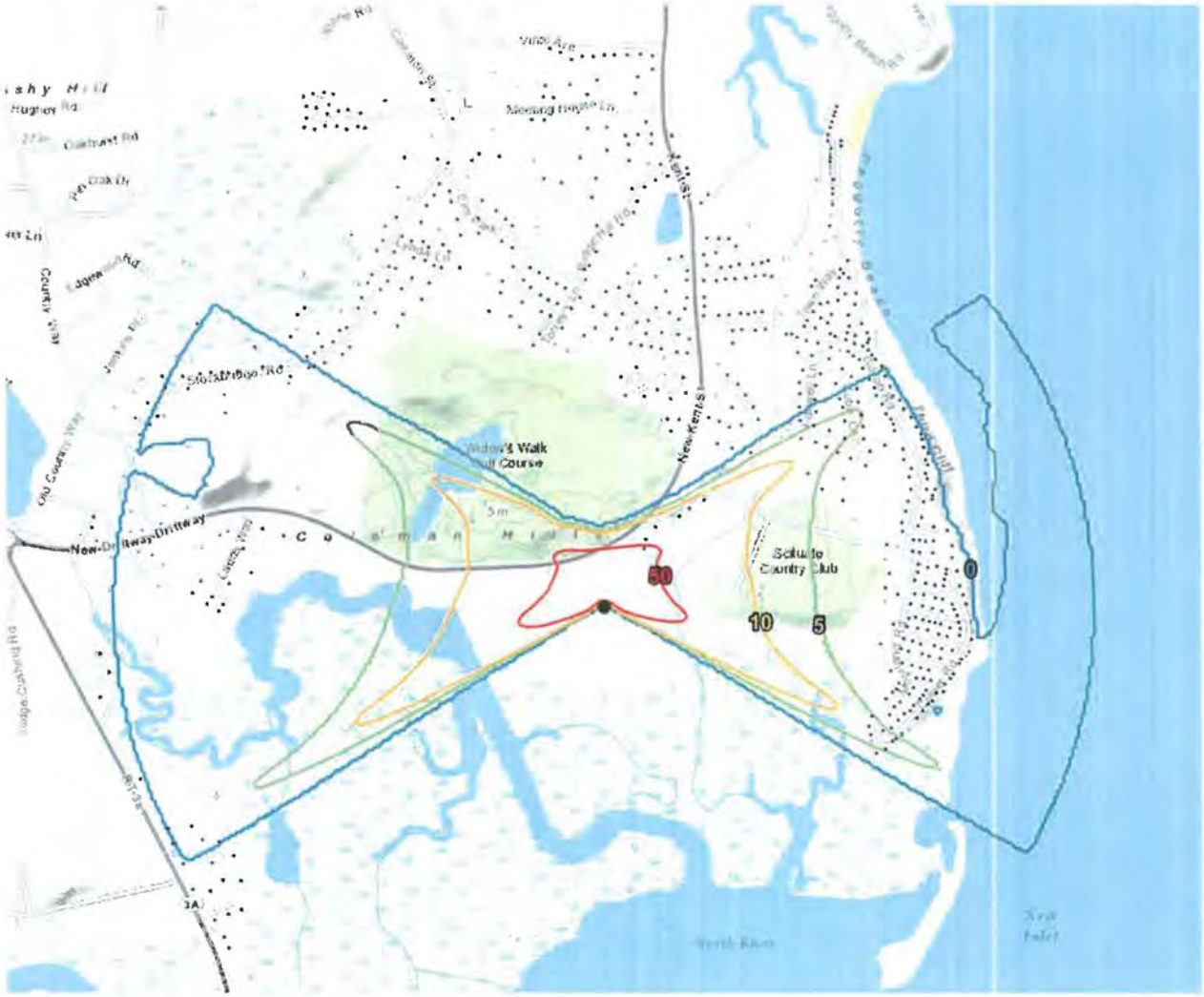
Example thresholds are industry standards for shadow flicker modeling and are not indicative of local policy or allowable levels.

Flicker Results

Top 10 Receptors

Address	Receptor Type	Parcel Use	Height (m)	Width (m)	*Realistic* Case Flicker hours/yr	*Theoretical Worst Case* Max Flicker hours/day
151 Driftway	Structure	Residential	6	13	69:08:00	1:44
141 Driftway	Structure	Residential	3	8	40:10:00	1:25
141 Driftway	Structure	Residential	10	11	30:31:00	1:18
131 Driftway	Structure	Residential	6	15	25:50:00	1:06
125 Driftway	Structure	Residential	6	15	21:31	1:00
119 Driftway	Structure	Residential	6	11	17:58	0:52
91 Driftway	Structure	Commercial	10	20	13:50	0:49
Driftway	Parcel Cen.	Recreational	10	20	10:47	0:43
26 Hewes Rd	Structure	Residential	10	20	10:11	0:31
72 Moorland Rd	Structure	Residential	10	20	10:01	0:28

Realistic Case - Hours per Year



Map and tabular results show slight differences in flicker time because they are modeled differently. Maps are prepared by modeling shadow flicker within 10 x 10 meter grid cells suspended horizontally at 1.5 meters above ground level. Receptors modeled for tabular results are variously-sized, stand vertical, and are oriented to directly face the turbine.

Hours per Year

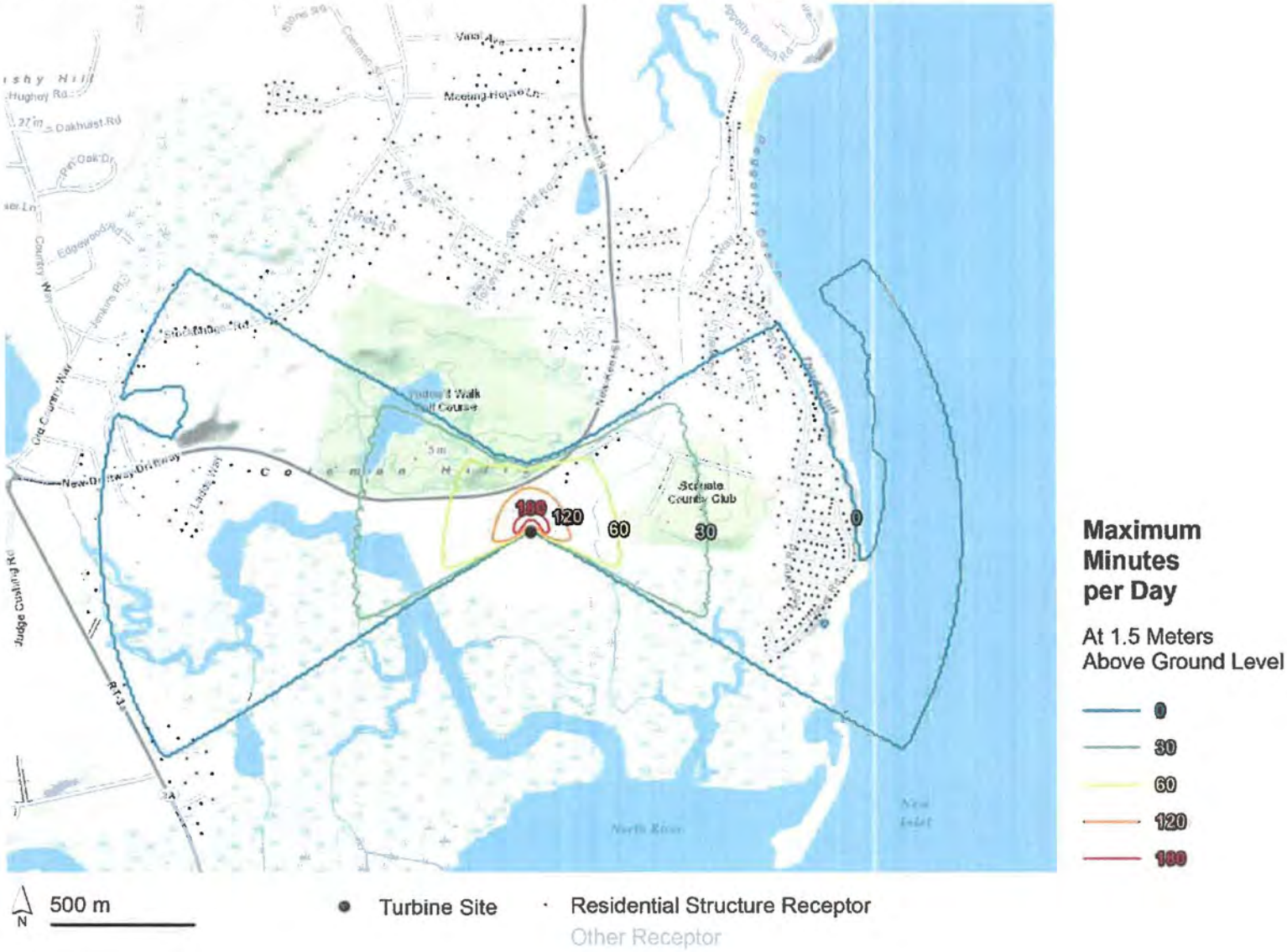
At 1.5 Meters
Above Ground Level

- 0
- 5
- 10
- 50

N 500 m

- Turbine Site
- Residential Structure Receptor
- Other Receptor

Theoretical Worst Case - Maximum Minutes per Day



Line-of-Sight Survey

- Assesses line-of-sight to each turbine from public streets within the study area
- Accounts for trees and buildings that block line-of-sight to turbines
- Line-of-sight results are **not** typically incorporated into modeling results because databases for trees and structures are not readily available

Line-of-Sight Survey

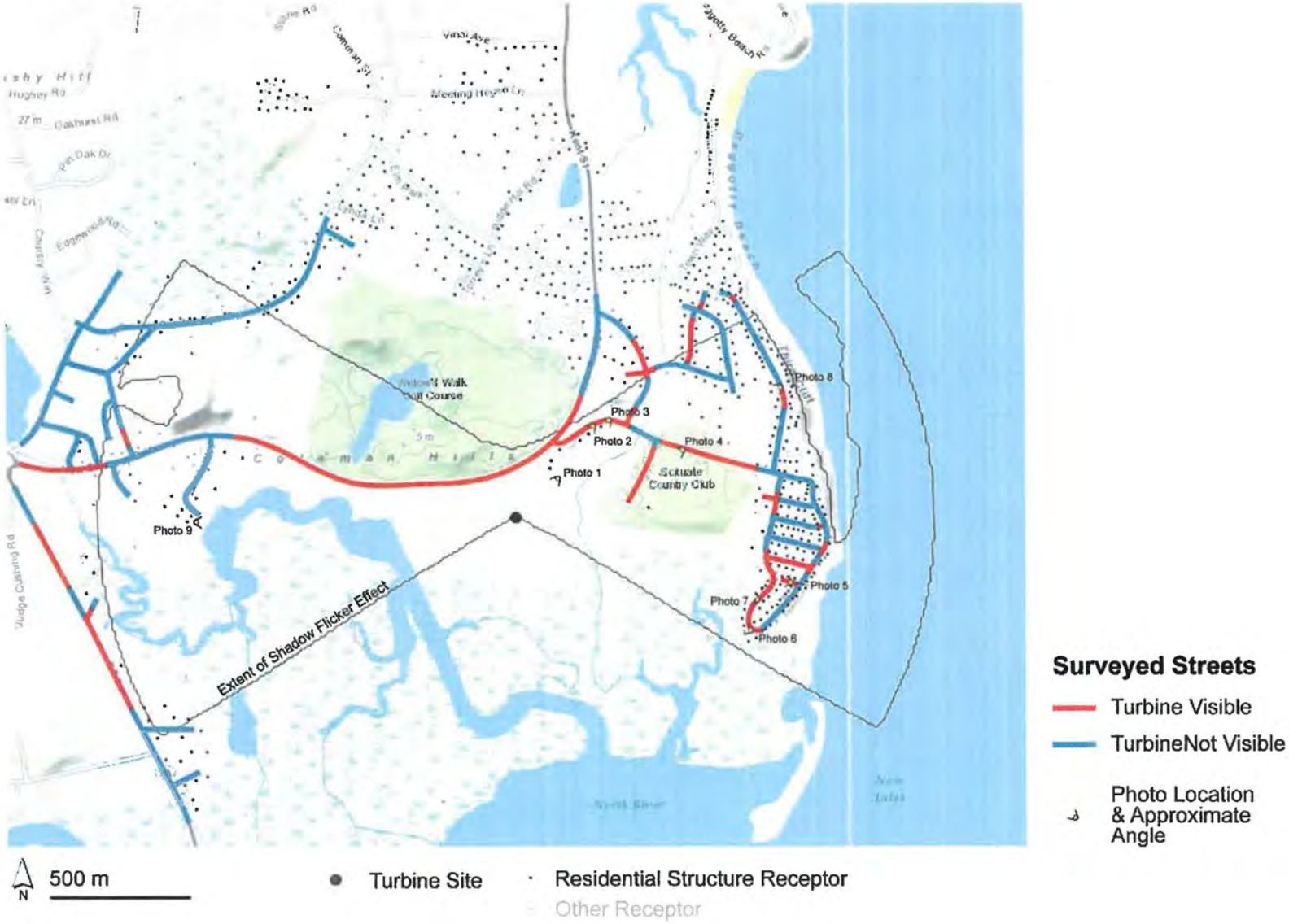


Photo 2

Scituate Shadow Flicker Study - Appendix D

From Driftway looking southeast

Summary

- Identified nearly 700 receptors within 1.5 km (0.9 mi) of Scituate turbine.
- Modeling estimates that 10 of these receptors (8 of them residential) experience more than 10 hours of shadow flicker per year.
- Turbine is visible from the road adjacent to these receptors.

Questions?

How can I find results for my home or property?

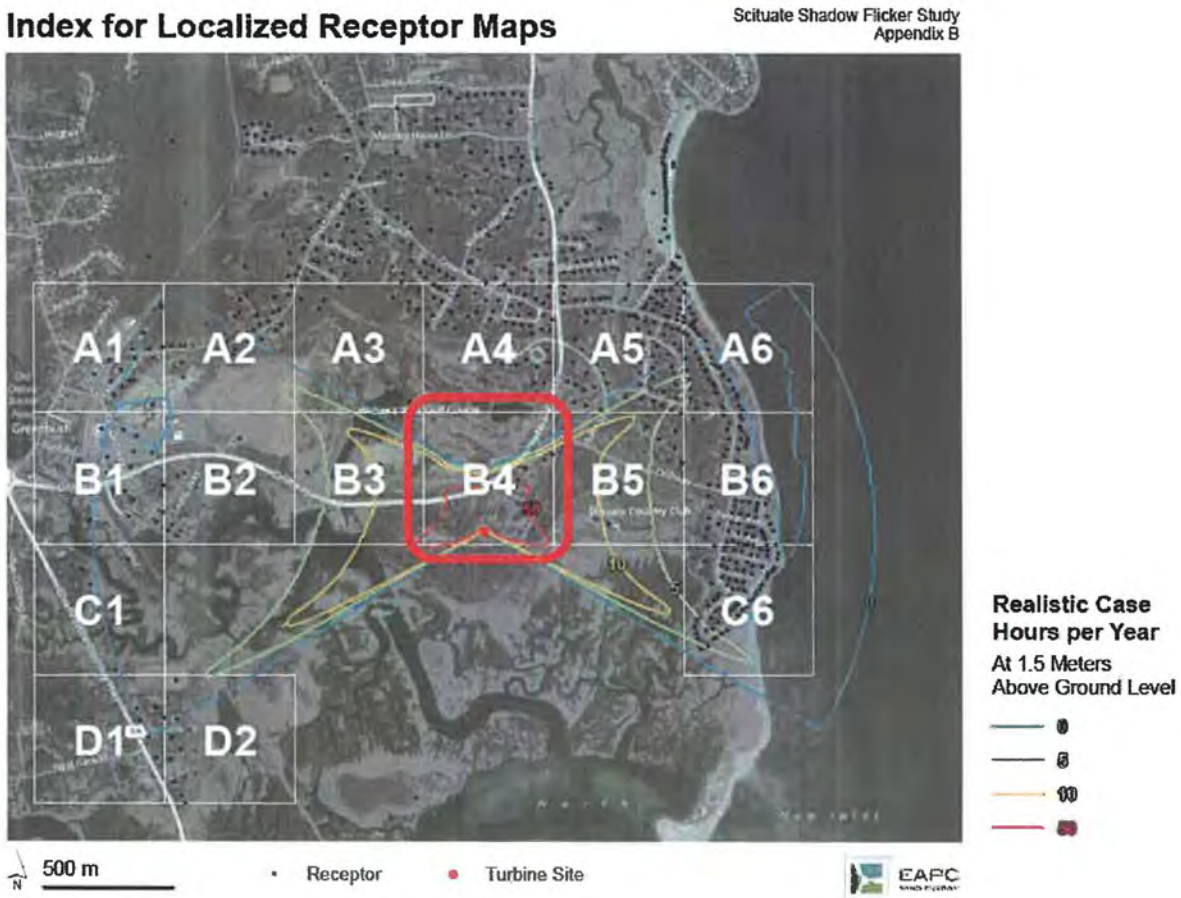
Appendix B – Shadow Flicker Maps

Appendix C – Receptor Data Table

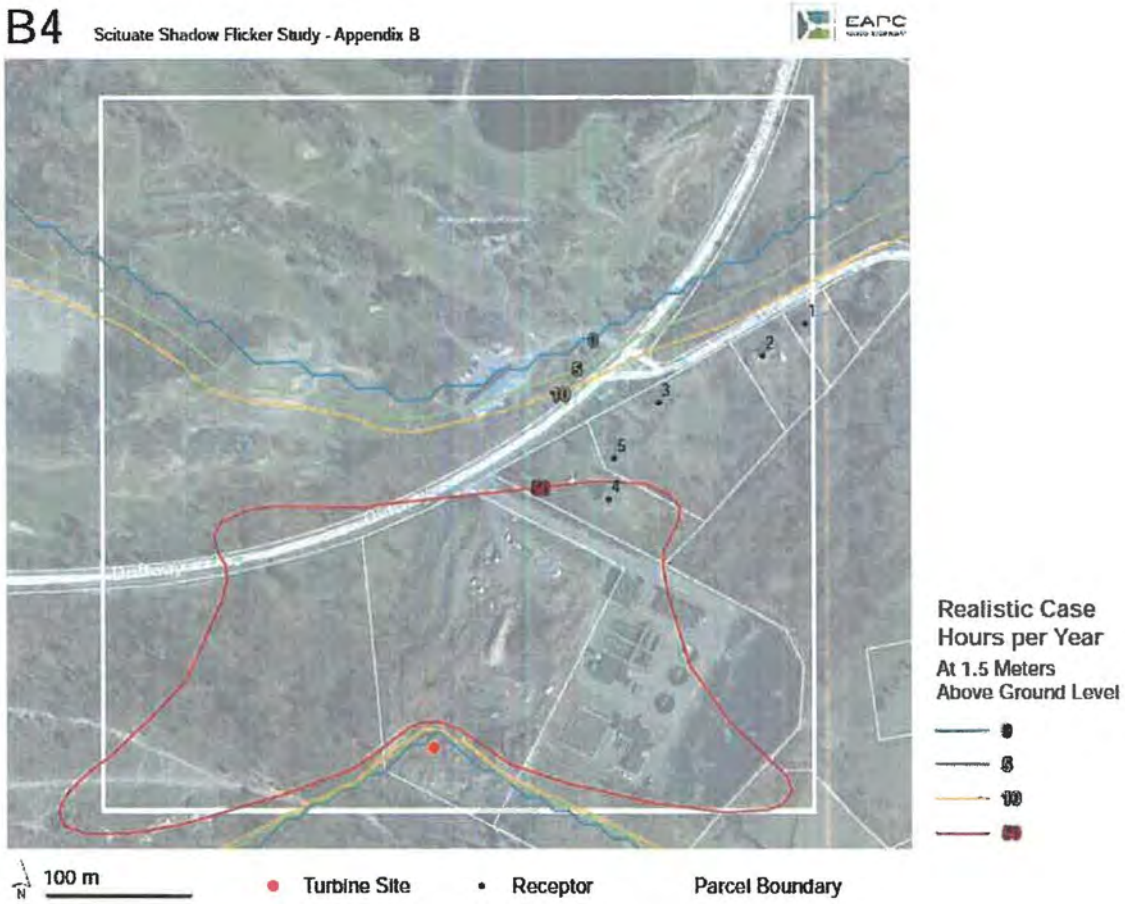
Appendix D – Field Survey

Appendix E – WindPro Report

Appendix B – Shadow Flicker Maps



Appendix B – Shadow Flicker Maps



Appendix C – Receptor Data Table

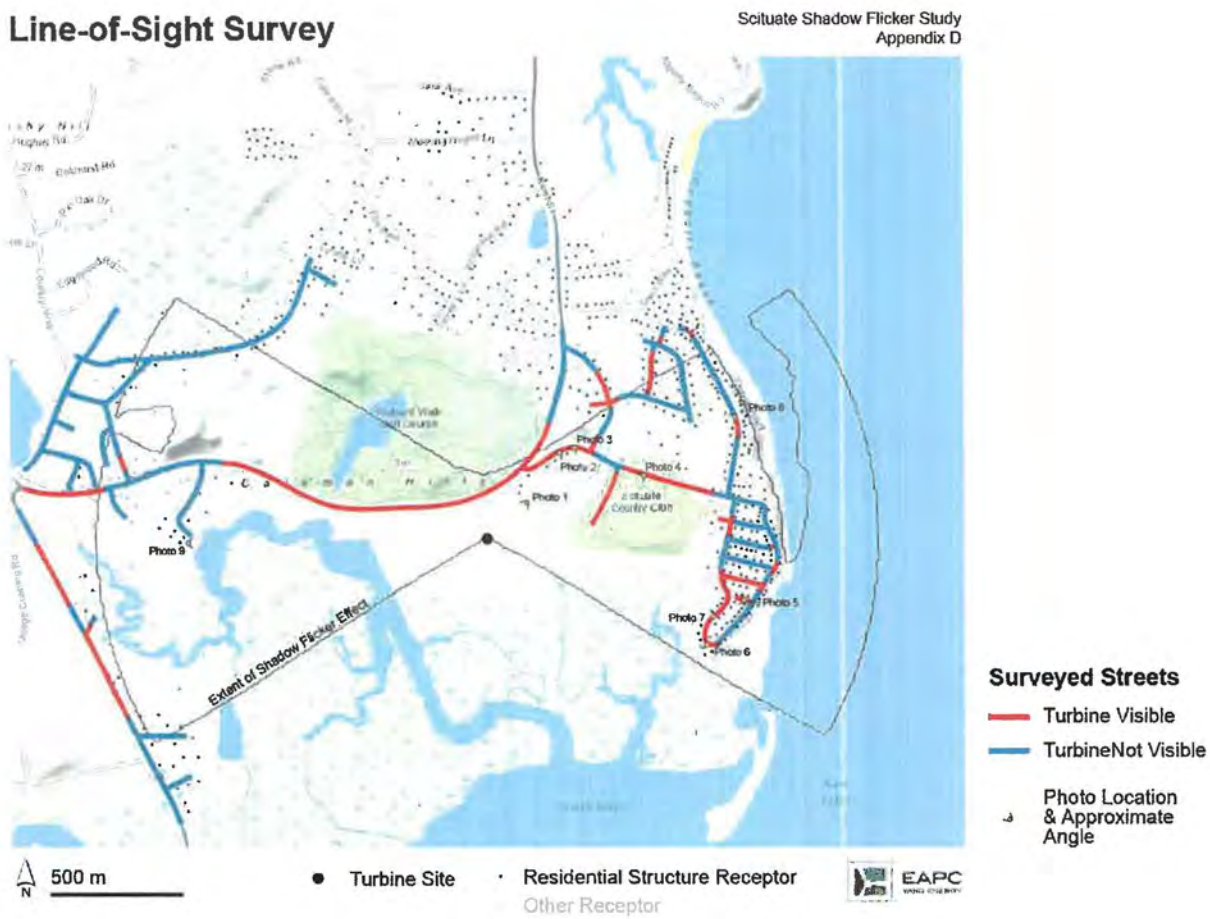
EAPC

Scituate Shadow Flicker Study - Appendix C

page 1 of 12

	Receptor Location				Receptor Information					Modeled Shadow Flicker			
										Theoretical Worst Case			Realistic Case
Parcel Address	Map Index	Receptor Longitude (NAD83)	Receptor Latitude (NAD83)	Receptor Elevation (meters)	Receptor Type	Parcel Use	Units on Parcel	Style of Primary Structure	Stories of Primary Structure	Shadow Flicker Time per Year (hh:mm)	Shadow Flicker Days per Year	Maximum Shadow Time per Day (hh:mm)	Shadow Flicker Time per Year (hh:mm)
1 Bassin Ln	A5 - 35	-70.719322	42.182301	10.9	Structure	Residential	1	Conventional	1.75	0:00	0	0:00	0:00
2 Bassin Ln	A6 - 7	-70.718518	42.182216	15.7	Structure	Residential	1	Conventional	2	0:00	0	0:00	0:00
3 Bassin Ln	A5 - 29	-70.719283	42.182507	10.7	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
4 Bassin Ln	A6 - 6	-70.718470	42.182319	15.2	Structure	Residential	1	Cott/Bungalow	1	0:00	0	0:00	0:00
6 Bassin Ln	A6 - 4	-70.718984	42.182421	13.3	Structure	Residential	1	Conventional	2	0:00	0	0:00	0:00
7 Bassin Ln	A5 - 23	-70.719197	42.182688	10.6	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
8 Bassin Ln	A6 - 3	-70.718536	42.182451	14.3	Structure	Residential	1	Colonial	2.5	0:00	0	0:00	0:00
9 Bassin Ln	A5 - 18	-70.719213	42.182970	9.8	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
14 Bassin Ln	A6 - 2	-70.718734	42.182743	12.2	Structure	Residential	1	Conventional	2	0:00	0	0:00	0:00
15 Bassin Ln	A6 - 1	-70.718972	42.183277	9.1	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
17-19 Bassin Ln		-70.718532	42.183581	6.1	Structure	Residential	1	Conventional	2.5	0:00	0	0:00	0:00
5 Bearce Ln		-70.736036	42.184292	14.4	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
9 Bearce Ln		-70.735427	42.184112	15.0	Structure	Residential	1	Contemporary	1.75	0:00	0	0:00	0:00
12 Bearce Ln		-70.735810	42.183821	13.4	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
15 Bearce Ln		-70.734780	42.183975	15.2	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
18 Bearce Ln	A3 - 1	-70.735067	42.183519	14.2	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
Blanchard Rd		-70.721620	42.184569	3.0	Parcel Centroid	Residential			0	0:00	0	0:00	0:00
8 Blanchard Rd		-70.724104	42.183963	3.0	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
11 Blanchard Rd		-70.723947	42.184323	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
12 Blanchard Rd		-70.723774	42.184007	3.0	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
15 Blanchard Rd		-70.723591	42.184357	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
16 Blanchard Rd		-70.723422	42.184022	3.0	Structure	Residential	1	Cape	1.5	0:00	0	0:00	0:00
19 Blanchard Rd		-70.723269	42.184422	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
20 Blanchard Rd		-70.723025	42.184032	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
23 Blanchard Rd		-70.722768	42.184421	3.0	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
24 Blanchard Rd		-70.722663	42.184085	3.0	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
27 Blanchard Rd		-70.722417	42.184455	3.0	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
28 Blanchard Rd		-70.722331	42.184105	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
31 Blanchard Rd		-70.722172	42.184509	3.0	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
32 Blanchard Rd		-70.722047	42.184065	3.0	Structure	Residential	1	Cape	2	0:00	0	0:00	0:00
6 Brown Av	C6 - 40	-70.716593	42.173005	9.8	Structure	Residential	1	Ranch	1	7:46	35	0:20	2:37
8 Brown Av	C6 - 38	-70.716871	42.173022	9.9	Structure	Residential	1	Conventional	2	8:16	35	0:21	2:47
Buckeye Ln	A1 - 17	-70.743822	42.179498	15.2	Structure	Industrial		Light Manuf.	1	0:00	0	0:00	0:00
10 Bunny Ln		-70.725875	42.184577	3.0	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
11 Bunny Ln		-70.726008	42.183655	7.8	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
15 Bunny Ln		-70.726372	42.184088	5.8	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
66 C J Cushing Way		-70.742498	42.165719	3.0	Structure	Residential	1	Split Level	2	0:00	0	0:00	0:00
76 C J Cushing Way	D2 - 11	-70.742653	42.166021	3.4	Structure	Residential	1	Contemporary	2	0:00	0	0:00	0:00
98 C J Cushing Way	D1 - 6	-70.743621	42.167346	9.1	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
110 C J Cushing Way	D1 - 5	-70.744180	42.168061	9.0	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
126 C J Cushing Way	D1 - 2	-70.744725	42.169052	5.5	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
132 C J Cushing Way	D2 - 1	-70.742894	42.170016	3.0	Parcel Centroid	Residential			0	8:06	49	0:14	3:14
146 C J Cushing Way	C1 - 5	-70.745717	42.170412	3.0	Structure	Residential	1	Conventional	2	0:00	0	0:00	0:00
184 C J Cushing Way	C1 - 3	-70.746849	42.173380	4.8	Structure	Residential	1	Ranch	1	0:00	0	0:00	0:00
192 C J Cushing Way	C1 - 4	-70.747178	42.172703	3.4	Structure	Residential	1	Contemporary	2	0:00	0	0:00	0:00
230 C J Cushing Way Rear	C1 - 2	-70.747175	42.173895	4.8	Structure	Residential	1	Colonial	2	0:00	0	0:00	0:00
21 Cedar Hill Ln	A3 - 3	-70.732574	42.183173	18.7	Structure	Residential	1	Raised Ranch	1	0:00	0	0:00	0:00
23 Cedar Hill Ln		-70.732147	42.183630	18.6	Structure	Residential	1	Cape	1.5	0:00	0	0:00	0:00
27 Cedar Hill Ln		-70.732067	42.184001	17.1	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00
31 Cedar Hill Ln		[illegible]	[illegible]	14.6	Structure	Residential	1	Cape	1.75	0:00	0	0:00	0:00

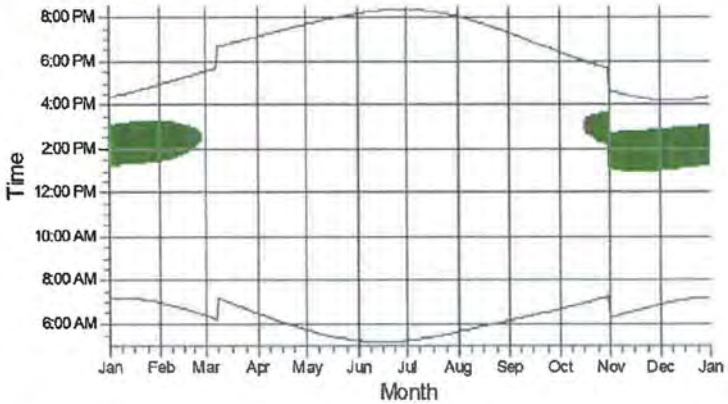
Appendix D – Field Survey



Appendix E – WindPro Report

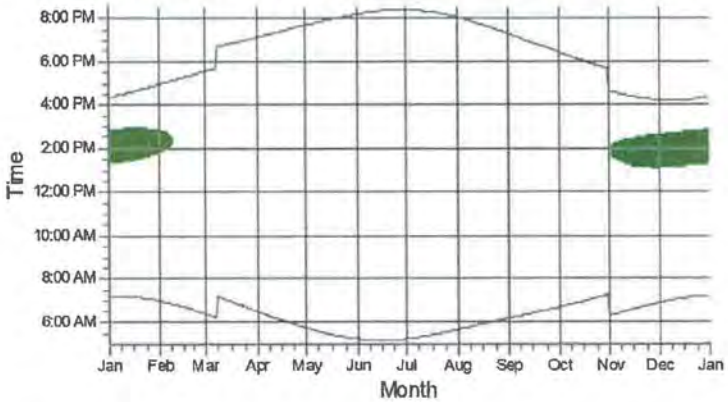
151 Driftway

CY: Shadow Receptor: 13.0 × 6.0 Azimuth: 0.0° Slope: 90.0° (113)



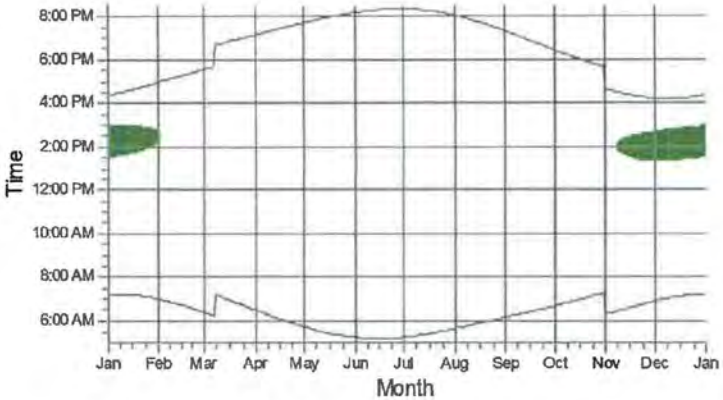
141 Driftway

ZG: Shadow Receptor: 8.0 × 3.0 Azimuth: 0.0° Slope: 90.0° (716)



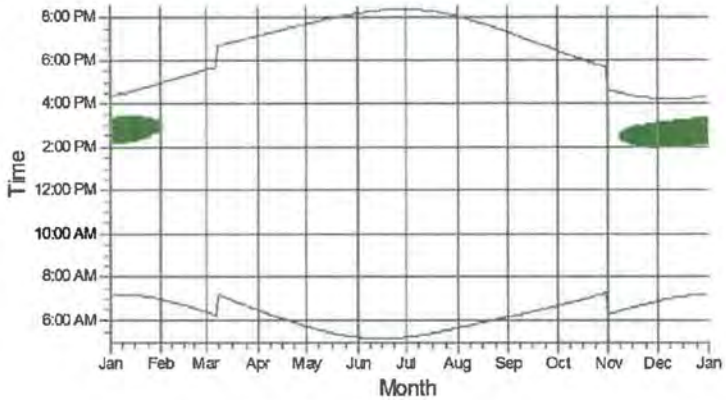
141 Driftway

DF: Shadow Receptor: 11.0 × 10.0 Azimuth: 0.0° Slope: 90.0° (120)

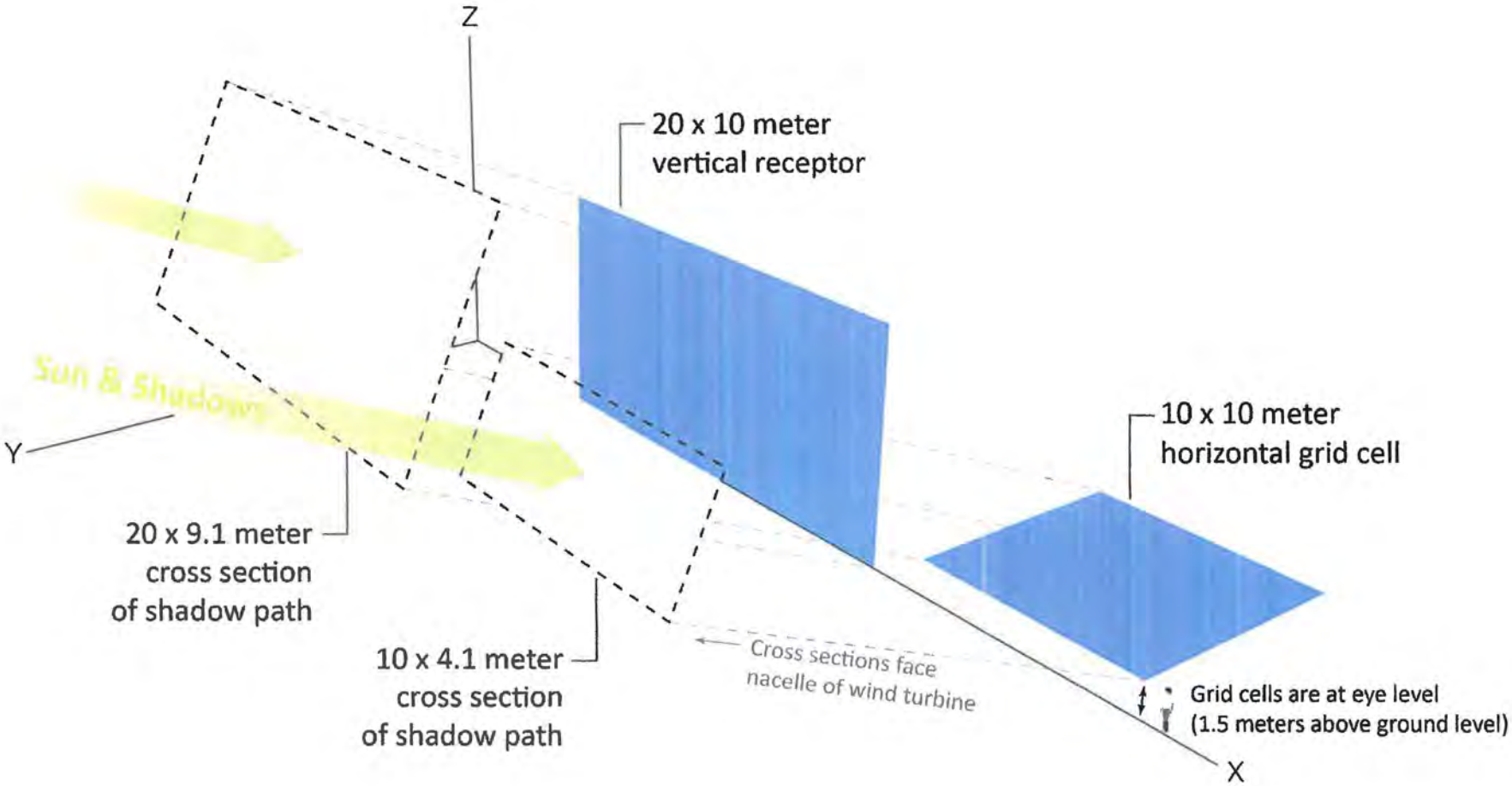


131 Driftway

DJ: Shadow Receptor: 15.0 × 6.0 Azimuth: 0.0° Slope: 90.0° (124)



Why is there discrepancy between the table showing shadow flicker estimates and the map showing shadow flicker estimates?


Z
20 x 10 meter
vertical receptor
Sun & Shadow
Y
10 x 10 meter
horizontal grid cell
20 x 9.1 meter
cross section
of shadow path
10 x 4.1 meter
cross section
of shadow path
Cross sections face
nacelle of wind turbine
Grid cells are at eye level
(1.5 meters above ground level)
X

Orig → Accounting

CONTRACT FOR THE PROCUREMENT
OF
GOODS AND SERVICES

Wind Turbine Acoustical Testing

Epsilon Associates

Contract 18-WT-01

June 2018

Town of Scituate, Massachusetts
600 Chief Justice Cushing Highway
Scituate, MA 02066
www.scituatema.gov

AGREEMENT

The following provisions shall constitute an Agreement between the Town of Scituate, acting by and through its Town Administrator and/or Board of Selectmen, hereinafter referred to as "Town", and Epsilon Associates with an address of 3 Mill & Main Place, Suite 250, Maynard, MA 01754, hereinafter referred to as "Contractor", effective as of the June 1, 2018. In consideration of the mutual covenants contained herein, the parties agree as follows:

ARTICLE 1: SCOPE OF WORK:
The Contractor shall perform all work in accordance with the specifications contained in Attachment A – Epsilon Associates proposal dated April 25, 2018 – "Subject: Wind Turbine Acoustical Study."

ARTICLE 2: TIME OF PERFORMANCE:
The contractor shall complete all work and services required on or before June 30, 2019. If completion is not achieved by said date, the Contractor shall be liable to the Town for liquidated damages in the amount of $0.00 per calendar day.

ARTICLE 3: COMPENSATION:
The Town shall pay the Contractor for the performance of the work outlined in Article 1 above on a Time & Materials basis for a firm-fixed, not-to-exceed cost of $50,000 in accordance with the provisions of the specifications, or as set forth in an attachment hereto in Attachment B – "Volume 2 – Pricing Proposal."

ARTICLE 4; CONTRACT DOCUMENTS:
The following documents form the Contract and all are as fully a part of the Contract as if attached to this Agreement herein:
1. This Agreement.
2. Amendments, or other changes mutually agreed upon between the parties.
3. All attachments to the Agreement.

In the event of conflicting provisions, those provisions most favorable to the Town shall govern.

ARTICLE 5: CONTRACT TERMINATION:
The Town may suspend or terminate this agreement by providing the Contractor with ten (10) days written notice for the reasons outlined as follows:
1. Failure of the Contractor, for any reason, to fulfill in a timely and proper manner its obligations under this Agreement.
2. Violation of any of the provisions of this Agreement by the Contractor.
3. A determination by the Town that the Contractor has engaged in fraud, waste, mismanagement, misuse of funds, or criminal activity with any funds provided by this Agreement.
4. The contract may be terminated for convenience by the Town.

ARTICLE 6: INDEMNIFICATION:
The Contractor shall, to the maximum extent permitted by law, indemnify and save harmless the Town of Scituate, its officers, and employees from and against damages, liabilities, actions, suits, proceedings, claims, demands, losses, costs and expenses (including reasonable attorneys' fees) to the extent that they arise out of the negligent professional services being performed or to be performed by the Contractor, its employees, agents, or subcontractors. The existence of insurance shall in no way limit the scope of this indemnification. The Contractor further agrees

to reimburse the Town of Scituate for damage to its property caused by the contractor, its employees, agents, subcontractors or materials. Contractor shall be solely responsible for all local taxes or contributions imposed or required under the Social Security, Workers' Compensation, and income tax laws. Further, the Contractor shall indemnify and hold harmless the Town with respect to any damages, expenses, or claims arising from or in connection with any of the work performed or to be performed under this Agreement.

ARTICLE 7: AVAILABILITY OF FUNDS:
The compensation provided by this Agreement is subject to the availability and appropriation of funds. The contractor shall be obligated to provide services hereunder, only to the extent that said funds are available.

ARTICLE 8: APPLICABLE LAW:
The Contractor agrees to comply with all applicable local, state and federal laws, regulations and orders relating to the completion of this Agreement. This Agreement shall be governed by and construed in accordance with the law of the Commonwealth of Massachusetts.

ARTICLE 9: ASSIGNMENT:
The Contractor shall not make any assignment of this Agreement without the prior written approval of the Town.

ARTICLE 10: AMENDMENTS:
All amendments or any changes to the provisions specified in this Contract can only occur when mutually agreed upon by the Town and Contractor. Further, such amendments or changes shall be in writing and signed by officials with authority to bind the Town. Additionally, all amendments and changes shall be approved by the Finance Director/Town Accountant prior to execution by the awarding authority. No amendment or change to the contract provisions shall be made until after the written execution of the amendment or change to the Contract by both parties.

ARTICLE 11: INSURANCE:
The Contractor shall be responsible to the Town or any third party for any property damage or bodily injury caused by it, any of its subcontractors, employees or agents in the performance of, or as a result of, the work under this Agreement. The Contractor and any subcontractors used hereby certify that they are insured for workers compensation, property damage, personal and product liability. The Contractor and any subcontractor it uses shall purchase, furnish copies of, and maintain in full force and effect insurance policies in the amounts here indicated.

General Liability

Bodily Injury Liability:	$1,000,000 per occurrence
Property Damage Liability	$1,000,000 per occurrence
(or combined single limit)	$1,000,000 per occurrence

Automobile Liability

Bodily Injury Liability:	$1,000,000 per occurrence
Property Damage Liability	$1,000,000 per occurrence
(or combined single limit)	$1,000,000 per occurrence

Workers' Compensation Insurance (as required by law)
Coverage for all employees in accordance with Massachusetts General Laws Prior to commencement of any work under this Agreement, the Contractor shall provide the Town with Certificates of Insurance which include the Town as an additional named insured (except for Workers' Compensation Insurance and Professional Liability Insurance) and which include a thirty day notice of cancellation to the Town.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed on the day and year first above written.

CONTRACTOR

Robert D. O'Neal
Signature

Robert D. O'Neal, Managing Principal
Printed Name and Title

TOWN of SCITUATE

Board of Selectmen:

Karen Canfield
Karen Canfield

Maura C. Curran
Maura C. Curran

John F. Danehey
John F. Danehey

Shawn Harris
Shawn Harris

Anthony V. Vegnani
Anthony V. Vegnani

Certification of Availability of Funds

Nancy Holt – Finance Director

CERTIFICATION OF NON-COLLUSION

The undersigned certifies under the penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

Kevin O'Neal
(Signature)

Epsilon Associates, Inc.
(Name of Business)

6/4/18
(Date)

****

CERTIFICATION AS TO PAYMENT OF STATE TAXES

Pursuant to M.G.L.v.62C, S49A, I certify under the penalties of perjury that the Contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes.

04-3350756
Social Security Number or
Federal Identification Number

Epsilon Associates
Signature of Individual or
Corporate Name

By: M B Briggs
Corporate Officer
(If applicable)

ACKNOWLEDGMENT OF RECEIPT OF CONFLICT OF INTEREST LAW

Introduction to the Conflict of Interest Law for the Private Sector

The conflict of interest law, G. L. c. 268A , is one of several laws that govern your dealings with public officials and employees. Below are some of the general rules that you must follow. You could face civil and criminal penalties if you take a prohibited action. Many aspects of the law are complicated and there are often exemptions to the general rules. We encourage you to seek legal advice from the Commission regarding how the law would apply to you in a particular situation.

- **Bribery**: You may not offer or give anything to a public official in exchange for that official agreeing to perform or not perform an official act. This prohibition applies to *all* offers and gifts, regardless of their value. You also may not give, offer or promise anything to a public employee (or prospective public employee) with the intent to influence an official act, or to persuade the employee to commit, collude in or allow a fraud. (G. L. c. 268A , § 2)

- **Registered Executive and Legislative Agents**: If your job involves interaction with the state Legislature, the Executive Branch, or independent authorities, you should contact the Secretary of State's Office regarding whether you are required to register as an Executive or Legislative Agent. Registered Agents may not give *anything* to a public official or policy-making public employee, or to an immediate family member of a public official or policy-making public employee. This prohibition applies to meals, drinks, entertainment, and all other types of offers or gifts, regardless of their value. (G.L. c. 3, § 43)

- **Gifts and Gratuities**: Even if you are *not* a Registered Agent, you may not give a public official or *any* public employee anything "of substantial value" for or because of the official's duties. (G. L. c. 268A , § 3(a).)

    - Gifts that are worth $50 or more are considered to be of "substantial value" and are therefore prohibited.

    - This restriction applies to meals, drinks, entertainment, discounts, free educational conferences, waived event admission costs, travel reimbursements, gifts of appreciation, retirement presents, and all other forms of gratuities that are given to public officials. Honoraria for speeches may be given to state legislators, but *not* to appointed officials or employees.

    - If more than one gift is given to a public employee, the value of all gratuities may be aggregated to reach the "substantial value" threshold. The value of gifts given to immediate family members of a public employee may, in certain circumstances, be attributed to the public employee.

    - "Standing offers" (*e.g.*, "call me anytime you want to go to a game") are almost always considered to be of "substantial value", even if the cost of a single event is less than $50, because the public employee could accept the offer more than once.

    - You *may* generally pay for travel and limited other expenses incurred by a public employee in connection with a "legitimate speaking engagement". Contact the Commission for more information about this exemption.

- You *may* pay for travel, meals and other costs for state Executive Branch employees who utilize the "Travel and Participation in Training Sessions Where Private Entities Provide Financing" process described in 801 CMR 7.00. Note that this process requires advance approval by the state employee's Agency Head and Cabinet Secretary.

- **Hiring Public Employees**: Except in rare instances, you may *not* pay or otherwise compensate a public employee in connection with any matter that is "of direct and substantial interest" to their public employer. (G. L. c. 268A , §§ 4(b), 11(b) and 17(b).)

  Types of matters that are considered "of direct and substantial interest" to the Commonwealth (or, in the case of a county or municipal employee, the relevant public employer) include: any matter pending before, under the official jurisdiction of, or involving action by an agency, board, commission or department of the public employer; any effort to change regulations, policies or procedures; and any contract, court case, or other legal matter to which the public employer is a party.

  - You *may* pay "special" state, county and municipal employees in connection with matters of interest to their public employers, if they have not personally participated in the matters, the matters are not under their official jurisdiction and not pending in their agency if they serve on more than 60 days a year. Also, special exemptions apply to state legislators; contact the Commission for more information.

Hiring Former Public Employees: Former public employees and their business partners may*never* accept money or other forms of compensation in connection with matters in which they participated as public employees. Also, even if they did not personally participate in the matters, there is a one year "cooling-off" period before former public officials may personally appear before government agencies in connection with matters that had been under their official responsibility. (G. L. c. 268A, §§ 5, 12 and 18.)

- Special prohibitions apply to former state employees who worked on privatization contracts; contact the Commission for more information.

ACKNOWLEDGMENT OF RECEIPT

I, Tom O'Neil **, a vendor for Town of Scituate, hereby acknowledge that I received a copy of the summary of the conflict of interest law on** 6/4/18 **.**

(date)

Epsilon ASSOCIATES INC.

Attachment A

Epsilon Scituate Wind_Post-Compliance Noise–Vol. 1 Qualifications.docx

April 25, 2018

3 Mill & Main Place, Suite 250
Maynard, MA 01754
www.epsilonassociates.com

Mr. Albert Bangert
Special Projects Director
Town of Scituate
Scituate, MA 02066
Via email: abangert@scituatema.gov

Subject: Wind Turbine Acoustical Study – Scituate Wind, MA

Dear Mr. Bangert:

Epsilon Associates, Inc. (Epsilon) is pleased to respond to the Town of Scituate March 2018 Request for Proposal (RFP) for consulting services for a Wind Turbine Acoustical Study ("study"). Scituate Wind is a single wind turbine located at 161 Driftway on property owned by the Town of Scituate. The wind turbine became commercially operational in March 2012. The purpose of the study is to determine compliance with the MA DEP Noise Policy.

Scope of Services

Task 1 – Protocol & Site Visit

Prior to the start of testing, Epsilon will provide to the Town's project manager a detailed sampling protocol that defines and expands upon the sites to be evaluated, procedure to be used, the data to be collected, the statistical measures to be reported and the measurement averaging periods as well as how the data will be used to determine the sound impact (increase in sound over background) during each of the sampling events. The protocol will draw from the requirements spelled out in the RFP, the generic MA DEP Wind Turbine Noise Study Protocol (attached to this proposal), and Epsilon's experience in conducting this type of testing. The protocol will also include the procedure for identifying potential testing periods based on weather conditions, and how a "go/no-go" decision will be reached. This scope and budget includes time for regularly tracking meteorological conditions and communicating those possible periods to the team.

This scope of work and budget assumes four (4) locations will be tested as per the RFP. It is strongly recommended that a site visit be conducted to agree on the exact locations for the four monitors in advance of the actual equipment deployment.

Actual locations will be selected with the advice of the Town's project manager. Epsilon assumes this will happen, and a one day trip to the Project area is included in this budget. The protocol will include a map showing the selected monitoring locations. The protocol will be reviewed by the Town and MassDEP and adjusted to reflect comments as needed before testing commences.

Agreeing on testing locations in the protocol has the important benefit of giving someone time to secure permission from the landowners to set up testing equipment on their property. The Town of Scituate will be responsible for obtaining any necessary permission from the landowners and/or homeowners. Epsilon will provide our contact information, and photos of sample equipment setups to aid in the permission process.

Task 2 – Sound Level Measurement Programs

Once the protocol is approved, the sound level testing will be scheduled. The monitoring will be done in accordance with the program agreed upon in Task 1 "Protocol." Generally, broadband A-weighted (dBA) and un-weighted octave band sound levels will be measured for 10 minutes with the wind turbine operating. The wind turbine will then be turned off and a background measurement will be made for 10 minutes. This procedure will be repeated at each location three times (total of four ON/OFF measurements at each location). This process will be repeated on three additional nights (total of four nights). Testing will generally be conducted during the hours of 1 to 4 AM (+/- 2 hours) to coincide with the quietest background levels.

During measurement periods, each location will be attended by an Epsilon field technician to identify all audible noise sources (local traffic, resident generated sounds, etc.) with and without the wind turbine operating as well as instances when the sound of the wind exceeds the sound of the wind turbine. Other required comments are: date & time, weather conditions, ground level wind speed & direction. Epsilon proposes a team of four field personnel in order to collect contemporaneous data at all four locations, and to minimize the amount of ON/OFF conditions for Scituate Wind.

The following metrics will be measured at a minimum: Lmax, Leq, and L90. Logging will be done at 1-second intervals using fast time averaging.

The ground level wind speed and wind direction will be continuously measured and logged at one of the test locations. Handheld wind speed measurements will be made at the other three locations. Testing will aim to be done under hub height wind speeds of 9-12 m/s, and calm to light ground-level winds with no precipitation. Epsilon will monitor the weather forecasts on a weekly basis, and will

coordinate with the Town and wind turbine operator when favorable conditions appear imminent.

Equipment which will be used for this task includes:

- Larson Davis model 831 ANSI S1.4-1983 Type 1 Sound Level Meter (or equivalent). This instrument can measure A-weighted, unweighted octave band, and unweighted one-third octave band levels simultaneously. Audio recordings will also be collected at each location.
- Larson Davis model CAL200 ANSI S1.40-1984 acoustic calibrator
- HOBO H21-002 micro-weather station with 2-meter tripod and data logger.

Acoustic instruments used for measurements shall have current calibration certificates from an independent laboratory, which are traceable to a measurement standard established by the National Institute of Standards and Technology (NIST). The sound level meter's measurement accuracy shall be confirmed with an acoustic calibrator mounted over the microphone prior to commencement of the acoustical test.

The wind turbine operator, Scituate Wind LLC, shall provide information about wind turbine operation as requested by Epsilon, including wind speed & direction at hub height, blade pitch setting, and generator output or load.

Task 3 – Process and Analyze Data

Data collected in Task 2 will be analyzed and processed as outlined in the Protocol. This will involve QA/QC on all data, removing data which do not meet the criteria in the Protocol, establishing background, and calculating "Turbine-only" sound levels. The raw, cleaned (i.e. clearly presented), or consolidated acoustic, wind, and turbine operational data will be provided.

Task 4 – Report

A technical report will be prepared discussing the results of the measurement programs. The report will contain the information as required in the Protocol. This report will, at a minimum, summarize:

- The methodology for monitoring
- The methodology for analyzing data
- The results and conclusions of the analysis

The report will detail the methodology laid out in this scope and draw relevant conclusions with respect to whether the wind turbine is operating in compliance from the analysis.

A draft and then final report will be prepared for the Town. All review submittals will be sent electronically in both MSWord and PDF format. One round of comments is assumed. Epsilon will participate in one team conference call to discuss the report.

QUALIFICATIONS

Epsilon Associates, Inc. is a well-established, privately held environmental engineering and consulting firm located in Maynard, Massachusetts. Founded in 1997, we specialize in securing environmental approvals for energy, infrastructure, and real estate projects for public and private sector clients. Epsilon's planning, environmental and historic experts provide the expertise and clarity to successfully guide development projects through regulatory processes.

Epsilon staff has extensive experience in the wind energy industry having provided sound level studies for over 125 wind energy facilities across the United States. More than 15 of these projects were in Massachusetts. In addition to working for wind energy developers, we have also served as technical consultants to the State of New Hampshire Site Evaluation Committee, Connecticut Siting Council on their review of wind energy facilities, and for the Massachusetts Clean Energy Center (MassCEC) on the Research Study on Wind Turbine Acoustics (RSOWTA).

Epsilon has extensive experience with both short-term attended and long-term unattended sound compliance monitoring at wind energy projects. Epsilon has performed compliance monitoring for these projects (partial listing):

1. Avangrid, Groton Wind, NH
2. NOTUS Clean Energy, Falmouth, MA
3. Acciona Energy, Pioneer Grove Wind, IA
4. Babcock & Brown, Allegheny Ridge Wind, PA
5. Heritage Sustainable Energy, Big Turtle Wind II, MI
6. John Deere Wind Energy, Michigan Wind I, MI
7. MidAmerican Energy, Adams County Wind, IA
8. NextEra Energy Resources, Ghost Pine Wind, Alberta, Canada
9. NextEra Energy Resources, Golden West Wind, CO
10. NextEra Energy Resources, Lee-DeKalb Wind, IL
11. NextEra Energy Resources, Pheasant Run Wind, MI
12. NextEra Energy Resources, Tuscola Bay Wind, MI

13. NextEra Energy Resources, Waymart Wind, PA
14. NextEra Energy Resources, Ashtabula Wind, ND

Robert O'Neal will be the Principal-in-Charge for this testing program. Rob is a Managing Principal at Epsilon and is Board Certified through the Institute of Noise Control Engineering (INCE). He will be supported by members of Epsilon's Acoustics Group and Epsilon's GIS services. Members of the Acoustics Group who may perform these services are all qualified and are listed below. Professional resumes of each person are included with this proposal. No subcontractors will be used by Epsilon. Depending on the timing of the programs, and staff availability, other experienced Epsilon field technicians may participate.

- Robert O'Neal
- Richard Lampeter
- Ryan Callahan
- Clint Cyr
- Christopher Hoyt
- Alyssa Mathews

References for three people familiar with our wind energy sound level work are listed below.

Mr. Dan Webb, NOTUS Clean Energy, Falmouth, MA
danwebb@notuscleanenergy.com; 508-566-1882

Mr. Peter McPhee, Massachusetts Clean Energy Center, Boston, MA (RSOWTA)
pmcphee@masscec.com; 617-315-9343

Mr. Jack Kenworthy, Walden Green Energy, Portsmouth, NH (Antrim Wind)
jack.kenworthy@waldengreenenergy.com; 603-570-4842

Schedule

A schedule following authorization to proceed is outlined below. Given the very specific meteorological conditions required for the testing, there may be long gaps between approval and completion of the fourth night of testing. The table below summarizes the expected schedule.

Task	Schedule
Prepare draft protocol	2 weeks after notice to proceed (NTP)
Site visit to ID testing locations	2 weeks after NTP
Schedule Night #1 for Testing	2 weeks after approval of protocol
Schedule Nights #2-#4 for Testing	Within 2 nights of completion of previous Night
Process/Analyze Data	Within 2 weeks after each Night
Draft report	Within 3 weeks of Night #4 completion
Final report	Within 1 week of team comments

Budget

The pricing proposal is found in a separate submittal as per the RFP.

If you have any questions on this proposal, please feel free to call me at (978) 461-6236, or e-mail me at roneal@epsilonassociates.com.

Sincerely,

EPSILON ASSOCIATES, Inc.

Robert D. O'Neal, CCM, INCE Board Certified
Managing Principal

Attachment: MA DEP generic wind turbine noise study protocol
Epsilon staff CVs

Current Wind Turbine Noise Study Protocol (generic)

Equipment:

- Sampling will be performed with a Type I digital Meter with accuracy to +/- 1 dB. The sampler will be set to collect data on the "A" weighted scale in "slow" response mode with a one second recording interval (log period). The sampler will have received a factory calibration certificate within 12 months of the date of the study and will be field calibrated before and after each sampling event.
- The Wind Turbine Operator shall provide hub-height wind speeds (10 minute averages) obtained from equipment on either the north or south turbine.

Sampling Sites and Operating Conditions:

- Three to five sites will be sampled at the point of perceived maximum impact from the wind turbines. At minimum, the sites to be sampled including the home closest to the wind turbine from each affected neighborhood. Additional sites may be added as conditions during sampling warrant and at the discretion of MassDEP.
- MassDEP will coordinate with the residents at the selected site to determine the point of greatest sound impact and will conduct the sampling at or near that location or at the property line, whichever is practicable. Sampling will not be conducted indoors.
- The sampler will be mounted at a height of approximately 1.3 meters and shall be located so as to comply with offsets from vertical reflecting surfaces as specified in ANSI 12.9, Part 3.
- Multiple operating conditions (wind speeds/ wind direction) will be evaluated including the following:
    1. At or near the cut-in wind speed where background sound will be the lowest (4-5 m/s wind speed at hub height) and the affected residences will be downwind or perpendicular and to the right of the turbine (to the right when facing the turbine)
    2. At the wind speed where manufacturer data indicates there will be the greatest sound power level from the turbine (9-11 m/s) and the affected residences will be downwind or perpendicular and to the right of the turbine (to the right when facing the turbine)
    3. Sampling of multiple wind directions may be required to capture these conditions at the selected sampling sites.

Procedure:

- Sampling will start with data collection during the quietest overnight hours to be determined on a site specific basis (generally 1am-4am). Should sampling during that time period reveal no exceedence of MassDEP's noise policy at one or more locations for the given wind conditions sampled, additional daytime and evening sampling will not be conducted for those locations.
- Sampling days will be selected based on predicted wind conditions. MassDEP will make every effort to notify The Town, the turbine owner/operator and residents at whose properties sampling will be conducted at least 24 hours in advance of a sampling event.
- To evaluate the effect of wind speed on turbine sound emission levels (impact sound), three sampling runs will be conducted at each site under each operating condition to establish an L_{max}

for each respective operating condition. L_{max} is the highest sampled sound level attributed to the sound source (wind turbines) during the sampling run on a one second average. The L_{max} from each of three runs at a single site and operating condition will be averaged to create a single L_{max} for that sampling site under the select wind conditions.

- Each sampling run will be 5 minutes in duration. Samples will be collected manually every 5 seconds (60 sound measurements). Consistent with current MassDEP guidance, any peak sound levels that can be attributed to another sound source (e.g. local traffic, resident generated sounds, etc.) will be identified by the study attendant and discarded from the data set before determining L_{max}.
- At each site, background sampling shall be performed to determine the L_{90} background against which the L_{max} will be compared. The study attendant shall coordinate with the wind turbine owner/ operator to shut down the wind turbine for the purpose of sampling background. If MassDEP is unable to collect background samples at each site or if the wind turbine cannot be shut down, MassDEP reserves the right to define the background sound levels by sampling at a surrogate site of similar land use and proximity to other local sound sources (but not impacted by the wind turbine)
- As the sampling will be done under conditions where the wind might significantly contribute to total sound recorded, MassDEP will make an effort to exclude data from analysis where the sound of the wind is dominant over the sound of the wind turbines.
- At selected sites, a pure tone analysis will be conducted. For pure tone analysis, the meter will be set to collect linear sound on a "slow" response and an octave band filter will be employed to speciate sound pressure levels for 10 octave bands. Pure tone analysis will include collection of one minute L_{eq} sound pressure levels with the wind turbines operating and without the wind turbines operating to evaluate the impact of the wind turbines to pure tone.

Assessment of Results

Once the data is collected and quality control review is complete, MassDEP will analyze all of the data to determine if the sound levels from the wind turbines comply with MassDEP's Noise Policy Threshold for impact sound of 10 dB(A) at each of the sampling sites and under each of the defined operating scenarios. The pure tone data will be analyzed to determine if any octave band center frequency sound pressure level attributable to the wind turbines exceeds the two adjacent center frequency sound pressure level by three decibels or more. The results will be compiled into a single report to be provided to the Town once the sampling and data quality review is complete.

Epsilon ASSOCIATES INC.

Attachment B

Epsilon Scituate Wind_Post-Compliance Noise–Vol. 2 Pricing.docx

April 25, 2018

Mill & Main Place, Suite 250
Maynard, MA 01754
www.epsilonassociates.com

Mr. Albert Bangert
Special Projects Director
Town of Scituate
Scituate, MA 02066
Via email: abangert@scituatema.gov

Subject: Wind Turbine Acoustical Study – Scituate Wind, MA

Dear Mr. Bangert:

Epsilon Associates, Inc. (Epsilon) is pleased to respond to the Town of Scituate March 2018 Request for Proposal (RFP) for consulting services for a Wind Turbine Acoustical Study ("study"). Scituate Wind is a single wind turbine located at 161 Driftway on property owned by the Town of Scituate. The wind turbine became commercially operational in March 2012. The purpose of the study is to determine compliance with the MA DEP Noise Policy.

This letter contains "Volume 2 – Pricing Proposal" to accompany "Volume 1 – Qualifications" from Epsilon Associates, Inc. dated April 25, 2018.

Pricing Proposal

Billings for professional services as outlined in the Epsilon Associates, Inc. Scope of Work dated April 25, 2018 will be performed on a Time & Materials basis for a firm-fixed, not-to-exceed cost of $50,000. The approximate cost for each task is shown below for informational purposes.

Task 1	Protocol & Site Visit	$3,500
Task 2	Sound Level Measurement Programs (4 nights)	$30,400
Task 3	Process/Analyze Data (all 4 nights)	$8,400
Task 4	Reports (draft/final)/provide data	$7,700

The cost estimate is based on our current understanding as to the level of effort as outlined in the Scope of Work, and is valid through the end of 2018. Billings for professional services will be based on actual accrued time and expenses using the rates shown in Tables 1 and 2 attached. The cost estimate includes labor, materials,

travel expenses, and equipment rental fees. This estimate also assumes that once a site visit is under way, that it is not canceled or postponed for any reasons out of the control of Epsilon. Travel to the Scituate Wind site will be billed using the current IRS mileage rate.

Items Not Covered in Scope/Price

The following items are not included in the budget for this work. If these items, or other items not included in the Scope, are requested by the Town, they can be performed on a Time & Materials basis at our rates shown in this pricing proposal.

- More than four nights of measurements
- Meetings or hearings to present the results or answer questions

If you have any questions on this proposal, please feel free to call me at (978) 461-6236, or e-mail me at roneal@epsilonassociates.com.

Sincerely,

EPSILON ASSOCIATES, Inc.

Robert D. O'Neal

Robert D. O'Neal, CCM, INCE Board Certified
Managing Principal

Table 1 **Staff Assignments**

Staff	Title	Hourly Rate
Robert O'Neal	Managing Principal	$245
Richard Lampeter	Associate	$198
Ryan Callahan	Senior Engineer	$180
Clint Cyr	Project Engineer II	$145
Christopher Hoyt	Project Scientist III	$130
Andrew Thompson	GIS	$130
Alyssa Mathews	Staff Scientist II	$110

Table 2 **Other Costs**

Equipment	Cost
Type 1 sound meter	$350/night
Audio recorder	$25/night
Meteorological tower	$50/night

SOUND LEVEL COMPLIANCE EVALUATION REPORT

Scituate Wind
Town of Scituate, Massachusetts

Prepared for:

Town of Scituate
600 Chief Justice Cushing Highway
Scituate, MA 02066

Prepared by:

Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

March 6, 2020

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1.0 EXECUTIVE SUMMARY

Scituate Wind is a 1.5-megawatt (MW) wind power generation facility composed of a single Sinovel wind turbine located on land located next to the Wastewater Treatment Plant in the Town of Scituate, Massachusetts. Epsilon Associates, Inc. (Epsilon) has been retained by the Town of Scituate (the Town) to conduct a post-construction sound level compliance assessment for the wind turbine.

A post-construction compliance study was performed by Tech Environmental in 2013 through 2015 following the commissioning of the wind turbine.[1] That study sampled noise during four nights at five locations and found the wind turbine in compliance with the Massachusetts Department of Environmental Protection (MassDEP) Noise Policy at all locations for all four nights.

As a result of noise complaints from residents in the Town of Scituate, the Town requested another compliance study be performed. The sound level measurement locations were selected by the Town of Scituate's Special Projects Director based on the noise complaints received regarding the wind turbine. Two of the four locations were the same as in the TechEnvironmental study.

The results of the current program show that sound pressure levels due to the wind turbine, under wind conditions identified as conditions resulting in maximum sound power levels[2] and wind conditions identified by residents filing noise complaints, meet the requirements set forth in the MassDEP Noise Policy at each of the monitoring locations with the exception of one (1) location. Following measurement methodologies agreed upon by the MassDEP, Scituate Wind was determined to be in non-compliance at the nearest residence to the wind turbine during one of the four nights of measurements. The residence (151 Driftway) is 650 feet to the northeast of the wind turbine and it is Epsilon's understanding that the owners of the residence were recipients of mitigation funds by Scituate Wind, LLC.

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1 TechEnvironmental. (2015). Scituate Wind Compliance Sound Monitoring Study Scituate, Massachusetts. Waltham, MA.

2 As defined by the MassDEP Wind Turbine Noise Study Protocol

2.0 INTRODUCTION

Scituate Wind is a wind energy facility, owned by Scituate Wind, LLC, that is comprised of a single wind turbine situated on a parcel leased from the Town of Scituate at the Town's Wastewater Treatment Plant (WWTP) located at 161 Driftway in Scituate, MA. The wind turbine is a Sinovel SL1500 1.5MW unit with a hub height (HH) of 80 meters. The wind turbine became commercially operational in March 2012.

A post-construction compliance study was performed by Tech Environmental in 2013 through 2015 following the commissioning of the wind turbine. That study sampled noise during four nights at five locations and found the wind turbine in compliance with the MassDEP Noise Policy at all locations on all nights.

As a result of noise complaints from residents in the Town of Scituate, the Town requested another compliance study be performed.

In order to determine compliance with the MassDEP Noise Policy, this post-construction sound level measurement program was conducted by Epsilon in 2019. The details and findings of this measurement program are presented within this report.

3.0 SOUND TERMINOLOGY

There are several ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following information defines the sound level measurement terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (to 53 dB), not a doubling to 100 dB. Thus, every three-dB change in sound levels represents a doubling or halving of sound energy. Related to this is the fact that a change in sound levels of less than three dB is imperceptible to the human ear.

Another property of decibels is that if one source of noise is 10 dB (or more) louder than another source, then the total sound level is approximately the sound level of the louder source. For example, a source of sound at 60 dB plus another source of sound at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument.[3] It contains "weighting networks" (e.g., A-, C-, Z-weightings) to adjust the frequency response of the instrument. Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds, often addressed in musical terms as "pitch" or "tone". The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies. The A-weighting network is the accepted scale used for community sound level measurements; therefore, sounds are frequently reported as detected with a sound level meter using this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. These sound levels are reported in decibels designated as "dBA". Z-weighted sound levels are measured sound levels without any weighting curve and are otherwise referred to as "unweighted". Sound pressure levels for some common indoor and outdoor environments are shown in Figure 3-1.

Because the sounds in our environment vary with time they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are exceedance levels and the equivalent level, both of which are derived from some quantity of moment-to-moment sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value between 0 and 100 in terms of percentage. Several sound level metrics that are commonly reported in community noise monitoring are described below.

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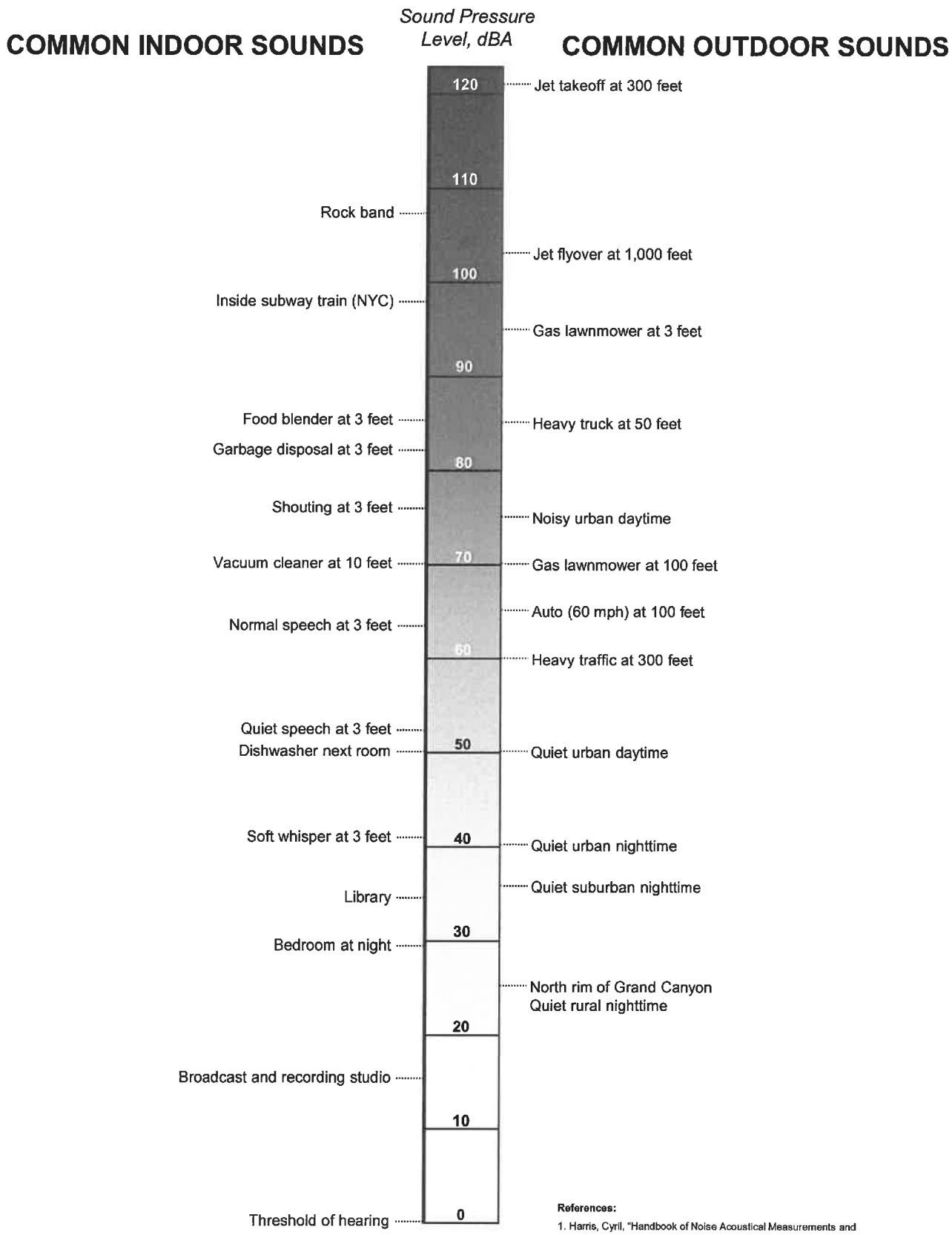
[3] *American National Standard Electroacoustics - Sound Level Meters*, ANSI S1.4-2014 (R2019), published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources. The L_{90} is used to describe background sound levels in accordance with the MassDEP Noise Policy.

- L_{eq}, the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by loud noises if there are fluctuating sound levels.

- L_{max} is the maximum sound level over a given time period. The L_{max} is typically due to discrete, identifiable events such as an airplane overflight, car or truck passby, or a dog bark for example. An alternate meaning and definition of 'L_{max}' is used in this assessment as described in later sections.



References:

1. Harris, Cyril, "Handbook of Noise Acoustical Measurements and Noise Control", p 1-10., 1998
2. "Controlling Noise", USAF, AFMC, AFDTC, Elgin AFB, Fact Sheet, August 1996
3. California Dept. of Trans., "Technical Noise Supplement", Oct, 1998

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Figure 3-1

Common Indoor and Outdoor Sound Levels

4.0 NOISE REGULATIONS

4.1 Federal Regulations

There are no federal community noise regulations applicable to this Project.

4.2 State of Massachusetts Regulations

The Massachusetts Department of Environmental Protection (MassDEP) has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth's air pollution control regulations. Under the MassDEP regulations, noise is considered to be an air contaminant and, thus, 310 CMR 7.10 prohibits "unnecessary emissions" of noise.

MassDEP administers this regulation through Noise Policy DAQC 90-001 dated February 1, 1990 which limits a source to a 10-dBA increase in the ambient sound level measured at the project property line and at the nearest residences. The ambient level is defined as the background A-weighted sound level that is exceeded 90% of the time (L_{90}) measured during operational hours. For a source which will or could operate 24-hours per day, the lowest ambient level typically occurs during the quietest nighttime period (12 AM to 4 AM).

The MassDEP policy further prohibits "pure tone" conditions where the sound pressure level in any octave band is at least 3 dB greater than the sound levels in each of the two adjacent octave bands. An example of a potential "pure tone" is a fan with a bad bearing that produces an objectionable squealing sound.

4.3 Town of Scituate Bylaws

The Section 740.6 of the Town of Scituate Massachusetts Zoning Bylaws contains the following language pertaining to sound from a Wind Energy Conversion System (WECS) for the purpose of obtaining a Special Permit:

> *The wind facility and associated equipment shall conform to the provisions of the Department of Environmental Protection Division of Air Quality Noise Regulations (310 CMR 7.10). An analysis prepared by the registered qualified engineer will be required to demonstrate compliance with the above standards.*

Pre-permitting modeling was performed by Atlantic Design Engineers[4] and followed the then generally acknowledged interpretation of the MassDEP's Noise Policy. The MassDEP has since changed its interpretation of how sound data are collected and analyzed as it relates to wind energy. This methodology was formalized in the "Current Wind Turbine

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[4] Atlantic Design Engineers, LLC, Acoustic Analysis, Scituate Community Wind Project, 167 Driftway, Scituate, MA, prepared for Town of Scituate, March 3, 2010, with Addendum dated March 18, 2010.

Noise Study Protocol (generic)" initially created for the Falmouth wind turbines. This study follows that updated data collection and analysis process, as modified and discussed herein.

5.0 SOUND LEVEL MEASUREMENT PROGRAM

5.1 Overview

In order to determine compliance with the MassDEP Noise Policy in response to concern from residents in the Town, a sound level measurement program was conducted in 2019.

Prior to the commencement of the sound level measurement program, a protocol was developed by Epsilon. The protocol was originally designed to meet the conditions specified in the MassDEP's 2013 Wind Turbine Noise Study Protocol ("WTNSP"). A program kickoff meeting occurred on August 7, 2018 between the Town, Scituate Wind, LLC, the residential coordinator[5], and Epsilon to discuss the details of the preliminary measurement protocol and visit[6] each of the proposed residential locations to select specific measurement points. Following the meeting, a draft of the measurement protocol was submitted to the MassDEP on August 28, 2018. A round of comments was received by the Town on September 19 but was then supplemented on September 21. Epsilon provided comment responses on September 26 that were forwarded to the MassDEP on October 2 and the protocol was revised. On November 6, 2018, Epsilon received additional comments from MassDEP on the revised protocol. Responses to the November comments were provided by Epsilon and forwarded to the MassDEP. The final Protocol[7], approved by the MassDEP, outlined the measurement locations, measurement methodology, data evaluation methodology, and instrumentation to be used in the study. The Protocol, attachments[8], and final comments from the MassDEP have been included in this report as Appendix A.[9]

5.2 Sound Level Measurement Locations

The Town of Scituate, through the Special Projects Director, identified the four locations for sound testing that were included in the Protocol. These locations are shown in Figure 5-1. Permission for sound level monitoring on the private properties was acquired prior to the commencement of the measurement program. Photos of the sound level measurement locations are presented in Figures 5-2 through 5-5.[10]

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5 Resident whom provided notice to the other residents when measurements would be performed.

6 Scituate Wind, LLC did not attend the measurement location visits.

7 Town of Scituate Sound Level Compliance Monitoring Protocol – Massachusetts Department of Environmental Protection, October 18, 2018.

8 Includes the MassDEP WTNSP.

9 NOTE: Comments from the MassDEP allowed for "fast" sound level meter setting as requested by the residents as opposed to the "slow" setting in the MassDEP's "Current Wind Turbine Noise Study Protocol".

10 Field photos were taken at night when testing occurred, so the photos are generally dark.

- Location 1: 151 Driftway - This residence is approximately 650 feet to the north-northeast of the wind turbine and is the nearest residence to the wind turbine. This site was also modeled by Atlantic Design Engineers pre-permitting and tested by Tech Environmental post construction.

- Location 2: 26 Hewes Road - This residence is approximately half a mile to the northeast of the wind turbine and is representative of the impacts at the residential properties on Hewes Road.

- Location 3: 122 Gilson Road - This residence is approximately 0.6 miles to the northeast of the wind turbine and is representative of the impacts at the residential properties on Gilson Road. This site was also tested by Tech Environmental post construction.

- Location 4: 34 Driftway - This residence is approximately half a mile to the east-northeast of the wind turbine.

5.3 Field Program and Methodology

Per the MassDEP-approved Protocol, short-term (5-minute) A-weighted broadband and unweighted octave-band sound level measurements were made at the four locations under operational and ambient conditions (i.e., with the wind turbine shutdown). Measurements were made at the four locations simultaneously[11] and attended by four Epsilon staff who noted the sound sources during the testing as well as the time and description of any specific episodic sound events (e.g., car passby). Field sheets for operational period testing were designed to ensure that sufficient and detailed notes could be taken by each field technician with some uniformity across all measurements. The sheets contained tables that were sectioned into 5-second time intervals such that key sound sources could be identified efficiently during each 5-second time slice. This time interval was selected as a convenient and reasonable spacing for notetaking. A sample field sheet is attached to this report as Appendix B.

Three (3) 5-minute operational measurements were made at all four locations on each night. These measurements were generally consecutive as there may have been a few minutes in between each period for the technician to prepare the note sheets before starting the next 5-minute measurement. Immediately following the operational measurements, Epsilon requested that the wind turbine be shutdown. Upon receipt of confirmation that the wind turbine was completely shut down, Epsilon staff members performed three consecutive 5-minute ambient measurements and documented the sound sources observed.

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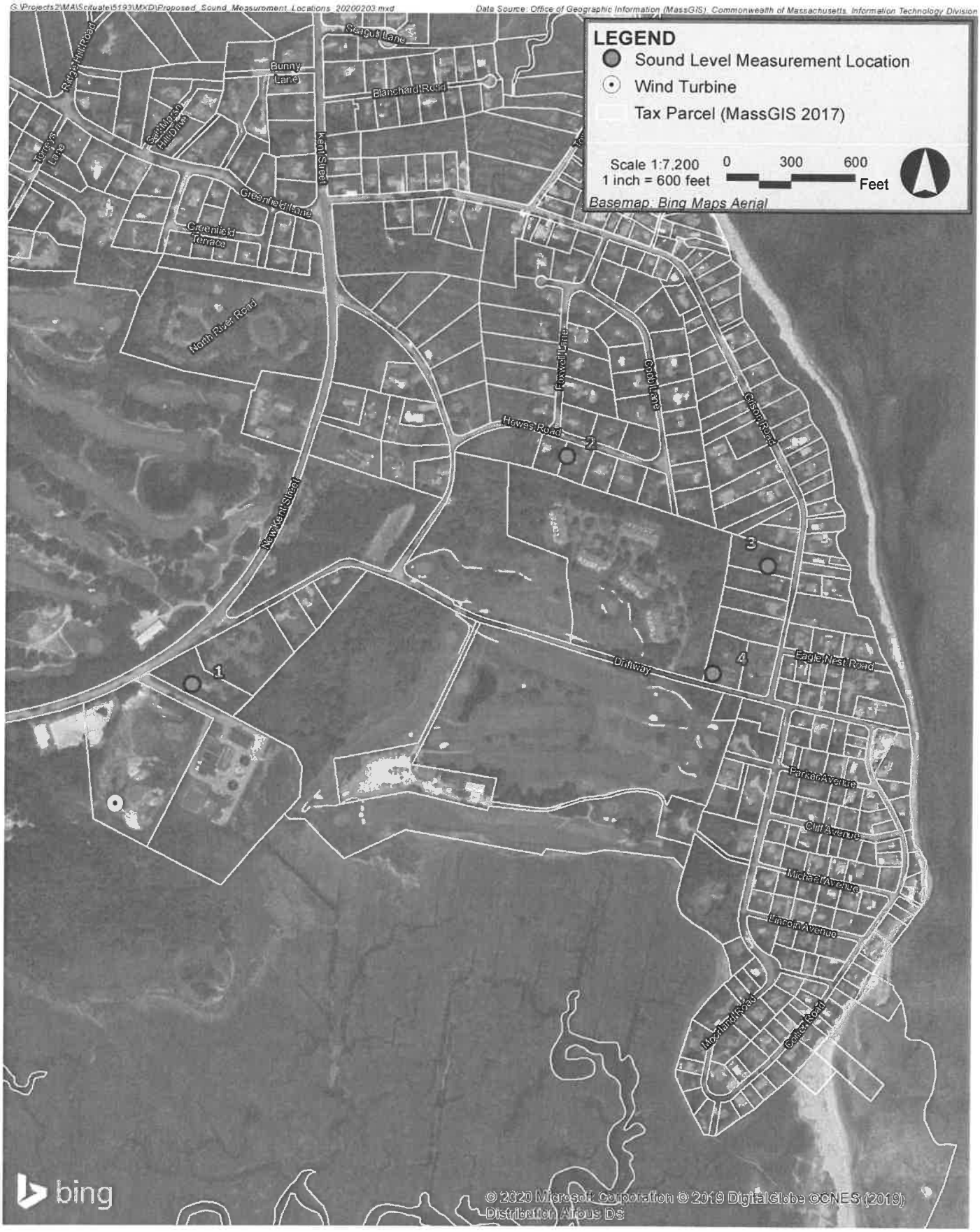
[11] Within approximately 15 minutes.



Scituate Wind **Scituate, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 5-1

Sound Level Measurement Locations

Figure 5-2 Location 1 - Photo of Sound Level Measurement Location

Figure 5-3 Location 2 - Photo of Sound Level Measurement Location

Figure 5-4 Location 3 - Photo of Sound Level Measurement Location

Figure 5-5 Location 4 - Photo of Sound Level Measurement Location

For the duration of measurements on each night, Scituate Wind, LLC collected data with the supervisory control and data acquisition (SCADA) system to determine whether the wind turbine was operating under the desired conditions outlined in the Protocol. Additionally, Scituate Wind, LLC was standing by each night to implement the shutdowns when requested by Epsilon.[12] Wind speed and wind turbine output conditions were periodically relayed to Epsilon throughout the course of the measurements each night. Following each night of sound level measurements, Scituate Wind, LLC provided the SCADA data recorded at hub height to Epsilon in spreadsheet format. Hub height wind speed was measured by an anemometer on top of the wind turbine's nacelle.

For the sound level data to be considered valid, measurements had to occur with no precipitation, the roads had to be dry, and ground-level wind speeds needed to be less than 5 m/s (11 mph) as per the Protocol. Ground-level wind speed and wind direction data were measured continuously and logged at Location 3 on each night.[13] Handheld wind speed measurements and other meteorological observations were made at the other three locations.

Based on input from the residents involved in the study, the targeted wind direction for operational measurements was WSW which generally corresponds to the downwind direction of the residences to the wind turbine. Therefore, the targeted wind direction for measurements was WSW (247.5° ± 45°). Upwind measurements were avoided in this measurement program.

Per the Protocol and guidance from the MassDEP, testing was conducted between the hours of 1 AM and 4 AM to coincide with the quietest background levels and to be consistent with the MassDEP WTNSP. The Protocol required that sound levels be captured on two (2) nights with hub height wind speeds at least 9 m/s and that sound levels be captured on two (2) nights with hub height winds speeds between 5 and 10 m/s. Therefore, a total of four (4) nights were sampled. Through diligent weather forecast monitoring, the dates shown in Table 5-1 were selected for the measurements. Delays between monitoring events were generally the result of inadequate meteorological conditions, staffing/equipment unavailability, or wind turbine maintenance. The hub height wind speeds targeted on each night are also identified in Table 5-1. Actual recorded wind speeds and additional data from these nights are presented in Section 6 of this report.

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[12] Scituate Wind, LLC was present at Location 1 during the first night of measurements but controlled the wind turbine from a remote (off-site) location during the other 3 nights. Communication between Epsilon and Scituate Wind, LLC was via mobile phone during the last 3 nights.

[13] Wind direction was not measured on the second night.

Table 5-1 Measurement Dates and Targeted Conditions

Date	Targeted HH Wind Speed Conditions
April 19, 2019	≥ 9 m/s
July 31, 2019	5 to 10 m/s
October 2, 2019	≥ 9 m/s
December 6, 2019	5 to 10 m/s

5.4 Measurement Equipment

Sound level and meteorological data collection instrumentation are described in Sections 5.4.1 and 5.4.2, respectively.

5.4.1 Sound Level Instrumentation

Four (4) Larson Davis model 831 sound level meters (SLM's) were used for the monitoring on each night. The Larson Davis model 831 sound level meters measured broadband, full octave band, and one-third octave band sound levels. All instruments have data logging capability. The SLM's were attended during each measurement and were programmed to summarize statistical data in 5-minute periods with a 1-second resolution. All microphones were tripod mounted at a height of approximately 1.3 meters as per the WTNSP. The measurement equipment was calibrated in the field before and after the surveys with the manufacturer's acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-2006 (R2016). All calibrations were within ± 1.0 dB from the most recent calibration. Additionally, the meters were calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the past 12 months of the measurement periods. The sound level instrumentation used for the measurement program is summarized for each night in Tables 5-2 through 5-5.

Audio recordings were collected for all sampling periods (both operational and ambient) for quality assurance/quality control purposes using external audio recorders connected to each sound level meter.[14] The clocks on the audio recorders were synchronized with the clocks on the SLM's.

[14] On the 4th night, 2 of the 4 audio recorders were not connected directly to the SLM but were positioned close to the microphone for a representative audio signal.

Table 5-2 Sound Level Measurement Instrumentation – Night 1

Equipment	Model	Serial Number
Meter	Larson Davis 831	4374
Microphone	PCB Piezotronics 377C20	165110
Preamp	PCB Piezotronics PRM831	046515
Meter	Larson Davis 831	3047
Microphone	PCB Piezotronics 377B20	LW130579
Preamp	PCB Piezotronics PRM831	023825
Meter	Larson Davis 831	4373
Microphone	PCB Piezotronics 377C20	165061
Preamp	PCB Piezotronics PRM831	046514
Meter	Larson Davis 831	3751
Microphone	PCB Piezotronics 377C20	162996
Preamp	PCB Piezotronics PRM831	029562

Table 5-3 Sound Level Measurement Instrumentation – Night 2

Equipment	Model	Serial Number
Meter	Larson Davis 831	2155
Microphone	PCB Piezotronics 377B20	112256
Preamp	PCB Piezotronics PRM831	016478
Meter	Larson Davis 831	4373
Microphone	PCB Piezotronics 377C20	165061
Preamp	PCB Piezotronics PRM831	046514
Meter	Larson Davis 831	1993
Microphone	PCB Piezotronics 377B20	110889
Preamp	PCB Piezotronics PRM831	015260
Meter	Larson Davis 831	3044
Microphone	PCB Piezotronics 377C20	170889
Preamp	PCB Piezotronics PRM831	023824

Table 5-4 Sound Level Measurement Instrumentation – Night 3

Equipment	Model	Serial Number
Meter	Larson Davis 831	1992
Microphone	PCB Piezotronics 377B20	112340
Preamp	PCB Piezotronics PRM831	015258
Meter	Larson Davis 831	4373
Microphone	PCB Piezotronics 377C20	165061
Preamp	PCB Piezotronics PRM831	046514
Meter	Larson Davis 831	4375
Microphone	PCB Piezotronics 377C20	165757
Preamp	PCB Piezotronics PRM831	046516
Meter	Larson Davis 831	4374
Microphone	PCB Piezotronics 377C20	165110
Preamp	PCB Piezotronics PRM831	046515

Table 5-5 Sound Level Measurement Instrumentation – Night 4

Equipment	Model	Serial Number
Meter	Larson Davis 831	2155
Microphone	PCB Piezotronics 377B20	112256
Preamp	PCB Piezotronics PRM831	016478
Meter	Larson Davis 831	1993
Microphone	PCB Piezotronics 377B20	110889
Preamp	PCB Piezotronics PRM831	015260
Meter	Larson Davis 831	3751
Microphone	PCB Piezotronics 377C20	162996
Preamp	PCB Piezotronics PRM831	029562
Meter	Larson Davis 831	2154
Microphone	PCB Piezotronics 377B20	112245
Preamp	PCB Piezotronics PRM831	016477

5.4.2 *Meteorological Instrumentation*

Continuous ground-level wind data were collected at measurement Location 3 on each of the four measurement nights. The meteorological instrumentation used on each night is summarized in Table 5-6. The wind sensors were mounted at a height of approximately 2 meters above ground level and data were logged every 1 minute.[15] A HOBO H21-002 micro-weather station (manufactured by Onset Computer Corporation) was used to continuously measure the wind data on Nights 1 and 2. A combination wind speed and direction sensor was used on Night 1 that has a wind speed measurement range of 0 to 44 m/s (99 mph) and an accuracy of ±0.5 m/s (1.1 mph). The starting threshold is 0.5 m/s (1.1 mph). The wind direction measurement range is 0 to 358 degrees (2-degree dead band), with an accuracy of ±5 degrees. On Night 2, a wind speed-only[16] sensor was used that has a measurement range of 0 to 45 m/s (100 mph), an accuracy of ±1.1 m/s (2.4 mph), and a starting threshold of less than 1 m/s (2.2 mph). On Nights 3 and 4, wind speed and wind direction data were collected using an ATMOS 41 weather station and EM60 data logger (manufactured by Meter Group, Inc.). The weather station has a wind speed measurement range of 0 to 30 m/s (67 mph) and an accuracy of ±0.3 m/s (0.67 mph). The wind direction measurement range is 0 to 359 degrees with an accuracy of ±5 degrees. Figures 5-6 and 5-7 show the ground-level meteorological equipment setups on Night 2 and 3, respectively.[17]

At the three other measurement locations (Locations 1, 2, and 4), brief meteorological observations were made using handheld instrumentation. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator or a Kestrel 3000 Weather Meter. Temperature and humidity measurements were made using a General Tools digital psychrometer or a Kestrel 3000 Weather Meter. Unofficial observations about meteorology were made to characterize the conditions.

Meteorological data from the closest National Weather Service (NWS) station in Marshfield, MA (Marshfield Municipal Airport) provided by the National Centers for Environmental Information (NCEI) were archived for all four measurement nights and are provided in Appendix C.

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[15] 1-second logging was implemented on Nights 1 and 2 which was averaged into 1-minute data bins.

[16] This deviates from the Protocol.

[17] Field photos were taken at night when testing occurred, so the photos are generally dark.

Table 5-6 Ground-level Meteorological Instrumentation

Night	Equipment	Model	Serial Number
1	Logger	Onset H21-002	1159087
	Sensor	Onset S-WCA-003	9877585
2	Logger	Onset H21-002	1159089
	Sensor	Onset S-WSA-M003	10481215
3	Logger	METER Em60	z6-03114
	Sensor	METER ATMOS 41	ATM-410002535
4	Logger	METER Em60	z6-03114
	Sensor	METER ATMOS 41	ATM-410002535

Figure 5-6 Epsilon Meteorological Instrumentation – Location 3 (HOBO)

Figure 5-7 Epsilon Meteorological Instrumentation – Location 3 (ATMOS)

6.0 EVALUATION OF SOUND LEVELS

The intent of the sound level measurement program was to collect sound data during periods that would be representative of worst-case conditions based on the potential maximum sound power output from the wind turbine[18] and representative of conditions when noise complaints were filed to the Town.

The Project is subject to the MassDEP Noise Policy limiting sound levels from the wind turbine to 10 dBA over ambient. As discussed in the MassDEP-approved Protocol, compliance must be evaluated by calculating an 'L_{max}'[19] sound pressure level by averaging the three (3) highest representative 1-second L_{eq} sound levels and calculating the difference between the 'L_{max}' and the lowest measured 5-minute ambient L_{90} sound level. The 'L_{max}' sound levels are 'total' sound levels (wind turbine + ambient) and have been used in the evaluations. This is conservative since it includes both wind turbines and ambient (non-wind turbine) sound levels. If necessary, the ambient L_{90} sound level may be subtracted (on an energy basis) from the operational sound level to obtain the "wind-turbine-only" sound pressure level. This wind-turbine-only sound level would then be used in the evaluation.

In addition, compliance has been evaluated against the MassDEP-defined 'pure tone' conditions as described in the Protocol. Operational, unweighted octave band L_{eq} sound pressure levels, averaged over 1-minute intervals, have been used to determine whether the wind turbine causes any octave band center frequency sound level to exceed the two adjacent center frequency sound level by 3 dB or more. Octave band L_{eq} sound levels from the ambient measurements were evaluated using the same methodology.

6.1 Data Processing and Evaluation Methodology

Sound level data from each night of measurements were processed using three different methods. The methods were determined based on the availability of data where the sound level would be most representative of the contribution to the sound level from the wind turbine. The three data processing methods are listed below in order of most representative to least representative. Conservatism in the evaluation results increases with the higher methodology number (e.g., Method 3 provides the least representative, and the most conservative, results). The data processing methods are based on the details provided in the field notes for each location on each night. To build on the details provided in Section 5.3 of this report, sound sources were documented during each 5-second period during operational measurements. The field sheets indicated one or more of the following sound sources during any given 5-second period: wind turbine, wind gusts, cars, insects/vegetation, or other. The field technician could specify an occurrence of a noise event. In periods when the wind turbine was clearly the dominant sound

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18 As defined by the WTNSP.

19 This terminology usage differs from the statistical definition of L_{max}.

source, the technician indicated the period with a star (or some other emphasis) in the wind turbine field column on the note sheet. The following three methods were used for processing the operational data only. The ambient sound levels were determined using the 5-minute L_{90} values measured by the meters, and observations were documented by the field technicians.

- **Method 1** – A data processing method where the evaluation only considers periods when the wind turbine is noted with emphasis as the dominant noise source during a given 5-second period. This allows for an analysis that is the most representative of the wind-turbine-attributable sound levels with minimal influence from other external noise sources that are unrelated to the wind turbine. If no periods were noted with emphasis on wind turbine sound contribution during an operational period, Method 2 was used to process the data for that 5-minute operational period, which is more conservative.

- **Method 2** – A data processing method where the evaluation only considers periods when the wind turbine was noted as a noise source without other noise sources indicated on the notes (i.e., no emphasis added). This method incorporates all the data points included in Method 1 but also includes any periods when the wind turbine field column was checked on the note sheet without indication of other sources (i.e., no wind, cars, vegetation, or other noise events noted). In periods during the warmer months (Night 2 and Night 3) when insects were prevalent, the insects were not considered a disqualifying noise source as they were present in ambient and operational data periods relatively consistently. This is a conservative approach. If less than 5% of the data points (15 seconds, or three 5-second periods) in a given 5-minute operational measurement met the criteria of Method 2, Method 3 was used to process the data for that 5-minute operational period, which is more conservative.

- **Method 3** – A data processing method where the evaluation considers all of the data points included in Method 2 but also includes any data point when the wind turbine was noted with wind noise also noted. This method still excludes any periods when other external noise events (a car or vegetation for example) were indicated on the field notes. This method is the least representative and most conservative of the three methodologies but allows for a higher number of data points to be included in the analysis.

If the linear difference between the 'L_{max}' and the minimum L_{90} sound level was found to exceed the 10-dBA threshold during data processing, a refined analysis was performed on the data to ensure that the periods were attributable to the wind turbine per the Protocol. The refined analysis consisted of listening to the applicable audio recordings. For each of the maximum 1-second L_{eq} data points identified using Method 1, the audio recording was consulted to determine whether some noise event, unrelated to the wind turbine, was identifiable. If an alternate sound source (e.g., wind gust or field technician movement) was clearly identifiable, that L_{eq} sound level was eliminated from the evaluation. The 1-second periods selected using Method 1 were analyzed, starting with the highest sound level, until no alternate sound source was identifiable. The highest 1-second L_{eq} sound level without an identifiable alternate sound source was selected for calculating the 'L_{max}' that was used in the sound level evaluation.

6.2 Evaluation of Sound Levels on Individual Nights

Short-term attended sound level measurements were conducted at four locations in the Town of Scituate within approximately 0.6 miles of the Scituate Wind site on four separate nights. The focus of this analysis was on evaluating sound level compliance based on the methodologies set forth in the MassDEP-approved Protocol.

6.2.1 Night 1 – April 19, 2019 (Hub Height Wind Speed > 9 m/s)

Operational and ambient sound level measurements were performed at all four locations between 2:30 AM and 4:00 AM on April 19, 2019. Conditions with hub height wind speeds over 9 m/s were targeted.

6.2.1.1 Measured Meteorological and Wind Turbine Conditions

Ground-level wind conditions measured at Location 3 on April 19, 2019 are presented in Figure 6-1. One-minute averaged wind speeds ranged from 2.7 to 5.1 m/s and the average wind direction was 247° (WSW). The NWS station in Marshfield indicated a SW wind direction and field observations indicated S to SW.

SCADA data were provided by Scituate Wind, LLC for the full duration of the measurements on Night 1. These data were provided in 10-minute time-synchronized averages. The average wind speeds at hub height and the average power output from the wind turbine during the operational and ambient measurements are provided in Table 6-1. These conditions were generally steady during the course of the measurements. The table also summarizes the ground-level conditions during the measurements and indicates whether each of the conditions meet the parameters identified in the Protocol. The SCADA wind direction data for this period, as adjusted based on Scituate Wind's field observations, were consistent with the data collected by Epsilon and the NWS.

Figure 6-1 Ground-Level Meteorological Data – Night 1 (April 19, 2019)

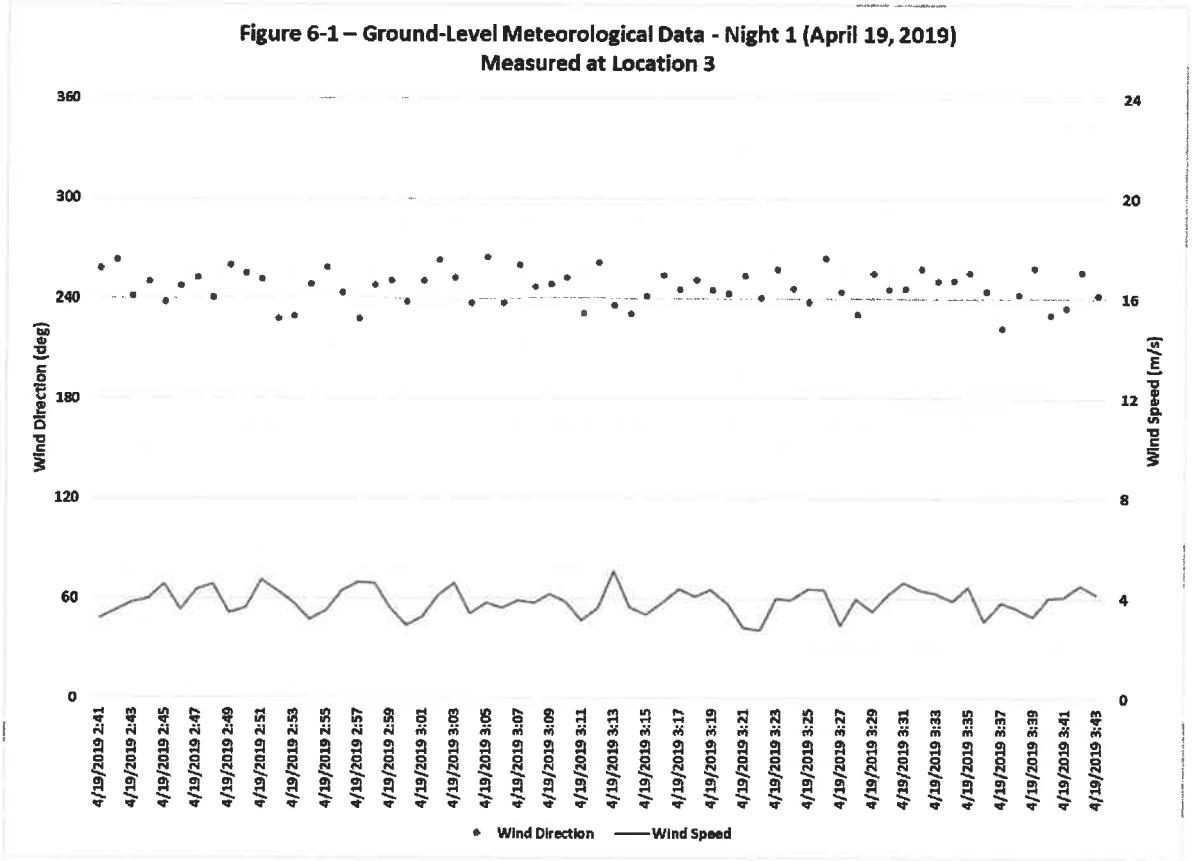

Table 6-1 Meteorological and Wind Turbine Conditions - Night 1 (April 19, 2019)

Condition	Measurement Period		Meets Parameters in the Protocol?
	Operational	Ambient	
Average HH Wind Speed	14.7 m/s	14.8 m/s	Yes
Average Wind Turbine Output	1500 kW	0	Yes
Ground-Level Wind Speed[1]	2.7 – 5.1		Yes
Wind Direction[1]	WSW		Yes

Notes:

1. As measured at Location 3.

6.2.1.2 Sound Level Results

Sound levels on April 19, 2019 were significantly impacted by ambient sound sources including wind and rustling vegetation. Although winds at the ground were within the appropriate range for sound level measurements, stronger winds around hub height and at the treetops made it difficult to clearly identify sound from the wind turbine at the measurement locations. At three of the four measurement locations, the wind turbine was audible at times, but ambient noise generally contributed to the sound levels. Therefore, the 1-second L_{eq} sound levels were mainly determined through the data processing Method 2 or 3 (as described in Section 6.1). The highest representative 1-second L_{eq} sound levels measured during the three 5-minute operational periods are presented in Table 6-2. The timeframe in which each 5-minute measurement was captured is included in the table. The average of the three L_{eq} sound levels, or 'L_{max}', is presented in the right-most column. The wind turbine was never audible at Location 2 during Night 1, so no L_{eq} sound levels could be evaluated.

The three ambient L_{90} sound levels measured at each location on Night 1 are presented in Table 6-3. The timeframe in which each 5-minute measurement was captured is included in the table. The minimum measured L_{90} sound level to be used in the evaluation is presented in the right-most column of the table.

The Protocol specifies that the wind-turbine-attributable 'L_{max}' shall be used in the compliance evaluation. The 'L_{max}' sound levels in Table 6-2 are 'total' sound levels (wind turbine + ambient). For informational purposes, the minimum L_{90} ambient from Table 6-3 was subtracted, on an energy basis, from the 'L_{max}' sound level to provide a closer representation of wind-turbine-attributable sound levels as shown in Table 6-4. According to ANSI S12.18-1994 (R2019), this procedure is possible when the 'total' sound level is at least 3 dBA higher than the ambient sound level. For Location 4, total sound is only 1 dBA higher than ambient sound, therefore, no wind-turbine-attributable 'L_{max}' can be calculated for Location 4.

Table 6-2 Operational Sound Pressure Levels - Night 1 (April 19, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{eq} (2:41-3:02 AM)	Operational #2 L_{eq} (2:47-3:09 AM)	Operational #3 L_{eq} (2:58-3:18 AM)	'L_{max}'[2]
1 - 151 Driftway	53	58	57	56
2 - 26 Hewes	N/A	N/A	N/A	N/A[1]
3 - 122 Gilson	55	55	57	56
4 - 34 Driftway	56	54	52	54

Notes:

1. No L_{max} was attainable at this location.
2. Only whole numbers are shown; calculations are performed using values with additional precision.

Table 6-3 Ambient Sound Pressure Levels - Night 1 (April 19, 2019)

Location	Sound Pressure Level (dBA) Ambient #1 L_{90} (3:24-3:30 AM)	Ambient #2 L_{90} (3:29-3:36 AM)	Ambient #3 L_{90} (3:34-3:43 AM)	Minimum Ambient L_{90}
1 - 151 Driftway	51	49	49	49
2 - 26 Hewes	50	50	49	49
3 - 122 Gilson	51	54	51	51
4 - 34 Driftway	53	57	54	53

Table 6-4 Wind-Turbine-Attributable Sound Pressure Levels - Night 1 (April 19, 2019)

Location	Sound Pressure Level (dBA) 'L_{max}'	Ambient L_{90}	Wind-Turbine-Attributable 'L_{max}'[3]
1 - 151 Driftway	56	49	55
2 - 26 Hewes	N/A	49	N/A[1]
3 - 122 Gilson	56	51	55
4 - 34 Driftway	54	53	N/A[2]

Notes:

1. No L_{max} was attainable at this location.
2. Cannot be calculated per ANSI S12.18-1994 (R2019).
3. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.1.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on April 19, 2019 and is presented in Table 6-5. The total 'L_{max}' sound levels shown in the earlier Table 6-2 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level. A difference of no more than 7 dBA was measured at the four locations.[20] In addition, no MassDEP-defined pure tones were observed during testing on Night 1.

[20] A conclusion cannot be drawn at Location 2 as 'L_{max}' could not be determined.

Table 6-5 Broadband Sound Level Evaluation - Night 1 (April 19, 2019)

Location	Sound Pressure Level (dBA)			
	'L_{max}'	Ambient L_{90}	Difference Between 'L_{max}' and Ambient L_{90}[1]	Complies?
1 - 151 Driftway	56	49	7	Yes
2 - 26 Hewes	N/A	49	N/A	Inconclusive
3 - 122 Gilson	56	51	5	Yes
4 - 34 Driftway	54	53	1	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.2 Night 2 – July 31, 2019 (Hub Height Wind Speed 5-10 m/s)

Operational and ambient sound level measurements were performed at all four locations between 1:00 AM and 2:30 AM on July 31, 2019. Conditions with hub height wind speeds between 5 and 10 m/s were targeted.

6.2.2.1 Measured Meteorological and Wind Turbine Conditions

Ground-level wind conditions measured at Location 3 on July 31, 2019 are presented in Figure 6-2. One-minute averaged wind speeds ranged from 0.1 to 1.1 m/s. Continuous ground-level wind direction data were not collected during this night of measurements; however, the NWS station in Marshfield indicated a SW wind direction and field observations indicated a SW wind direction.

SCADA data were provided by Scituate Wind, LLC for the full duration of the measurements on Night 2. These data were provided in 1-minute time-synchronized averages. The average wind speeds at hub height and the average power output from the wind turbine during the operational and ambient measurements are provided in Table 6-6. These conditions were generally steady during the course of the measurements. The table also summarizes the ground-level conditions during the measurements and indicates whether each of the conditions meet the parameters identified in the Protocol. The SCADA wind direction data for this period, as adjusted based on Scituate Wind's field observations, were consistent with the data collected by Epsilon and the NWS.

Figure 6-2 Ground-Level Meteorological Data – Night 2 (July 31, 2019)

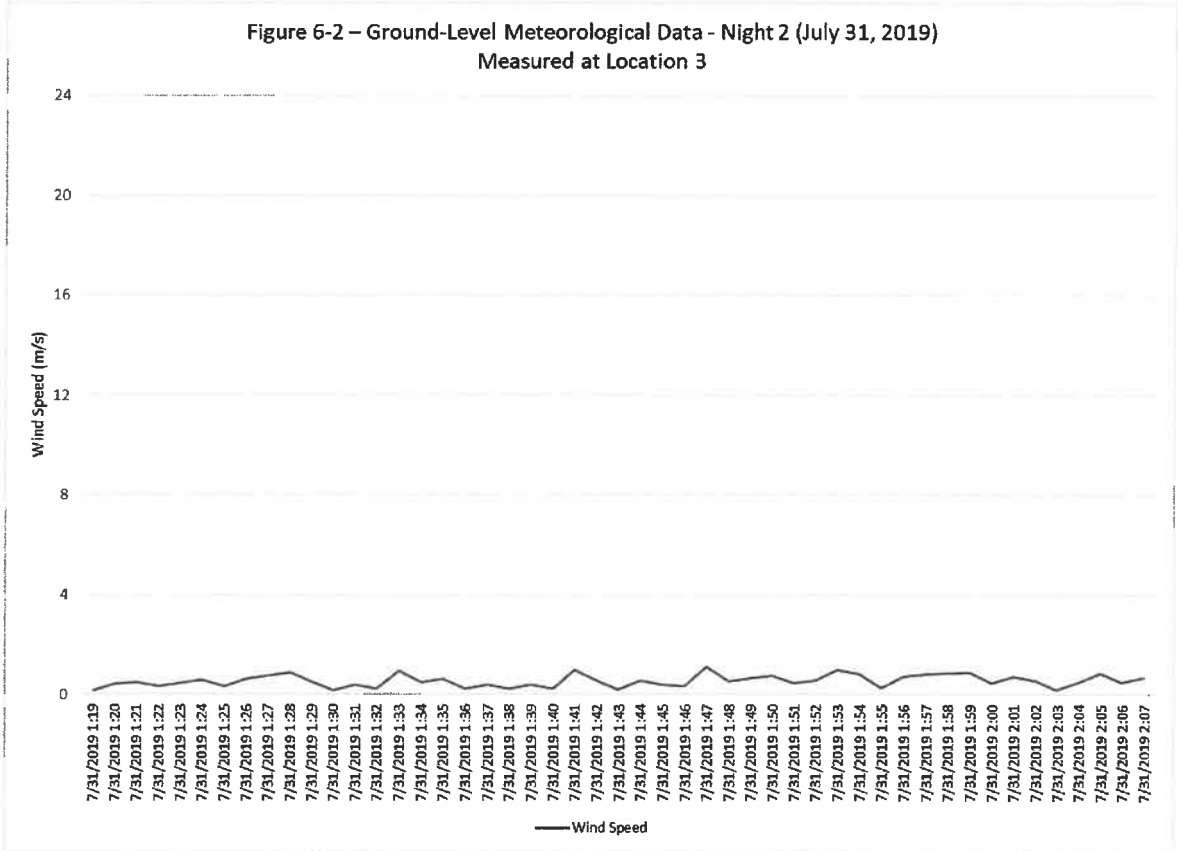

Table 6-6 Meteorological and Wind Turbine Conditions - Night 2 (July 31, 2019)

Condition	Measurement Period		Meets Parameters in the Protocol?
	Operational	Ambient	
Average HH Wind Speed	7.6 m/s	8.2 m/s	Yes
Average Wind Turbine Output	814 kW	0	Yes
Ground-Level Wind Speed[1]	0.1 – 1.1 m/s		Yes
Wind Direction[2]	SW		Yes[3]

Notes:

1. As measured at Location 3.
2. As indicated by field observations and the NWS station in Marshfield, MA.
3. Is within 45° of WSW.

6.2.2.2 Sound Level Results

Sound levels on July 31, 2019 were the result of sound from the wind turbine, wind gusts, vegetation, insects, and some cars and/or aircraft. Data processing for the operational sound levels was based on Methods 1 and 2 described in Section 6.1. At three of the four measurement locations, the field notes had periods that showed emphasis on wind turbine contribution. Field notes from Location 1 provided no periods with emphasis on wind turbine sound; however, Location 1 is the closest location to the wind turbine and at least half of the 5-second periods during each of the three operational periods indicated only wind turbine sound.[21] Audio recordings at Location 1 were reviewed to verify that no non-wind turbine noise sources were clearly contributing to the 1-second L_{eq} sound levels. The highest representative 1-second L_{eq} sound levels measured during the three 5-minute operational periods are presented in Table 6-7. The timeframe in which each 5-minute measurement was captured is included in the table. The average of the three L_{eq} sound levels, or 'L_{max}', is presented in the right-most column.

The three ambient L_{90} sound levels measured at each location on Night 2 are presented in Table 6-8. The timeframe in which each 5-minute measurement was captured is included in the table. The minimum measured L_{90} sound level to be used in the evaluation is presented in the right-most column of the table.

The Protocol specifies that the wind-turbine-attributable 'L_{max}' shall be used in the compliance evaluation. The 'L_{max}' sound levels in Table 6-7 are 'total' sound levels (wind turbine + ambient). For informational purposes, the minimum L_{90} ambient was subtracted, on an energy basis, from the 'L_{max}' sound level to provide a closer representation of wind-turbine-attributable sound levels as shown in Table 6-9.

Table 6-7 Operational Sound Pressure Levels - Night 2 (July 31, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{eq} (1:19-1:25 AM)	Operational #2 L_{eq} (1:25-1:32 AM)	Operational #3 L_{eq} (1:31-1:38 AM)	'L_{max}'[1]
1 - 151 Driftway	51	51	51	51
2 - 26 Hewes	48	46	52	49
3 - 122 Gilson	41	42	43	42
4 - 34 Driftway	41	44	43	43

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

[21] I.e., at least 2.5 minutes of each 5-minute measurement indicated only wind turbine sound.

Table 6-8 Ambient Sound Pressure Levels - Night 2 (July 31, 2019)

Location	Sound Pressure Level (dBA) Ambient #1 L_{90} (1:51-1:58 AM)	Ambient #2 L_{90} (1:56-2:03 AM)	Ambient #3 L_{90} (2:01-2:08 AM)	Minimum Ambient L_{90}
1 - 151 Driftway	38	39	37	37
2 - 26 Hewes	41	41	41	41
3 - 122 Gilson	39	39	39	39
4 - 34 Driftway	38	39	38	38

Table 6-9 Wind-Turbine-Attributable Sound Pressure Levels - Night 2 (July 31, 2019)

Location	Sound Pressure Level (dBA) 'L_{max}'	Ambient L_{90}	Wind-Turbine-Attributable 'L_{max}'[1]
1 - 151 Driftway	51	37	51
2 - 26 Hewes	49	41	48
3 - 122 Gilson	42	39	39
4 - 34 Driftway	43	38	41

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.2.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on July 31, 2019 and is presented in Table 6-10. The total 'L_{max}' sound levels shown in the earlier Table 6-7 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level with the exception of Location 1.

Table 6-10 Broadband Sound Level Evaluation - Night 2 (July 31, 2019)

Location	Sound Pressure Level (dBA) 'L_{max}'	Ambient L_{90}	Difference Between 'L_{max}' and Ambient L_{90}[1]	Complies?
1 - 151 Driftway	51	37	13	No
2 - 26 Hewes	49	41	8	Yes
3 - 122 Gilson	42	39	3	Yes
4 - 34 Driftway	43	38	4	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

In addition to the broadband analysis, the octave-band sound level data were analyzed for MassDEP-defined pure tones on a 1-minute basis for both operational and ambient measurement periods. Three of the four locations had pure tones present as described herein.

A pure tone was present in the 63 Hz octave band during all the 1-minute ambient periods at Location 1 (151 Driftway). The field notes indicate the presence of a hum from the nearby wastewater treatment plant (WWTP). This hum is the likely cause of the 63 Hz pure tone during the ambient measurement periods. The pure tone measured at this location during the ambient tests is not attributable to the wind turbine.

At Location 2 (26 Hewes Rd), a pure tone was measured in all but one minute of testing (operational and ambient) in the 8,000 Hz octave band. Field notes indicated high frequency insect noise was present consistently throughout testing which is the likely cause of the 8,000 Hz pure tone as insect noise is characteristically in frequencies above the 1,000 Hz octave band,[22] and is typically present during warmer months. A pure tone at 63 Hz was also measured during the last minute of the ambient testing. The field notes indicated sound from an "AC" (air-conditioner) unit for a substantial duration of the testing and ambient temperatures during the testing were above 70° Fahrenheit. The air conditioner is likely the cause of the 63 Hz pure tone. The pure tones measured at this location are not attributable to the wind turbine.

A pure tone in the 1,000 Hz octave band was measured during a single operational minute at Location 4 (34 Driftway). The field notes indicated that a car was the primary sound source for approximately 45 seconds of the minute that contained the pure tone.[23] Based on prior sound level measurement experience by Epsilon, it can be concluded that the pure tone was attributable to the car observed. No other operational period contained a pure tone on Night 2 at Location 4. The pure tone measured at this location is not attributable to the wind turbine.

All 1-minute periods with pure tones on Night 2 are presented in Appendix D.

6.2.3 Night 3 – October 2, 2019 (Hub Height Wind Speed > 9 m/s)

Operational and ambient sound level measurements were performed at all four locations between 1:00 AM and 2:00 AM on October 2, 2019. Conditions with hub height wind speeds over 9 m/s were targeted.

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[22] Support for this statement may be found in ANSI S12.100-2014 (R2019).

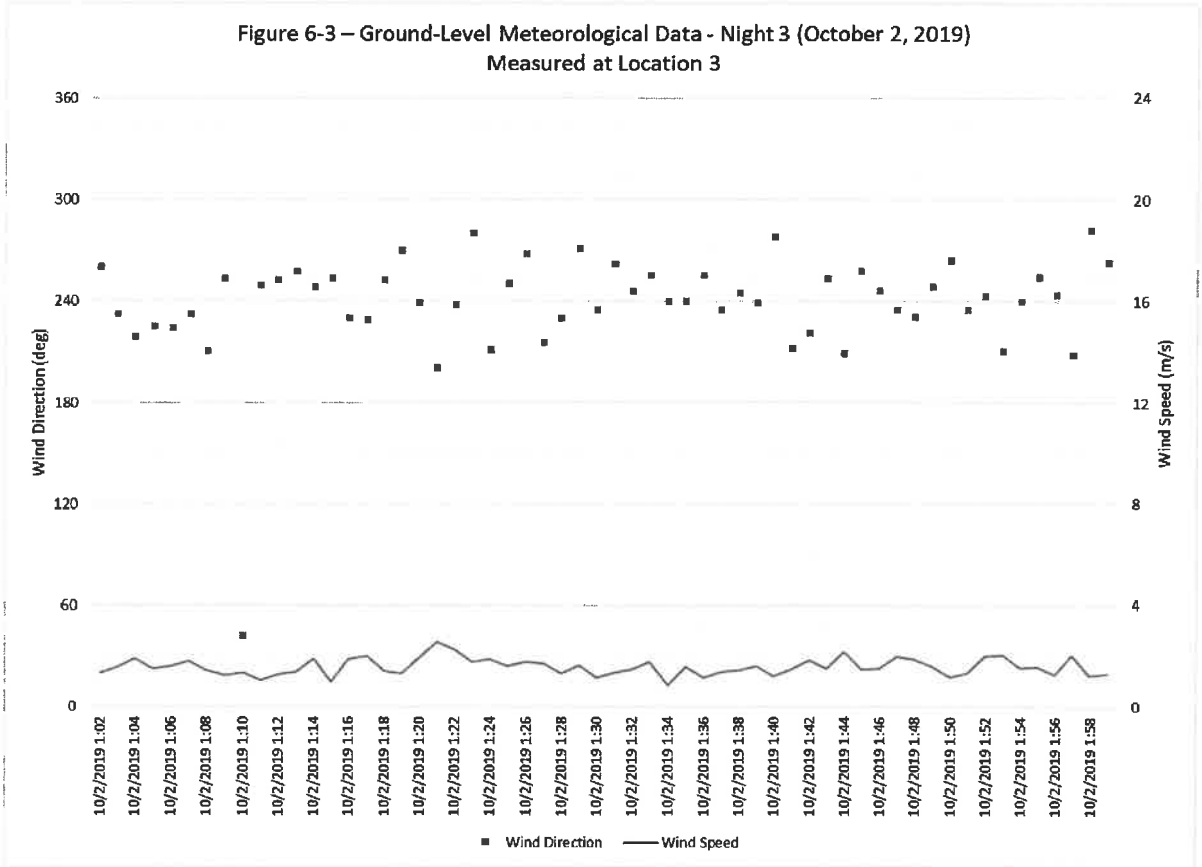
[23] A vehicular passby was confirmed in a review of the audio recording.

6.2.3.1 Measured Meteorological and Wind Turbine Conditions

Ground-level wind conditions measured at Location 3 on October 2, 2019 are presented in Figure 6-3. One-minute averaged wind speeds ranged from 0.8 to 2.6 m/s and the average wind direction was 238° (SW). The NWS station in Marshfield indicated a SW wind direction and field observations indicated S to SW.[24]

SCADA data were provided by Scituate Wind, LLC for the full duration of the measurements on Night 3. These data were provided in 1-minute time-synchronized averages. The average wind speeds at hub height and the average power output from the wind turbine during the operational and ambient measurements are provided in Table 6-11. These conditions were generally steady during the course of the measurements. The table also summarizes the ground-level conditions during the measurements and indicates whether each of the conditions meet the parameters identified in the Protocol.

Figure 6-3 Ground-Level Meteorological Data – Night 3 (October 2, 2019)



24 The SCADA data indicated a northwesterly wind direction, which is not supported by the other data sources and field observations.

Table 6-11 Meteorological and Wind Turbine Conditions - Night 3 (October 2, 2019)

Condition	Measurement Period		Meets Parameters in the Protocol?
	Operational	Ambient	
Average HH Wind Speed	10.3 m/s	9.7 m/s	Yes
Average Wind Turbine Output	1378 kW	0	Yes
Ground-Level Wind Speed[1]	0.8 – 2.6		Yes
Wind Direction[1]	SW		Yes[2]

Notes:

1. As measured at Location 3.
2. Is within 45° of WSW.

6.2.3.2 Sound Level Results

Sound levels on October 2, 2019 were the result of sound from insects, the wind turbine, wind gusts, vegetation, and some cars. Data processing for the operational sound levels were based on all three methods described in Section 6.1. At three of the four measurement locations, the field notes had periods that showed emphasis on wind turbine contribution.[25] The only location without any wind-turbine-emphasized periods was Location 4, so Method 3 was conservatively used for all 3 operational periods. The highest representative 1-second L_{eq} sound levels measured during the three 5-minute operational periods are presented in Table 6-12. The timeframe in which each 5-minute measurement was captured is included in the table. The average of the three L_{eq} sound levels, or 'L_{max}', is presented in the right-most column.

The three ambient L_{90} sound levels measured at each location on Night 3 are presented in Table 6-13. The timeframe in which each 5-minute measurement was captured is included in the table. The minimum measured L_{90} sound level to be used in the evaluation is presented in the right-most column of the table.

The Protocol specifies that the wind-turbine-attributable 'L_{max}' shall be used in the compliance evaluation. The 'L_{max}' sound levels in Table 6-12 are 'total' sound levels (wind turbine + ambient). For informational purposes, the minimum L_{90} ambient was subtracted, on an energy basis, from the 'L_{max}' sound level to provide a closer representation of wind-turbine-attributable sound levels as shown in Table 6-14. According to ANSI S12.18-1994 (R2019), this procedure is possible when the 'total' sound level is at least 3 dBA higher than the ambient sound level. Since total sound is within 3 dBA of ambient sound at all four locations, no wind-turbine-attributable 'L_{max}' can be calculated for any of the four locations.

[25] Not necessarily during all 3 of the 5-minute operational periods.

Table 6-12 Operational Sound Pressure Levels - Night 3 (October 2, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{eq} (1:02-1:12 AM)	Operational #2 L_{eq} (1:08-1:17 AM)	Operational #3 L_{eq} (1:14-1:23 AM)	'L_{max}'[1]
1 - 151 Driftway	61	59	59	60
2 - 26 Hewes	54	55	57	55
3 - 122 Gilson	52	53	52	53
4 - 34 Driftway	55	55	54	55

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

Table 6-13 Ambient Sound Pressure Levels - Night 3 (October 2, 2019)

Location	Sound Pressure Level (dBA)			
	Ambient #1 L_{90} (1:40-1:46 AM)	Ambient #2 L_{90} (1:46-1:51 AM)	Ambient #3 L_{90} (1:51-1:58 AM)	Minimum Ambient L_{90}
1 - 151 Driftway	57	57	57	57
2 - 26 Hewes	54	54	54	54
3 - 122 Gilson	51	51	51	51
4 - 34 Driftway	53	53	53	53

Table 6-14 Wind-Turbine-Attributable Sound Pressure Levels - Night 3 (October 2, 2019)

Location	Sound Pressure Level (dBA)		
	'L_{max}'	Ambient L_{90}	Wind-Turbine-Attributable 'L_{max}'[2]
1 - 151 Driftway	60	57	N/A[1]
2 - 26 Hewes	55	54	N/A[1]
3 - 122 Gilson	53	51	N/A[1]
4 - 34 Driftway	55	53	N/A[1]

Notes:

1. Cannot be calculated per ANSI S12.18-1994 (R2019).
2. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.3.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on October 2, 2019 and is presented in Table 6-15. The total 'L_{max}' sound levels shown in the earlier Table 6-12 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level. A difference of no more than 3 dBA was measured at the four locations.

Table 6-15 Broadband Sound Level Evaluation - Night 3 (October 2, 2019)

Location	Sound Pressure Level (dBA)			
	'L_{max}'	Ambient L_{90}	Difference Between 'L_{max}' and Ambient L_{90}[1]	Complies?
1 - 151 Driftway	60	57	3	Yes
2 - 26 Hewes	55	54	1	Yes
3 - 122 Gilson	53	51	2	Yes
4 - 34 Driftway	55	53	2	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

In addition to the broadband analysis, the octave-band sound level data were analyzed for MassDEP-defined pure tones on a 1-minute basis for both operational and ambient measurement periods. All four locations had pure tones present as described below.

On Night 3 of testing, all four locations had a pure tone in the 4,000 Hz octave band. As discussed for Night 2, high frequency pure tones are commonly caused by insects. A cross-comparison with the field notes from those locations indicated insect noise consistently throughout testing across all four locations which is the probable cause for the pure tones. The 4,000 Hz pure tones are not attributable to the wind turbine.

There were also four (4) minutes of ambient testing at Location 1 that had pure tones at 63 Hz. A cross-comparison of the field notes and the time stamps of the pure tones indicates that these pure tones occurred during periods when cars were a noted sound source. The cars noted during these periods are the probable cause for the 63 Hz pure tones.[26] The 63 Hz pure tones measured during the ambient tests are not attributable to the wind turbine.

All 1-minute periods with pure tones on Night 3 are presented in Appendix D.

6.2.4 Night 4 – December 6, 2019 (Hub Height Wind Speed 5-10 m/s)

Operational and ambient sound level measurements were performed at all four locations between 1:00 AM and 2:00 AM on December 6, 2019. Conditions with hub height wind speeds between 5-10 m/s were targeted.

6.2.4.1 Measured Meteorological and Wind Turbine Conditions

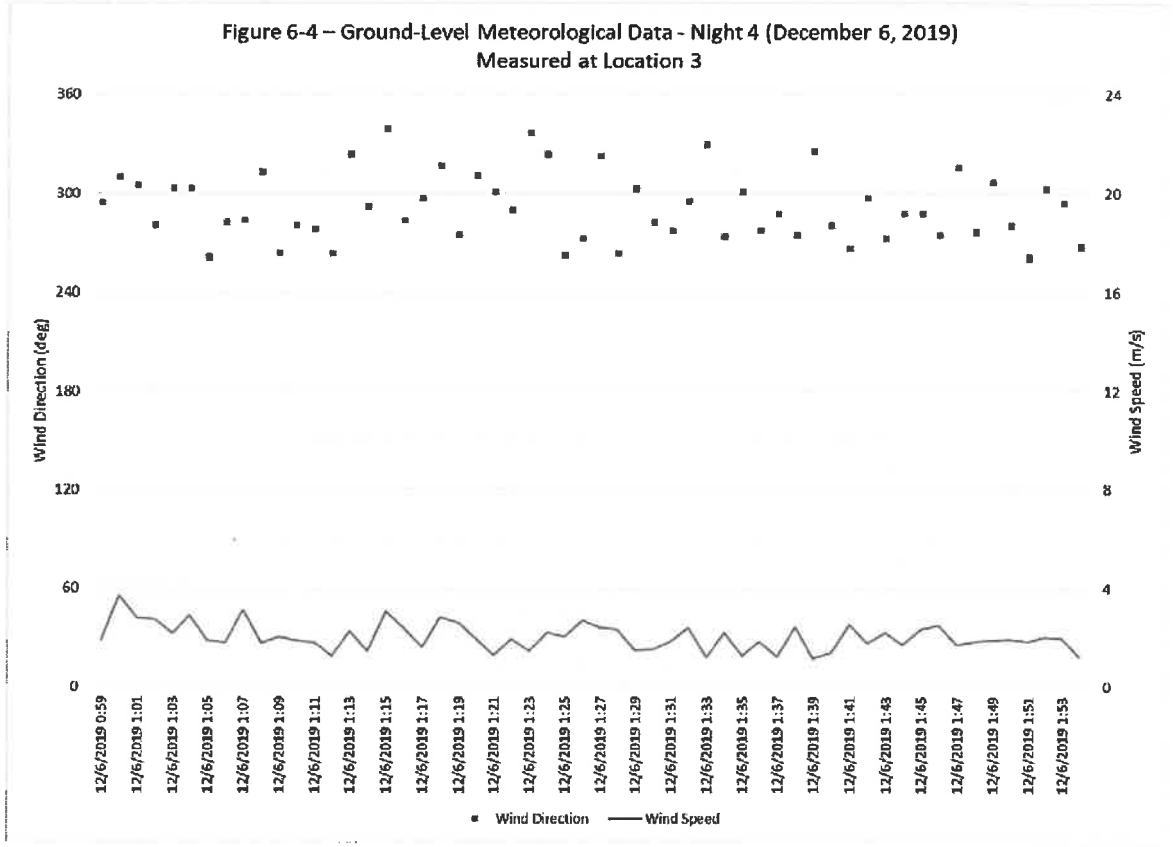
Ground-level wind conditions measured at Location 3 on December 6, 2019 are presented in Figure 6-4. One-minute averaged wind speeds ranged from 1.1 to 3.7 m/s and the average wind direction was 292° (WNW). The NWS station in Marshfield indicated a variable wind direction;

[26] Although not indicated in the field notes from Night 3, the nearby WWTP may have been contributing to the ambient sound levels this night as it was prevalent during other measurement nights.

therefore, data from the second most representative NWS station (Plymouth Municipal Airport) were reviewed and indicated wind to be coming from the west. These data are included in Appendix C of this report. Field observations indicated W to NW.[27]

SCADA data were provided by Scituate Wind, LLC for the full duration of the measurements on Night 4. These data were provided in 1-minute time-synchronized averages. The average wind speeds at hub height and the average power output from the wind turbine during the operational and ambient measurements are provided in Table 6-16. It can be seen in the table that the hub height wind speed dropped substantially between the operational measurements and the ambient measurements. The difference between the average wind speeds is 2.9 m/s, which exceeds the condition of ±2 m/s specified by the MassDEP staff in their final comments on the Protocol. Ground-level wind speeds remained relatively constant during both sets of measurements. Table 6-16 summarizes the ground-level conditions during the measurements and indicates whether each of the conditions meet the parameters identified in the Protocol.

Figure 6-4 Ground-Level Meteorological Data – Night 4 (December 6, 2019)



27 The SCADA data indicated a northerly wind direction, which is not supported by the other data sources and field observations.

Table 6-16 Meteorological and Wind Turbine Conditions - Night 4 (December 6, 2019)

Condition	Measurement Period		Meets Parameters in the Protocol?
	Operational	Ambient	
Average HH Wind Speed	7.8 m/s	4.9 m/s	No[2]
Average Wind Turbine Output	799 kW	0	Yes
Ground-Level Wind Speed[1]	1.1 – 3.7		Yes
Wind Direction[1]	WNW		Yes[3]

Notes:

1. As measured at Location 3.
2. Difference is greater than the ±2 m/s condition.
3. Is within 45° of WSW.

6.2.4.2 Sound Level Results

Sound levels on December 6, 2019 were the result of sound from the wind turbine, wind gusts, vegetation, and some cars/aircraft. Data processing for the operational sound levels were all based on Method 1 as described in Section 6.1 because the field notes at all four measurement locations had periods that showed emphasis on wind turbine contribution. In addition, audio recordings at all four locations were reviewed to verify that no non-wind turbine noise sources were clearly contributing to the 1-second L_{eq} sound levels. The highest representative 1-second L_{eq} sound levels measured during the three 5-minute operational periods are presented in Table 6-17. The timeframe in which each 5-minute measurement was captured is included in the table. The average of the three L_{eq} sound levels, or 'L_{max}', is presented in the right-most column.

The three ambient L_{90} sound levels measured at each location on Night 4 are presented in Table 6-18. The timeframe in which each 5-minute measurement was captured is included in the table. As noted in the previous section, the hub height wind speeds were stronger during the operational measurements than during the ambient measurements. Therefore, the ambient sound levels do not provide an apples-to-apples comparison to the background sound levels that may have been present during the operational measurements. Using the minimum measured L_{90} sound level in the evaluation would be overly conservative and does not meet the Protocol. Therefore, the L_{90} sound level measured during the first 5-minute period (i.e., measured closest in time to the operational measurements) at each of the four locations have been used in the evaluation and are presented in the right-most column of Table 6-18.

The Protocol specifies that the wind-turbine-attributable 'L_{max}' shall be used in the compliance evaluation. The 'L_{max}' sound levels in Table 6-17 are 'total' sound levels (wind turbine + ambient). For informational purposes, the minimum L_{90} ambient was subtracted, on an energy basis, from the 'L_{max}' sound level to provide a closer representation of wind-turbine-attributable sound levels as shown in Table 6-19.

Table 6-17 Operational Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{eq} (1:00-1:13 AM)	Operational #2 L_{eq} (1:07-1:19AM)	Operational #3 L_{eq} (1:14-1:25 AM)	'L_{max}'[1]
1 - 151 Driftway	45	45	45	45
2 - 26 Hewes	42	40	41	41
3 - 122 Gilson	40	40	42	40
4 - 34 Driftway	41	40	40	41

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

Table 6-18 Ambient Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Ambient #1 L_{90} (1:34-1:43 AM)	Ambient #2 L_{90} (1:39-1:48 AM)	Ambient #3 L_{90} (1:44-1:53 AM)	Representative Ambient L_{90}[1]
1 - 151 Driftway	36	34	34	36
2 - 26 Hewes	32	31	32	32
3 - 122 Gilson	31	32	32	31
4 - 34 Driftway	31	33	31	31

Notes:

1. Period closest in time to the operational measurements.

Table 6-19 Wind-Turbine-Attributable Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)		
	'L_{max}'	Ambient L_{90}	Wind-Turbine-Attributable 'L_{max}'[1]
1 - 151 Driftway	45	36	45
2 - 26 Hewes	41	32	40
3 - 122 Gilson	40	31	40
4 - 34 Driftway	41	31	40

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.4.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on December 6, 2019 and is presented in Table 6-20. The total 'L_{max}' sound levels shown in the earlier Table 6-17 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level.

Table 6-20 Broadband Sound Level Evaluation - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	'L_{max}'	Ambient L_{90}	Difference Between 'L_{max}' and Ambient L_{90}[1]	Complies?
1 - 151 Driftway	45	36	9	Yes
2 - 26 Hewes	41	32	9	Yes
3 - 122 Gilson	40	31	9	Yes
4 - 34 Driftway	41	31	9	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

In addition to the broadband analysis, the octave-band sound level data were analyzed for MassDEP-defined pure tones on a 1-minute basis for both operational and ambient measurement periods. All four locations had pure tones present as described below.

On Night 4, Location 1 had two (2) minutes of ambient testing that had pure tones. The pure tones occurred at 63 Hz during one minute and 1,000 Hz in the subsequent minute. The field notes indicate the presence of a hum from the nearby wastewater treatment plant. This hum is the likely cause of the 63 Hz pure tone during the ambient measurement periods. The field notes indicated vehicles passing during the time that the pure tones were measured.[28] Based on prior sound level measurement experience by Epsilon, it can be concluded that the 1,000 Hz pure tone was attributable to the vehicles observed. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

Location 2 had one (1) operational minute with a 63 Hz pure tone. This location also had two (2) ambient minutes with a 63 Hz pure tone and two (2) ambient minutes with a 500 Hz pure tone. During the operational period with the pure tone, the field technician noted aircraft as a primary sound source. A similar tone was present during ambient testing and aircraft was also noted. Another sound source noted during the ambient testing was 'possible traffic'. The measurement location is approximately 1.5 miles from Route 3A. The probable causes for the pure tones observed at this location are the overhead aircrafts and distant vehicles. No other operational periods contained a pure tone on Night 4 at Location 2. The pure tones measured at this location are not attributable to the wind turbine.

Location 3 had a pure tone at 63 Hz during a single minute of the ambient. Similar to Location 2, the field notes indicated distant traffic and an aircraft overhead during the ambient measurements. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

[28] A vehicular passby was confirmed with a review of the audio recording.

Location 4 had six (6) minutes (3 operational, 3 ambient) with an observed pure tone at 63 Hz. The field notes for Location 4 indicated distant traffic during the ambient measurements and aircraft, similar to the other locations. The measurement location is approximately 1.5 miles from Route 3A. The probable causes for the pure tones observed at this location are distant vehicles and aircraft as the pure tones were also present during ambient measurements. The pure tones measured at this location are not attributable to the wind turbine.

All 1-minute periods with pure tones on Night 4 are presented in Appendix D.

6.3 Summary of Wind-Turbine-Only Sound

Though not required for the compliance evaluation, examination of the wind-turbine-only sound levels is insightful. Table 6-21 summarizes the wind-turbine-only sound levels from all four nights as presented in Tables 6-4, 6-9, 6-14, and 6-19, respectively. In addition, the average wind turbine power output of each night during the operational measurements is shown. Nights where ambient background and total sound were within 3 dBA at any given location are shown as N/A since a source-only sound cannot be calculated. Table 6-21 shows how important background is to a source-only calculation. Nights 2 and 4 had virtually identical average power output and thus should have had the same wind-turbine-only sound levels. However, at Locations 1 and 2 they differ by 6-8 dBA from one night to the other. A closer review of the SCADA data on Night 2 revealed that winds at the hub, coupled to the power output, were generally steady during the operational measurements. Conversely, winds at the hub, as well as the power output, on Night 4 fluctuated over the course of the operational measurements. The differences shown at these two locations on these nights may also be due to non-wind-turbine sound sources. Locations 3 and 4 were within 1 dBA from one to the other. Similarly, under high wind conditions (Nights 1 and 3), the background is so high that it makes determination of a wind-turbine-only sound level nearly impossible due to the correspondingly high ambient sound levels.

Table 6-21 Summary of Wind-Turbine-Only Sound – All Four Nights (dBA)

Location	Night 1 (1500 kW)	Night 2 (814 kW)	Night 3 (1378 kW)	Night 4 (799 kW)
1 - 151 Driftway	55	51	N/A	45
2 - 26 Hewes	N/A	48	N/A	40
3 - 122 Gilson	55	39	N/A	40
4 - 34 Driftway	N/A	41	N/A	40

6.4 Residual Sound Level (L_{90}) Comparison

When a source of sound is steady and dominating, the L_{90} provides a good indicator of sound levels from that specific source. Therefore, when an "on/off" test is done in real time for a source of source such as wind turbines, a comparison of the L_{90} values is a good indicator of the impact of that sound source. Table 6-22 below provides this L_{90} to L_{90} comparison for informational purposes. In this table, the highest of the three measured L_{90} "on" periods is used to be

conservative, while the ambient values are the same as the previous evaluation tables. The same L_{90} to L_{90} comparison was done in the 2015 Tech Environmental report and has been historically used by the MassDEP in evaluating noise compliance at fossil-fueled power plants.

The results in Table 6-22 show that during high power output (Nights 1 and 3) the increase over background was very small—0 to 3 dBA in Night 1 and 0 to 1 dBA in Night 3. During moderate power output (Nights 2 and 4) the increase over background (except for Location 1) ranged from 1 to 2 dBA (Night 2) and 4 to 6 dBA (Night 4). At Location 1, the increases ranged from 9 to 11 dBA during Nights 2 and 4. Although power output was very similar between Night 2 (814 kW) and Night 4 (799 kW) the operational sound levels were louder by 3 to 7 dBA on Night 2 compared to Night 4 suggesting that something else may have influenced sound levels besides the wind turbine.

Table 6-22 Measured L_{90} to L_{90} Comparison

Night	Location	Sound Pressure Level (dBA)		
		Maximum Operational L_{90}	Ambient L_{90}	Difference[1]
Night 1 (April 19, 2019)	1 - 151 Driftway	52	49	3
	2 - 26 Hewes	51	49	2
	3 - 122 Gilson	51	51	0
	4 - 34 Driftway	54	53	0
Night 2 (July 31, 2019)	1 - 151 Driftway	49	37	11
	2 - 26 Hewes	43	41	2
	3 - 122 Gilson	40	39	1
	4 - 34 Driftway	40	38	1
Night 3 (October 2, 2019)	1 - 151 Driftway	58	57	1
	2 - 26 Hewes	53	54	--[2]
	3 - 122 Gilson	51	51	0
	4 - 34 Driftway	53	53	0
Night 4 (December 6, 2019)	1 - 151 Driftway	43	36	9
	2 - 26 Hewes	36	32	4
	3 - 122 Gilson	37	31	6
	4 - 34 Driftway	37	31	6

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.
2. Operational sound level is lower than the ambient sound level.

7.0 CONCLUSIONS

At the request of the Town of Scituate, a post-construction sound level measurement program was conducted in 2019 for Scituate Wind. The 4-night program followed methodologies outlined in the measurement Protocol that was approved by MassDEP staff. The measurement data were analyzed and evaluated per the Protocol against the MassDEP Noise Policy.

The results of this program show that sound pressure levels due to the wind turbine, under wind conditions identified as resulting in maximum sound power levels[29] and under wind conditions identified by residents filing noise complaints, meet the requirements set forth in the MassDEP Noise Policy at each of the monitoring locations with the exception of one (1) location during one of the four nights. Scituate Wind did not comply with the MassDEP Noise Policy at the nearest residence to the wind turbine during one (1) night of measurements. The residence (151 Driftway) is 650 feet to the northeast of the wind turbine and it is Epsilon's understanding that the owners of the residence were recipients of mitigation funds by Scituate Wind, LLC.

Table 7-1 summarizes the evaluations at the four measurement locations on all four nights of measurements.

Table 7-1 Summary of Scituate Wind Sound Level Evaluations

Location	Demonstrates Compliance with MassDEP Noise Policy?			
	Night 1 (April 19, 2019)	Night 2 (July 31, 2019)	Night 3 (October 2, 2019)	Night 4 (December 6, 2019)
1 - 151 Driftway	YES	NO	YES	YES
2 - 26 Hewes	YES	YES	YES	YES
3 - 122 Gilson	YES	YES	YES	YES
4 - 34 Driftway	YES	YES	YES	YES

[29] As defined by the MassDEP WTNSP.

Appendix A

Sound Level Compliance Monitoring Protocol (and Attachments)

Town of Scituate

Sound Level Compliance Monitoring Protocol – Massachusetts Department of Environmental Protection October 18, 2018

Introduction

Epsilon Associates, Inc. ("Epsilon") will perform sound monitoring, in accordance with this MassDEP-reviewed protocol, to assess off-property sound levels from operation of the single wind turbine owned by Scituate Wind located in Scituate, MA. This document describes the sound level measurement locations, measurement methodology, data evaluation methodology, and acoustical equipment utilized.

Epsilon proposes to coordinate with the Town of Scituate, Scituate Wind LLC, and the Resident Coordinator to conduct the monitoring on four (4) weeknights. The wind turbine will be shut down for at least one (1) monitoring interval each night in order to establish the background (ambient) sound levels under the same conditions as the operational sound level measurements. The intent is to identify off-property sound levels that are representative of wind turbine contribution only, excluding impacts from other sound sources, and to compare those sound levels to MassDEP guidance thresholds. This measurement protocol has been designed to conform to DEP's 2013 generic Wind Turbine Noise Study Protocol ("WTNSP") attached for reference.

Measurement Locations

The Town of Scituate, through the Special Projects Director, identified the four locations for sound testing. Permission for sound level monitoring has been granted[1] by the landowners at all locations identified below:

1: 151 Driftway - This residence is approximately 650 feet to the north-northeast of the wind turbine and is the nearest residence to the wind turbine.

2: 26 Hewes Road - This residence is approximately half a mile to the northeast of the wind turbine and is representative of the impacts at the residential properties on Hewes Road.

3: 122 Gilson Road - This residence is approximately 0.6 miles to the northeast of the wind turbine and is representative of the impacts at the residential properties on Gilson Road.

4: 34 Driftway - This residence is approximately half a mile to the east-northeast of the wind turbine.

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[1] As of August 14, 2018.

Figure 1 shows the measurement locations overlaid on an aerial orthophoto. These locations were refined with a site visit by Epsilon, the Town's Special Projects Director, and the Resident Coordinator on August 7, 2018. Specific microphone locations will have a minimum setback distance of 25 feet from structures that could cause reflection (in compliance with ANSI 12.9 Part 3 standards).

Photographs will be taken at each sampling location that indicate the location and set-up of the sound meter. These photographs shall be included in the final report submitted to the MassDEP.

Measurement Methodology

Short-term (5-minute) A-weighted broadband and un-weighted octave-band sound level measurements will be made at four locations. Measurements will be made at each location simultaneously and will be attended by Epsilon staff who will note the dominant sound sources during the testing as well as the time and description of any specific episodic sound events.

Using the 'fast' sound meter setting, the 1-second sound levels shall be recorded which will include at a minimum L_{max}, L_{eq}, and L_{90} data over 5-minute sampling periods. Operational testing will aim to be done under targeted hub height wind speeds and calm to light ground-level winds with no precipitation. At least three (3) 5-minute operational measurements will be made each night. Epsilon staff members attending each of the monitoring locations will closely monitor background (non-wind turbine) sounds during both the "turbine off' as well as "turbine on" sampling periods and will cancel or restart any 5-minute sampling period that is determined to include excessive levels of persistent, or otherwise significant, off-site contamination. The three (or more) operational measurements will be made consecutively before shutdowns occur for ambient measurements.

Based on input from the home owners involved in the study, the targeted wind direction for operational measurements will be WSW. This is generally the downwind direction of the residences to the wind turbine; therefore, the targeted wind direction range for measurements will be WSW (247.5°) $\pm 45°$. Upwind measurements will be avoided in this measurement program.

Ambient sound level measurements will be made with the wind turbine shut down immediately following the operational measurements. Scituate Wind, LLC, is expected to collect data during each night of measurements to determine whether the wind turbine was operating under the desired conditions for the operational measurements and to be available to perform the shutdowns. Targeted operational conditions are when hub height wind speeds are at least 9 m/s (i.e., during maximum sound power conditions) and when hub height wind speeds are comparable to the speeds during which noise complaints were filed to the Town (5-10 m/s). It will be confirmed with Scituate Wind LLC immediately following the ambient measurements that hub height wind speeds during the ambient period were similar to the operational periods. Scituate Wind LLC shall provide information about wind turbine operation as requested by Epsilon, including wind speed

and direction at hub height, blade pitch setting, and generator output or load following each night of monitoring.

All raw data collected during the sound study will be made available to the Town upon request. All sound level meter readings will be reported in a manner consistent with the accuracy of the meter being used.

Measurement Time Periods

Testing will generally be conducted during the hours of 1 AM to 4 AM to coincide with the quietest background levels and to be consistent with the DEP WTNSP. A total of four (4) nights will be sampled; 2 nights with hub height wind speeds at least 9 m/s, 2 nights with hub height winds speeds between 5 and 10 m/s. The Town of Scituate and Scituate Wind LLC will be invited to observe each sampling event. MassDEP personnel may be invited to observe each sampling event at the invitation of the Town of Scituate. All four monitoring locations will be sampled concurrently for operational then ambient sound. It is anticipated that the monitoring will take place during the summer and/or fall of 2018.

Weather Considerations

In order for the data to be considered valid, the following conditions will be confirmed:

- No precipitation.
- Dry roads.
- Ground-level wind speed less than 5 m/s (11 mph) as per ANSI standards.

The ground level wind speed and wind direction will be continuously measured and logged at one of the test locations. Handheld wind speed measurements will be made at the other three locations. Testing will aim to be done under hub height wind speeds described in the prior text. Epsilon will monitor the weather forecasts on a weekly basis, and will coordinate with the Town, Scituate Wind LLC, and the Resident Coordinator when favorable conditions appear imminent.

Instrumentation

Acoustical instrumentation during the measurement periods will conform to American National Standards Institute (ANSI) S1.4-1983 for Type 1 (precision) sound measurement instrumentation. Instrumentation for measuring octave-band sound levels will conform to ANSI S1.11-1986 for Octave-Band and Fractional-Octave-Band Analog and Digital Filters. The instrumentation will be capable of measuring the following descriptors over 5-minute intervals with a 1-second time history: L_{max}, L_{90}, and L_{eq}. For each descriptor type, A-weighted sound levels and un-weighted octave-band sound levels will be measured. All microphones will be tripod-mounted at a height of approximately 1.3 meters as per the WTNSP, will utilize the manufacturer's windscreen, and will be oriented toward the wind turbine. The locations will be sited away from structures in compliance with ANSI standards.

Audio recordings will be collected for all sampling periods (both operational and ambient) for quality assurance/quality control purposes using external audio recorders connected to each sound level meter.

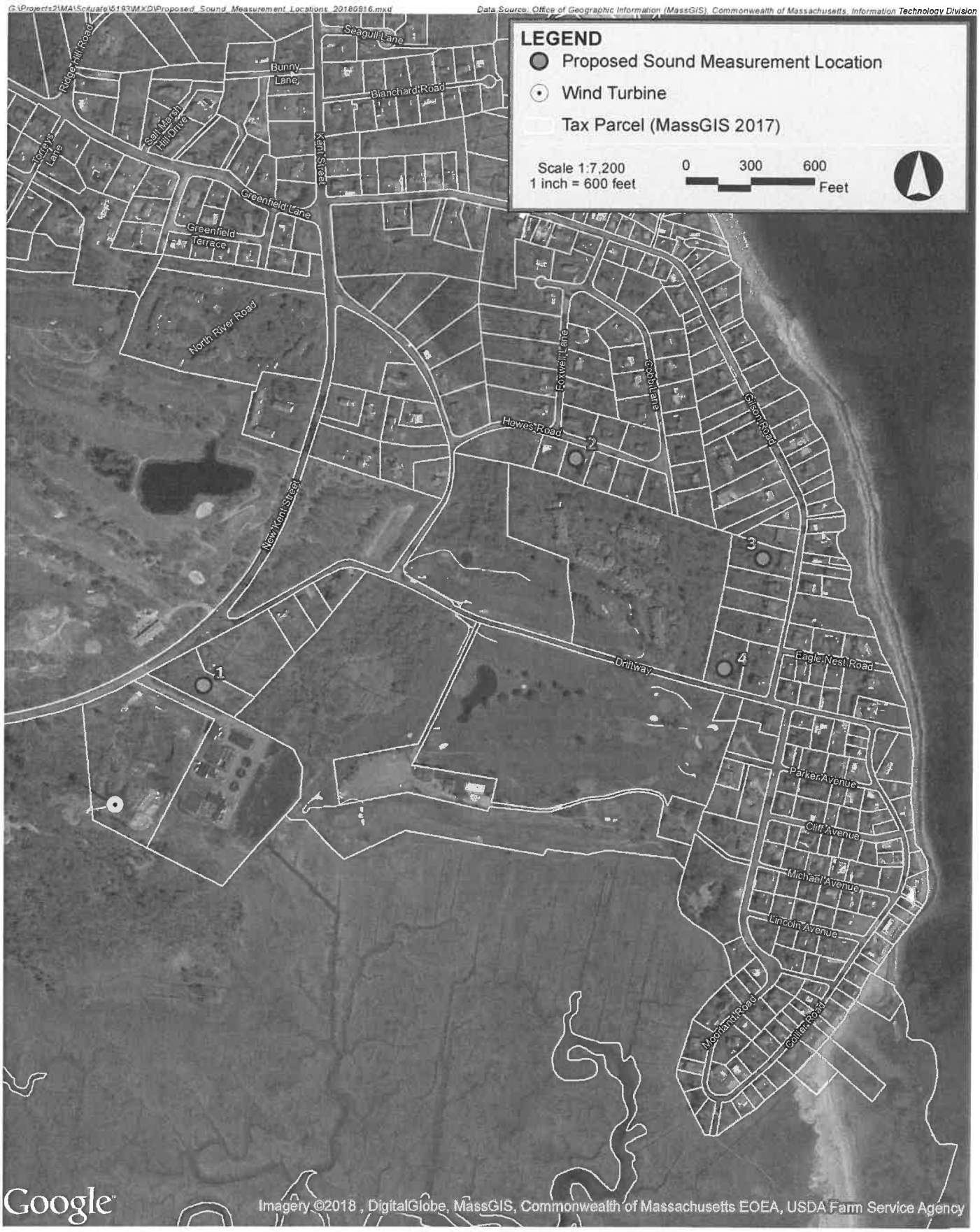
A HOBO H21-002 micro-weather station (by Onset Computer Corporation) will be deployed at one of the sound measurement locations each night to measure ground-level wind speed and direction at a 2-meter height.

Documentation of Compliance

To evaluate the collected data for comparison with requirements under 310 CMR 7.10 and MassDEP's Noise Policy, Epsilon will perform the following steps for each monitoring location (each monitoring location is analyzed separately and independently):

- Following guidance from the MassDEP, the wind turbine-attributable operational 'L_{max}' sound level will be calculated by averaging the three (3) highest 1-second L_{eq} (dBA) sound levels on each night for each location.
- The broadband ambient sound levels will be determined using the L_{90} (dBA) sound level metric.
- Evaluate compliance with the MassDEP guidance by calculating the difference between the A-weighted ambient and operational sound levels, and comparing against a standard of a 10-dBA difference. Compliance will be determined by comparing the 'L_{max}' values to the ambient L_{90} values.
- Evaluate compliance with requirements regarding "pure tone" conditions as defined in the MassDEP Noise Policy using measured octave band spectra. Un-weighted octave-band L_{eq} sound pressure levels, averaged over 1-minute intervals, will be used for a pure tone analysis. The WTNSP requires the measurement of 10 octave bands[2]. These levels will be measured concurrently with the broadband sound levels during the operational and the ambient measurement periods. Compliance will be achieved based on documentation that no octave-band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by three decibels or more, in a manner that does not already exist in the ambient sound.
- A sound report will be generated to document the results of the measurement program and the compliance evaluation. The report will contain graphs, tables, power production data, hub height wind speed, wind direction, and sound level data. A copy of the report will be provided to the MassDEP as requested.

[2] Assumed by Epsilon to be 31.5 Hz through 16,000 Hz octave bands.



Scituate Wind **Scituate, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 1

Proposed Sound Measurement Locations

Current Wind Turbine Noise Study Protocol (generic)

Equipment:

- Sampling will be performed with a Type I digital Meter with accuracy to +/- 1 dB. The sampler will be set to collect data on the "A" weighted scale in "slow" response mode with a one second recording interval (log period). The sampler will have received a factory calibration certificate within 12 months of the date of the study and will be field calibrated before and after each sampling event.
- The Wind Turbine Operator shall provide hub-height wind speeds (10 minute averages) obtained from equipment on either the north or south turbine.

Sampling Sites and Operating Conditions:

- Three to five sites will be sampled at the point of perceived maximum impact from the wind turbines. At minimum, the sites to be sampled including the home closest to the wind turbine from each affected neighborhood. Additional sites may be added as conditions during sampling warrant and at the discretion of MassDEP.
- MassDEP will coordinate with the residents at the selected site to determine the point of greatest sound impact and will conduct the sampling at or near that location or at the property line, whichever is practicable. Sampling will not be conducted indoors.
- The sampler will be mounted at a height of approximately 1.3 meters and shall be located so as to comply with offsets from vertical reflecting surfaces as specified in ANSI 12.9, Part 3.
- Multiple operating conditions (wind speeds/ wind direction) will be evaluated including the following:
    1. At or near the cut-in wind speed where background sound will be the lowest (4-5 m/s wind speed at hub height) and the affected residences will be downwind or perpendicular and to the right of the turbine (to the right when facing the turbine)
    2. At the wind speed where manufacturer data indicates there will be the greatest sound power level from the turbine (9-11 m/s) and the affected residences will be downwind or perpendicular and to the right of the turbine (to the right when facing the turbine)
    3. Sampling of multiple wind directions may be required to capture these conditions at the selected sampling sites.

Procedure:

- Sampling will start with data collection during the quietest overnight hours to be determined on a site specific basis (generally 1am-4am). Should sampling during that time period reveal no exceedence of MassDEP's noise policy at one or more locations for the given wind conditions sampled, additional daytime and evening sampling will not be conducted for those locations.
- Sampling days will be selected based on predicted wind conditions. MassDEP will make every effort to notify The Town, the turbine owner/operator and residents at whose properties sampling will be conducted at least 24 hours in advance of a sampling event.
- To evaluate the effect of wind speed on turbine sound emission levels (impact sound), three sampling runs will be conducted at each site under each operating condition to establish an L_{max}

for each respective operating condition. L_{max} is the highest sampled sound level attributed to the sound source (wind turbines) during the sampling run on a one second average. The L_{max} from each of three runs at a single site and operating condition will be averaged to create a single L_{max} for that sampling site under the select wind conditions.

- Each sampling run will be 5 minutes in duration. Samples will be collected manually every 5 seconds (60 sound measurements). Consistent with current MassDEP guidance, any peak sound levels that can be attributed to another sound source (e.g. local traffic, resident generated sounds, etc.) will be identified by the study attendant and discarded from the data set before determining L_{max}.
- At each site, background sampling shall be performed to determine the L_{90} background against which the L_{max} will be compared. The study attendant shall coordinate with the wind turbine owner/ operator to shut down the wind turbine for the purpose of sampling background. If MassDEP is unable to collect background samples at each site or if the wind turbine cannot be shut down, MassDEP reserves the right to define the background sound levels by sampling at a surrogate site of similar land use and proximity to other local sound sources (but not impacted by the wind turbine)
- As the sampling will be done under conditions where the wind might significantly contribute to total sound recorded, MassDEP will make an effort to exclude data from analysis where the sound of the wind is dominant over the sound of the wind turbines.
- At selected sites, a pure tone analysis will be conducted. For pure tone analysis, the meter will be set to collect linear sound on a "slow" response and an octave band filter will be employed to speciate sound pressure levels for 10 octave bands. Pure tone analysis will include collection of one minute L_{eq} sound pressure levels with the wind turbines operating and without the wind turbines operating to evaluate the impact of the wind turbines to pure tone.

Assessment of Results

Once the data is collected and quality control review is complete, MassDEP will analyze all of the data to determine if the sound levels from the wind turbines comply with MassDEP's Noise Policy Threshold for impact sound of 10 dB(A) at each of the sampling sites and under each of the defined operating scenarios. The pure tone data will be analyzed to determine if any octave band center frequency sound pressure level attributable to the wind turbines exceeds the two adjacent center frequency sound pressure level by three decibels or more. The results will be compiled into a single report to be provided to the Town once the sampling and data quality review is complete.

Responses to DEP Comments on Proposed Protocol for Scituate Wind

Comments Provided: 9/21/2018

Responses Dated: 9/26/2018

MassDEP Southeast Regional Office has reviewed the proposed protocol dated August 28, 2018, prepared by Epsilon Associates, Inc., and offers the following comments/questions/recommendations:

1. The 'fast' meter setting is the appropriate setting for both ambient and operational sound monitoring.
   Response: Okay

2. Page 1, first paragraph: strike the reference of MassDEP approving the monitoring protocol. MassDEP is providing comments on the protocol.
   Response: Okay

3. Since the MassDEP 2013 generic Wind Turbine Noise Sound Study Protocol is frequently referenced in the proposed protocol, the document should be attached to the protocol for reference.
   Response: Okay, will attach

4. Lmax should be further defined. The MassDEP monitoring method used for recent wind turbine monitoring programs is based on a maximum sound level Lmax. This Lmax is represented by the average of the three highest 1-second LEQ (turbine ON) values and compared to a baseline (turbine OFF) L90 sound level to determine compliance with the MassDEP Noise Policy.
   Response: Okay, operational sound levels will be calculated using the average of the three highest 1-second Leq values as described in the comment.

5. MassDEP recommends that sampling not be limited to direct downwind conditions and that Epsilon consider a range around the downwind direction. MassDEP has found that in other similar studies worse case sound impacts were not located directly downwind of the sound source.
   Response: Okay, will specify

6. What are the elevations of the sample locations and how does elevation play a role in choosing potential monitoring locations?
   Response: Locations were selected based on input from the community/town.

7. Will any noise reduced operation modes, curtailment plans, etc. be enacted during the sound testing?
   Response: There will not be any noise reduced operation modes, curtailment plans, etc. be enacted during the sound testing

8. MassDEP recommends that the full range of power production be evaluated (low, medium, high) during the sound monitoring, and the low, medium, and high power production ranges should be clearly defined.
   Response: Power production conditions have been selected based on actual conditions experienced during which complaints have been filed. As described in the Scituate Wind protocol, wind speeds as low as 5 m/s will be tested as well as wind speeds during maximum wind turbine sound power.

9. How was it determined what the quietest ambient hours are in the target areas? Also, a +/- 2 hours in the proposed 1 am to 4 am range could result in a monitoring window of 11 pm to 6am. There could be a significant difference in ambient within this period of time. MassDEP recommends that supporting documentation/data be provided which identifies the quietest ambient hours, and that the monitoring window be shortened to ensure that monitoring is conducted during the quietest ambient hours.
   Response: The Protocol will be revised to state a measurement timeframe of 1am to 4am without the ±2 hour flexibility.

10. Regarding ambient measurement, persistent uncharacteristic sound sources (e.g. persistent barking dogs, etc.) should be flagged and excluded from the data.
    Response: Okay

11. Describe how the data will be reported in the final report (i.e. graphs, tables, power production data, hub height wind speed, wind direction, sound levels, etc.).
    Response: The final sound report will contain graphs, tables, power production data, hub height wind speed, wind direction, and sound levels.

12. MassDEP requests that sound turbine power curves be provided with the completed sound monitoring report.
    Response: Wind turbine power curves are typically confidential by the turbine manufacturer and will therefore not be included in the sound report.

13. MassDEP requests that a copy of the complete sound monitoring report be submitted to MassDEP.

Response: Okay

Responses to DEP Comments on Protocol for Scituate Wind

Comments Provided: 10/31/2018

Responses Dated: 11/27/2018

MassDEP Southeast Regional Office has reviewed the proposed protocol, revised October 18, 2018, prepared by Epsilon Associates, Inc., and offers the following comments/questions/recommendations:

1. MassDEP previously recommended that "the full range of power production be evaluated (low, medium, high) during the sound monitoring, and the low, medium, and high power production ranges should be clearly defined." The Town of Scituate responded to this recommendation as follows: "Power production conditions have been selected based on actual conditions experienced during which complaints have been filed. As described in the Scituate Wind protocol, wind speeds as low as 5 m/s will be tested as well as wind speeds during maximum wind turbine sound power."

   At the bottom of page 2 of the protocol it states, "Targeted operational conditions are when hub height wind speeds are at least 9 m/s (i.e., during maximum sound power conditions) and when hub height wind speeds are comparable to the speeds during which noise complaints were filed to the Town (5-10 m/s)."

   Similarly, page 3 of the protocol states, "A total of four (4) nights will be sampled; 2 nights with hub height wind speeds at least 9 m/s, 2 nights with hub height winds speeds between 5 and 10 m/s."

   The above two paragraphs are written in such a way that the two targeted ranges for hub height wind speed (at least 9 m/s and 5-10 m/s) could potentially be the same (i.e. 9 or 10 m/s fall under both ranges). If the intent is to target two distinct ranges of hub height wind speed, perhaps the two ranges should be "at least 9 m/s" and "5-8 m/s". In addition, the WTNSP states, in part, that multiple hub height wind speeds be evaluated, including when background sound will be the lowest and when manufacturer data indicates there will be the greatest sound power level from the turbine. Current language in the Protocol does not ensure compliance with this WTNSP provision.

   Response: Background sound levels will be lowest during the quietest nighttime hours and when ground level winds are light which is when background measurements will be performed. As described in the Protocol, manufacturer data indicate the greatest sound power level from the turbine will be when hub height wind speeds are at least 9 m/s. Measurements will be performed under

these conditions. The hub height wind speed ranges identified in the Protocol are designed for two scenarios; when complaints occur and when the sound power output from the wind turbine is greatest. Evaluations will be performed in that manner.

2. MassDEP previously commented that "Lmax should be further defined. The MassDEP monitoring method used for recent wind turbine monitoring programs is based on a maximum sound level Lmax. This Lmax is represented by the average of the three highest 1-second LEQ (turbine ON) values and compared to a baseline (turbine OFF) L90 sound level to determine compliance with the MassDEP Noise Policy." The Town of Scituate responded to this recommendation as follows: "Okay, operational sound levels will be calculated using the average of the three highest 1-second Leq values as described in the comment."

   To further clarify this procedure, the highest 1-second Leq from each 5-minute sampling period will be averaged to create a single Lmax for that sampling site under the select wind conditions. (i.e. the highest 1-second Leqs to be averaged cannot be from within the same 5-minute sampling period or represent different operating conditions). The WTNSP describes this procedure in detail.

   Response: Okay

3. MassDEP previously commented, "How was it determined what the quietest ambient hours are in the target areas? Also, a +/- 2 hours in the proposed 1 am to 4 am range could result in a monitoring window of 11 pm to 6am. There could be a significant difference in ambient within this period of time. MassDEP recommends that supporting documentation/data be provided which identifies the quietest ambient hours, and that the monitoring window be shortened to ensure that monitoring is conducted during the quietest ambient hours." The Town of Scituate responded to this comment as follows: "The Protocol will be revised to state a measurement timeframe of 1am to 4am without the ±2 hour flexibility."

   The WTNSP states, "Sampling will start with data collection during the quietest overnight hours **to be determined on a site specific basis** (generally 1 am-4 am)." Again, MassDEP recommends that supporting documentation/data be provided which identifies the quietest ambient hours at the target areas.

   Response: Please see the attached pre-construction sound study report which documents ambient sound levels. Appendix B of the study presents hourly L90 sound levels measured in the vicinity of the site. It can be derived from these data that 1 am to 4 am are generally the quietest hours in the area.

4. At the bottom of page 2 of the protocol it states, "It will be confirmed with Scituate Wind LLC immediately following the ambient measurements that hub height wind speeds during the

ambient period **were similar to** the operational periods." MassDEP recommends that "similar" be further defined (i.e. +/- 2 m/s).

Response: Okay

5. On page 4 of the protocol it states, "The broadband ambient sound levels will be determined using the L90 (dBA) sound level metric." MassDEP recommends including additional description of how L90 will be determined/calculated. It is unclear whether multiple 5-minute sampling periods will be utilized for ambient sound level measurements, similar to operational testing, or whether an alternate scenario is proposed.

   Response: The L90 will be the measured L90 sound level of the one 5-minute ambient measurement collected that night. The ambient measurement will be canceled or restarted if any sampling period is determined to include excessive levels of persistent, or otherwise significant, off-site contamination, or not representative of the operational weather conditions. A new L90 ambient will be measured for each of the four nights of testing.

6. On page 4 of the protocol it states, "Compliance will be determined by comparing the 'Lmax' values to the ambient L90 values." MassDEP recommends further clarifying that Lmax and L90 values will be compared under the same wind conditions, monitoring locations, etc.

   Response: Okay

7. MassDEP requests clarification as to whether the residence located at Monitoring Location #1, 151 Driftway, has previously been subject to an agreement/buyout with the Town regarding sound created by the Scituate Wind LLC turbine. If an agreement/buyout was previously established, how would that affect any potential noise issues documented at Monitoring Location #1 by the sound level compliance monitoring?

   Response: Mitigation funds were provided to the resident at 151 Driftway by Scituate Wind, LLC; however, the Town has elected to measure at this residence during this program.

Appendix B

Sample Field Note Sheet (Operational)

Sound Monitoring Form Page____ of____ **Epsilon**

Msmt Start Time:	1:00	SLM Msmt ID:	011
Operation Condition:	Operational		☐Same as previous

Run Time	Wind Turbine	Wind Gusts	Cars	Other (e.g. insects, vegetation, etc.)
0:00:00 - 0:00:05		✓		✓
0:00:05 - 0:00:10		✓		✓
0:00:10 - 0:00:15	WT	✓		✓
0:00:15 - 0:00:20	clearly at	✓		✓
0:00:20 - 0:00:25	audible times	✓		✓
0:00:25 - 0:00:30	✓			✓
0:00:30 - 0:00:35	✓			✓
0:00:35 - 0:00:40	✓	✓		✓
0:00:40 - 0:00:45	✓	✓		
0:00:45 - 0:00:50	✓			
0:00:50 - 0:00:55	✓			
0:00:55 - 0:01:00	✓			✓
0:01:00 - 0:01:05	✓			✓
0:01:05 - 0:01:10	✓			
0:01:10 - 0:01:15	✓			
0:01:15 - 0:01:20	✓	✓		
0:01:20 - 0:01:25	✓			✓
0:01:25 - 0:01:30	✓			✓
0:01:30 - 0:01:35	✓	✓		✓
0:01:35 - 0:01:40	✓			
0:01:40 - 0:01:45	✓			✓
0:01:45 - 0:01:50	✓			✓
0:01:50 - 0:01:55	✓			✓
0:01:55 - 0:02:00	✓			✓
0:02:00 - 0:02:05	✓			✓
0:02:05 - 0:02:10	✓	✓		
0:02:10 - 0:02:15				✓
0:02:15 - 0:02:20				
0:02:20 - 0:02:25	✓			
0:02:25 - 0:02:30	✓			✓
0:02:30 - 0:02:35	✓			
0:02:35 - 0:02:40	✓*			
0:02:40 - 0:02:45	✓			✓
0:02:45 - 0:02:50	✓			✓
0:02:50 - 0:02:55	✓			✓
0:02:55 - 0:03:00	✓			
0:03:00 - 0:03:05				✓
0:03:05 - 0:03:10	✓			
0:03:10 - 0:03:15	✓			
0:03:15 - 0:03:20				✓
0:03:20 - 0:03:25	✓			✓
0:03:25 - 0:03:30	✓			✓
0:03:30 - 0:03:35	✓			✓
0:03:35 - 0:03:40	✓			✓
0:03:40 - 0:03:45	✓			✓
0:03:45 - 0:03:50	✓			✓
0:03:50 - 0:03:55	✓			
0:03:55 - 0:04:00				✓
0:04:00 - 0:04:05	✓			
0:04:05 - 0:04:10	✓			✓
0:04:10 - 0:04:15	✓			✓
0:04:15 - 0:04:20	* ✓			
0:04:20 - 0:04:25	✓			
0:04:25 - 0:04:30	✓	✓		✓
0:04:30 - 0:04:35		✓*		✓
0:04:35 - 0:04:40				
0:04:40 - 0:04:45				
0:04:45 - 0:04:50	✓			
0:04:50 - 0:04:55	✓			
0:04:55 - 0:05:00	* ✓			

some vegetation, chimes, leaves

5-Minute Result: L_{eq} L_{90} (dBA)

Appendix C

National Weather Service Data (Marshfield Municipal Airport)

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
April 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W

Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
18	0010	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	5	220		30.26				FM-15		30.27
18	0035	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	220		30.26				FM-15		30.27
18	0055	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	210		30.26				FM-15		30.27
18	0115	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	220		30.25				FM-15		30.26
18	0135	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	220		30.25				FM-15		30.26
18	0155	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	220		30.25				FM-15		30.26
18	0215	7	CLR:00	10.00		43	6.1	41	5.0	39	3.9	87	6	220		30.24				FM-15		30.25
18	0235	7	CLR:00	10.00		41	5.0	40	4.4	39	3.9	93	5	230		30.24				FM-15		30.25
18	0255	7	CLR:00	10.00		41	5.0	40	4.4	39	3.9	93	3	230		30.24				FM-15		30.25
18	0315	7	CLR:00	10.00		39	3.9	38	3.3	37	2.8	93	3	230		30.24				FM-15		30.25
18	0335	7	CLR:00	10.00		39	3.9	38	3.3	37	2.8	93	0	000		30.24				FM-15		30.25
18	0355	7	CLR:00	10.00		37	2.8	37	2.8	37	2.8	100	0	000		30.25				FM-15		30.26
18	0415	7	CLR:00	10.00		37	2.8	37	2.8	36	2.2	93	3	240		30.25				FM-15		30.26
18	0435	7	CLR:00	10.00		36	2.2	36	2.2	36	2.2	100	0	000		30.26				FM-15		30.27
18	0455	7	CLR:00	10.00		36	2.2	36	2.2	36	2.2	100	0	000		30.26				FM-15		30.27
18	0515	7	CLR:00	10.00		36	2.2	36	2.2	36	2.2	100	0	000		30.27				FM-15		30.28
18	0535	7	CLR:00	10.00		37	2.8	37	2.8	37	2.8	100	0	000		30.27				FM-15		30.28
18	0555	7	CLR:00	10.00		41	5.0	40	4.4	39	3.9	93	0	000		30.27				FM-15		30.28
18	0615	7	SCT:04 100	10.00		45	7.2	42	5.6	39	3.9	81	3	200		30.28				FM-15		30.29
18	0635	7	FEW:02 100	10.00		45	7.2	41	5.0	37	2.8	76	3	160		30.28				FM-15		30.29
18	0655	7	FEW:02 85	10.00		46	7.8	42	5.6	37	2.8	71	5	180		30.27				FM-15		30.28
18	0715	7	BKN:07 85	10.00		46	7.8	42	5.6	36	2.2	66	5	170		30.27				FM-15		30.28
18	0735	7	BKN:07 75 OVC:08 85	10.00		46	7.8	42	5.6	37	2.8	71	7	160		30.26				FM-15		30.27
18	0755	7	OVC:08 70	10.00		46	7.8	41	5.0	34	1.1	62	9	150		30.26				FM-15		30.27
18	0815	7	OVC:08 65	10.00		46	7.8	40	4.4	32	0.0	57	9	VRB		30.25				FM-15		30.26
18	0835	7	OVC:08 65	10.00		46	7.8	42	5.6	36	2.2	66	7	VRB		30.26				FM-15		30.27
18	0855	7	OVC:08 65	10.00		48	8.9	42	5.6	34	1.1	58	9	VRB		30.26				FM-15		30.27
18	0915	7	FEW:02 55 OVC:08 65	10.00		48	8.9	41	5.0	32	0.0	54	6	VRB	*	30.26				FM-15		30.27
18	0935	7	FEW:02 40 FEW:02 50 OVC:08 65	10.00		48	8.9	42	5.6	34	1.1	58	7	140	*	30.24				FM-15		30.25
18	0955	7	OVC:08 60	10.00		48	8.9	43	6.1	37	2.8	66	8	140		30.24				FM-15		30.25
18	1015	7	OVC:08 60	10.00		48	8.9	43	6.1	37	2.8	66	9	150		30.24				FM-15		30.25
18	1035	7	FEW:02 49 OVC:08 60	10.00		46	7.8	43	6.1	39	3.9	76	11	130		30.22				FM-15		30.23
18	1055	7	FEW:02 48 OVC:08 55	10.00		46	7.8	43	6.1	39	3.9	76	8	160		30.24				FM-15		30.25
18	1115	7	OVC:08 55	10.00		46	7.8	43	6.1	39	3.9	76	8	140	17	30.23				FM-15		30.24
18	1135	7	OVC:08 55	10.00		48	8.9	44	6.7	39	3.9	71	9	140		30.23				FM-15		30.24
18	1155	7	OVC:08 55	10.00		48	8.9	44	6.7	39	3.9	71	10	140	17	30.22				FM-15		30.23
18	1215	7	BKN:07 50 BKN:07 100	10.00		50	10.0	45	7.2	39	3.9	67	15	140		30.20				FM-15		30.21
18	1235	7	BKN:07 49 BKN:07 80 BKN:07 100	10.00		52	11.1	47	8.3	41	5.0	67	14	130		30.20				FM-15		30.21
18	1255	7		10.00		50	10.0	46	7.8	41	5.0	71	11	140	18	30.19				FM-15		30.20
18	1315	7		9.00		50	10.0	46	7.8	41	5.0	71	9	140		30.18				FM-15		30.19

18	1335	7	OVC:08 46	10.00		52	11.1	46	7.8	39	3.9	62	13	VRB	24	30.17				FM-15		30.18
18	1355	7	BKN:07 42 OVC:08 50	10.00		52	11.1	46	7.8	39	3.9	62	14	160	23	30.14				FM-15		30.15
18	1415	7	OVC:08 38	10.00		52	11.1	46	7.8	39	3.9	62	14	180	25	30.14				FM-15		30.15
18	1435	7	OVC:08 33	10.00		52	11.1	46	7.8	39	3.9	62	14	VRB	21	30.13				FM-15		30.14
18	1455	7	OVC:08 32			52	11.1	46	7.8	39	3.9	62	13	170	23	30.13				FM-15		30.14
18	1515	7	OVC:08 31	10.00		52	11.1	47	8.3	41	5.0	67	8	170	18	30.13				FM-15		30.14
18	1535	7	OVC:08 28	10.00		50	10.0	47	8.3	43	6.1	76	10	VRB	22	30.12				FM-15		30.13
18	1555	7		10.00		50	10.0	46	7.8	41	5.0	71	6	150	18	30.11				FM-15		30.12
18	1615	7		10.00		50	10.0	47	8.3	43	6.1	76	8	140	*	30.09				FM-15		30.10
18	1635	7	BKN:07 18 OVC:08 23	10.00		48	8.9	47	8.3	45	7.2	87	7	130		30.08				FM-15		30.09
18	1655	7	OVC:08 15	10.00		48	8.9	47	8.3	45	7.2	87	7	140		30.06				FM-15		30.07
18	1715	7	OVC:08 14	10.00		48	8.9	47	8.3	46	7.8	94	6	150	*	30.05				FM-15		30.06
18	1735	7	OVC:08 15	10.00		48	8.9	47	8.3	46	7.8	94	6	VRB		30.04				FM-15		30.05
18	1755	7	OVC:08 16	9.00		50	10.0	49	9.4	48	8.9	94	5	170		30.03				FM-15		30.04
18	1815	7	OVC:08 16	10.00		52	11.1	51	10.6	50	10.0	94	9	VRB		30.01				FM-15		30.02
18	1835	7	OVC:08 16	10.00		54	12.2	52	11.1	50	10.0	88	10	VRB	18	30.00				FM-15		30.01
18	1855	7	OVC:08 15	10.00		55	12.8	53	11.7	52	11.1	88	9	VRB		29.99				FM-15		30.00
18	1915	7	OVC:08 14	10.00		57	13.9	54	12.2	52	11.1	82	7	VRB	20	29.99				FM-15		30.00
18	1935	7	OVC:08 14	10.00		57	13.9	55	12.8	54	12.2	88	9	VRB	16	29.98				FM-15		29.99
18	1955	7	OVC:08 13	10.00		57	13.9	55	12.8	54	12.2	88	14	VRB	25	29.96				FM-15		29.97
18	2015	7	OVC:08 11	10.00		57	13.9	56	13.3	55	12.8	94	16	190	26	29.95				FM-15		29.96
18	2035	7	OVC:08 10	10.00		59	15.0	57	13.9	55	12.8	88	16	200	28	29.94				FM-15		29.95
18	2055	7	OVC:08 10	10.00		59	15.0	58	14.4	57	13.9	94	15	200	25	29.93				FM-15		29.94
18	2115	7	OVC:08 9	10.00		61	16.1	59	15.0	57	13.9	88	20	210	30	29.92				FM-15		29.93
18	2135	7	OVC:08 9	10.00		61	16.1	60	15.6	59	15.0	94	15	VRB	29	29.91				FM-15		29.92
18	2155	7	OVC:08 8	9.00		61	16.1	60	15.6	59	15.0	94	17	VRB	30	29.90				FM-15		29.91
18	2215	7	OVC:08 7	9.00		61	16.1	60	15.6	59	15.0	94	16	200	30	29.89				FM-15		29.90
18	2235	7	OVC:08 7	8.00		61	16.1	61	16.1	61	16.1	100	21	210	29	29.89				FM-15		29.90
18	2255	7	OVC:08 8	10.00		63	17.2	62	16.7	61	16.1	94	21	210	30	29.88				FM-15		29.89
18	2315	7	OVC:08 8	10.00		63	17.2	62	16.7	61	16.1	94	21	220	32	29.89				FM-15		29.90
18	2335	7	OVC:08 9	10.00		63	17.2	62	16.7	61	16.1	94	17	210	25	29.89				FM-15		29.90
18	2355	7	OVC:08 10	10.00		63	17.2	62	16.7	61	16.1	94	18	210	28	29.88				FM-15		29.89
19	0015	7	BKN:07 12 OVC:08 19	10.00		63	17.2	62	16.7	61	16.1	94	22	220	36	29.88				FM-15		29.89
19	0035	7	BKN:07 14 OVC:08 23	10.00		64	17.8	62	16.7	61	16.1	88	18	220	33	29.87				FM-15		29.88
19	0055	7	BKN:07 16 OVC:08 22	10.00		64	17.8	62	16.7	61	16.1	88	15	220	30	29.86				FM-15		29.87
19	0115	7	BKN:07 15 OVC:08 21	10.00		64	17.8	62	16.7	61	16.1	88	18	220	34	29.85				FM-15		29.86
19	0135	7	BKN:07 13 OVC:08 18	10.00		64	17.8	62	16.7	61	16.1	88	18	VRB	31	29.84				FM-15		29.85
19	0155	7	BKN:07 13 OVC:08 20	10.00		64	17.8	62	16.7	61	16.1	88	23	220	37	29.84				FM-15		29.85
19	0215	7	BKN:07 13 OVC:08 19	10.00		64	17.8	62	16.7	61	16.1	88	23	220	52	29.83				FM-15		29.84
19	0235	7	OVC:08 12	10.00		64	17.8	62	16.7	61	16.1	88	18	VRB	44	29.83				FM-15		29.84
19	0255	7	OVC:08 13	10.00		64	17.8	62	16.7	61	16.1	88	17	230	31	29.82				FM-15		29.83
19	0315	7	OVC:08 12	10.00		64	17.8	62	16.7	61	16.1	88	17	230	33	29.82				FM-15		29.83
19	0335	7	BKN:07 13 OVC:08 20	10.00		64	17.8	62	16.7	61	16.1	88	16	230	33	29.81				FM-15		29.82
19	0355	7	BKN:07 15 BKN:07 21	10.00		63	17.2	61	16.1	59	15.0	88	23	230	34	29.82				FM-15		29.83
19	0415	7	SCT:04 14 BKN:07 19	10.00		63	17.2	61	16.1	59	15.0	88	13	VRB	31	29.82				FM-15		29.83
19	0435	7	SCT:04 15	10.00		63	17.2	61	16.1	59	15.0	88	20	VRB	30	29.82				FM-15		29.83
19	0455	7	SCT:04 17 SCT:04 24	10.00		64	17.8	61	16.1	59	15.0	83	20	VRB	31	29.82				FM-15		29.83

19	0515	7	FEW:02 17 SCT:04 24	10.00		63	17.2	61	16.1	59	15.0	88	22	220	38	29.82				FM-15		29.83
19	0535	7	FEW:02 16 FEW:02 23	10.00		64	17.8	61	16.1	59	15.0	83	17	230	36	29.82				FM-15		29.83
19	0555	7	FEW:02 16 FEW:02 23	10.00		64	17.8	61	16.1	59	15.0	83	17	VRB	28	29.82				FM-15		29.83
19	0615	7	FEW:02 16	10.00		64	17.8	61	16.1	59	15.0	83	20	220	33	29.81				FM-15		29.82
19	0635	7	FEW:02 18	10.00		64	17.8	61	16.1	59	15.0	83	21	VRB	33	29.82				FM-15		29.83
19	0655	7	FEW:02 19	10.00		66	18.9	62	16.7	59	15.0	78	16	220	26	29.82				FM-15		29.83
19	0715	7	FEW:02 36	10.00		66	18.9	62	16.7	59	15.0	78	18	220	39	29.82				FM-15		29.83
19	0735	7	CLR:00	10.00		66	18.9	62	16.7	59	15.0	78	16	220	39	29.83				FM-15		29.84
19	0755	7	CLR:00	10.00		66	18.9	62	16.7	59	15.0	78	22	230	32	29.83				FM-15		29.84
19	0815	7	FEW:02 24 FEW:02 49	10.00		68	20.0	63	17.2	59	15.0	73	14	VRB	32	29.82				FM-15		29.83
19	0835	7	FEW:02 22 FEW:02 26 SCT:04 70	10.00		68	20.0	63	17.2	59	15.0	73	16	VRB	36	29.82				FM-15		29.83
19	0855	7	SCT:04 21 SCT:04 27 BKN:07 50	10.00		70	21.1	64	17.8	61	16.1	73	21	220	34	29.82				FM-15		29.83
19	0915	7	BKN:07 16 BKN:07 22 BKN:07 26	10.00		68	20.0	64	17.8	61	16.1	78	22	220	38	29.82				FM-15		29.83
19	0935	7	BKN:07 17 OVC:08 22	10.00		68	20.0	64	17.8	61	16.1	78	24	220	38	29.82				FM-15		29.83
19	0955	7	OVC:08 19	10.00		70	21.1	66	18.9	63	17.2	78	14	230	30	29.83				FM-15		29.84
19	1015	7	BKN:07 19 OVC:08 24	10.00		70	21.1	66	18.9	63	17.2	78	15	220	37	29.82				FM-15		29.83
19	1035	7	BKN:07 20 BKN:07 25 BKN:07 42	10.00		70	21.1	66	18.9	63	17.2	78	24	220	37	29.82				FM-15		29.83
19	1055	7	SCT:04 20 BKN:07 25 BKN:07 29	9.00		70	21.1	66	18.9	63	17.2	78	20	220	39	29.82				FM-15		29.83
19	1115	7	BKN:07 20 BKN:07 26 BKN:07 90	10.00		72	22.2	66	18.9	63	17.2	73	25	VRB	43	29.82				FM-15		29.83
19	1135	7	BKN:07 21 BKN:07 90 BKN:07 110	10.00		72	22.2	66	18.9	63	17.2	73	20	230	33	29.82				FM-15		29.83
19	1155	7	BKN:07 20 BKN:07 27 BKN:07 90	10.00		70	21.1	66	18.9	63	17.2	78	22	VRB	38	29.81				FM-15		29.82
19	1215	7	BKN:07 22 BKN:07 27 BKN:07 35	10.00		72	22.2	66	18.9	63	17.2	73	18	VRB	33	29.81				FM-15		29.82
19	1235	7	BKN:07 22 BKN:07 29 BKN:07 37	9.00		70	21.1	66	18.9	63	17.2	78	22	220	33	29.81				FM-15		29.82
19	1255	7	BKN:07 21 BKN:07 28 BKN:07 37	10.00		70	21.1	66	18.9	63	17.2	78	24	210	32	29.81				FM-15		29.82
19	1315	7	BKN:07 19 BKN:07 24 BKN:07 37	10.00		70	21.1	66	18.9	63	17.2	78	21	220	32	29.81				FM-15		29.82
19	1335	7		10.00		70	21.1	66	18.9	63	17.2	78	22	210	37	29.81				FM-15		29.82
19	1355	7		6.00	HZ:7 |FU |HZ	70	21.1	66	18.9	63	17.2	78	18	210	30	29.81				FM-15		29.82
19	1415	7	BKN:07 17 OVC:08 22	5.00	BR:1 ||	66	18.9	64	17.8	63	17.2	88	16	VRB	28	29.81				FM-15		29.82
19	1435	7	OVC:08 14	7.00		66	18.9	64	17.8	63	17.2	88	16	210	28	29.82				FM-15		29.83
19	1455	7	OVC:08 13	4.00	BR:1 ||	66	18.9	64	17.8	63	17.2	88	20	220	30	29.82				FM-15		29.83
19	1515	7	OVC:08 12	2.00	BR:1 ||	66	18.9	64	17.8	63	17.2	88	21	210	31	29.82				FM-15		29.83
19	1535	7	BKN:07 10 OVC:08 15	2.00	BR:1 ||	64	17.8	64	17.8	64	17.8	100	15	VRB	25	29.82				FM-15		29.83

19	1555	7	BKN:07 10 OVC:08 15	4.00	BR:1 ||	64	17.8	64	17.8	64	17.8	100	15	VRB	25	29.82				FM-15	0.01	29.83
19	1615	7	BKN:07 10 OVC:08 15	9.00		64	17.8	64	17.8	64	17.8	100	18	210	31	29.82				FM-15		29.83
19	1635	7	BKN:07 8 OVC:08 11	3.00	BR:1 ||	64	17.8	64	17.8	64	17.8	100	15	220	28	29.82				FM-15		29.83
19	1655	7	OVC:08 8	7.00		64	17.8	64	17.8	64	17.8	100	17	220	34	29.82				FM-15		29.83
19	1715	7	OVC:08 9	7.00		66	18.9	65	18.3	64	17.8	94	15	220	24	29.82				FM-15		29.83
19	1735	7	OVC:08 8	6.00	BR:1 ||	66	18.9	65	18.3	64	17.8	94	16	220	29	29.82				FM-15		29.83
19	1755	7	OVC:08 8	6.00	BR:1 ||	66	18.9	65	18.3	64	17.8	94	14	210	26	29.82				FM-15		29.83
19	1815	7	OVC:08 10	6.00	BR:1 ||	66	18.9	65	18.3	64	17.8	94	15	VRB	31	29.83				FM-15		29.84
19	1835	7	OVC:08 10	7.00		66	18.9	65	18.3	64	17.8	94	14	210	25	29.83				FM-15		29.84
19	1855	7	OVC:08 11	5.00	BR:1 ||	66	18.9	65	18.3	64	17.8	94	20	210		29.83				FM-15		29.84
19	1915	7	OVC:08 11	7.00		66	18.9	65	18.3	64	17.8	94	16	210	23	29.84				FM-15		29.85
19	1935	7	OVC:08 11	7.00		66	18.9	65	18.3	64	17.8	94	13	210	24	29.85				FM-15		29.86
19	1955	7	OVC:08 12	7.00		66	18.9	65	18.3	64	17.8	94	11	VRB	20	29.85				FM-15		29.86
19	2015	7	OVC:08 12	8.00		66	18.9	65	18.3	64	17.8	94	14	210	23	29.86				FM-15		29.87
19	2035	7	OVC:08 12	9.00		66	18.9	65	18.3	64	17.8	94	16	210	23	29.85				FM-15		29.86
19	2055	7	OVC:08 13	10.00		68	20.0	66	18.9	64	17.8	88	16	200	29	29.85				FM-15		29.86
19	2115	7	OVC:08 13	10.00		68	20.0	66	18.9	64	17.8	88	18	210	29	29.84				FM-15		29.85
19	2135	7	OVC:08 13	10.00		68	20.0	66	18.9	64	17.8	88	16	200	26	29.84				FM-15		29.85
19	2155	7	OVC:08 12	10.00		68	20.0	66	18.9	64	17.8	88	16	210	29	29.84				FM-15		29.85
19	2215	7	OVC:08 11	10.00		68	20.0	66	18.9	64	17.8	88	15	200	30	29.84				FM-15		29.85
19	2235	7	OVC:08 12	10.00		68	20.0	66	18.9	64	17.8	88	14	VRB	25	29.83				FM-15		29.84
19	2255	7	OVC:08 14	9.00		66	18.9	65	18.3	64	17.8	94	21	200	32	29.83				FM-15		29.84
19	2315	7	OVC:08 14	9.00		68	20.0	66	18.9	64	17.8	88	25	200	38	29.82				FM-15		29.83
19	2335	7	OVC:08 14	5.00	BR:1 ||	66	18.9	65	18.3	64	17.8	94	18	190	33	29.82				FM-15		29.83
19	2355	7	OVC:08 11	6.00	BR:1 ||	66	18.9	66	18.9	66	18.9	100	17	VRB	30	29.81				FM-15		29.82

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Precipitation
April 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W
Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	For Hour (LST) Ending at																								Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	01
02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.02	02
03	0.06	0.07	0.18	0.13	0.11	0.04	0.03	0.03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	03
04	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	04
05	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.03	0.03	0.02	0.03	05
06	0.03	0.02	M	0.02	0.03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	06
07	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	07
08	M	M	M	0.01	0.01	0.01	0.04	0.07	0.05	0.11	0.01	0.01	M	M	M	0.01	M	M	M	M	M	M	M	M	08
09	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.04	0.04	0.01	M	M	M	09
10	M	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	10
11	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	11
12	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.02	0.04	12
13	0.01	0.01	M	0.01	0.02	0.08	0.10	0.14	0.04	M	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	13
14	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.02	M	0.03	14
15	0.01	M	0.02	M	0.10	0.27	0.57	0.15	0.01	M	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	15
16	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	16
17	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	17
18	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	18
19	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	19
20	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	M	0.01	0.08	0.01	M	0.04	0.03	M	M	20
21	0.01	M	M	M	M	M	M	0.02	0.09	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	21
22	M	M	M	M	M	M	M	M	M	M	0.04	0.21	0.15	0.08	0.01	0.17	0.24	0.15	0.13	0.11	0.05	0.01	M	0.01	22
23	M	M	M	M	0.01	0.01	M	0.03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	23
24	M	M	0.01	0.02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	24
25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	25
26	M	M	M	M	M	M	M	0.01	0.05	M	M	M	M	M	M	M	M	0.01	0.01	0.10	M	M	M	0.05	26
27	0.03	0.01	0.02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	27
28	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	0.01	0.01	0.01	M	0.02	M	M	M	M	28
29	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	29
30	M	0.02	0.04	0.01	0.01	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	30

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
July 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W

Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation) AU | AW | MW	Dry Bulb Temp (F)	Dry Bulb Temp (C)	Wet Bulb Temp (F)	Wet Bulb Temp (C)	Dew Point Temp (F)	Dew Point Temp (C)	Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
30	0015	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	3	230		29.95				FM-15		29.96
30	0035	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	5	220		29.95				FM-15		29.96
30	0055	4		10.00		75	23.9			72	22.2	89	5	VRB						FM-15		29.95
30	0115	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	230		29.94				FM-15		29.95
30	0135	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	VRB		29.94				FM-15		29.95
30	0155	4		10.00		73	22.8			72	22.2	94	3	230						FM-15		29.95
30	0215	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	VRB		29.94				FM-15		29.95
30	0235	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	240		29.94				FM-15		29.95
30	0255	4		10.00		73	22.8			72	22.2	94	0	000						FM-15		29.95
30	0315	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	3	250		29.94				FM-15		29.95
30	0335	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	3	260		29.95				FM-15		29.96
30	0355	4		10.00		73	22.8			72	22.2	94	0	000						FM-15		29.96
30	0415	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	3	240		29.95				FM-15		29.96
30	0435	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	3	240		29.96				FM-15		29.97
30	0455	4		10.00		73	22.8			73	22.8	100	0	000						FM-15		29.97
30	0515	7	CLR:00	10.00		73	22.8	73	22.8	73	22.8	100	6	VRB		29.96				FM-15		29.97
30	0535	7	CLR:00	10.00		73	22.8	73	22.8	73	22.8	100	3	230		29.96				FM-15		29.97
30	0555	4		10.00		75	23.9			73	22.8	94	5	VRB						FM-15		29.98
30	0615	7	CLR:00	10.00		77	25.0	74	23.3	73	22.8	89	6	230		29.97				FM-15		29.98
30	0635	7	CLR:00	10.00		79	26.1	75	23.9	73	22.8	84	7	240		29.97				FM-15		29.98
30	0655	4		10.00		79	26.1			73	22.8	84	7	230						FM-15		29.99
30	0715	7	CLR:00	10.00		81	27.2	75	23.9	73	22.8	79	7	230	*	29.98				FM-15		29.99
30	0735	7	CLR:00	10.00		82	27.8	76	24.4	73	22.8	74	7	VRB		29.98				FM-15		29.99
30	0755	4		10.00		82	27.8			73	22.8	74	6	220						FM-15		29.99
30	0815	7	CLR:00	10.00		82	27.8	76	24.4	73	22.8	74	7	VRB		29.98				FM-15		29.99
30	0835	7	CLR:00	10.00		82	27.8	77	25.0	75	23.9	79	3	210		29.99				FM-15		30.00
30	0855	4		10.00		86	30.0			75	23.9	70	8	250						FM-15		29.99
30	0915	7	CLR:00	10.00		88	31.1	79	26.1	75	23.9	66	5	VRB		29.98				FM-15		29.99
30	0935	7	CLR:00	10.00		88	31.1	77	25.0	73	22.8	62	5	VRB		29.98				FM-15		29.99
30	0955	4		10.00		90	32.2			73	22.8	59	6	VRB						FM-15		29.99
30	1015	7	CLR:00	10.00		90	32.2	78	25.6	73	22.8	59	7	VRB		29.98				FM-15		29.99
30	1035	7	CLR:00	10.00		91	32.8	78	25.6	73	22.8	56	5	VRB	*	29.98				FM-15		29.99
30	1055	4		10.00		91	32.8			73	22.8	56	6	210	11					FM-15		29.99
30	1115	7	FEW:02 44 FEW:02 95	10.00		91	32.8	78	25.6	73	22.8	56	6	210		29.97				FM-15		29.98
30	1135	7	FEW:02 43 FEW:02 75 SCT:04 95	10.00		91	32.8	78	25.6	72	22.2	52	6	VRB	*	29.97				FM-15		29.98
30	1155	4		10.00		91	32.8			72	22.2	52	7	VRB						FM-15		29.98
30	1215	7	FEW:02 49	10.00		93	33.9	78	25.6	72	22.2	49	8	VRB		29.97				FM-15		29.98
30	1235	7	FEW:02 48 FEW:02 70 FEW:02 80	10.00		93	33.9	77	25.0	70	21.1	47	6	VRB		29.96				FM-15		29.97
30	1255	4		10.00		93	33.9			72	22.2	49	7	VRB	15					FM-15		29.97
30	1315	7	CLR:00	10.00		93	33.9	77	25.0	70	21.1	47	9	VRB		29.96				FM-15		29.97
30	1335	7	FEW:02 60 FEW:02 100	10.00		91	32.8	78	25.6	72	22.2	52	6	210	*	29.96				FM-15		29.97
30	1355	4		10.00		93	33.9			72	22.2	49	7	220						FM-15		29.96

30	1415	7	CLR:00	10.00		93	33.9	78	25.6	72	22.2	49	8	VRB		29.95				FM-15		29.96
30	1435	7	FEW:02 55	10.00		93	33.9	78	25.6	72	22.2	49	8	220	18	29.94				FM-15		29.95
30	1455	4		10.00		93	33.9			73	22.8	53	8	VRB	15					FM-15		29.95
30	1515	7	SCT:04 50 SCT:04 60	10.00		93	33.9	79	26.1	73	22.8	53	10	VRB		29.93				FM-15		29.94
30	1535	7	FEW:02 50	10.00		93	33.9	78	25.6	72	22.2	49	10	200	18	29.93				FM-15		29.94
30	1555	4		10.00		91	32.8			72	22.2	52	10	220	20					FM-15		29.94
30	1615	7	CLR:00	10.00		91	32.8	78	25.6	72	22.2	52	10	220		29.93				FM-15		29.94
30	1635	7	CLR:00	10.00		91	32.8	78	25.6	72	22.2	52	10	VRB		29.93				FM-15		29.94
30	1655	4		10.00		90	32.2			72	22.2	55	9	200	15					FM-15		29.94
30	1715	7	CLR:00	10.00		90	32.2	77	25.0	72	22.2	55	7	VRB	*	29.93				FM-15		29.94
30	1735	4		10.00		88	31.1			70	21.1	55	10	220	17					FM-15		29.94
30	1755	4		10.00		88	31.1			70	21.1	55	9	220	18					FM-15		29.95
30	1815	4		10.00		86	30.0			70	21.1	59	7	210	14					FM-15		29.95
30	1835	4		10.00		84	28.9			70	21.1	62	9	220	15					FM-15		29.96
30	1855	4		10.00		82	27.8			70	21.1	66	8	210						FM-15		29.97
30	1915	7	CLR:00	10.00		82	27.8	74	23.3	70	21.1	66	6	220		29.96				FM-15		29.97
30	1935	7	CLR:00	10.00		81	27.2	74	23.3	70	21.1	70	7	220		29.97				FM-15		29.98
30	1955	4		10.00		81	27.2			72	22.2	74	7	220						FM-15		29.98
30	2015	7	CLR:00	10.00		81	27.2	75	23.9	72	22.2	74	7	VRB		29.97				FM-15		29.98
30	2035	7	CLR:00	10.00		79	26.1	74	23.3	72	22.2	79	7	220	*	29.97				FM-15		29.98
30	2055	4		10.00		79	26.1			72	22.2	79	7	220						FM-15		29.99
30	2115	7	CLR:00	10.00		79	26.1	74	23.3	72	22.2	79	7	VRB		29.98				FM-15		29.99
30	2135	7	CLR:00	10.00		79	26.1	74	23.3	72	22.2	79	8	220		29.98				FM-15		29.99
30	2155	4		10.00		79	26.1			72	22.2	79	7	VRB						FM-15		29.99
30	2215	7	CLR:00	10.00		77	25.0	74	23.3	72	22.2	83	6	230		29.99				FM-15		30.00
30	2235	7	CLR:00	10.00		77	25.0	74	23.3	72	22.2	83	8	220	*	29.98				FM-15		29.99
30	2255	4		10.00		77	25.0			72	22.2	83	7	220						FM-15		30.00
30	2315	7	CLR:00	10.00		77	25.0	74	23.3	72	22.2	83	6	220		29.99				FM-15		30.00
30	2335	7	CLR:00	10.00		77	25.0	74	23.3	72	22.2	83	8	220		29.99				FM-15		30.00
30	2355	4		10.00		77	25.0			72	22.2	83	7	230						FM-15		30.00
31	0015	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	7	220		29.99				FM-15		30.00
31	0035	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	5	230		29.99				FM-15		30.00
31	0055	4		10.00		75	23.9			72	22.2	89	7	230						FM-15		30.00
31	0115	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	7	VRB		29.98				FM-15		29.99
31	0135	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	7	220		29.98				FM-15		29.99
31	0155	4		10.00		75	23.9			72	22.2	89	6	230						FM-15		29.99
31	0215	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	7	VRB		29.98				FM-15		29.99
31	0235	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	6	220		29.97				FM-15		29.98
31	0255	4		10.00		75	23.9			72	22.2	89	5	220						FM-15		29.98
31	0315	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	7	240		29.97				FM-15		29.98
31	0335	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	6	230		29.97				FM-15		29.98
31	0355	4		10.00		73	22.8			72	22.2	94	6	250						FM-15		29.99
31	0415	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	6	250		29.98				FM-15		29.99
31	0435	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	VRB		29.98				FM-15		29.99
31	0455	4		10.00		73	22.8			72	22.2	94	5	240						FM-15		29.99
31	0515	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	5	250		29.98				FM-15		29.99
31	0535	7	CLR:00	10.00		75	23.9	73	22.8	72	22.2	89	6	240		29.99				FM-15		30.00
31	0555	4		10.00		75	23.9			72	22.2	89	6	240						FM-15		30.00
31	0615	7	CLR:00	10.00		77	25.0	74	23.3	72	22.2	83	6	230		29.99				FM-15		30.00
31	0635	7	CLR:00	10.00		79	26.1	74	23.3	72	22.2	79	8	240		29.99				FM-15		30.00
31	0655	4		10.00		79	26.1			73	22.8	84	6	240						FM-15		30.00
31	0715	7	CLR:00	10.00		81	27.2	75	23.9	73	22.8	79	8	250		29.99				FM-15		30.00
31	0735	7	CLR:00	10.00		81	27.2	75	23.9	73	22.8	79	8	230		29.99				FM-15		30.00
31	0755	7	CLR:00	10.00		82	27.8	76	24.4	73	22.8	74	7	VRB		29.99				FM-15		30.00
31	0815	7	CLR:00	10.00		84	28.9	76	24.4	73	22.8	70	6	260		29.99				FM-15		30.00
31	0835	7	CLR:00	10.00		84	28.9	76	24.4	73	22.8	70	7	230		29.99				FM-15		30.00

31	0855	4		10.00		86	30.0			73	22.8	66	6	VRB						FM-15		30.01
31	0915	7	CLR:00	10.00		86	30.0	77	25.0	73	22.8	66	6	VRB	*	30.00				FM-15		30.01
31	0935	7	CLR:00	10.00		88	31.1	77	25.0	72	22.2	59	6	VRB	*	30.00				FM-15		30.01
31	0955	4		10.00		90	32.2			73	22.8	59	5	VRB						FM-15		30.01
31	1015	7	CLR:00	10.00		90	32.2	77	25.0	72	22.2	55	5	VRB	*	29.99				FM-15		30.00
31	1035	7	CLR:00	10.00		90	32.2	77	25.0	72	22.2	55	10	230		29.99				FM-15		30.00
31	1055	4		10.00		90	32.2			70	21.1	52	6	VRB	14					FM-15		30.00
31	1115	7	CLR:00	10.00		91	32.8	76	24.4	70	21.1	49	10	210		29.98				FM-15		29.99
31	1135	7	CLR:00	10.00		91	32.8	76	24.4	70	21.1	49	3	VRB	*	29.98				FM-15		29.99
31	1155	4		10.00		93	33.9			70	21.1	47	10	210	17					FM-15		29.99
31	1215	7	FEW:02 41 FEW:02 70 FEW:02 110	10.00		91	32.8	76	24.4	70	21.1	49	9	210		29.98				FM-15		29.99
31	1235	7	FEW:02 42 FEW:02 50 SCT:04 110	10.00		93	33.9	77	25.0	70	21.1	47	10	240		29.97				FM-15		29.98
31	1255	4		10.00		93	33.9			70	21.1	47	9	VRB	15					FM-15		29.97
31	1315	7	CLR:00	10.00		93	33.9	76	24.4	68	20.0	44	13	210	18	29.95				FM-15		29.96
31	1335	7	CLR:00	10.00		90	32.2	79	26.1	75	23.9	63	6	VRB	*	29.95				FM-15		29.96
31	1355	7	CLR:00	10.00		91	32.8	78	25.6	72	22.2	52	6	VRB	*	29.94				FM-15		29.95
31	1415	7	CLR:00	9.00		93	33.9	76	24.4	68	20.0	44	8	VRB	17	29.94				FM-15		29.95
31	1435	7	FEW:02 50 FEW:02 75	10.00		93	33.9	77	25.0	70	21.1	47	10	210		29.93				FM-15		29.94
31	1455	7	FEW:02 50 FEW:02 65 FEW:02 75	10.00		91	32.8	78	25.6	72	22.2	52	10	230	17	29.94				FM-15		29.95
31	1515	7	CLR:00	10.00	VCTS:7 ||	91	32.8	78	25.6	72	22.2	52	15	210		29.94				FM-15		29.95
31	1535	7	CLR:00	10.00	VCTS:7 ||	91	32.8	76	24.4	70	21.1	49	9	220	20	29.95				FM-15		29.96
31	1555	7	FEW:02 40 SCT:04 48	10.00		82	27.8	73	22.8	68	20.0	62	13	VRB	30	29.99				FM-15		30.00
31	1615	7	FEW:02 42 SCT:04 70 SCT:04 85	10.00		79	26.1	72	22.2	68	20.0	70	8	VRB	24	29.99				FM-15		30.00
31	1635	7	FEW:02 110	10.00		79	26.1	73	22.8	70	21.1	74	8	VRB	*	29.99				FM-15		30.00
31	1655	4		10.00		77	25.0			66	18.9	69	6	270	11					FM-15		30.00
31	1715	7	CLR:00	10.00		77	25.0	70	21.1	66	18.9	69	0	000		29.99				FM-15		30.00
31	1735	7	CLR:00	10.00		77	25.0	70	21.1	66	18.9	69	0	000		29.99				FM-15		30.00
31	1755	4		10.00		77	25.0			68	20.0	74	3	VRB						FM-15		30.01
31	1815	7	CLR:00	10.00		77	25.0	71	21.7	68	20.0	74	0	000		30.00				FM-15		30.01
31	1835	4		10.00		77	25.0			68	20.0	74	0	000						FM-15		30.01
31	1855	4		10.00		77	25.0			68	20.0	74	0	000						FM-15		30.02
31	1915	7	SCT:04 44 BKN:07 50 SCT:04 55	10.00		75	23.9	70	21.1	68	20.0	78	0	000		30.00				FM-15		30.01
31	1935	7	FEW:02 49	10.00		75	23.9	72	22.2	70	21.1	83	5	180		30.00				FM-15		30.01
31	1955	4		10.00		75	23.9			68	20.0	78	0	000						FM-15		30.01
31	2015	7	CLR:00	10.00		73	22.8	70	21.1	68	20.0	83	0	000		30.00				FM-15		30.01
31	2035	7	FEW:02 37	10.00		75	23.9	70	21.1	68	20.0	78	5	190		30.00				FM-15		30.01
31	2055	4		10.00		73	22.8			68	20.0	83	0	000						FM-15		30.00
31	2115	7	FEW:02 40	10.00		73	22.8	70	21.1	68	20.0	83	0	000		29.99				FM-15		30.00
31	2135	7	BKN:07 41	10.00		73	22.8	71	21.7	70	21.1	89	3	170		29.99				FM-15		30.00
31	2155	4		10.00		73	22.8			70	21.1	89	0	000						FM-15		30.00
31	2215	7	CLR:00	10.00		73	22.8	71	21.7	70	21.1	89	0	000		29.99				FM-15		30.00
31	2235	7	FEW:02 39	10.00		73	22.8	71	21.7	70	21.1	89	0	000		29.99				FM-15		30.00
31	2255	4		10.00		72	22.2			70	21.1	94	0	000						FM-15		30.00
31	2315	7	CLR:00	10.00		73	22.8	71	21.7	70	21.1	89	0	000		29.98				FM-15		29.99
31	2335	7	CLR:00	10.00		73	22.8	71	21.7	70	21.1	89	0	000		29.99				FM-15		30.00
31	2355	7	CLR:00	10.00		73	22.8	72	22.2	72	22.2	94	3	250		29.98				FM-15		29.99

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Precipitation
July 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W
Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	For Hour (LST) Ending at																								Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	01
02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	02
03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	03
04	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	04
05	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	05
06	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.29	0.13	0.03	0.01	M	M	M	06
07	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	07
08	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	08
09	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	09
10	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	10
11	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	11
12	0.02	0.02	0.65	0.48	0.74	0.10	0.25	0.02	M	0.12	M	M	M	M	M	M	0.01	M	M	M	M	M	0.01	M	12
13	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	13
14	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	14
15	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	15
16	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	16
17	M	M	M	M	M	M	M	M	M	M	0.03	M	M	M	M	M	M	0.53	0.07	0.02	M	M	M	M	17
18	M	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	18
19	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	19
20	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	20
21	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	21
22	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.51	0.17	0.06	M	22
23	M	M	M	0.01	0.01	0.07	0.02	0.03	0.05	0.29	0.22	0.11	0.01	M	M	M	M	M	M	M	M	M	M	M	23
24	M	M	M	M	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	24
25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	25
26	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	26
27	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	27
28	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	28
29	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	29
30	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	30
31	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
October 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W

Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	0015	7	BKN:07 70	10.00		55	12.8	52	11.1	50	10.0	82	3	180		30.20				FM-15		30.21
01	0035	7	SCT:04 70	10.00		55	12.8	52	11.1	50	10.0	82	3	210		30.21				FM-15		30.22
01	0055	7	BKN:07 65 BKN:07 75	10.00		55	12.8	52	11.1	50	10.0	82	0	000		30.19				FM-15		30.20
01	0115	7	BKN:07 65 OVC:08 75	10.00		57	13.9	53	11.7	50	10.0	77	0	000		30.18				FM-15		30.19
01	0135	7	OVC:08 65	10.00		57	13.9	53	11.7	50	10.0	77	6	190		30.17				FM-15		30.18
01	0155	7	OVC:08 65	10.00		57	13.9	53	11.7	50	10.0	77	5	190		30.16				FM-15		30.17
01	0215	7	FEW:02 55 OVC:08 65	10.00		57	13.9	53	11.7	50	10.0	77	0	000		30.16				FM-15		30.17
01	0235	7	BKN:07 50 OVC:08 65	10.00		57	13.9	53	11.7	50	10.0	77	0	000		30.16				FM-15		30.17
01	0255	7	OVC:08 50	10.00		55	12.8	53	11.7	52	11.1	88	5	210		30.16				FM-15		30.17
01	0315	7	FEW:02 37 BKN:07 50 OVC:08 65	10.00		57	13.9	54	12.2	52	11.1	82	0	000		30.15				FM-15		30.16
01	0335	7	BKN:07 47 OVC:08 65	10.00		57	13.9	54	12.2	52	11.1	82	3	180		30.14				FM-15		30.15
01	0355	7	OVC:08 44	10.00		57	13.9	54	12.2	52	11.1	82	5	200		30.14				FM-15		30.15
01	0415	7	OVC:08 42	10.00		57	13.9	54	12.2	52	11.1	82	3	200		30.13				FM-15		30.14
01	0435	7	OVC:08 39	10.00		57	13.9	54	12.2	52	11.1	82	0	000		30.13				FM-15		30.14
01	0455	7	OVC:08 38	10.00		57	13.9	55	12.8	54	12.2	88	0	000		30.13				FM-15		30.14
01	0515	7	OVC:08 36	10.00		57	13.9	55	12.8	54	12.2	88	0	000		30.13				FM-15		30.14
01	0535	7	OVC:08 36	10.00		57	13.9	55	12.8	54	12.2	88	5	190		30.13				FM-15		30.14
01	0555	7	FEW:02 19 FEW:02 29 OVC:08 36	3.00	BR:1 ||	57	13.9	55	12.8	54	12.2	88	6	190		30.13				FM-15		30.14
01	0615	7	FEW:02 20 FEW:02 29 OVC:08 35	7.00		57	13.9	55	12.8	54	12.2	88	0	000		30.13				FM-15		30.14
01	0635	7	FEW:02 21 SCT:04 29 OVC:08 35	2.50	BR:1 ||	57	13.9	56	13.3	55	12.8	94	6	160		30.12				FM-15		30.13
01	0655	7	FEW:02 20 OVC:08 35	10.00		57	13.9	56	13.3	55	12.8	94	5	170		30.12				FM-15	0.02	30.13
01	0715	7	BKN:07 33	10.00		57	13.9	56	13.3	55	12.8	94	0	000		30.12				FM-15		30.13
01	0735	7	OVC:08 33	10.00		57	13.9	57	13.9	57	13.9	100	0	000		30.12				FM-15		30.13
01	0755	7	BKN:07 33	10.00		59	15.0	58	14.4	57	13.9	94	5	150		30.12				FM-15		30.13
01	0815	7	OVC:08 32	3.00	BR:1 ||	59	15.0	58	14.4	57	13.9	94	6	170		30.11				FM-15		30.12
01	0835	7	OVC:08 30	10.00		59	15.0	58	14.4	57	13.9	94	0	000		30.10				FM-15		30.11
01	0855	7	OVC:08 27	10.00		59	15.0	59	15.0	59	15.0	100	5	VRB		30.10				FM-15		30.11
01	0915	7	OVC:08 25	10.00		61	16.1	60	15.6	59	15.0	94	7	180		30.09				FM-15		30.10
01	0935	7	BKN:07 24 OVC:08 31	9.00		61	16.1	60	15.6	59	15.0	94	7	180		30.08				FM-15		30.09
01	0955	7	BKN:07 24 BKN:07 30 OVC:08 49	10.00		63	17.2	61	16.1	59	15.0	88	7	VRB	*	30.07				FM-15		30.08
01	1015	7	BKN:07 23 BKN:07 39 OVC:08 47	6.00	BR:1 ||	63	17.2	61	16.1	59	15.0	88	10	200		30.06				FM-15		30.07

01	1035	7	BKN:07 24 OVC:08 44	10.00		63	17.2	62	16.7	61	16.1	94	8	180		30.05				FM-15		30.06
01	1055	7	OVC:08 22	10.00		63	17.2	62	16.7	61	16.1	94	8	VRB		30.04				FM-15		30.05
01	1115	7	OVC:08 22	10.00		64	17.8	62	16.7	61	16.1	88	7	200		30.03				FM-15		30.04
01	1135	7	OVC:08 21	10.00		66	18.9	63	17.2	61	16.1	83	8	210		30.03				FM-15		30.04
01	1155	7	OVC:08 21	10.00		66	18.9	63	17.2	61	16.1	83	8	200	*	30.01				FM-15		30.02
01	1215	7	BKN:07 21 BKN:07 28	10.00		68	20.0	64	17.8	61	16.1	78	8	VRB	18	30.00				FM-15		30.01
01	1235	7	BKN:07 20 BKN:07 28	10.00		68	20.0	65	18.3	63	17.2	83	8	VRB	20	30.00				FM-15		30.01
01	1255	7	OVC:08 19	10.00		68	20.0	65	18.3	63	17.2	83	9	VRB	17	29.99				FM-15		30.00
01	1315	7	OVC:08 19	10.00		68	20.0	65	18.3	63	17.2	83	10	VRB		29.98				FM-15		29.99
01	1335	7	OVC:08 18	10.00		70	21.1	66	18.9	63	17.2	78	11	200	17	29.96				FM-15		29.97
01	1355	7	OVC:08 17	10.00		70	21.1	66	18.9	63	17.2	78	10	210	16	29.95				FM-15		29.96
01	1415	7	OVC:08 17	10.00		70	21.1	66	18.9	63	17.2	78	13	210	21	29.94				FM-15		29.95
01	1435	7	OVC:08 17	10.00		70	21.1	66	18.9	63	17.2	78	13	210	21	29.94				FM-15		29.95
01	1455	7		10.00		70	21.1	66	18.9	63	17.2	78	10	220	20	29.93				FM-15	0.01	29.94
01	1515	7	OVC:08 17	10.00		70	21.1	66	18.9	63	17.2	78	10	VRB		29.93				FM-15		29.94
01	1535	7	OVC:08 17	10.00		70	21.1	66	18.9	63	17.2	78	10	210		29.93				FM-15		29.94
01	1555	7	OVC:08 17	10.00		70	21.1	66	18.9	64	17.8	83	8	220	16	29.93				FM-15		29.94
01	1615	7	OVC:08 18	10.00		70	21.1	66	18.9	64	17.8	83	11	220		29.91				FM-15		29.92
01	1635	7	BKN:07 18	10.00		70	21.1	66	18.9	64	17.8	83	9	VRB	*	29.91				FM-15		29.92
01	1655	7	FEW:02 18	10.00		68	20.0	66	18.9	64	17.8	88	13	210	20	29.90				FM-15		29.91
01	1715	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	8	220	*	29.90				FM-15		29.91
01	1735	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	10	210	22	29.88				FM-15		29.89
01	1755	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	11	VRB		29.89				FM-15		29.90
01	1815	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	11	220		29.89				FM-15		29.90
01	1835	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	10	VRB	18	29.88				FM-15		29.89
01	1855	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	11	VRB		29.86				FM-15		29.87
01	1915	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	13	220	18	29.87				FM-15		29.88
01	1935	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	10	VRB	17	29.87				FM-15		29.88
01	1955	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	8	VRB	17	29.86				FM-15		29.87
01	2015	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	11	220	18	29.85				FM-15		29.86
01	2035	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	13	220	18	29.84				FM-15		29.85
01	2055	7	CLR:00	10.00		68	20.0	66	18.9	64	17.8	88	10	230	21	29.83				FM-15		29.84
01	2115	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	11	220	22	29.83				FM-15		29.84
01	2135	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	10	VRB	21	29.83				FM-15		29.84
01	2155	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	13	220	21	29.81				FM-15		29.82
01	2215	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	9	VRB	17	29.81				FM-15		29.82
01	2235	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	11	230	21	29.80				FM-15		29.81
01	2255	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	9	230	21	29.78				FM-15		29.79
01	2315	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	8	230	16	29.78				FM-15		29.79
01	2335	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	10	VRB	21	29.76				FM-15		29.77
01	2355	7	CLR:00	10.00		70	21.1	67	19.4	66	18.9	88	7	VRB	17	29.75				FM-15		29.76
02	0015	7	CLR:00	10.00		70	21.1	67	19.4	66	18.9	88	11	VRB	20	29.75				FM-15		29.76
02	0035	7	CLR:00	10.00		70	21.1	67	19.4	66	18.9	88	11	VRB	18	29.74				FM-15		29.75
02	0055	7	CLR:00	10.00		70	21.1	69	20.6	68	20.0	94	10	VRB		29.73				FM-15		29.74
02	0115	7	CLR:00	10.00		70	21.1	69	20.6	68	20.0	94	13	240	25	29.72				FM-15		29.73
02	0135	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	11	VRB	20	29.72				FM-15		29.73
02	0155	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	11	240	21	29.73				FM-15		29.74
02	0215	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	9	240	18	29.72				FM-15		29.73
02	0235	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	9	VRB	17	29.72				FM-15		29.73
02	0255	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	9	VRB	18	29.72				FM-15		29.73
02	0315	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	10	240		29.72				FM-15		29.73
02	0335	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	8	VRB	16	29.71				FM-15		29.72
02	0355	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	9	VRB	16	29.71				FM-15		29.72
02	0415	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	9	VRB	17	29.72				FM-15		29.73

02	0435	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	10	VRB	17	29.72				FM-15		29.73
02	0455	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	10	VRB		29.72				FM-15		29.73
02	0515	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	8	240		29.73				FM-15		29.74
02	0535	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	7	VRB	*	29.73				FM-15		29.74
02	0555	7	CLR:00	10.00		72	22.2	69	20.6	68	20.0	88	7	250		29.73				FM-15		29.74
02	0615	7	FEW:02 90	10.00		72	22.2	69	20.6	68	20.0	88	9	240		29.74				FM-15		29.75
02	0635	7	FEW:02 85 FEW:02 110	10.00		72	22.2	69	20.6	68	20.0	88	6	VRB	*	29.75				FM-15		29.76
02	0655	7	CLR:00	10.00		73	22.8	70	21.1	68	20.0	83	7	VRB	*	29.74				FM-15		29.75
02	0715	7	CLR:00	10.00		73	22.8	70	21.1	68	20.0	83	7	VRB	*	29.75				FM-15		29.76
02	0735	7	CLR:00	10.00		73	22.8	70	21.1	68	20.0	83	6	VRB	*	29.76				FM-15		29.77
02	0755	7	CLR:00	10.00		75	23.9	72	22.2	70	21.1	83	6	VRB	*	29.77				FM-15		29.78
02	0815	7	FEW:02 33 FEW:02 110	10.00		75	23.9	72	22.2	70	21.1	83	5	VRB	*	29.76				FM-15		29.77
02	0835	7	FEW:02 33 FEW:02 110	10.00		77	25.0	72	22.2	70	21.1	79	5	VRB		29.76				FM-15		29.77
02	0855	7	FEW:02 27	10.00		77	25.0	72	22.2	70	21.1	79	6	290		29.76				FM-15		29.77
02	0915	7	FEW:02 35	10.00		77	25.0	72	22.2	70	21.1	79	5	VRB		29.77				FM-15		29.78
02	0935	7	FEW:02 35	10.00		77	25.0	72	22.2	70	21.1	79	5	310		29.76				FM-15		29.77
02	0955	6	SCT:04 29 SCT:04 90	10.00		77	25.0	72	22.2	70	21.1	79	0	000		29.76				FM-15		29.77
02	1015	6	BKN:07 27 BKN:07 90	10.00		77	25.0	72	22.2	70	21.1	79	0	000		29.77				FM-15		29.78
02	1035	6	BKN:07 26 BKN:07 31	9.00		77	25.0	71	21.7	68	20.0	74	0	000		29.75				FM-15		29.76
02	1055	6	FEW:02 27 SCT:04 31 SCT:04 44	10.00		77	25.0	72	22.2	70	21.1	79	0	000		29.76				FM-15		29.77
02	1115	7	FEW:02 43 FEW:02 80 FEW:02 100	10.00		75	23.9	70	21.1	68	20.0	78	5	VRB		29.76				FM-15		29.77
02	1135	6	FEW:02 24 FEW:02 43 SCT:04 55	10.00		73	22.8	69	20.6	66	18.9	78	5	VRB		29.76				FM-15		29.77
02	1155	6	FEW:02 23 FEW:02 35 SCT:04 55	9.00	-DZ:01 |DZ |DZ	73	22.8	70	21.1	68	20.0	83	3	VRB		29.74				FM-15		29.75
02	1215	6	CLR:00	10.00		75	23.9	70	21.1	68	20.0	78	7	050		29.74				FM-15		29.75
02	1235	6	FEW:02 21 BKN:07 28 BKN:07 120	10.00		73	22.8	67	19.4	64	17.8	74	5	VRB	*	29.75				FM-15		29.76
02	1255	6	BKN:07 21 OVC:08 27	10.00		70	21.1	66	18.9	64	17.8	83	13	050	21	29.76				FM-15		29.77
02	1315	6	OVC:08 24	10.00		68	20.0	66	18.9	64	17.8	88	9	050		29.76				FM-15		29.77
02	1335	7	OVC:08 26	10.00		68	20.0	66	18.9	64	17.8	88	13	060		29.78				FM-15		29.79
02	1355	7	OVC:08 26	10.00		66	18.9	64	17.8	63	17.2	88	15	060		29.79				FM-15		29.80
02	1415	7	FEW:02 1 FEW:02 20 OVC:08 28	3.00	-RA:02 |RA |RA	64	17.8	62	16.7	61	16.1	88	13	060		29.79				FM-15		29.80
02	1435	7	SCT:04 1 BKN:07 19 OVC:08 29	1.25	RA:02 |RA |RA	63	17.2	63	17.2	63	17.2	100	11	060	18	29.79				FM-15		29.80
02	1455	7	BKN:07 3 BKN:07 9 OVC:08 17	1.25	RA:02 |RA |RA	63	17.2	63	17.2	63	17.2	100	10	070		29.79				FM-15	0.13	29.80
02	1515	7	BKN:07 4 OVC:08 10	1.00	RA:02 |RA |RA	63	17.2	63	17.2	63	17.2	100	7	080	16	29.81				FM-15		29.82
02	1535	7	BKN:07 4 OVC:08 10	2.50	-DZ:01 |DZ |DZ	63	17.2	63	17.2	63	17.2	100	8	070		29.82				FM-15		29.83
02	1555	7	OVC:08 4	7.00		63	17.2	63	17.2	63	17.2	100	9	060		29.83				FM-15	0.08	29.84

02	1615	7	BKN:07 4 BKN:07 8 OVC:08 13	1.50	-RA:02 |RA |RA	63	17.2	63	17.2	63	17.2	100	8	060		29.84				FM-15		29.85
02	1635	7	BKN:07 5 BKN:07 9 OVC:08 13	10.00		63	17.2	63	17.2	63	17.2	100	9	060		29.85				FM-15		29.86
02	1655	7	OVC:08 4	5.00	BR:1 ||	63	17.2	63	17.2	63	17.2	100	11	070	17	29.86				FM-15	0.01	29.87
02	1715	7	OVC:08 5	4.00	-RA:02 |RA |RA	63	17.2	63	17.2	63	17.2	100	11	060		29.87				FM-15		29.88
02	1735	7	BKN:07 5 OVC:08 9	10.00		61	16.1	61	16.1	61	16.1	100	11	060	18	29.88				FM-15		29.89
02	1755	7	OVC:08 7	10.00		61	16.1	61	16.1	61	16.1	100	11	060	18	29.89				FM-15	0.01	29.90
02	1815	7	FEW:02 1 BKN:07 8 OVC:08 13	1.25	BR:1 ||	61	16.1	61	16.1	61	16.1	100	14	060	21	29.90				FM-15		29.91
02	1835	7	FEW:02 8 SCT:04 12 OVC:08 19	9.00		61	16.1	61	16.1	61	16.1	100	13	060	21	29.90				FM-15		29.91
02	1855	7	BKN:07 10 OVC:08 19	10.00		61	16.1	60	15.6	59	15.0	94	11	050	17	29.92				FM-15		29.93
02	1915	7	BKN:07 10 OVC:08 16	10.00		61	16.1	60	15.6	59	15.0	94	17	060		29.93				FM-15		29.94
02	1935	7	OVC:08 13	10.00		59	15.0	58	14.4	57	13.9	94	14	050	24	29.95				FM-15		29.96
02	1955	7	OVC:08 14	10.00		59	15.0	57	13.9	55	12.8	88	16	060	23	29.97				FM-15		29.98
02	2015	7	OVC:08 17	10.00		59	15.0	56	13.3	54	12.2	82	15	050	24	29.98				FM-15		29.99
02	2035	7	OVC:08 18	10.00		59	15.0	56	13.3	54	12.2	82	11	VRB	23	30.00				FM-15		30.01
02	2055	7	OVC:08 20	10.00		59	15.0	55	12.8	52	11.1	77	11	040	22	30.00				FM-15		30.01
02	2115	7	OVC:08 24	10.00		59	15.0	54	12.2	50	10.0	72	10	VRB	21	30.01				FM-15		30.02
02	2135	7		10.00		59	15.0	54	12.2	50	10.0	72	9	VRB	17	30.01				FM-15		30.02
02	2155	7	OVC:08 26	10.00		59	15.0	54	12.2	50	10.0	72	11	050	17	30.03				FM-15		30.04
02	2215	7	OVC:08 25	10.00		57	13.9	52	11.1	48	8.9	72	15	050	22	30.03				FM-15		30.04
02	2235	7	OVC:08 29	10.00		57	13.9	51	10.6	46	7.8	67	8	040	18	30.04				FM-15		30.05
02	2255	7	BKN:07 30 OVC:08 34	10.00		57	13.9	51	10.6	46	7.8	67	9	VRB	18	30.05				FM-15		30.06
02	2315	7	BKN:07 28 OVC:08 33	10.00		57	13.9	51	10.6	46	7.8	67	9	VRB	18	30.06				FM-15		30.07
02	2335	7	SCT:04 28 OVC:08 34	10.00		55	12.8	49	9.4	43	6.1	63	10	VRB	21	30.06				FM-15		30.07
02	2355	7	OVC:08 35	10.00		55	12.8	49	9.4	43	6.1	63	13	VRB	21	30.07				FM-15		30.08

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Precipitation
October 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W
Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	For Hour (LST) Ending at																								Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01	M	M	M	M	M	M	0.02	M	M	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	M	01
02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.13	0.08	0.01	0.01	M	M	M	M	M	M	02
03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	0.01	03
04	M	M	0.03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	04
05	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	05
06	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	06
07	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.12	0.06	0.06	07
08	0.04	0.02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	08
09	M	M	M	M	M	0.02	0.01	0.01	M	M	M	M	0.03	0.06	0.12	0.09	0.07	M	M	M	M	M	M	M	09
10	M	M	M	M	M	M	0.02	0.02	0.03	0.03	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	10
11	M	M	M	M	M	M	0.01	M	M	0.01	0.08	0.03	0.05	0.05	0.04	M	M	0.01	0.01	0.05	0.02	0.02	0.02	0.01	11
12	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	12
13	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	13
14	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	14
15	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	15
16	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.03	0.05	0.22	0.44	16
17	0.46	M	M	M	M	M	M	M	M	M	M	M	M	0.95	M	M	M	M	M	M	M	M	M	M	17
18	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	18
19	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	19
20	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	20
21	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	21
22	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	22
23	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	23
24	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	24
25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	25
26	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	26
27	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	27
28	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	28
29	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	29
30	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	30
31	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
December 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W
Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
05	0015	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	250		29.46				FM-15		29.47
05	0035	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	250		29.45				FM-15		29.46
05	0055	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	240		29.46				FM-15		29.47
05	0115	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	6	240		29.46				FM-15		29.47
05	0135	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	250		29.46				FM-15		29.47
05	0155	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	VRB		29.47				FM-15		29.48
05	0215	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	250		29.47				FM-15		29.48
05	0235	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	240		29.47				FM-15		29.48
05	0255	7	FEW:02 70	10.00		32	0.0	31	-0.6	30	-1.1	93	3	250		29.47				FM-15		29.48
05	0315	7	BKN:07 70	10.00		32	0.0	32	0.0	32	0.0	100	3	VRB		29.47				FM-15		29.48
05	0335	7	FEW:02 70	10.00		32	0.0	31	-0.6	30	-1.1	93	6	250		29.47				FM-15		29.48
05	0355	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	250		29.48				FM-15		29.49
05	0415	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	250		29.48				FM-15		29.49
05	0435	7	CLR:00	10.00		32	0.0	32	0.0	32	0.0	100	5	VRB		29.49				FM-15		29.50
05	0455	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	6	260		29.49				FM-15		29.50
05	0515	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	6	250		29.50				FM-15		29.51
05	0535	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	VRB		29.51				FM-15		29.52
05	0555	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	3	260		29.51				FM-15		29.52
05	0615	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	6	260		29.52				FM-15		29.53
05	0635	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	6	260		29.53				FM-15		29.54
05	0655	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	6	VRB		29.54				FM-15		29.55
05	0715	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	3	VRB		29.54				FM-15		29.55
05	0735	7	CLR:00	10.00		32	0.0	31	-0.6	30	-1.1	93	5	250		29.55				FM-15		29.56
05	0755	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	VRB		29.56				FM-15		29.57
05	0815	7	CLR:00	10.00		34	1.1	32	0.0	30	-1.1	87	6	240		29.56				FM-15		29.57
05	0835	7	CLR:00	8.00		36	2.2	34	1.1	32	0.0	87	6	VRB	*	29.57				FM-15		29.58
05	0855	7	CLR:00	10.00		36	2.2	34	1.1	30	-1.1	81	6	VRB	*	29.57				FM-15		29.58
05	0915	7	CLR:00	10.00		36	2.2	34	1.1	32	0.0	87	7	260		29.57				FM-15		29.58
05	0935	7	CLR:00	10.00		37	2.8	35	1.7	32	0.0	81	8	VRB	16	29.58				FM-15		29.59
05	0955	7	CLR:00	10.00		39	3.9	36	2.2	32	0.0	75	8	VRB	*	29.58				FM-15		29.59
05	1015	7	CLR:00	10.00		41	5.0	37	2.8	32	0.0	70	11	VRB	18	29.58				FM-15		29.59
05	1035	7	CLR:00	10.00		41	5.0	37	2.8	30	-1.1	66	10	250		29.58				FM-15		29.59
05	1055	7	CLR:00	10.00		41	5.0	37	2.8	30	-1.1	66	8	VRB	18	29.58				FM-15		29.59
05	1115	7	CLR:00	10.00		43	6.1	38	3.3	30	-1.1	61	8	VRB	17	29.58				FM-15		29.59
05	1135	7	CLR:00	10.00		43	6.1	38	3.3	30	-1.1	61	11	VRB		29.58				FM-15		29.59
05	1155	7	CLR:00	10.00		45	7.2	39	3.9	30	-1.1	57	10	VRB	20	29.58				FM-15		29.59
05	1215	7	CLR:00	10.00		43	6.1	38	3.3	30	-1.1	61	9	VRB	17	29.59				FM-15		29.60
05	1235	7	CLR:00	10.00		45	7.2	39	3.9	30	-1.1	57	11	VRB	17	29.58				FM-15		29.59
05	1255	7	CLR:00	10.00		45	7.2	39	3.9	30	-1.1	57	8	VRB	17	29.59				FM-15		29.60
05	1315	7	CLR:00	10.00		45	7.2	39	3.9	30	-1.1	57	10	VRB	20	29.59				FM-15		29.60
05	1335	7	FEW:02 39	10.00		43	6.1	37	2.8	28	-2.2	57	8	VRB	18	29.60				FM-15		29.61
05	1355	6	BKN:07 43	10.00		43	6.1	37	2.8	28	-2.2	57	9	300	16	29.61				FM-15		29.62
05	1415	7	OVC:08 48	10.00		43	6.1	37	2.8	28	-2.2	57	8	VRB	*	29.62				FM-15		29.63
05	1435	7	OVC:08 50	10.00		43	6.1	37	2.8	27	-2.8	53	11	VRB	21	29.63				FM-15		29.64
05	1455	7	OVC:08 50	10.00		43	6.1	37	2.8	27	-2.8	53	7	VRB	16	29.64				FM-15		29.65
05	1515	7	OVC:08 50	10.00		43	6.1	37	2.8	27	-2.8	53	8	280		29.65				FM-15		29.66
05	1535	7	OVC:08 55	10.00		41	5.0	35	1.7	27	-2.8	57	8	VRB		29.67				FM-15		29.68

05	1555	7	OVC:08 55	10.00		41	5.0	35	1.7	27	-2.8	57	7	280		29.68				FM-15		29.69
05	1615	7	OVC:08 55	10.00		41	5.0	35	1.7	27	-2.8	57	7	VRB	*	29.69				FM-15		29.70
05	1635	7	OVC:08 60	10.00		41	5.0	35	1.7	27	-2.8	57	8	VRB	16	29.70				FM-15		29.71
05	1655	7	OVC:08 60	10.00		39	3.9	34	1.1	27	-2.8	61	7	VRB		29.72				FM-15		29.73
05	1715	7	OVC:08 60	10.00		39	3.9	34	1.1	27	-2.8	61	9	280	18	29.74				FM-15		29.75
05	1735	7	OVC:08 60	10.00		39	3.9	34	1.1	25	-3.9	56	9	VRB	17	29.75				FM-15		29.76
05	1755	7	OVC:08 65	10.00		39	3.9	32	0.0	21	-6.1	48	6	VRB	16	29.76				FM-15		29.77
05	1815	7	OVC:08 65	10.00		39	3.9	32	0.0	21	-6.1	48	8	VRB	16	29.78				FM-15		29.79
05	1835	7	OVC:08 65	10.00		39	3.9	32	0.0	21	-6.1	48	9	VRB	16	29.78				FM-15		29.79
05	1855	7	BKN:07 70	10.00		37	2.8	31	-0.6	21	-6.1	52	10	VRB	18	29.79				FM-15		29.80
05	1915	7	SCT:04 75	10.00		37	2.8	31	-0.6	19	-7.2	48	11	VRB	17	29.80				FM-15		29.81
05	1935	7	FEW:02 75	10.00		36	2.2	30	-1.1	19	-7.2	52	8	270	20	29.81				FM-15		29.82
05	1955	7	CLR:00	10.00		36	2.2	30	-1.1	19	-7.2	52	8	VRB	16	29.82				FM-15		29.83
05	2015	7	CLR:00	10.00		36	2.2	30	-1.1	19	-7.2	52	8	VRB	*	29.83				FM-15		29.84
05	2035	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	6	VRB	16	29.84				FM-15		29.85
05	2055	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	10	VRB	17	29.84				FM-15		29.85
05	2115	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	10	VRB		29.85				FM-15		29.86
05	2135	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	9	VRB	17	29.86				FM-15		29.87
05	2155	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	8	VRB	18	29.88				FM-15		29.89
05	2215	7	CLR:00	10.00		34	1.1	29	-1.7	18	-7.8	51	9	VRB		29.88				FM-15		29.89
05	2235	7	CLR:00	10.00		34	1.1	29	-1.7	19	-7.2	56	8	VRB	16	29.89				FM-15		29.90
05	2255	7	CLR:00	10.00		32	0.0	28	-2.2	19	-7.2	60	10	VRB	17	29.90				FM-15		29.91
05	2315	7	CLR:00	10.00		32	0.0	28	-2.2	19	-7.2	60	8	VRB	*	29.92				FM-15		29.93
05	2335	7	CLR:00	10.00		32	0.0	28	-2.2	19	-7.2	60	5	VRB	*	29.93				FM-15		29.94
05	2355	7	CLR:00	10.00		32	0.0	28	-2.2	19	-7.2	60	6	VRB		29.94				FM-15		29.95
06	0015	7	CLR:00	10.00		32	0.0	27	-2.8	16	-8.9	51	10	VRB	20	29.95				FM-15		29.96
06	0035	7	CLR:00	10.00		32	0.0	27	-2.8	16	-8.9	51	5	VRB	16	29.96				FM-15		29.97
06	0055	7	CLR:00	10.00		32	0.0	27	-2.8	16	-8.9	51	5	VRB	*	29.97				FM-15		29.98
06	0115	7	CLR:00	10.00		30	-1.1	26	-3.3	16	-8.9	55	7	VRB	*	29.98				FM-15		29.99
06	0135	7	CLR:00	10.00		30	-1.1	26	-3.3	16	-8.9	55	9	VRB		29.99				FM-15		30.00
06	0155	7	CLR:00	10.00		30	-1.1	26	-3.3	16	-8.9	55	7	VRB	*	30.01				FM-15		30.02
06	0215	7	CLR:00	10.00		30	-1.1	26	-3.3	16	-8.9	55	0	000		30.02				FM-15		30.03
06	0235	7	CLR:00	10.00		30	-1.1	26	-3.3	18	-7.8	59	3	VRB		30.02				FM-15		30.03
06	0255	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	0	000		30.03				FM-15		30.04
06	0315	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	0	000		30.03				FM-15		30.04
06	0335	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	6	VRB		30.03				FM-15		30.04
06	0355	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	0	000		30.04				FM-15		30.05
06	0415	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	5	VRB	*	30.03				FM-15		30.04
06	0435	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	8	VRB	16	30.04				FM-15		30.05
06	0455	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	5	VRB	*	30.05				FM-15		30.06
06	0515	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	6	VRB		30.05				FM-15		30.06
06	0535	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	5	VRB		30.06				FM-15		30.07
06	0555	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	0	000		30.07				FM-15		30.08
06	0615	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	0	000		30.07				FM-15		30.08
06	0635	7	CLR:00	10.00		28	-2.2	25	-3.9	18	-7.8	64	5	240		30.08				FM-15		30.09
06	0655	7	CLR:00	10.00		28	-2.2	25	-3.9	19	-7.2	69	3	250		30.08				FM-15		30.09
06	0715	7	CLR:00	10.00		28	-2.2	25	-3.9	19	-7.2	69	5	VRB		30.08				FM-15		30.09
06	0735	7	CLR:00	10.00		28	-2.2	25	-3.9	19	-7.2	69	5	240		30.08				FM-15		30.09
06	0755	7	CLR:00	10.00		30	-1.1	26	-3.3	19	-7.2	64	3	VRB		30.09				FM-15		30.10
06	0815	7	CLR:00	10.00		30	-1.1	26	-3.3	19	-7.2	64	3	VRB		30.09				FM-15		30.10
06	0835	7	CLR:00	10.00		32	0.0	28	-2.2	19	-7.2	60	6	VRB	*	30.09				FM-15		30.10
06	0855	7	CLR:00	10.00		32	0.0	28	-2.2	21	-6.1	64	6	VRB	*	30.09				FM-15		30.10
06	0915	7	CLR:00	10.00		32	0.0	28	-2.2	21	-6.1	64	6	VRB		30.10				FM-15		30.11
06	0935	7	CLR:00	10.00		32	0.0	28	-2.2	21	-6.1	64	7	230		30.09				FM-15		30.10
06	0955	7	CLR:00	10.00		34	1.1	29	-1.7	21	-6.1	60	6	VRB	*	30.09				FM-15		30.10
06	1015	7	FEW:02 70 FEW:02 80	10.00		34	1.1	29	-1.7	21	-6.1	60	5	220	*	30.08				FM-15		30.09

06	1035	7	FEW:02 70 FEW:02 80	10.00		34	1.1	29	-1.7	21	-6.1	60	6	VRB	*	30.07				FM-15		30.08
06	1055	7	CLR:00	10.00		36	2.2	31	-0.6	21	-6.1	56	7	220	*	30.06				FM-15		30.07
06	1115	7	FEW:02 70 FEW:02 85	10.00		36	2.2	31	-0.6	21	-6.1	56	10	230	18	30.06				FM-15		30.07
06	1135	7	BKN:07 70	10.00		36	2.2	31	-0.6	21	-6.1	56	11	220		30.04				FM-15		30.05
06	1155	7	OVC:08 70	10.00		36	2.2	31	-0.6	21	-6.1	56	8	VRB	*	30.04				FM-15		30.05
06	1215	7	OVC:08 65	9.00		36	2.2	31	-0.6	21	-6.1	56	7	VRB	16	30.03				FM-15		30.04
06	1235	7	OVC:08 65	10.00		36	2.2	31	-0.6	21	-6.1	56	8	220		30.02				FM-15		30.03
06	1255	7	BKN:07 65	10.00		36	2.2	31	-0.6	21	-6.1	56	5	220	*	30.01				FM-15		30.02
06	1315	7	FEW:02 60	10.00		36	2.2	31	-0.6	23	-5.0	60	6	220		30.01				FM-15		30.02
06	1335	7	CLR:00	10.00		36	2.2	31	-0.6	23	-5.0	60	6	210		30.00				FM-15		30.01
06	1355	7	CLR:00	10.00		36	2.2	31	-0.6	23	-5.0	60	3	VRB		29.99				FM-15		30.00
06	1415	7	CLR:00	10.00		37	2.8	32	0.0	23	-5.0	56	5	VRB		29.97				FM-15		29.98
06	1435	7	CLR:00	10.00		37	2.8	32	0.0	23	-5.0	56	5	180		29.97				FM-15		29.98
06	1455	7	SCT:04 15 SCT:04 20	10.00		37	2.8	33	0.6	25	-3.9	60	0	000		29.97				FM-15		29.98
06	1515	7	FEW:02 2 BKN:07 9 OVC:08 19	4.00	* |* |	37	2.8	33	0.6	27	-2.8	65	5	170		29.97				FM-15		29.98
06	1535	7	BKN:07 2 BKN:07 9 BKN:07 16	2.50V	* |* |	36	2.2	33	0.6	28	-2.2	75	5	VRB		29.95				FM-15		29.96
06	1555	7	FEW:02 2 SCT:04 11 BKN:07 24	8.00		36	2.2	34	1.1	30	-1.1	81	0	000		29.94				FM-15		29.95
06	1615	7	FEW:02 20 SCT:04 24 BKN:07 41	9.00		36	2.2	34	1.1	32	0.0	87	0	000		29.94				FM-15		29.95
06	1635	7	FEW:02 24 FEW:02 29 BKN:07 45	10.00		36	2.2	34	1.1	32	0.0	87	0	000		29.93				FM-15		29.94
06	1655	7	SCT:04 46	10.00		36	2.2	34	1.1	32	0.0	87	0	000		29.92				FM-15		29.93
06	1715	7	CLR:00	10.00	* |* |	34	1.1	33	0.6	32	0.0	93	5	350		29.92				FM-15		29.93
06	1735	7	BKN:07 38 BKN:07 46	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.92				FM-15		29.93
06	1755	7	SCT:04 38 BKN:07 47 OVC:08 55	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.91				FM-15	0.01	29.92
06	1815	7	FEW:02 46 OVC:08 50	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.90				FM-15		29.91
06	1835	7	FEW:02 36 BKN:07 55	10.00		36	2.2	35	1.7	34	1.1	93	3	300		29.90				FM-15		29.91
06	1855	7	FEW:02 33 SCT:04 40 SCT:04 55	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.90				FM-15		29.91
06	1915	7	FEW:02 32 SCT:04 43 BKN:07 50	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.90				FM-15		29.91
06	1935	7	BKN:07 49	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.90				FM-15		29.91
06	1955	7	OVC:08 49	10.00		36	2.2	35	1.7	34	1.1	93	0	000		29.91				FM-15		29.92
06	2015	7	OVC:08 47	10.00		36	2.2	35	1.7	34	1.1	93	3	260		29.91				FM-15		29.92
06	2035	7	OVC:08 43	10.00		36	2.2	35	1.7	34	1.1	93	3	VRB		29.92				FM-15		29.93
06	2055	7	BKN:07 42 BKN:07 75	10.00		34	1.1	34	1.1	34	1.1	100	3	260		29.92				FM-15		29.93
06	2115	7	FEW:02 42 FEW:02 70	10.00		34	1.1	34	1.1	34	1.1	100	3	VRB		29.93				FM-15		29.94
06	2135	7	CLR:00	10.00		34	1.1	34	1.1	34	1.1	100	5	VRB		29.95				FM-15		29.96
06	2155	7	CLR:00	10.00		34	1.1	33	0.6	32	0.0	93	5	VRB		29.96				FM-15		29.97
06	2215	7	FEW:02 34	10.00		34	1.1	33	0.6	32	0.0	93	7	VRB	*	29.98				FM-15		29.99
06	2235	7	SCT:04 36	10.00		34	1.1	34	1.1	34	1.1	100	9	VRB	17	29.99				FM-15		30.00

06	2255	7	SCT:04 11 SCT:04 17 BKN:07 39	10.00		34	1.1	33	0.6	32	0.0	93	9	VRB	16	30.01				FM-15		30.02
06	2315	7	BKN:07 12 BKN:07 18	10.00		34	1.1	33	0.6	32	0.0	93	14	310	22	30.01				FM-15		30.02
06	2335	7	FEW:02 12 FEW:02 18	10.00		34	1.1	32	0.0	28	-2.2	81	9	VRB	24	30.03				FM-15		30.04
06	2355	7	CLR:00	10.00		32	0.0	31	-0.6	28	-2.2	87	11	VRB	20	30.03				FM-15		30.04

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Precipitation
December 2019

Generated on 01/06/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 11 ft. Lat: 42.0983° N Lon: -70.6722° W
Station: **MARSHFIELD MUNICIPAL AIRPORT, MA US WBAN: 72225664774 (KGHG)**

Date	For Hour (LST) Ending at																								Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.02	0.03	0.02	0.08	0.14	0.12	0.06	01
02	0.02	0.01	M	0.03	0.01	0.02	M	0.03	0.01	0.02	0.02	0.02	0.03	0.03	0.06	0.08	0.04	0.03	0.04	0.03	0.02	0.01	0.03	0.01	02
03	0.03	0.06	0.05	0.03	0.01	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	M	M	M	03
04	M	M	M	M	M	M	M	M	M	M	M	M	0.04	0.03	M	M	M	M	M	M	M	M	M	M	04
05	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	05
06	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.01	M	M	M	M	M	M	06
07	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	07
08	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	08
09	M	M	M	M	M	M	M	0.01	0.02	0.03	0.05	0.11	0.03	0.07	0.02	0.02	M	0.10	0.12	0.03	0.10	0.11	0.05	0.06	09
10	0.04	0.04	0.03	M	M	M	M	M	M	M	M	M	M	M	0.05	0.03	0.03	0.01	M	M	M	M	M	0.01	10
11	0.02	0.01	0.01	0.04	M	M	M	M	M	M	M	M	0.01	M	0.01	0.01	M	M	M	M	M	M	M	M	11
12	M	M	M	M	M	M	M	M	M	M	M	M	M	0.03	M	M	M	M	M	M	M	M	M	M	12
13	M	M	M	M	M	M	M	M	M	M	0.01	M	M	M	M	M	M	M	M	0.02	0.01	0.01	M	M	13
14	0.02	0.11	0.19	0.14	0.15	0.16	0.08	0.12	0.13	0.10	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	14
15	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	15
16	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	16
17	M	M	M	M	M	M	M	M	M	M	0.02	0.07	0.15	0.09	0.02	M	0.06	0.05	0.02	0.01	0.04	0.01	0.01	0.01	17
18	0.05	0.01	M	0.01	M	M	M	M	M	M	0.03	M	M	M	M	M	M	M	M	M	M	M	M	M	18
19	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	19
20	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	20
21	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	21
22	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	22
23	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	23
24	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	24
25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	25
26	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	26
27	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	27
28	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	28
29	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.03	0.03	0.03	29
30	0.04	0.06	0.12	0.06	0.05	0.01	0.01	0.04	0.05	0.04	0.06	0.06	0.06	0.03	M	0.01	0.02	0.03	0.01	0.01	0.06	0.03	0.02	0.02	30
31	0.04	0.02	0.04	0.03	0.05	0.02	0.07	0.03	0.02	0.01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
December 2019

Generated on 02/04/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 149 ft. Lat: 41.9097° N Lon: -70.7294° W

Station: **PLYMOUTH MUNICIPAL AIRPORT, MA US WBAN: 72506454769 (KPYM)**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
05	0052	7	SCT:04 90	10.00		31	-0.6	30	-1.1	28	-2.2	89	5	240		29.31	8	0.00	29.47	FM-15	0.00	29.47
05	0152	7	CLR:00	3.00	BR:1 ||	28	-2.2	28	-2.2	28	-2.2	100	3	270		29.32			29.48	FM-15	0.00	29.48
05	0252	7	CLR:00	8.00		29	-1.7	28	-2.2	27	-2.8	92	5	250		29.32			29.49	FM-15	0.00	29.48
05	0316	7	CLR:00	1.75	BR:1 ||	26	-3.3	26	-3.3	26	-3.3	100	3	250		29.32				FM-16		29.48
05	0325	7	CLR:00	0.50	FZ:8 FG:2 |FG |	26	-3.3	26	-3.3	26	-3.3	100	3	270		29.33				FM-16		29.49
05	0335	7	CLR:00	2.50	BR:1 ||	29	-1.7	28	-2.2	27	-2.8	92	5	250		29.33				FM-16		29.49
05	0342	7	SCT:04 110	8.00		29	-1.7	28	-2.2	27	-2.8	92	5	250		29.33				FM-16		29.49
05	0352	7	BKN:07 110	10.00		30	-1.1	29	-1.7	28	-2.2	92	6	240		29.33	1	-0.02	29.49	FM-15	0.00	29.49
05	0452	7	SCT:04 75 BKN:07 100 OVC:08 120	8.00		28	-2.2	28	-2.2	27	-2.8	96	3	260		29.34			29.51	FM-15	0.00	29.50
05	0552	7	FEW:02 120	9.00		28	-2.2	28	-2.2	27	-2.8	96	3	270		29.37			29.53	FM-15	0.00	29.53
05	0652	7	CLR:00	10.00		29	-1.7	28	-2.2	27	-2.8	92	6	240		29.39	3	-0.06	29.56	FM-15	0.00	29.55
05	0752	7	CLR:00	9.00		29	-1.7	28	-2.2	27	-2.8	92	6	240		29.41			29.57	FM-15	0.00	29.57
05	0852	7	CLR:00	10.00		34	1.1	32	0.0	29	-1.7	82	9	270		29.42			29.59	FM-15	0.00	29.58
05	0952	7	CLR:00	10.00		36	2.2	34	1.1	30	-1.1	79	10	270		29.44	1	-0.05	29.60	FM-15	0.00	29.60
05	1052	7	CLR:00	10.00		39	3.9	35	1.7	30	-1.1	70	10	290		29.44			29.60	FM-15	0.00	29.60
05	1152	7	CLR:00	10.00		40	4.4	35	1.7	28	-2.2	63	13	300	22	29.44			29.60	FM-15	0.00	29.60
05	1252	7	CLR:00	10.00		41	5.0	36	2.2	28	-2.2	60	14	280	23	29.44	3	0.00	29.60	FM-15	0.00	29.60
05	1352	7	BKN:07 44	10.00		41	5.0	35	1.7	26	-3.3	55	14	290	28	29.47			29.63	FM-15	0.00	29.63
05	1452	7	OVC:08 50	10.00		40	4.4	35	1.7	26	-3.3	58	11	290		29.49			29.66	FM-15	0.00	29.65
05	1552	7	OVC:08 55	10.00		39	3.9	34	1.1	26	-3.3	60	9	270		29.53	3	-0.09	29.70	FM-15	0.00	29.69
05	1652	7	OVC:08 60	10.00		38	3.3	33	0.6	25	-3.9	60	10	270		29.58			29.74	FM-15	0.00	29.74
05	1752	7	OVC:08 65	10.00		37	2.8	32	0.0	23	-5.0	57	10	270		29.63			29.79	FM-15	0.00	29.79
05	1852	7	OVC:08 70	10.00		36	2.2	31	-0.6	21	-6.1	55	9	270	22	29.65	1	-0.12	29.81	FM-15	0.00	29.81
05	1952	7	CLR:00	10.00		34	1.1	29	-1.7	18	-7.8	52	15	270	22	29.67			29.84	FM-15	0.00	29.83
05	2052	7	CLR:00	10.00		32	0.0	27	-2.8	18	-7.8	56	14	270	21	29.70			29.86	FM-15	0.00	29.86
05	2152	7	FEW:02 60	10.00		32	0.0	27	-2.8	18	-7.8	56	13	280		29.73	3	-0.08	29.89	FM-15	0.00	29.89
05	2252	7	CLR:00	10.00		31	-0.6	27	-2.8	18	-7.8	59	8	270		29.76			29.92	FM-15	0.00	29.92
05	2352	7	CLR:00	10.00		30	-1.1	26	-3.3	17	-8.3	58	7	280		29.79			29.95	FM-15	0.00	29.95
06	0052	7	CLR:00	10.00		30	-1.1	26	-3.3	17	-8.3	58	10	280		29.82	3	-0.09	29.99	FM-15	0.00	29.98
06	0152	7	CLR:00	10.00		28	-2.2	25	-3.9	17	-8.3	63	7	270		29.86			30.02	FM-15	0.00	30.02
06	0252	7	CLR:00	10.00		27	-2.8	24	-4.4	17	-8.3	66	8	260		29.88			30.04	FM-15	0.00	30.04
06	0352	7	CLR:00	10.00		28	-2.2	25	-3.9	17	-8.3	63	10	260		29.89	1	-0.06	30.05	FM-15	0.00	30.05
06	0452	7	CLR:00	10.00		26	-3.3	23	-5.0	17	-8.3	69	8	250		29.91			30.07	FM-15	0.00	30.07
06	0552	7	CLR:00	10.00		25	-3.9	22	-5.6	16	-8.9	69	7	240		29.92			30.08	FM-15	0.00	30.08
06	0652	7	CLR:00	10.00		26	-3.3	23	-5.0	17	-8.3	69	6	240		29.93	1	-0.05	30.09	FM-15	0.00	30.09
06	0752	7	CLR:00	10.00		27	-2.8	24	-4.4	19	-7.2	72	7	230		29.93			30.10	FM-15	0.00	30.09
06	0852	7	CLR:00	10.00		31	-0.6	28	-2.2	21	-6.1	67	10	230		29.94			30.11	FM-15	0.00	30.10
06	0952	7	FEW:02 70	10.00		33	0.6	29	-1.7	22	-5.6	64	9	230		29.94	1	-0.01	30.11	FM-15	0.00	30.10
06	1052	7	BKN:07 80 OVC:08 90	10.00		34	1.1	30	-1.1	22	-5.6	61	9	220		29.91			30.08	FM-15	0.00	30.07
06	1152	7	OVC:08 70	10.00		34	1.1	30	-1.1	22	-5.6	61	8	230		29.89			30.05	FM-15	0.00	30.05
06	1252	7	BKN:07 55 OVC:08 75	10.00		35	1.7	30	-1.1	22	-5.6	59	7	220		29.86	6	+0.08	30.03	FM-15	0.00	30.02
06	1352	7	SCT:04 60 OVC:08 80	10.00		36	2.2	32	0.0	24	-4.4	62	5	200		29.84			30.00	FM-15	0.00	30.00

06	1452	7	FEW:02 37 BKN:07 47 OVC:08 60	10.00		37	2.8	33	0.6	26	-3.3	65	5	VRB		29.82			29.98	FM-15	0.00	29.98
06	1552	7	OVC:08 50	10.00		37	2.8	34	1.1	28	-2.2	70	0	000		29.79	8	+0.07	29.95	FM-15	0.00	29.95
06	1652	7	OVC:08 55	10.00		36	2.2	34	1.1	30	-1.1	79	0	000		29.76			29.93	FM-15	T	29.92
06	1752	7	SCT:04 36 OVC:08 49	10.00	-RA:02 |RA |RA	35	1.7	34	1.1	33	0.6	93	3	100		29.75			29.91	FM-15	T	29.91
06	1852	7	OVC:08 60	10.00		35	1.7	35	1.7	34	1.1	96	0	000		29.74	6	+0.05	29.91	FM-15	T	29.90
06	1952	7	SCT:04 43 BKN:07 55 OVC:08 100	10.00		35	1.7	34	1.1	33	0.6	93	3	240		29.75			29.91	FM-15	0.00	29.91
06	2052	7	BKN:07 46 OVC:08 70	10.00		34	1.1	33	0.6	32	0.0	92	3	280		29.77			29.94	FM-15	0.00	29.93
06	2152	7	FEW:02 40	10.00		35	1.7	33	0.6	31	-0.6	85	8	290		29.81	3	-0.06	29.97	FM-15	0.00	29.97
06	2252	7	SCT:04 28	10.00		35	1.7	33	0.6	30	-1.1	82	16	300	23	29.85			30.02	FM-15	0.00	30.01
06	2325	7	BKN:07 16 BKN:07 22	10.00		33	0.6	31	-0.6	29	-1.7	85	13	310	22	29.87				FM-16		30.03
06	2344	7	OVC:08 14	10.00		32	0.0	31	-0.6	28	-2.2	85	13	320	20	29.88				FM-16		30.04
06	2352	7	OVC:08 14	10.00		32	0.0	31	-0.6	28	-2.2	85	14	310	24	29.88			30.04	FM-15	0.00	30.04

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 149 ft. Lat: 41.9097° N Lon: -70.7294° W
Station: **PLYMOUTH MUNICIPAL AIRPORT, MA US WBAN: 72506454769 (KPYM)**

Local Climatological Data
Hourly Precipitation
December 2019

Generated on 02/04/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																								Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																	T	0.03	0.04	0.06	0.27	0.17	0.12	0.09	01
02	0.04	0.03	0.04	0.03	0.04	0.04	0.02	0.02	0.06	0.06	0.05	0.06	0.05	0.07	0.04	0.05	0.06	0.13	0.12	0.14	0.12	0.10	0.09	0.10	02
03	0.05	0.05	0.02	0.04	0.01	0.02	0.03	0.02	0.01	0.02	0.02	0.03	T	T	T	T	T				M	M			03
04	M					M	M																		04
05																									05
06																	T	T	T						06
07																									07
08																									08
09				T	T	T	T	0.06	0.03	0.04	0.11	M	M	M	M	M	M	M	M	M	0.19	M	0.07	0.10	09
10	0.05	0.07	0.04	T											0.05	0.01	0.01	T			0.01	T	0.01	0.01	10
11	0.01	0.01	0.03	0.05	T	0.02	0.03	0.03	0.06	0.07	0.06	0.04	T												11
12					M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M				12
13															M	M	M	M	T	0.03	0.01	T	M	M	13
14	0.07	0.15	0.26	0.22	0.13	0.17	0.12	0.15	0.15	0.11	0.03	T			T	0.01			T	0.01	T	M	M	M	14
15	M					M	M	M																	15
16								M	M	M	M														16
17						T	0.05s	0.03	0.04	0.09	0.04	0.05	0.09	0.08	0.05	T	0.08	0.04	0.04	0.02	0.01	0.02	0.01	0.01	17
18	0.02	0.02	0.03	0.01	T				T									T	T						18
19		T																							19
20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29																				T	T	0.01	0.02	0.04	29
30	0.06	0.09	0.15	0.09	0.04	0.03	0.02	0.16	0.10	0.13	0.04	0.09	0.10	0.02	0.01	T	0.05	0.01	0.07	0.03	0.13	0.03	0.03	0.05	30
31	0.05	0.05	0.07	0.02	0.04	0.01	0.04	T								T									31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.05	0.09	0.11	0.13	0.18	0.26	0.31	0.35	0.40	0.50	0.60	0.67
Ending Date Time (yyyy-mm-dd hh:mi)	2019-12-14 05:24	2019-12-14 02:29	2019-12-14 02:33	2019-12-14 02:39	2019-12-14 02:33	2019-12-14 02:31	2019-12-14 02:39	2019-12-14 03:02	2019-12-14 03:27	2019-12-14 03:46	2019-12-14 04:17	2019-12-14 04:38

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Appendix D

MassDEP Pure Tone Periods

Appendix D – MassDEP Pure Tone Periods

Table 1a - Measured Pure Tones - Night 2 (July 31, 2019) - Location 1

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Ambient	1:51 AM	45	54	39	36	35	34	31	31	28	23
Ambient	1:52 AM	45	54	40	35	35	34	31	29	28	22
Ambient	1:53 AM	45	54	39	35	34	34	31	29	27	22
Ambient	1:54 AM	45	54	40	36	35	35	32	31	28	23
Ambient	1:55 AM	46	54	40	36	36	35	33	32	29	23
Ambient	1:56 AM	45	54	39	35	35	35	33	33	30	24
Ambient	1:57 AM	46	54	40	41	35	34	32	31	28	23
Ambient	1:58 AM	48	54	46	42	35	34	32	31	29	23
Ambient	1:59 AM	47	54	40	36	35	34	31	30	29	23
Ambient	2:00 AM	46	54	39	36	35	35	31	31	30	23
Ambient	2:01 AM	46	54	40	35	35	34	31	29	29	22
Ambient	2:02 AM	45	54	40	35	34	34	32	31	30	23
Ambient	2:03 AM	45	53	40	33	33	32	30	29	29	23
Ambient	2:04 AM	45	53	40	33	33	32	30	29	29	23
Ambient	2:05 AM	45	54	41	33	34	32	30	29	29	22

Table 1b - Measured Pure Tones - Night 2 (July 31, 2019) - Location 2

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Operational	1:19 AM	51	50	47	42	43	34	31	30	41	25
Operational	1:20 AM	50	50	47	41	42	34	31	31	41	26
Operational	1:21 AM	50	49	45	40	42	34	30	32	41	26
Operational	1:22 AM	50	50	46	40	43	35	31	32	42	26
Operational	1:23 AM	50	50	45	41	42	35	32	33	42	26
Operational	1:26 AM	51	50	46	40	41	34	30	32	41	27
Operational	1:27 AM	55	52	49	42	44	37	30	32	41	27
Operational	1:28 AM	51	51	48	43	44	34	30	32	41	27
Operational	1:29 AM	51	52	48	42	44	34	28	30	41	26
Operational	1:30 AM	51	51	47	41	43	34	31	32	41	26
Operational	1:32 AM	50	51	48	42	43	35	32	34	39	28
Operational	1:33 AM	50	50	46	41	43	34	30	31	40	26
Operational	1:34 AM	51	50	47	42	44	35	30	32	40	26
Operational	1:36 AM	51	50	47	42	42	34	31	32	39	26
Ambient	1:53 AM	47	48	39	35	36	32	31	35	40	25
Ambient	1:54 AM	46	47	39	36	36	33	32	36	41	26
Ambient	1:55 AM	49	47	40	35	37	34	32	35	41	26
Ambient	1:56 AM	50	46	39	35	36	32	31	35	39	26
Ambient	1:57 AM	49	48	45	44	35	31	29	34	39	26
Ambient	1:58 AM	48	49	42	41	38	33	31	35	39	25
Ambient	1:59 AM	46	48	39	35	35	32	29	34	39	25
Ambient	2:00 AM	47	48	39	35	35	31	29	34	40	26
Ambient	2:01 AM	46	48	40	35	36	32	29	34	40	26
Ambient	2:02 AM	46	47	39	34	35	32	30	35	40	26
Ambient	2:03 AM	46	46	39	35	36	32	30	34	39	26
Ambient	2:04 AM	46	46	39	35	36	32	31	35	40	26
Ambient	2:05 AM	46	47	39	36	36	33	31	35	39	26
Ambient	2:06 AM	45	48	39	35	36	32	31	35	39	26
Ambient	2:07 AM	46	49	39	35	35	32	30	34	39	26

Note: Highlighting indicates pure tone

Appendix D – MassDEP Pure Tone Periods

Table 1c - Measured Pure Tones - Night 2 (July 31, 2019) - Location 4

Measurement	Start Time	1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Operational	1:28 AM	50	48	45	42	42	45	39	33	29	26

Table 1d - Measured Pure Tones - Night 3 (October 2, 2019) - Location 1

Measurement	Start Time	1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Operational	1:02 AM	63	58	54	51	51	44	47	57	37	29
Operational	1:03 AM	63	58	55	52	52	45	47	57	40	31
Operational	1:04 AM	63	59	55	52	52	45	47	57	37	29
Operational	1:05 AM	64	59	55	51	52	45	47	57	35	28
Operational	1:06 AM	63	59	55	51	52	46	48	57	41	33
Operational	1:08 AM	63	58	54	51	51	44	47	57	37	29
Operational	1:09 AM	60	59	55	51	51	45	47	57	37	29
Operational	1:10 AM	60	60	55	52	51	45	47	57	38	30
Operational	1:11 AM	60	59	55	51	52	44	47	57	36	28
Operational	1:12 AM	61	60	56	52	52	45	48	57	39	31
Operational	1:15 AM	60	59	55	52	51	45	47	57	39	30
Operational	1:16 AM	59	59	55	52	51	45	47	57	39	30
Operational	1:17 AM	59	58	54	51	51	45	47	57	38	30
Operational	1:18 AM	60	59	55	52	51	44	47	57	37	29
Operational	1:19 AM	60	59	56	52	51	46	47	57	38	30
Ambient	1:40 AM	50	52	42	39	41	41	45	57	35	29
Ambient	1:41 AM	54	53	42	42	42	42	46	57	39	31
Ambient	1:42 AM	49	52	42	40	40	41	46	57	35	29
Ambient	1:43 AM	54	52	42	38	39	39	46	57	36	29
Ambient	1:44 AM	51	52	43	42	43	43	46	57	40	31
Ambient	1:45 AM	48	51	41	38	39	39	45	57	35	29
Ambient	1:46 AM	48	51	42	41	41	40	45	57	36	29
Ambient	1:47 AM	48	52	44	42	42	42	45	57	35	29
Ambient	1:48 AM	50	51	42	42	42	40	45	57	37	29
Ambient	1:49 AM	51	52	44	43	43	42	46	57	38	31
Ambient	1:50 AM	49	51	43	39	40	39	45	57	37	29
Ambient	1:51 AM	55	51	41	38	38	38	45	57	36	29
Ambient	1:52 AM	60	51	41	37	38	37	45	57	35	28
Ambient	1:53 AM	60	51	41	38	39	39	45	57	36	29
Ambient	1:54 AM	60	51	42	38	39	38	45	57	36	29

Note: Highlighting indicates pure tone

Appendix D – MassDEP Pure Tone Periods

Table 1e - Measured Pure Tones - Night 3 (October 2, 2019) - Location 2

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Operational	1:11 AM	53	52	48	42	43	38	46	50	40	32
Ambient	1:41 AM	51	47	42	39	42	41	49	52	41	31
Ambient	1:42 AM	49	50	44	40	41	40	48	52	41	30
Ambient	1:43 AM	51	48	42	40	41	40	48	52	42	31
Ambient	1:44 AM	52	48	41	37	38	37	48	52	41	30
Ambient	1:45 AM	47	46	40	37	39	38	48	52	42	32
Ambient	1:46 AM	52	47	41	40	41	38	48	52	41	30
Ambient	1:47 AM	56	49	43	39	40	39	48	52	41	31
Ambient	1:48 AM	47	46	42	41	42	40	49	52	41	31
Ambient	1:49 AM	46	46	41	38	39	38	48	52	42	31
Ambient	1:50 AM	55	48	42	38	40	39	49	52	42	31
Ambient	1:51 AM	60	52	42	37	38	36	49	52	42	30
Ambient	1:52 AM	47	47	40	37	38	37	49	52	42	31
Ambient	1:53 AM	47	46	40	36	37	36	49	52	42	30

Table 1f - Measured Pure Tones - Night 3 (October 2, 2019) - Location 3

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Operational	1:02 AM	51	47	44	43	43	42	45	48	42	33
Operational	1:04 AM	55	48	44	42	42	41	45	48	40	31
Operational	1:09 AM	54	49	45	44	44	42	45	48	42	33
Operational	1:14 AM	56	48	45	45	45	44	46	49	44	36
Operational	1:16 AM	54	49	45	44	44	43	46	49	44	34
Operational	1:17 AM	54	48	44	43	43	41	45	48	42	32
Operational	1:18 AM	53	48	44	43	43	42	45	49	43	33
Ambient	1:43 AM	56	48	42	41	41	40	45	48	42	32
Ambient	1:46 AM	54	48	43	43	44	43	46	49	44	34
Ambient	1:48 AM	55	46	43	43	43	42	46	49	44	34
Ambient	1:50 AM	48	45	41	41	42	41	45	48	43	33

Table 1g - Measured Pure Tones - Night 3 (October 2, 2019) - Location 4

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Operational	1:19 AM	53	50	47	42	42	40	47	50	39	30
Ambient	1:51 AM	51	48	43	40	42	41	47	50	41	31
Ambient	1:54 AM	53	48	44	41	43	42	47	51	41	32
Ambient	1:55 AM	57	50	44	42	43	43	47	51	41	33
Ambient	1:57 AM	56	50	44	41	43	42	47	51	41	32

Table 1h - Measured Pure Tones - Night 4 (December 6, 2019) - Location 1

		1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
Measurement	**Start Time**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Ambient	1:50 AM	53	60	40	35	33	31	26	24	22	22
Ambient	1:51 AM	61	58	42	35	37	43	38	26	22	22

Note: Highlighting indicates pure tone

Appendix D – MassDEP Pure Tone Periods

Table 1i - Measured Pure Tones - Night 4 (December 6, 2019) - Location 2

Measurement	Start Time	1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Operational	1:15 AM	53	58	46	39	40	39	39	41	39	28
Ambient	1:36 AM	53	57	43	36	34	30	25	22	21	23
Ambient	1:40 AM	52	57	41	38	42	35	28	25	24	23
Ambient	1:41 AM	52	51	42	42	46	39	32	28	25	24

Table 1j - Measured Pure Tones - Night 4 (December 6, 2019) - Location 3

Measurement	Start Time	1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Ambient	1:44 AM	51	55	38	33	32	27	23	22	21	23

Table 1k - Measured Pure Tones - Night 4 (December 6, 2019) - Location 4

Measurement	Start Time	1-Minute Leq Sound Pressure Level (dB) by Octave-Band Center Frequency (Hz)									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Operational	1:02 AM	54	57	44	41	39	34	30	27	24	23
Operational	1:14 AM	54	58	45	40	38	32	27	25	23	22
Operational	1:21 AM	51	57	40	35	33	28	24	22	20	21
Ambient	1:38 AM	51	55	39	33	31	26	25	23	21	21
Ambient	1:39 AM	50	54	39	31	30	26	22	21	19	21
Ambient	1:42 AM	52	58	40	35	33	30	27	24	21	21

Note: Highlighting indicates pure tone

12 Feb 2009
Planning Bd
review

TO: Don Walters, Chairman
Scituate Planning Board

FROM: Al Bangert, Director
Department of Public Works

DATE: 11 February 2009

RE: INFORMAL DISCUSSION - WIND TURBINE AT SEWER PLANT

Don-

Thanks for the opportunity to meet with you and the Planning Board Thursday night to discuss the Town's application for a Special Permit pursuant to Scituate Zoning Bylaw 740 – Wind Energy Conversion System.

BACKGROUND: The Scituate Renewable Energy Committee (Reidy, Limbacher, et. al.) applied for a grant from the Massachusetts Technology Collaborative to conduct a formal feasibility study for erecting a wind turbine to generate electric power and reduce the Town's energy costs. They contracted with the consultants KEMA and Tech Environmental to analyze the physical, financial, acoustic, and environmental effects of various turbine sizes and locations. The Committee completed their work and made a recommendation to the Selectmen that the Town proceeds with a project to construct a large-scale turbine on the parcel of Town land next to the Sewer Treatment Plant on the Driftway. The Department of Public Works is now on point to carry this project forward.

On Thursday night I'll be prepared to brief the Board on the project, the site, the layout, the dimensions, etc. I would like to get the Board's guidance before I invest the Town's money in further preparation of a formal Special Permit application.

NEXT STEPS:

1. Obtain a Special Permit under SZB 740 - Wind Energy Conversion System.
2. Obtain Town Meeting permission to lease a portion of the property at 167 Driftway for the purpose of erecting a wind turbine.
3. Issue a Request for Proposals to lease the parcel, erect a wind turbine and provide reduced cost energy to the Town via a "Planned Power Agreement."

See you Thursday evening.

Al Bangert

Cc: Bill Limbacher
Paul Reidy
Laura Harbottle
Rick Agnew

3 March 2011
Ply Co. Commission

TOWN OF SCITUATE

600 Chief Justice Cushing Hwy.
Scituate, Massachusetts 02066
Telephone (781) 545-8741
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pvinchesi@town.scituate.ma.us

PATRICIA A. VINCHESI
Town Administrator

February 16, 2011

Met 3/3/11

Plymouth County Commissioners
11 South Russell Street
Plymouth, MA 02360

Re: Scituate Wind QECB Application

Dear Commissioners:

I am writing on behalf of the Town of Scituate to respectfully request that the Plymouth County Commissioners hold a hearing at its earliest opportunity to review the application submitted by Scituate Wind, LLC ("Scituate Wind)" for Qualified Energy Conservation Bonds (QECB) which have been made available to communities within Plymouth County. It is my understanding that Scituate Wind is at present the only applicant that has applied for an award of private-activity QECBs in Plymouth County. The Town offers its strong endorsement for Scituate Wind's application.

For the past two years, the Town has worked closely with Scituate Wind to develop an innovative and model power purchase agreement. We are very much looking forwarded to the construction and operation of the Town's first wind turbine this spring-summer. The project will generate many benefits for our Town and is anticipated to save approximately $250,000 in annual energy costs. In addition to the projected savings, this agreement should insulate our municipal budget from spikes in the regional cost of electric power. Consistent with the Town's new status as a "Green Community," the clean, renewable energy from this wind power project will reduce the Town's carbon footprint and offset toxic air emissions from traditional grid power. Moreover, the Town and the project's developers will ensure that the project is an educational tool for students throughout Plymouth County.

If the QECB are approved by the Commission, Scituate Wind will immediately be able to finance the project through Cambridge Savings Bank which has been included in its filings to you. As you are aware, the QECB program provides a cost of capital low enough to help finance small, community-based wind projects. Scituate's project certainly fits this criteria. The award of these bonds is essentially the last step between now and the start of construction.

The award of QECB by the Commissioners will play a key role in enabling Scituate Wind to provide clean, renewable power to our Town.

22 Jun 2011
Building Commission

TO: WHOM IT MAY CONCERN

DATE: June 22, 2011

SUBJECT: SCITUATE WIND LLC - SET-BACK COMPLIANCE

I have reviewed the wind turbine project to be constructed at 167 Driftway.

The location as indicated on Exhibit A – Leased Premises Plan for Scituate Community Wind Project dated May 23, 2011 complies with the Town of Scituate Zoning Bylaw, Sections 740.1 and 740.2 concerning setbacks from traveled ways and property lines.

Neal Duggan
Zoning Enforcement Officer
Town of Scituate

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

COPY

November 13, 2012

Mr. Russell Clark, Chairman
Scituate Board of Health
Town Hall
600 Chief Justice Cushing Highway
Scituate, MA 02066

Dear Chairman Clark and Board Members:

On November 2, 2012, MassDEP received an inquiry from Jennifer L. Sullivan, Health Department Director with questions regarding Wind Turbine Sound Sampling. By this letter I would like to address the wind turbine sound sampling questions posed to us by your Health Department Director. The following details the questions asked and our response.

1. **How should the testing be done?**
   Enclosed with this letter is the sampling protocol MassDEP is currently using to determine sound impacts from the Fairhaven Wind Turbines. This document spells out the specifics of how testing would be conducted in Fairhaven. The protocol provides the details of when to sample and where to sample as well as how to use the results of the sampling to determine compliance. We would recommend that a similar site specific protocol be developed for Scituate. We believe it would be helpful if the protocol developed for sampling in Scituate was sent to us for review and comment so that the testing will be consistent with what MassDEP has used to determine regulatory compliance. Please note that the sampling described in the attached protocols is an "attended" study with technical staff present during the testing. This is done so that the sound impacts from the wind turbine can be defined and segregated from other sounds in the area.

2. **What qualifications should someone who is doing the testing have?**
   If the Town is looking for contractor assistance, most consulting firms who do this kind of work have trained acousticians on staff. A suitable consultant will also have the appropriate equipment as defined in the protocol.

   The person conducting the testing has to be able to follow the protocol and make a determination of what sounds are coming from the Turbine as opposed to sounds from other sources. Board of Health staff could be trained to do the same.

3. **How do you find contractors?**
   Most consulting firms with acoustics measurement services can be found through a yellow pages or Google search. There are a number of firms located locally that have the ability and equipment to carry out this type of sampling protocol. You should concentrate on firms who have some experience in conducting wind turbine sound sampling (rather than a firm that specializes in indoor sound or OSHA Compliance).

4. **"What does the testing mean or not mean"?**
   Testing that follows the MassDEP Protocol is done to determine if the sound source complies with the MassDEP Regulation 310 CMR 7.10 which, in summary, states that no person may cause excess noise and the MassDEP Policy which defines noise as sound that exceeds 10 dBA over background without operation of the sound source (in this case, the wind turbine).

5. **What is the optimal time to test?**
   The protocol defines the conditions (wind speed and wind direction) and time for testing. Initial testing has been done for "worst case" conditions which is generally when the background or ambient sound without the wind turbine is low or between midnight and 4am. There may be some local variation in those times based on traffic patterns or other sound producing activities in the area. The wind conditions we generally test include very low winds where background sound would be low but the turbines would be operating and generating sound (3-4 m/s) and high wind conditions where the sound power level from the turbine is maximized. In the latter case, background will also be louder (sound of wind and trees).

6. **Can wind turbine noise be distinguished from other noise?**
   The sound from the wind turbine can be more easily distinguished from other sounds late at night and under low wind conditions when there are few if any other sources of sound in the background. Under higher wind conditions the wind turbine sound can still be distinguished but it is more challenging to separate the sound of the turbine from the sound of the wind or other sound producing sources. At some sampling locations, it may not be possible to hear the wind turbine under some wind conditions and if the operator cannot easily distinguish the turbine sound at a given location, sampling at that location or under those conditions would not be recommended or useful.

7. **How many sites should be tested?**
   MassDEP has focused sampling on residential locations at certain distances and directions from the turbines based on the complaint data. In Falmouth we sampled four to six locations in the neighborhoods closest to the turbines which are south and west of the turbines. In Fairhaven we are sampling five locations in neighborhoods encircling the turbines. Sampling sites are chosen based on a variety of factors but we generally have chosen the home closest to the wind turbines in any given direction in order to sample at what should be the "worst case" location. In some instances in Falmouth, we have also selected homes where it was suspected that elevation played a role in the sound impact.

I hope this information gives you a starting point for your discussion. Should you have any questions or need any further information, please feel free to contact Laurel Carlson in our Boston Office at 617-348-4095 or Marc Wolman, also in Boston at 617-292-5515.

Sincerely,

Phillip Weinberg, Regional Director

Cc: Martin Suuberg, MassDEP Deputy Commissioner
Maria Pinaud, MassDEP SERO Deputy Regional Director
Jennifer Sullivan, Health Agent
Laurel Carlson, MassDEP
Marc Wolman, MassDEP

Att.

Wind Turbine Noise Study Protocol: Fairhaven **July 2012**

Equipment:

- Sampling will be performed with a Type I digital Meter (Quest Sound Pro SEL) with accuracy to +/- 1 dB. The sampler will be set to collect data on the "A" weighted scale in "slow" response mode with a one second recording interval (log period). The sampler will be calibrated before and after each sampling event.
- Ground level wind speed will be extrapolated from nearby met data including data from New Bedford Airport and from West Island Weather (KMAFAIRH13). Fairhaven Wind LLC shall provide hub-height wind speeds (10 minute averages) obtained from equipment on either the north or south turbine.

Sampling Sites and Operating Conditions:

- A minimum of four sites will be sampled at the point of perceived maximum impact from the wind turbines. Four sites will be sampled including 3 Teal Circle, 3 Shawmut St, the last residence on Little Bay Road, and the residence at the corner of Mill Road and Route 6. Additional sites may be added as conditions during sampling warrant and at the discretion of MassDEP. MassDEP will coordinate with the residents at the selected sites to determine the point of greatest impact and will conduct the sampling at or near that location or at the property line, whichever is practicable. Sampling will not be conducted indoors.
- The sampler will be mounted at a height of approximately 1.3 meters and shall be located so as to comply with offsets from vertical reflecting surfaces as specified in ANSI 12.9.
- Four different operating conditions (wind speeds/ wind direction) will be evaluated including the following:
    1. At or near the cut-in wind speed where background sound will be the lowest (4-5 m/s wind speed at hub height) with winds from the south, west or southwest such that the Shawmut Street/ Weeden Road and Mill Street area is generally downwind from the turbines.
    2. At or near the cut-in wind speed where background sound will be the lowest (4-5 m/s wind speed at hub height) with winds from the east, southeast or northeast such that the area of Teal Street, John St and Little Bay Road are located generally downwind from the turbines;
    3. At the wind speed where manufacturer data indicates there will be the greatest sound power level from the turbine (9-11 m/s) with winds from the west or southwest,
    4. At a wind speed at or near where the manufacturer data indicates the turbines will produce the greatest sound power level (9-11 m/s) with winds from the east or northeast.

  Multiple days of sampling will be required to collect all of the scenarios and locations identified herein.

Procedure:

- Sampling may be conducted during one or more time periods including:

- quietest hours (1am-4am)
- daytime off-peak hours (1:30 pm-4pm);
- evening hours (8pm-11 pm) and

- Sampling will start with data collection during the quietest overnight hours (1am-4am). Should sampling during that time period reveal no exceedence of MassDEP's noise policy at one or more locations for the given wind conditions sampled, daytime and evening sampling will not be conducted for those locations.
- Sampling days will be selected based on predicted wind conditions. MassDEP will make every effort to notify The Town, Fairhaven Wind LLC and residents at whose properties sampling will be conducted at least 24 hours in advance of a sampling event.
- To evaluate the effect of wind speed on turbine sound emission levels (impact sound), three sampling runs will be conducted at each site under each operating condition to establish an L_{max} for each respective operating condition. L_{max} is the highest sampled sound level attributed to the sound source (wind turbines) during the sampling run on a one second average. The L_{max} from each of three runs at a single site and operating condition will be averaged to create a single L_{max} for that sampling site under the select wind conditions.
- Each sampling run will be 5 minutes in duration. Samples will be collected manually every 5 seconds (60 sound measurements). Consistent with current MassDEP guidance, any peak sound levels that can be attributed to another sound source (e.g. local traffic, resident generated sounds, etc.) will be identified by the study attendant and discarded from the data set before determining L_{max}.
- At four sites, (Little Bay Road, Teal Circle, Mill Road and Shawmut Street), a pure tone analysis will be conducted. For pure tone analysis, the meter will be set to collect linear sound on a "slow" response and an octave band filter will be employed to speciate sound pressure levels for 10 octave bands. Pure tone analysis will include collection of one minute L_{eq} sound pressure levels with the wind turbines operating and without the wind turbines operating to evaluate the impact of the wind turbines to pure tone.
- At four sites (Little Bay Road, Teal Circle, Mill Road, Shawmut Street) background sampling shall be performed to determine the L_{90} background against which the L_{max} will be compared. The study attendant shall coordinate with Fairhaven Wind LLC to shut down both wind turbines for the purpose of sampling background.
- As the sampling will be done under conditions where the wind might significantly contribute to total sound recorded, MassDEP will make an effort to exclude data from analysis where the sound of the wind is dominant over the sound of the wind turbines.

Assessment of Results

Once the data is collected and quality control review is complete, MassDEP will analyze all of the data to determine if the sound levels from the wind turbines comply with MassDEP's Noise Policy Threshold for impact sound of 10 dB(A) at each of the sampling sites and under each of the defined operating scenarios. The pure tone data will be analyzed to determine if any octave band center frequency sound pressure level attributable to the wind turbines exceeds the two adjacent center frequency sound pressure level by three decibels or more. The results will be compiled into a single report to be provided to the Town once the sampling and data quality review is complete.

Lorraine Devin

From: Al Bangert
Sent: Tuesday, October 17, 2017 1:30 PM
To: Maura Curran; Vegnani Tony; Danehey John; Lorraine Devin; Harris Shawn; Karen Canfield
Cc: Jennifer Keefe
Subject: Cost to curtain turbine in summer evenings
Attachments: Cost to shutdown in summer evenings-revised.docx

BOS-
Attached is a revised copy of the FILE MEMO detailing the cost to shut down the turbine during April 15th through October 15th from 11PM to 6AM.

Essentially,

To curtail operations for 6-months from 11pm-6am this summer would have cost taxpayers a total of $163,000 ($68k we would owe Scituate Wind plus $95k in lost revenue from National Grid).

To curtail during this same period and time, but only when winds are from the westerly direction (north-north-west to south-south-west) would have cost $110,000.

More detail is in the attached write-up. These are numbers are based upon real data.

AGB

Lorraine Devin

From: Al Bangert
Sent: Friday, March 23, 2018 10:28 AM
To: Lorraine Devin; Maura Curran; Vegnani Tony; John Danehey; Shawn Harris; Karen Canfield
Cc: James Boudreau
Subject: Wind Turbine Noise Testing

BOS-

Here is an update on turbine noise compliance testing.

- In the fall the Board voted to seek a qualified acoustical engineering firm to field test the wind turbine for noise levels relative to the state regulations.
- I prepared a Request for Services which was advertised in the Patriot Ledger and the Commonwealth's ComBuys register.
- Eleven firms, including 3 suggested by Mr. Dardi, requested or were sent the RFS.
- Four firms replied that they were either too busy or not qualified to do the testing.
- Ultimately we received three responses to the Request for Services. Two of these fell far short of responding in a responsive manner and were disqualified.
- I checked the references on the remaining firm. The DEP had experience with the principal member of the responding firm. Their feedback was quite negative. Therefore, I cannot recommend that we use this firm.
- The next step is for me to go back to two of the firms that were too busy to respond in a timely manner and ask if they would reconsider responding to the RFS.

Based upon the responses we received and the previous testing done by the Town several years ago, we can expect the acoustical testing to cost between $28,000 and $35,000.

Please let me know if you would like to discuss this further.

AGB

Lorraine Devin

From: Al Bangert
Sent: Tuesday, May 29, 2018 9:10 PM
To: Karen Canfield; Lorraine Devin; Maura Curran; Danehey John; Vegnani Tony; Harris Shawn; Michele Seghezzi; James Boudreau
Subject: Wind Turbine summer abatement

BOS-
The program to cease turbine operation under certain wind conditions begins on June 1st. (We will cease "ceasing" when we do noise testing. I'll keep you and neighborhood informed of timing once a plan has been finalized.) Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Lorraine Devin

From: Nancy Holt
Sent: Monday, September 23, 2019 9:32 AM
To: Lorraine Devin
Subject: RE: Turbine info
Attachments: OY7 Production Shortfall_amount due Town of Scituate.xlsx

Hi Lorraine:

No, that would likely be Al. AL and I received the attached from Robert Russell at Scituate Wind LLC on May 21, 2019 but Al might need to interpret it to see if this what you are looking for in response to the question.

Thanks,
Nancy

****

Nancy Holt
Finance Director/Town Accountant
Town of Scituate
600 Chief Justice Cushing Hwy
Scituate, MA 02066
Tel: (781) 545-8711
Fax: (781) 545-8704
Website: www. scituatema.gov

-----Original Message-----
From: Lorraine Devin
Sent: Monday, September 23, 2019 9:24 AM
To: Nancy Holt
Subject: FW: Turbine info

HI Nancy,

Do you recall or have record of the analysis of shutting off the wind turbine.

Thanks,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----

From: Karen Canfield
Sent: Saturday, September 21, 2019 9:02 AM
To: Lorraine Devin
Subject: Turbine info

Hi Lorraine,
Can you tell me what meeting date discussed Nancy's analysis of wind turbine shut off costs? I'd like to review the numbers again and can't seem to find them.
Thanks,
Karen

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

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Scituate Wind LLC
Wind Turbine

Operational Year 7
(April 2018-March 2019)

Contract Year	Fiscal Year	Calendar Year	NGRID Dates	Production kWh	NG Credit $
7	FY18	2018	4/4-5/3	324,809	$63,159.19
7	FY18	2018	5/3-6/5	223,044	$39,832.36
7	FY18	2018	6/5-7/5	214,460	$38,241.43
7	FY19	2018	7/5-8/5	186,206	$32,952.17
7	FY19	2018	8/5-9/4	53,731	$9,501.44
7	FY19	2018	9/4-10/3	242,268	$42,879.27
7	FY19	2018	10/3-11/1	233,260	$41,550.57
7	FY19	2018	11/1-12/4	192,494	$39,853.58
7	FY19	2018	12/6-1/6	131,307	$27,182.39
7	FY19	2019	1/6-2/4	202,561	$41,938.36
7	FY19	2019	2/4-3/5	306,969	$63,626.35
7	FY19	2019	3/5-4/3	325,562	$67,817.61
adjustment for voluntary curtailment- 2018				3,360	
Total				2,640,031	$508,534.72

original NGRID		revised NGRID	
kWh	NG Credit $	kWh	NG Credit $
318,399	$ 56,352.99	186,206	$ 32,952.17

Average NG credit per kWh		$0.1926
Operating Year kWh shortfall	359,969	
Scituate Wind rate for Contract Year 7		$0.0990
Shortfall (net of lost NG credits less SW rate)		$33,701.93

Lorraine Devin

From:	Albert Bangert <agbangert@mac.com>
Sent:	Wednesday, July 10, 2019 3:37 PM
To:	Harris Shawn; Vegnani Tony; Maura Curran; Michele Seghezzi; Lorraine Devin; Karen Canfield; James Boudreau; Karen Connolly
Subject:	Fwd: Scituate Turbine Data Requested
Attachments:	Wind Conditions -- 6-12-15-2019 mornings.xlsx; ATT00001.htm

BOS-
I have sent along to Mr. Dardi the data he requested at your meeting a couple of weeks ago.
The data from the turbine reports that the wind conditions did not meet the curtailment criteria previously established.
Al Bangert

Begin forwarded message:

From: Al Bangert <abangert@scituatema.gov>
Subject: Fwd: Scituate
Date: July 10, 2019 at 7:17:43 AM EDT
To: Bangert Albert <agbangert@comcast.net>

Sent from my iPhone

Begin forwarded message:

From: Gordon Deane <gdeane@palmcap.com>
Date: July 8, 2019 at 5:33:27 PM EDT
To: Al Bangert <abangert@scituatema.gov>
Subject: RE: Scituate

Al,

Since it was unclear whether "the nights of ..." meant the nights starting those dates or the mornings of those dates, we've downloaded the SCADA data for the mornings of June 12, 13, 14 & 15. We then ran an "if, then" to determine if the curtailment conditions were met. They weren't.

As a reminder, the curtailment conditions are:

(a) Wind is blowing from a wind direction which is within 22.5 degrees of the Southwest (225);
(b) Wind is below 4.5 meters/second at the nacelle; and
(c) The time is between 11 PM and 6 AM.

I hope this is helpful.

Gordon

-----Original Message-----
From: Al Bangert [mailto:abangert@scituatema.gov]
Sent: Monday, July 08, 2019 3:35 PM
To: Gordon Deane
Subject: Scituate

Hi, Gordon-
At the request of the Selectmen, please send me the wind speed and direction data from the SCADA for the period 12:01am thru 6:00am on the nights of June 12, 13, and 14th. I will provide it to Mr. Dardi. He claims the turbine was noisy during times when his iPhone data indicated it should have been shut down.
Thanks,
Al

Sent from my iPhone

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

September 3, 2018

Commonwealth of Massachusetts
Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108

Commissioner Martin Suuberg

Dear Mr. Suuberg,

It has been over a month since I sent you the attached letter requesting an explanation as to why the current Noise Regulation 310 CMR 7.10 has not been modified to properly evaluate the unique noise created by large wind turbines.

Since as early as 2011, the DEP has acknowledged the fact that the current evaluation/noise compliance regulations have been inadequate and in 2012 they convened an investigative panel to develop corrective changes. In 2014 the findings of that panel were publicly announced by Laurel Carlson in a meeting where she announced, quite emphatically, "slow is out fast is in." Yet no changes have been made to the current noise regulation. And people continue to suffer in locations where wind turbines have been built too close to their homes.

Why have you not responded to my inquiry of August 1, 2018? Is non-responsiveness an accepted practice by the Commonwealth of Massachusetts? I would expect, at least, an acknowledgement of my letter.

My neighbors and I have had our lives and homes significantly affected by a wind turbine and I expect an answer to this letter?

Sincerely,

David M Dardi
122 Gilson Rd
Scituate, MA 02066

cc: Scituate Board of Selectmen
cc: Millie Garcia-Serrano, Director, Southeast Office of MassDEP

August 1, 2018

Commonwealth of Massachusetts
Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108

Commissioner Martin Suuberg

Dear Mr. Suuberg,

The Mass DEP is an important part of the State Government entrusted with the responsibility of protecting the resources and the people of the Commonwealth of Massachusetts. One area of particular concern to me is the current DEP Noise Regulation which governs the installation and control of large wind turbines. That regulation was summed up nicely by the acting DEP director of SE region in a letter sent by him to the Falmouth Board of Selectmen. In that letter dated June 30, 2011, David Johnson said "Evaluation of sound impacts from Wind Turbines is a complicated issue that was not considered by MassDEP when it developed its evaluation/noise compliance guidance in the early 1970's and as revised in 1990." So it was not surprising that your office convened the WNTAG panel in the summer of 2012 with the goal of modifying the current noise regulation so as to take into effect the unique noise emanating from wind turbines. I attended everyone of the meetings and participated when I was allowed. Finally on March 7, 2014, in a POST WNTAG summation, Laurel Carlson stated, "slow is out fast is in". Yet it is now August of 2018 and nothing has been done to implement these changes.

Instead testing has continued in communities all around the Commonwealth using "slow" metering; with the knowledge that "fast metering" is necessary to capture and measure the impulse noise of wind turbines or more specifically the Aerodynamic Amplitude Modulation, In essence, any and all test results using the current noise regulation are grossly inaccurate.

Currently in the town of Scituate, in answer to a large number of noise complaints by residents over the last 6 1/2 years, the Board of Selectmen has hired Epsilon Associates to perform compliance testing. I am a member of the group who is adversely affected by the wind turbine in Scituate and have been asked by the Selectmen to participate in the process of the current testing. I have read the monitoring protocols submitted by Epsilon and as the DEP regulations dictate, they will be using "slow" metering. I am sure that the test results will not be a true indication of the situation as it exists, nor an indicator of the nuisance that a wind turbine that is located too close to residential properties creates. This will be only a waste of Fifty Thousand Dollars to Scituate taxpayers and just another false exoneration to an offending wind turbine.

The thousands of complaints around the Commonwealth are a statement that something is wrong. Your action of convening the WNTAG Panel is your acknowledgement that you

agree that something is wrong and the current noise regulation is flawed. Laurel Carlson's statement is a viable beginning to a solution; Yet nothing has been formalized by the DEP.

When will the current noise regulation be notified to use "fast" metering instead of "slow"?

Sincerely,

David M Dardi BSCE, PLS
122 Gilson Rd
Scituate, MA 02066

cc: Scituate Board of Selectmen

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

COPY

June 30, 2011

Falmouth Board of Selectmen
c/o the Honorable Mary Pat Flynn, Chairman
Falmouth Town Hall
55 Town Hall Square
Falmouth, MA 02540

Falmouth Board of Health
David Carignan, Health Agent
Falmouth Town Hall
55 Town Hall Square
Falmouth, MA 02540

RE: Harris Miller Miller & Hanson, Inc (HMMH) Wind Turbine Study Addendum, April 1, 2011

Dear Chairman Flynn and Agent Carignan:

In response to requests from the Falmouth Board of Selectmen, this letter will provide a response and additional guidance from the Massachusetts Department of Environmental Protection (MassDEP) regarding the April 1, 2011, HMMH Addendum to HMMH's September 2010 report concerning sound observation data gathered to evaluate the sound impacts from Falmouth Turbine Wind 1. The April 1, 2011 Addendum included additional information that MassDEP has carefully reviewed in preparing this letter. As you know, MassDEP previously provided guidance related to its recommended approach for sound evaluation in a January 24, 2011 letter (included herewith as Attachment 1) and met with HMMH on March 4, 2011 to discuss sound observations related to Wind 1 (meeting minutes included herewith as Attachment 2). This letter is based on MassDEP's evaluation of the original September 2010 HMMH report, the April 1, 2011 Addendum, the discussions with HMMH on March 4, 2011, and MassDEP's attendance at the Falmouth Board of Selectmen's meeting on June 6, 2011.

At the outset, MassDEP would like to acknowledge the work performed to date by HMMH on behalf of the Town and to commend the Board of Selectmen for their attention to this important issue. Evaluation of sound impacts from Wind Turbines is a complicated issue that was not considered by

MassDEP when it developed its sound evaluation/noise compliance guidance in the early 1970s and as revised in 1990. Accordingly, we appreciate the Town of Falmouth's and HMMH's efforts to work with MassDEP as we update our sound evaluation/noise compliance guidance to specifically address Wind Turbines.

In our January 24, 2011 letter, MassDEP provided guidance indicating that when we evaluate sound source compliance with the limit of 10dBA above background provided in MassDEP's Noise Policy for purposes of making nuisance determinations, the evaluation normally involves a comparison of the quiet period L90 background to the Lmax associated with the sound source in question for the same period. It is important to note that in most cases, MassDEP relies on attended sound observation studies so that sound observations/decibel readings can be attributed to particular sound sources and so the Lmax used for comparison to L90 background is from the sound source in question and not some other sound source. A limitation of attended studies is that they are short-term and provide only small amounts of data for impact evaluation and compliance decision-making. Long-term unattended studies, like the one performed by HMMH, can provide substantially more data so impact evaluations can include different sound source operating conditions and more times of day, but can leave questions unanswered regarding Lmax data observations and data capture related to the specific sound source in question.

During the March 4, 2011 meeting MassDEP and HMMH discussed how the data obtained through Falmouth's long-term unattended study could be used to make a determination of compliance with the MassDEP Noise policy. The study conducted by HMMH on behalf of Falmouth generated a significant volume of data that was not easily analyzed and the results presented in the September 2010 report were not in a format that would allow MassDEP to make a compliance determination. In the March 4, 2011 meeting we were informed of the specifics of how the study was designed (with input from the residents) and what the limits of the data were. At that time, we asked for the data to be reconfigured to compare L90 background to L90 with the wind turbine operating under various wind speeds under the assumption that if the wind turbine sound is a constant, such a comparison would provide us a means to compare background with and without the turbine to isolate the turbine sound profile.

The reconfigured data from HMMH's long-term unattended study indicates that Wind Turbine 1's broad band L90 one-hour sound impact compared to the L90 one-hour background at the same wind speed is no greater than 7.7 dBA. The study also appears to show that the wind turbine does not appear to be causing or contributing to any pure tone condition. There was one pure tone observed in the data but it was present with both the turbine on and off and is likely attributable to another source.

Despite the results of the reconfigured data, the September 2010 study shows a substantial number of Lmax sound observations that exceed 10dBA over background, both when the turbine is operating and not operating. While these observations cannot be attributed to turbine operation, MassDEP continues to have concern that these unattributed sound observations need to be further evaluated before a compliance determination can be made relative to broad band sound impacts from turbine operation. Therefore, MassDEP recommends that the Town conduct limited additional short term attended monitoring to augment the HMMH study.

MassDEP is in the process of updating its guidance for conducting sound surveys to specifically address sound emissions from wind turbines. The current MassDEP Noise Sampling Guidance was developed to be generally applicable to industrial noise sources that typically exhibit fairly steady emission signatures with relatively little frequency and octave variation. Current guidance recommends collecting attended sound observations every 6 seconds over a 17 minute period for a L90 quiet background to Lmax sound impact evaluation. In most cases, these industrial noise sources have the greatest impact during very low wind conditions and the amount of sound they generate does not change as wind conditions vary.

MassDEP is considering the following factors as it updates its noise survey data collection guidance for wind turbines:

1) Because wind speed varies greatly over time and wind turbine sound emissions vary with wind speed, characterizing turbine sound emissions at particular wind speeds may mean gathering data over shorter periods to control for variation in wind speed; and

2) Because the turbine blade oscillation sound cycle can be constant, provisions will need to be made to ensure there is data capture of peak sound within the cycle. A regularly repeating sound cycle with data gathered at regular intervals can synchronize and result in no observations of the cycle at the sound emission peak.

Accordingly, a short term attended study to augment the information from the HMMH study should be designed to be consistent with current MassDEP Guidance as modified for concerns of variable wind speed by collecting both background sound levels (L90) as well as turbine operational sound levels (Lmax). Specifically, the short term attended study should include the following:

- To evaluate the impact of wind speed on turbine sound emission levels, MassDEP recommends three sampling runs be conducted for each of three different turbine operating conditions (wind speeds). This will establish an Lmax for each respective wind turbine operating condition.

    - The three different operating conditions (wind speeds) MassDEP recommends be evaluated are: 1) at or near the cut-in wind speed where background will be the lowest; 2) at the wind speed where manufacturer data indicates there will be the greatest sound power level from the turbine; and, 3) at the maximum wind speed where the turbine will be operating.

- Likewise, three sampling runs should be conducted in conditions similar to the three different turbine operating conditions so that L90 background can be established for each operating condition.

- Each sampling run should be 5 minutes in duration and samples collected every 5 seconds (60 sound measurements).

cc: Heather Harper, Acting Town Manager
Town Hall
59 Town Hall Square
Falmouth, MA 02540

ecc: Falmouth Department of Public Works
dpw@falmouthmass.us

Chris Menge, HMMH
cmenge@hmmh.com

Francis Yanuskiewicz , Weston & Sampson
januskif@wseinc.com

MassDEP – Boston
Attn: Marc Wolman, Air Branch Chief
Alicia McDevitt, Deputy Commissioner

MassDEP – SERO
Attn: David Johnston, Acting Regional Director
John Winkler, Permit Section Chief

Allison Richman

From: Lorraine Devin
Sent: Monday, August 17, 2020 3:07 PM
To: Allison Richman
Subject: FW: more WT background stuff

Pleasr print for Wind turbine meeting.

Thanks,

Lorraine

Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

From: Karen Canfield <kcanfield@scituatema.gov>
Sent: Monday, August 17, 2020 2:42 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: more WT background stuff

From: Albert Bangert <agbangert@icloud.com>
Sent: Friday, August 14, 2020 3:20 PM
To: Ellen Andrew-Kasper
Cc: James Boudreau; Karen Canfield
Subject: Re:

I have inserted responses below in red.
Al Bangert

On Aug 12, 2020, at 1:13 PM, Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:

Good Afternoon Al-
I understand that you have taken an interest in the identity and credentials of the sound engineer that is reviewing the "testing" done by Epsilon to specifically show WT "compliance" rather than document the actual noise conditions we neighbors have had to deal with for the past 8 years.
Since you are asking, I have a few questions as well.
What are the names and credentials of the two consultants who helped you write the RFP for the Scituate Wind Acoustic Monitoring Sound Study, performed by Epsilon and

resulting in the March 6, 2020 "report"? (I don't recall using any consultants to write the RFP.)
What are your credentials for acting as a representative? (I was asked by the Board of Selectmen to issue and RFP to do turbine noise compliance testing and to coordinate the effort.) of Epsilon to review the technical (what you claimed as "final" ") testing" report with the BOS and concerned, impacted citizens? (The contract with Epsilon did not include having them make an in-person formal presentation of their written report to the Board of Selectmen. It is my understanding that the Board is extending Epsilon's contact and they will prepare a verbal report.)
Why did you push forward with the "testing" when the MassDEP made it clear that they were not "***approving the monitoring protocol"?***
Did the MassDEP inform the Town of Scituate and you that any third party noise testing needed both MassDEP approval for the protocols as well as a review of subsequent reporting? (The DEP said it was not their role to approve or disapprove a testing plan, but they were willing to review it and offer comments. Their comments were incorporated into the final testing plan.) Neither of these was obtained in Scituate's case.

Reference Comment #1 from the DEP Comments on Protocol for Scituate Wind:

1. Page1, first paragraph: strike the reference of MassDEP approving the monitoring protocol.
MassDEP is providing comments on the protocol.

Lastly, why did you provide/include scientifically irrelevant information regarding the McKeevers in this protocol? (This was a matter of public record.) It is quite unprofessional appearing....

I am sure you are interested in providing total transparency around this. In attempting to accurately reflect the nuisance and clear noise noncompliant conditions we live with due to this incorrectly sited industrial WT, I hoped your efforts would appear more unbiased.

Thank you for your time and I look forward to your reply.
Ellen Kasper
120 Gilson Rd

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Allison Richman

From: Lorraine Devin
Sent: Monday, August 17, 2020 3:08 PM
To: Allison Richman
Subject: FW: Meeting with Scituate Wind

Pleasr print for Wind Turbine meeting.

Thanks,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----
From: Karen Canfield <kcanfield@scituatema.gov>
Sent: Monday, August 17, 2020 2:47 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: Fw: Meeting with Scituate Wind

From: Karen Canfield
Sent: Thursday, August 13, 2020 11:19 AM
To: David Dardi
Subject: Re: Meeting with Scituate Wind

The purpose of the meeting is to review the Epsilon report and the ongoing complaints. I will forward as much background information as possible to the BOS before the meeting, including your questions and engineering review (if provided). I am sure Mr Vegnani will update the board about his meeting during our discussion.

As I understand it, Mr Vegnani is trying to get as much quantitative info he can from those who have registered complaints. It is not an "official" request because BOS has not met to discuss this. Each member is trying to be as informed as possible prior to our meeting. As we've discussed before, BOS cannot confer privately as a board on any matter.

Karen

> On Aug 13, 2020, at 9:51 AM, David Dardi <ddardi@att.net> wrote:
>
> Karen,
>

> Recently Tony Vegnani met with representatives of Scituate Wind to discuss solutions to the noise problems created by the wind turbine. Because of that meeting Tony asked that all effected parties collect data for some kind of evaluation program.
>
> Will the Board of Selectmen be putting this on their agenda so that the general public can hear what was discussed at that meeting?
> And is this request from Tony Vegnani an official request from the Board of Selectmen?
>
>
> David Dardi
> 122 Gilson Rd
>
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Al Bangert

On Aug 12, 2020, at 1:13 PM, Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:

Good Afternoon Al-
I understand that you have taken an interest in the identity and credentials of the sound engineer that is reviewing the "testing" done by Epsilon to specifically show WT "compliance" rather than document the actual noise conditions we neighbors have had to deal with for the past 8 years.
Since you are asking, I have a few questions as well.
What are the names and credentials of the two consultants who helped you write the RFP for the Scituate Wind Acoustic Monitoring Sound Study, performed by Epsilon and resulting in the March 6, 2020 "report"? (I don't recall using any consultants to write the RFP.)
What are your credentials for acting as a representative? (I was asked by the Board of Selectmen to issue and RFP to do turbine noise compliance testing and to coordinate the effort.) of Epsilon to review the technical (what you claimed as "final" ") testing" report with the BOS and concerned, impacted citizens? (The contract with Epsilon did not include having them make an in-person formal presentation of their written report to the Board of Selectmen. It is my understanding that the Board is extending Epsilon's contact and they will prepare a verbal report.)
Why did you push forward with the "testing" when the MassDEP made it clear that they were not "***approving the monitoring protocol"?***
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I am sure you are interested in providing total transparency around this. In attempting to accurately reflect the nuisance and clear noise noncompliant conditions we live with due to this incorrectly sited industrial WT, I hoped your efforts would appear more unbiased.

Thank you for your time and I look forward to your reply.
Ellen Kasper
120 Gilson Rd

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Allison Richman

From: Lorraine Devin
Sent: Monday, August 24, 2020 1:16 PM
To: Allison Richman
Subject: FW: WT Meeting

Please add to wind turbine book

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

From: Lorraine Devin
Sent: Monday, August 17, 2020 3:05 PM
To: Allison Richman <arichman@scituatema.gov>
Subject: FW: WT Meeting

For wind turbine meeting

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

From: Karen Canfield <kcanfield@scituatema.gov>
Sent: Monday, August 17, 2020 2:28 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: Fw: WT Meeting

From Resident
for wind turbine package

From: MARK MCKEEVER <keever151@comcast.net>
Sent: Saturday, August 15, 2020 1:49 PM
To: Joanne Levesque; Karen Canfield
Cc: Ellen Andrew-Kasper; Tony Vegnani; Andrew Goodrich; Karen Connolly; Maura Curran; David Dardi; Generic BoardOfHealth; James Boudreau; O'Connor, Patrick (SEN); Phyllis Karlberg; vfortev; Paul Ohrenberger; Stephen; Lorraine Devin
Subject: Re: WT Meeting

Hello to all,

We live at 151 Driftway and our property is 640' from the Scituate Wind facility.
We have informed various town officials, ever since the wind turbine was commissioned, that when it comes to turbine noise impacts the wind direction does not make a difference. This facility creates noise which is emotionally and physically abusive no matter where the wind is blowing from. It is good to know that the information provided by Joanne Levesque from the Kingston acoustic reporting proves that our testimony was based on proven science admitted to by acoustic professionals.

We urge the Board of Selectmen to read all of the documentation/testimony which we submitted with the Board of Health. All of our testimony, including doctors letters, should be on file and available for review.

We want the BOS to know that our family continues to suffer from headaches, anxiety, insomnia and ringing in our ears. The documentation/testimony we've submitted includes the fact that we did not have any of these symptoms, or health issues, before the wind turbine began to operate creating outrageous levels of noise and shadow flicker (not a flicker but a strobe light).

One medical update we'd like you to be aware of is that Mark recently experienced a heart attack at the age of 49. This situation has degraded our health and well-being for years with no remedy while other communities, with turbines located at distances further than our home, have taken action to protect neighbors.

We urge you to understand that the added stress, lack of sleep and headaches continue to be a part of his current health. Please know that we are totally exhausted from this ongoing experience of living so close to an industrial scale wind turbine. The process we have been put through, by way of questionable testing methods and delays in agreeing to discuss and investigate this matter, only adds to our stress levels.

We also want to make note that the false narrative which has been spun over the years that by signing the agreement, which was promoted by town officials and was intended only to halt our opposition to the permitting process, we forfeited our right to be protected is inaccurate and misleading. As the terms of the agreement show we did not sign away our right to be protected and we should not be treated any differently by the BOS than any other wind turbine neighbor. The fact is we were assured, prior to permitting, that this facility would comply with all laws and regulations and the language in the agreement supports this fact.

Please understand that we find it improper for Epsilon to have mentioned the agreement omitting the fact that the agreement included language which the developer agreed to that the facility would comply with all state and local laws and regulations once the turbine began to operate/produce power.

This facility very clearly does not comply with our state noise regulation or our state nuisance law; in fact the horrendous noise and shadow flicker are the very definition of nuisance!.

We deserve to live peacefully in our home.
We pay our taxes.
We give back to our community.

Why don't we deserve better than the eight plus years of abuse, stonewalling and questionable testing tactics which we have been subjected to?

Why does the town continue to refuse to acknowledge that a very big mistake was made in permitting this size and scale wind facility; especially since so many neighbors have had their health impacted?

We are hopeful that the BOS will finally take the time to right this wrong and allow us an opportunity to recuperate from eight and a half years of abuse that no family should have to endure.

If you have any questions please don't hesitate to contact us.

Lauren and Mark McKeever
151 Driftway

On 08/14/2020 8:53 AM Joanne Levesque <joanne@levesque.us> wrote:

Good Morning to all,

Karen, If you could provide the contact information/ directions for submissions on the matter of Scituate Wind relative to the ongoing nuisance noise and strobing issues that would be very much appreciated. In short, how would you like the correspondence / submissions to be addressed for proper consideration by all members of the board and so that all members of the public have access to questions / concerns / submissions so that an open process can move forward?

For now, I would like to submit information which I hope will clarify the need to reconsider the notion that *"wind direction"* should be a factor when adopting a mitigation order intended to remedy noise impacts for all neighbors.

Topic of Concern: "Wind Direction"

Mr. Vegnani, in his communication of August 12, 2020, made the following statement:

Can I ask those of you on the email to assist in the analysis? For the next several weeks can you rate the level of noise from 0- meaning no noise up to 5 the most noise and forward the info to me at end of August . It would be best if you emailed me back independently. This information will help us as we review the impact of specific wind directions.

Background:
HMMH, the consultant which engaged in acoustic monitoring and reporting in Kingston, included as part of their report important information relative to *"wind direction"* and sound propagation . Apparently neither Scituate Wind nor consultants Tech Environmental and Epsilon have put forth this information so that Scituate officials might understand that it is inappropriate to focus on *"wind direction"* either for purposes of testing or for purposes of drafting a protective order of abatement.

Observation:
Independent acoustic consultants have cautioned many times over the last several years that designing testing protocols and mitigation orders which focus on *"wind speed"* and *"wind direction"*,rather than focusing on power production levels, was nothing short of a distraction. My observations are that wind industry consultants continue to use *"wind speed"* and *"wind direction"* to distract, prolong testing as was done here in Scituate and essentially muddy up the water in regards to what should be an effort to document worst case noise conditions which occur at high to full power production.

Point of concern:
1. It has been known for many years now among acoustic professionals that when it comes to the subject of wind turbine sound propagation ***"utility scale turbine sound levels are typically about the same for any wind direction."* (see snip below from the Kingston Acoustical Report by consultant HMMH)***
One of the most important factors to be considered here in Scituate is that there are homes located within this stated distance therefore any testing or mitigation should not have been designed around *"wind direction"* when considering these properties.

2. It is important to note that the MassDEP authored a letter to Kingston Town officials which included a specific acknowledgement that *"wind direction"* was not determined to be a factor; making it all the more frustrating for me to know that Scituate town officials appear to be under the impression *"wind direction"*, especially for homes within a certain distance, should somehow form the basis upon which to collect data or design a mitigation plan. I'd be happy to make an attempt to obtain a copy of the MassDEP letter to the Town of Kingston (2015?) or the town of Scituate might request the letter directly from the town of Kingston to further support the fact that *"wind direction"* is not a factor for noise propagation for areas closest to the turbine - please advise.

3. I would contend that the McKeever family's testimony, going all the way back to 2012, supports the fact that *"wind direction"* is not a factor when it comes to Scituate Wind created noise impacts.

4. Continued focus on *"wind direction"* is contrary to common knowledge and thus an error for the purposes of drafting an order of mitigation / abatement.

Evidence to support the point:

*Page 94 of Kingston's HMMH Report informs us of the fact that when it comes to ***"wind turbine sound propagation utility scale turbine sound levels are typically about the same for any wind direction"***.

Furthermore, recent research on wind turbine sound directivity and current best practices[11] for acoustical modeling of wind turbine sound propagation indicate that utility-scale turbine sound levels are typically about the same for any wind direction and generally only vary by at most about 2 decibels directly at the crosswind direction (given site distances within approximately 2000 feet of the wind turbine).

10.5 Sound Level Increase Predictions

The supplemental ambient monitoring results and corresponding sound level increase predictions are presented in the following report sub-sections. Note that diurnal trends in ambient L_{90} sound levels were observed to differ slightly on each day of monitoring. The sound level increase predictions incorporate this variability to appropriately establish periods when exceedances of the MassDEP noise policy have the potential to occur and times when sound level increases of less than 10 dBA are anticipated.

Figures 26, 28, 30, and 32 illustrate the slow-response A-weighted L_{90} sound levels measured over time at each ambient monitoring site. The data collected at 18 Copper Beech is provided with insect noise included and also with the contribution from insect noise removed.

Figures 27, 29, 31, and 33 depict the same ambient L_{90} sound levels now plotted against corresponding wind speed data (above turbine cut-in) and also highlighted to indicate various time periods. Additional ambient data previously collected during March and April of 2014 is also included for reference and in supplement to the September 2014 data set in order to include all available information on ambient conditions in subsequent sound level increase predictions. (Refer to ambient L_{90} data provided in Appendix D for 5-minute and 20-minute monitoring intervals.)

Tables 37 through 49 present ambient sound level increase predictions for each monitoring location during various periods throughout the day. Because the wind speed data measured by the ultrasonic

[11] Institute of Acoustics, "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise" May 2013

As a matter of logic I would not expect Scituate Wind to have put forth this sort of information as part of any meeting with Mr. Vegnani or any other Scituate town official. My experience informs me that wind developers omit information that might hurt their ability to operate or which might expose fatal flaws within testing protocols (such as use of Leq with no correction factor) or mitigation designs (such as focus on *"wind speed"* and *"wind direction"* rather than power production levels).

In closing I believe, based on my experiences and facts which have been uncovered throughout S.E Massachusetts as a result of industrial scale wind turbines sited too close to residential homes and neighborhoods, that most if not all permits were premised upon serious errors, omissions and misrepresentations of fact. As a practical matter I have not witnessed, as yet, any wind developer voluntarily producing facts which would jeopardize their business operation. Understanding that to be the case might prove helpful as far as unearthing information to support protective action as provided under existing law; both the state noise regulation 310 CMR 7,0 and our state nuisance law Chapter 111, section 122.

I hope this information is of some value to the board as you move forward to remedy this public health matter of concern.

Feel free to reach out and ask any questions.

Best Regards,

Joanne Levesque

617-688-1441

On Thu, Aug 13, 2020 at 7:03 PM Karen Canfield < kcanfield@scituatema.gov> wrote:

To all,
Thank you for your email and for articulating your concerns. As I've said to a number of the undersigned, the town of scituate meets with contractors, vendors, and organizations every single day to further town business. This is not obstructionist or shady; this is necessary to conduct town business. In the case of Mr Vegnani's meeting, he wanted to verify that the shutdown mandated by BOS was occurring — and it is — and to discuss other operational issues directly. There was no need for a public meeting because no votes or decisions were made. Quite frankly, this meeting was to further inquiry into your concerns so the BOS has all the facts as we deliberate and in no way, shape, or form was intended as a "secret" or back handed meeting as clearly implied. Mr Vegnani will provide the board with any necessary information gleaned at that meeting when we meet publicly. That he is reaching out to you all because of questions he had from his meeting is a clear example of his concern for advocating on your behalf.

While I understand your frustration with the delays in reviewing the report and the continued disturbances, I will strongly recommend that you recognize that this Board has been operating in good faith to ensure that the report is reviewed with us much transparency as possible and that all of our questions are asked and answered so that we know what options are available to addressing those concerns.

I will make all of your correspondence available to the entire BOS for review before our public meeting.

I will also remind you, as I have several times to some of you, our meeting will be for the BOS to review the report and be satisfied with the findings. We will examine all information, including the questions and any reports Dr Dardi has or will provide in advance. This is not a public hearing and I caution you all to remember that we are trying to be as balanced, fair, open, inclusive, and productive as possible. Your demands to "shut it off" cannot simply occur without this process, including a thorough discussion of the financial ramifications of any such measure, should they be warranted.

If you would like to submit further documentation for the board to consider, please do so as soon as possible through our office so that BOS has adequate time to review before our discussion.

Sincerely,
Karen Canfield

On Aug 13, 2020, at 5:45 PM, Ellen Andrew-Kasper <
ellenak47@gmail.com> wrote:

Good Afternoon Karen-
I'm inquiring about Mr. Vegnani's email response to my request for protection of our health and property from
WT Nuisance/Noise, Disturbance of the Peace...
In your latest email to me you did not mention that he was meeting w/ Scituate Wind.
In a previous email to you I requested transparency from BOS in communications around this.
The fact that affected neighbors cannot get a mtg w/ BOS/BOH d/t COVID yet Mr. Vegnani finds time to meet w/ Scituate Wind is rather disturbing. No notice. No public input or involvement. No information regarding discussions. This by the BOS member whose signature is on the contract w/ Scituate Wind? Mr. Vegnani seems to have paid little attention to or chosen to ignore the requests, reams of scientific info and emails regarding other towns efforts to protect their citizens sent to BOS/BOH since the WT was first turned on. In addition, he has neglected to mention the existence of a "report" with REAL data that shows noise reg noncompliance at one home and if analyzed properly would undoubtedly show noise noncompliance at ALL other test sites.
It has been well established by acoustic experts that the best, most accurate, judgement of noise disturbance is the human ear. (I have forwarded that info to BOS/BOH myself in the past.) Thus, our 8 YEARS of complaints is grounds enough to declare the WT a Nuisance and in Violation of it's Special Permit.

We deserve the same protection from disturbance that Mr. Vegnani gets.
Scituate Wind has not complied with the Mitigation agreement. Mitigation efforts based on wind speed/direction have proved to be inadequate and irrelevant. For Mr. Vegnani to ask us to rate the sound and report individually to him is ridiculous, wastes time on useless information, delays any progress, and subjects us to continued negative health impacts from the improperly sited industrial WT.
To be clear, this is not "Sound" coming from the turbine. It is NOISE along with VIBRATION, PRESSURE, and FLICKER and there IS a remedy.
Shut it down.

Ellen Kasper

Stephen Werther
Valerie Vitale
Philip Vitale
Phyllis Karlberg
Dave Dardi
Joann Bianchini
Mark McKeever
Lauren McKeever
Paul Ohrenberger

Sent from my iPhone

> On Aug 12, 2020, at 2:39 PM, Ellen Andrew-Kasper < Ellenak47@gmail.com> wrote:
>
> Karen-
> I'm sure you know I meant Scituate Wind/Gordon Deane complying with the Mitigation Agreement. (That's what disturbed sleep does....)
>
> On Wed, Aug 12, 2020 at 2:20 PM Ellen Andrew-Kasper < ellenak47@gmail.com> wrote:
>
>> Thank you Karen-
>>
>> As an affected neighbor of 8 years I can tell you that the wind speed, direction and output of the WT that cause us the most disturbance have NOT changed. More likely, Gordon Deane and friends have baked criteria into the agreement that does NOT reflect the reality of conditions under which we experience disturbance and have been continually voicing complaints about. It should at the LEAST be shut down completely from 9PM through 7A. We'd also appreciate a quiet early bedtime as the BOS has fought to provide one of their own. We want to enjoy the homes we work hard to maintain and expect to enjoy.
>>
>> Scheduling us as soon as possible is much appreciated.
>> Ellen Kasper

On Wed, Aug 12, 2020 at 1:59 PM Karen Canfield < kcanfield@scituatema.gov> wrote:

Hello Ellen,
We are planning to schedule the meeting in late September. Still working out technology plan.

We have confirmed with scituate wind that the turbine is shut off during the times required by previous complaint analysis. It appears that now the disturbances/complaints are being recorded when the wind is a different direction than the original parameters. That data is being analyzed and will be part of our September conversation.

As the current Chair of BOS, I'm happy to receive all BOS correspondence and can redirect as necessary. In this case, I'm copying our TA.

Karen

> On Aug 12, 2020, at 1:51 PM, Ellen Andrew-Kasper < ellenak47@gmail.com> wrote:

>
>
> Good Afternoon Karen-
>
> Hope you are well. Taking time to catch up on emails and thought I'd circle back around to check on a time frame for the Zoom Meeting with BOS, Epsilon, Al Banget and WT affected neighbors? Our health continues to suffer due to the noise/vibration/flicke r we experience from the improperly sited industrial WT so we are anxious to move forward as quickly as possible.
>
> We are also wondering why Epsilon continues to violate the Mitigation Agreement it made with the BOS years ago? We continue to experience incredibly loud WT disturbances during conditions where it should be shutting down.
>
> Are you the person I should continue to direct my emails to regarding this issue?
>
> Thank You-
> Ellen Kasper
> 120 Gilson Rd
>
>

>
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August 18, 2020

ADDITIONAL QUESTIONS AND COMMENTS TO EPSILON REPORT

1. Why wasn't there any testing performed on Night 1(April 19, 2019) at location #2 (26 Hewes Rd). Only three locations were tested instead of four as the contract requires.
2. In regards to Night 4 testing on December 6, 2019:

   Explain why in Table 6-17 the values of Leq for 122 Gilson Rd were not properly averaged to show the value of 41 instead of 40.

   Explain why in Table 6-18 the lowest value of L90 is not used so as to be in accordance with the MassDEP generic protocol document found in the report in Appendix A. Please note the corrected values in the attachment.

   Note that in amended Table 6-20, by using the proper values, non compliance to the noise regulation is found at all four locations.

Table 6-17 Operational Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{90} (1:00-1:13 AM)	Operational #2 L_{90} (1:07-1:19AM)	Operational #3 L_{90} (1:14-1:25 AM)	L_{max}[1]
1 - 151 Driftway	45	45	45	45
2 - 26 Hewes	42	40	41	41
3 - 122 Gilson	40	40	42	40
4 - 34 Driftway	41	40	40	41

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

Table 6-18 Ambient Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Ambient #1 L_{90} (1:34-1:43 AM)	Ambient #2 L_{90} (1:39-1:48 AM)	Ambient #3 L_{90} (1:44-1:53 AM)	Representative Ambient L_{90}[1]
1 - 151 Driftway	36	34	34	36
2 - 26 Hewes	32	31	32	32
3 - 122 Gilson	31	32	32	31
4 - 34 Driftway	31	33	31	31

Notes:

1. Period closest in time to the operational measurements.

Table 6-19 Wind-Turbine-Attributable Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)		
	L_{max}[1]	Ambient L_{90}[1]	Wind-Turbine-Attributable L_{max}[1]
1 - 151 Driftway	45	36	45
2 - 26 Hewes	41	32	40
3 - 122 Gilson	40	31	40
4 - 34 Driftway	41	31	40

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.4.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on December 6, 2019 and is presented in Table 6-20. The total 'L_{max}' sound levels shown in the earlier Table 6-17 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level.

Table 6-20 Broadband Sound Level Evaluation - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	L_{eq}	Ambient L_{eq}	Difference Between 'L_{eq}' and Ambient L_{eq}'	Complies?
1 - 151 Driftway	45	36	9	Yes
2 - 26 Hewes	41	32	9	Yes
3 - 122 Gilson	40	31	9	Yes
4 - 34 Driftway	41	31	9	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

In addition to the broadband analysis, the octave-band sound level data were analyzed for MassDEP-defined pure tones on a 1-minute basis for both operational and ambient measurement periods. All four locations had pure tones present as described below.

On Night 4, Location 1 had two (2) minutes of ambient testing that had pure tones. The pure tones occurred at 63 Hz during one minute and 1,000 Hz in the subsequent minute. The field notes indicate the presence of a hum from the nearby wastewater treatment plant. This hum is the likely cause of the 63 Hz pure tone during the ambient measurement periods. The field notes indicated vehicles passing during the time that the pure tones were measured.[28] Based on prior sound level measurement experience by Epsilon, it can be concluded that the 1,000 Hz pure tone was attributable to the vehicles observed. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

Location 2 had one (1) operational minute with a 63 Hz pure tone. This location also had two (2) ambient minutes with a 63 Hz pure tone and two (2) ambient minutes with a 500 Hz pure tone. During the operational period with the pure tone, the field technician noted aircraft as a primary sound source. A similar tone was present during ambient testing and aircraft was also noted. Another sound source noted during the ambient testing was 'possible traffic'. The measurement location is approximately 1.5 miles from Route 3A. The probable causes for the pure tones observed at this location are the overhead aircrafts and distant vehicles. No other operational periods contained a pure tone on Night 4 at Location 2. The pure tones measured at this location are not attributable to the wind turbine.

Location 3 had a pure tone at 63 Hz during a single minute of the ambient. Similar to Location 2, the field notes indicated distant traffic and an aircraft overhead during the ambient measurements. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

[28] A vehicular passby was confirmed with a review of the audio recording.

BOS Meeting March 24, 2020

TOPIC: Wind Turbine Sound Level Compliance Testing Results

This provides the Board of Selectmen with a summary of the final report on the wind turbine sound level compliance testing. The full report is attached.

BACKGROUND

- In May 2018 the BOS awarded a $50,000 contract to Epsilon Associates to conduct a wind turbine noise compliance test.
- Epsilon worked with the MassDEP over the course of five months to establish an agreed upon "Sound Level Compliance Monitoring Protocol" involving four Scituate locations[1] and specific wind conditions[2]. Final agreement with the DEP was reached 11/27/19.
- Epsilon began monitoring wind conditions and completed the first on April 19, 2019.
- Sound level testing consists of measuring the "L-max" or maximum sound emitted by the turbine when running versus the "L-90" or lowest sound level with the turbine shutdown. Sound is quantified using the logarithmic decibel scale as dBA[3].

DISCUSSION

- Epsilon completed all of the evening noise tests between 1am and 4am[4] generating 16 data sets incorporating several hundred direct measurements of ambient and turbine sound levels. Scituate Wind LLC cooperated fully with Epsilon throughout the overnight testing periods.
- The results of the testing program show that sound levels due to the wind turbine operating during wind conditions producing maximum power and during wind conditions identified by resident noise complaints comply with the MassDEP Noise Policy[5] with the exception of one night at one location.
- This table summarizes the difference in decibels between maximum sound levels with the turbine running versus the lowest ambient noise level. Compliance requires this difference to be less than 10 dBA.

Test Date	**4/19/19**		**7/31/19**		**10/2/19**		**12/6/19**	
Wind Conditions	**> 20 mph**		**11-22 mph**		**> 20 mph**		**11-22 mph**	
151 Driftway	7 dBA	yes	13 dBA	no	3 dBA	yes	9 dBA	yes
26 Hewes	negligible	yes	8 dBA	yes	1 dBA	yes	9 dBA	yes
122 Gilson	5 dBA	yes	3 dBA	yes	2 dBA	yes	9 dBA	yes
34 Driftway	1 dBA	yes	4 dBA	yes	2 dBA	yes	9 dBA	yes

- In order to further understand the apparent non-compliance that occurred at 151 Driftway on 7/31/19, Epsilon analyzed the L-90 sound level differences between turbine on and turbine off. The property is adjacent to the turbine and the sewage treatment plant, and the turbine is more audible at this location than at the other three locations by 1 to 3 dBA. However, on July 31st this difference jumped to 9 dBA suggesting that something else may have influenced the sound levels besides the wind turbine on this evening (pages 6-20 and 6-21 of the report.)

Respectfully submitted,
Albert Bangert

---

[1] McKeever residence, Karlsberg residence, Dardi residence, Vitali residence.

[2] Winds from the West-Southwest (+/- 45 degrees) at speeds above 20mph and at speeds between 11-22mph.

[3] These terms are more fully explained by Epsilon in Section 3 of the attached report.

[4] 4/19/19, 7/31/19, 10/2/19 and 12/6/19.

[5] The MassDEP regulations are explained in Section 4 of the attached report.

Allison Richman

From: Lorraine Devin
Sent: Monday, August 17, 2020 3:05 PM
To: Allison Richman
Subject: FW: WT Meeting

For wind turbine meeting

Lorraine

Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

From: Karen Canfield <kcanfield@scituatema.gov>
Sent: Monday, August 17, 2020 2:28 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: Fw: WT Meeting

From Resident
for wind turbine package

From: MARK MCKEEVER <keever151@comcast.net>
Sent: Saturday, August 15, 2020 1:49 PM
To: Joanne Levesque; Karen Canfield
Cc: Ellen Andrew-Kasper; Tony Vegnani; Andrew Goodrich; Karen Connolly; Maura Curran; David Dardi; Generic BoardOfHealth; James Boudreau; O'Connor, Patrick (SEN); Phyllis Karlberg; vfortev; Paul Ohrenberger; Stephen; Lorraine Devin
Subject: Re: WT Meeting

Hello to all,

We live at 151 Driftway and our property is 640' from the Scituate Wind facility.
We have informed various town officials, ever since the wind turbine was commissioned, that when it comes to turbine noise impacts the wind direction does not make a difference. This facility creates noise which is emotionally and physically abusive no matter where the wind is blowing from. It is good to know that the information provided by Joanne Levesque from the Kingston acoustic reporting proves that our testimony was based on proven science admitted to by acoustic professionals.

We urge the Board of Selectmen to read all of the documentation/testimony which we submitted with the Board of Health. All of our testimony, including doctors letters, should be on file and available for review.

We want the BOS to know that our family continues to suffer from headaches, anxiety, insomnia and ringing in our ears. The documentation/testimony we've submitted includes the fact that we did not

have any of these symptoms, or health issues, before the wind turbine began to operate creating outrageous levels of noise and shadow flicker (not a flicker but a strobe light).

One medical update we'd like you to be aware of is that Mark recently experienced a heart attack at the age of 49. This situation has degraded our health and well-being for years with no remedy while other communities, with turbines located at distances further than our home, have taken action to protect neighbors.

We urge you to understand that the added stress, lack of sleep and headaches continue to be a part of his current health. Please know that we are totally exhausted from this ongoing experience of living so close to an industrial scale wind turbine. The process we have been put through, by way of questionable testing methods and delays in agreeing to discuss and investigate this matter, only adds to our stress levels.

We also want to make note that the false narrative which has been spun over the years that by signing the agreement, which was promoted by town officials and was intended only to halt our opposition to the permitting process, we forfeited our right to be protected is inaccurate and misleading. As the terms of the agreement show we did not sign away our right to be protected and we should not be treated any differently by the BOS than any other wind turbine neighbor. The fact is we were assured, prior to permitting, that this facility would comply with all laws and regulations and the language in the agreement supports this fact.

Please understand that we find it improper for Epsilon to have mentioned the agreement omitting the fact that the agreement included language which the developer agreed to that the facility would comply with all state and local laws and regulations once the turbine began to operate/produce power.

This facility very clearly does not comply with our state noise regulation or our state nuisance law; in fact the horrendous noise and shadow flicker are the very definition of nuisance!.

We deserve to live peacefully in our home.
We pay our taxes.
We give back to our community.

Why don't we deserve better than the eight plus years of abuse, stonewalling and questionable testing tactics which we have been subjected to?
Why does the town continue to refuse to acknowledge that a very big mistake was made in permitting this size and scale wind facility; especially since so many neighbors have had their health impacted?

We are hopeful that the BOS will finally take the time to right this wrong and allow us an opportunity to recuperate from eight and a half years of abuse that no family should have to endure.

If you have any questions please don't hesitate to contact us.

Lauren and Mark McKeever
151 Driftway

On 08/14/2020 8:53 AM Joanne Levesque <joanne@levesque.us> wrote:

Good Morning to all,

Karen, If you could provide the contact information/ directions for submissions on the matter of Scituate Wind relative to the ongoing nuisance noise and strobing issues that would be very much appreciated. In short, how would you like the correspondence / submissions to be addressed for proper consideration by all members of the board and so that all members of the public have access to questions / concerns / submissions so that an open process can move forward?

For now, I would like to submit information which I hope will clarify the need to reconsider the notion that *"wind direction"* should be a factor when adopting a mitigation order intended to remedy noise impacts for all neighbors.

Topic of Concern: "Wind Direction"

Mr. Vegnani, in his communication of August 12, 2020, made the following statement:

Can I ask those of you on the email to assist in the analysis? For the next several weeks can you rate the level of noise from 0- meaning no noise up to 5 the most noise and forward the info to me at end of August . It would be best if you emailed me back independently. This information will help us as we review the impact of specific wind directions.

Background:
HMMH, the consultant which engaged in acoustic monitoring and reporting in Kingston, included as part of their report important information relative to *"wind direction"* and sound propagation . Apparently neither Scituate Wind nor consultants Tech Environmental and Epsilon have put forth this information so that Scituate officials might understand that it is inappropriate to focus on *"wind direction"* either for purposes of testing or for purposes of drafting a protective order of abatement.

Observation:
Independent acoustic consultants have cautioned many times over the last several years that designing testing protocols and mitigation orders which focus on *"wind speed"* and *"wind direction"*,rather than focusing on power production levels, was nothing short of a distraction. My observations are that wind industry consultants continue to use *"wind speed"* and *"wind direction"* to distract, prolong testing as was done here in Scituate and essentially muddy up the water in regards to what should be an effort to document worst case noise conditions which occur at high to full power production.

Point of concern:
1. It has been known for many years now among acoustic professionals that when it comes to the subject of wind turbine sound propagation ***"utility scale turbine sound levels are typically***

about the same for any wind direction."* (see snip below from the Kingston Acoustical Report by consultant HMMH)

One of the most important factors to be considered here in Scituate is that there are homes located within this stated distance therefore any testing or mitigation should not have been designed around *"wind direction"* when considering these properties.

2. It is important to note that the MassDEP authored a letter to Kingston Town officials which included a specific acknowledgement that *"wind direction"* was not determined to be a factor; making it all the more frustrating for me to know that Scituate town officials appear to be under the impression *"wind direction"*, especially for homes within a certain distance, should somehow form the basis upon which to collect data or design a mitigation plan. I'd be happy to make an attempt to obtain a copy of the MassDEP letter to the Town of Kingston (2015?) or the town of Scituate might request the letter directly from the town of Kingston to further support the fact that *"wind direction"* is not a factor for noise propagation for areas closest to the turbine - please advise.

3. I would contend that the McKeever family's testimony, going all the way back to 2012, supports the fact that *"wind direction"* is not a factor when it comes to Scituate Wind created noise impacts.

4. Continued focus on *"wind direction"* is contrary to common knowledge and thus an error for the purposes of drafting an order of mitigation / abatement.

Evidence to support the point:

*Page 94 of Kingston's HMMH Report informs us of the fact that when it comes to ***"wind turbine sound propagation utility scale turbine sound levels are typically about the same for any wind direction".***

Furthermore, recent research on wind turbine sound directivity and current best practices[41] for acoustical modeling of wind turbine sound propagation indicate that utility-scale turbine sound levels are typically about the same for any wind direction and generally only vary by at most about 2 decibels directly at the crosswind direction (given site distances within approximately 2000 feet of the wind turbine).

10.5 Sound Level Increase Predictions

The supplemental ambient monitoring results and corresponding sound level increase predictions are presented in the following report sub-sections. Note that diurnal trends in ambient L_{90} sound levels were observed to differ slightly on each day of monitoring. The sound level increase predictions incorporate this variability to appropriately establish periods when exceedances of the MassDEP noise policy have the potential to occur and times when sound level increases of less than 10 dBA are anticipated.

Figures 26, 28, 30, and 32 illustrate the slow-response A-weighted L_{90} sound levels measured over time at each ambient monitoring site. The data collected at 18 Copper Beech is provided with insect noise included and also with the contribution from insect noise removed.

Figures 27, 29, 31, and 33 depict the same ambient L_{90} sound levels now plotted against corresponding wind speed data (above turbine cut-in) and also highlighted to indicate various time periods. Additional ambient data previously collected during March and April of 2014 is also included for reference and in supplement to the September 2014 data set in order to include all available information on ambient conditions in subsequent sound level increase predictions. (Refer to ambient L_{90} data provided in Appendix D for 5-minute and 20-minute monitoring intervals.)

Tables 37 through 49 present ambient sound level increase predictions for each monitoring location during various periods throughout the day. Because the wind speed data measured by the ultrasonic

[41] Institute of Acoustics, "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise" May 2013

HARRIS MILLER MILLER & HANSON INC. 94

As a matter of logic I would not expect Scituate Wind to have put forth this sort of information as part of any meeting with Mr. Vegnani or any other Scituate town official. My experience informs me that wind developers omit information that might hurt their ability to operate or which might expose fatal flaws within testing protocols (such as use of Leq with no correction factor) or mitigation designs (such as focus on *"wind speed"* and *"wind direction"* rather than power production levels).

In closing I believe, based on my experiences and facts which have been uncovered throughout S.E Massachusetts as a result of industrial scale wind turbines sited too close to residential homes and neighborhoods, that most if not all permits were premised upon serious errors, omissions and misrepresentations of fact. As a practical matter I have not witnessed, as yet, any wind developer voluntarily producing facts which would jeopardize their business operation. Understanding that to be the case might prove helpful as far as unearthing information to support protective action as provided under existing law; both the state noise regulation 310 CMR 7,0 and our state nuisance law Chapter 111, section 122.

I hope this information is of some value to the board as you move forward to remedy this public health matter of concern.

Feel free to reach out and ask any questions.

Best Regards,

Joanne Levesque

617-688-1441

On Thu, Aug 13, 2020 at 7:03 PM Karen Canfield < kcanfield@scituatema.gov> wrote:

To all,
Thank you for your email and for articulating your concerns. As I've said to a number of the undersigned, the town of scituate meets with contractors, vendors, and organizations every single day to further town business. This is not obstructionist or shady; this is necessary to conduct town business. In the case of Mr Vegnani's meeting, he wanted to verify that the shutdown mandated by BOS was occurring — and it is — and to discuss other operational issues directly. There was no need for a public meeting because no votes or decisions were made. Quite frankly, this meeting was to further inquiry into your concerns so the BOS has all the facts as we deliberate and in no way, shape, or form was intended as a "secret" or back handed meeting as clearly implied. Mr Vegnani will provide the board with any necessary information gleaned at that meeting when we meet publicly. That he is reaching out to you all because of questions he had from his meeting is a clear example of his concern for advocating on your behalf.

While I understand your frustration with the delays in reviewing the report and the continued disturbances, I will strongly recommend that you recognize that this Board has been operating in good faith to ensure that the report is reviewed with us much transparency as possible and that all of our questions are asked and answered so that we know what options are available to addressing those concerns.

I will make all of your correspondence available to the entire BOS for review before our public meeting.

I will also remind you, as I have several times to some of you, our meeting will be for the BOS to review the report and be satisfied with the findings. We will examine all information, including the questions and any reports Dr Dardi has or will provide in advance. This is not a public hearing and I caution you all to remember that we are trying to be as balanced, fair, open, inclusive, and productive as possible. Your demands to "shut it off" cannot simply occur without this process, including a thorough discussion of the financial ramifications of any such measure, should they be warranted.

If you would like to submit further documentation for the board to consider, please do so as soon as possible through our office so that BOS has adequate time to review before our discussion.

Sincerely,
Karen Canfield

On Aug 13, 2020, at 5:45 PM, Ellen Andrew-Kasper <
ellenak47@gmail.com> wrote:

Good Afternoon Karen-
I'm inquiring about Mr. Vegnani's email response to my request for protection of our health and property from
WT Nuisance/Noise, Disturbance of the Peace...
In your latest email to me you did not mention that he was meeting w/ Scituate Wind.
In a previous email to you I requested transparency from BOS in communications around this.
The fact that affected neighbors cannot get a mtg w/ BOS/BOH d/t COVID yet Mr. Vegnani finds time to meet w/ Scituate Wind is rather disturbing. No notice. No public input or involvement. No information regarding discussions. This by the BOS member whose signature is on the contract w/ Scituate Wind? Mr. Vegnani seems to have paid little attention to or chosen to ignore the requests, reams of scientific info and emails regarding other towns efforts to protect their citizens sent to BOS/BOH since the WT was first turned on. In addition, he has neglected to mention the existence of a "report" with REAL data that shows noise reg noncompliance at one home and if analyzed properly would undoubtedly show noise noncompliance at ALL other test sites.
It has been well established by acoustic experts that the best, most accurate, judgement of noise disturbance is the human ear. (I have forwarded that info to BOS/BOH myself in the past.) Thus, our 8 YEARS of complaints is grounds enough to declare the WT a Nuisance and in Violation of it's Special Permit.

We deserve the same protection from disturbance that Mr. Vegnani gets.
Scituate Wind has not complied with the Mitigation agreement. Mitigation efforts based on wind speed/direction have proved to be inadequate and irrelevant. For Mr. Vegnani to ask us to rate the sound and report individually to him is ridiculous, wastes time on useless information, delays any progress, and subjects us to continued negative health impacts from the improperly sited industrial WT.
To be clear, this is not "Sound" coming from the turbine. It is NOISE along with VIBRATION, PRESSURE, and FLICKER and there IS a remedy.
Shut it down.

Ellen Kasper

Stephen Werther
Valerie Vitale
Philip Vitale
Phyllis Karlberg
Dave Dardi
Joann Bianchini
Mark McKeever
Lauren McKeever
Paul Ohrenberger

Sent from my iPhone

> On Aug 12, 2020, at 2:39 PM, Ellen Andrew-Kasper < Ellenak47@gmail.com> wrote:
>
> Karen-
> I'm sure you know I meant Scituate Wind/Gordon Deane complying with the Mitigation Agreement. (That's what disturbed sleep does....)
>
> On Wed, Aug 12, 2020 at 2:20 PM Ellen Andrew-Kasper < ellenak47@gmail.com> wrote:
>
>> Thank you Karen-
>>
>> As an affected neighbor of 8 years I can tell you that the wind speed, direction and output of the WT that cause us the most disturbance have NOT changed. More likely, Gordon Deane and friends have baked criteria into the agreement that does NOT reflect the reality of conditions under which we experience disturbance and have been continually voicing complaints about. It should at the LEAST be shut down completely from 9PM through 7A. We'd also appreciate a quiet early bedtime as the BOS has fought to provide one of their own. We want to enjoy the homes we work hard to maintain and expect to enjoy.
>>
>> Scheduling us as soon as possible is much appreciated.
>> Ellen Kasper

On Wed, Aug 12, 2020 at 1:59 PM Karen Canfield < kcanfield@scituatema.gov> wrote:

Hello Ellen,
We are planning to schedule the meeting in late September. Still working out technology plan.

We have confirmed with scituate wind that the turbine is shut off during the times required by previous complaint analysis. It appears that now the disturbances/complaints are being recorded when the wind is a different direction than the original parameters. That data is being analyzed and will be part of our September conversation.

As the current Chair of BOS, I'm happy to receive all BOS correspondence and can redirect as necessary. In this case, I'm copying our TA.

Karen

> On Aug 12, 2020, at 1:51 PM, Ellen Andrew-Kasper < ellenak47@gmail.com> wrote:

>
>
> Good Afternoon Karen-
>
> Hope you are well. Taking time to catch up on emails and thought I'd circle back around to check on a time frame for the Zoom Meeting with BOS, Epsilon, Al Banget and WT affected neighbors? Our health continues to suffer due to the noise/vibration/flicke r we experience from the improperly sited industrial WT so we are anxious to move forward as quickly as possible.
>
> We are also wondering why Epsilon continues to violate the Mitigation Agreement it made with the BOS years ago? We continue to experience incredibly loud WT disturbances during conditions where it should be shutting down.
>
> Are you the person I should continue to direct my emails to regarding this issue?
>
> Thank You-
> Ellen Kasper
> 120 Gilson Rd
>
>

>
Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

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Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Allison Richman

From: Lorraine Devin
Sent: Monday, August 17, 2020 3:02 PM
To: Allison Richman
Subject: FW: Additional Questions To Epsilon Report
Attachments: Addditonal Comments to Report.doc; Day 4 Amended.pdf

Please add this note and attachments to the wind turbine file.

Thanks,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----
From: Karen Canfield <kcanfield@scituatema.gov>
Sent: Monday, August 17, 2020 2:20 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: Fw: Additional Questions To Epsilon Report

For our wind turbine backup

From: David Dardi <ddardi@att.net>
Sent: Sunday, August 16, 2020 11:55 AM
To: Karen Canfield
Cc: Maura Curran; Andrew Goodrich
Subject: Additional Questions To Epsilon Report

Karen,

Please add the attached questions and amended report findings to the questions for Epsilon. I don't understand how such a simple mistake in mathematics went unnoticed but it significantly changes the results of the report.

Night 4 is found in NON COMPLIANCE at all four locations.

Dave Dardi
122 Gilson Rd

August 18, 2020

ADDITIONAL QUESTIONS AND COMMENTS TO EPSILON REPORT

1. Why wasn't there any testing performed on Night 1(April 19, 2019) at location #2 (26 Hewes Rd). Only three locations were tested instead of four as the contract requires.
2. In regards to Night 4 testing on December 6, 2019:

   Explain why in Table 6-17 the values of Leq for 122 Gilson Rd were not properly averaged to show the value of 41 instead of 40.

   Explain why in Table 6-18 the lowest value of L90 is not used so as to be in accordance with the MassDEP generic protocol document found in the report in Appendix A. Please note the corrected values in the attachment.

   Note that in amended Table 6-20, by using the proper values, non compliance to the noise regulation is found at all four locations.

Table 6-17 Operational Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Operational #1 L_{90} (1:00-1:13 AM)	Operational #2 L_{90} (1:07-1:19AM)	Operational #3 L_{90} (1:14-1:25 AM)	'L_{max}'[1]
1 - 151 Driftway	45	45	45	45
2 - 26 Hewes	42	40	41	41
3 - 122 Gilson	40	40	42	40
4 - 34 Driftway	41	40	40	41

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

Table 6-18 Ambient Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	Ambient #1 L_{90} (1:34-1:43 AM)	Ambient #2 L_{90} (1:39-1:48 AM)	Ambient #3 L_{90} (1:44-1:53 AM)	Representative Ambient L_{90}[1]
1 - 151 Driftway	36	34	34	36
2 - 26 Hewes	32	31	32	32
3 - 122 Gilson	31	32	32	31
4 - 34 Driftway	31	33	31	31

Notes:

1. Period closest in time to the operational measurements.

Table 6-19 Wind-Turbine-Attributable Sound Pressure Levels - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)		
	'L_{max}'	Ambient L_{90}	Wind-Turbine-Attributable 'L_{max}'[1]
1 - 151 Driftway	45	36	45
2 - 26 Hewes	41	32	40
3 - 122 Gilson	40	31	40
4 - 34 Driftway	41	31	40

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

6.2.4.3 Evaluation of Compliance

An evaluation of broadband sound level compliance was performed for all four locations using data measured on December 6, 2019 and is presented in Table 6-20. The total 'L_{max}' sound levels shown in the earlier Table 6-17 have been conservatively used in the evaluation. All locations meet the MassDEP requirement of no more than a 10-dBA difference between the 'L_{max}' sound level and the ambient L_{90} sound level.

Table 6-20 Broadband Sound Level Evaluation - Night 4 (December 6, 2019)

Location	Sound Pressure Level (dBA)			
	[illegible]	Ambient L_{90}	Difference Between '[illegible]' and Ambient 'L_{90}'	Complies?
1 - 151 Driftway	45	36	9	Yes
2 - 26 Hewes	41	32	9	Yes
3 - 122 Gilson	40	31	9	Yes
4 - 34 Driftway	41	31	9	Yes

Notes:

1. Only whole numbers are shown; calculations are performed using values with additional precision.

In addition to the broadband analysis, the octave-band sound level data were analyzed for MassDEP-defined pure tones on a 1-minute basis for both operational and ambient measurement periods. All four locations had pure tones present as described below.

On Night 4, Location 1 had two (2) minutes of ambient testing that had pure tones. The pure tones occurred at 63 Hz during one minute and 1,000 Hz in the subsequent minute. The field notes indicate the presence of a hum from the nearby wastewater treatment plant. This hum is the likely cause of the 63 Hz pure tone during the ambient measurement periods. The field notes indicated vehicles passing during the time that the pure tones were measured.[28] Based on prior sound level measurement experience by Epsilon, it can be concluded that the 1,000 Hz pure tone was attributable to the vehicles observed. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

Location 2 had one (1) operational minute with a 63 Hz pure tone. This location also had two (2) ambient minutes with a 63 Hz pure tone and two (2) ambient minutes with a 500 Hz pure tone. During the operational period with the pure tone, the field technician noted aircraft as a primary sound source. A similar tone was present during ambient testing and aircraft was also noted. Another sound source noted during the ambient testing was 'possible traffic'. The measurement location is approximately 1.5 miles from Route 3A. The probable causes for the pure tones observed at this location are the overhead aircrafts and distant vehicles. No other operational periods contained a pure tone on Night 4 at Location 2. The pure tones measured at this location are not attributable to the wind turbine.

Location 3 had a pure tone at 63 Hz during a single minute of the ambient. Similar to Location 2, the field notes indicated distant traffic and an aircraft overhead during the ambient measurements. The pure tones measured at this location during the ambient testing are not attributable to the wind turbine.

---

28 A vehicular passby was confirmed with a review of the audio recording.

Lorraine Devin

From: Karen Canfield
Sent: Wednesday, September 2, 2020 11:00 AM
To: Ellen Andrew-Kasper
Cc: Tony Vegnani; James Boudreau; Al Bangert; David Dardi; O'Connor, Patrick (SEN); Lorraine Devin
Subject: Re: WT Meeting

Ellen,
I have been involved with this discussion for over three years now. The pages of documents I refer to are all part of the public record (and I'm quite certain Mr. Dardi and others have most of them by now) and I have personally assembled a background file for my education and referral from these public documents.

In preparation for the BOS review of the Epsilon study, I have instructed our office to assemble a notebook for each BOS member with all relevant historical information on the turbine. This is in process. It is critical to me that, before we meet, BOS has had an opportunity to review this information and not just the Epsilon report. Further, I have asked the BOS office to prepare an extra hard copy folder to be available at Town Hall for public review as well as a digital file created for distribution. As you can well imagine, there is a great deal of paper involved, again all public information. This will take time to assemble and scan, but I will forward when it's available.

The BOS review of the Epsilon Report is tentatively scheduled for the September 22, 2020 Board of Selectmen meeting. The confirmation will be made when the final agenda is posted. The meeting format at present is to be via zoom to facilitate public review of materials presented, if any. Materials referenced above will be provided in advance to both the BOS and the public. Normally public distribution of background material is not made available until the date of the meeting, but in this case will be released as soon as possible.

I respectfully request that any future correspondence resist casting the Town of Scituate employees and officials in a nefarious light. We have a dedicated, professional team working very hard to fulfill our obligations to residents within the confines of the law at all times. Each one of us understands and empathizes with the impact you've experienced from the wind turbine operation. To imply that anyone is making shady, illegal, or underhanded agreements in this matter is flat out wrong and, quite frankly, not conducive to addressing the problem at hand.

Sincerely,
Karen Canfield

From: Ellen Andrew-Kasper <ellenak47@gmail.com>
Sent: Wednesday, September 02, 2020 10:11 AM
To: Karen Canfield
Cc: Tony Vegnani; James Boudreau; Al Bangert; Joanne Levesque; David Dardi; O'Connor, Patrick (SEN)
Subject: Re: WT Meeting

GM Karen-
I'm sure you are very busy at this time!

Might Joanne, David and I have access to those 1000 pages of information so that we are all on the same "page"?
The letter sent by the BOS to the operator would be very helpful.
Whatever the instructions were they have never been followed and we continue to suffer the consequences.
We know you prefer to believe Scituate LLCs claim that they adhere to the agreement but, trust US, we live with it...We all do have much better things to do than complain.
It seems the two people who have been involved since the beginning would be cognizant of any legal ramifications involved and be very "careful" when drawing up any agreements, sending letters, corresponding, etc.
We all know that the WT is a nuisance and can be declared as such and in violation of the special permit.
That the BOS involved since the beginning has not used this to protect us while at the same time protecting their own homes from noise nuisance is quite troubling.
Again, I understand you are new to this but in addition to suffering with the nuisance, we have watched neighbors and concerned citizens being treated quite poorly around this and we are understandably disturbed.
Thank you and we look forward to getting the information so we can be prepared as well.
Ellen Kasper

On Tue, Sep 1, 2020 at 4:37 PM Karen Canfield <kcanfield@scituatema.gov> wrote:
Ellen,
I have reviewed over 1,000 pages of documentation from the past eight years, the only "mitigation" decision that I'm aware of is BOS voting that the turbine not operate under certain conditions, as decided on by the BOS several years ago (nighttime May-Oct when wind blows in a certain direction). The specifics can be found in the BOS minutes. I'm happy to pull them for you, but I have primary election responsibilities today. As you may recall, the shut-off requirements were based on the data analyzing when complaints came in and which way the wind was blowing any the time. This analysis was supported by Mr. Dardi's observations at the time, in my recollection. I will see if I can find the letter with instructions to the operator -- I can't imagine one wasn't sent (The TA normally is charged with implementing the BOS directives. I've personally not seen such a letter, but we typically do not get copied on such correspondence). Any such letter wouldn't have been an agreement between BOS/Scituate Wind - it would've been informing them of the required changes to operation.

Is there something else you're referring to? Mr. Vegnani and Mr. Boudreau scheduled a meeting to ensure that the terms of the shut-off approved are occurring. They will provide an update to BOS at our review meeting. As I've said repeatedly, this was a meeting between town officials and the operator, not a public meeting and, as such, documentation is not required or public domain nor has it even been presented to BOS for discussion yet.

Again, I apologize for the quick answer. I take my responsibilities as a BOS member seriously, but cannot focus on this until after the election. Thanks for understanding.
Karen

From: Ellen Andrew-Kasper <ellenak47@gmail.com>
Sent: Tuesday, September 01, 2020 9:34 AM
To: Karen Canfield; Tony Vegnani
Cc: James Boudreau; Joanne Levesque; David Dardi; O'Connor, Patrick (SEN)
Subject: Re: WT Meeting

Thank you Karen.
We would still like to have the actual "Mitigation Agreement" that was created on our behalf by the town and Scituate Wind so that we can look at the details.
Will you or Mr. Vegnani please forward that to us?
I understand you are busy but this should not require much time or effort.
As we continue to experience noise in conditions we expect the WT to be shut off we are anxious to see exactly how this mitigation is actually supposed to help us.
Thank you-
Ellen Kasper

On Mon, Aug 31, 2020 at 2:56 PM Karen Canfield <kcanfield@scituatema.gov> wrote:
Hi Ellen,
Thank you for your email. You've brought up a lot of issues which I'd like to respond fully to, but am underwater with my professional work at the moment. I will respond as soon as possible. Please know this is issue is front of mind and I look forward to the full BOS review of all surrounding issues.
Karen

From: Ellen Andrew-Kasper <ellenak47@gmail.com>
Sent: Thursday, August 27, 2020 1:41 PM
To: Karen Canfield; James Boudreau; Tony Vegnani
Subject: Fwd: WT Meeting

Hello Karen-
Again, requesting transparency and affected neighbors inclusion in communications regarding the Scituate WT.
I'm not sure that you can truly understand our frustration without living with this nuisance in your backyard.
I'm also not sure you can truly understand why we would question Mr Vegnani "advocating" on our behalf without including us in that meeting with Scituate Wind unless you had been dealing with it for 8 1/2 years.
We continue to experience nuisance noise during conditions where we would expect it to be shut off . It would be helpful for us to get a copy of the alleged "Mitigation Agreement" so we can actually see the details of how the nuisance is allowed to continue.
Would you or Mr. Vegnani be able to provide us with that?

It was also interesting to hear that TA JB was communicating with Seth Pickering from DEP.
We would like to know if that conversation occurred before or after our Zoom call with Seth and what exactly was discussed/planned. Maybe that is where the formal request letter from the BOH and TA for DEP assistance plan originated?
I expect Dave Dardi has already received or will be receiving that letter shortly?

Thank you for your continued assistance with this matter.
Ellen Kasper

---------- Forwarded message ---------
From: **Karen Canfield** <kcanfield@scituatema.gov>
Date: Thu, Aug 13, 2020 at 7:03 PM
Subject: Re: WT Meeting

To: Ellen Andrew-Kasper <ellenak47@gmail.com>
Cc: Tony Vegnani <avegnani@scituatema.gov>, Andrew Goodrich <agoodrich@scituatema.gov>, Karen Connolly <keconnolly@comcast.net>, Maura Curran <mcurran@scituatema.gov>, David Dardi <ddardi@att.net>, Joanne Levesque <joanne@levesque.us>, Generic BoardOfHealth <boardofhealth@scituatema.gov>, James Boudreau <jboudreau@scituatema.gov>, O'Connor, Patrick (SEN) <Patrick.O'Connor@masenate.gov>, Phyllis Karlberg <phylhk26@aol.com>, vfortev <vfortev@aol.com>, Paul Ohrenberger <pohrenberger@yahoo.com>, Mckeever, Mark <keever151@comcast.net>, Stephen <stephencja@gmail.com>, Lorraine Devin <ldevin@scituatema.gov>

To all,
Thank you for your email and for articulating your concerns. As I've said to a number of the undersigned, the town of scituate meets with contractors, vendors, and organizations every single day to further town business. This is not obstructionist or shady; this is necessary to conduct town business. In the case of Mr Vegnani's meeting, he wanted to verify that the shutdown mandated by BOS was occurring — and it is — and to discuss other operational issues directly. There was no need for a public meeting because no votes or decisions were made. Quite frankly, this meeting was to further inquiry into your concerns so the BOS has all the facts as we deliberate and in no way, shape, or form was intended as a "secret" or back handed meeting as clearly implied. Mr Vegnani will provide the board with any necessary information gleaned at that meeting when we meet publicly. That he is reaching out to you all because of questions he had from his meeting is a clear example of his concern for advocating on your behalf.

While I understand your frustration with the delays in reviewing the report and the continued disturbances, I will strongly recommend that you recognize that this Board has been operating in good faith to ensure that the report is reviewed with us much transparency as possible and that all of our questions are asked and answered so that we know what options are available to addressing those concerns.

I will make all of your correspondence available to the entire BOS for review before our public meeting.

I will also remind you, as I have several times to some of you, our meeting will be for the BOS to review the report and be satisfied with the findings. We will examine all information, including the questions and any reports Dr Dardi has or will provide in advance. This is not a public hearing and I caution you all to remember that we are trying to be as balanced, fair, open, inclusive, and productive as possible. Your demands to "shut it off" cannot simply occur without this process, including a thorough discussion of the financial ramifications of any such measure, should they be warranted.

If you would like to submit further documentation for the board to consider, please do so as soon as possible through our office so that BOS has adequate time to review before our discussion.

Sincerely,
Karen Canfield

On Aug 13, 2020, at 5:45 PM, Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:

Good Afternoon Karen-

I'm inquiring about Mr. Vegnani's email response to my request for protection of our health and property from WT Nuisance/Noise, Disturbance of the Peace...
In your latest email to me you did not mention that he was meeting w/ Scituate Wind.
In a previous email to you I requested transparency from BOS in communications around this.
The fact that affected neighbors cannot get a mtg w/ BOS/BOH d/t COVID yet Mr. Vegnani finds time to meet w/ Scituate Wind is rather disturbing. No notice. No public input or involvement. No information regarding discussions. This by the BOS member whose signature is on the contract w/ Scituate Wind? Mr. Vegnani seems to have paid little attention to or chosen to ignore the requests, reams of scientific info and emails regarding other towns efforts to protect their citizens sent to BOS/BOH since the WT was first turned on. In addition, he has neglected to mention the existence of a "report" with REAL data that shows noise reg noncompliance at one home and if analyzed properly would undoubtedly show noise noncompliance at ALL other test sites.
It has been well established by acoustic experts that the best, most accurate, judgement of noise disturbance is the human ear. (I have forwarded that info to BOS/BOH myself in the past.) Thus, our 8 YEARS of complaints is grounds enough to declare the WT a Nuisance and in Violation of it's Special Permit.
We deserve the same protection from disturbance that Mr. Vegnani gets.
Scituate Wind has not complied with the Mitigation agreement. Mitigation efforts based on wind speed/direction have proved to be inadequate and irrelevant. For Mr. Vegnani to ask us to rate the sound and report individually to him is ridiculous, wastes time on useless information, delays any progress, and subjects us to continued negative health impacts from the improperly sited industrial WT.
To be clear, this is not "Sound" coming from the turbine. It is NOISE along with VIBRATION, PRESSURE, and FLICKER and there IS a remedy.
Shut it down.

Ellen Kasper
Stephen Werther
Valerie Vitale
Philip Vitale
Phyllis Karlberg
Dave Dardi
Joann Bianchini
Mark McKeever
Lauren McKeever
Paul Ohrenberger

Sent from my iPhone

> On Aug 12, 2020, at 2:39 PM, Ellen Andrew-Kasper <Ellenak47@gmail.com> wrote:
>
> Karen-

I'm sure you know I meant Scituate Wind/Gordon Deane complying with the Mitigation Agreement. (That's what disturbed sleep does....)

On Wed, Aug 12, 2020 at 2:20 PM Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:
Thank you Karen-

As an affected neighbor of 8 years I can tell you that the wind speed, direction and output of the WT that cause us the most disturbance have NOT changed. More likely, Gordon Deane and friends have baked criteria into the agreement that does NOT reflect the reality of conditions under which we experience disturbance and have been continually voicing complaints about. It should at the LEAST be shut down completely from 9PM through 7A. We'd also appreciate a quiet early bedtime as the BOS has fought to provide one of their own. We want to enjoy the homes we work hard to maintain and expect to enjoy.

Scheduling us as soon as possible is much appreciated.
Ellen Kasper

On Wed, Aug 12, 2020 at 1:59 PM Karen Canfield <kcanfield@scituatema.gov> wrote:
Hello Ellen,
We are planning to schedule the meeting in late September. Still working out technology plan.

We have confirmed with scituate wind that the turbine is shut off during the times required by previous complaint analysis. It appears that now the disturbances/complaints are being recorded when the wind is a different direction than the original parameters. That data is being analyzed and will be part of our September conversation.

As the current Chair of BOS, I'm happy to receive all BOS correspondence and can redirect as necessary. In this case, I'm copying our TA.

Karen

> On Aug 12, 2020, at 1:51 PM, Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:
>
>
> Good Afternoon Karen-
>
> Hope you are well. Taking time to catch up on emails and thought I'd circle back around to check on a time frame for the Zoom Meeting with BOS, Epsilon, Al Banget and WT affected neighbors? Our health continues to suffer due to the noise/vibration/flicker we experience from the improperly

sited industrial WT so we are anxious to move forward as quickly as possible.
>
> We are also wondering why Epsilon continues to violate the Mitigation Agreement it made with the BOS years ago? We continue to experience incredibly loud WT disturbances during conditions where it should be shutting down.
>
> Are you the person I should continue to direct my emails to regarding this issue?
>
> Thank You-
> Ellen Kasper
> 120 Gilson Rd
>
>
>
Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.
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Lorraine Devin

From: Karen Canfield
Sent: Wednesday, September 9, 2020 12:06 PM
To: Lorraine Devin
Subject: Fwd: Additional Questions To Epsilon Report
Attachments: Addditonal Comments to Report.doc; ATT00001.htm; Day 4 Amended.pdf; ATT00002.htm

Begin forwarded message:

From: Karen Canfield <kcanfield@scituatema.gov>
Date: August 16, 2020 at 5:08:04 PM EDT
To: James Boudreau <jboudreau@scituatema.gov>
Subject: Fwd: Additional Questions To Epsilon Report

Begin forwarded message:

From: David Dardi <ddardi@att.net>
Date: August 16, 2020 at 11:59:11 AM EDT
To: Karen Canfield <kcanfield@scituatema.gov>
Cc: Maura Curran <mcurran@scituatema.gov>, Andrew Goodrich <agoodrich@scituatema.gov>
Subject: Additional Questions To Epsilon Report

Karen,

Please add the attached questions and amended report findings to the questions for Epsilon. I don't understand how such a simple mistake in mathematics went unnoticed but it significantly changes the results of the report.

Night 4 is found in NON COMPLIANCE at all four locations.

Dave Dardi
122 Gilson Rd

QUESTIONS FOR EPSILON ASSOCIATES-SCITUATE TESTING

1. In 1.0 Executive Summary, paragraph 4: "The residence (151 Driftway) is 650 feet to the northeast of the wind turbine and it is Epsilon's understanding that the owners of the residence were recipients of mitigation funds by Scituate Wind, LLC."

   What is the source of this information and why do you feel it is appropriate to be included in a sound data gathering and evaluation report?

2. The report was submitted anonymously. Who takes responsibility for its content and accuracy?
3. Why does the post-measurement analysis avoid showing the occurrence of non-compliance at 151 Driftway?
4. Why is there non-compliance with ANSI S12.9 Part 3 in excluding dB(A) corruption from audible sounds: insects, tree frogs, and leaf rustle, by excluding octave bands from 2 kHz and identify with dB(ANS)
5. Why did Epsilon not comply with ANSI S12.9/ANSI S1.13 for instrument quality audio recordings and substitute low quality MP3 audio files in lieu of SR option: calibrated WAV files as the Larson Davis 831 meter is capable of recording?

6. Explain the inconsistency between SCADA files and with sound measurements logs for the turbine on and turbine off ambient. The ambient (L90) are too high by including turbine noise contributions

7. In the document Sound Level Compliance Monitoring Protocol , October 18, 2018, why is there a contradiction between the use of Leq in the Section, Documentation of Compliance and the use of Lmax in the established Current Wind Turbine Noise Study Protocol (generic) , which is attached to those final protocols. Please look at the attached communication from Dan DiSalvio, dated Sept 25, 2018, addressed to David Dardi and Karen Canfield. Even the representative from the MassDEP didn't know why Leq is being specified and requested that copy of the MassDEP Generic Protocols to be attached.

8. Since you used Leq in determining the Lmax why didn't you apply a 6 to 11 dB correction factor to Leq as calculated in MASSACHUSETTS STUDY ON WIND TRUBINE ACOUSTICS, February 2, 2016 which said study was co-authored by Epsilon Associates.

Lorraine Devin

From:	Karen Canfield
nt:	Wednesday, September 9, 2020 12:07 PM
To:	Lorraine Devin
Subject:	Fwd: Modification to Questions for Epsilon
Attachments:	Questions.pdf; ATT00001.htm

Begin forwarded message:

From: David Dardi <ddardi@att.net>
Date: August 7, 2020 at 7:31:19 PM EDT
To: Karen Canfield <kcanfield@scituatema.gov>
Subject: Modification to Questions for Epsilon

Karen,

I felt it necessary to modify question #7 and to attach a copy of the email from Dan SiSalvio (Compliance Officer at MassDEP) that he sent to you and I in Sept 2018. This is very important since it had to do with the final adopted testing protocols that Epsilon used and the controversy surrounding it. I have been trying to get MassDEP to formally acknowledge what their own employee already stated. If Epsilon were to have used Lmax (the maximum noise value- the thump or whooshing sound) instead of Leq(an average of all noise-as you know an average is NOT the greatest value) then non-compliance to the Noise Regulation would have occurred at all locations on every night of the testing.

However, with that said, it should be noted that even if Leq is continued to be inappropriately used then non compliance would to shown if the insect noise had been properly removed from the values (See question 4). The report, from my consulting engineer, will address that issue in detail. I will forward you a copy when the report is finalized.

Dave

Subject: RE: Scituate Wind Turbine Sound Monitoring
From: "DiSalvio, Dan (DEP)" <dan.disalvio@state.ma.us>
Date: 9/25/2018, 5:01 PM
To: David Dardi <ddardi@att.net>
CC: Karen Canfield <kcanfield@scituatema.gov>

Mr. Dardi,

I am not sure myself what the "MassDEP 2013 generic Wind Turbine Noise Sound Study Protocol" is, which is why I requested that a copy be attached to the protocol for reference.

In regards to your second question, I am not aware of a document that formalizes the switch from Lmax to Leq for wind turbine sampling. It is my understanding that much of these accepted procedures resulted from the WNTAG advisory committee, which I was not a part of. The issues you raise towards the bottom of your email rise above my level of expertise, and I am not in a position to deviate from accepted DEP procedures for wind turbine sound monitoring. Therefore I refer you to Laurel Carlson (617-348-4095) and Marc Wolman (617-292-5515) of the MassDEP Boston Office regarding these issues.

Sincerely,

Dan DiSalvio
Compliance and Enforcement Chief
Bureau of Air and Waste
MassDEP Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347
508-946-2878

-----Original Message-----
From: David Dardi [mailto:ddardi@att.net]
Sent: Sunday, September 23, 2018 8:38 AM
To: DiSalvio, Dan (DEP)
Cc: Karen Canfield
Subject: Re: Scituate Wind Turbine Sound Monitoring

Mr. DiSalvio,

After a re-examination of the proposed Epsilon testing protocols and to your response to them of 9/21/2018, I have been prompted to add the following:

3. I am not aware of the "MassDEP 2013 generic Wind Turbine Noise Sound Study Protocol" Could you please furnish me a copy or a link to that document?

4. This actually is a continuation of discussion on my last communication with you in regards to Leq. Starting with Falmouth, MassDEP has been insistent on using the average of Lmax from three consecutive runs with the SLOW meter setting. I am not aware of any formal switch from Lmax to Leq. Can you furnish me a copy or link to that document.

Whereas it is essential to use FAST in place of SLOW metering, the use of the 1 second Leq may very well negate the gain in accuracy in the switch from SLOW to FAST (as you have directed in your comment #1.) The attached graph from the WNTAG RSG study, illustrates the different metrics on AAM waveform of about 3 dBA amplitude. The pink squares (1s
LAsmax) is what DEP has been using. There has been a great deal of urging for the use of the blue circles (1s, LAfmax) to capture a truer measure of what is heard. The use of the 1s Leq is NOT an improvement, and I am uncertain how or if the SLOW/FAST meter setting affects the 1s, Leq readings.
While AAM sample shown here has only a 3 dBA peak to peak amplitude, samples from the Falmouth test results are more than 10 dBA. While the difference here may be 1,5 dBA, the Falmouth testing samples show a difference of 4.5 + dBA.

Based upon all the questions and controversy surrounding the testing protocol, I think that it is essential that you meet with me to discuss the issues involved. Not only am I involved as a liaison but I am an affected member of the community. It is not only my responsibility to see that a true and accurate assessment is made of the noise but to also ensure that the town does not spend money uselessly on an unreliable and inaccurate test.

Please notify me is you will grant me and an associate of mine a meeting.

Sincerely,

David M Dardi
122 Gilson Rd

Tel: 207-892-6691

S.E. Ambrose & Associates

15 Great Falls Road, Windham, ME 04062

Acoustics, Environmental Sound & Industrial Noise Control

Email; seaa@myfairpoint.net

October 26, 2017

Lorraine Devin, Executive Assistant
Board of Selectmen
Scituate Town Offices
600 Chief Justice Cushing Way
Scituate, MA 02066

Ref: Scituate Wind Turbine Noise

Dear Chair and Members:

Scituate does not need more wind turbine noise measurements. A review of the 2008 *Acoustic Study of Three Wind Turbines*[1], and the 2015 *Scituate Wind Compliance Sound Monitoring Study*[2] are sufficient to confirm Scituate Wind does not comply. MassDEP Noise Policy limits the Lmax increase to 10 dB above the *"real"* ambient baseline L90. Scituate Wind warrants nighttime curtailment.

Baseline ambient background L90s represent the quietest hours, which occur late at night during calm conditions with no leaf rustle or wind in branches. MassDEP altered its Noise Policy for when the baseline ambient L90s are established. A subtle change in interpretation from pre-permit to post-operation, which has a dramatic effect on the baseline ambient L90s. Wind contamination or *"faux noise"* is included increasing L90 and decreasing the difference with Lmax. This change will more often show a *"false compliance"* lieu of an actual exceedance. Research has shown that wind masking starts when the wind turbine noise level is about 10 dB quieter than the ambient sound level[3]. Rephrased: masking onset occurs when the ambient sound level is 10 dB louder than the wind turbine.

In 2008, Scituate's lowest ambient L90 was 29 dBA, measured north of the waste-water treatment plant, between Driftway Road and the golf course. The 29 dBA measurement is supported by Table 1 (ref 1): *30 dBA-Rural Area-Nighttime*. Yet, the study reported higher L90s ranging from 35 to 52 dBA: *Quiet Urban Area-Nighttime*, which were later revised: 36 to 45 dBA. The 2008 study erred by not considering 29 dBA (L90) and Table 1. If noise levels were measured where people live, about 3000-ft to the east, these levels would likely be quieter than 29 dBA.

Compliance noise measurements require skilled observers[4], who can discriminate and rank order audible sources while witnessing meter fluctuations. The listener must ascertain when the "test" noise source is at its maximum level, which occurs when operating near maximum electric power output.

Noise level compliance measurements need to be verified by having a strong (±3 dB) correlation with predicted levels to exclude potential coincidental measurements. Wind turbine noise level predictions

[1] *Acoustic Study of Three Wind Turbines*, Tech Environmental, Scituate, Massachusetts, 2008.
[2] *Scituate Wind Compliance Sound Monitoring Study*, Scituate, Massachusetts, Tech Environmental, June 2015.
[3] Karl Bolin, Doctoral Thesis, April 2009.
[4] ANSI/ASA S12.9, Part 3, "Short Term Measurements with an Observer Present."

are estimates for the long-term average (Leq), and not the maximum (Lmax). A 2016 MassDEP Study[5] found Lmax 6 to 11 dB higher than the predicted mean Leq. Therefore, 6 to 11 dB must be added to the predicted Leq for Lmax to benchmark measured operational Lmax thresholds under MassDEP rules.

The 2008 (ref 1) and 2015 (ref 2) did not provide wind turbine sound power level (Lw) data. A 2010 Addendum study[6] included noise prediction datasheets showing wind turbine Lws from 101.2 to 110.2 dBA. Scituate Wind is estimated to have a Lw 105 dBA.

A spreadsheet was used to predict wind turbine noise levels (Leqs) for full electric power output at each measurement location (ref 2). The closest residence location (ML-1) is about 700-ft from the wind turbine, whereas the remaining four (ML-2, 3 & 4) are at distances ranging from 3200 to 3550-ft. All tables are shown on page 3.

Results show that 45% of the noise level measurements have strong correlations (±3 dB) with predicted levels. The remaining 55% were excluded because of low electric power output.

Summary - Scituate Wind Noise Predictions and Measurements

Loc	Predicted		Aug 14-15, 2013		March 15, 2014		June 3, 2014		May 5, 2015	
	Lmax (6)	Lmax (11)	ON	% Pwr	ON	% Pwr	ON	% Pwr	ON	% Pwr
ML1	**54.0**	**59.0**								
ML2	**40.2**	**45.2**							**48.1**	69.9
ML3	40.5	**45.5**			**45.9**	101.0	**42.5**	41.4	**43.6**	60.7
ML4	40.6	**45.6**			**43.9**	98.3	**42.7**	52.2	**42.4**	55.1
ML5	39.6	**44.6**			**43.0**	94.7	**42.5**	63.3		

MassDEP Noise Policy compliance should be based on the 2008 quietest baseline ambient measurement L90 of 29 dBA (ref 1). Therefore, the compliance Lmax is 39 dBA. The above summary table shows all predicted and measured noise levels exceed Lmax 39 dBA.

These exceedances may be even greater if the baseline ambient L90's more than 3500-ft away are closer to the mid-20s dBA, as measured in other seaside communities. Using available data, I have shown that Scituate Wind does not comply with the noise limits. These results confirm neighbor complaints.

May this help with your deliberation. Experience has shown that neighbor complaints more often indicate sound assessment errors, and will persist until corrected.

Thank you for your time and consideration. Please feel free to contact me with any questions.

Respectfully,

Stephen E. Ambrose

Stephen E. Ambrose, ASA, *INCE, Board Certified Emeritus*
Principal Consultant

[5] *Massachusetts Study on Wind Turbine Acoustics*, Massachusetts Clean Energy Center and Department of Environmental Protection, Resource Systems Group, Inc., Feb 18, 2016

[6] Addendum to Acoustic Analysis Scituate Community Wind Project, Atlantic Design Engineers, March 2010.

Complete Situate Wind Noise Assessment Spreadsheet – Predicted vs Measured

Table 1 - All Noise Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
	Leq	Lmax (6)	Lmax (11)	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr
ML1	48.0	54.0	59.0	49.0	50.5	18.8	44.8	51.8	101.2	41.2	47.0	19.0	41.2	51.2	69.9
ML2	34.2	40.2	45.2	34.8	38.7	20.2	47.3	na	101.2	36.8	40.6	10.5	46.0	48.1	69.9
ML3	34.5	40.5	45.5	33.6	35.2	15.0	40.5	45.9	101.0	36.0	42.5	41.4	42.5	43.6	60.7
ML4	34.6	40.6	45.6	31.2	34.5	21.9	41.7	43.9	98.3	37.1	42.7	52.2	40.2	42.4	55.1
ML5	33.6	39.6	44.6	35.3	36.4	27.8	38.0	43.0	94.7	38.4	42.5	63.3	40.6	na	60.7

Table 2 - Leq Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
	Leq	Lmax (6)	Lmax (11)	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr
ML1	48.0			49.0	50.5	18.8	44.8	51.8	101.2				41.2	51.2	69.9
ML2	34.2			34.8	38.7	20.2									
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Table 3 - Leq +6 = Lmax Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
		Lmax (6)			ON	% Pwr		ON	% Pwr		ON	% Pwr		ON	% Pwr
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ML4		40.6						43.9	98.3		42.7	52.2		42.4	55.1
ML5		39.6						43.0	94.7		42.5	63.3			

Table 4 - Leq + 11 Lmax Predictions and Measurements

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
			Lmax (11)		ON	% Pwr		ON	% Pwr		ON	% Pwr		ON	% Pwr
ML1			59.0												
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ML3			45.5					45.9	101.0						
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ML5			44.6												

Summary - Scituate Wind Noise Predictions and Measurements

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
		Lmax (6)	Lmax (11)		ON	% Pwr		ON	% Pwr		ON	% Pwr		ON	% Pwr
ML1		**54.0**	**59.0**												
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Tel: 207-892-6691

S.E. Ambrose & Associates

15 Great Falls Road, Windham, ME 04062

Acoustics, Environmental Sound & Industrial Noise Control

Email; seaa@myfairpoint.net

September 24, 2018

Lorraine Devin, Executive Assistant
Board of Selectmen
Scituate Town Offices
600 Chief Justice Cushing Way
Scituate, MA 02066

Ref: Scituate Wind Turbine Noise

Dear Chair and Select Board Members:

Scituate does not need more wind turbine noise measurements. International standards dating back to 1971 provide the essential evidence for why noise complaints persist, which could have been predicted. MassDEP and MassDPH were pressured to support and promote wind turbine development.

International Standards Organization (ISO 1996:1971) references land-use compatibility from rural to urban communities. The most stringent noise limits are at night to protect sleep. Scituate Wind is in which type of community? Sound levels near Scituate Wind have been measured at less than 30 dBA without wind turbines

Recommended Night Community Noise Limits

Rural	Suburban	Urban Residential	Urban Mixed
25 dBA	**30 dBA**	35 dBA	40 dBA

American National Standards Institute (ANSI 12.9, Part 4 & 5) provides the following recommendations for communities quieter than 45 dBA.

Part 4: *In newly created situations, especially when the community is not familiar with the sound source in question, higher community annoyance can be expected. This difference may be equivalent to up to 5 dB.*

Research has shown that there is a greater expectation for and value placed on "peace and quiet" in quiet rural settings. In quiet rural areas, this greater expectation for "peace and quiet" may be equivalent to up to 10 dB.

The above two factors are additive. A new, unfamiliar sound source sited in a quiet rural area can engender much greater annoyance levels than are normally estimated for reference level: 45 dBA representing typical urban communities, ... *This increase in annoyance may be equivalent to adding up to 15 dB to the measured or predicted levels*.

Part 5 *30 dBA compatible,* ***35 dBA marginally compatible.*** Note: ANSI levels are 5 dB louder than ISO due to using a different quantifier: Level day-night average versus level night, which are effectively the same.

ANSI standards (S 12.9-Part 3, S12.100, S 12.18) require sound level measurements exclude contamination from insects, short-duration transients (traffic, aircraft, ...), seasonal natural sounds (insects, tree frogs, ...), and wind. Wind ruins measurements and is not valid for masking (ANSI).

Equipment specific standards that do not conform with standards developed to protect health should be ignored; e.g. IEC 61400. Ref: [https://en.wikipedia.org/wiki/IEC_61400]

> *"The 61400 is a set of design requirements made to ensure that wind turbines are appropriately engineered against damage from hazards within the planned lifetime. The standard concerns most aspects of the turbine life from site conditions before construction, to turbine components being tested, assembled and operated. Wind turbines are capital intensive and are usually purchased before they are being erected and commissioned. ...*
>
> *Turbulence intensity quantifies how much the wind varies typically within 10 minutes. Because the fatigue loads of a number of major components in a wind turbine are mainly caused by turbulence, the knowledge of how turbulent a site is of crucial importance. Normally the wind speed increases with increasing height. In flat terrain the wind speed increases logarithmically with height. In complex terrain the wind profile is not a simple increase and additionally a separation of the flow might occur, leading to heavily increased turbulence."* [complex terrain represents Scituate]

Protecting public health should be the paramount concern, and not protecting financial benefits. Scituate has been misled by acoustic consultants motivated to protect their clients from public noise complaints. Caution is warranted to avoid engaging compliant consultants with shared objectives to promote wind turbine development.

Thank you for your time and consideration. Please feel free to contact me with any questions.

Respectfully,

Stephen E Ambrose

Stephen E. Ambrose, ASA, *INCE, Board Certified Emeritus*
Principal Consultant

cc: Millie Garcia-Serrano, Regional Director MassDEP SERO

Lorraine Devin

From:	Lorraine Devin
Sent:	Friday, October 27, 2017 10:18 AM
To:	Al Bangert; Anthony Vegnani (tveg@yahoo.com); John Danehey; John Danehey (jdanehey@doesq.com); Karen Canfield; Maura Curran; Shawn Harris; Shawn Harris; Tony Vegnani; Jennifer Keefe
Subject:	FW: Situate Wind Letter
Attachments:	Scituate WT Noise Letter 26Oct17-1.pdf

Dear Selectmen, Al and Jenn,

I received the following letter regarding the wind turbine to distribute to all of you today from Stephen E. Ambrose, ASA, INCE, Board Certified Emeritus Principal Consultant. I have also put a copy in your inboxes.

FYI,
Lorraine

Lorraine Devin
Town of Scituate
Town Administrator/Board of Selectmen's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
Phone: 781-545-8740

-----Original Message-----
From: Stephen E Ambrose [mailto:seaa@myfairpoint.net]
Sent: Thursday, October 26, 2017 3:37 PM
To: Lorraine Devin
Subject: Situate Wind Letter

Lorraine,

I respectfully prepared this letter for the Board of Selectmen.
Please share this letter with the Town Administrator and Board of Health.
Thank you and best wishes.

--
Steve

Neighbors are far better acoustic analyzers for determining the quality of their life versus any acoustic instrument left unattended by an expert.

Stephen E. Ambrose, INCE, Bd.Cert.
Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
15 Great Falls Road Mobile: 207.653.9099
Windham, ME 04062 email: seaa@myfairpoint.net

Lorraine Devin

From: Stephen E Ambrose <seaa@myfairpoint.net>
Sent: Thursday, October 26, 2017 3:37 PM
To: Lorraine Devin
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Attachments: Scituate WT Noise Letter 26Oct17-1.pdf

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Please share this letter with the Town Administrator and Board of Health.
Thank you and best wishes.

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Tel: 207-892-6691

S.E. Ambrose & Associates

15 Great Falls Road, Windham, ME 04062

Acoustics, Environmental Sound & Industrial Noise Control

Email; seaa@myfairpoint.net

October 26, 2017

Lorraine Devin, Executive Assistant
Board of Selectmen
Scituate Town Offices
600 Chief Justice Cushing Way
Scituate, MA 02066

Ref: Scituate Wind Turbine Noise

Dear Chair and Members:

Scituate does not need more wind turbine noise measurements. A review of the 2008 *Acoustic Study of Three Wind Turbines*[1], and the 2015 *Scituate Wind Compliance Sound Monitoring Study*[2] are sufficient to confirm Scituate Wind does not comply. MassDEP Noise Policy limits the Lmax increase to 10 dB above the *"real"* ambient baseline L90. Scituate Wind warrants nighttime curtailment.

Baseline ambient background L90s represent the quietest hours, which occur late at night during calm conditions with no leaf rustle or wind in branches. MassDEP altered its Noise Policy for when the baseline ambient L90s are established. A subtle change in interpretation from pre-permit to post-operation, which has a dramatic effect on the baseline ambient L90s. Wind contamination or *"faux noise"* is included increasing L90 and decreasing the difference with Lmax. This change will more often show a *"false compliance"* lieu of an actual exceedance. Research has shown that wind masking starts when the wind turbine noise level is about 10 dB quieter than the ambient sound level[3]. Rephrased: masking onset occurs when the ambient sound level is 10 dB louder than the wind turbine.

In 2008, Scituate's lowest ambient L90 was 29 dBA, measured north of the waste-water treatment plant, between Driftway Road and the golf course. The 29 dBA measurement is supported by Table 1 (ref 1): *30 dBA-Rural Area-Nighttime*. Yet, the study reported higher L90s ranging from 35 to 52 dBA: *Quiet Urban Area-Nighttime*, which were later revised: 36 to 45 dBA. The 2008 study erred by not considering 29 dBA (L90) and Table 1. If noise levels were measured where people live, about 3000-ft to the east, these levels would likely be quieter than 29 dBA.

Compliance noise measurements require skilled observers[4], who can discriminate and rank order audible sources while witnessing meter fluctuations. The listener must ascertain when the "test" noise source is at its maximum level, which occurs when operating near maximum electric power output.

Noise level compliance measurements need to be verified by having a strong (±3 dB) correlation with predicted levels to exclude potential coincidental measurements. Wind turbine noise level predictions

[1] *Acoustic Study of Three Wind Turbines,* Tech Environmental, Scituate, Massachusetts, 2008.
[2] *Scituate Wind Compliance Sound Monitoring Study*, Scituate, Massachusetts, Tech Environmental, June 2015.
[3] Karl Bolin, Doctoral Thesis, April 2009.
[4] ANSI/ASA S12.9, Part 3, "Short Term Measurements with an Observer Present."

are estimates for the long-term average (Leq), and not the maximum (Lmax). A 2016 MassDEP Study[5] found Lmax 6 to 11 dB higher than the predicted mean Leq. Therefore, 6 to 11 dB must be added to the predicted Leq for Lmax to benchmark measured operational Lmax thresholds under MassDEP rules.

The 2008 (ref 1) and 2015 (ref 2) did not provide wind turbine sound power level (Lw) data. A 2010 Addendum study[6] included noise prediction datasheets showing wind turbine Lws from 101.2 to 110.2 dBA. Scituate Wind is estimated to have a Lw 105 dBA.

A spreadsheet was used to predict wind turbine noise levels (Leqs) for full electric power output at each measurement location (ref 2). The closest residence location (ML-1) is about 700-ft from the wind turbine, whereas the remaining four (ML-2, 3 & 4) are at distances ranging from 3200 to 3550-ft. All tables are shown on page 3.

Results show that 45% of the noise level measurements have strong correlations (±3 dB) with predicted levels. The remaining 55% were excluded because of low electric power output.

Summary - Scituate Wind Noise Predictions and Measurements

Loc	Predicted		Aug 14-15, 2013		March 15, 2014		June 3, 2014		May 5, 2015	
	Lmax (6)	Lmax (11)	ON	% Pwr	ON	% Pwr	ON	% Pwr	ON	% Pwr
ML1	**54.0**	**59.0**								
ML2	**40.2**	**45.2**							**48.1**	69.9
ML3	40.5	**45.5**			**45.9**	101.0	**42.5**	41.4	**43.6**	60.7
ML4	40.6	**45.6**			**43.9**	98.3	**42.7**	52.2	**42.4**	55.1
ML5	39.6	**44.6**			**43.0**	94.7	**42.5**	63.3		

MassDEP Noise Policy compliance should be based on the 2008 quietest baseline ambient measurement L90 of 29 dBA (ref 1). Therefore, the compliance Lmax is 39 dBA. The above summary table shows all predicted and measured noise levels exceed Lmax 39 dBA.

These exceedances may be even greater if the baseline ambient L90's more than 3500-ft away are closer to the mid-20s dBA, as measured in other seaside communities. Using available data, I have shown that Scituate Wind does not comply with the noise limits. These results confirm neighbor complaints.

May this help with your deliberation. Experience has shown that neighbor complaints more often indicate sound assessment errors, and will persist until corrected.

Thank you for your time and consideration. Please feel free to contact me with any questions.

Respectfully,

Stephen E. Ambrose

Stephen E. Ambrose, ASA, *INCE, Board Certified Emeritus*
Principal Consultant

[5] *Massachusetts Study on Wind Turbine Acoustics*, Massachusetts Clean Energy Center and Department of Environmental Protection, Resource Systems Group, Inc., Feb 18, 2016

[6] Addendum to Acoustic Analysis Scituate Community Wind Project, Atlantic Design Engineers, March 2010.

Complete Situate Wind Noise Assessment Spreadsheet – Predicted vs Measured

Table 1 - All Noise Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
	Leq	Lmax (6)	Lmax (11)	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr
ML1	48.0	54.0	59.0	49.0	50.5	18.8	44.8	51.8	101.2	41.2	47.0	19.0	41.2	51.2	69.9
ML2	34.2	40.2	45.2	34.8	38.7	20.2	47.3	na	101.2	36.8	40.6	10.5	46.0	48.1	69.9
ML3	34.5	40.5	45.5	33.6	35.2	15.0	40.5	45.9	101.0	36.0	42.5	41.4	42.5	43.6	60.7
ML4	34.6	40.6	45.6	31.2	34.5	21.9	41.7	43.9	98.3	37.1	42.7	52.2	40.2	42.4	55.1
ML5	33.6	39.6	44.6	35.3	36.4	27.8	38.0	43.0	94.7	38.4	42.5	63.3	40.6	na	60.7

Table 2 - Leq Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013			March 15, 2014			June 3, 2014			May 5, 2015		
	Leq	Lmax (6)	Lmax (11)	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr	OFF	ON	% Pwr
ML1	48.0			49.0	50.5	18.8	44.8	51.8	101.2				41.2	51.2	69.9
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Table 3 - Leq +6 = Lmax Predictions and Compliance Measurements Reported as Lmax

Loc	Predicted			Aug 14-15, 2013		March 15, 2014		June 3, 2014		May 5, 2015	
		Lmax (6)		ON	% Pwr	ON	% Pwr	ON	% Pwr	ON	% Pwr
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Table 4 - Leq + 11 Lmax Predictions and Measurements

Loc	Predicted			Aug 14-15, 2013		March 15, 2014		June 3, 2014		May 5, 2015	
			Lmax (11)	ON	% Pwr	ON	% Pwr	ON	% Pwr	ON	% Pwr
ML1			59.0								
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Summary - Scituate Wind Noise Predictions and Measurements

Loc	Predicted			Aug 14-15, 2013		March 15, 2014		June 3, 2014		May 5, 2015	
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ML5		39.6	44.6			43.0	94.7	42.5	63.3		

From: **Joanne Levesque** joanne@levesque.us
Subject: **Wind turbine sound monitoring "protocol"**
Date: **Aug 30, 2018 at 1:06:10 PM**
To: **Karen Canfield** kcanfield@scituatema.gov

Hi Karen,

There are a few issues with the sound protocol I just reviewed.

One issue - the collection of "Fast" meter readings along with the "Slow" is in need of some consideration.

Would you be able to verify IF the consultant "Epsilon" informed the town :

1. that taking "Fast" meter readings, as requested by Mr. Dardi was not "feasible" nor was it "reasonable"?, and

2. that Epsilon did not have available the equipment to take "Fast" meter readings along with the "Slow" meter readings so far agreed to?

These two questions are very important for reasons I will explain once verified... there is no need for me to venture into this topic if in fact Mr Dardi's perfectly reasonable and sound request to ask that "Fast" meter readings be taken along with the "Slow" was accepted.

If, on the other hand, "Fast" meter readings are being denied then I would suggest a serious reconsideration of the refusal to document both the slow meter (favored by wind industry consultants and developers) AND fast meter readings which are more representative of the actual sound levels heard by neighbors ... fast meter readings capture impulsive noise sources and this was verified by the MassDEP during the WNTAG process. That "fast meter" readings have not officially been adopted leaves one to wonder: why? and secondarily begs the question what is the harm in documenting this information which so many, if not all, independent acoustical experts agree should be the mechanism for collecting data relative to wind turbine noise investigations.

If you have any other questions - please do not hesitate to call me.

Best Regards,

Joanne Levesque
617-688-1441

Re: WT DISTURBANCE

Joanne Levesque <joanne@levesque.us>

Ellen Andrew-Kasper <ellenak47@gmail.com>;

Generic BoardOfHealth <boardofhealth@scituatema.gov>; Karen Canfield <kcanfield@scituatema.gov>; Karen Connolly <keconnolly@comcast.net>; Shawn Harris <sharris@scituatema.gov>; Tony Vegnani <avegnani@scituatema.gov>; Maura Curran <mcurran@scituatema.gov>; vfortev <vfortev@aol.com>; Karlberrg, Phylis <phylhk26@aol.com>; Mckeever, Mark <keever151@comcast.net>; David Dardi <ddardi@att.net>; Paul Ohrenberger <pohrenberger@yahoo.com>;

Falmouth, Ma Dr. Hallstein 14Jan16 (1).pdf;

Good Morning to all,

I thought it might be helpful to share Dr. Hallstein's (Falmouth) letter, as written to the Falmouth ZBA on January 14, 2016,. Dr. Hallstein's professional observations and experiences support:

1. the need for protective action to take place so, at a minimum, impacted Scituate neighbors can sleep during the typical community quiet hours, and
2. the contention that, to date, there has been inadequate official response to neighbors' requests for a proper noise and nuisance investigation (both full spectrum noise and strobing conditions).

as such, neighbors' experiences are being trivialized to varying degrees.

During the March 24, 2020 BOS meeting more than one member of the board stated that they "acknowledge there are problems" yet there does not seem to ever have been any concerted effort to properly, and fully, define the "problems".

My observations inform me that a key stumbling block to providing a protective remedy, as afforded by the appropriate application or our laws and regulations, is the apparent reluctance to define the full spectrum of noise conditions which neighbors have been adversely impacted by since the wind turbine was commissioned in 2012. Testing efforts, to date, have been designed to prevent an evaluation of the full spectrum of noise impacts (audible range, low frequency and infrasound). In addition, there has been no effort that I am aware of to properly evaluate the strobing (shadow flicker) which most adversely, and outrageously, impacts McKeever's property. Make no mistake strobing is a visual pollutant which adversely impacts the optic pathways. A public health nuisance to be sure!

Excerpt of Dr. Hallstein's letter is pasted below and his letter is attached - Dr. Hallstein speaks very clearly in support of the testimony provided by Scituate neighbors since 2012.

I hope you find Dr. Hallstein's letter supportive of the critical need to properly, and fully, define the "problems" experienced by neighbors living too close to the Scituate wind power facility.

Best Regards,

Joanne Levesque
617-688-1441

On Mon, Apr 13, 2020 at 9:30 AM < > wrote:
We were BOTH kept awake through the night

Sent from my iPhone

To: Zoning Board of Appeals, Falmouth, MA 14 January 2016
From: William Hallstein, MD
Subject: Wind turbine permitting

Dear members of the Zoning Board of Appeals,

I am submitting this letter for your consideration as you contemplate the matter of whether or not to issue a permit for the wind turbines. In way of introduction I am a psychiatric physician and Falmouth resident since 1970. This year I will have been practicing medical psychiatry for 49(forty nine) years. Consultation/liaison psychiatry has been my focus. This means sorting out diagnostic questions about intertwined medical/psychiatric illnesses, the most difficult diagnostic questions in medicine, whether in a general hospital, locked psychiatric unit or maximum security prison. I will be brief and to the point as I explain why I urge you to deny a permit for the Falmouth wind turbines.

1. The human nervous system is the most sensitive instrument available to date for evaluating the impact of the Falmouth wind turbines on residents who live close to them. The ONLY experts in the discussion are the people who are sensing the sound, vibrations, pressure waves, etc emitted by the turbines. There is no one more "expert" than these people. No so called expert has either equipment nor information more accurate and sensitive than the affected residents' nervous systems. NO instruments more sensitive than people have been invented! Others who claim to be experts are peddling smoke and mirrors in an effort to invalidate and discredit the affected residents. Also, other turbines in other places are not the issue, since local topography must be considered. The impact of the Falmouth wind turbines on Falmouth residents who live nearby is all that is relevant. I believe they are definitely hurting people living near them and encourage you to NOT permit the turbines, now, long after they were constructed illegally.

Over the past few years I have spent significant amounts of time in the vicinity of the turbines in an effort to understand what the affected residents are describing. My findings were unanticipated and surprised me. I was not prepared for the intensity and intrusiveness of both sound and vibration felt consistently and repeatedly throughout the years of my studying the phenomena on location. I recall my introduction to the sound of "low flying jet airplanes" overhead loud enough to interrupt conversation; and, of course, the "planes" kept coming one after another in endless sequence with each rotation of a turbine blade!!! I was searching the sky looking for the aircraft when my eye caught the turbine blades , and then it all made sense, of course; no aircraft in sight, only Wind I blades. Later on, as I leaned against one of the houses in the neighborhood, I felt an unusual sensation best described as compression, coupled with a rhythmic vibration felt through my feet. Anyone who discredits, demeans and calls the affected turbine neighbors "crazy" hasn't done his or her homework, in addition to being mean spirited. The homework is not difficult: stand in the turbine neighborhood for as long as I have and feel what happens to you.

The sensations are real and disturbing. It is totally clear to me that I could not live within the radius of influence of the turbines, and I have no idea how the neighbors who are in the turbine area can sustain a healthy quality of life. Against the backdrop of what I have learned from personal experience with the effect of the turbines I see the Town of Falmouth trying to crush the residents impacted by the turbines.

2. Let's move on to sleep disturbance and sleep deprivation which is the bedrock of the area of medicine in which I have worked for 49 years! Sleep disturbance is not a trivial matter, even though it has been trivialized by the Falmouth Board of Health. Children with inadequate sleep perform poorly academically, emotionally and physically(they present a higher than normal incidence of physical illnesses). For ANYONE (athletes, truck drivers, ship operators, aircraft pilots, lawyers and physicians, et al) sleep deprived and fatigued, errors in judgement increase, accident rates increase, in addition to physical and emotional symptoms and cognitive impairment. In the world of medical observation all varieties of illnesses are destabilized secondary to inadequate sleep: diabetic blood sugars become labile and erratic, cardiac rhythms become irregular, migraines erupt and increase in intensity, tissue healing is retarded, to list a few across the entire range of physical illnesses. Psychiatric problems intensify as the sleep deprived brain decompensates; mood disorders become more extreme and psychotic signs and symptoms more severe.

People with no previously identified psychiatric illness are destabilized by sleep deprivation. Sleep deprivation experiments have repeatedly been terminated because test subjects become psychotic; they begin to hallucinate auditory and visual phenomena. They develop paranoid delusions. This all happens in the "normal" brain. Sleep deprivation has been used as an effective means of torture and a technique for extracting confessions.

I could work my way through 49 years of observing sleep disturbances and deprivation, but that is more than the scope of this letter. I am writing because I have witnessed Town of Falmouth officials and members of other boards trivialize symptom reports from people who are stalwart residents of the Town of Falmouth. I have witnessed attempts by town officials and other board members to discredit people whom I believe the wind turbines are hurting. Furthermore, all the Wind I neighbors I have examined are passionate about the need for sustainable energy in an effort to reduce fossil fuel dependence.

I see no honest way for the ZBA to issue a permit for the Falmouth wind turbines. Basically, as I see it, the town installed commercial wind generating power plants in a residential neighborhood. Inappropriately permitting the illegally sited turbines will continue to impair the development of well designed and properly sited wind turbines which are vitally needed.

Sincerely,

William Hallstein, MD
36 South Road
Falmouth, MA 02540

Lorraine Devin

From:	Joanne Levesque <joanne@levesque.us>
Sent:	Wednesday, August 12, 2020 6:29 AM
To:	Lorraine Devin
Cc:	Karen Canfield; David Dardi; Ellen Andrew-Kasper
Subject:	Re: [Scituate MA] Letter to BOS, 9-24-18, Stephen Ambrose (Sent by Joanne Levesque, Joanne@Levesque.us)

Good Morning Lorraine,

Thank you so very much for your prompt reply to my inquiry.

To better inform you on the genesis of my inquiry, I had a conversation recently with Mr. Ambrose during which he informed me of the letters he'd submitted to the Town of Scituate BOS and he made mention during that conversation that he had never received a reply/response.

Perhaps you might re-send the acknowledgement communication to Mr. Ambrose since for whatever reason he has no record of a response of any kind.

In addition, since the wind turbine issue remains unresolved and in fact a high priority for those neighbors who continue to be impacted coupled with the fact that the content of Mr. Ambrose's communications are of value in an effort to educate town officials as to the importance of appropriate "standards" might it be possible to send the two letters you referenced to the current board members for their review?

Upon your response from yesterday I reached out to Mr. Ambrose to let him know you'd sent an acknowledgement and his reply is seen below.

I, of course, would not presume to know the reason for the apparent disconnect here but would appreciate it if Mr. Ambrose's professional letters, on a topic he has great understanding of and experience with, are given some measure of consideration by town officials.

Thank you for your time, Lorraine, I sincerely appreciate your efforts!

Best Regards,
Joanne Levesque
617-688-1441

Joanne,
I did not receive confirmation that my letters were received or forwarded to the BOS.
I also did not receive a response from any BOS member or code enforcement officer...
Steve

--
Sound Decisions Have Quiet Results

Stephen E. Ambrose, ASA, INCE Bd.Cert. emeritus
Acoustics, Environmental Sound & Industrial Noise

SE Ambrose & Associates
15 Great Falls Road
Windham, ME 04062

Tel: 207.892.6691
Cell: 207.653.9099
seaa@myfairpoint.net

On Tue, Aug 11, 2020 at 3:09 PM Lorraine Devin <ldevin@scituatema.gov> wrote:
Dear Ms. Levesque,

I have received two letters from Mr. Ambrose dated September 24, 2018 and October 26, 2017. Both letters were sent to the Board of Selectmen, the Town Administrator, the Board of Health Director at the time and Al Bangert who was the project manager for the wind turbine at the time. I'm not sure who is telling you they did not receive the letter. In addition, I sent personal responses to Mr. Ambrose that I was forwarding the letters. The letters were quite some time ago and whoever you are speaking with may not recall. Please let me know what action you would like taken at this time or let me know who is saying they did not receive the letters and I can speak with them.

Best,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----
From: cmsmailer@civicplus.com <cmsmailer@civicplus.com>
Sent: Tuesday, August 11, 2020 1:55 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: [Scituate MA] Letter to BOS, 9-24-18, Stephen Ambrose (Sent by Joanne Levesque, Joanne@Levesque.us)

Hello ldevin,

Joanne Levesque (Joanne@Levesque.us) has sent you a message via your contact form (https://www.scituatema.gov/users/ldevin/contact) at Scituate MA.

If you don't want to receive such e-mails, you can change your settings at https://www.scituatema.gov/user/366/edit.

Message:

Good Afternoon Lorraine,

I would appreciate knowing whether you received the letter sent to you, dated September 24, 2018, by Mr. Stephen Ambrose (S.E. Ambrose Associates).

The letter was to be provided to the Chair and Board members of the Board of Selectmen.

Mr. Ambrose has informed me he followed up to inquire why he received neither an acknowldgement nor a response of any kind an was informed the letter was not provided to the BOS.

Might you confirm the receipt of said letter and that you provided it to the Chair and the Board members.

I have attached a copy for your review.

Thank you for your time and attention.

Joanne Levesque
617-688-1441

Lorraine Devin

From: Lorraine Devin
Sent: Tuesday, August 11, 2020 3:10 PM
To: 'Joanne@Levesque.us'
Cc: Karen Canfield
Subject: RE: [Scituate MA] Letter to BOS, 9-24-18, Stephen Ambrose (Sent by Joanne Levesque, Joanne@Levesque.us)

Dear Ms. Levesque,

I have received two letters from Mr. Ambrose dated September 24, 2018 and October 26, 2017. Both letters were sent to the Board of Selectmen, the Town Administrator, the Board of Health Director at the time and Al Bangert who was the project manager for the wind turbine at the time. I'm not sure who is telling you they did not receive the letter. In addition, I sent personal responses to Mr. Ambrose that I was forwarding the letters. The letters were quite some time ago and whoever you are speaking with may not recall. Please let me know what action you would like taken at this time or let me know who is saying they did not receive the letters and I can speak with them.

Best,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----
From: cmsmailer@civicplus.com <cmsmailer@civicplus.com>
Sent: Tuesday, August 11, 2020 1:55 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Subject: [Scituate MA] Letter to BOS, 9-24-18, Stephen Ambrose (Sent by Joanne Levesque, Joanne@Levesque.us)

Hello ldevin,

Joanne Levesque (Joanne@Levesque.us) has sent you a message via your contact form (https://protect-us.mimecast.com/s/UHQtCOY20gH5p6wiEkSwn?domain=scituatema.gov) at Scituate MA.

If you don't want to receive such e-mails, you can change your settings at https://protect-us.mimecast.com/s/d-2BCPN9VjHvK7Zl0ozoY?domain=scituatema.gov.

Message:

Good Afternoon Lorraine,

I would appreciate knowing whether you received the letter sent to you, dated September 24, 2018, by Mr. Stephen Ambrose (S.E. Ambrose Associates).

The letter was to be provided to the Chair and Board members of the Board of Selectmen.

Mr. Ambrose has informed me he followed up to inquire why he received neither an acknowldgement nor a response of any kind an was informed the letter was not provided to the BOS.

Might you confirm the receipt of said letter and that you provided it to the Chair and the Board members.

I have attached a copy for your review.

Thank you for your time and attention.

Joanne Levesque
617-688-1441

Lorraine Devin

From: Lorraine Devin
Sent: Monday, September 24, 2018 4:29 PM
To: Anthony Vegnani (tveg@yahoo.com); Karen Canfield; Maura Curran; Shawn Harris; Shawn Harris; Tony Vegnani
Subject: FW: Scituate Wind Letter
Attachments: Scituate WT Noise Letter3 24Sep2018).pdf

FYI

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----
From: Stephen E Ambrose [mailto:seaa@myfairpoint.net]
Sent: Monday, September 24, 2018 3:55 PM
To: Lorraine Devin
Cc: Millie Garcia-Serrano
Subject: Scituate Wind Letter

Lorraine,
I respectfully prepared this letter for the Board of Selectmen.
Please share this letter with the Town Administrator and Board of Health.
Thank you and best wishes....
Steve

--

Stephen E. Ambrose, ASA, INCE Bd.Cert. Emeritus Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
15 Great Falls Road Mobile: 207.653.9099
Windham, ME 04062 email: seaa@myfairpoint.net

Lorraine Devin

From: Stephen E Ambrose <seaa@myfairpoint.net>
Sent: Monday, September 24, 2018 3:55 PM
To: Lorraine Devin
Cc: Millie Garcia-Serrano
Subject: Scituate Wind Letter
Attachments: Scituate WT Noise Letter3 24Sep2018).pdf

Lorraine,
I respectfully prepared this letter for the Board of Selectmen.
Please share this letter with the Town Administrator and Board of Health.
Thank you and best wishes....
Steve

--

Stephen E. Ambrose, ASA, INCE Bd.Cert. Emeritus Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
15 Great Falls Road Mobile: 207.653.9099
Windham, ME 04062 email: seaa@myfairpoint.net

Lorraine Devin

From: Lorraine Devin
Sent: Wednesday, March 28, 2018 3:04 PM
To: seaa@myfairpoint.net
Subject: FW: Situate Wind Letter
Attachments: Scituate WT Noise Letter 26Oct17-1.pdf

Dear Mr. Ambrose,

I have the letter you sent to the Town of Scituate on 10/26/17 and a copy is attached. Mr. Bangert is managing the RFP process for this project and he can be reached at 781-545-8831 or you can email him at abangert@scituatema.gov

Best,
Lorraine

Lorraine Devin
Town of Scituate
Town Administrator/Board of Selectmen's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
Phone: 781-545-8740

-----Original Message-----
From: Stephen E Ambrose [mailto:seaa@myfairpoint.net]
Sent: Thursday, October 26, 2017 3:37 PM
To: Lorraine Devin
Subject: Situate Wind Letter

Lorraine,

I respectfully prepared this letter for the Board of Selectmen.
Please share this letter with the Town Administrator and Board of Health.
Thank you and best wishes.

--
Steve

Neighbors are far better acoustic analyzers for determining the quality of their life versus any acoustic instrument left unattended by an expert.

Stephen E. Ambrose, INCE, Bd.Cert.
Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
15 Great Falls Road Mobile: 207.653.9099
Windham, ME 04062 email: seaa@myfairpoint.net

Lorraine Devin

From: Lorraine Devin
Sent: Wednesday, November 8, 2017 11:36 AM
To: Al Bangert; Maura Curran
Subject: FW: Scituate Wind Letter

Dear Al & Maura,

I received a call today from Mr. Stephen Ambrose saying he has not received a response to his letter. He said he is 70 years old and retired. He was not solicited by anyone. He would like to share his knowledge and he feels it would be useful to Scituate. He has experience with Kingston, Fairhaven and Falmouth wind turbines. He feels another test will not provide the information you need and would like to speak with you about his thoughts and ideas to help only. He understands what the citizens are going through. He asked that you call him back at Tel: 207.892.6691

FYI,
Lorraine

Lorraine Devin
Town of Scituate
Town Administrator/Board of Selectmen's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
Phone: 781-545-8740

From: Al Bangert
Sent: Friday, October 27, 2017 12:49 PM
To: Lorraine Devin
Cc: Anthony Vegnani (tveg@yahoo.com); John Danehey; John Danehey (jdanehey@doesq.com); Karen Canfield; Maura Curran; Shawn Harris; Shawn Harris; Tony Vegnani; Jennifer Keefe
Subject: Re: Situate Wind Letter

Mr. Ambrose is a consultant to the anti-wind industry.

Sent from my iPhone

On Oct 27, 2017, at 10:17 AM, Lorraine Devin <ldevin@scituatema.gov> wrote:

> Dear Selectmen, Al and Jenn,
>
> I received the following letter regarding the wind turbine to distribute to all of you today from Stephen E. Ambrose, ASA, INCE, Board Certified Emeritus
> Principal Consultant. I have also put a copy in your inboxes.
>
> FYI,
> Lorraine
>
> Lorraine Devin
> Town of Scituate
> Town Administrator/Board of Selectmen's Office
> 600 Chief Justice Cushing Highway

Scituate, MA 02066
Phone: 781-545-8740

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To: Lorraine Devin
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Steve

Neighbors are far better acoustic analyzers for determining the quality of their life versus any acoustic instrument left unattended by an expert.

Stephen E. Ambrose, INCE, Bd.Cert.
Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
15 Great Falls Road Mobile: 207.653.9099
Windham, ME 04062 email: seaa@myfairpoint.net

<Scituate WT Noise Letter 26Oct17-1.pdf>

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Lorraine Devin

From: Lorraine Devin
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To: Al Bangert; Maura Curran
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FYI,
Lorraine

Lorraine Devin
Town of Scituate
Town Administrator/Board of Selectmen's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
Phone: 781-545-8740

From: Al Bangert
Sent: Friday, October 27, 2017 12:49 PM
To: Lorraine Devin
Cc: Anthony Vegnani (tveg@yahoo.com); John Danehey; John Danehey (jdanehey@doesq.com); Karen Canfield; Maura Curran; Shawn Harris; Shawn Harris; Tony Vegnani; Jennifer Keefe
Subject: Re: Situate Wind Letter

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Sent from my iPhone

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> Lorraine
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> 600 Chief Justice Cushing Highway

Scituate, MA 02066
Phone: 781-545-8740

-----Original Message-----
From: Stephen E Ambrose [mailto:seaa@myfairpoint.net]
Sent: Thursday, October 26, 2017 3:37 PM
To: Lorraine Devin
Subject: Situate Wind Letter

Lorraine,

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Thank you and best wishes.

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Steve

Neighbors are far better acoustic analyzers for determining the quality of their life versus any acoustic instrument left unattended by an expert.

Stephen E. Ambrose, INCE, Bd.Cert.
Acoustics, Environmental Sound and Industrial Noise
SE Ambrose '& Associates Tel: 207.892.6691
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<Scituate WT Noise Letter 26Oct17-1.pdf>

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Lorraine Devin

From: Nancy Holt
Sent: Monday, September 23, 2019 9:32 AM
To: Lorraine Devin
Subject: RE: Turbine info
Attachments: OY7 Production Shortfall_amount due Town of Scituate.xlsx

Hi Lorraine:

No, that would likely be Al. AL and I received the attached from Robert Russell at Scituate Wind LLC on May 21, 2019 but Al might need to interpret it to see if this what you are looking for in response to the question.

Thanks,
Nancy

****

Nancy Holt
Finance Director/Town Accountant
Town of Scituate
600 Chief Justice Cushing Hwy
Scituate, MA 02066
Tel: (781) 545-8711
Fax: (781) 545-8704
Website: www. scituatema.gov

-----Original Message-----
From: Lorraine Devin
Sent: Monday, September 23, 2019 9:24 AM
To: Nancy Holt
Subject: FW: Turbine info

HI Nancy,

Do you recall or have record of the analysis of shutting off the wind turbine.

Thanks,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

-----Original Message-----

From: Karen Canfield
Sent: Saturday, September 21, 2019 9:02 AM
To: Lorraine Devin
Subject: Turbine info

Hi Lorraine,
Can you tell me what meeting date discussed Nancy's analysis of wind turbine shut off costs? I'd like to review the numbers again and can't seem to find them.
Thanks,
Karen

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

Lorraine Devin

From: Joanne Levesque <joanne@levesque.us>
Sent: Friday, August 14, 2020 8:43 PM
To: Lorraine Devin
Subject: Re: WT Meeting

Here you go - Please let me know if this works for you - Thank you so very much and I apologize for the inconvenience.

#1 - Page 94 - Kingston - HMMH Report (2015)

"Furthermore, recent research on wind turbine sound directivity and current best practices11 for acoustical modeling of wind turbine sound propagation indicate that utility-scale turbine sound levels are typically about the same for any wind direction and generally only vary by at most about 2 decibels directly at the crosswind direction (given site distances within approximately 2000 feet of the wind turbine)."

11 Institute of Acoustics, "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise" May 2013.

Snip from HMMH Report:

Furthermore, recent research on wind turbine sound directivity and current best practices[11] for acoustical modeling of wind turbine sound propagation indicate that utility-scale turbine sound levels are typically about the same for any wind direction and generally only vary by at most about 2 decibels directly at the crosswind direction (given site distances within approximately 2000 feet of the wind turbine).

10.5 Sound Level Increase Predictions

The supplemental ambient monitoring results and corresponding sound level increase predictions are presented in the following report sub-sections. Note that diurnal trends in ambient L_{90} sound levels were observed to differ slightly on each day of monitoring. The sound level increase predictions incorporate this variability to appropriately establish periods when exceedances of the MassDEP noise policy have the potential to occur and times when sound level increases of less than 10 dBA are anticipated.

Figures 26, 28, 30, and 32 illustrate the slow-response A-weighted L_{90} sound levels measured over time at each ambient monitoring site. The data collected at 18 Copper Beech is provided with insect noise included and also with the contribution from insect noise removed.

Figures 27, 29, 31, and 33 depict the same ambient L_{90} sound levels now plotted against corresponding wind speed data (above turbine cut-in) and also highlighted to indicate various time periods. Additional ambient data previously collected during March and April of 2014 is also included for reference and in supplement to the September 2014 data set in order to include all available information on ambient conditions in subsequent sound level increase predictions. (Refer to ambient L_{90} data provided in Appendix D for 5-mintue and 20-minute monitoring intervals.)

Tables 37 through 49 present ambient sound level increase predictions for each monitoring location during various periods throughout the day. Because the wind speed data measured by the ultrasonic

[11] Institute of Acoustics, "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise" May 2013.

HARRIS MILLER MILLER & HANSON INC. 94

#2 Page 96 - Kingston - HMMH Report (2015)

While these conclusions are based only on monitoring conducted during downwind conditions, comparable results are also anticipated with other wind directions given that turbine sound levels are likely about the same for most wind directions at the distance of this neighborhood from the KWI turbine (refer to Section 10.4) and since measured ambient sound levels were about the same overall regardless of wind direction (see Section 10.3).
HMMH Report No. 305270.001 C:\Users\jec\Desktop\New folder\KingstonAcousticalStudy_TechReport_HMMH_19August2015_FINAL.docx August 19, 2015

On Fri, Aug 14, 2020 at 4:38 PM Lorraine Devin <ldevin@scituatema.gov> wrote:

Again this is not printing and the font is too small. Can you resend so it can be read.

Thanks,

Lorraine

Lorraine Devin

Selectmen/Town Administrator's Office

600 Chief Justice Cushing Highway

Scituate, MA 02066

781-545-8740

www.scituatema.gov

From: Joanne Levesque <joanne@levesque.us>
Sent: Friday, August 14, 2020 3:38 PM
To: Lorraine Devin <ldevin@scituatema.gov>
Cc: David Dardi <ddardi@att.net>; Ellen Andrew-Kasper <ellenak47@gmail.com>; Karlberrg, Phylis <phylhk26@aol.com>; Mckeever, Mark <keever151@comcast.net>; Ohrenberger, Paul <pohrenberger@yahoo.com>; Vitali, Valerie <vfortev@aol.com>
Subject: Fwd: WT Meeting

Good Afternoon Lorraine,

To: Scituate BOS

Re: Wind Turbine Meeting

Subject: *"Wind Direction"* - Further evidence to support the contention that *"wind direction"*, for locations within approximately 2,000' of an industrial scale wind facility, should not be considered material when designing testing protocols or drafting of abatement orders.

Selectboard members,

As an addendum to my submission on *"wind direction"* from earlier today I would like to add the following information as found in the 2015 Kingston, Ma Acoustic Monitoring Study.

Please note that the setback distances of the homes in this Kingston neighborhood range from 780' to over 1,400' away from the Independence wind turbine.

Page 96 -

While these conclusions are based only on monitoring conducted during downwind conditions, comparable results are also anticipated with other wind directions given that turbine sound levels are likely about the same for most wind directions at the distance of this neighborhood from the KWI turbine (refer to Section 10.4) and since measured ambient sound levels were about the same overall regardless of wind direction (see Section 10.3).

Best Regards,

Joanne Levesque

617-688-1441

---------- Forwarded message ---------
From: **Joanne Levesque** <joanne@levesque.us>
Date: Fri, Aug 14, 2020 at 8:53 AM
Subject: Re: WT Meeting
To: Karen Canfield <kcanfield@scituatema.gov>
Cc: Ellen Andrew-Kasper <ellenak47@gmail.com>, Tony Vegnani <avegnani@scituatema.gov>, Andrew Goodrich <agoodrich@scituatema.gov>, Karen Connolly <keconnolly@comcast.net>, Maura Curran

<mcurran@scituatema.gov>, David Dardi <ddardi@att.net>, Generic BoardOfHealth <boardofhealth@scituatema.gov>, James Boudreau <jboudreau@scituatema.gov>, O'Connor, Patrick (SEN) <Patrick.O'Connor@masenate.gov>, Phyllis Karlberg <phylhk26@aol.com>, vfortev <vfortev@aol.com>, Paul Ohrenberger <pohrenberger@yahoo.com>, Mckeever, Mark <keever151@comcast.net>, Stephen <stephencja@gmail.com>, Lorraine Devin <ldevin@scituatema.gov>

Good Morning to all,

Karen, If you could provide the contact information/ directions for submissions on the matter of Scituate Wind relative to the ongoing nuisance noise and strobing issues that would be very much appreciated. In short, how would you like the correspondence / submissions to be addressed for proper consideration by all members of the board and so that all members of the public have access to questions / concerns / submissions so that an open process can move forward?

For now, I would like to submit information which I hope will clarify the need to reconsider the notion that *"wind direction"* should be a factor when adopting a mitigation order intended to remedy noise impacts for all neighbors.

Topic of Concern: "Wind Direction"

Mr. Vegnani, in his communication of August 12, 2020, made the following statement:

Can I ask those of you on the email to assist in the analysis? For the next several weeks can you rate the level of noise from 0- meaning no noise up to 5 the most noise and forward the info to me at end of August . It would be best if you emailed me back independently. This information will help us as we review the impact of specific wind directions.

Background:

HMMH, the consultant which engaged in acoustic monitoring and reporting in Kingston, included as part of their report important information relative to *"wind direction"* and sound propagation. Apparently neither Scituate Wind nor consultants Tech Environmental and Epsilon have put forth this information so that Scituate officials might understand that it is inappropriate to focus on *"wind direction"* either for purposes of testing or for purposes of drafting a protective order of abatement.

Observation:

Independent acoustic consultants have cautioned many times over the last several years that designing testing protocols and mitigation orders which focus on *"wind speed"* and *"wind direction"*,rather than focusing on power production levels, was nothing short of a distraction. My observations are that wind industry consultants continue to use *"wind speed"* and *"wind direction"* to distract, prolong testing as was done here in Scituate and essentially muddy up the water in regards to what should be an effort to document worst case noise conditions which occur at high to full power production.

Point of concern:

1. It has been known for many years now among acoustic professionals that when it comes to the subject of wind turbine sound propagation ***"utility scale turbine sound levels are typically about the same for any wind direction."* (see snip below from the Kingston Acoustical Report by consultant HMMH)***

One of the most important factors to be considered here in Scituate is that there are homes located within this stated distance therefore any testing or mitigation should not have been designed around *"wind direction"* when considering these properties.

2. It is important to note that the MassDEP authored a letter to Kingston Town officials which included a specific acknowledgement that *"wind direction"* was not determined to be a factor; making it all the more frustrating for me to know that Scituate town officials appear to be under the impression *"wind direction"*, especially for homes within a certain distance, should somehow form the basis upon which to collect data or design a mitigation plan. I'd be happy to make an attempt to obtain a copy of the MassDEP letter to the Town of Kingston (2015?) or the town of Scituate might request the letter directly from the town of Kingston to further support the fact that *"wind direction"* is not a factor for noise propagation for areas closest to the turbine - please advise.

3. I would contend that the McKeever family's testimony, going all the way back to 2012, supports the fact that *"wind direction"* is not a factor when it comes to Scituate Wind created noise impacts.

4. Continued focus on *"wind direction"* is contrary to common knowledge and thus an error for the purposes of drafting an order of mitigation / abatement.

Evidence to support the point:

*Page 94 of Kingston's HMMH Report informs us of the fact that when it comes to ***"wind turbine sound propagation utility scale turbine sound levels are typically about the same for any wind direction".***

Furthermore, recent research on wind turbine sound directivity and current best practices[11] for acoustical modeling of wind turbine sound propagation indicate that utility-scale turbine sound levels are typically about the same for any wind direction and generally only vary by at most about 2 decibels directly at the crosswind direction (given site distances within approximately 2000 feet of the wind turbine).

10.5 Sound Level Increase Predictions

The supplemental ambient monitoring results and corresponding sound level increase predictions are presented in the following report sub-sections. Note that diurnal trends in ambient L_{90} sound levels were observed to differ slightly on each day of monitoring. The sound level increase predictions incorporate this variability to appropriately establish periods when exceedances of the MassDEP noise policy have the potential to occur and times when sound level increases of less than 10 dBA are anticipated.

Figures 26, 28, 30, and 32 illustrate the slow-response A-weighted L_{90} sound levels measured over time at each ambient monitoring site. The data collected at 18 Copper Beech is provided with insect noise included and also with the contribution from insect noise removed.

Figures 27, 29, 31, and 33 depict the same ambient L_{90} sound levels now plotted against corresponding wind speed data (above turbine cut-in) and also highlighted to indicate various time periods. Additional ambient data previously collected during March and April of 2014 is also included for reference and in supplement to the September 2014 data set in order to include all available information on ambient conditions in subsequent sound level increase predictions. (Refer to ambient L_{90} data provided in Appendix D for 5-mintue and 20-minute monitoring intervals.)

Tables 37 through 49 present ambient sound level increase predictions for each monitoring location during various periods throughout the day. Because the wind speed data measured by the ultrasonic

[11] Institute of Acoustics, "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise" May 2013.

HARRIS MILLER MILLER & HANSON INC. 94

As a matter of logic I would not expect Scituate Wind to have put forth this sort of information as part of any meeting with Mr. Vegnani or any other Scituate town official. My experience informs me that wind developers omit information that might hurt their ability to operate or which might expose fatal flaws within testing protocols (such as use of Leq with no correction factor) or mitigation designs (such as focus on *"wind speed"* and *"wind direction"* rather than power production levels).

In closing I believe, based on my experiences and facts which have been uncovered throughout S.E Massachusetts as a result of industrial scale wind turbines sited too close to residential homes and neighborhoods, that most if not all permits were premised upon serious errors, omissions and misrepresentations of fact. As a practical matter I have not witnessed, as yet, any wind developer voluntarily producing facts which would jeopardize their business operation. Understanding that to be the case might prove helpful as far as unearthing information to support protective action as provided under existing law; both the state noise regulation 310 CMR 7,0 and our state nuisance law Chapter 111, section 122.

I hope this information is of some value to the board as you move forward to remedy this public health matter of concern.

Feel free to reach out and ask any questions.

Best Regards,

Joanne Levesque

617-688-1441

On Thu, Aug 13, 2020 at 7:03 PM Karen Canfield <kcanfield@scituatema.gov> wrote:

To all,

Thank you for your email and for articulating your concerns. As I've said to a number of the undersigned, the town of scituate meets with contractors, vendors, and organizations every single day to further town business. This is not obstructionist or shady; this is necessary to conduct town business. In the case of Mr Vegnani's meeting, he wanted to verify that the shutdown mandated by BOS was occurring — and it is — and to discuss other operational issues directly. There was no need for a public meeting because no votes or decisions were made. Quite frankly, this meeting was to further inquiry into your concerns so the BOS has all the facts as we deliberate and in no way, shape, or form was intended as a "secret" or back handed meeting as clearly implied. Mr Vegnani will provide the board with any necessary information gleaned at that meeting when we meet publicly. That he is reaching out to you all because of questions he had from his meeting is a clear example of his concern for advocating on your behalf.

While I understand your frustration with the delays in reviewing the report and the continued disturbances, I will strongly recommend that you recognize that this Board has been operating in good faith to ensure that the

report is reviewed with us much transparency as possible and that all of our questions are asked and answered so that we know what options are available to addressing those concerns.

I will make all of your correspondence available to the entire BOS for review before our public meeting.

I will also remind you, as I have several times to some of you, our meeting will be for the BOS to review the report and be satisfied with the findings. We will examine all information, including the questions and any reports Dr Dardi has or will provide in advance. This is not a public hearing and I caution you all to remember that we are trying to be as balanced, fair, open, inclusive, and productive as possible. Your demands to "shut it off" cannot simply occur without this process, including a thorough discussion of the financial ramifications of any such measure, should they be warranted.

If you would like to submit further documentation for the board to consider, please do so as soon as possible through our office so that BOS has adequate time to review before our discussion.

Sincerely,

Karen Canfield

On Aug 13, 2020, at 5:45 PM, Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:

Good Afternoon Karen-

I'm inquiring about Mr. Vegnani's email response to my request for protection of our health and property from WT Nuisance/Noise, Disturbance of the Peace...

In your latest email to me you did not mention that he was meeting w/ Scituate Wind.

In a previous email to you I requested transparency from BOS in communications around this.

The fact that affected neighbors cannot get a mtg w/ BOS/BOH d/t COVID yet Mr. Vegnani finds time to meet w/ Scituate Wind is rather disturbing. No notice. No public input or involvement. No information regarding discussions. This by the BOS member whose signature is on the contract w/ Scituate Wind? Mr. Vegnani seems to have paid little attention to or chosen to ignore the requests, reams of scientific info and emails regarding other towns efforts to protect their citizens sent to BOS/BOH since the WT was first turned on. In addition, he has neglected to mention the existence of a "report" with REAL data that shows noise reg

noncompliance at one home and if analyzed properly would undoubtedly show noise noncompliance at ALL other test sites.

It has been well established by acoustic experts that the best, most accurate, judgement of noise disturbance is the human ear. (I have forwarded that info to BOS/BOH myself in the past.) Thus, our 8 YEARS of complaints is grounds enough to declare the WT a Nuisance and in Violation of it's Special Permit.

We deserve the same protection from disturbance that Mr. Vegnani gets.

Scituate Wind has not complied with the Mitigation agreement. Mitigation efforts based on wind speed/direction have proved to be inadequate and irrelevant. For Mr. Vegnani to ask us to rate the sound and report individually to him is ridiculous, wastes time on useless information, delays any progress, and subjects us to continued negative health impacts from the improperly sited industrial WT.

To be clear, this is not "Sound" coming from the turbine. It is NOISE along with VIBRATION, PRESSURE, and FLICKER and there IS a remedy.

Shut it down.

Ellen Kasper

Stephen Werther

Valerie Vitale

Philip Vitale

Phyllis Karlberg

Dave Dardi

Joann Bianchini

Mark McKeever

Lauren McKeever

Paul Ohrenberger

Sent from my iPhone

On Aug 12, 2020, at 2:39 PM, Ellen Andrew-Kasper <Ellenak47@gmail.com> wrote:

Karen-

I'm sure you know I meant Scituate Wind/Gordon Deane complying with the Mitigation Agreement. (That's what disturbed sleep does....)

On Wed, Aug 12, 2020 at 2:20 PM Ellen Andrew-Kasper <ellenak47@gmail.com> wrote:

> Thank you Karen-
>
> As an affected neighbor of 8 years I can tell you that the wind speed, direction and output of the WT that cause us the most disturbance have NOT changed. More likely, Gordon Deane and friends have baked criteria into the agreement that does NOT reflect the reality of conditions under which we experience disturbance and have been continually voicing complaints about. It should at the LEAST be shut down completely from 9PM through 7A. We'd also appreciate a quiet early bedtime as the BOS has fought to provide one of their own. We want to enjoy the homes we work hard to maintain and expect to enjoy.
>
> Scheduling us as soon as possible is much appreciated.
>
> Ellen Kasper
>
> On Wed, Aug 12, 2020 at 1:59 PM Karen Canfield <kcanfield@scituatema.gov> wrote:
>
> > Hello Ellen,
> > We are planning to schedule the meeting in late September. Still working out technology plan.
> >
> > We have confirmed with scituate wind that the turbine is shut off during the times required by previous complaint analysis. It appears that now the disturbances/complaints are being recorded when the wind is a different direction than the original parameters. That data is being analyzed and will be part of our September conversation.
> >
> > As the current Chair of BOS, I'm happy to receive all BOS correspondence and can redirect as necessary. In this case, I'm copying our TA.
> >
> > Karen

> On Aug 12, 2020, at 1:51 PM, Ellen Andrew-Kasper
<ellenak47@gmail.com> wrote:
>
>
> Good Afternoon Karen-
>
> Hope you are well. Taking time to catch up on emails and thought I'd circle back around to check on a time frame for the Zoom Meeting with BOS, Epsilon, Al Banget and WT affected neighbors? Our health continues to suffer due to the noise/vibration/flicker we experience from the improperly sited industrial WT so we are anxious to move forward as quickly as possible.
>
> We are also wondering why Epsilon continues to violate the Mitigation Agreement it made with the BOS years ago? We continue to experience incredibly loud WT disturbances during conditions where it should be shutting down.
>
> Are you the person I should continue to direct my emails to regarding this issue?
>
> Thank You-
> Ellen Kasper
> 120 Gilson Rd
>
>
>
Please remember when writing or responding that the Secretary of State's Office has determined that email is a public record and all e-mail communications sent or received by persons using the Town of Scituate network may be subject to disclosure under the Massachusetts Public Records Law (M.G.L. Chapter 66, Section 10) and the Federal Freedom of Information Act.

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MURPHY, HESSE, TOOMEY & LEHANE, LLP
Attorneys At Law

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QUINCY, MA 02269-9126
TEL: 617-479-5000 FAX: 617-479-6469

75 FEDERAL STREET
SUITE 410
BOSTON, MA 02110
TEL: 617-479-5000 FAX: 617-338-1324

ONE MONARCH PLACE
SUITE 1310R
SPRINGFIELD, MA 01144
TEL: 888-841-4850 FAX: 617-479-6469

www.mhtl.com

Please Respond to Quincy

December 19, 2012

Charles Eisenberg, Manager
Scituate Wind LLC
56 Cummings Park
Woburn, MA 01801

Gordon Deane, Manager
Scituate Wind LLC
c/o Palmer Management Corporation
13 Elm Street, Suite 200
Cohasset, MA 02025

Gentlemen:

This office represents the Town of Scituate.

Pursuant to Articles IX and XII of the Amended and Restated Site Lease between the Town of Scituate and Scituate Wind LLC, as well as any other applicable provisions, I am providing notice of a third party action against the Scituate Board of Health commenced in the Plymouth Superior Court. The case is entitled Mark McKeever and Lauren McKeever v. Russell Clark, Francis Lynch and Michael Vazza as members of the Scituate Board of Health and the Scituate Board of Health, Civil Action 2012-1424-A. A copy of the complaint is enclosed.

Please arrange for your attorney to contact me on this matter.

Very truly yours,

James A. Toomey

JAT\sd
Enclosure

cc w/ enclosure:
Patricia Vinchesi, Town Administrator
Town of Scituate
Albert G. Bangert, Director
Department of Public Works
Town of Scituate
Jeffrey M. Bernstein, Esq.

702352v1

CIVIL ACTION COVER SHEET	TRIAL COURT OF MASSACHUSETTS SUPERIOR COURT DEPARTMENT COUNTY OF PLYMOUTH	DOCKET NO. 12-1424A

PLAINTIFF(S)	DEFENDANT(S)
Mark McKeever and Lauren McKeever	Russell Clark, Francis Lynch, and Michael Vazza, as they are members of the Board of Health of the Town of Scituate
Type Plaintiff's Attorney name, Address, City/State/Zip Phone Number and BBO#	Type Defendant's Attorney Name, Address, City/State/Zip Phone Number (If Known)
Tanya D. Trevisan & Kevin J. Joyce Law Offices of Gerard F. Doherty 50 Franklin Street, Suite 3A Boston, MA 02110 (617) 542-8905	James Toomey Murphy Hesse Toomey & Lehane, LLC 300 Crown Colony Drive P.O. Box 9126 Quincy, MA 02269-9126 (617) 479-5000

TYPE OF ACTION AND TRACK DESIGNATION (See reverse side)

CODE NO.	TYPE OF ACTION (specify)	TRACK	IS THIS A JURY CASE?
E02	Appeal of Board of Health of Town of Scituate under G.L. c. 30A	X	] Yes ⊗] No

The following is a full, itemized and detailed statement of the facts on which plaintiff relies to determine money damages. For this form, disregard double or treble damage claims; indicate single damages only.

TORT CLAIMS
(Attach additional sheets as necessary)

A. Documented medical expenses to date:
   1. Total hospital expenses $
   2. Total doctor expenses $
   3. Total chiropractic expenses $
   4. Total physical therapy expenses $
   5. Total other expenses (describe) $

   Subtotal $

B. Documented lost wages and compensation to date $
C. Documented property damages to date $
D. Reasonably anticipated future medical expenses $
E. Reasonably anticipated lost wages and compensation to date $
F. Other documented items of damages (describe) $

G. Brief description of plaintiff's injury, including nature and extent of injury (describe)

FILED
COMMONWEALTH OF MASSACHUSETTS
SUPERIOR COURT DEPT. OF THE TRIAL COURT
PLYMOUTH COUNTY
DEC 14 2012
Clerk of Court

Total $

CONTRACT CLAIMS
(Attach additional sheets as necessary)

Provide a detailed description of claim(s):

TOTAL $.....

PLEASE IDENTIFY, BY CASE NUMBER, NAME AND COUNTY, ANY RELATED ACTION PENDING IN THE SUPERIOR COURT DEPARTMENT

"I hereby certify that I have complied with the requirements of Rule 5 of the Supreme Judicial Court Uniform Rules on Dispute Resolution (SJC Rule 1:18) requiring that I provide my clients with information about court-connected dispute resolution services and discuss with them the advantages and disadvantages of the various methods."

Signature of Attorney of Record _____ Date: 12/14/2012

A.O.S.C. 3-2007

McKeever vs Board of Health
is a 23 page document if you would like a complete copy please contact BOS office.
Scituate Wind vs McKeeever was a confidential settlement.

COMMONWEALTH OF MASSACHUSETTS

PLYMOUTH, ss.

SUPERIOR COURT
C.A. No. 12-1424A

MARK McKEEVER and LAUREN McKEEVER,
Plaintiffs

v.
RUSSELL CLARK, FRANCIS LYNCH, and MICHAEL VAZZA, as they are members of the BOARD OF HEALTH OF THE TOWN OF SCITUATE, and not individually, and the BOARD OF HEALTH OF THE TOWN OF SCITUATE,
Defendants

COMPLAINT

FILED
COMMONWEALTH OF MASSACHUSETTS
SUPERIOR COURT DEPT. OF THE TRIAL COURT
PLYMOUTH COUNTY
DEC 14 2012
Clerk of Court

INTRODUCTION

This is an action brought by plaintiffs Mark McKeever and Lauren McKeever (the "McKeevers") pursuant to G.L. c. 30A, § 14, seeking judicial review of a decision by the Board of Health of the Town of Scituate (the "Board of Health"). The decision denied a petition submitted by the McKeevers and other residents of Scituate to the Board of Health which requests that the Board of Health order Scituate Wind, LLC,[1] to cease and desist its operations relating to an industrial wind turbine (the "Wind Turbine") sited six hundred and forty feet (640') from the McKeevers' home. Since the Wind Turbine became operational in March 2012, the McKeevers and their two small children have been continually suffering from symptoms including, but not limited to, sleep

[1] Scituate Wind, LLC, currently owns and operates the industrial wind turbine located on property owned by the Town of Scituate (the "Town") at 167 Driftway, Scituate, Massachusetts.

Lorraine Devin

From: Cynthia L. Amara <camara@mhtl.com>
Sent: Monday, August 31, 2020 10:08 AM
To: Lorraine Devin
Subject: RE: McKeever vs Scituate Board of Health Docket 12-1424A

Hi Lorraine:

The case, McKeever vs Scituate Board of Health, is closed. On 01/30/2013 a Notice of Voluntary Dismissal was filed with the Court.
Let me know if you need anything further.

Cindy

Cindy Amara, Esq.
MURPHY, HESSE, TOOMEY & LEHANE, LLP
Crown Colony Plaza | 300 Crown Colony Drive, Suite 410 | Quincy, MA 02169
Tel: (617) 479-5000 | Fax: (617) 479-6469
E-mail: camara@mhtl.com

From: Lorraine Devin [mailto:ldevin@scituatema.gov]
Sent: Friday, August 28, 2020 10:53 AM
To: Cynthia L. Amara
Subject: McKeever vs Scituate Board of Health Docket 12-1424A

Cindy,

I am preparing a wind turbine binder for the BOS for an upcoming BOS meeting. I need to know the outcome of the McKeever vs Scituate Board of Health Docket 12-1424A. I am attaching the information for you. It is my understanding that this case was dismissed because there was a confidential agreement between the McKeever's and Scituate wind. This is hearsay information and I need you to verify what the outcome of the law suit was so I may inform the current BOS.

Thank you,

Lorraine
Lorraine Devin
Selectmen/Town Administrator's Office
600 Chief Justice Cushing Highway
Scituate, MA 02066
781-545-8740
www.scituatema.gov

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

COPY

June 30, 2011

Falmouth Board of Selectmen
c/o the Honorable Mary Pat Flynn, Chairman
Falmouth Town Hall
55 Town Hall Square
Falmouth, MA 02540

Falmouth Board of Health
David Carignan, Health Agent
Falmouth Town Hall
55 Town Hall Square
Falmouth, MA 02540

RE: Harris Miller Miller & Hanson, Inc (HMMH) Wind Turbine Study Addendum, April 1, 2011

Dear Chairman Flynn and Agent Carignan:

In response to requests from the Falmouth Board of Selectmen, this letter will provide a response and additional guidance from the Massachusetts Department of Environmental Protection (MassDEP) regarding the April 1, 2011, HMMH Addendum to HMMH's September 2010 report concerning sound observation data gathered to evaluate the sound impacts from Falmouth Turbine Wind 1. The April 1, 2011 Addendum included additional information that MassDEP has carefully reviewed in preparing this letter. As you know, MassDEP previously provided guidance related to its recommended approach for sound evaluation in a January 24, 2011 letter (included herewith as Attachment 1) and met with HMMH on March 4, 2011 to discuss sound observations related to Wind 1 (meeting minutes included herewith as Attachment 2). This letter is based on MassDEP's evaluation of the original September 2010 HMMH report, the April 1, 2011 Addendum, the discussions with HMMH on March 4, 2011, and MassDEP's attendance at the Falmouth Board of Selectmen's meeting on June 6, 2011.

At the outset, MassDEP would like to acknowledge the work performed to date by HMMH on behalf of the Town and to commend the Board of Selectmen for their attention to this important issue. Evaluation of sound impacts from Wind Turbines is a complicated issue that was not considered by

MassDEP when it developed its sound evaluation/noise compliance guidance in the early 1970s and as revised in 1990. Accordingly, we appreciate the Town of Falmouth's and HMMH's efforts to work with MassDEP as we update our sound evaluation/noise compliance guidance to specifically address Wind Turbines.

In our January 24, 2011 letter, MassDEP provided guidance indicating that when we evaluate sound source compliance with the limit of 10dBA above background provided in MassDEP's Noise Policy for purposes of making nuisance determinations, the evaluation normally involves a comparison of the quiet period L90 background to the Lmax associated with the sound source in question for the same period. It is important to note that in most cases, MassDEP relies on attended sound observation studies so that sound observations/decibel readings can be attributed to particular sound sources and so the Lmax used for comparison to L90 background is from the sound source in question and not some other sound source. A limitation of attended studies is that they are short-term and provide only small amounts of data for impact evaluation and compliance decision-making. Long-term unattended studies, like the one performed by HMMH, can provide substantially more data so impact evaluations can include different sound source operating conditions and more times of day, but can leave questions unanswered regarding Lmax data observations and data capture related to the specific sound source in question.

During the March 4, 2011 meeting MassDEP and HMMH discussed how the data obtained through Falmouth's long-term unattended study could be used to make a determination of compliance with the MassDEP Noise policy. The study conducted by HMMH on behalf of Falmouth generated a significant volume of data that was not easily analyzed and the results presented in the September 2010 report were not in a format that would allow MassDEP to make a compliance determination. In the March 4, 2011 meeting we were informed of the specifics of how the study was designed (with input from the residents) and what the limits of the data were. At that time, we asked for the data to be reconfigured to compare L90 background to L90 with the wind turbine operating under various wind speeds under the assumption that if the wind turbine sound is a constant, such a comparison would provide us a means to compare background with and without the turbine to isolate the turbine sound profile.

The reconfigured data from HMMH's long-term unattended study indicates that Wind Turbine 1's broad band L90 one-hour sound impact compared to the L90 one-hour background at the same wind speed is no greater than 7.7 dBA. The study also appears to show that the wind turbine does not appear to be causing or contributing to any pure tone condition. There was one pure tone observed in the data but it was present with both the turbine on and off and is likely attributable to another source.

Despite the results of the reconfigured data, the September 2010 study shows a substantial number of Lmax sound observations that exceed 10dBA over background, both when the turbine is operating and not operating. While these observations cannot be attributed to turbine operation, MassDEP continues to have concern that these unattributed sound observations need to be further evaluated before a compliance determination can be made relative to broad band sound impacts from turbine operation. Therefore, MassDEP recommends that the Town conduct limited additional short term attended monitoring to augment the HMMH study.

MassDEP is in the process of updating its guidance for conducting sound surveys to specifically address sound emissions from wind turbines. The current MassDEP Noise Sampling Guidance was developed to be generally applicable to industrial noise sources that typically exhibit fairly steady emission signatures with relatively little frequency and octave variation. Current guidance recommends collecting attended sound observations every 6 seconds over a 17 minute period for a L90 quiet background to Lmax sound impact evaluation. In most cases, these industrial noise sources have the greatest impact during very low wind conditions and the amount of sound they generate does not change as wind conditions vary.

MassDEP is considering the following factors as it updates its noise survey data collection guidance for wind turbines:

1) Because wind speed varies greatly over time and wind turbine sound emissions vary with wind speed, characterizing turbine sound emissions at particular wind speeds may mean gathering data over shorter periods to control for variation in wind speed; and

2) Because the turbine blade oscillation sound cycle can be constant, provisions will need to be made to ensure there is data capture of peak sound within the cycle. A regularly repeating sound cycle with data gathered at regular intervals can synchronize and result in no observations of the cycle at the sound emission peak.

Accordingly, a short term attended study to augment the information from the HMMH study should be designed to be consistent with current MassDEP Guidance as modified for concerns of variable wind speed by collecting both background sound levels (L90) as well as turbine operational sound levels (Lmax). Specifically, the short term attended study should include the following:

- To evaluate the impact of wind speed on turbine sound emission levels, MassDEP recommends three sampling runs be conducted for each of three different turbine operating conditions (wind speeds). This will establish an Lmax for each respective wind turbine operating condition.

    - The three different operating conditions (wind speeds) MassDEP recommends be evaluated are: 1) at or near the cut-in wind speed where background will be the lowest; 2) at the wind speed where manufacturer data indicates there will be the greatest sound power level from the turbine; and, 3) at the maximum wind speed where the turbine will be operating.

- Likewise, three sampling runs should be conducted in conditions similar to the three different turbine operating conditions so that L90 background can be established for each operating condition.

- Each sampling run should be 5 minutes in duration and samples collected every 5 seconds (60 sound measurements).

- Sampling should be limited to "A" weighted sound levels with the decimeter set to "slow" response. To ensure data capture of the highest sound level emitted by the turbine as the blade rotates past the tower, each 5 minute study for turbine operation should be initiated as near as possible to wind turbine sound cycle emission peak.

Once the data is collected, the L90 background for each of the three sampling runs that were collected when the turbine was not operating would be defined as the average of the 6th lowest reading from each run. Lmax for each of the three runs collected when the turbine was operating at the three different operating conditions being evaluated should be averaged to result in an Lmax value that can be compared to the L90 background for each operating condition.

Consistent with current guidance, any peak sound levels that can be attributed to another sound source (e.g. local traffic, resident generated sounds) should be discarded from the data set before determining Lmax.

As noted above, MassDEP continues work to update our Noise Policy and Sampling Guidance in light of the challenge in evaluating wind turbine noise. The sound evaluation data from the Falmouth Wind Turbine study and discussions with residents and officials from the Town of Falmouth have been very informative. However, we believe that the additional data collection and analysis described above will allow the Department to reach a more definitive conclusion about the turbine's compliance with the Noise Policy than has been possible thus far. MassDEP also believes it should be feasible to complete this additional assessment, as well as MassDEP's review, in a relatively short period of time, and the Department is committed to working closely with the Town of Falmouth and HMMH as part of their ongoing evaluation of sound emissions from Falmouth Wind Turbine 1.

Finally, as was indicated by MassDEP at the June 6 Board of Selectmen meeting, MassDEP, along with the Massachusetts Department of Public Health, has also recently begun to convene an expert scientific panel on potential health impacts associated with exposure to wind turbines, including issues related to noise from turbines. MassDEP hopes that the results of this expert panel review will also help inform our ongoing evaluation of the Noise Policy, and that it will be of assistance to the Board of Selectmen and the Health Department as they continue to review these issues.

Please contact Laurel Carlson, Acting Deputy Director for the Bureau of Waste Prevention at (508) 946-2764 if you wish to meet to discuss in greater detail the specific elements MassDEP would recommend for collection of sound emission observations associated with wind turbine operation.

Sincerely,

David Johnston
Acting Regional Director

J/LC/lm

cc: Heather Harper, Acting Town Manager
Town Hall
59 Town Hall Square
Falmouth, MA 02540

ecc: Falmouth Department of Public Works
dpw@falmouthmass.us

Chris Menge, HMMH
cmenge@hmmh.com

Francis Yanuskiewicz , Weston & Sampson
januskif@wseinc.com

MassDEP – Boston
Attn: Marc Wolman, Air Branch Chief
Alicia McDevitt, Deputy Commissioner

MassDEP – SERO
Attn: David Johnston, Acting Regional Director
John Winkler, Permit Section Chief