

Thorndike Wind Energy Facility Ordinance *(Proposed for Enactment on 3/20/10)*

Section I. Purpose and Intent

1.1 This Ordinance is adopted pursuant to 30-A M.R.S.A. § 3001, to protect the health, safety, welfare, and quality of life of the Town of Thorndike and its residents. This Ordinance shall be known as the “Thorndike Wind Energy Facility Ordinance.”

Section II. Applicability; Site Permit and Operational License Required

2.1 This Ordinance applies to all Wind Energy Facilities (see definition) proposed to be constructed or operated after the effective date of the Ordinance.

2.2 It shall be unlawful and a violation of this Ordinance to begin construction and/or operation of a Wind Energy Facility without a Site Permit and Operational License.

2.3 The burden of compliance with all aspects of this Ordinance is on the Applicant and the Owner/operator of a Wind Energy Facility. Approval of a Site Permit and Operational License by the Planning Board does not abrogate or reduce the responsibility of the Applicant or the Owner/operator to comply with this Ordinance. Consistent violations, particularly of the sound limits, may lead to decommissioning and removal of the Wind Energy Facility.

2.4 This Ordinance includes Sections (I) through (XII), together with the Appendix and References Section. Decisions regarding compliance or approval of an Applicant’s Site Permit and Operational License must be made in light of the entire Ordinance.

Section III. Definitions

3.1 The following terms are defined as follows.

A) Ambient Sound includes all sound present in a given environment. It includes intermittent sounds, such as aircraft, barking dogs, wind gusts, mobile farm or construction machinery, and vehicles traveling along a nearby road. It also includes insect and other nearby sounds from birds, animals or people.

B) Applicant means the individual or business entity that seeks to secure a Permit or License under this Ordinance.

C) A-Weighted Sound Level (dBA) is one measure of the overall sound level. This measure is designed to reflect the response of the human ear, which does not respond equally to all frequencies. Lower frequency sounds are given less weight than those in the mid-range of human perception. The resulting measure is said to be A-weighted and the units are dBA.

D) Background Sound (L_{90}) is defined over a continuous ten minute period to be the average sound level during the quietest one continuous minute of the ten minutes. L_{90} may be measured relative to A-weighting or C-weighting, in which case it may be denoted $L_{90}A$ or $L_{90}C$. It refers to sound that is normally present at least 90% of the time, and excludes any sound generated by a WEF. It also excludes intermittent sounds from flora, fauna, wind and human activity. Background sound levels vary during different times of the day and night. Because wind turbines operate continuously, the background sound levels of interest are those during quieter periods which are often the evening and night.

E) C-Weighted Sound Level (dBC) is similar to the A-weighted sound level (dBA), but it does not de-emphasize low frequencies to the extent that A-weighting does. For sounds with a

significant low-frequency component, dBC is a more accurate measure of the energy of the sound waves than dBA.

F) Decibel (dB) refers to a dimensionless quantity which is proportional to the logarithm (base 10) of a ratio of two quantities that are proportional to the power, energy or intensity of sound. One of these quantities is a reference level relative to which all other levels are measured.

G) Frequency is the number of complete oscillations or cycles per unit of time. See Hertz, below.

H) Good Utility Practice means any of the practices, methods and acts with respect to the safe operation of a WEF engaged in or approved by a significant portion of the electric utility industry and, in particular, those portions of the industry with experience in the construction, operation and maintenance of wind turbines during the relevant time period; or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision is made, could be expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be acceptable practices, methods or acts generally accepted in the region.

I) Height means the total distance measured from the grade of the property as it existed prior to the construction of the wind energy system, facility, tower, turbine, or related facility at the base to its highest point. In the case of a wind turbine, this includes the length of the blade at its highest possible point.

J) Hertz (Hz) is a unit of cycles per second. A process that repeats itself a given number of times in one second is said to occur at that many Hertz.

K) Measurement Point (MP) refers to a location where sound and/or vibration are measured.

L) Mitigation Waiver means a legally enforceable, written agreement between the Applicant and a Non-participating Landowner in which the landowner waives certain setback, noise or other protections afforded in the Ordinance. A Parcel in which the landowner has entered into such an agreement becomes a Participating Parcel. A complete copy of any such agreement must be provided to the Planning Board and recorded in the Penobscot County Registry of Deeds.

M) Noise means any unwanted sound produced by a WEF. Noise does not need to be loud to constitute an interference with the health and well-being of residents

N) Non-Participating Parcel means a parcel of real estate that is neither a Project Parcel nor a Participating Parcel.

O) Occupied Structure means any structure that is, or is likely to be, occupied by persons or livestock. This includes, but is not limited to dwellings, places of business, places of worship, schools, and barns.

P) Owner/operator means the person or entity with legal ownership of a WEF or WES, including successors and assigns, that has the authority and responsibility to operate the WEF on a day-to-day basis. An Owner/operator must have the legal authority to represent and bind.

Q) Participating Parcel means a parcel of real estate that is not a Project Parcel, but is subject to a Mitigation Waiver. A complete copy of the Mitigation Waiver must be provided to the Planning Board, and filed with the Waldo County Registry of Deeds.

R) Project Boundary means the boundaries of the WEF as shown on the site plan submitted to and approved by the Planning Board in accordance with this Ordinance.

S) Project Parcel means any parcel(s) of real estate on which all or any part of a WEF will be constructed.

T) Property Line means the recognized and mapped property boundary line.

U) Public Way means any road capable of carrying motor vehicles, including, but not limited to, any state highway, municipal road, county road, unincorporated territory road or other road dedicated to the public.

V) Qualified Independent Acoustical Consultant. Qualifications for persons conducting baseline and other measurements and reviews related to the Application for a WEF or for enforcement actions against an operating WEF include, at a minimum, demonstration of competence in the specialty of community noise testing and Board Certified Membership in the Institute of Noise Control Engineers (INCE). Certifications such as Professional Engineer (P.E.) do not test for competence in acoustical principles and measurement and are thus not, without further qualification, appropriate for work under this Ordinance. The Independent Qualified Acoustical Consultant can have no direct or indirect financial or other relationship to an Applicant.

W) Scenic or Special Resource means a scenic resource of state or national significance, as defined in Title 35-A M.R.S.A. § 3451(9), any site registered in the National Registry of Historic Places, or a scenic or special resource of local significance identified as such in the Thorndike Comprehensive Plan, or listed on the Visual Resource Inventory of the Thorndike Comprehensive Plan.

X) Sensitive Receptor means places or structures intended for human habitation, whether inhabited or not, public parks, state and federal wildlife areas, the manicured areas of recreational establishments designed for public use, including but not limited to golf courses, camp grounds and other nonagricultural businesses. These areas are more likely to be sensitive to the exposure of the noise, vibration, shadow or flicker generated by a WEF. These areas include, but are not limited to: schools, daycare centers, elder care facilities, hospitals, places of seated assemblage, nonagricultural businesses and residences.

Y) Sound. A fluctuation of air pressure which is propagated as a wave through air.

Z) Sound Level (L_{10}) refers to the sound level exceeded 10% of the time. During any continuous ten minute period, L_{10} is defined to be the average sound level during the loudest one continuous minute of the ten minutes. L_{10} may be measured relative to A-weighting or C-weighting, in which case it may be denoted L_{10A} or L_{10C} .

AA) Sound Level (L_{90}) refers to Background Sound (see above).

BB) Sound Level (L_{eq}) is the frequency-weighted equivalent sound level. It is defined to be the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound. L_{eq} may be measured relative to A-weighting or C-weighting, in which case it may be denoted L_{eqA} or L_{eqC} .

CC) Sound Level (pre/post). Each of the Sound Levels defined above, L_{90} , L_{10} and L_{eq} , whether A-weighted or C-weighted, may be followed by “(pre)” or “(post)”. Post-construction Sound Levels measured with all elements of the WEF turned on will be denoted with “(post)”. During the application process, before the WEF has been constructed, “(post)” will be used to denote the pre-construction estimate of the post-construction Sound Level. Pre-construction Sound Levels, or Sound Levels measured with all elements of the WEF turned off will be denoted with “(pre)”. See the Appendix, particularly Parts c(3)A, c5 and d.

DD) Turbine Height- the distance measured from the surface of the tower foundation to the highest point of any turbine rotor blade measured at the highest arc of the blade.

EE) Wind Energy System (WES) means equipment that converts and then transfers energy from the wind into usable forms of energy on a large, industrial scale using one or more turbines with combined nameplate capacity of over 100 kW for commercial or utility purposes with sale off premises or onto the utility grid.

FF) Wind Energy Facility (WEF) means all of the land and equipment used by the Wind Energy System and its support facilities including the wind turbine(s), tower, access roads, control facilities, meteorological towers, maintenance and all power collection and transmission systems.

GG) Wind Energy Facility Operational License or WEF Operational License means a license to operate a Wind Energy System issued by the Planning Board in accordance with this Ordinance

HH) Wind Energy Facility Site Permit or WEF Site Permit means a Permit to construct a Wind Energy System issued by the Planning Board in accordance with this Ordinance.

II) Wind Turbine or Turbine (WT) means a mechanical device which captures the energy of the wind and converts it into usable forms of energy. The primary components of a wind turbine are the blade assembly, electrical generator and tower.

Section IV. Site Permit Application Procedures

4.1 Applications for a WEF Site Permit shall be submitted to the Planning Board. The application for a WEF Site Permit shall include all of the information, documents, plans, deposits and other items required to be submitted with an application under Section V, a preliminary cost agreement and the fees specified in Section VII, along with any costs outlined in the Appendix. At least ten (10) copies of all written materials, including maps or drawings, shall be provided. Written materials shall be contained in a bound report. Digital copies of this information may be required as well.

4.2 The Planning Board shall, with assistance from such staff, consultants, committees or commissions as it deems appropriate, determine whether the Application is complete and contains all of the materials, information, agreements, deposits and payments required to be submitted with an Application under Sections V, VI, VII, and the Appendix. If an Application is not complete, then the Applicant shall be so advised, and no further action shall be taken by the Planning Board until a complete Application is received.

4.3 After the Planning Board determines that an Application is complete, the Planning Board shall so notify the applicant in writing and schedule a public hearing to be held within 30 days. The Board shall have notice of the date, time and place of the hearing given to the applicant and published at least 2 times in a newspaper of general circulation, with the first notice published at least 7 days before the hearing. Costs of the hearing shall be charged to the escrow account.

4.4 Following the public hearing, the Planning Board will review the record and determine whether the Application meets all requirements of this Ordinance. In determining whether the Application meets the requirements of this Ordinance, the Planning Board may obtain assistance from such staff and consultants as it deems appropriate. The Planning Board shall process the Application as soon as reasonable and feasible, given the complexity of the Application, other business facing the Town, staff and other resources, questions that arise during the review process, and other matters affecting the time needed to complete the review process.

4.5 If an Application is complete and meets all requirements of this Ordinance, and the Applicant has paid all fees and costs pursuant to Sections V and VII and the Appendix, then the Planning Board shall approve a WEF Site Permit for the WEF. If an Application does not meet all requirements of this Ordinance or the Applicant has not paid all fees and costs, then the Planning Board may deny the Application or approve the Application with conditions that will assure compliance with this Ordinance. If an Application is approved with conditions, then a WEF Site Permit for the WEF shall be issued when all conditions of approval have been satisfied.

4.6 Any significant modification of the approved WEF, such as but not limited to, the number of WTs, tower height, tower locations, turbine design and specifications shall require the Applicant to obtain an amended Site Permit from the Planning Board, pursuant to this Ordinance. The application procedures and permit requirements and standards for amending a Site Permit are the same as for an initial application.

4.7

An Application for a WEF Site Permit shall include the following information and meet the following requirements.

- A) The Applicant's name, address and phone number, and the name, address and phone number of the Owner/operator, if different.
- B) A narrative describing the proposed WEF, including an overview of the project, the project location, and the generating capacity and expected production of the WEF.
- C) Evidence of the Applicant's technical and financial ability to implement the project as proposed.
- D) An overview map that includes the extent of the entire Town, showing all roads, together with the location of all WT access roads, power transmission lines, and all other features of the WEF deemed to be relevant by the Planning Board.
- E) The tax map and lot number of all Project Parcels, including any deed restrictions or easements
- F) For any Project Parcel that is not owned by the Applicant, a copy of any agreement(s) between the owner of the Project Parcel and the Applicant and/or the Owner/operator.
- G) The boundaries of all Project Parcels, surveyed by a Maine Professional Land Surveyor, with name, registration number and seal of the surveyor provided.
- H) The boundaries of all Participating Parcels.
- I) The boundaries of all Non-Participating Parcels located within 5,280 feet of any proposed WT, together with the distance to, and bearing to, all boundary lines relative to each proposed WT, as measured from the nearest point of the property line to the WT. This information shall be provided by a Maine Professional Land Surveyor.

J) The names, addresses and phone numbers of the owners of all Project Parcels, Participating Parcels, and Non-Participating Parcels located within 5,280 feet of any proposed WT, with each property owner's status indicated (Project Parcel, Participating Parcel or Non-Participating Parcel), including the book and page reference of the identified owner's interest as recorded in the Waldo County Registry of Deeds.

K) An aerial photo showing all Project Parcels, Participating Parcels, and Non-Participating Parcels located within 5,280 feet of any proposed WT and indicating any current agricultural uses.

L) Existing zoning of each Project Parcel and all required zoning setbacks on each Project Parcel.

M) Soils information of at least medium intensity, analyzed for relevant drainage characteristics.

N) The location of all components of the WEF, including but not limited to the WTs, access roads, control facilities, meteorological towers, turnout locations, substation(s), ancillary equipment, buildings, structures, and temporary staging areas, together with maintenance and all power collection and transmission systems.

O) The location and description of all structures located on Project Parcels, and all occupied structures located on Participating and Non-Participating Parcels located within 5,280 feet of any proposed WT.

P) The location of any existing culverts, utility poles, signs or other prominent man-made features on the parcel or on any property within 100 feet of the area to be developed.

Q) Dimensional representation and sizes of the structural components of the tower construction including the base, footings, tower, and blades.

R) The distance between each WT tower and each of the following shall be shown on the site plan: structures on all Project Parcels and Participating Parcels; structures on all Non-Participating Parcels located within 5,280 feet of any boundary of a Project Parcel; all utility lines, telephone lines, and public ways located within 5,280 feet of any proposed WT.

4.8 Schematic of electrical systems associated with the proposed WEF including all existing and proposed electrical connections and components.

4.9 Manufacturer's specifications and installation and operation instructions.

4.10 The topography of the site at an appropriate contour interval (2 to 20 foot), showing direction of proposed surface water drainage across and from Project Parcels and Participating Parcels, with an assessment of impacts on downstream properties and water resources, including, but not limited to, streams and wetlands. The survey references from which the elevation was determined should be clearly marked both on the plan and at/near the site.

4.11 The location of any of the following found within 5,280 feet of any proposed WT: open drainage courses, wetlands, and other important natural areas and site features, including, but not limited to, floodplains, deer wintering areas, low level avian migration routes significant wildlife habitats, scenic areas, habitat of rare and endangered plants and animals, unique natural areas, sand and gravel aquifers and historic and/or archaeological resources, together with a description of such features.

4.12 Provisions made for handling all solid wastes, including hazardous and special wastes and the location and proposed screening of any on-site collection or storage facilities.

4.13 The location, dimensions and materials to be used in the construction of proposed roads, driveways, parking areas and loading areas, together with an assessment of any changes to traffic flow.

Note: Any new or upgraded road or driveway must also comply with the requirements of the Thorndike Road Ordinance or Driveway Permit portions of the Thorndike Land Use Ordinance, as appropriate.

4.14 A topographical overlay for the Project Parcel(s), Participating Parcels and Non-Participating Parcels located within 5280 feet of any proposed WT.

4.15 The size and scale of maps and diagrams shall be as determined by the Planning Board, and shall include a north arrow, the date, the scale, and date and seal of a Maine Professional Land Surveyor or professional engineer.

4.16 Emergency shut down plan.

4.17 The site plan shall include such additional relevant information as the Planning Board may require.

Section V. Site Permit Requirements and Standards

5.1 Sound Modeling, Sound Standards and Sound-Related Enforcement Procedures

A) *Independent Pre-licensing Sound Study.* An Application for a WEF Site Permit shall include a four season sound study as specified in the Appendix. This study shall be conducted by a Qualified Independent Acoustical Consultant approved by the Planning Board. The consultant will review this study and assist the Planning Board in determining whether the proposed WEF will comply with the sound limits set forth in this Ordinance. The Applicant shall provide financial surety that the cost of the study, and its review, will be borne by the Applicant, in accordance with Section (VII) of this Ordinance.

B) *Sound Limits.* No Site Permit shall be issued if the pre-licensing information or sound study indicates that the proposed WEF will not comply with the following requirements, which are to apply everywhere within one mile (5280 feet) of any WT, except on Project Parcel(s) or on a Participating Parcel(s) which is subject to a Mitigation Waiver which specifies different sound limits than those below. If pre-construction estimates of the post-construction sound levels, exceed the limits below, then the WEF Application will be denied; if these limits are exceeded after the WEF has been built, then the WEF will be in violation of this Ordinance.

1)

The sound limits below are stated in terms of $L_{90}A(\text{pre})$, $L_{\text{eq}}A(\text{post})$, $L_{\text{eq}}C(\text{post})$, $L_{90}C(\text{post})$ and $L_{\text{eq}}A(\text{post})$. Each of these quantities is defined in the Appendix, particularly in Parts c(3)A, c5 and d. Prior to construction of the WEF, the “pre” values are as measured and the “post” values are as calculated, following the guidelines of the Appendix. After the WEF has been constructed, the “pre” values are the WEF-Off values and the “post” values are the WEF-On values.

2) *Audible Sound Limit.* The appropriate value to use for the pre-construction sound level in the three tests below is $L_{90}A(\text{pre})$; the appropriate value to use for the post construction sound level is $L_{\text{eq}}A(\text{post})$.

- a) No WT, WES or WEF shall be located so as to generate post-construction sound levels that exceed 40 dBA at night (8:30 p.m. to 6:00 a.m.) or 45 dBA during the day (6:00 a.m. to 8:30 p.m.).
 - b) A 5 dB penalty is applied for tones as defined in IEC 61400-11.
- 3) *Low Frequency Sound Limit.*
- a) $L_{eq}C(\text{post})$ minus $L_{90}A(\text{pre})$ must be less than 20 dB outside of any occupied structure.
 - b) $L_{90}C(\text{post})$ may not exceed 50 dBC, without contribution from other ambient sounds, for properties located one mile or more away from state highways or other major roads, and it may not exceed 55 dBC for properties closer than one mile from a state highway or other major road.
- 4) *Mitigation Waiver.* Property owners may waive these sound restrictions with a written Mitigation Waiver agreement. A complete copy of any such agreement must be filed with the Planning Board and Recorded in the Waldo County Registry of Deeds.
- 5) *Post-construction Sound Measurements.* Starting within twelve months after the date when the WEF is operating, a post-construction sound study shall be performed, with all WTs operating, as described in Part d of the Appendix. Post-construction sound studies shall be conducted by a Qualified Independent Acoustical Consultant chosen by the Planning Board. The Permittee will provide financial surety that the costs of these studies shall be paid by the Permittee. The surety required by Section VII shall include these costs. A Consultant of the Permittee may observe the Town's consultant. The WEF Permittee shall provide all technical information required by the Planning Board or Independent Qualified Acoustical Consultant before, during, and/or after any acoustical studies required by this document and for local area acoustical measurements. The post-construction sound measurements, as described in Part d of the Appendix, shall be repeated every three years throughout the life of the facility.

5.2 Set-Back Requirements

- A) A WEF shall comply with the following set-back requirements, which shall apply in addition to the siting requirements found elsewhere in this Ordinance. If more than one set-back requirement applies, the greater set-back distance shall be met.
- 1) All parts of a WEF shall comply with all applicable set-back requirements in the Town's zoning Ordinance.
 - 2) Each WT shall be set back at least 1,800 feet from the property line of any Non-Participating Parcel. Property owners may waive this setback with a written Mitigation Waiver agreement.
 - 3) Each WT shall be set back at least 1,500 feet from any public way.
 - 4) Each WT shall be set back at least 1,200 feet from any above-ground electric power line or telephone line except that a lesser setback shall be permitted if the utility agrees, in writing, and this agreement is approved by the Planning Board.
 - 5) Each WT shall be set back not less than 5,280 feet from any residence, business, school, daycare facility, church, hospital, or other Occupied Structure on any Non-

Participating Parcel. Property owners may waive this setback with a written Mitigation Waiver agreement.

6) All WTs must be set back a minimum of 2,500 feet from any Scenic or Special Resource as defined in Section (III).

7) All set-back distance measurements shall be based on horizontal distances.

B) Minor changes in approved plans necessary to address field conditions may be approved by the Planning Board, provided that any such change does not affect compliance with the Ordinance. The Permittee shall submit revised plans to the Planning Board showing the proposed minor change, which, if approved, shall be considered an amendment to an existing WEF Site Permit and/or Operational License, as appropriate. In the event that a majority of the Planning Board believes that a requested change constitutes a material change to a Site Permit and/or Operational License, or if the changes will affect compliance with the Ordinance, full reapplication is required.

C) All construction activities must conform to the approved WEF site plan, including any conditions of approval and minor changes approved by the Planning Board to address field conditions.

D) Upon completion of the project, the Permittee must provide the Planning Board with a set of construction plans showing the structures and site improvements as actually constructed. These "as-built" plans must be submitted within thirty days of completion of the WEF, and before commencement of operation of the WEF.

5.3 Plan and Risk Assessment for Road and Property Use

A) An Application for a WEF Site Permit shall include a road and property use and risk assessment plan containing the following information and meeting the following requirements.

1) A description and map of all public ways, and other property, in the Town to be used or affected in connection with the construction of the WEF, including a description of how and when such ways and property will be used or affected.

2) A description of the type and length of vehicles and type, weight and length of loads to be conveyed on all public ways in the Town.

3) A complete assessment of the proposed use of public ways in the Town in connection with the construction of the WEF, including the adequacy of turning radii; the ability of the public ways to sustain loads without damage; the need to remove or modify (permanently or temporarily) signs, trees, utilities, or anything else; any reasonably foreseeable damage to public ways or other property, public or private; any reasonably foreseeable costs that the Town may incur in connection with the use of property in the Town, including but not limited to costs relating to traffic control, public safety, or damage to public ways, or to other public or private property.

4) A traffic control and safety plan relating to the use of public ways in the Town in connection with the construction of the WEF.

5) Any additional relevant information that the Planning Board may request relating to the use of public ways or other effects on public and private property that may occur in connection with the construction and operation of the WEF.

6) Any new or upgraded road or driveway must receive additional approvals as required by the Road Ordinance or Driveway Permit portions of the Land Use Ordinance, as appropriate.

B) The Planning Board will evaluate the risk assessment plan with assistance from such consultants that it deems appropriate, including without limitation a third-party engineer approved by the Planning Board, the cost to be solely borne by the Applicant. The Planning Board may document the condition of public ways and other property to be used in connection with the construction of the WEF in such manner as it deems appropriate. The Planning Board may require changes to the risk assessment plan that it deems to be appropriate to protect public safety, to protect public and private property, and to address anticipated costs to the Town associated with construction of the WEF.

C) If the Applicant requires the temporary closure of any public way, the Planning Board may require the Applicant to enter into an agreement relating to the use of the public way.

D) The Applicant shall be responsible for paying for any damage to any public way. If the risk assessment anticipates damage to any public way, the Planning Board may require the Applicant to provide a surety in an amount that the Planning Board determines appropriate to secure any obligations under the agreement, including but not limited to any obligation relating to alterations or modifications to public ways made in connection with the Applicant's activities.

5.4 Design Plan and Design Requirements. An Application for a WEF Site Permit shall include a design plan containing the information and meeting the following requirements.

- 1) The total height of any WT shall not exceed 500 feet above grade, as measured to the blade tips at their maximum distance above grade.
- 2) Wind Turbines shall be painted a non-reflective, non-obtrusive color.
- 3) The design of the buildings shall, to the extent reasonably feasible, use materials, colors, textures, screening and landscaping that will blend with and be compatible with the natural setting and the existing environment.
- 4) Wind Turbines shall not be artificially lighted, except to the extent required by law, and strobe or other intermittent lights are prohibited unless required by law.
- 5) No advertising or display shall be permitted, other than reasonable identification of the manufacturer or operator of the Wind Turbines or WEF.
- 6) Electrical controls and control wiring and power-lines must be wireless or below ground, except where WES collector wiring is brought together for connection to the utility grid.
- 7) The clearance between the ground and the Wind Turbine blades shall be not less than 75 feet.

5.5 Additional Protection Requirements. The Application shall include a statement from the Federal Aviation Administration that the proposed WEF will not pose a hazard to aircraft. The Applicant must also provide memoranda from the Maine Department of Inland Fisheries and Wildlife (MDIFW) Environmental Coordinator and from the Maine Natural Areas Program (MNAP) outlining any concerns that these bodies may have with the proposed WEF. In the absence of any

such concerns, the Applicant must provide copies of correspondence with these bodies showing that no such concerns exist. The Applicant must demonstrate that the proposed WEF will not have an undue adverse effect on rare, threatened, or endangered wildlife, significant wildlife habitat, rare, threatened or endangered plants and rare and exemplary natural plant communities and ecosystems.

5.6 Blasting Plan and Requirements. Owner/operator shall not undertake any blasting in connection with the construction of the WEF unless the Applicant has notified the Town and submitted a blasting plan consistent with applicable laws and regulations. The plan must be reviewed and approved by the Planning Board before any blasting may take place. No blasting shall be undertaken without 48 hours notice to all residents within a half mile radius, measured horizontally, from the blasting area. All blasting operations will cover the blasting area with sufficient stemming, matting or natural protective cover to prevent debris from falling on nearby properties.

5.7 Signal Interference Requirements. The WEF shall not cause any disruption or loss of radio, telephone, television or similar signals.

5.8 Shadow Flicker and Blade Glint Assessment and Requirements

A) Shadow flicker occurs when the blades of a Wind Turbine pass between the sun and/or moon and an observer, casting a readily observable, moving shadow on the observer and his or her immediate environment. The Application shall include a detailed shadow flicker and blade glint assessment model and an estimate of the expected amount of flicker and glint.

B) This study must meet the following requirements.

1) The study shall be prepared by a registered professional regularly engaged in this type of work who is approved by the Planning Board. The Applicant shall be responsible for paying the registered professional's fees and all costs associated with conducting the study. The Applicant shall provide financial surety to the Town for the cost of the study in accordance with Section VII of this Ordinance.

2) The study will examine the areas within a one mile radius of any WT in the proposed WEF.

3) The model will be calculated using the following minimum inputs:

- a) Turbine locations (proposed and existing)
- b) Shadow flicker Sensitive Receptor locations
- c) Existing topography (elevation contours and vegetation)
- d) Rotor diameter, blade width and hub height
- e) Joint wind speed and direction distribution (wind rose table)
- f) Hours of sunshine (long term monthly references)

4) The model may be prepared by use of current aerial photography and topographical maps. A site visit by the preparer is required to identify Sensitive Receptors and to verify the existing conditions.

5) The study shall estimate the locations and durations of shadow flicker caused by the proposed WEF within the study area. The study shall clearly indicate the duration of

shadow flicker at locations throughout the study area, showing the total number of hours per year anticipated.

- 6) The study must include estimates for the duration of shadow flicker at all existing occupied structures, structures permitted for construction, schools, churches, public buildings, and roadways. The estimated duration of shadow flicker at any residential parcel shall include flicker that occurs within 100 feet of the residence.
- 7) The study must include a statement of the assumptions made, methodology applied, and data used by the study. This information must be sufficient to allow an independent third party to verify the results of the study.
- 8) The study shall include a paint sample that demonstrates the color, texture and gloss of the proposed surface coating and a certification that the proposed surface coating will not create a reflective surface conducive to blade glint.

C)

The Application will not be approved if the study estimates that the duration and location of flicker will satisfy any of the following conditions.

- 1) There are more than 10 hours of flicker per year on any Non-participating Parcel.
- 2) There are more than 10 hours of flicker per year on any roadway.
- 3) Flicker is possible at intersections of any roadways.

If after construction, the WEF violates any of these three conditions, then the WEF will be in violation of this Ordinance.

5.9 Sign Plan and Sign Requirements. An Application for a WEF Site Permit shall include a sign plan meeting the requirements in this section.

- A) The plan shall provide reasonable signage at the WEF, identifying the Project Parcels as being part of the WEF and providing appropriate safety notices and warnings.
- B) No advertising material or signage other than warning, equipment information or indicia of ownership shall be allowed on the Wind Turbines. This prohibition shall include the attachment of any flag, decorative sign, streamers, pennants, ribbons, spinners or waving, fluttering or revolving devices, but not including weather devices.
- C) The address and phone number of the Owner/operator and Licensee shall be posted on all access points from public roads.

5.10 Stray Voltage Assessment and Requirements.

- A) An Application for a WEF Site Permit shall include reports of stray voltage analyses in accordance with this section. The Applicant shall conduct and include a report of a preconstruction stray voltage test on all commercial livestock facilities located within a one-mile radius of the Project Parcels. The tests shall be performed by an investigator, approved by the Planning Board, using a testing protocol which is approved by the Planning Board. A report of the tests shall be provided with the WEF Site Permit Application and shall be provided to the owners of all property included in the study area. Applicant shall seek written permission from property owners prior to conducting testing on such owners' property. Applicant shall not be required to perform testing on property where the owners have refused to grant permission to conduct the testing.

B) Following construction of the WEF and within one year after commencing operation, the Applicant shall conduct a post-construction stray voltage test on all commercial livestock facilities located within a one-mile radius of the Project Parcels. The tests shall be performed by an investigator approved by the Planning Board and shall be performed using a testing protocol which is approved by the Planning Board. A report of the tests shall be provided to the Planning Board and to the owners of all property included in the study area. Applicant shall seek written permission from property owners prior to conducting testing on private property. Applicant shall not be required to perform testing on property where the owners have refused to grant permission to conduct the testing.

C) The Applicant or subsequent holder of the Operational License shall provide neutral isolation devices to property owners where testing reveals neutral-to-earth voltages in excess of 0.5 volts caused by the WEF.

5.11 Security Plan and Requirements. The Application shall include a security plan that contains the information and meets the requirements in this section or offers alternative strategies that achieve the objectives of effectively discouraging vandals and climbers.

A) The outside of Wind Turbines shall not be climbable.

B) All access doors to the towers and electrical equipment shall be locked.

C) Warning signs shall be placed on each tower, all electrical equipment, and each entrance to the WEF.

5.12 Fire Prevention and Emergency Response Plan and Requirements.

A) An Application for a WEF Site Permit shall include a fire prevention and emergency response plan containing the information and meeting the requirements in this section. The plan shall describe the potential fire and emergency scenarios that may require a response from fire, emergency medical services, police or other emergency responders.

B) The plan shall designate the specific agencies that would respond to potential fire or other emergencies, shall describe all emergency response training and equipment needed to respond to a fire or other emergency, shall include an assessment of the training and equipment available to the designated agencies, and shall provide for any special training or emergency response equipment that the designated agencies need to use in responding to a potential fire or other emergency. The study shall be conducted at Applicant's cost and the Applicant shall pay for the cost of any training or equipment required by local fire and emergency responders.

C) Access to the WEF and construction area(s) shall be constructed and maintained following a detailed erosion control plan in a manner designed to control erosion and to provide maneuverability for service and emergency response vehicles.

5.13 Emergency Shutdown Plan and Requirements. An Application for a WEF Site Permit shall include an emergency shutdown plan. The plan shall describe the circumstances under which an emergency shutdown may be required to protect public safety, and shall describe the procedures that the Town and the Owner/operator and Licensee will follow in the event an emergency shutdown is required.

5.14 Decommissioning and Site Restoration Plan and Requirements. An Application for a WEF Site Permit shall include a decommissioning and site restoration plan containing the information and meeting the requirements in this section.

A) The plan shall provide for the removal from the Project Parcels, and lawful disposal or disposition of, all Wind Turbines and other structures, hazardous materials ,and electrical facilities. The plan shall provide for the removal of all access roads and foundations unless the landowner wishes them left in place. The plan shall provide for the restoration of the Project Parcels to a condition similar to that which existed before construction of the WEF.

B) The plan shall provide for the decommissioning of the site upon the expiration or revocation of the WEF Permit, or upon the abandonment of the WEF. The WEF shall be deemed abandoned if its operation has ceased for six consecutive months without substantiating communication concerning the ceasing of operations to the satisfaction of the Planning Board.

C) The plan shall include provisions for financial surety to ensure completion of decommissioning and site restoration, in form and amount satisfactory to the Planning Board. A performance bond or a cash escrow account held by the Town with 5% of the estimated cost of decommissioning to be added by the WEF on an annual basis shall be acceptable surety, the total amount to be based on the estimated cost of completing the decommissioning and site restoration in accordance with the approved plan, adjusted for inflation, and as approved by the Planning Board.

D) The plan shall include written authorization from the WEF Permittee and all owners of all Project Parcels for the Town to access the Project Parcels and implement the decommissioning and site restoration plan, in the event that the WEF Permittee fails to implement the plan. The written authorization shall be in a form approved by the Planning Board and recorded in the Waldo County Registry of Deeds.

5.15 Mitigation Waiver Agreement. Non-participating Landowners may waive certain specified protections in this Ordinance using a written, legally enforceable Mitigation Waiver negotiated between the wind turbine Applicant and the Non-participating Landowner, who thereby becomes a Participating Landowner. Complete copies of executed Mitigation Waivers must be included with the submission of the WEF Application. The Mitigation Waiver must be recorded in the Waldo County Registry of Deeds, and describe the benefited and burdened properties. Any subsequent deed must advise all subsequent owners of the burdened property.

5.16 Inspections. Wind Turbines shall be inspected after construction is completed but before becoming operational, and every two years thereafter, for structural and operational integrity by a Maine licensed professional engineer, and the Owner/operator and/or Licensee shall submit a copy of the inspection report to the Planning Board. If such report recommends that repairs or maintenance are to be conducted, then the Owner/operator and/or Licensee shall provide the Planning Board with a written schedule for the repairs or maintenance. Failure to complete the repairs or maintenance in accordance with the schedule shall be deemed a violation of this Ordinance.

5.17 Liability Insurance. The Applicant, Permittee, Owner/operator and Licensee, as applicable, shall maintain a current general liability policy for the WEF that covers bodily injury and property damage in an amount commensurate with the scope and scale of the WEF, and acceptable to the Planning Board. Certificates of insurance shall be provided to the Planning Board annually. The policy must include the requirement that the Planning Board will be provided at least ten days notice by the policy provider in the case of cancellation or change to the policy. In addition, the Applicant, Permittee, Owner/operator and Licensee, as applicable, must inform the Planning Board of such changes.

5.18 Construction Codes.

A) All wiring shall be installed according to local, state, and national electrical codes.

B) All construction shall be conducted in accordance with the International Building Code 2006, published by the International Code Council, Inc.

Section VI. Operational License

6.1 Applications for a WEF Operational License shall be submitted to the Planning Board.

A) Where an Applicant is applying for a new or amended WEF Site Permit, the application for a WEF Operational License, or amended license, shall be submitted to the Planning Board in conjunction with the Site Permit application, and shall include the application form and the separate fee specified in Section VII.

B) Where an Applicant is applying for a WEF Operational License renewal, a new License as the result of transfer of ownership or operation, or reinstatement or modification of an Operational License, the Applicant shall submit an application form, a copy of the existing WEF Site Permit, and the fee specified in Section VII.

6.2 The application for a WEF Operational License shall include the following items:

A) The Applicant's name, address and phone number, and the name, address and phone number of the Owner/operator, if different;

B) An emergency directory for the Owner/operator sufficient to allow the Town to contact the Owner/operator at any time;

C) Evidence of the Applicant's technical and financial ability to operate the WEF in accordance with this Ordinance, the Site Permit, and the Operational License;

D) For any Project Parcel that is not owned by the Applicant, a copy of any agreement(s) between the owner of the Project Parcel and the Applicant;

E) An updated security plan in accordance the requirements of Section V(k);

F) An updated fire prevention and emergency response plan in accordance with the requirements of Section V(l);

G) An updated emergency shutdown plan in accordance with the requirements of Section V(m);

H) An updated decommissioning and site restoration plan in accordance with the requirements of Section (V)(n), including a transfer of financial surety rights from prior License holder;

I) Updated liability insurance information in accordance with the requirements of Section (V)(q); and

J) A signed statement from the Applicant that the Applicant agrees to assume full responsibility for complying with the provisions of this Ordinance and the Site Permit, including agreeing to continue or complete any duties and obligations of the former Operational License holder under this Ordinance or former Operational License, including, but not limited to, the requirement for post-construction sound measurements, post-construction stray voltage testing, wind turbine inspections, and submission to inspections. Items (3) through (9) do not need to be duplicated if the Operational License is submitted in conjunction with an application for a Site Permit.

6.3 The Planning Board shall, with assistance from such staff, consultants, committees or commissions as it deems appropriate, determine whether the Application is complete. If an Application is not complete, then the Applicant shall be so advised, and no further action shall be taken by the Planning Board until a complete Application is received.

6.4 After the Planning Board determines that an Application is complete, the Planning Board shall determine whether the Application meets all requirements of this Ordinance. In determining whether the Application meets the requirements of this Ordinance, the Planning Board may obtain assistance from such staff and consultants as it deems appropriate. The Planning Board shall process the Application as soon as reasonable and feasible, given the complexity of the Application, other business facing the Town, staff and other resources, questions that arise during the review process, and other matters affecting the time needed to complete the review process.

6.5 If an Application is complete and meets all requirements of this Ordinance, and the Applicant has paid all fees and costs, then the Planning Board shall approve a WEF Operational License for the WEF. If an Application does not meet all requirements of this Ordinance or the Applicant has not paid all fees and costs, then the Planning Board may deny the Application or approve the Application with conditions that will assure compliance with this Ordinance. If an Application is approved with conditions, then a WEF Operational License for the WEF shall be issued when all conditions of approval have been satisfied, or, when the Planning Board deems appropriate under the circumstances, the Planning Board may issue a Temporary Operational License for up to 90 days.

Section VII. Fees and Costs

7.1 Preliminary Cost Agreement. At the time an Application for a WEF Site Permit is filed with the Town, the Applicant shall execute for the benefit of the Town an agreement to pay and provide adequate surety guaranteeing payment of the cost of the investigation, review and processing of the Application, including without limitation by way of enumeration, legal, engineering, acoustical, planning, environmental, and staff administrative costs as provided in this Ordinance. The agreement shall provide for the establishment of an escrow account with a minimum of \$10,000 cash deposit to be provided by the Applicant to begin review under this Ordinance. The Town may use the funds in the escrow account in connection with the application review as allowed by this Ordinance. In the event that the cash deposit in escrow is insufficient to complete the review, the Town shall notify the Applicant that additional funds are necessary and of the amount reasonably believed necessary to complete the review, and the Applicant shall provide the additional funds. The Planning Board shall not begin processing, or in the case of where additional funds are requested, shall not continue processing, the Application until the preliminary cost agreement is approved and signed and until the required surety, or additional surety, and/or funds, are provided to the Town.

7.2 The application fee for a Site Permit shall consist of a base application fee of \$2,500.00, plus \$500.00 for every WT included in the project.

7.3 The application fee for an Operational License is \$1,000.

7.4 The annual fee for an Operational License is \$250.00.

Section VIII. Expiration of Site Permit Approval and WEF Operational License

8.1 If on-site construction of a WEF is not significantly commenced within one year of the date of issue of a Site Permit, the Site Permit shall automatically lapse and become null and void. If an approved WEF is not completed within 30 months after a Site Permit is issued, then the Site Permit shall expire, and the Applicant must reapply. The Planning Board may, for good cause shown, grant a one-time extension of up to six months for either start of construction or completion of construction provided such request is submitted prior to the lapse or expiration of the Site Permit.

8.2 A WEF Operational License issued under this Ordinance shall expire twenty years after the date it is issued, unless earlier terminated.

8.3 A WEF Operational License shall be deemed abandoned if its operation has ceased for six consecutive months, without communication to the Planning Board of an explanation to the Planning Board's satisfaction. An Operational License expires immediately upon abandonment.

8.4 A WEF Operational License shall automatically terminate upon transfer of ownership or operation of the WEF. The proposed new owner or operator shall be required to obtain a new Operational License, which must be in place prior to the transfer of ownership or operation of the WEF.

Section IX. Violations, Complaints and Penalties

9.1 Violations of This Ordinance. It shall be unlawful to construct or operate any WEF or part thereof in violation of any provision of this Ordinance, a WEF Site Permit, or a WEF Operational License; any violation thereof is punishable, upon conviction, in accordance with 30-A M.R.S.A. § 4452(3), and shall include attorneys fees and a penalty to address economic benefit as provided in 30-A M.R.S.A. § 4452(3)(D) and (H). All fines assessed under this Ordinance shall inure to the benefit of the Town of Thorndike. Each day a violation exists or continues shall constitute a separate offense.

9.2 Complaint Review Board. Prior to permitting any WEF, the town shall establish a Complaint Review Board to serve as the enforcing Authority. The Complaint Review Board will consist of three Commissioners as follows:

- A) One Town Selectperson
- B) The Code Enforcement Officer (CEO)
- C) One member of the Planning Board

9.3 Complaints and Modification, Revocation or Suspension. The Complaint Review Board pursuant to Section IX(9.3) will serve as the Enforcing Authority for WEFs and will have continuing jurisdiction to modify, revoke, or suspend all WEF Operational licenses in accordance with this section. Such authority shall be in addition to the Town's authority to prosecute violations and take other enforcement action.

- A) In this section, "violation" means a violation of this Ordinance, or a violation of a WEF Site Permit issued under this Ordinance, or a violation of a WEF Operational License.
- B) Any resident of the Town, real property tax-payer to the Town, or Town official may file a written complaint with the Town Clerk alleging that a WEF Permittee, Owner/operator or Licensee has committed or is committing a violation. Such complaints shall be forwarded to the Complaint Review Board.
- C) The Complaint Review Board shall preliminarily review the complaint. In connection with its preliminary review, the Complaint Review Board may require the Code Enforcement Officer or other person or persons to conduct such investigations and make such reports as the Complaint Review Board may direct. The Complaint Review Board may request information from the WEF Permittee, Owner/operator and/or Licensee, the complainant, and any other person or entity to assist with its preliminary review.
- D) Following its preliminary review, the Complaint Review Board may:

- 1) Dismiss the complaint;
 - 2) Refer the complaint to the Town attorney for prosecution; or
 - 3) Conduct a public meeting to determine whether the alleged violation(s) have occurred, and what remedial action should be taken. Prior to such meeting, notice of the meeting shall be given to the WEF Permittee, Owner/operator, Licensee, as applicable, and the complainant. The WEF Permittee, Owner/operator, Licensee, as applicable, and the complainant, and any other person, may appear at the meeting and may offer testimony and other relevant evidence, and may be represented by any attorney. If the Complaint Review Board concludes that violations have occurred, the Complaint Review Board may:
 - a) Impose conditions on the WEF Site Permittee, Owner/operator and/or Licensee to the extent reasonably necessary to discontinue the violation(s) or avoid any recurrence thereof; or
 - b) Suspend the WEF Site Permit and/or Operational License until such time as the WEF Permittee, Owner/operator and/or Licensee presents and implements a plan, satisfactory to the Complaint Review Board that will discontinue the violation(s) or prevent any recurrence thereof, and meets such further conditions as the Complaint Review Board deems appropriate to discontinue and prevent further violations; or
 - c) Recommend to the Select Board that the matter be referred to the Town's attorney for prosecution seeking that the WEF Site Permit and/or Operational License be revoked and that decommissioning of the WEF be directed, if the Complaint Review Board concludes that no reasonable modification can be made to the WEF to discontinue or prevent violations; or
 - d) Refer the matter to the Select Board and Town's attorney for prosecution, subject to Complaint Review Board and Select Board approval; or
 - e) Take no action, if the Complaint Review Board concludes that no further action is needed to discontinue or prevent violations, and that prosecution is unwarranted.
- E) Following any such hearing, the Complaint Review Board's written decision shall be furnished to the WEF Permittee, Owner/operator and/or Licensee, as applicable, and to the complainant.
- F) An appeal from the decision of the Complaint Review Board may be taken to the Appeals Board by the WEF Permittee, Owner/operator or Licensee, or a complainant. Such appeal must be in writing and must specify the grounds thereof, and must be filed with the Town Clerk within 30 days after the final action of the Complaint Review Board. The Town Clerk shall provide any appeal to the Appeals Board. The Appeals Board shall fix a reasonable time for the hearing of the appeal, and shall give public notice thereof as well as due notice to the WEF Permittee, Owner/operator and/or Licensee, as applicable, and the complainant. The action of the Complaint Review Board shall be sustained unless the Appeals Board, by a favorable vote of the majority of all members of the Appeals Board, reverses or modifies the Complaint Review Board's determination.
- G) An appeal from a decision of the Board of Appeals shall be made to Superior Court in accordance with M.R.Civ.P. 80B.

Section X.

Maintenance, Amendments, and Miscellaneous Requirements

10.1 A WEF shall be constructed, operated, and maintained, and repaired in accordance with the approved Site Permit, Operational License, and this Ordinance. Where a standard or requirement is not provided by either this Ordinance, the WEF Site Permit or the WEF Operational License, the WEF Permittee and Licensee shall comply with Good Utility Practices.

10.2 All components of the Wind Turbine Project shall conform to relevant and applicable local, state and national building codes.

10.3 A WEF Permittee may apply to the Planning Board for changes to a WEF Site Permit or Operational License. The Application shall describe the requested change or changes. The Planning Board shall review the Application and determine what provisions of this Ordinance and Appendix will apply to the Application. The Application will then be processed in accordance with all provisions of this Ordinance deemed to be applicable by the Planning Board. The provisions of Section (VII), together with all other instances where this Ordinance outlines financial obligations of the Applicant, Permittee, Owner/operator and Licensee shall apply to any Application for changes to a WEF Site Permit or Operational License. An Application for changes will be required for any significant modification to the approved WEF Permit, including, but not limited to: any change in the number of WTs; any change in WT height, location, design, or specification; or any substantive change to any required plan or insurance coverage.

10.4 The WEF Permittee, Owner/operator and/or Licensee, as applicable, shall notify the Town of any extraordinary event as soon as possible, and in no case more than 12 hours after the event. "Extraordinary events" shall include but not be limited to tower collapse, catastrophic turbine failure, fires, leakage of hazardous materials, unauthorized entry to the tower base, thrown blade or hub, any injury to a Facility worker or other person that requires emergency medical treatment, or other event that impacts the health and safety of the Town or its residents.

10.5 Approval of a WEF Permit under this Ordinance does not exempt an Applicant from obtaining other applicable permits from the Town of Thorndike, such as building, electrical, plumbing and shoreland zoning permits, as applicable, or any applicable state or federal permit.

Section XI. Severability; Conflicts with Other Ordinances, Laws, and Regulations; Appeal

11.1 If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be invalid or unconstitutional by reason of any decision of any court of competent jurisdiction, such decision shall not affect the validity of any other section, subsection, sentence, clause or phrase or part thereof. The Town hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause, phrase or part thereof even if any one or more sections, subsections, sentences, clauses, phrases or parts thereof may be declared invalid or unconstitutional.

11.2 Whenever a provision of this Ordinance conflicts with or is inconsistent with another provision of this Ordinance or of any other Town Ordinance, or Federal or State of Maine rule, regulation or statute, the more restrictive provision shall apply.

11.3 Except as provided in Section IX.3 F), an aggrieved party may appeal a decision of the Planning Board to Superior Court in accordance with M.R.Civ.P. 80B.

Section XII. Effective Date

12.1 This Ordinance shall take effect immediately upon passage.

Appendix.

A.1 Introduction. The purpose of this Appendix is to describe the requirements for pre-construction and post-construction sound and vibration monitoring. Determining the sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision-makers. This protocol is based in part on criteria published in American National Standards S12.9 - Quantities and Procedures for Description and Measurement of Environmental Sound, and S12.18 for the measurement of sound pressure level outdoors. Where there are differences between the procedures and definitions of this document and ANSI standards, this document shall apply. Where a standard's requirements may conflict with other standards or with this document, the most stringent requirements shall apply. IEC 61400-11 procedures are not suitable for enforcement of these requirements except for the presence of tones.

A.2 Instrumentation. All instruments and other tools used to measure audible, inaudible and low frequency sound shall meet the requirements for ANSI or IEC Type 1 Integrating Averaging Sound Level Meter with one-third octave band analyzer with frequency range from 6.3 Hz to 20k Hz and capability to simultaneously measure dBA LN and dBC LN. The instrument must also be capable of measuring low level background sounds down to 20 dBA, and must conform, at a minimum, to the requirements of ANSI S1.43-1997. Measurements shall only be made with the instrument manufacturer's approved wind screen. A compatible acoustic field calibrator is required with certified ± 0.2 dB accuracy. Portable meteorological measurement requirements are outlined in ANSI S12.9 Part 3 and are required to be located within 5 meters of the sound measuring microphone. The microphone shall be located at a height of 1.2 to 1.5 meters for all tests unless circumstances require a different measurement position. In that case, the reasons shall be documented and include any adjustments needed to make the results correspond to the preferred measurement location.

A.3 Pre-construction Sound Measurement and Study. An assessment of the sound environment in the area surrounding the proposed WEF is necessary in order to predict the impact of a proposed project. The following guidelines shall be used in developing an estimate of an area's pre-construction sound environment. All testing is to be performed by a Qualified Independent Acoustical Consultant chosen by the Planning Board. The Applicant may file objections detailing any concerns it may have with the Planning Board's selection. These concerns will be addressed in the study. Objections must be filed prior to the start of the sound study. Test results and the study will be reported to the Planning Board.

A) Location of Measurement Points for Pre-construction Sound Measurement.
Sites to be used as Measurement Points shall be selected as follows.

- 1) Sites should not be located near large objects, such as buildings. The distance to buildings or other structures should be twice the largest dimension of the structure, if possible.
- 2) The sites shall include those locations anticipated to have the highest sound emissions of the proposed WEF.
- 3) The sites shall include those locations where the background soundscape is quietest.
- 4) The sites shall include locations along the property line(s) of Project Parcel(s) and Participating Parcel(s). The intent is to anticipate the locations along the property line(s) that will receive the highest sound emissions. The Applicant and the owner of relevant Project Parcel(s) and Participating Parcel(s) must provide access to allow measurements to be taken. The Permit will not be approved if such access is refused. Mitigation Waivers for any parcel(s) do not eliminate the requirement that access be provided.
- 5) The sites shall include locations selected to represent the sound level at all Sensitive Receptors located within 1.5 miles of the boundaries of the proposed WEF.
- 6) Sites shall be located with the assistance of the Planning Board and property owner(s).

7) Additional sites may be chosen by the Consultant conducting the study if these sites will improve the accuracy of the study's conclusions.

B) *Conditions under which Measurements are to be Taken.* At each Measurement Point, information will be gathered under the conditions specified.

1) The duration of each measurement shall be ten continuous minutes for each quantity listed in Part c(3)A, below, at each location. Longer-term tests are not appropriate. In most cases, it should be possible to derive all values described in Part c(3)A from a single ten minute sample. The duration must include at least six minutes that are not affected by transient sounds from near-by and non-natural sources. Multiple ten minute samples over longer periods may be used to improve the reliability, in which case the quietest ten minute sample will be used.

2) Measurements shall be taken during the times of day and night expected to be have the quietest background sound level, as appropriate for the site. The preferred nighttime testing time for background sound levels is from 10 pm until 4 am. If circumstances indicate that samples should be taken at a different time, then the test may be conducted at an alternate time, if approved by the Planning Board.

3) Measurements must be made on a week-day of a non-holiday week. Week-end measurements may be taken at selected sites where there are weekend activities that may be affected by WT sound.

4) Measurements must be taken at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface, following ANSI S12.9 Part 3 protocol together with any other requirements found in this Ordinance.

5) Measurements taken when the wind speeds exceed two meters per second (4.5 miles per hour) at the microphone location are not valid. A windscreen of the type recommended by the monitoring instrument manufacturer must be used for all data collection.

6) All elements of any pre-existing WEF, whether operated by the current Applicant or some other party, must be turned off for the duration of background sound level measurements. Willingness of the Applicant to abide by this condition for any future Applicants is a requirement of Permit approval.

C) *Quantities to be Measured.* At each Measurement Point, the following information will be gathered, at a minimum, and provided as part of the Study.

1) L_{eq} , L_{10} and L_{90} , each to be given in dBA and in dBC. L_{90} is the value for the quietest continuous minute of a continuous ten minute period, L_{10} is the value for the loudest continuous minute of a continuous ten minute period, and L_{eq} is the average value over the entire ten minute period. To distinguish these values from their post-construction counterparts, these values may be denoted $L_{eq}(pre)$, $L_{10}(pre)$ and $L_{90}(pre)$, with an "A" or a "C", depending on the weight. For instance, $L_{10}A(pre)$ means the A-weighted preconstruction measurement of L_{10} . The ten minute period shall be considered invalid if either

a) $L_{10}A$ minus $L_{90}A$ is greater than 10 dBA; or

b) $L_{10}C$ minus $L_{90}C$ is greater than 15 dBC.

2) One-third octave band sound pressure levels, averaged over each ten minute sample. selection. These concerns will be addressed in the study. Objections must be filed prior to the start of the sound study. Test results and the study will be reported to the Planning Board.

a) *Location of Measurement Points for Pre-construction Sound Measurement.* Sites to be used as Measurement Points shall be selected as follows.

1. Sites should not be located near large objects, such as buildings. The distance to buildings or other structures should be twice the largest dimension of the structure, if possible.
2. The sites shall include those locations anticipated to have the highest sound emissions of the proposed WEF.
3. The sites shall include those locations where the background soundscape is quietest.
4. The sites shall include locations along the property line(s) of Project Parcel(s) and Participating Parcel(s). The intent is to anticipate the locations along the property line(s) that will receive the highest sound emissions. The Applicant and the owner of relevant Project Parcel(s) and Participating Parcel(s) must provide access to allow measurements to be taken. The Permit will not be approved if such access is refused. Mitigation Waivers for any parcel(s) do not eliminate the requirement that access be provided.
5. The sites shall include locations selected to represent the sound level at all Sensitive Receptors located within 1.5 miles of the boundaries of the proposed WEF.
6. Sites shall be located with the assistance of the Planning Board and property owner(s).
7. Additional sites may be chosen by the Consultant conducting the study if these sites will improve the accuracy of the study's conclusions.

b) *Conditions under which Measurements are to be Taken.* At each Measurement Point, information will be gathered under the conditions specified.

1. The duration of each measurement shall be ten continuous minutes for each quantity listed in Part c(3)A, below, at each location. Longer-term tests are not appropriate. In most cases, it should be possible to derive all values described in Part c(3)A from a single ten minute sample. The duration must include at least six minutes that are not affected by transient sounds from near-by and non-natural sources. Multiple ten minute samples over longer periods may be used to improve the reliability, in which case the quietest ten minute sample will be used.
2. Measurements shall be taken during the times of day and night expected to be have the quietest background sound level, as appropriate for the site. The preferred nighttime testing time for background sound levels is from 10 pm until 4 am. If circumstances indicate that samples should be taken at a different time, then the test may be conducted at an alternate time, if approved by the Planning Board.
3. Measurements must be made on a week-day of a non-holiday week. Week-end measurements may be taken at selected sites where there are weekend activities that may be affected by WT sound.
4. Measurements must be taken at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface, following ANSI S12.9 Part 3 protocol together with any other requirements found in this Ordinance.

5. Measurements taken when the wind speeds exceed two meters per second (4.5 miles per hour) at the microphone location are not valid. A windscreen of the type recommended by the monitoring instrument manufacturer must be used for all data collection.

6. All elements of any pre-existing WEF, whether operated by the current Applicant or some other party, must be turned off for the duration of background sound level measurements. Willingness of the Applicant to abide by this condition for any future Applicants is a requirement of Permit approval.

c) *Quantities to be Measured.* At each Measurement Point, the following information will be gathered, at a minimum, and provided as part of the Study.

1. L_{eq} , L_{10} and L_{90} , each to be given in dBA and in dBC. L_{90} is the value for the quietest continuous minute of a continuous ten minute period, L_{10} is the value for the loudest continuous minute of a continuous ten minute period, and L_{eq} is the average value over the entire ten minute period. To distinguish these values from their post-construction counterparts, these values may be denoted $L_{eq}(pre)$, $L_{10}(pre)$ and $L_{90}(pre)$, with an "A" or a "C", depending on the weight. For instance, $L_{10}A(pre)$ means the A-weighted preconstruction measurement of L_{10} . The ten minute period shall be considered invalid if either

i. $L_{10}A$ minus $L_{90}A$ is greater than 10 dBA; or

ii. $L_{10}C$ minus $L_{90}C$ is greater than 15 dBC.

2. One-third octave band sound pressure levels, averaged over each ten minute sample.

3. A narrative description of any intermittent sounds registered during each measurement.

4. A narrative description of the steady sounds that form the background soundscape.

5. Digital recording of all data, sampled at a rate of at least 44,100 Hz with signed 16 bit Pulse Code Modulation, as described in IEC 60908, and measured using a recording instrument meeting ANSI S1.4. This may be augmented with video recordings.

6. Wind speed and direction, humidity and temperature, together with the corresponding information from the nearest ten meter weather reporting station.

d) *Information to be supplied by the Applicant.* The Applicant must provide the following information.

1. The make and model of all WT units to be installed in the WEF.

2. The sound power of all WT units to be installed in the WEF, expressed in watts, and abbreviated as L_w . This information must have been determined for the WT manufacturer under laboratory conditions specified by IEC 61400-11, and provided to the Applicant. It cannot be assumed that these values represent the highest sound output for any operating condition; they reflect the operating conditions necessary to meet the IEC 61400-11 requirements. The lowest frequency for acoustic power (L_w) required in IEC 61400-11 is 50 Hz. This Ordinance requires wind turbine certified acoustic power (L_w) levels at rated load for the total frequency range from 6.3 Hz to 10,000 Hz, in one-third octave frequency bands tabulated to the nearest 0.1 dB.

3. Any additional information that the Consultant reasonably deems necessary to fulfill the requirements in Part c(5), below.

4. The burden is on the Applicant to provide sufficient information to establish that operation of the WEF will meet the requirements of this Ordinance.

e) Required Elements of the Study

1. The purpose of the study is, first, to establish a consistent and scientifically sound procedure for evaluating existing background levels of audible and low-frequency sound; and, second, to determine whether the proposed WEF will meet the conditions set forth in Section V. The characteristics of the proposed WEF and the features of the surrounding environment will influence the design of the study. Site layout, types of WES/WT selected and the existence of other significant local audible and low frequency sound sources and Sensitive Receptors should be taken into consideration.

2. Determining whether the proposed WEF will meet the conditions set forth in this Ordinance requires that the Consultant predict the postconstruction sound level of the proposed WEF. At each Measurement Point, the Consultant must estimate values for L_{90} , L_{10} and L_{eq} , both A-weighted and C-weighted, for a total of six values at each Measurement Point. These pre-construction estimates of the post-construction sound level will be denoted $L_{90}(\text{post})$, $L_{10}(\text{post})$ and $L_{eq}(\text{post})$, each of which may have an "A" or a "C" to indicate the method of weighting.

3. In determining these post-construction values, the Consultant should assume worst-case conditions for producing sound emissions. The assumed wind speed shall be the speed that results in the worst-case (i.e., highest) dBA and dBC sound levels in the area surrounding the WEF. The wind direction shall be taken to be the dominant wind direction in each season. If other wind directions may cause levels to exceed those of the predominant wind direction at Sensitive Receptors, then these levels and conditions shall be considered in the Study. To accommodate enforcement under weather conditions where this is a significant difference between the wind speed at ground-level and at hub-height, any predictive model shall assume that the winds at hub-height are sufficient for the highest sound emission, even though the enforcement tests will be with ground-level wind speeds of ten miles per hour or less.

4. In the event that there are several pending Permit Applications, or preexisting WEF(s), the estimated post-construction values shall be the combined predicted output of all proposed or existing WEFs. All of these WEFs will be treated using the same methodology to arrive at combined value for the predicted post-construction sound level.

5. Each additional WEF adds to the sound-burden of a community. If the contribution to sound levels of a proposed WEF, together with the sound generated by pre-existing WEFs would raise sound levels beyond the limits of this Ordinance, then the proposed WEF will not be approved.

6. At a minimum, the study shall include the following information, and meet the following requirements.

i. The study shall address conditions in all four seasons, and it is required that measurements be taken at each Measurement Point at least once in each of the four seasons. The quietest period of each season should be chosen for measurement.

ii. The study may be based on computer models, but shall include a description of all assumptions made in the model's construction and algorithms. This description must be sufficient to allow an independent third party to verify the conclusions of the study. If the model does not consider the effects of wind direction, worst-case weather, operating

conditions, geography of the terrain, and/or the effect of reinforcement from coherent sounds or tones from the turbines, then these shortcomings must be identified and other means used to adjust the model's output to account for these factors.

- iii. The minimum and maximum distance between any Measurement Points.
- iv. The distance between each Measurement Point and any significant local sound sources.
- v. The predicted sound pressure levels for each of the 1/1 octave bands as un-weighted dB in tabular form from 6.3 Hz to 10,000 Hz. This should be given for a set of locations throughout the study area deemed by the Consultant and Planning Board to be representative.
- vi. Eight iso-contour maps shall be included, two for each season, showing the level of pre-construction background sound, as given by $L_{90}A(\text{pre})$ and $L_{90}C(\text{pre})$. These maps shall extend to a minimum of 1.5 miles beyond the perimeter of the project boundary, and may be extended to a distance of more than 1.5 miles at the discretion of the Planning Board. The scale shall be such as to allow individual Measurement Points and Sensitive Receptors to be distinguished.
- vii. Eight iso-contour maps shall be included, two for each season, showing the level of post-construction sound, as given by $L_{eq}A(\text{post})$ and $L_{eq}C(\text{post})$. These maps shall cover the same area and use the same scale as those in (F).
- viii. Eight iso-contour maps shall be included, two for each season. Four of these maps shall show the value of $L_{eq}A(\text{post})$ minus $L_{90}A(\text{pre})$, one map for each season; and four maps shall show $L_{eq}C(\text{post})$ minus $L_{90}A(\text{pre})$, one map for each season. These maps shall cover the same area and use the same scale as those in (F).
- ix. All maps shall use of contour interval of no more than 5 dB, and shall extend out, at a minimum, to distance sufficient to show the 30 dBA or 40 dBC boundary, whichever is greater.
- x. Maps shall show the location of a Measurement Points, sources of any significant local non-WEF sound or vibration, and the location of all Sensitive Receptors, including, but not limited to, schools, daycare centers, hospitals, residences, places of worship, and elderly care facilities.
- xi. A map shall be included that shows the layout of the project area, including topography, the project boundary lines and property lines.
- xii. Any additional information that the Consultant and Planning Board reasonably believe will aid in making a more informed decision as to whether the proposed WEF will meet the requirements of this Ordinance.

D) Post-construction Sound Measurement and Study

- 1) Post-construction sound studies require two sets of measurements. One set of measurements shall be gathered using the same methodology as outlined in Part (c), above. These measurements may be referred to as the "WEF-Off Measurements." The second set of measurements shall be gathered as set forth in this Part (d), and may be referred to as the "WEF-On Measurements". The WEF-On Measurement Points shall be the same as those used as WEF-On Measurement Points. All

testing is to be performed by a Qualified Independent Acoustical Consultant chosen by the Planning Board.

- 2) At the discretion of the Planning Board, the pre-construction sound measurements, taken in Part (c), can be substituted for the WEF-Off Measurements if a random sampling of 10% of the pre-construction study sites shows that $L_{90}A$ and $L_{90}C$ levels have not changed by more than ± 5 dB when measured under the same meteorological conditions.
- 3) If there have been any complaints about WEF sound or low frequency sound by any resident of an occupied dwelling, then a location or locations on that property will be included in the WEF-Off and WEF-On Measurement Points.
- 4) This location(s) will be selected jointly by the complainant and Consultant. In addition, the Consultant and Planning Board may include additional Measurement Points where they reasonably believe that doing so will improve the accuracy of the study.
- 5) The WEF-On Measurements shall be taken under the conditions listed below, and the quantities measured shall be as specified in Part c(3), above.
 - a) The duration of each measurement shall be ten continuous minutes for each quantity listed in Part c(3)A, above, at each location. The duration must include at least six minutes that are not affected by transient sounds from near-by, non-natural, non-WEF sources. Multiple ten minute samples over longer periods may be used to improve the reliability.
 - b) Measurements must be taken at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface, following ANSI S12.9 Part 3 protocol together with any other requirements found in this Ordinance.
 - c) Measurements must be taken with the wind speed at hub-height sufficient for full operating capacity, and at two meters per second (4.5 miles per hour) or less at the microphone location. Conditions should reflect the loudest sound emissions from the WEF. For purposes of enforcement, the wind speed and direction at the WT blade height shall be selected to reproduce the conditions leading to the enforcement action. A windscreen of the type recommended by the monitoring instrument manufacturer must be used for all data collection.
- 6) The Consultant shall provide a study including the same information and meeting the same requirements as the pre-construction sound study described in Part c(5), except that the values for $L_{90}(\text{post})$, $L_{10}(\text{post})$ and $L_{\text{eq}}(\text{post})$ (both A-weighted and C-weighted) shall be taken to be the measured WEF-On values.
- 7) For the purposes of enforcement, the post-construction values of $L_{90}A(\text{post})$, $L_{90}C(\text{post})$, $L_{10}A(\text{post})$, $L_{10}C(\text{post})$, $L_{\text{eq}}A(\text{post})$ and $L_{\text{eq}}C(\text{post})$ are defined to be equal to the measured WEF-On value of each quantity.

References

ANSI/ASA S12.9-1993/Part 3 (R2008) - American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present

This standard is the second in a series of parts concerning description and measurement of outdoor environmental sound. The standard describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation. These measurements are distinguished by the requirement to have an observer present. Sound may be produced by one or

more separate, distributed sources of sound such as a highway, factory, or airport. Methods are given to correct the measured levels for the influence of background sound. For the purposes of this Ordinance the options that are provided in ANSI S12.9-Part 3 (2008) shall be applied with the additional following requirements:

Wind Turbine Siting Acoustical Measurements ANSI S12.9 Part 3 Selection of options and other requirements

4.2 background sound: Use definition (1) 'long-term

4.3 long-term background sound: The L_{90} excludes short term background sounds

4.4 basic measurement period: Ten (10) minutes L_{90} (10 min)

4.5 Sound Measuring Instrument: Type 1 integrating meeting ANSI S1.43

6.5 Windscreen: Required

7.1 Long-term background sound

7.2 Data collection Methods: Second method Observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)

8 Source(s) Data Collection: All requirements in ANSI S12.18 Method #2 precision to the extent possible while still permitting testing of the conditions that lead to complaints.

8.3(a) All meteorological observations required at both (not either) microphone and nearest 10m weather reporting station.

8.3(b) For a 10 minute sound measurement to be valid the wind velocity shall not exceed 2m/s (4.5 mph) measured less than 5m from the microphone. Compliance sound measurements shall not be taken when winds exceed 2m/s.

8.3(c) In addition to the required acoustic calibration checks the sound measuring instrument internal noise floor must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading from the sound level meter or other recording instrument to determine an approximation of the instrument self noise. This calibrator covered microphone must demonstrate that the results of this test are at least 5 dB below the immediately previous ten minute acoustic test results for the acoustic data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self noise. As a precaution sound measuring instrumentation should be removed from any air conditioned space at least an hour before use. Nighttime measurements are often performed very near the dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the data.

8.4 to the end: The remaining sections of ANSI S 12.9 Part 3 Standard do not apply.

**ANSI S12.18-1994 (R2004) American National Standard
Procedures for Outdoor Measurement of Sound Pressure Level**

This American National Standard describes procedures for the measurement of sound pressure levels in the outdoor environment, considering the effects of the ground, the effects of refraction due to wind and temperature gradients, and the effects due to turbulence. This standard is focused on measurement of sound pressure levels produced by specific sources outdoors. The measured sound pressure levels can be used to calculate sound pressure levels at other distances from the source or to extrapolate to other environmental conditions or to assess compliance with regulation. This standard describes two methods to measure sound pressure levels outdoors. METHOD No. 1: general method; outlines conditions for routine measurements. METHOD No. 2: precision method; describes strict conditions for more accurate measurements. This standard assumes the measurement of A-weighted sound pressure level or time-averaged sound pressure level or octave, 1/3-octave or narrow-band sound pressure level, but does not preclude determination of other sound descriptors.

**ANSI S1.43-1997(R2007) American National Standard
Specifications for Integrating Averaging Sound Level Meters**

This Standard describes instruments for the measurement of frequency-weighted and time-average sound pressure levels. Optionally, sound exposure levels may be measured. This standard is consistent with the relevant requirements of ANSI S1.4-1983(R 1997) American National Standard Specification for Sound Level Meters, but specifies additional characteristics that are necessary to measure the time average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

**ANSI S1.11-2004 American National Standard
'Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters'**

This standard provides performance requirements for analog, sampled-data, and digital implementations of bandpass filters that comprise a filter set or spectrum analyzer for acoustical measurements. It super-cedes ANSI S1.11-1986 (R1998) American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters, and is a counterpart to International Standard IEC 61260:1995 Electroacoustics - Octave-Band and Fractional-Octave-Band Filters. Significant changes from ANSI S1.11-1986 have been adopted in order to conform to most of the specifications of IEC 61260:1995. This standard differs from IEC 61260:1995 in three ways: (1) the test methods of IEC 61260 clauses 5 is moved to an informative annex, (2) the term 'band number', not present in IEC 61260, is used as in ANSI S1.11-1986, (3) references to American National Standards are incorporated, and (4) minor editorial and style differences are incorporated.

**ANSI S1.400-2006 American National Standard
Specifications and Verification Procedures for Sound Calibrators
IEC 60908 Audio Recording – Compact disk digital audio system**

Applies to a pre-recorded optical reflective digital audio disc system. Defines those parameters of compact discs that affect interchangeability between discs and players. Is also intended as a reference for manufacturers wishing to produce discs and/or players that conform to the system described.

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-05

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-0

Wind turbine generator systems - Part 11: Acoustic noise measurement techniques

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. The standard has been prepared with the anticipation that it would be applied by:

- the wind turbine manufacturer striving to meet well defined acoustic emission performance requirements and/or a possible declaration system;
- the wind turbine purchaser in specifying such performance requirements;
- the wind turbine operator who may be required to verify that stated, or required, acoustic performance specifications are met for new or refurbished units;
- the wind turbine planner or regulator who must be able to accurately and fairly define acoustical emission characteristics of a wind turbine in response to environmental regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis and reporting of complex acoustic emissions from wind turbine generator systems. The standard will benefit those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of wind turbines. The measurement and analysis techniques recommended in this document should be applied by all parties to insure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.