

12.2 Noise Standards

For all wind turbines, the primary guiding principle is that their operation must not be disruptive at any time of day or night. Current sound limitations in the state of Maine regulating noise from WTG reflect sound limits applicable to urban residential and urban mixed neighborhoods instead of the deep quiet of rural areas such as Montville to which this Ordinance pertains.



12.2.1 Principles Governing Sound Measurements

- 12.2.1.1 Section 27.0 applies in addition to relevant paragraphs of Section 28.0. Procedures in Section 27.0 and Section 28.0 are mandatory and additional to the relevant application procedures.
- 12.2.1.2 Sound measurements must be made to all non-participating property lines within and up to two (2) miles measured horizontally from the Project Boundary.
- 12.2.1.3 All sound measurements will be filtered for both dBA and dBC.
- 12.2.1.4 All sound measurements before construction, and after will be made by a Professional Engineer who is a Full Member of the Institute of Noise Control Engineering (INCE).
- 12.2.1.5 This engineer must be an independent contractor to the Town of Montville, and have no ties to wind developers or related conflicts of interest.

12.2.2 Noise Limits at Non-participating Property Lines

No WTG turbine shall be located so as to cause an exceedence of the pre-construction/operation background sound levels by more than 5 dBA or dBC. The background sound levels shall be the L90 dB sound levels sound descriptor (both A and C weighing) measured during a pre-construction noise study during the quietest time of evening or night. Measurements shall be for ten (10) minutes or more. L90 results are valid when L10 results are no more than 15 dB above L90 for the same time period. Noise sensitive sites are to be selected based on the WTG's predicted sound emissions (in dBA, dBC and 1/3 octaves to blade passage frequency), which are to be provided by the Applicant.

- 12.2.2.1 Audible noise levels (dBA) due to wind turbine operation will not exceed the pre-construction ambient noise level by more than 5 dBA as measured at any property line. Property owners may waive this noise restriction with a written Mitigation Waiver. (See Section 12.4.)
- 12.2.2.2 Low frequency noise levels (dBC) due to wind turbine operation as measured inside or at any Property Line will not exceed:
 - 1. 20 decibels (measured as dBC) above the pre-development ambient noise level (measured as dBA).
 - 2. A maximum not-to-exceed level of 50 dBC.Property owners may waive this noise restriction with a written Mitigation Waiver. (See Section 12.4.)
- 12.2.2.3 Noise measurement standards and procedures are described in Section 27.0.

**Town of JACKSON
Wind Turbine Ordinance**

23 June 2011 SUMMARY Study of Set-Back and Sound:

Set-Back

The minimal allowable horizontal distance as measured from the center of a wind turbine to a defined point (i.e. a property line or occupied building)

Set-Back Distance

13 x Turbine height (i.e. 450 ft x 13= 5,850 ft)

Noise Standards

dBA not to exceed preconstruction ambient noise levels by more than 5dBA at property line

Low frequency sound measured inside an occupied building or at property line not to exceed 20 decibels (dBC) above preconstruction ambient noise (measured as dBA)

Preconstruction noise studies shall be conducted for all properties within 2 times the set-back of proposed wind turbine site

DATA EXTRACTED FROM JACKSON WIND TURBINE ORDINANCE (52 pages):

13.1.2 Setback standards for Type 2,3,and 4 wind turbines:

- a. Non-participating Landowner Property Lines – Type 2, 3 and 4 Wind Turbines will be set back from the property line of any non-participating landowner a distance of no less than 13 times the turbine height. Non-participating property owners may waive this setback with a written Mitigation Waiver (see Section 13.4 - Mitigation Waiver).
- b. Public Roads - Type 2, 3 and 4 Wind Turbines will be set back from any public road a distance no less than 4 times the turbine height.

13.1.3 Setbacks from Scenic or Special Resources

All Wind Turbines exceeding 80 feet or tree height on site, whichever is greater, must be set back a minimum of 2,500 feet from any Scenic or Special Resource as defined in Section 8.

Table 3: Summary of Setback Standards

Turbine Type	Non-participating Property Line	Public Roads	Scenic or Special Resources
Type 1 <=100'	1.5x Turbine Height	1.5x Turbine Height	2500' if greater than 80' or tree height
Type 1 >100' and < 150'	3x Turbine Height	3x Turbine Height	2500' if greater than 80' or tree height
Type 2,3&4	13x Turbine Height	4x Turbine Height	2500' if greater than 80' or tree height

13.2 Noise Standards

13.2.1 Noise Limits at Non-participating Property Lines

For Type 1 and Type 2 Wind Turbines, audible noise levels (dBA) at the property line due to wind turbine operations shall not exceed 35 dB(A) from 6 AM (8 AM on Sundays) to 8:30 PM and 30 dB(A) from 8:30 PM to 6 AM (8 AM on Sundays). Property owners may waive this noise restriction with a written Mitigation Waiver. (see Section 13.4 -Mitigation Waiver).

13.2.2 Noise Standards for Type 3 and 4 wind turbines:

- a. Audible noise levels (dBA) due to wind turbine operation will not exceed:

The pre-construction ambient noise level by more than 5dBA as measured at any property line. Pre-construction ambient noise studies shall be conducted, by the applicant, for all properties located within 2 times the setback of proposed wind turbine site.

Non-participating property owners may waive these noise restrictions with a Mitigation Waiver. (see Section 13.4 -Mitigation Waiver).

- b. Low frequency noise levels (dBC) due to wind turbine operation as measured inside an occupied building or at any property line will not exceed:

i. 20 decibels (measured as dBC) above the pre-construction ambient noise level (measured as dBA). Pre-construction ambient noise studies shall be conducted, by the applicant, for all properties located within 2 times the setback of proposed wind turbine site.

ii. 50 dBC.

Property owners may waive these noise restrictions with a written Mitigation Waiver. (see Section 13.4 Mitigation Waiver)

- c. Noise measurement standards and procedures that must be used are contained in Appendix A.

**Town of PHILLIPS
Wind Energy Facility Ordinance**

23 June 2011 SUMMARY Study of Set-Back and Sound:

Set-Back Standards - calculated from Table 1 for:

- Falling and Debris Hazards
- Flicker Hazard
- Acoustic Hazard (see Table 2)

Set-Back

A distance measured horizontally in feet from the center axis of any wind turbine or meteorological tower radially 360°

Acoustic Standards

Not to exceed 30dBA or 50dBC at property lines, or structures in Town of Phillips

DATA EXTRACTED FROM PHILLIPS WIND ORDINANCE (17 pages):

9.3 Acoustic Standards. Sound levels due to the operation of the WEF shall not exceed 30 dBA or 50 dBC at property lines or structures in the Town of Phillips. Owner/Operators may request a waiver of these standards by means of written Covenants as specified in section 14.2.3 of this Ordinance.

9.3.1 Sound measurements shall be carried out at appropriate property lines or structures as soon as possible after the Town of Phillips Planning Board determines that a violation of the noise standards may have occurred.

9.3.2 All sound measurements shall be made by a professional acoustical engineer who is a Full Member of the Institute of Noise Control Engineering (INCE) or who possesses some comparable qualification. The engineer shall be chosen by the Owner/Operator from a list provided by the Planning Board and paid by the Owner/Operator.

9.3.3 Except as specifically noted otherwise, sound measurements shall be conducted in compliance with the American National Standards Institute (ANSI) Standard S12.18-1994 "Outdoor Measurements of Sound Pressure."

9.3.4 Sound level meters and calibration equipment shall comply with the latest version of ANSI Standard S1.4 "Specifications for General Purpose Sound Level Meters," and shall have been calibrated at a recognized laboratory within one year before the sound measurements are carried out.

TABLE 1

SETBACK DISTANCE STANDARDS ALL MEASUREMENTS AND DISTANCES IN FEET

SETBACK (FT)	METEOROLOGICAL TOWER	TYPE 0 & TYPE 1	TYPE 2	TYPE 3
FALLING & DEBRIS HAZARD	$S_{frc} = H_o \times 1.5$ Where: S_{frc} Setback Distance H_o Height Overall	$S_{frc} = H_o \times 1.5$ Where: S_{frc} Setback Distance H_o Height Overall	$S_{frc} = H_o \times 1.5$ Where: S_{frc} Setback Distance H_o Height Overall	$S_{frc} = H_o \times 1.5$ Where: S_{frc} Setback Distance H_o Height Overall
FLICKER HAZARD	Not Applicable	$S_c = (H_o / 176) \times 1.5$ Where: S_c Setback Distance H_o Height Overall Not including 120° to 240° True	$S_c = (H_o / 176) \times 1.5$ Where: S_c Setback Distance H_o Height Overall Not including 120° to 240° True	Flicker Analysis Report
ACOUSTIC HAZARD	Not Applicable	$S_s = 10^{((L_w + L_u + L_s + 4 \log(n) - 5 - 30) / 20)}$ Where: S_s - Setback Distance L_w - Manufacturer's Guaranteed Maximum Sound Power Level, in dBA re 1pW L_u - Uncertainty Factor = 5 L_s - Safety Factor = 2 n - No. of Turbines for one turbine $4 \log(n) = 0$	$S_s = 10^{((L_w + L_u + L_s + 4 \log(n) - 5 - 30) / 20)}$ Where: S_s - Setback Distance L_w - Manufacturer's Guaranteed Maximum Sound Power Level, in dBA re 1pW L_u - Uncertainty Factor = 5 L_s - Safety Factor = 2 n - No. of Turbines for one turbine $4 \log(n) = 0$	$S_s = 10^{((L_w + L_u + L_s + 4 \log(n) - 5 - 30) / 20)}$ Where: S_s - Setback Distance L_w - Manufacturer's Guaranteed Maximum Sound Power Level, in dBA re 1pW L_u - Uncertainty Factor = 5 L_s - Safety Factor = 2 n - No. of Turbines

TABLE 2
Acoustic Setback Distance in Feet

Property Line Criteria, dBA:	30
Uncertainty Factor, dBA:	5
Safety Factor, dBA:	2

Manufacturer's Guaranteed Maximum Sound Power Level, dBA re 1pW	Number of Wind Turbines									
	1	2	3	4	5	6	7	8	9	10
70	211	243	263	279	292	302	312	320	328	335
71	237	272	295	313	327	338	350	359	368	376
72	266	306	331	351	367	381	393	403	413	422
73	299	343	372	394	412	427	441	452	463	473
74	335	385	417	442	462	479	494	508	520	531
75	376	432	468	496	519	538	555	570	583	596
76	422	484	525	556	582	603	622	639	654	668
77	473	544	589	624	653	676	698	717	734	750
78	531	610	661	701	732	756	783	805	824	841
79	596	684	742	786	822	852	879	903	924	944
80	668	768	833	882	922	956	986	1,013	1,037	1,059
81	750	861	934	989	1,035	1,073	1,107	1,137	1,164	1,189
82	841	967	1,048	1,110	1,161	1,204	1,242	1,275	1,306	1,334
83	944	1,084	1,176	1,246	1,303	1,351	1,393	1,431	1,465	1,496
84	1,059	1,217	1,320	1,398	1,461	1,516	1,563	1,606	1,644	1,679
85	1,189	1,365	1,481	1,568	1,640	1,701	1,754	1,801	1,844	1,884
86	1,334	1,532	1,661	1,760	1,840	1,908	1,968	2,021	2,069	2,113
87	1,496	1,719	1,864	1,974	2,064	2,141	2,208	2,268	2,322	2,371
88	1,679	1,928	2,091	2,215	2,316	2,402	2,478	2,545	2,605	2,661
89	1,884	2,164	2,347	2,485	2,599	2,695	2,780	2,855	2,923	2,985
90	2,113	2,428	2,633	2,789	2,916	3,024	3,119	3,203	3,280	3,350
91	2,371	2,724	2,954	3,129	3,272	3,393	3,500	3,594	3,680	3,758
92	2,661	3,056	3,315	3,511	3,671	3,807	3,927	4,033	4,129	4,217
93	2,985	3,429	3,719	3,939	4,119	4,272	4,406	4,525	4,633	4,732
94	3,350	3,848	4,173	4,420	4,622	4,793	4,943	5,077	5,198	5,309
95	3,758	4,317	4,682	4,959	5,156	5,378	5,547	5,697	5,832	5,957
96	4,217	4,844	5,253	5,564	5,818	6,034	6,223	6,392	6,544	6,683
97	4,732	5,435	5,894	6,243	6,528	6,771	6,983	7,172	7,343	7,499
98	5,309	6,098	6,613	7,005	7,325	7,597	7,835	8,047	8,239	8,414
99	5,957	6,842	7,420	7,860	8,219	8,524	8,791	9,029	9,244	9,441
100	6,683	7,677	8,326	8,819	9,221	9,564	9,863	10,130	10,372	10,593
101	7,499	8,614	9,342	9,895	10,347	10,731	11,067	11,366	11,637	11,885
102	8,414	9,665	10,482	11,102	11,609	12,040	12,417	12,753	13,057	13,335
103	9,441	10,844	11,760	12,457	13,025	13,509	13,932	14,309	14,650	14,956
104	10,593	12,168	13,195	13,977	14,615	15,158	15,632	16,055	16,438	16,788
105	11,885	13,652	14,808	15,682	16,398	17,007	17,540	18,014	18,444	18,836
106	13,335	15,318	16,612	17,596	18,399	19,082	19,680	20,212	20,694	21,135
107	14,962	17,187	18,639	19,743	20,644	21,411	22,081	22,679	23,219	23,714
108	16,788	19,284	20,913	22,152	23,163	24,023	24,775	25,446	26,052	26,607
109	18,836	21,637	23,465	24,855	25,989	26,954	27,798	28,551	29,231	29,854
110	21,135	24,278	26,328	27,888	29,160	30,243	31,190	32,035	32,798	33,497
111	23,714	27,240	29,541	31,290	32,719	33,934	34,996	35,943	36,800	37,584
112	26,607	30,564	33,145	35,108	36,711	38,074	39,286	40,329	41,290	42,170
113	29,854	34,293	37,190	39,392	41,190	42,720	44,057	45,250	46,329	47,315
114	33,497	38,477	41,728	44,199	46,216	47,933	49,433	50,771	51,981	53,088
115	37,584	43,172	46,819	49,592	51,855	53,781	55,465	56,966	58,324	59,566

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