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On the overlap region between wind turbine infrasound and infrasound from other sources and its relation to criteria.

Geoff Leventhall Ashtead KT21 1NL UK geoff@activenoise.co.uk

Summary
A bylaw has been introduced in the town of Plympton-Wyoming, Ontario, with the intention of restricting levels of wind turbine infrasound (0.1Hz to 20Hz). Blade pass tones greater than 50dB are specified as an indication of excessive infrasound. These tones normally have a fundamental frequency of around 1Hz, where the hearing threshold is not well known, but is probably about 130dB. Restricting an average level to 80dB below median hearing threshold is an unusual requirement. Blade pass tones have normally disappeared from the wind turbine spectrum by 10Hz, or lower. The threshold at 10Hz is nearly 100dB

Natural infrasound covers a frequency range from about 0.001Hz to 10Hz, but some occurrences produce higher frequencies of short duration. It was decided to look at the overlap region between wind turbine infrasound and other infrasound in order to help assess the scientific basis of the Plympton-Wyoming bylaw.

It was found that there is no evidence to support the bylaw.

1. Introduction
Much time and energy has been expended on assessing infrasound from wind turbines, leading to the general result that levels are very low, and not a health problem. This confirms earlier conclusions. (Leventhall 2006) Attempts which have been made to show a link between infrasound and effects on humans are based on higher levels and different frequencies, generally tonal, from those generated by wind turbines. For example, Salt and Lichtenhan describe four mechanisms by which infrasound from wind turbines might affect people, but do not give frequencies or levels. (Salt and Lichtenhan 2014) However, on checking the references in the Salt and Lichtenhan paper, Dobie showed that all those experimental levels which demonstrated effects were in the frequency range 30-50Hz at levels of 80 to 120dB. (Dobie 2014) Salt and Lichtenhan's paper, although including "wind turbine noise" in the title, is therefore not relevant to the actual noise from wind turbines.

Tribunals and similar legal hearings in a number of countries have concluded that wind turbine A-weighted noise, at agreed criterion levels, is not a cause of serious harm to health and this has led objectors to focus increasing attention on infrasound, making exaggerated claims about its effects. We now have a very confused situation in which many people hold sincere beliefs about infrasound, but these beliefs are based on false information, which they have received from unreliable sources, typically the leading objectors to wind turbines.

Infrasound has become the Godzilla of acoustics.

An example is in the town of Plympton-Wyoming, Ontario, which has recent**ly** introduced limits on infrasound from wind turbines in Bylaw No. 62 of 2014, reproduced in Section 9 of this paper, where the most relevant parts of the bylaw are highlighted. Source: http://plympton-wyoming.com/cmsfiles/2014-62.pdf

2. Summary of Bylaw Conditions

The main requirements to prevent excessive infrasound are given as:

1. Measurement range is from 0.1Hz to 20Hz. All measurements are inside the complaint buildings. *Comment: 0.1Hz, one cycle in 10 seconds, is a very low frequency*

2. No wind facility shall emit Infra-sound in the frequency between 0Hz and 20Hz. *Comment: This is a very clear statement. No infrasound at all from wind turbines!*

3. Excessive Infra-sound occurs when measurements identify blade pass tones and their harmonics, present during wind turbine operation, but not present when the turbines are not operating. *Comment: This relaxes the previous condition, and focusses attention on blade pass tones, which are typically in the range of 1 to 10Hz, or lower. It is not clear whether the complaint must be specific to infrasound or generally on noise. For example, are infrasound tests required if a complaint is on audible amplitude modulation?*

4. The limiting levels are when the blade pass tone, or any of its harmonics are at a sound pressure level of 50 dB or more, when energy is averaged over a period of one to several minutes or more….. *Comment: The blade pass tones are limited to 50dB. A decibel level should not be specified without also specifying the measurement bandwidth. The measurement period is imprecise.*

5. Additionally, the peaks of the sound pressure exceed this average by10 dB or more. *Comment: how many peaks per measurement period are permitted*?

6. The difference between C-weighted and A-weighted levels is limited to 15dB at any measurement point, inside or outside an occupied building. The difference between an un-weighted (linear, L) sound level (including infrasound from 0.1 Hz and above) and an A-weighted sound level is limited to 20 decibels

at the measurement point. *Comment: It is likely that, in many locations, C-A and L-A are greater than these limits when the turbines are not operating, due to high levels of natural infrasound around 0.1Hz.*

7. No wind facility shall cause "Infrasonic Barometric Pressure Disturbance " (IBPD) where any cyclic pressure disturbance having amplitude at any given frequency in the stated frequency range exceeds 2 milli-Pascal's RMS (0.002 Pascal RMS) for a repeatable duration of 10 seconds or more in any 40-second period: Here, given frequency means an identifiable repetition rate, which is continuous for the 10-second measurement, having at least 2 full cycles that exceed +/- 2.828 milli-Pascal peak (=0.002 Pa RMS). The IBPD measurements shall be made with doors and windows closed. Note that 0.002 Pascal RMS is equivalent to 40dBZ. *Comment: The meaning of IBPD is not clear. If it refers to the pressure pulses generated by the blade passing the tower, then the pulses are the time variation of the sum of the blade tones. The term dBZ is not normally defined down to 0.1Hz. 40dB Linear down to 0.1Hz is likely to be exceeded with turbines off.*

3. Reasons behind these conditions.

The bylaw states:

"Infra-sound" means sound with energy in the frequency range of 0-20 Hz. It is often considered to be inaudible for most people unless at a relatively high amplitude but has been shown to be perceived via other senses at lower amplitudes especially for complex non-steady, non-sinusoidal pressure waves.

The significant part of this statement is that infrasound "has been shown to be perceived via other senses at lower amplitudes especially for complex non-steady, non-sinusoidal pressure waves."

Therefore it is necessary to consider whether infrasound at a frequency of around 1Hz and level of 50 – 60dB, is perceived by "other senses".

4. Perception of infrasound.

The ear is the most sensitive receptor of infrasound in the body. Suggestions that infrasound can be felt, but not heard, are incorrect, and are part of the mythology of fear which has developed around infrasound. (Leventhall 2006) Non-auditory perception through infrasound-induced body vibration occurs at levels about 30dB above the normal hearing threshold, as has been shown by experiments with both hearing and profoundly deaf subjects (Yamada, Ikuji et al. 1983) Infrasound induced sensation of the head occurs at levels well above hearing threshold (Takahashi and Harada 2007). It has also been shown that infrasound just below hearing threshold is not detected, whilst infrasound just above hearing threshold causes sleepiness. (Landström, Liszka et al. 1982, Landström and Byström 1984) (Landström, Lundström et al. 1983)

The effect of infrasound on the hair cells in guinea pig ears has been investigated by Salt and Hullar and an outer hair cell (OHC) response was shown to occur at 5Hz for

levels below the threshold for hearing perception by the guinea pig (Salt and Hullar 2010). By extrapolating this over a wider low frequency range, based on assumed physical processes in the ear, and taking into account relative sensitivities of humans and guinea pigs, Salt proposed a human OHC threshold of 100dB at 1Hz falling at 40dB per decade (12dB/octave) to 100Hz. However, it is not known whether exceedance of the threshold has any adverse physiological effects. As Salt and Hullar say in their conclusions:

> The fact that some inner ear components (such as the OHC) may respond to infrasound at the frequencies and levels generated by wind turbines does not necessarily mean that they will be perceived or disturb function in any way. On the contrary though, if infrasound is affecting cells and structures at levels that cannot be heard this leads to the possibility that wind turbine noise could be influencing function or causing unfamiliar sensations.

It is five years since the paper was published, there has been no further clarification of this important point. Perhaps this is because infrasound from wind turbine blade tones at residences is generally well below the OHC threshold. Salt's outer hair cell threshold is therefore not relevant to blade tone infrasound from wind turbines.

5 Infrasound from wind turbines.

This has been measured a number of times in recent years, often following pressure from objectors. A selection of measurements is as follows:

UK (Hayes 2006)
Canada (Hepburn 2006)
USA (O'Neal, Hellweg et al. 2011)
Japan (Tachibana, Yanob et al. 2014)
USA (Walker, Hessler et al. 2012)
Australia (Evans, Cooper et al. 2013)
Australia (Hansen, Zajamsek et al. 2014a) (Hansen, Zajamsek et al. 2013) (Hansen, Zajamsek et al. 2014b)
Australia (Cooper 2014)

The analyses have been mainly in one third octave bands although Walker, Hessler et al, and others, have shown very clear narrow band levels. Fig. 1 is an example. (Walker, Hessler et al. 2012) In this spectrum, which is typical of wind turbine infrasound, the measurement bandwidth is 0.05Hz.

The upper trace is external noise from 0.1Hz to 1000Hz. Blade pass tones are clearly visible, in the 1Hz to 5Hz range, on both the external and internal spectra at levels of 50-60dB, which are well below hearing threshold. The increase in the internal noise at around 10Hz to 30Hz is from building vibration induced by the cyclic pulses from the wind turbine. Recently, S. Cooper has carried measurements which give similar results in the blade passing frequency range. (Cooper 2014).

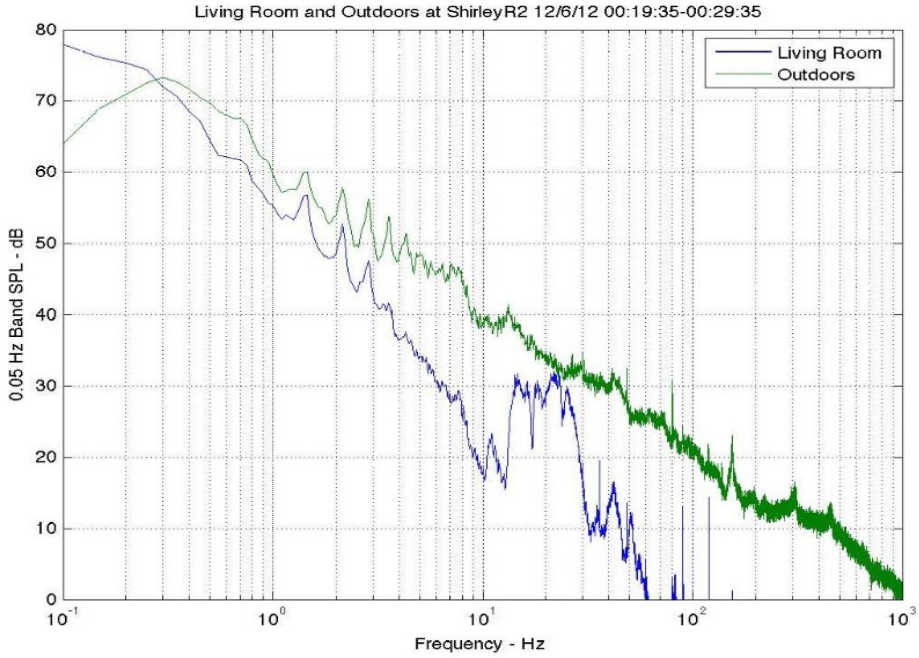

Fig 1 Shirley Wind Farm Spectra

6. Complex sounds.

The bylaw states that infrasound is "perceived via other senses at lower amplitudes especially for complex non-steady ,non-sinusoidal pressure waves". Here, "other senses" means different senses to hearing and "lower amplitudes" means lower than the hearing threshold. However, we are considering tones at around 1 – 5 Hz ,in the region of 50dB, where the hearing threshold is about 130dB -105dB. There is no evidence that these low levels in the 1-5Hz region have any effect on humans. The Salt OHC threshold is a potential limit, but this threshold is 100dB at 1Hz. Therefore the Salt threshold does not provide evidence for limiting wind turbine blade tones to the levels in the bylaw.

Complex sounds are sounds with a number of components. It is possible that several sounds, which are separately below the hearing threshold, may have combined energy which exceeds the threshold. However, this will not occur for the wind turbine tones of around 1Hz and its harmonics, as they are too low in level for their energy to approach the threshold. Wind turbine tones fluctuate in level and anecdotal claims have been made of large fluctuations, but published measurements show a fluctuation of the peak at about 15dB above the average level (Bray and James 2011). Other measurements have shown a comparable peak fluctuation for infrasound from wind turbines, but also noted that, when the turbines are not operating, there is a similar variation in background infrasound to that which occurs during wind turbine operation. (Zajamsek, Hansen et al. 2014)

Therefore it is concluded that the statement in the bylaw referring to non-auditory perception is not relevant to blade tone infrasound from wind turbines.

7. Natural and other infrasound

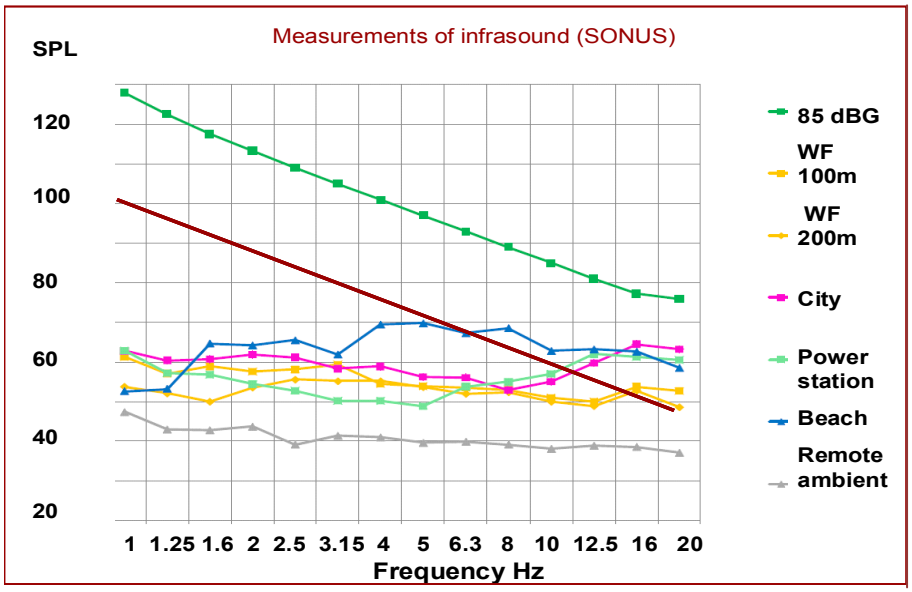

Fig 2 Measurements of infrasound (Turnbull, Turner et al 2012). The top green line Is an 85dBG curve. The lower brown line parallel to this is the Salt threshold for outer hair cell activity.

Levels of infrasound which occur from man-made sources in urban and industrial regions, and naturally in coastal and isolated areas, are similar to those from wind turbines (Turnbull, Turner et al. 2012). Fig 2 shows levels measured by Turnbull, Turner et al. The straight, sloping upper line is 85dBG, which is an approximate limit for audibility The straight line below this is Salt's assumed outer hair cell threshold. The lines below this are the spectra for various infrasound sources. The natural beach infrasound and the artificial city infrasound are greater than the wind farm (WF) infrasound. All sources, natural and man-made exceed the Salt threshold at the higher end of the infrasound region. Note that the wind farm measurements are at only 100m and 200m from the wind farm and will be lower at normal separation distances.

Measurements at proposed windfarm sites have shown that third octave background low frequency sound levels increase when hub height wind speeds are at the turbine design value (Guldberg 2012). These low frequency background levels are similar to, or greater than, the predicted low frequency wind turbine noise at neighbouring properties and are also below the normal hearing threshold. Other current work has shown that at distances of 1.8km and 2.7km from the Macarthur wind farm in Australia, which has 145 turbines, there is no difference in infrasound levels from before construction to when the wind farm is operating. (Evans 2013). Infrasound from wind turbines can be extracted from background noise up to around 10km from the wind turbines, but this requires complex equipment and processing and does not imply that infrasound is significant at 10km.(Styles , England et al. 2005)

Natural infrasound in the region of 0.2Hz is a common occurrence, originating in microbaroms[1]. For example, microbarom 6 hour averages are in the region of 70 to 90dB. (Waxler and Gilbert 2006), whilst Shams shows microbarom power spectral

[1] Microbaroms are infrasonic waves which are generated by marine storms, when ocean surface waves radiate energy into the atmosphere. The waves have a frequency of about 0.2Hz (5 second period) and propagate for thousands of kilometres through the atmosphere, so that they are detected over land.

density as high as 120dB at 0.2Hz. (Shams, Zuckerwar et al. 2013). We are not affected by this natural infrasound, which is at higher sound pressure levels than the wind turbine infrasound at 0.2Hz. The whole body vibration frequency which is most sensitive for production of motion sickness is about 0.2Hz (Kennedy, Allgood et al. 1987). Consequently, it has been suggested that 0.2Hz infrasound is especially noxious to humans, (Schomer, Erdreich et al. 2013), but the wide occurrence of microbaroms at higher levels than from wind turbines, at similar frequency to the sound from wind turbines, makes this unlikely. Additionally, we produce high internal levels of infrasound, originating in heartbeat, breathing etc. (Leventhall 2013).

A common source of infrasound is from walking or jogging, as the resulting body movement leads to changes in the height of the ear. Walking exposes us to infrasound at about 1Hz at a level of around 75dB (Stead, Cooper et al. 2014). This is greater than that from wind turbines at 1Hz.

8 Conclusions.

Science does not support the conditions in the Plympton-Wyoming bylaw, which is largely aimed at restricting blade passing tones. There is no evidence that the very low level of blade passing tones affects humans, whilst there is evidence that it does not.

The bylaw only serves to discredit the Town Councillors who adopted it, and those who advised them in its development.

9. Appendix

CORPORATION OF THE TOWN OF PLYMPTON-WYOMING BY-LAW Number 62 of 2014
Being a by-law to provide for the regulation of wind turbine noise within the Town of Plympton-Wyoming

WHEREAS section 9 of the Municipal Act, 2001, S.O. 2001, c. 25, as amended, provides that a municipality has the capacity, rights, powers and privileges of a natural person for the purpose of exercising its authority under this or any other Act;

AND WHEREAS subsections 11 (2) and 11 (3) of the *Municipal Act, 2001* provides that a municipality may pass by-laws respecting: in paragraph 5 of s.11(2), Economic, social and environmental well-being of the municipality; in paragraph 6 of s.11 (2), Health, safety and well-being of persons; in paragraph 7 of s.11(2), Services and things that the municipality is authorized to provide under subsection (1); in paragraph
8 of s.11(2), Protection of persons and property; in paragraph 9 of s.11(3), Animals; in paragraph 7 of s.11(3), Structures including fences and signs;

AND WHEREAS subsection 14(1) of the *Municipal Act, 2001* provides that a by-law is without effect to the extent of any conflict with, (a) a provincial or federal Act or a regulation made under such an Act; or (b) an instrument of a legislative nature, including an order, licence or approval, made or issued under a provincial or federal Act or regulation;

AND WHEREAS subsection 14(2) of the *Municipal Act, 2001* provides that, without restricting the generality of subsection 14(1) of the *Municipal Act, 2001,* there is a conflict between a by-law of a municipality and an Act, regulation or instrument described in that subsection if the by-law frustrates the purpose of the Act, regulation or instrument.

AND WHEREAS section 128 of the *Municipal Act, 2001* provides that a municipality may prohibit and regulate with respect to public nuisances, including matters that, in the opinion of Council are or could become public nuisances;

AND WHEREAS section 129 of the *Municipal Act, 2001* provides that, without limiting sections 9 and 10 of the Act, a municipality may: (a) prohibit and regulate with respect to noise, vibration, odour, dust and outdoor illumination, including indoor lighting that can be seen outdoors; and (b) prohibit the matters described in clause (a) unless a permit is obtained from the municipality for those matters and may impose conditions for obtaining, continuing to hold and renewing the permit, including requiring the submission of plans;

AND WHEREAS in the opinion of Council of the Corporation of the Town of Plympton- Wyoming, certain kinds of noise are or could become a public nuisance;

AND WHEREAS section 444 of the *Municipal Act, 2001* provides that the municipality may make an order requiring the person who contravened the by-law or who caused or permitted the contravention or the owner or occupier of the land on which the contravention occurred to discontinue the contravening activity, and any person who contravenes such an order is guilty of an offence;

AND WHEREAS section 447.8 of the *Municipal Act, 2001* provides that a by-law of a municipality made under this or any other Act may,
(a) adopt by reference, in whole or in part, with such changes as the council considers appropriate, any code, standard, procedure or regulation as it stands at a specific date, as it stands at the time of adoption or as amended from time to time; and
(b) require compliance with any code, standard, procedure or regulation so adopted; AND WHEREAS the people have a right to and should be ensured an environment free from unusual, unnecessary, or excessive sound (i.e. noise) or vibration which may degrade the quality and tranquility of their life or cause nuisance; and

AND WHEREAS it is the policy of the Council to reduce and control such noise or vibration;

NOW THEREFORE, the Council of the Corporation of the Town of Plympton• Wyoming enacts as follows:

Interpretation

In this by-law:

"A-weighted Sound Pressure Level" means the Sound Pressure Level modified by application of an A-weighting network. It is measured in decibels, A-weighted, and denoted "dBA";

"A-weighting" means the frequency weighting characteristic as specified in the International Electrotechnical Commission (IEC) Standard 61672, and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound. It is denoted as "A";

"Decibel" means a dimensionless measure of Sound Level or Sound PressureLevel, denoted as dB;

"Equivalent Sound Level" is the value of the constant sound level which would result in exposure to the same total A-weighted energy as would the specified time• varying sound, if the constant sound level persisted over an equal time interval. It is denoted Lcq and is measured in dB A-weighting (dBA); Other weightings including un-weighted time varying sound can also be expressed as equivalent sound levels.

"Infrasonic Barometric Pressure Disturbance" (IBPD) refers to Barometric Pressure Disturbances inside any home in the frequency range of from 0.2 Hz to 20Hz.

"Infra-sound" means sound with energy in the frequency range of 0-20 Hz. It is often considered to be inaudible for most people unless at a relatively high amplitude but has been shown to be perceived

via other senses at lower amplitudes especially for complex non-steady, non-sinusoidal pressure waves. Modern utility scale wind turbines produce an infrasonic blade passage tone typically centered at a frequency of 1 Hz or lower. [E.G. a wind turbine with hub rotation of 10 rpm would have a blade pass frequency of 0.5 Hz] The most significant noise inside of a dwelling occurs from tones produced by the rotating blades of the wind turbine in the frequency range between 0.25 Hz and 10 Hz. Most of this energy is below 3 Hz with sound pressures increasing as frequency decreased down to the blade pass frequency.

"Inhabitants" means one or more persons who reside in the Town of Plympton• Wyoming;

"Low Frequency Noise" (LFN) refers to sounds with energy in the lower frequency range of 20 to 200 Hz.

"Municipality" means the geographic area whose Inhabitants are incorporated as the Corporation of the Town of Plympton-Wyoming;

"Noise" means unwanted sound; "Proponent" means a person who has been issued a Renewable Energy Approval for a Wind Facility;

"Renewable Energy Approval or REA" means an approval authorizing the construction, installation, operation, use and retiring of a Wind Facility, issued pursuant to section 47.5 of the *Environmental Protection Act,* R.S.O. 1990, Chapter E.19;

"Sound" is an oscillation in pressure, stress, particle displacement or particle velocity, in a medium with internal forces (e.g. elastic, viscous), or the superposition of such propagated oscillations, which may or may not cause an auditory sensation;

"Sound Level" means the A-weighted Sound Pressure Level;

"Sound Level Limit" is the limiting value described in terms of the one hour A•
weighted Equivalent Sound Level;

"Sound Pressure" means the instantaneous difference between the actual pressure and the average or barometric pressure at a given location. The unit of measurement is the micro pascal (µPa);

"Sound Pressure Level" means twenty times the logarithm to the base 10 of the ratio of the effective pressure (µPa) of a sound to the reference pressure of 20
µPa;

"Wind Facility" means a renewable energy generation facility at which wind is used to generate electricity through the use of one or more Wind Turbines and associated infrastructure;

"Wind Turbine" means (a) the structure that supports an electrical generator used to convert wind energy into electricity, (b) the electrical and mechanical
equipment, including electrical generators, used to convert wind energy into electricity, and (c) the based and foundation to which the structure mentioned in clause (a) is attached;

2. Regulation

(a) A Proponent shall ensure that a Wind Facility for which the Proponent has been issued an REA, is operated in compliance with the REA, specifically the Sound Level Limits stated in the REA.

(b) A Proponent shall submit an electronic copy of final versions of the following to the clerk of the Municipality at the same time as it is being submitted to an office of the Ontario Ministry of the Environment:

(i) Acoustic Audit Report - Immission, if one is required by an REA issued to the Proponent for a Wind Facility;

(ii) Acoustic Audit Report- Emission, if one is required by an REA issued to the Proponent for a Wind Facility;

(iii) A record of any complaint alleging an Adverse Effect due to noise caused by the operation of a Wind Facility operated by the Proponent pursuant to an REA, if such record is required to be created and provided to an office of the Ontario Ministry of the Environment by the REA.

(c) A Proponent shall provide the clerk of the Municipality with a toll-free number and email address for noise complaints at least 60 days prior to generating electricity for the first time, at the Wind Facility for which the Proponent has been issued an REA.

(d) No Wind Facility shall make, cause or permit the emission of Infra-sound in the frequency between 0 Hz and 20 Hz. Infra-sound is deemed to be excessive when measurements inside of dwellings, using instruments suitable for sound pressure measurements at frequencies of 0.1 Hz to 20 Hz identify blade pass tones and their harmonics, present during wind turbine operation, when the following conditions are present and limits are exceeded:

i) Tests inside a dwelling at locations associated with complaints show that there is a tone at the blade pass frequency (or its harmonics) during periods of wind turbine operation that are not present when wind turbines are not operating confirms the presence of wind turbine blade pass tones and/or harmonics.

ii) If the blade pass tone, or any of its harmonics, produce a sound pressure level of 50 dB or more when energy averaged over a period of one to several minutes or more, and,

iii) The crests (peaks) of the sound pressure exceed this average by 10 dB or more.

(e) No Wind Facility shall make, cause or permit the emission of LFN, where the difference between a C-weighted sound level and an A-weighted sound level is greater than 15 decibels at any measurement point inside or outside an occupied structure, or the difference between an un-weighted sound level (including infrasound from 0.1 Hz and above, using an instrument rated to measure infrasound down to 0.1 Hz) and an A-weighted sound level is greater than 20 decibels at any such measurement point.

(f) No Wind Facility shall make, cause or permit IBPD, where any cyclic pressure disturbance having amplitude at any given frequency in the stated frequency range exceeds 2 milli-Pascal's RMS (0.002 Pascal RMS) for a repeatable duration of 10 seconds or more in any 40-second period:

i) Given frequency: Means an identifiable repetition rate, which is continuous for the 10-second measurement, having at least 2 full cycles that exceed +/- 2.828 milli-Pascal peak (=0.002 Pa RMS). The IBPD measurements shall be made with doors and windows closed. Equivalence: 0.002 Pascal RMS is equivalent to 40dBZ.

(ii) Measurement Approach: Micro-Barometer transducers may be used in conjunction with modern digital Oscilloscopes and Spectral Analysis equipment to perform this measurement. Some special purpose microphones may also be used (Infrasonic microphones). Standard noise measurement meters cannot generally be used to make this measurement.

(iii) Source Identification: The source of IBPD can be identified as required by incorporating Cross-Correlation techniques available in modern spectral analysis equipment, in conjunction with optical or other correlation devices or remote transducers.

(g) Without limiting the generality of the foregoing, no Wind Facility shall emit or cause or permit the emission of a nuisance resulting from any act listed herein, within the geographical limits of the Town of Plympton-Wyoming, except as permitted by Section 3.

(h) The Wind Facility and associated equipment shall, at all times, conform to Ministry of Environment Noise Guidelines. An analysis, prepared by a qualified acoustician, shall be presented to demonstrate compliance with these noise standards and be consistent with all Ministry of the Environment Noise Guidelines then in force.

3. Exemptions Granted by the Municipality

(1) Application to the Municipality

Notwithstanding anything contained in this by-law, any person may make application to the Municipality for an exemption from any of the provisions of this by-law with respect to any source of sound and the Municipality may refuse to grant any exemption or may grant the exemption applied for or any exemption of lesser effect and any exemption granted shall specify a time period during which it is effective and may contain such terms and conditions as the Municipality deems appropriate.

(2) Details of Application to the Municipality

The application mentioned in subsection (1) shall be made in writing, in the form attached as Schedule 1, and shall contain:

(a) The name, address and telephone number of the applicant;
(b) A description of the source and location of sound in respect of which exemption is sought;
(c) A statement of the particular provision or provisions of this by-law from which the exemption is sought;
(d) The period of time, of a duration not in excess of six months, for which the exemption is sought;
(e) The reasons why the exemption should be granted;
(f) A statement of the steps, if any, planned or presently being taken to bring about compliance with the by-law;

(3) Breach

Any breach of the terms or conditions of an exemption granted by the Municipality that is caused or permitted by the applicant shall render the exemption null and void.

4. Severability

If a court of competent jurisdiction should declare any section or part of a section of this by- law to be invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of the by-law and it is hereby declared that the remainder of the by-law shall be valid and shall remain in force.

5. Offence and Penalties

(a) Every person who contravenes any provision of this by-law is guilty of an offence.

(b) A person who is convicted of an offence under this by-law is liable, for each day or part of a day that the offence continues, to a minimum fine of $500 and a maximum fine of $10,000, and the total of all daily fines may exceed $100,000.

(c) A person who is convicted of an offence under this by-law is also liable to pay all reasonable costs incurred by the Municipality in conjunction with obtaining the conviction of that person. With respect to the costs of acoustical testing performed to obtain the conviction, the costs will only be considered reasonable if the acoustical testing was performed under the supervision of an engineer licensed to practice engineering in the Province of Ontario who meets the definition of Acoustical Consultant set out in the REA for the person's Wind Facility;
(d) The court in which the conviction has been entered and any court of competent jurisdiction thereafter may make an order prohibiting the continuation or repetition of the offence by the person convicted, and such order shall be in addition to any other penalty imposed on the person convicted.

6. Enforcement

This by-law shall be enforced by a By-law Officer of the Town of Plympton• Wyoming in accordance with Part III of the *Provincial Offences Act,* R.S.O. 1990, c.P.33.

A By-law Officer may enter on land at any reasonable time for the purpose of carrying out an inspection to determine whether or not this bylaw is being complied with. Entry to any place actually being used as a dwelling unit shall be subject to the requirements of the *Municipal Act,* 2001, as amended.

7. This by-law may be referred to as the Wind Turbine Noise By-Law.

a. This by-law 37 of 2014 be withdrawn and that all other by-laws or parts of by-laws inconsistent with this by-law are hereby repealed.

9. This by-law shall come into full force and effect on the date of the final passing thereof.

Read a first and second this 24th day of September, 2014.

Lonny Napper

Mayor – Lonny Napper

Brianna Coughlin

Clerk – Brianna Coughlin

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