APPENDIX A

Supporting Information

Ministry of the Environment | Ministère de l'Environnement

Ontario

ACOUSTIC ASSESSMENT REPORT CHECK-LIST

Company Name: _____

Company Address: _____

_____

Location of Facility: _____

_____

The attached Acoustic Assessment Report was prepared in accordance with the guidance in the ministry document "Information to be Submitted for Approval of Stationary Sources of Sound" (NPC 233) dated October 1995 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact: _____

Name: _____

Title: _____

Phone Number: _____

Signature: _____

Date: _____

Technical Contact: _____

Name: _____

Representing: _____

Phone Number: _____

Signature: _____

Date: _____

ACOUSTIC ASSESSMENT REPORT CHECKLIST

	Required Information		
		Submitted	Explanation/Reference
1.0	**Introduction** (Project Background and Overview)	☐ Yes	
2.0	**Facility Description**		
	2.1 Operating hours of facility and significant Noise Sources	☐ Yes	
	2.2 Site Plan identifying all significant Noise Sources	☐ Yes	
3.0	**Noise Source Summary**		
	3.1 ***Noise Source Summary Table***	☐ Yes	
	3.2 Source noise emissions specifications	☐ Yes	
	3.3 Source power/capacity ratings	☐ Yes	
	3.4 Noise control equipment description and acoustical specifications	☐ Yes	
4.0	**Point of Reception Noise Impact Calculations**		
	4.1 ***Point of Reception Noise Impact Table***	☐ Yes	
	4.2 Point(s) of Reception (POR) list and description	☐ Yes	
	4.3 Land-use Zoning Plan	☐ Yes	
	4.4 Scaled Area Location Plan	☐ Yes	
	4.5 Procedure used to assess noise impacts at each POR	☐ Yes	
	4.6 List of parameters/assumptions used in calculations	☐ Yes	
5.0	**Acoustic Assessment Summary**		
	5.1 ***Acoustic Assessment Summary Table***	☐ Yes	
	5.2 Rationale for selecting applicable noise guideline limits	☐ Yes	
	5.3 Predictable Worst Case Impacts Operating Scenario	☐ Yes	
6.0	**Conclusions**		
	6.1 Statement of compliance with the selected noise performance limits	☐ Yes	
7.0	**Appendices** (Provide details such as)	☐ Yes	
	Listing of Insignificant Noise Sources	☐ Yes	
	Manufacture's Noise Specifications	☐ Yes	
	Calculations	☐ Yes	
	Instrumentation	☐ Yes	
	Meteorology during Sound Level Measurements	☐ Yes	
	Raw Data from Measurements	☐ Yes	
	Drawings (Facility / Equipment)	☐ Yes	

BACKGROUND ON ENVIRONMENTAL ACOUSTICS

How is an Audible Sound Generated?

Any vibrating surface has the potential to oscillate the surrounding air. These movements create pressure fluctuations that disperse from the surface in the form of a pressure wave, analogous to an object falling into a calm water surface, with the intensity of the wave decreasing with distance. An ear, acting like a microphone, responds to the air pressure fluctuations allowing the brain to process the fluctuations as an audible sound. The average human ear's response to sound is in the range of 20 Hz to 20,000 Hz, with the upper frequency range decreasing with age and over exposure to noise.

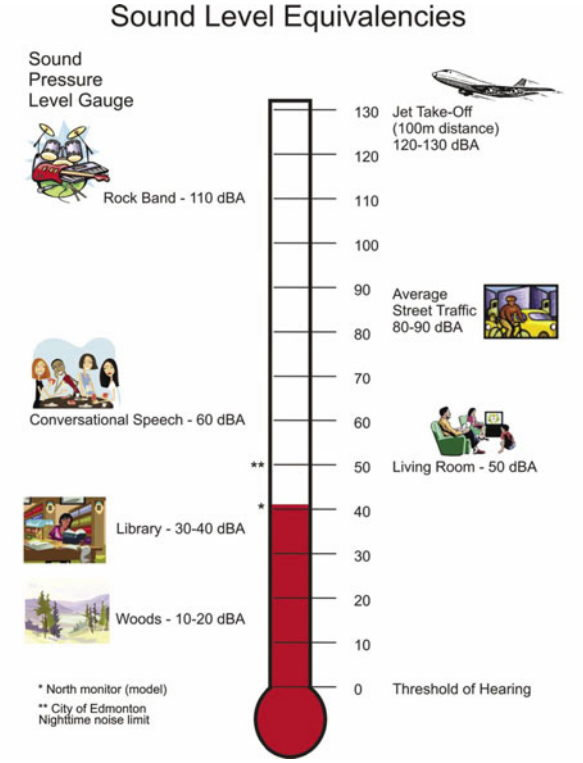
Sound Pressure Levels – why do we apply Decibels?

As noted above, the human ear has a wide frequency range of response, and the ability to hear an enormous range of sound intensities within those frequencies. For example, a jet engine take-off may produce one million times more sound intensity than sounds of nature in a typical forest. We apply the decibel or logarithmic scale

Since decibels are based upon a logarithmic scale, it is important to have an understanding of how a change in the sound level will be perceived. In dealing with environmental noise levels, differences of 1 or 2 dB are considered to be insignificant and typically not detectable by the human ear; a change of 3 to 5 dB is considered to be detectable but generally not sufficient to cause an adverse reaction to the sound; a difference of 5 to 10 dB is considered to be significant and may cause and adverse reaction and mitigation is recommended.

What is Noise?

When sounds interfere with human activity, it is considered noise. The degree of annoyance from a noise exposure is highly subjective, as it depends on the person, the environment, and many non-acoustical factors such as: temperature, lighting, and occupant activity and occupation. A recent study by Health Canada [Health Canada,2002] found that while less than 10% of the people surveyed were either very bothered or extremely bothered by noise exposure, there appeared to be significant variance amongst population densities (5% very bothered in urban areas versus 1% very bothered in rural areas) and amongst geographical regions (e.g. 5% very bothered in Ontario versus 2.4% very bothered in Alberta). One may conclude that if a noise annoyance study were conducted in an industrial, rural town, they may receive significantly different results if the same study was conducted in a non-industrial, urban area.



How is Sound Measured?

Sound is measured using a Sound Level Meter (SLM). A modern SLM consists of a polarized condenser microphone, digital memory, and a variety of acoustic filters allowing for various narrow band sound measurements in addition to averaged overall levels. SLM response times are also key considerations in sound measurement, including 'slow' response for sounds that vary slowly with time, 'fast' response for sounds that vary quickly with time, and 'impulse' for short-duration impact type sounds.

How is Sound Energy Reduced in the Environment?

The most significant mechanism for sound reduction within the environment is geometric spreading or divergence loss. For a point source, this results in a 6 dB reduction in sound level for every doubling of distance. In practical terms, this is limited in its application, as very few sources are found to be greater than 500 to 1,000 m from significant noise receptors (e.g. residences, hospitals, schools, etc.) in most cities and towns. Air absorption is another way energy is extracted from a propagating sound wave. And, a ground interaction also influences the sound energy reduction, as sound waves interact with the ground (often with variable acoustic impedance), causing destructive interference between the direct sound from a source and the indirect sound from the ground-reflected sound.

Noise Emission versus Noise Immission

The sounds generated by equipment produce noise emissions that are typically organized within noise source inventory for a particular facility or process. The incoming sounds from all noise sources (L_{pi}) are called noise immissions, and are based on the cumulative, logarithmic summation of the sound pressure levels (L_{pT}), as follows:

$$L_{p_T} = 10 \log \left(\sum_{i=1}^{N} 10^{\frac{L_{pi}}{10}} \right)$$

ISO 9613 – Basics of Outdoor Sound Propagation

Outdoor sound propagation, as detailed in the international standard ISO 9613, Parts 1 and 2, and industry best practices, mainly consider five (5) main acoustical mechanisms, including:

- Source geometry and type (point, line, coherent incoherent);
- Meteorological conditions (wind and temperature variants, atmospheric turbulence);
- Atmospheric absorption of sound;
- Terrain – type and contours (ground absorption and reflection); and,
- Obstructions (buildings, barriers, vegetation, etc.).

Hemispherical sound spreading

For a point source, in a loss-less medium with no reflections, the sound levels decay by 6 dB per doubling of distance. If the source is directional, an additional term (Directivity Index, DI) is needed to account for the uneven distribution of sound as a function of direction. The DI is the difference between the actual sound pressure and the sound pressure from a non-directional source with the same acoustic power. It can be validated experimentally, or calculated analytically such as a moving piston at the end of a long tube (Beranek, 1954).

Atmospheric Absorption

Sound energy is dissipated in the air by two main mechanisms:

- Viscous losses due to the friction between air molecules; and,
- A relaxation process, where molecules vibrate and rotate in the atmosphere causing interference with the incoming sound.

The atmospheric absorption of sound has been found to be a function of frequency, temperature, and molar concentration of water vapour. At distances of less than 500 m, the atmospheric absorption is generally insignificant (i.e. < 1 dB). At larger separation distances, this phenomena may be significant, in particular within the high frequencies (i.e. > 1 KHz). The most common atmospheric settings used in acoustical prediction is 10 deg. Celsius and 70% relative humidity (ISO 9613-2).

Meteorological Effects

Over open ground areas, vertical wind velocity gradients may exist due to friction between the moving air and ground. Wind speed profiles are strongly dependent on the time of day, weather conditions, and the nature of the surface (roughness). The wind speed, in the absence of turbulence, will vary logarithmically up to a height of 100 m, with negligible changes at higher altitudes. The velocity gradient creates a sound speed profile (i.e. changing speed of sound versus height), influencing the propagation where the sound wave propagating in the direction of wind will be bent downward, and sound wave propagation against the wind will be bent upward. This process is called refraction, where the sound waves are ‘curved’ in the direction of the lower sound speed.

Analogous to wind direction, refraction may occur due to vertical temperature gradients. The speed of sound in air is proportional to the square root of the temperature. In the presence of a temperature gradient, the effect is to refract sound waves in the direction of lower sound speed, or lower temperature. Typically, this may result in sound waves refracting upward during a sunny afternoon period (negative temperature gradient), and sound waves refracting downward during a calm evening period (positive temperature gradient).

Refraction effects can cause both increases and decreases in sound levels compared to a uniform atmosphere. One common approach is to calculate the sound levels assuming no refraction, assuming this represents a reasonable prediction of the equivalent or time averaged sound level that would be observed.

Ground Interactions

The surface over which sound propagates is often somewhere between highly reflective and highly absorptive. The prediction of the ground interaction with the sound propagation requires knowledge of the reflective and absorptive properties, known as the acoustic impedance, of the intervening ground surface(s). The main factors in determining the ground effect include the distance between the source and receiver (i.e. direct path), distance of any ground reflected paths, angle of incidence of the reflected paths, and the flow resistivity of the surface that is used to derive ground impedance. Experiments have been used to derive flow resistivity for various ground surfaces, including snow covered ground (very low resistivity), grass (moderate resistivity), and asphalt areas (very high resistivity). Vegetation and foliage may provide a minor amount of sound attenuation when significantly dense and only significant at large separation distances (i.e. greater than 200 m).

Noise Barriers

When the line of sight between a noise source and a receiver is obstructed by a non-porous wall, building, or berm, the sound waves must diffract around the object in order to be heard at the receiver. This effect is limited by the sound reduction of the obstruction itself. Typically, the sound propagating through the obstruction or barrier must be 10 dB less than the sound waves diffracting around it. The barrier material's acoustic effectiveness is typically described as the Transmission Loss (TL, dB). The measure of the line of sight blockage that a barrier provides is called the Fresnel number, and is inversely proportionally to the wavelength of sound. Therefore, a barrier's effectiveness increases with increasing frequency.

THE CORPORATION OF THE MUNICIPALITY OF CLARINGTON

BY-LAW 2007 - 071

Being a By-law to prohibit noises likely to disturb the inhabitants of the Municipality of Clarington and to repeal By-law 89-184 and its amendments

WHEREAS Section 129 of *the Municipal Act, 2001,* S.O. 2001, Chapter 25 states that a local municipality may prohibit and regulate noise matters;

AND WHEREAS The Council of the Corporation of the Municipality of Clarington deems it appropriate to enact a by-law to regulate and control noise levels within the Municipality of Clarington;

NOW THEREFORE the Council of the Corporation of the Municipality of Clarington enacts as follows:

1. GENERAL PROVISIONS

1.1 No person shall ring any bell, blow or sound any horn or cause the same to be rung, blown or sounded, or shout or create, cause or permit any unusual or excessive noises likely to disturb any other inhabitant of the Municipality of Clarington.

1.2 Without limiting the generality of section 1.1 the following are deemed to be noises likely to disturb the inhabitants of the Municipality of Clarington:

(a) the ringing of bells, blowing of horns or sounding of sirens on any motor vehicle except to the extent that such ringing, blowing or sounding is required by law or by the requirements of safety;

(b) the sound or noise from or created by a radio or phonograph, or any musical or sound-producing instrument of whatsoever kind when such radio or phonograph or instrument is played or operated in such manner or with such volume as to annoy or disturb the peace, quiet, comfort or repose of any individual in any dwelling house, apartment house, hotel or other type of residence outside the premises where the instrument is being played;

(c) the grating, grinding or rattling noise or sound caused by a condition of disrepair or maladjustment of any motor vehicle, motorcycle, or other vehicle whatsoever or part or accessory thereof;

(d) the blowing of any steam or air whistle attached to or used in connection with any stationary boiler or other machine or mechanism, except for the purpose of giving notice to workmen of the time to commence or cease work or as a warning of danger;

e) the noise made by power lawnmowers, outboard motors or similar power motors;

(f) the noise made by the discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, motor vehicle or motorcycle except through a muffler or other device which effectively prevents loud or explosive noise;

(g) any noise which may be heard beyond the lot upon which it is made at sufficient volume to disturb persons beyond such lot;

(h) the persistent barking, calling or whining, or other similar persistent noise made by any domestic pet, or any other animal kept, or used for any purpose other than agriculture.

2. EXEMPTIONS

2.1 Notwithstanding the other provisions of this By-law, the restrictions listed in sections 1.1 and 1.2 shall not apply to prevent:

(a) the use, in a reasonable manner, of any apparatus or mechanism for the amplification of the human voice or music in a public place within the limits of the Municipality;

(b) any military or other band or any parade operating with written permission having been first obtained from the Municipality;

(c) any police, fire, public or emergency service vehicle or ambulance in the lawful discharge of its assigned duties;

(d) any sound arising from the operation of any railway which operates under the Railway Act of Canada or from any plant or work in connection with any such railway;

(e) the sound of church bells or carillons; and

(f) the making by any person upon his or her own property, noise which is reasonable and necessary taking into account the volume and time of day, for his or her enjoyment and use of such property provided that such noise does not interfere with the lawful enjoyment of any adjoining property owner or occupant.

2.2 Notwithstanding the other provisions of this By-law, the restrictions listed in sections 1.1 and 1.2 shall not apply to a person who permits or causes the emission of sound in connection with any traditional, festive, or religious activities, and to such activities listed hereunder;

(a) the Bowmanville Foundry Co. Ltd., manufacturing;

(b) Goodyear Canada Inc., manufacturing;

(c) Oshawa Ski Club, recreational snowmaking;

(d) Mosport Park, automobile and motorcycle racing;

(e) Blue Circle Canada Inc., its licensed pit and quarry operations and all accessory uses related thereto.

3. CURFEWS

3.1 A noise curfew shall apply to the following operations and/or businesses within the Municipality of Clarington:

(a) the Orono Fish and Hunt Club, shooting range;

(b) the Union Rod and Gun Club, shooting range; and

(c) the Marksman Club of Oshawa, shooting range.

This curfew shall commence at 11:00 p.m. and continue until 7:00 a.m. the following morning, Sunday night through Saturday morning, then commence again at 11:00 p.m. Saturday night and continue until 10:00 a.m. Sunday morning.

3.2 With respect to a licensed canine kennel there shall be a noise curfew imposed, to wit:

(a) evenings - Sunday to Friday inclusive, there shall be a curfew commencing at 11:00 p.m. and continuing until 7:00 a.m. of the following day; Saturday, the curfew shall commence at 11:00 p.m. and shall continue until 8:00 a.m. Sunday morning;

(b) during the periods identified as the curfew hours, any kennel noise, more particularly the barking of dogs, which carries beyond the boundary of the property upon which the licensed kennel is situated shall be deemed to be a contravention; and

(c) that during non-curfew hours, that is from 7:00 a.m. to 11:00 p.m., Monday to Saturday inclusive, and from 8:00 a.m. to 11:00 p.m. Sunday, continuous barking for a period in excess of 1 hour at any time shall be deemed to be a contravention.

3.3 A noise curfew shall apply to any noise from any excavation or construction work whatsoever, including the erection, demolition, alteration or repair of any building;

(a) arising between the hours of 11:00 p.m. until 7:00 a.m. the following day, Monday through Saturday, 11:00 p.m. Saturday night until 10:00 a.m. Sunday and 5:00p.m. Sunday until 7:00 a.m. Monday morning.

(b) except in the case of urgent necessity and then only under prior authorization from the Municipality.

3.4 During the time when construction, excavation or demolition work is permitted on Sunday as outlined in Section 3.3 above, such work shall not include the operation of any mechanically powered excavation or earth moving equipment.

3.5 A noise curfew shall apply to the use of propane guns and other such similar devices used to protect agricultural produce from predation by any animal, reptile or bird. This curfew shall be commence at 11:00 p.m. and continue until 7:00 a.m. seven days per week.

3.6 Time restrictions as set out above in this by-law for Sundays shall apply in the same manner for all statutory holidays.

3.7 No person shall cause, create or permit any noise in contravention of the curfew times as outlined throughout Section 3.

4. ENFORCEMENT

4.1 This By-law shall apply to all property within the limits of the Municipality and shall be enforced on a complaint basis only by the Durham Regional Police Service and the Clarington Municipal Law Enforcement Officers and, where applicable, the Clarington Animal Services Officers.

4.2 The complaint shall include the name, address and telephone number or other contact information of the complainant. Failure to provide the required complainant information shall render the complaint incomplete and it will not be investigated.

4.3 Anonymous complaints or third party complaints which attempt to obscure the identity of the complainant will not be investigated.

4.4 Where an officer has determined that a complaint has been filed for a malicious or vexatious reason or as part of an ongoing pattern of harassment, the officer may, after conferring and confirming with the Manager of Municipal Law Enforcement, cease the investigation and close the file with no further action taken. The officer shall then advise the complainant of this in writing.

4.5 Where the subject matter of an investigation is the same or the circumstances are substantially similar to that for which charges or other court actions have already been initiated, no additional court action pursuant to this By-law will be initiated by the Municipality.

4.6 Nothing in this By-law prevents any individual from privately initiating a charge for an alleged offence.

5. PENALTY

5.1 Every person who contravenes any provision of this by-law is guilty of an offence and upon conviction liable to a fine as set out in the *Provincial Offences Act.*

5.2 Should any section, clause, or provision of this By-law be declared by a court of competent jurisdiction to be invalid, the same shall not affect the

validity of this By-law as a whole or any part thereof, other than the part so declared to be invalid.

5.3 The provisions of this by-law shall come into full force and effect immediately upon its final passing by Council.

5.4 By-law 89-184 and its amendments are hereby repealed.

Read a first time this 2nd day of April, 2007
Read a second time this 2nd day of April, 2007
Read a third time and finally passed this 2nd day of April, 2007

Jim Abernethy
Mayor

Patti L. Barrie
Municipal Clerk