



Taseko Prosperity Gold-Copper Project

Appendix 4-3-A

Appendix 4-3-A Noise Descriptors

A.1 Commonly Used Noise Terminology

Airborne Sound: Sound that reaches the point of interest by propagation through air.

Ambient Noise: All noises that exist in an area and are not related to a facility covered by Directive 38. Ambient noise includes sound from other industrial noise not subject to this directive, transportation sources, animals, and nature. Ambient noise is the same as background sound level.

Ambient Sound Level (ASL): The ASL consists of all noise in the area that is not related to ERCB-regulated facilities. This noise includes sound from other non-ERCB regulated industrial facilities, transportation sources, animals and nature. The ASL does not include any energy-related industrial component and must be measured without it. The ASL can be measured when the sound level in an area is not felt to be represented by the Basic Sound Levels in ERCB Directive 38, p. 16, Table 2. The ASL must be measured under representative conditions. As with comprehensive sound levels, representative conditions do not constitute absolute worst-case conditions (i.e., the quietest day in this case) but conditions that portray typical conditions for the area.

Attenuation: The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.).

Background Sound Level: It includes noise from all sources other than the sound of interest (i.e. sound other than that being measured, for example, sound from other industrial noise not being measured, transportation sources, animals, and natures sound).

Basic Sound Level (BSL): The A-weighted Leq sound level commonly observed to occur in the designated land-use categories with industrial presence. The BSL is assumed to be 5 dBA above the ASL and is set out in Table 2 of Directive 38.

Calibration: The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

Calibrator (Acoustical): A device which produces a known sound pressure on the microphone of a sound level measurement system, and is used to adjust the system to standard specifications.

Category: A classification of a dwelling unit in relation to transportation routes used to arrive at a BSL.

Class A Adjustment: Consists of the sum of adjustments that account for the adjustment seasonal nature of the noise source, absence of both tonal and impulse/impact components, and the actual ambient sound level in an area. It cannot exceed +10 dBA. The Class A adjustment is added to the BSL, the daytime adjustment, and the Class B adjustment to arrive at a permissible sound level.

Class B Adjustment: An adjustment based on the duration of a noisy activity that recognizes that additional noise can be tolerated if it is known that the duration will be limited. An adjustment of B1, B2, B3, or B4 may be selected as applicable.

Comprehensive Sound Level (CSL): The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The CSL does include industrial components and must be measured with them, but it

should exclude abnormal noise events. The CSL is used to determine whether a facility is complying with ID 99-8.

Daytime: Defined as the hours from 07:00 to 22:00.

Daytime Adjustment: An adjustment that allows a 10 dBA increase because daytime sound levels are generally about 10 dBA higher than night-time values.

dB - Decibel: The logarithmic units associated with sound pressure level, sound power level, or acceleration level. See sound pressure level, for example.

dBA - Decibel, A-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to quiet sound levels. The resultant sound pressure level is therefore representative of the subjective response of the human ear. A-weighted sound pressure levels are denoted by the suffix 'A' (i.e. dBA), and the term pressure is normally omitted from the description (i.e., sound level or noise level).

dB C - Decibel, C-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to loud sound levels. C-weighted sound pressure levels are denoted by the suffix 'C' (i.e. dB C). C-weighted levels are often used in low-frequency noise analysis, as the filtering effect is nearly flat at lower frequencies.

dB L or dB Lin - Decibel, Linear: The logarithmic units associated with a sound pressure level, where the sound pressure signal is unfiltered, and represents the full spectrum of incoming noise.

Decibel Addition:

In acoustics, due to the logarithmic nature of the decibel scale, the addition of two or more sound pressure levels (denoted as SPL1, SPL2 ... SPLn) is done as follows:

$$SPL1 + SPL2 + \dots + SPLn = 10 \log (10^{(SPL1/10)} + 10^{(SPL2/10)} + \dots + 10^{(SPLn/10)})$$

As an example:

$$0 \text{ dB} + 0 \text{ dB} = 3 \text{ dB}$$

$$50 \text{ dB} + 50 \text{ dB} = 53 \text{ dB}$$

$$50 \text{ dB} + 47 \text{ dB} = 52 \text{ dB}$$

$$50 \text{ dB} + 40 \text{ dB} = 50 \text{ dB}$$

Directivity Factor (Q) (also, Directional or Directionality Factor): A factor mathematically related to Directivity Index, used in calculating propagated sound levels to account for the effect of reflecting surfaces near to the source. For example, for a source in free space where the sound is radiating spherically, $Q = 1$. For a source located on or very near to a surface (such as the ground, a wall, rooftop, etc.), where the sound is radiating hemispherically, $Q = 2$. This accounts for the additional sound energy reflecting off the surface, and translates into a +3 dB addition.

Directivity Index: In a given direction from a sound source, the difference in decibels between (a) the sound pressure level produced by the source in that direction, and (b) the space-average sound pressure level of that source, measured at the same distance.

Dwelling Unit: Any permanently or seasonally occupied residence with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling unit if it can be demonstrated that they are in regular and consistent use during the applicable season.

Dwelling Unit (most impacted): The nearest dwelling unit may not necessarily be the one most adversely affected because of factors such as topography or man-made features. For example, the nearest dwelling unit to a facility may be located behind an intervening ridge, while a more distant dwelling unit may be in direct line of sight with the facility. Care must be taken in determining the most impacted dwelling unit.

Energy Equivalent Sound Level (L_{eq}): An energy-average sound level taken over a specified period of time. It represents the average sound pressure encountered for the period. The time period is often added as a suffix to the label (i.e., $L_{eq}(24)$ for the 24-hour equivalent sound level). L_{eq} is usually A-weighted. An L_{eq} value expressed in dBA is a good, single value descriptor of the annoyance of noise.

Exceedance Noise Level (L_N): The noise level exceeded N% of the time. It is a statistical measure of the noise level. For highly varying sounds, the L90 represents the background noise level, L50 represents the median or typical noise level, and L10 represents the short term peak noise levels, such as those due to occasional traffic or a barking dog.

Facility: A facility is any operation used in exploration, processing, development, and transportation of energy resources. A new facility is one that was not in operation prior to the effective date of ID 99-8. An existing facility is one that was in operation prior to the effective date of this directive.

Far Field: Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the “near field” region.

Frequent Aircraft Flyovers: Used in the assessment of categories as part of a site-specific analysis for dwellings that lie within a contour area with a noise exposure forecast (NEF) 25 or greater, as designated by Transport Canada. In the absence of any NEF contours for a local airport, Transport Canada will be referenced for current air traffic statistics. In this case, to qualify for the BSL adjustment, a dwelling must be within 5 km of an airport that has a minimum of nine aircraft takeoffs or landings over the night-time period. Also see entry for Noise exposure forecast.

Free Sound Field (Free Field): A sound field in which the effects of obstacles or boundaries on sound propagated in that field are negligible.

Frequency: The number of times per second that the sine wave of sound or of a vibrating object repeats itself. Now expressed in hertz (Hz), formerly in cycles per second (cps).

Hertz (Hz): Unit of measurement of frequency, numerically equal to cycles per second.

Human Perception of Sound: The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. Table A-1 presents a general guideline.

Table A1: Human Perception of Sound

Increase in Noise Level (dBA)	Perception
1 to 3	Insignificant due to imperceptibility
4 to 5	Just noticeable difference
6 to 9	Marginally significant
10 or more	Significant, perceived as a doubling of sound exposure

Insertion Loss (IL): The arithmetic difference between the sound level from a source before and after the installation of a noise mitigation measure, at the same location. Insertion loss is typically presented as a positive number, i.e., the post-mitigation sound level is lower than the pre-mitigation level. Insertion loss is expressed in dB and is usually specified per 1/1 octave band, per 1/3 octave band, or overall.

Intensity: The sound energy flow through a unit area in a unit time.

Low Frequency Noise (LFN): Noise in the low frequency range, from infrasonic sounds (<20 Hz) up to 100 Hz.

Masking: a) The process by which the threshold of audibility for a sound is raised by the presence of another (masking) sound, or b) The amount by which the threshold of audibility of a sound is raised by the presence of another (masking) sound.

Near Field: The sound field very near to a source, where sound pressure does not obey the inverse-square law and the particle velocity is not in phase with the sound pressure.

Night-time: Defined as the hours from 22:00 to 07:00.

Noise: Unwanted sound.

Noise Level: Same as Sound Level, except applied to unwanted sounds.

Permanent Facility: Any existing or proposed facility that will be at a location longer than two months.

Permanently Occupied Dwelling: A fixed residence occupied on a full-time basis.

Permissible Sound Level (PSL): The maximum sound level that a facility should not exceed at a point 15 m from the nearest or most impacted dwelling unit. The PSL is the sum of the BSL, daytime adjustment, Class A adjustment, and Class B adjustment.

Pristine Area: A pure, natural area that might have a residence but no industrial presence, including energy, agricultural, forestry, manufacturing, recreational, or other industries that could make noise generation a consideration.

Representative Conditions: Those conditions typical for an area and/or the nature of a complaint. For ASLs, these are conditions that portray the typical activities for the area, not the quietest time. For CSLs, these do not constitute absolute worst-case conditions or the exact conditions the complainant has highlighted if those conditions are not easily duplicated. Sound levels must be taken only when representative conditions exist; this may necessitate a survey of extensive duration (two or more consecutive nights).

Seasonally Occupied Dwelling: A fixed residence that, while not being occupied on a full-time basis, is occupied on a regular basis. A regular basis does not imply a scheduled occupancy but implies use of six weeks per year or more. The residence must not be mobile and should have some sort of foundation or features of permanence (e.g., electrical power, domestic water supply, septic system) associated with it. Summer cottages or mobile homes are examples of seasonally occupied dwellings, while a holiday trailer simply pulled onto a site is not.

Sound: A dynamic (fluctuating) pressure.

Sound Level (SL): The A-weighted Sound Pressure Level expressed in dBA.

Sound Level Meter: An instrument comprised of a microphone, amplifier, output meter, and frequency-weighting networks which is used for the measurement of noise and sound levels.

Sound Pressure Level (SPL): The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-5} Pascals.

$$\text{SPL (dB)} = 20 \log(P_{\text{RMS}}/P_0)$$

Sound Power Level (PWL): The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W_0 is the reference power of 10^{-12} watts.

$$\text{PWL (dB)} = 10 \log(W/W_0)$$

Inter-relationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

Sound Transmission Class (STC): The preferred single figure rating system designed to give an estimate of the sound insulation properties of a structure or a rank ordering of a series of structures.

Sound Transmission Loss (STL): A measure of sound insulation provided by a structural configuration. Expressed in decibels, it is 10 times the logarithm to the base 10 of the reciprocal of the sound transmission coefficient of the configuration.

Spectrum: The description of a sound wave's resolution into its components of frequency and amplitude.

Tonal Components: Most energy industrial facilities typically exhibit a tonal component. Examples of tonal components are transformer hum, sirens, and piping noise. The ERCB Directive 38 specifies that the test for the presence of tonal components consists of two parts.

The first part must demonstrate that the sound pressure level of any one of the slow-response, A-weighted, 1/3-octave bands between 20 and 16 kHz is 10 dBA or more than the sound pressure level of at least one of the adjacent bands within two 1/3-octave bandwidths. In addition, there must be a minimum of a 5 dBA drop from the band containing the tone within 2 bandwidths on the opposite side. The second part is that the tonal component must be a pronounced peak clearly obvious within the spectrum

Transmission Loss: A measure of the reduction in sound energy resulting from incident sound waves striking a wall, partition or enclosure, and radiating through to the other side. Mathematically, the transmission coefficient t is the ratio of transmitted acoustic power to the incident acoustic power, and in decibels, the Transmission Loss (TL) of the wall is:

$$TL = 10 \log (1 / t)$$

The TL of a wall varies by frequency. The associated noise reduction (NR) due to the TL of the wall is a function of the TL and the acoustical parameters of the receiving space. For noise radiating from an enclosure into the outdoors, $NR \approx (TL + 6)$.