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Glen Earrach Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 5: Appendices
Appendix 14.1: Acoustic Terminology

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Quality information

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Issue History

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1.1 Overview of Acoustic Terminology

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A) or L_{pA} dB. Table 1 below lists the sound pressure level in dB (A) for common situations.

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy road, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared to daytime levels.

Table 1 Examples of typical noise levels

Typical noise level, dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery
60	Normal conversation
70	Telephone ringing at 2m
80	General factory noise level
90	Heavy goods vehicle from pavement
100	Pneumatic Drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

The equivalent continuous A-weighted sound pressure level, $L_{Aeq\ dB}$, is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.

When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations. A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, L_{A90}. This is the noise level exceeded for 90 % of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a one hour period, the L_{A90} will be the noise level exceeded for 54 minutes.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB. It is generally accepted that a change of 10 dB in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to changes in road traffic flow, or intermittent noise sources.

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