

# **Environmental Impact Assessment Report (EIAR)**

## **Volume 6 of 6: Appendices**

### **(Appendix A6.2) Fundamentals of Acoustics**

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## 1. Fundamentals of Acoustics

1. To assist with the understanding of some of the technical discussion in the Noise and Vibration Chapter, this section provides an overview of the fundamentals of acoustics.
2. A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).
3. The audible range of sounds expressed in terms of Sound Pressure Levels is 0 dB (for the threshold of hearing) to 120 dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10 dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.
4. The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' has been established to provide one of the best correlations with perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A),  $L_{pA}$  or  $L_{Aeq}$ . An indication of the level of some common sounds on the dB(A) scale is presented in Image A6.2.1.
5. The 'A' subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.
6. Appendix 6.1 of the Environmental Impact Assessment Report provides definitions of common acoustic terminology used in the noise assessment.

A.6.2.1: dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2012))

