

**Fanellan Hub 400 kV Substation and
Converter Station
Environmental Impact Assessment Report
Volume 4 | Technical Appendices**

Appendix 14.1 – Acoustics Glossary

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TECHNICAL APPENDIX 14: NOISE IMPACT ASSESSMENT

14.1 Acoustics Glossary

- 14.1.1 Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.
- 14.1.2 Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.
- 14.1.3 The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.
- 14.1.4 The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

dB (decibel)	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value and the scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1 m in front of a large sound reflecting object such as a building façade.
Ambient Noise Level	The all encompassing noise level measured in $L_{Aeq,T}$. The Ambient Noise Level incorporates background sounds as well as the industrial source noise under consideration.

Residual Noise Level	The Ambient Noise Level in the absence of the industrial source noise under consideration, measured in $L_{Aeq,T}$.
Specific Noise Level	The noise level measured in $L_{Aeq,T}$ attributed to the industrial noise source under consideration alone.
Background Noise Level	The noise level in the absence of the industrial source noise under consideration, measured in L_{A90} .
SLM	Sound Level Meter
Sound pressure	The increase or decrease in the atmospheric pressure due to the passage of a sound wave. The unit of measure in the SI system of units is the Pascal (Pa). The human ear can detect sound pressure over a range from 20 micropascals to 20 Pascals. The sound pressure by itself is not characteristic of the sound source. The sound pressure is dependent on the sound power of the source, distance from the source and acoustic features in the environment surrounding both source and receiver.
Sound pressure level, LP or SPL	Ten times the logarithm to the base 10 of the square of the ratio of the effective or root mean square of the sound pressure fluctuations, P , and a standard reference pressure, P_{ref} , of 20 micropascals. In this form the sound pressure is expressed as a level in decibels.
Sound power level, SWL	<p>Sound power is the total sound energy radiated by a source, in all directions and measured in watts.</p> <p>Sound Power is the sound intensity multiplied by the surface area = $p \cdot v \cdot A$: where p is the sound pressure, v the particle velocity and A is the surface area.</p>