2. Uncertainty Calculations

Section 10.2 of BS 4142 states several factors which give rise to uncertainty associated with calculations. **Table A2.1** presents uncertainties such as the noise source, weather, instrumentation, and rounding to address these, while **Table A2.2** presents uncertainties associated with calculation methods.

Table A2.1: Uncertainties Associated With The Noise Assessment

Uncertainty Item	BS4142 Measurement Uncertainty	Comments
1	The complexity of the sound source and the level of variability in sound emission from the source	The uncertainty associated with the sound source stems from the **laboratory** uncertainty, measurement standard, and repeatability of the measurement. This can typically range between ±5dB at low frequencies (≤250Hz) and ±3dB for mid to high frequencies (≥500Hz)[10]. For the purposes of this noise assessment, given the assessment is based on measurement of key operations at the Masons appeal site, **an uncertainty of ±3dB has been applied to take account of variability in measured operational noise levels**.
2	The range of suitable weather conditions during which measurements have been taken	Source noise measurements were short-term attended conducted on Tuesday 11th March 2025. Weather conditions at site (based on installed temporary weather station) on this day between 09:30-12:00 were no rain, wind direction predominantly NNE, windspeed ranging from 0.9 to 2.2 m/s and temperature ranging from 7.4 to 8.6°C. Weather conditions were therefore suitable for taking valid noise measurements (BS7445 and BS4142). Noise measurements were conducted at distances ranging from 3.7m to 6.0m from the source. Prevailing weather conditions at the time of conducting the source noise measurements were not considered to result in variability of the measured noise level. **On this basis this uncertainty has not been applied to measurement of the noise source**. Prevailing background sound levels (dB L_{A90}) were established through use of unattended environmental noise loggers. Clements Acoustics conducted a baseline survey from Tuesday 16th January to Thursday 18th January 2024. Weather conditions were stated as being no rain and low windspeed and therefore suitable for noise measurements. Waterman took additional unattended noise measurements to establish background sound levels pre operations on a Saturday 8th March 2025 and Sunday 9th March 2025. Weather conditions were measured by a weather station temporary installed at the Appeal Site. During both period there was no rain with wind speed ranging from calm to 0.4 m/s, direction Saturday ENE and Sunday SE. Weather conditions were appropriate to establish the **representative** prevailing background sound level in the absence of the specific sound source. **On this basis this uncertainty has not been applied to variability of the background sound level**.
3a & 3b	The measurement method and instrument variability between different practitioners in the way the method is applied	The noise survey was carried out with a Class 1 sound level meter having valid calibration certificates and with regard to BS 7445-1. Calibration checks were carried out both before and after the noise survey with the drift of the sound level meter observed to be within the tolerance of the sound meter (**±1.1 dB** at 1kHz **3a**). The measurement was carried out by Ameera Alil who holds appropriate acoustic qualification (L4 Acoustic Technician). It is assumed the variability between surveyors would amount to **±2 dB (3b).**
4	The level of rounding of each measurement recorded	Rounding of measurements (L_{A90}) and specific noise predictions (Ls) have been carried out to the nearest whole number as per BS 4142 for the assessment. As such an uncertainty associated with rounding of the noise data to **±1 dB** is considered.

10 Blazier, Geshwiler, and Mildred, Application of Manufacturers Sound Data, ASHRAE, October 1998.

Table A2.2: Uncertainty Associated With Noise Calculation

Uncertainty Item	BS4142 Calculation Uncertainty	Comments
5	Uncertainty in the calculation method	The uncertainty with propagation using CadnaA noise modelling software is understood to be as follows: $\sigma_D = 3*\log10(d)/10)$ in dB The distance between the main loading area and the nearest SRs on Clock House Road is approximately 100 metres to the garden boundary and 115 metres to the building. The uncertainty associated with propagation is therefore **±3 to 3.2 dB**. Where the main source is closer this value will reduce. For example when works are conducted at 30 to 50 metres the uncertainty reduces to **±1.4 to 2.1 dB**
6	Uncertainty in the personal carrying out the calculation	The uncertainty of different personal carrying out the noise assessment is assumed to be **±2 dB**

Table A2.3 quantifies the overall uncertainty associated with both the noise assessment and calculation.

Table A2.3: Calculation of combined uncertainty of noise assessment

Source of Uncertainty (Table A1.2 and Table A1.3)	Uncertainty (Half Width) dB	Uniform Distribution Assumed	Standard Uncertainty (Uncertainty/1.73)
1	3	√3 = 1.73	1.7
2	0	√3 = 1.73	0.0
3a	1.1	√3 = 1.73	0.6
3b	3	√3 = 1.73	1.2
4	1.0	√3 = 1.73	0.6
5	3.2 [1.4 at 30m 2.1 at 50m]	√3 = 1.73	1.8 [0.7 – 1.5]
6	2	√3 = 1.73	1.2
Combined Uncertainty (Root sum of squares of standard uncertainty)			**±3.1 dB** **[±2.5- 2.7dB]**