



Noise Impact Assessment

Nos.5 to 7 Ossett Lane, Earlsheaton, Dewsbury, WF12 8LU

Campbell Homes Ltd

SHF.1888.002.NO.R.002



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Noise Impact Assessment

Project:	SHF.1888.002
For:	Campbell Homes Ltd
Status:	DRAFT
Date:	March 2023
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1 Introduction

1.1 Project Introduction

- 1.1.1 Enzygo Limited has been commissioned by Campbell Homes Ltd to undertake a noise assessment to address Condition 8 of the outline planning consent for the residential development on a parcel of land at Nos.5 to 7 Ossett Lane, Earlsheaton, Dewsbury.
- 1.1.2 The development, granted outline consent in March 2022 under application reference 2021/60/91695/E, is for 5no. residential dwellings at the site with parking and external amenity spaces.
- 1.1.3 This assessment has considered the potential impact of the existing noise climate on the proposed development and has outlined mitigation advice to ensure appropriate internal and external noise levels can be achieved.
- 1.1.4 Details of the assessment methodology employed, together with the results of the noise survey, predictions, assessment, and conclusions are presented within this report.

1.2 Site Location

- 1.2.1 The site is located off Ossett Lane in the Earlsheaton area of Dewsbury. The site is in a largely residential area with numerous existing residential dwellings in all directions.
- 1.2.2 More specifically the area around the site is described as follows:
- To the north is an area of open scrub land which is understood to be allocated for residential use in the local plan;
 - To the east are existing residential dwellings fronting on to Ossett Lane;
 - To the south the site is directly adjacent to Ossett Lane and beyond this, residential properties; and,
 - To the west are further, existing residential dwellings.
- 1.2.3 The site location is presented in Figure 1-1 below.

Figure 1-1: Site Location Plan



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1.3 Consented Development

1.3.1 As indicated above, outline consent for the development was granted by Kirklees Council in March 2022 under application reference 2021/60/91695/E.

1.3.2 The outline consent was granted pursuant to several conditions. Condition 8 of the consent relates to noise and states the following:

“Before construction work commences a report specifying the measures to be taken to protect the development from noise from road traffic on Ossett Lane, Earlsheaton shall be submitted to and approved in writing by the Local Planning Authority.

The report shall:-

- a) Determine the existing noise climate*
- b) Predict the noise climate in gardens (daytime), bedrooms (night-time) and other habitable rooms of the development*
- c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required). The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained. All noise assessments*

should be carried out by a competent person. Developers may wish to contact the Association of Noise Consultants <http://www.association-of-noise-consultants.co.uk/> (020 8253 4518) or the Institute of Acoustics <http://www.ioa.org.uk> (0300 999 9675) for a list of members.

Reason: Having regard to residential amenity and environmental quality and to comply with policies LP24 and LP52 of the Kirklees Local Plan and chapter 12 of the National Planning Policy Framework."

1.3.3 The site layout plan is presented in Figure 1-2 below:

Figure 1-2: Site Location Plan



1.3.4 The layout plan above presents 5no. dwellings facing towards Ossett Lane, with external amenity spaces to the rear.

1.3.5 The dwellings are to be 2½ storeys in height (including lower ground and attic spaces where appropriate), with 4- and 5- bedrooms.

1.3.6 The buildings are to be of block and stone, cavity wall construction with pitched roofs.

1.3.7 House type A (plots 1 and 2) include a bedroom in the attic space of the pitched roof.

2 Standards and Guidance

2.1.1 A noise assessment for the development has been informed by the guidance detailed in British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS8233). This is considered the relevant guidance for developments of a residential nature. Reference has also been made to the Professional Practice Guidance on Planning and Noise. A summary of the relevant standards and guidance is presented below.

2.1.2 This report does not address any requirements under the building regulations, i.e., Approved Document E.

2.2 Professional Practice Guidance on Planning and Noise

2.2.1 The Professional Practice Guidance (ProPG) on Planning and Noise (May 2017) provides guidance on transport noise affecting new residential developments. The guidance was prepared by a working group formed from members of the Institute of Acoustics (IoA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH). It has no formal planning status but nevertheless represents industry good practice. It is specifically for assessing noise from predominantly transportation sources.

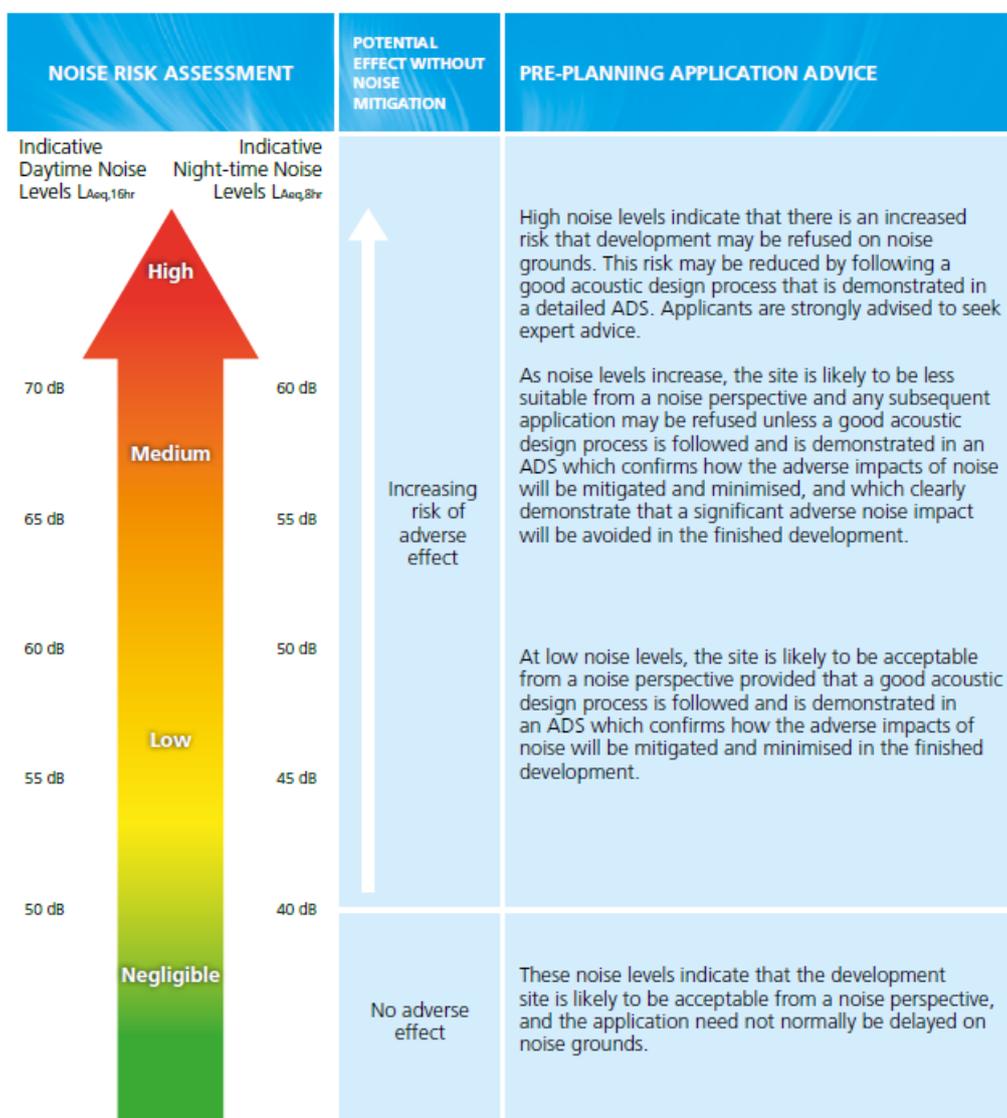
2.2.2 The guidance a two staged approach to an assessment:

- Stage 1 – a noise risk assessment of the proposed site; and,
- Stage 2 – a more detailed consideration of the development including good acoustic design, internal noise levels, external amenity and other issues.

2.2.3 The Stage 1 noise risk assessment, based on noise from transport sources is presented as an info graphic in Figure 1 of the document and is presented below.

2.2.4 It is noted that the risk levels are not directly correlated to specific noise levels to allow for the flexible consideration of potential impacts, including factors such as locality of the project and the wider context.

Figure 2-1: ProPG Stage 1 Risk Assessment



2.2.5 The Stage 1 assessment demonstrates that rising $L_{Aeq,T}$ noise levels relate to an increased risk of noise impacts.

2.2.6 Notes to the figure include a caveat that more than 10no. noise events exceeding 60dB L_{AFmax} during the night would put the site above the negligible risk category.

2.3 British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.3.1 National guidance on noise limits for dwellings is set out in BS8233:2014. This sets limits in terms of two noise parameters: the ambient level, L_{Aeq} and the maximum level, L_{AFmax} . The L_{AFmax} is the highest noise level in a given period and is determined by individual events such as a vehicle pass-bys. An L_{AFmax} limit is usually only applied at night, when sleep disturbance is more likely to be an issue. The L_{Aeq} is defined as the steady-state noise level which has the same energy as the actual time-varying noise over the same period. It is effectively the energy average noise level.

2.3.2 Appropriate internal noise levels are recommended in BS8233:2014 (shown in Table 1 below) and in the World Health Organisation (WHO) Guidance “Guidelines for Community Noise”, 1999.

Table 2-1: BS8233 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 Hours	23:00 to 07:00 Hours
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

2.3.3 The guidance values are generally taken as applying to noise sources without specific character, previously termed ‘anonymous noise’ in earlier versions of the standard.

2.3.4 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

“If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

2.3.5 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

“it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.”

3 Baseline Survey Information & Results

3.1 Introduction

- 3.1.1 To inform the assessments in this report, a baseline noise survey was undertaken by Enzygo at two locations within the site. The survey was undertaken by means of unattended monitoring covering both daytime and night-time periods.
- 3.1.2 The monitoring was undertaken between Wednesday 30th November and Friday 2nd December 2022. The location is detailed in Table 3-1 below.

Table 3-1: Noise Monitoring Locations

Monitoring Location	OS Grid Co-ordinates		Justification for Choice of Measurement Location
	Easting	Northing	
MP1	425912	421086	Location exposed to road traffic noise from Ossett Lane, approximating the facing façade of the buildings.
MP2	425891	421105	Location in the lea of the existing building, replicating the rear garden areas of the consented dwellings.

3.2 Measuring Equipment

- 3.2.1 The noise monitoring equipment used during the surveys is shown in Table 3-2 and was set to record the $L_{Aeq,T}$, L_{A90} , L_{A10} and L_{Amax} parameters in consecutive 15-minute periods.
- 3.2.2 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:
- Time Weighting: Fast
- Frequency Weighting: "A"
- 3.2.3 The sound level meters were field calibrated, using an acoustic calibrator, prior to and upon completion of the overall survey. No significant drift in calibration was noted.

Table 3-2: Noise Monitoring Equipment

Equip. Make & Model	Class	Calibration Level, dB	Serial No.	Calibration Date Prior to Survey
Rion NL52 Sound Level Meter	1	94.0	520990	August 2022
01dB Solo Sound Level Meter	1	94.0	65396	February 2022
Rion NC-75 Calibrator	-	-	34724233	August 2022

- 3.2.4 The external calibration documentation for the equipment used is available upon request.

3.3 Weather Conditions

3.3.1 As indicated, the monitoring was undertaken on an unattended basis therefore no direct records of weather conditions were recorded at the site. To that end, third party, commercially available weather data has been used to provide an overall review of the weather conditions during the unattended period. The forecast data indicates the following:

- Wednesday 30th November. Weather during the set-up period was noted as cold (4°C) with 100% cloud cover. No rain fell prior to or during the attended portion of the survey.
- Thursday 1st December. Dry and cold throughout the day with an ambient air temperature of between 2°C and 5°C. Wind speeds were relatively low, below 5m/s;
- Friday 2nd December. The ambient air temperature during the collection period was again cold, with an ambient air temperature of 2°C and 4°C. Wind speeds were low/still with no prevailing directional component.

3.3.2 The recorded weather conditions are generally within appropriate parameters and would have no detrimental effect on the measured survey data.

3.4 Existing Noise Climate

3.4.1 Subjective field notes indicate the noise climate in the area was governed by road traffic noise during both the set up and collection periods.

3.4.2 At the front of the building, the noise climate was governed by road traffic noise from Ossett Lane. Other noises included general environmental sounds, i.e., bird song, low level wind noise, etc.

3.4.3 The noise climate to the rear of the building was similar to the front though traffic noise was screened by the (existing) intervening building structure and subjectively at a lower level.

3.5 Survey Details and Results

3.5.1 The results of the baseline surveys are summarised in Tables 3-3 and 3-4. The summary tables below present the following information:

- The logarithmic average of the L_{Aeq} parameter;
- The maximum recorded L_{Amax} event; and,
- The arithmetic average of the background sound level (L_{A90}) and L_{A10} .

3.5.2 The full data set in Appendix A includes time history charts for each 24-hour period.

Location M01

3.5.3 Location M01 was sited close to the roadside of the site, with a clear line of sight to the road.

Table 3-3: Summary of Baseline Survey Results – Location M01

Period	Duration Hh:mm	Period	Average L _{Aeq,T} , dB	Max L _{Afmax} , dB	Average, L _{A90} dB	Average, L _{A10} , dB
Wednesday 30 th November 2022	11:15	Day	60.4	90.1	43.8	63.1
	08:00	Night	52.9	80.5	25.6	47.1
Thursday 1 st December 2022	16:00	Day	60.9	85.4	46.0	64.0
	08:00	Night	53.4	85.5	24.9	47.7
Friday 2 nd December 2022	04:45	Day	61.0	87.1	48.4	64.9

3.5.4 Noise levels along the Ossett Lane elevation of the site are relatively consistent between daytime and night-time periods. Daytime ambient noise levels are generally around 60dB to 61dB L_{Aeq} and during the night 53dB L_{Aeq}.

3.5.5 During the night-time period the background sound level falls to very low levels, with an average L_{A90} of 25dB or 26dB.

Location M02

3.5.6 Location M02 was sited to the rear of the site, in the lea of the existing building, providing a degree of screening from road traffic noise.

Table 3-4: Summary of Baseline Survey Results – Location M02

Period	Duration Hh:mm	Period	Average L _{Aeq,T} , dB	Max L _{Afmax} , dB	Average, L _{A90} dB	Average, L _{A10} , dB
Wednesday 30 th November 2022	11:00	Day	53.3	83.7	39.9	55.0
	08:00	Night	47.1	82.2	24.9	42.0
Thursday 1 st December 2022	16:00	Day	53.1	71.1	42.0	55.9
	08:00	Night	44.8	71.4	25.7	42.2
Friday 2 nd December 2022	04:45	Day	53.5	73.7	44.7	56.6

3.5.7 To the rear of the building, the daytime noise levels are again, relatively consistent, at 53dB L_{Aeq}.

3.5.8 There is slightly more variation in the night-time noise climate though it is not a significant variation. During the night, the ambient noise climate is 45dB to 47dB L_{Aeq}.

3.6 ProPG Assessment

3.6.1 The ProPG states that, the Stage 1 risk assessment should not include *‘the impact of any new or additional mitigation measures that may subsequently be included in the development proposals.....’*.

- 3.6.2 The measured noise data for location M01 would put the site in the 'low' risk category during the day and tending towards the 'medium' risk category during the night.
- 3.6.3 Location M02 was sited to the rear of the existing building which will not be retained in the final site plan. While not strictly in keeping with the intention of the Stage 1 ProPG assessment, the measured noise levels would put the location in the 'low' risk category during both the daytime and night.

4 Assessment of Impacts

4.1 Introduction

4.1.1 Sound insulation calculations for habitable rooms have been prepared in accordance with BS EN 12354-3 to determine the extent of the sound insulation required to meet the noise limits discussed earlier in the report. The assessment has been completed using the noise levels as shown in Table 4-1. Example calculations are provided in Appendix B.

4.2 Noise Levels

4.2.1 The noise levels established during the Enzygo survey, summarised in section 4, have been used to inform the assessments summarised below. The data presented in Table 3-3 above demonstrates that noise levels overlooking Ossett Lane are relatively consistent, at around 60dB/61dB L_{Aeq} . During the night-time periods they are 53dB $L_{Aeq,8hr}$.

4.2.2 At location M01, the 10th highest $L_{A_{fmax},15min}$ value falls between 70.9dB and 72.2dB. The paper published in the Proceedings of the Institute of Acoustics¹ indicates that $L_{A_{max},15min}$ values relate to $L_{A_{max},1min}$ values in the formula $L_{A_{fmax},1min} = L_{A_{fmax},15min} + 1.89dB$. This would give a conservative $L_{A_{fmax},1min}$ value at M01 of 74.1dB.

4.2.3 At location M02 the daytime ambient sound levels are again consistent at 53dB L_{Aeq} . During the night there is slightly more variation, with the logarithmic average at 46dB L_{Aeq} .

4.2.4 Analysis of the $L_{A_{fmax}}$ data for location M02 indicates the 10th highest $L_{A_{fmax},1min}$ value is 60.7dB.

4.2.5 Given the above, the following noise levels have been used in the assessments:

Table 4-1: Assessment Noise Levels

Elevation	Parameter	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
MP1	$L_{Aeq,16hr}$ Daytime	40	45	47	52	59	54	45	39	61
	$L_{Aeq,8hr}$ Night-time	34	36	40	44	50	45	45	36	53
	$L_{A_{fmax}}$ Night-time	60	63	65	66	71	66	66	60	74
MP2	$L_{Aeq,16hr}$ Daytime	57	51	45	46	51	46	38	38	53
	$L_{Aeq,8hr}$ Night-time	51	48	37	37	43	40	31	20	46
	$L_{A_{fmax}}$ Night-time	68	64	53	51	57	56	45	33	61

¹ Proceedings of the Institute of Acoustics. Vol. 43. Pt. 1. 2021. Empirical Relationship between L_{Night} and L_{Amax} . Conlan, Wei, Harvie-Clark.

- 4.2.6 The measured noise levels at MP1 represent the front facing façade of the dwellings, overlooking Ossett Lane. MP2 reflects the rear elevations of the buildings, including screening from the building structures.
- 4.2.7 In all instances, the noise levels are considered representative of free field values. Where appropriate, distance attenuation has been included in the calculations. Distance attenuation has been calculated on the assumption that the ambient (L_{Aeq}) noise level is a line source and the L_{Amax} events are a point source.
- 4.2.8 The elevated nature of the site, relative to the road, might offer a modicum of screening from road traffic noise. However, this is difficult to calculate and has been omitted from the calculations to present a worst-case assessment.

4.3 House Construction

- 4.3.1 The arrangement of dwellings is such that they have sensitive internal spaces on both the front and rear façades, including rooms in the pitched roof spaces.
- 4.3.2 The noise levels at MP2 are markedly lower than those at MP1 due to the screening of the building structures. The measured levels at MP2 are such that standard thermal double glazing and open windows ventilation would afford sufficient attenuation to only just exceed the internal noise limits. As such, standard thermal double glazing (6mm/12mm/6mm **33dB R_w**) and trickle vents (**31dB $D_{ne,w}$**) are proposed for all rear elevation elements.
- 4.3.3 For the front (road) facing facades, the following recommendations are made:

Glazing

- 4.3.4 The lounge/living spaces on the ground or upper ground floors are only considered to be sensitive to noise during the daytime period and are not subject to sleep disturbance criteria associated with L_{Amax} events. Given this, standard thermal double glazing provides sufficient attenuation to achieve appropriate internal noise levels.
- 4.3.5 For bedroom spaces overlooking Ossett Lane more acoustically robust glazing is required to address L_{Amax} events. In this instance **38dB R_w** glazing is proposed which could be achieved by 10mm/12mm/6mm double glazing.
- 4.3.6 In all instances, the required sound insulation applies to the whole window system: glazing and frames.

Walls

- 4.3.7 The specific construction of the walls has not been confirmed at this time. However, they are likely to be of reconstituted stone/cavity/block construction. For the purposes of the calculations, a simple brick/block construction has been assumed, giving **R_w 55dB**.
- 4.3.8 For the bedroom spaces in the pitched roof area, the facades are assumed to be the roof structure and assumes tiles on a pitched roof with insulation and internal plasterboard lining in accordance with BS8233.

Ventilation

4.3.9 The measured noise levels are such that open window ventilation would not achieve the internal noise levels. Given this, alternative ventilation is proposed on the facades overlooking Ossett Lane.

- Lounge/living spaces would require standard trickle vents, affording 31dB $D_{ne,w}$.
- Bedrooms require a more acoustically robust trickle vent, achieving 38dB $D_{ne,w}$.

4.3.10 The calculations assume one vent per room would provide sufficient background ventilation. If additional vents are required, the performance requirements increase by $10\log(n)$, where n is the number of vents, i.e., 2no. vents would necessitate a 3dB increase in performance requirements.

4.3.11 Windows should remain openable for purge ventilation and overheating control.

4.4 External Amenity Areas

4.4.1 The private external amenity spaces are generally located to the rear of the building, utilising the mass of the structures to screen the gardens from road traffic noise. With this arrangement, the noise climate in the rear garden areas fall comfortably below the 50dB L_{Aeq} level.

4.4.2 The exception to this arrangement is plot no. 5, where the garden wraps around the dwelling, from the rear to the eastern side of the property. With a robust 1.8m tall timber fence, the noise levels in this garden area would fall in the 50dB to 55dB L_{Aeq} range, falling comfortably below the upper guideline value of BS8233.

4.4.3 A noise contour plot demonstrating the external daytime noise levels in garden spaces in appendix C of this report.

4.5 Assessment Summary

4.5.1 The assessments presented in this report demonstrate that, with detailed consideration of the various façade elements, appropriate internal noise levels can be achieved with relatively standard façade treatments.

4.5.2 Table 4-2 below summarises the required façade attenuation for the various spaces.

Table 4-2: Glazing Summary

Elevation	Internal Space	Glazing	Ventilation
Ossett Lane Elevation	Lounge	33dB R_w – 6/12/6 Standard thermal double glazing	31dB $D_{ne,w}$ Trickle vent
	Bedrooms	38dB R_w – 10/12/6 Enhanced double glazing	38dB $D_{ne,w}$ Acoustic trickle vent
Rear Elevation	All Spaces	33dB R_w – 6/12/6 Standard thermal double glazing	31dB $D_{ne,w}$ Trickle vent

- 4.5.3 In general, the higher specification façade treatment is required for the bedroom spaces overlooking Ossett Lane as a means of addressing the ingress of L_{Amax} events during the night.
- 4.5.4 Aside from this, standard façade elements are appropriate.

5 Conclusion

- 5.1.1 Enzygo Limited has been commissioned by Campbell Homes Ltd to undertake a noise assessment to support a planning application for a residential development on a parcel of land at Nos.5 to 7 Ossett Lane, Earlsheaton, Dewsbury.
- 5.1.2 The noise assessment has been informed by a noise monitoring survey undertaken at the site and has assessed the potential impact of the existing noise climate on the proposed development and future residents of the dwellings.

5.2 Noise Assessment

- 5.2.1 Noise ingress calculations have been undertaken in line with BS EN 12354-3 and appropriate façade attenuation measures have been prescribed to ensure internal criteria are achieved.
- 5.2.2 The assessments demonstrate that, with relatively standard façade treatments, appropriate internal noise levels can be achieved.
- 5.2.3 The arrangement of the proposed development is such that external amenity areas, located to the rear of the buildings, generally benefit from screening by the intervening buildings. Where this is not possible, a robust 1.8m tall fence would provide sufficient screening to achieve appropriate levels in private garden spaces.
- 5.2.4 Given the above, there are no reasons, on noise grounds, why planning consent for the proposed residential development cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to ‘everyday’ occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this when undertaking the measurement of noise, the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The ‘loudness’ of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener’s ear, the time of the day and the general mood of the person.

With regards to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. Attempting produce a figure that relates this variable nature of noise to human subjective response, various statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
L_{A10,T}	The 10 th statistical percentile of a measurement period, i.e., the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
L_{A90,T}	The 90 th statistical percentile of a measurement period, i.e., the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all noise sources incident at one location, both in the near- and far-field (<i>The ambient sound comprises the residual sound and the specific sound when present</i>).
Ambient Sound Level L_a = L_{Aeq,T}	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level L_{A90,T}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level L_{Aeq,T}	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t ₂ – t ₁ , has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $L_{Aeq,T} = 10 \lg_{10} \left\{ \left(\frac{1}{T} \right) \int_{t_1}^{t_2} \left[p_A \frac{(t)^2}{p_0^2} \right] dt \right\}$

Term	Definition
	Where p_0 is the reference sound pressure (20 μ PA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t .
Measurement Time Interval T_m	Total time over which measurements are taken (<i>This may consist of the sum of several non-contiguous, short-term measurement time intervals</i>)
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over time, T .
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T .
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T .
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of $\pm 1\text{dB}$;
- Meteorology – allowance of $\pm 1.9\text{dB}$; and
- CadnaA noise propagation modelling software – operational accuracy of $\pm 2.1\text{dB}$

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of $\pm 3\text{dB}$.

Statement of Competency

The assessment has been undertaken by Mr Mark Harrison, Principal Acoustic Consultant at Enzygo Limited. Mr Harrison holds a Bachelor of Science degree in Music Technology and a post graduate Diploma in Acoustics and Noise Control.

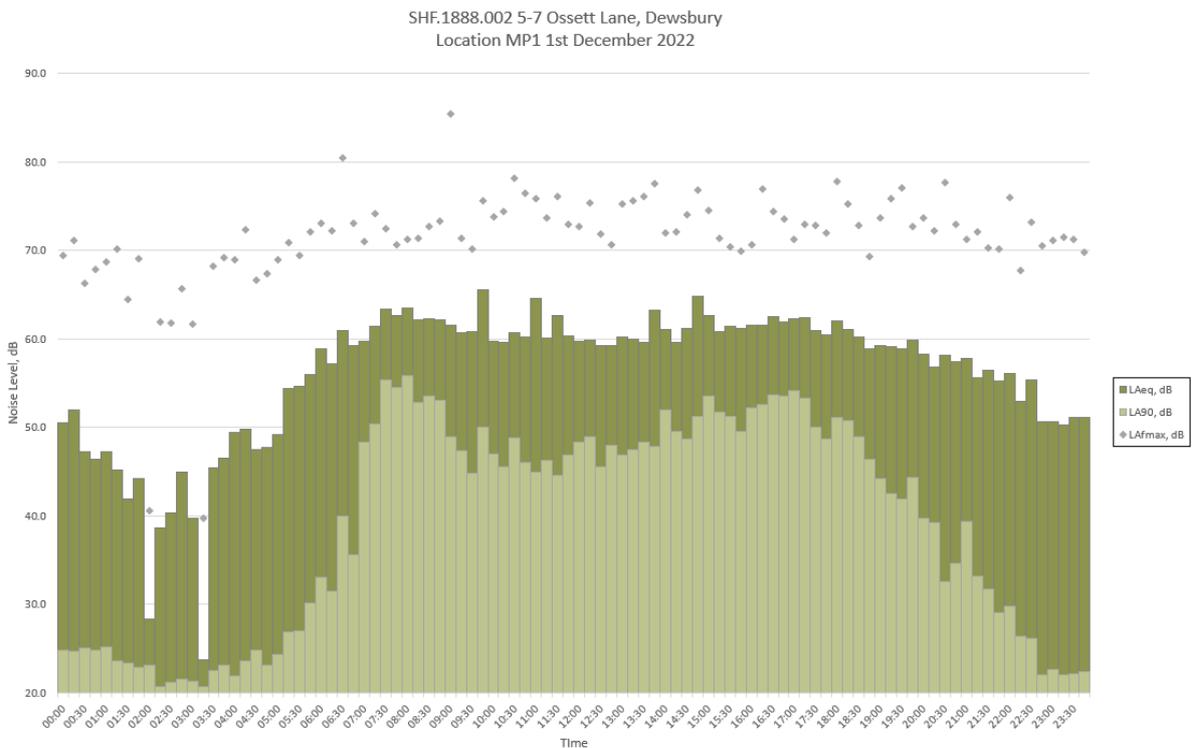
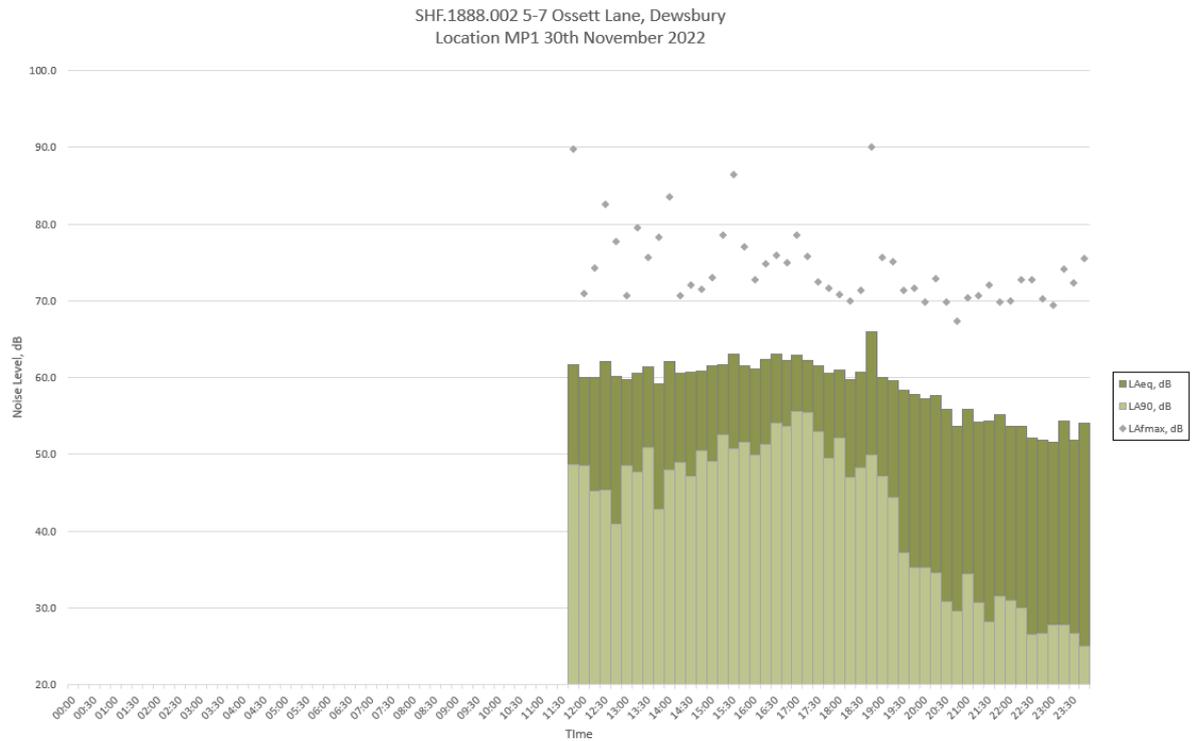
Mr Harrison has worked in acoustic consultancy since 2007 and has worked on noise and vibration assessments in several sectors including industrial / commercial developments; power generation and distribution; residential developments; transport schemes; and mineral extraction and processing.

The report has been prepared under the supervision of Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (Efw, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

Appendix A – Baseline Noise Data

Location M01: Survey Data - Time History Charts



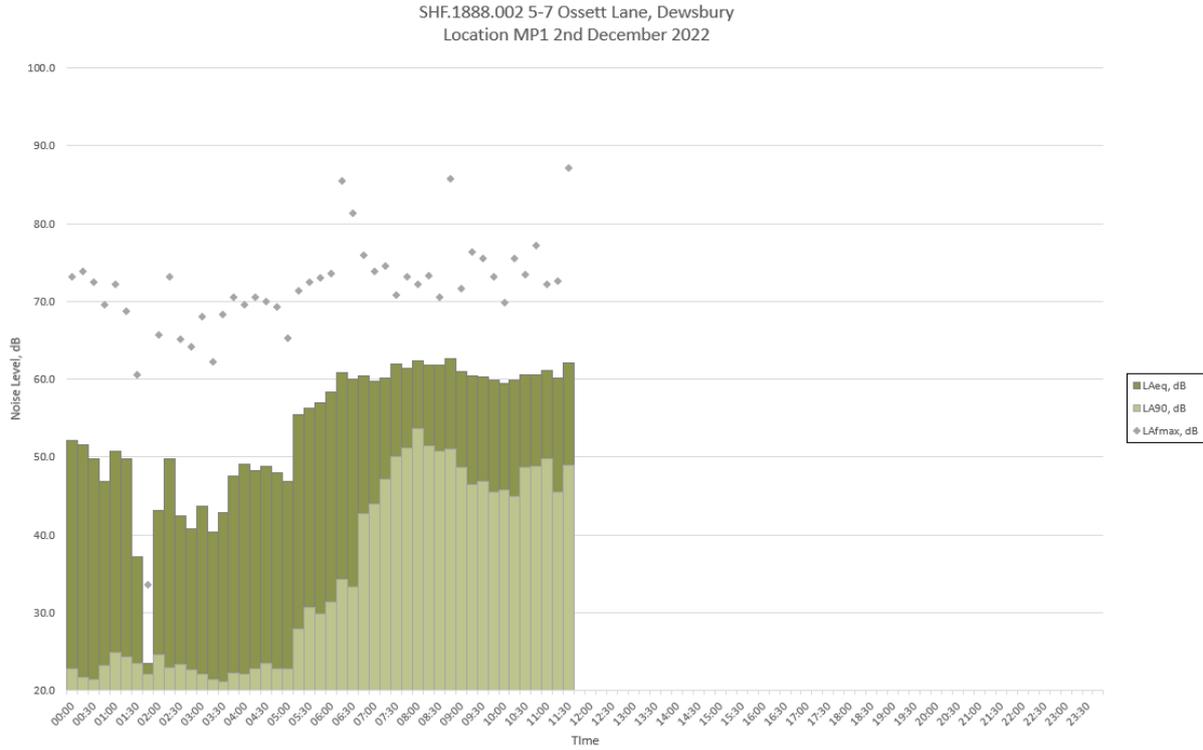


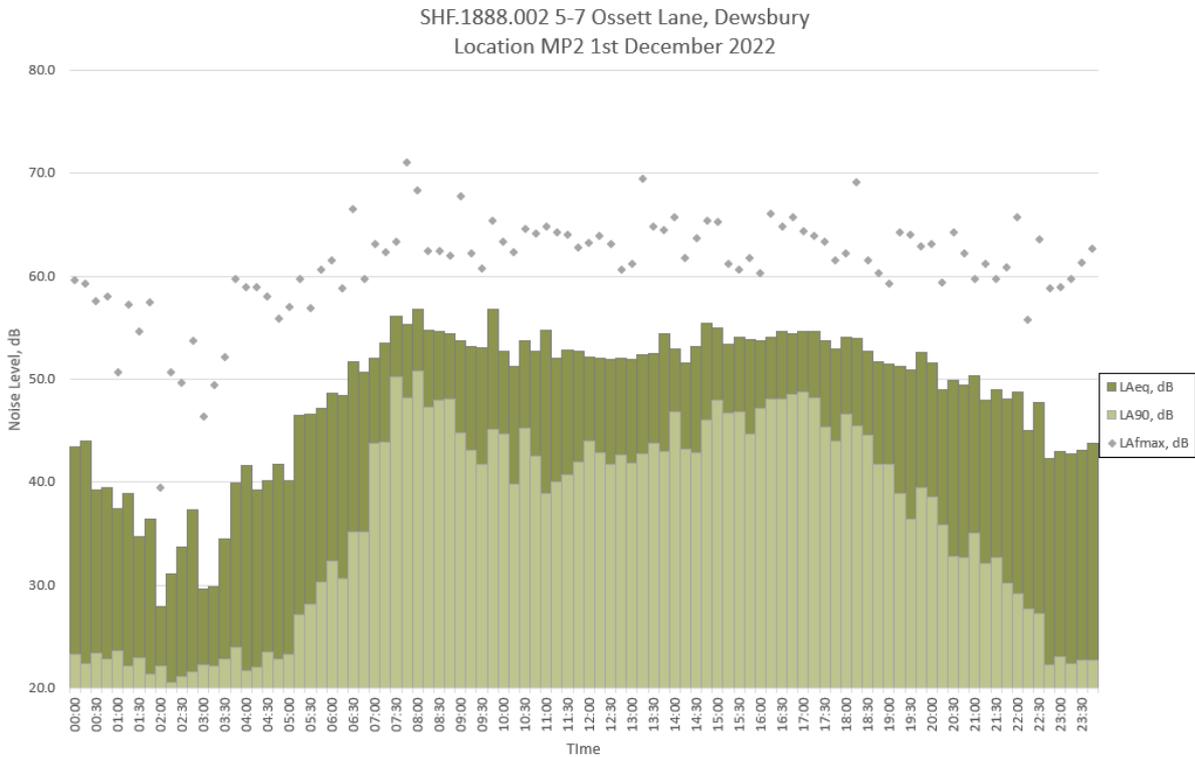
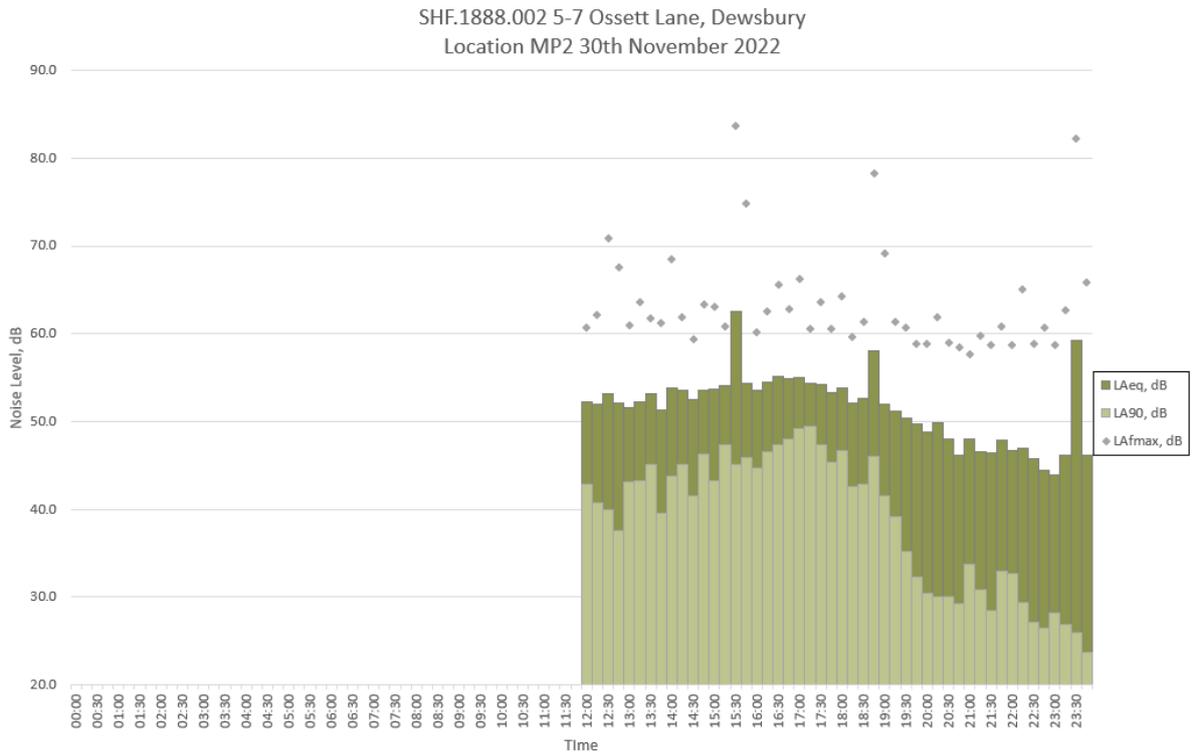
Table A-1: Location M01 - Noise Data

Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB	Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB
30/11/2022 11:45	61.7	89.8	64.8	48.7	30/11/2022 23:00	51.5	69.4	55.3	27.8
30/11/2022 12:00	60.0	71.0	63.9	48.5	30/11/2022 23:15	54.3	74.1	58.1	27.8
30/11/2022 12:15	60.0	74.3	64.4	45.2	30/11/2022 23:30	51.9	72.3	54.4	26.7
30/11/2022 12:30	62.1	82.6	65.2	45.3	30/11/2022 23:45	54.1	75.5	56.3	25.0
30/11/2022 12:45	60.1	77.7	63.9	40.9	01/12/2022 00:00	50.5	69.4	53.8	24.8
30/11/2022 13:00	59.8	70.7	63.9	48.5	01/12/2022 00:15	52.0	71.1	54.6	24.7
30/11/2022 13:15	60.5	79.5	64.4	47.7	01/12/2022 00:30	47.3	66.3	50.1	25.1
30/11/2022 13:30	61.4	75.6	65.3	50.9	01/12/2022 00:45	46.4	67.8	47.8	24.8
30/11/2022 13:45	59.2	78.3	63.3	42.9	01/12/2022 01:00	47.3	68.7	49.7	25.2
30/11/2022 14:00	62.1	83.5	65.9	47.9	01/12/2022 01:15	45.2	70.1	31.4	23.6
30/11/2022 14:15	60.6	70.7	64.6	49.0	01/12/2022 01:30	41.9	64.5	34.5	23.4
30/11/2022 14:30	60.7	72.1	64.8	47.1	01/12/2022 01:45	44.2	69.1	26.6	22.9
30/11/2022 14:45	60.8	71.5	64.7	50.5	01/12/2022 02:00	28.3	40.6	30.9	23.1
30/11/2022 15:00	61.5	73.0	65.3	49.1	01/12/2022 02:15	38.7	61.9	28.7	20.7
30/11/2022 15:15	61.7	78.5	65.3	52.6	01/12/2022 02:30	40.4	61.8	35.0	21.2
30/11/2022 15:30	63.1	86.4	65.6	50.7	01/12/2022 02:45	44.9	65.7	37.0	21.6
30/11/2022 15:45	61.5	77.1	65.3	51.6	01/12/2022 03:00	39.7	61.7	29.3	21.3
30/11/2022 16:00	61.1	72.8	65.1	49.9	01/12/2022 03:15	23.8	39.8	25.4	20.7
30/11/2022 16:15	62.3	74.8	65.8	51.3	01/12/2022 03:30	45.4	68.2	39.6	22.5
30/11/2022 16:30	63.0	76.0	66.2	54.0	01/12/2022 03:45	46.5	69.2	38.0	23.2
30/11/2022 16:45	62.2	74.9	65.8	53.6	01/12/2022 04:00	49.4	68.9	48.3	21.9
30/11/2022 17:00	62.9	78.5	66.0	55.6	01/12/2022 04:15	49.8	72.3	44.2	23.6
30/11/2022 17:15	62.2	75.8	65.4	55.5	01/12/2022 04:30	47.5	66.6	48.3	24.9
30/11/2022 17:30	61.6	72.5	65.1	52.9	01/12/2022 04:45	47.8	67.4	49.1	23.2
30/11/2022 17:45	60.6	71.7	64.5	49.5	01/12/2022 05:00	49.2	69.0	50.7	24.3
30/11/2022 18:00	61.0	70.8	65.1	52.1	01/12/2022 05:15	54.4	70.9	58.3	26.9
30/11/2022 18:15	59.8	70.0	63.7	47.0	01/12/2022 05:30	54.6	69.4	59.1	27.0
30/11/2022 18:30	60.7	71.4	64.7	48.3	01/12/2022 05:45	56.0	72.1	60.6	30.2
30/11/2022 18:45	65.9	90.1	65.4	49.9	01/12/2022 06:00	58.9	73.1	63.3	33.1
30/11/2022 19:00	60.0	75.6	63.7	47.1	01/12/2022 06:15	57.2	72.2	61.8	31.5
30/11/2022 19:15	59.6	75.1	63.4	44.4	01/12/2022 06:30	61.0	80.5	64.3	40.0
30/11/2022 19:30	58.4	71.4	62.5	37.1	01/12/2022 06:45	59.2	73.1	63.8	35.6
30/11/2022 19:45	57.8	71.6	62.3	35.2	01/12/2022 07:00	59.7	71.0	63.5	48.3
30/11/2022 20:00	57.3	69.9	61.7	35.2	01/12/2022 07:15	61.4	74.2	65.2	50.4
30/11/2022 20:15	57.7	72.9	61.9	34.5	01/12/2022 07:30	63.4	72.4	66.9	55.4
30/11/2022 20:30	55.9	69.8	60.1	30.8	01/12/2022 07:45	62.7	70.6	66.3	54.5
30/11/2022 20:45	53.6	67.3	58.1	29.5	01/12/2022 08:00	63.5	71.2	66.6	55.8
30/11/2022 21:00	55.8	70.4	60.4	34.4	01/12/2022 08:15	62.2	71.4	65.9	52.8
30/11/2022 21:15	54.2	70.7	59.0	30.7	01/12/2022 08:30	62.3	72.7	65.9	53.6
30/11/2022 21:30	54.3	72.1	58.3	28.2	01/12/2022 08:45	62.1	73.3	65.8	53.1
30/11/2022 21:45	55.2	69.8	59.6	31.5	01/12/2022 09:00	61.5	85.4	65.0	48.9
30/11/2022 22:00	53.7	70.0	58.0	31.0	01/12/2022 09:15	60.7	71.4	65.0	47.4
30/11/2022 22:15	53.7	72.7	57.7	30.0	01/12/2022 09:30	60.8	70.2	65.3	44.8
30/11/2022 22:30	52.1	72.7	55.8	26.5	01/12/2022 09:45	65.6	75.6	72.4	50.0
30/11/2022 22:45	51.8	70.2	54.7	26.7	01/12/2022 10:00	59.7	73.8	63.8	47.0

Period Start	L _{Aeq,r} dB	L _{Afmax,r} dB	L _{A10,r} dB	L _{A90,r} dB	Period Start	L _{Aeq,r} dB	L _{Afmax,r} dB	L _{A10,r} dB	L _{A90,r} dB
01/12/2022 10:15	59.6	74.4	63.7	45.6	01/12/2022 21:30	56.5	70.3	61.1	31.8
01/12/2022 10:30	60.7	78.1	64.9	48.8	01/12/2022 21:45	55.3	70.1	59.6	29.1
01/12/2022 10:45	60.2	76.4	64.6	46.0	01/12/2022 22:00	56.1	76.0	59.6	29.8
01/12/2022 11:00	64.6	75.8	67.5	44.9	01/12/2022 22:15	53.0	67.7	57.5	26.4
01/12/2022 11:15	60.1	73.7	64.3	46.3	01/12/2022 22:30	55.4	73.2	59.5	26.2
01/12/2022 11:30	62.7	76.1	64.5	44.6	01/12/2022 22:45	50.6	70.5	54.2	22.0
01/12/2022 11:45	60.4	73.0	64.5	46.9	01/12/2022 23:00	50.7	71.1	53.1	22.7
01/12/2022 12:00	59.7	72.7	63.8	48.4	01/12/2022 23:15	50.3	71.5	50.7	22.1
01/12/2022 12:15	59.8	75.4	63.6	48.9	01/12/2022 23:30	51.1	71.2	52.4	22.2
01/12/2022 12:30	59.2	71.9	63.4	45.5	01/12/2022 23:45	51.1	69.8	53.9	22.4
01/12/2022 12:45	59.3	70.6	63.3	48.0	02/12/2022 00:00	52.1	73.1	53.4	22.8
01/12/2022 13:00	60.2	75.3	63.9	46.9	02/12/2022 00:15	51.5	73.8	53.8	21.7
01/12/2022 13:15	60.0	75.6	64.1	47.5	02/12/2022 00:30	49.7	72.5	48.2	21.4
01/12/2022 13:30	59.6	76.1	63.8	48.3	02/12/2022 00:45	46.9	69.5	44.6	23.2
01/12/2022 13:45	63.2	77.6	65.9	47.9	02/12/2022 01:00	50.8	72.2	52.3	24.9
01/12/2022 14:00	61.1	72.0	65.0	52.0	02/12/2022 01:15	49.8	68.7	51.1	24.3
01/12/2022 14:15	59.6	72.1	63.6	49.5	02/12/2022 01:30	37.1	60.5	26.7	23.5
01/12/2022 14:30	61.2	74.0	65.1	48.7	02/12/2022 01:45	23.5	33.6	24.7	22.1
01/12/2022 14:45	64.8	76.8	67.7	51.2	02/12/2022 02:00	43.1	65.7	41.9	24.5
01/12/2022 15:00	62.6	74.5	66.2	53.6	02/12/2022 02:15	49.8	73.2	45.7	22.9
01/12/2022 15:15	60.8	71.4	64.4	51.7	02/12/2022 02:30	42.4	65.1	29.1	23.3
01/12/2022 15:30	61.4	70.4	65.2	51.2	02/12/2022 02:45	40.8	64.1	29.7	22.6
01/12/2022 15:45	61.2	69.9	65.0	49.5	02/12/2022 03:00	43.7	68.0	39.6	22.1
01/12/2022 16:00	61.6	70.7	65.3	52.2	02/12/2022 03:15	40.3	62.2	33.7	21.4
01/12/2022 16:15	61.5	77.0	65.0	52.6	02/12/2022 03:30	42.9	68.3	27.4	21.1
01/12/2022 16:30	62.5	74.4	65.7	53.7	02/12/2022 03:45	47.6	70.5	38.5	22.2
01/12/2022 16:45	61.9	73.5	65.5	53.5	02/12/2022 04:00	49.1	69.5	48.7	22.1
01/12/2022 17:00	62.3	71.2	65.9	54.2	02/12/2022 04:15	48.2	70.5	47.2	22.8
01/12/2022 17:15	62.4	72.9	65.7	53.3	02/12/2022 04:30	48.8	70.0	49.2	23.5
01/12/2022 17:30	61.0	72.8	65.1	50.0	02/12/2022 04:45	47.9	69.3	46.1	22.7
01/12/2022 17:45	60.5	72.0	64.6	48.7	02/12/2022 05:00	46.8	65.3	47.2	22.8
01/12/2022 18:00	62.0	77.8	65.4	51.1	02/12/2022 05:15	55.4	71.3	59.9	27.9
01/12/2022 18:15	61.1	75.2	64.9	50.8	02/12/2022 05:30	56.3	72.5	61.0	30.7
01/12/2022 18:30	60.2	72.8	64.0	49.0	02/12/2022 05:45	56.9	73.0	61.6	29.8
01/12/2022 18:45	58.9	69.3	62.9	46.4	02/12/2022 06:00	58.3	73.6	63.2	31.4
01/12/2022 19:00	59.2	73.7	63.2	44.2	02/12/2022 06:15	60.9	85.5	63.4	34.2
01/12/2022 19:15	59.1	75.9	63.0	42.5	02/12/2022 06:30	60.0	81.4	63.4	33.3
01/12/2022 19:30	58.9	77.1	63.1	41.9	02/12/2022 06:45	60.4	76.0	64.7	42.7
01/12/2022 19:45	59.9	72.7	64.0	44.3	02/12/2022 07:00	59.8	73.9	64.0	43.9
01/12/2022 20:00	58.3	73.7	62.4	39.7	02/12/2022 07:15	60.1	74.6	64.0	47.1
01/12/2022 20:15	56.8	72.2	60.9	39.2	02/12/2022 07:30	61.9	70.8	65.7	50.1
01/12/2022 20:30	58.2	77.7	61.9	32.6	02/12/2022 07:45	61.4	73.2	65.5	51.2
01/12/2022 20:45	57.4	73.0	61.6	34.7	02/12/2022 08:00	62.4	72.2	65.9	53.7
01/12/2022 21:00	57.8	71.3	61.9	39.4	02/12/2022 08:15	61.8	73.3	65.6	51.4
01/12/2022 21:15	55.6	72.1	60.0	33.2	02/12/2022 08:30	61.8	70.6	65.6	50.8

Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB
02/12/2022 08:45	62.6	85.8	66.0	51.0
02/12/2022 09:00	61.0	71.7	65.2	48.7
02/12/2022 09:15	60.4	76.3	64.5	46.4
02/12/2022 09:30	60.3	75.5	64.3	46.8
02/12/2022 09:45	59.9	73.1	64.2	45.5
02/12/2022 10:00	59.5	69.9	64.1	45.8
02/12/2022 10:15	59.9	75.5	63.9	44.9
02/12/2022 10:30	60.5	73.5	64.7	48.6
02/12/2022 10:45	60.5	77.2	64.6	48.8
02/12/2022 11:00	61.1	72.2	65.1	49.7
02/12/2022 11:15	60.2	72.6	64.5	45.5
02/12/2022 11:30	62.1	87.1	65.5	48.9

Location M02: Survey Data - Time History Charts



SHF.1888.002 5-7 Ossett Lane, Dewsbury
Location MP2 2nd December 2022

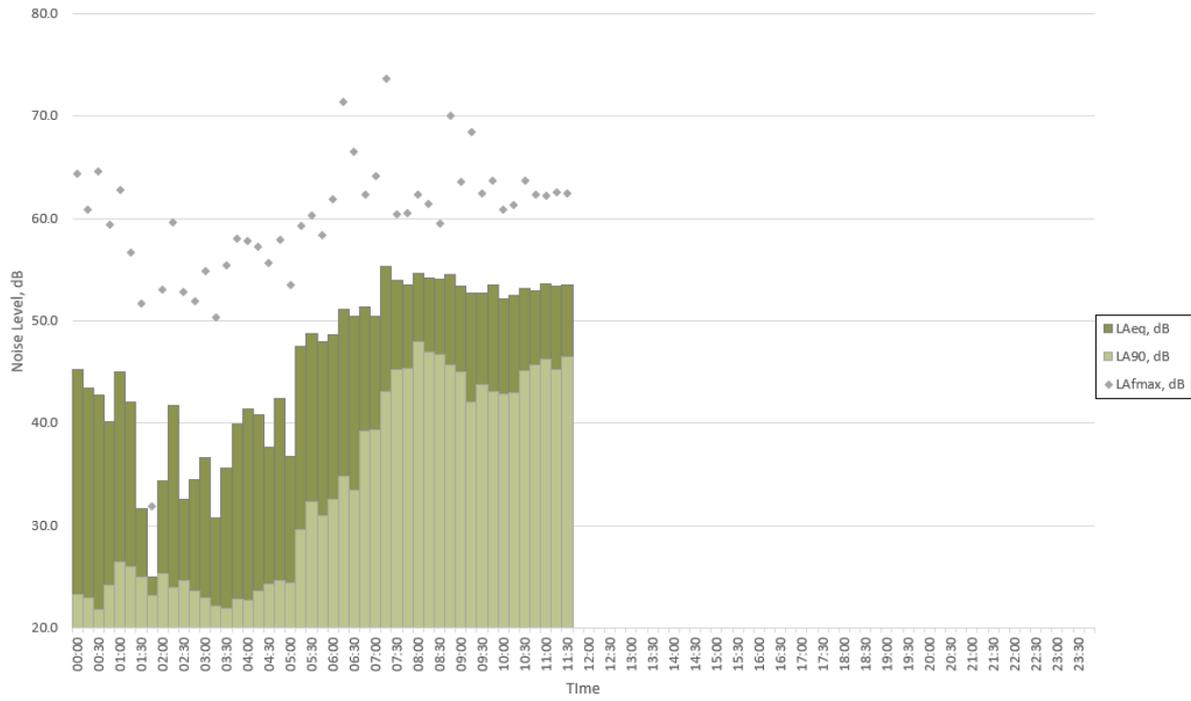


Table A-2: Location M02 - Noise Data

Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB	Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB
30/11/2022 12:00	52.2	60.7	56.1	42.9	30/11/2022 23:15	46.2	62.7	50.4	26.9
30/11/2022 12:15	52.0	62.2	55.6	40.7	30/11/2022 23:30	59.2	82.2	51.8	25.9
30/11/2022 12:30	53.1	70.9	56.3	39.9	30/11/2022 23:45	46.1	65.9	48.9	23.7
30/11/2022 12:45	52.1	67.6	55.7	37.6	01/12/2022 00:00	43.4	59.6	47.7	23.3
30/11/2022 13:00	51.6	60.9	55.3	43.1	01/12/2022 00:15	44.0	59.3	47.9	22.4
30/11/2022 13:15	52.3	63.6	55.5	43.3	01/12/2022 00:30	39.3	57.6	41.6	23.4
30/11/2022 13:30	53.2	61.8	56.5	45.1	01/12/2022 00:45	39.5	58.0	43.1	22.8
30/11/2022 13:45	51.3	61.2	55.1	39.6	01/12/2022 01:00	37.4	50.7	41.7	23.6
30/11/2022 14:00	53.8	68.5	57.0	43.8	01/12/2022 01:15	38.9	57.3	35.3	22.1
30/11/2022 14:15	53.6	61.9	56.8	45.1	01/12/2022 01:30	34.7	54.7	33.1	23.0
30/11/2022 14:30	52.5	59.4	56.1	41.5	01/12/2022 01:45	36.4	57.5	24.7	21.4
30/11/2022 14:45	53.6	63.4	56.7	46.3	01/12/2022 02:00	27.9	39.5	31.2	22.1
30/11/2022 15:00	53.7	63.1	57.2	43.2	01/12/2022 02:15	31.1	50.7	27.4	20.6
30/11/2022 15:15	54.1	60.8	57.0	47.3	01/12/2022 02:30	33.7	49.7	34.8	21.1
30/11/2022 15:30	62.5	83.7	57.0	45.1	01/12/2022 02:45	37.3	53.8	35.1	21.6
30/11/2022 15:45	54.4	74.8	57.0	45.9	01/12/2022 03:00	29.6	46.4	26.2	22.3
30/11/2022 16:00	53.6	60.2	56.9	44.7	01/12/2022 03:15	29.9	49.4	27.8	22.1
30/11/2022 16:15	54.5	62.5	57.7	46.5	01/12/2022 03:30	34.5	52.2	32.4	22.8
30/11/2022 16:30	55.2	65.6	58.0	47.4	01/12/2022 03:45	39.9	59.7	40.0	24.0
30/11/2022 16:45	54.9	62.8	58.0	48.0	01/12/2022 04:00	41.6	59.0	43.0	21.7
30/11/2022 17:00	55.0	66.3	57.6	49.2	01/12/2022 04:15	39.3	59.0	32.0	22.0
30/11/2022 17:15	54.3	60.5	56.8	49.4	01/12/2022 04:30	40.2	58.1	41.7	23.5
30/11/2022 17:30	54.2	63.6	57.1	47.4	01/12/2022 04:45	41.7	55.9	45.5	22.8
30/11/2022 17:45	53.3	60.5	56.7	45.4	01/12/2022 05:00	40.2	57.0	43.5	23.3
30/11/2022 18:00	53.8	64.2	57.0	46.7	01/12/2022 05:15	46.5	59.8	50.8	27.1
30/11/2022 18:15	52.1	59.7	55.6	42.6	01/12/2022 05:30	46.6	56.9	51.3	28.1
30/11/2022 18:30	52.6	61.4	56.2	42.9	01/12/2022 05:45	47.2	60.7	51.6	30.3
30/11/2022 18:45	58.1	78.3	58.1	46.0	01/12/2022 06:00	48.7	61.6	52.6	32.4
30/11/2022 19:00	52.0	69.1	55.7	41.6	01/12/2022 06:15	48.4	58.8	52.7	30.6
30/11/2022 19:15	51.2	61.3	54.5	39.1	01/12/2022 06:30	51.7	66.6	55.3	35.2
30/11/2022 19:30	50.4	60.7	54.0	35.2	01/12/2022 06:45	50.7	59.8	55.1	35.2
30/11/2022 19:45	49.7	58.8	54.1	32.3	01/12/2022 07:00	52.0	63.1	55.2	43.8
30/11/2022 20:00	48.8	58.9	53.0	30.4	01/12/2022 07:15	53.5	62.3	57.0	43.9
30/11/2022 20:15	49.8	61.9	53.6	30.1	01/12/2022 07:30	56.1	63.4	59.2	50.2
30/11/2022 20:30	48.0	59.0	52.5	30.0	01/12/2022 07:45	55.3	71.1	58.1	48.2
30/11/2022 20:45	46.2	58.4	50.4	29.2	01/12/2022 08:00	56.8	68.4	59.0	50.8
30/11/2022 21:00	48.0	57.7	52.0	33.7	01/12/2022 08:15	54.8	62.5	57.8	47.3
30/11/2022 21:15	46.5	59.8	50.6	30.8	01/12/2022 08:30	54.7	62.5	57.6	48.0
30/11/2022 21:30	46.4	58.7	50.6	28.5	01/12/2022 08:45	54.4	62.0	57.3	48.1
30/11/2022 21:45	47.9	60.8	52.1	32.9	01/12/2022 09:00	53.8	67.8	57.2	44.8
30/11/2022 22:00	46.7	58.7	51.1	32.7	01/12/2022 09:15	53.2	62.2	56.9	43.1
30/11/2022 22:15	46.9	65.0	50.3	29.4	01/12/2022 09:30	53.1	60.8	56.7	41.8
30/11/2022 22:30	45.8	58.9	50.2	27.1	01/12/2022 09:45	56.8	65.4	62.7	45.1
30/11/2022 22:45	44.4	60.7	48.2	26.5	01/12/2022 10:00	52.7	63.4	56.0	44.7
30/11/2022 23:00	43.9	58.7	48.4	28.2	01/12/2022 10:15	51.3	62.4	55.0	39.8

Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB	Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB
01/12/2022 10:30	53.7	64.6	57.2	45.2	01/12/2022 21:45	48.1	60.9	52.5	30.2
01/12/2022 10:45	52.7	64.2	56.6	42.5	01/12/2022 22:00	48.8	65.8	51.6	29.2
01/12/2022 11:00	54.8	64.9	58.3	38.9	01/12/2022 22:15	45.0	55.8	49.7	27.7
01/12/2022 11:15	52.0	64.3	55.8	40.1	01/12/2022 22:30	47.7	63.6	52.0	27.2
01/12/2022 11:30	52.8	64.1	55.4	40.7	01/12/2022 22:45	42.3	58.8	46.8	22.3
01/12/2022 11:45	52.7	62.8	56.4	42.0	01/12/2022 23:00	43.0	59.0	46.9	23.1
01/12/2022 12:00	52.2	63.3	55.4	44.0	01/12/2022 23:15	42.8	59.7	44.7	22.4
01/12/2022 12:15	52.1	63.9	55.0	42.9	01/12/2022 23:30	43.1	61.3	43.5	22.7
01/12/2022 12:30	51.9	63.2	55.8	41.8	01/12/2022 23:45	43.8	62.7	47.6	22.7
01/12/2022 12:45	52.1	60.7	55.6	42.6	02/12/2022 00:00	45.2	64.4	48.0	23.3
01/12/2022 13:00	51.9	61.2	55.2	41.9	02/12/2022 00:15	43.4	60.9	47.2	22.9
01/12/2022 13:15	52.4	69.5	55.8	42.8	02/12/2022 00:30	42.8	64.6	42.5	21.8
01/12/2022 13:30	52.5	64.8	56.0	43.8	02/12/2022 00:45	40.2	59.4	40.8	24.2
01/12/2022 13:45	54.4	64.5	58.0	43.0	02/12/2022 01:00	45.0	62.8	47.5	26.4
01/12/2022 14:00	52.9	65.7	56.2	46.8	02/12/2022 01:15	42.1	56.7	45.4	26.0
01/12/2022 14:15	51.6	61.8	54.9	43.2	02/12/2022 01:30	31.7	51.7	27.6	25.0
01/12/2022 14:30	53.2	63.7	56.7	42.9	02/12/2022 01:45	25.0	31.9	26.1	23.2
01/12/2022 14:45	55.5	65.4	58.3	46.1	02/12/2022 02:00	34.4	53.1	33.2	25.3
01/12/2022 15:00	55.0	65.3	57.9	48.0	02/12/2022 02:15	41.7	59.6	42.1	24.0
01/12/2022 15:15	53.4	61.2	56.4	46.7	02/12/2022 02:30	32.6	52.8	29.1	24.7
01/12/2022 15:30	54.1	60.7	57.1	46.8	02/12/2022 02:45	34.5	51.9	31.0	23.6
01/12/2022 15:45	53.9	61.8	57.0	44.7	02/12/2022 03:00	36.6	54.9	37.7	22.9
01/12/2022 16:00	53.8	60.3	56.7	47.2	02/12/2022 03:15	30.8	50.4	28.7	22.2
01/12/2022 16:15	54.1	66.1	57.0	48.1	02/12/2022 03:30	35.6	55.4	29.4	21.9
01/12/2022 16:30	54.7	64.9	57.3	48.1	02/12/2022 03:45	39.9	58.0	35.8	22.8
01/12/2022 16:45	54.4	65.7	57.2	48.5	02/12/2022 04:00	41.4	57.8	43.8	22.7
01/12/2022 17:00	54.6	64.4	57.4	48.8	02/12/2022 04:15	40.8	57.3	42.9	23.6
01/12/2022 17:15	54.6	63.9	57.3	48.2	02/12/2022 04:30	37.7	55.7	34.0	24.3
01/12/2022 17:30	53.7	63.4	57.0	45.4	02/12/2022 04:45	42.4	57.9	44.6	24.6
01/12/2022 17:45	53.0	61.6	56.4	44.0	02/12/2022 05:00	36.8	53.5	37.3	24.4
01/12/2022 18:00	54.1	62.2	56.8	46.6	02/12/2022 05:15	47.5	59.3	52.4	29.6
01/12/2022 18:15	54.0	69.1	56.8	45.5	02/12/2022 05:30	48.8	60.3	53.4	32.4
01/12/2022 18:30	52.7	61.6	55.9	44.6	02/12/2022 05:45	48.0	58.4	53.0	31.0
01/12/2022 18:45	51.7	60.3	55.2	41.8	02/12/2022 06:00	48.7	61.9	53.1	32.6
01/12/2022 19:00	51.5	59.3	54.9	41.7	02/12/2022 06:15	51.2	71.4	53.0	34.8
01/12/2022 19:15	51.3	64.3	55.0	38.9	02/12/2022 06:30	50.5	66.6	53.7	33.5
01/12/2022 19:30	50.9	64.1	55.0	36.4	02/12/2022 06:45	51.4	62.3	55.2	39.2
01/12/2022 19:45	52.6	62.9	56.4	39.5	02/12/2022 07:00	50.5	64.2	53.9	39.4
01/12/2022 20:00	51.6	63.1	55.7	38.6	02/12/2022 07:15	55.3	73.7	57.3	43.1
01/12/2022 20:15	49.0	59.4	53.2	35.9	02/12/2022 07:30	54.0	60.4	57.0	45.3
01/12/2022 20:30	49.9	64.3	53.5	32.8	02/12/2022 07:45	53.5	60.5	56.9	45.4
01/12/2022 20:45	49.5	62.2	53.4	32.7	02/12/2022 08:00	54.7	62.3	57.4	48.0
01/12/2022 21:00	50.3	59.8	54.7	35.1	02/12/2022 08:15	54.2	61.5	57.2	46.9
01/12/2022 21:15	48.0	61.2	51.9	32.1	02/12/2022 08:30	54.1	59.5	56.9	46.7
01/12/2022 21:30	49.0	59.7	53.4	32.7	02/12/2022 08:45	54.5	70.1	58.0	45.7

Period Start	L _{Aeq} dB	L _{Afmax} dB	L _{A10} dB	L _{A90} dB
02/12/2022 09:00	53.4	63.6	56.8	45.0
02/12/2022 09:15	52.7	68.5	56.0	42.1
02/12/2022 09:30	52.7	62.5	56.1	43.8
02/12/2022 09:45	53.5	63.7	57.1	43.1
02/12/2022 10:00	52.2	60.9	56.1	42.9
02/12/2022 10:15	52.5	61.3	56.0	43.0
02/12/2022 10:30	53.2	63.7	56.9	45.1
02/12/2022 10:45	52.9	62.4	55.9	45.7
02/12/2022 11:00	53.6	62.2	56.8	46.3
02/12/2022 11:15	53.4	62.6	56.9	45.2
02/12/2022 11:30	53.5	62.5	56.9	46.5

Appendix B – Noise Ingress Calculations

Table B-1: Plot 5 – Upper Ground Floor Lounge

Label	Parameter		Octave Band Centre Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	
	Leq	Spectrum	-21	-16	-14	-9	-2	-7	-16	-22	59.4
		Noise Level	38.4	43.4	45.4	50.4	57.4	52.4	43.4	37.4	
	Lmax	Spectrum									
		Noise Level									
Overheating	Openable Windows	Level Diff	13	13	13	13	13	13	13	13	
	Internal L _{eq}		25.4	30.4	32.4	37.4	44.4	39.4	30.4	24.4	46.4
	Internal L _{max}		-13	-13	-13	-13	-13	-13	-13	-13	-6
Vents	31 Dne,w: Trickle: Non Aco: More Complex	D _{ne,w}	29	30	31	31	32	28	31	25	
	B		0.00155	0.00123	0.00098	0.00098	0.00078	0.00195	0.00098	0.00389	
	Internal L _{eq}		11.4	15.4	16.4	21.4	27.4	26.4	14.4	14.4	31
	Internal L _{max}		-27.0	-28.0	-29.0	-29.0	-30.0	-26.0	-29.0	-23.0	-19.7
Windows	6/12/6 double glazing	R _{wi}	14	20	19	29	38	36	45	40	
	C		0.02748	0.0069	0.00869	0.00087	0.00011	0.00017	2.2E-05	6.9E-05	
	Internal L _{eq}		26.9	25.9	28.9	23.9	21.9	18.9	0.9	-0.1	27
	Internal L _{max}		-8.5	-14.5	-13.5	-23.5	-32.5	-30.5	-39.5	-34.5	-19.3
Wall	Example Wall from BS8233 (Brick and Block)	R _{ew}	36	40	44	45	51	56	58	50	
	D		0.00017	6.9E-05	2.7E-05	2.2E-05	5.5E-06	1.7E-06	1.1E-06	6.9E-06	
	Internal L _{eq}		4.9	5.9	3.9	7.9	8.9	-1.1	-12.1	-10.1	10.9
	Internal L _{max}		-30.5	-34.5	-38.5	-39.5	-45.5	-50.5	-52.5	-44.5	-38
Louvre	None/Infinite	R _{ew}	100	100	100	100	100	100	100	100	
	E	0	6.9E-11	6.9E-11	6.9E-11	6.9E-11	6.9E-11	6.9E-11	6.9E-11	6.9E-11	
	Internal L _{eq}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Internal L _{max}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
10 log (B+C+D+E) = F											
Total Internal L _{eq}											
Total Internal L _{max}											

Table B-2: Plot 5 – 1st Floor Bedroom 1

Label	Parameter	Label	Octave Band Centre Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	
	Leq	Spectrum	-19	-17	-13	-9	-3	-8	-8	-17	58.8
		Noise Level	39.8	41.8	45.8	49.8	55.8	50.8	50.8	41.8	
	Lmax	Spectrum	-14.2	-11.2	-9.2	-8.2	-3.2	-8.2	-8.2	-14.2	69.8
		Noise Level	55.6	58.6	60.6	61.6	66.6	61.6	61.6	55.6	
Overheating	Openable Windows	Level Diff	13	13	13	13	13	13	13	13	
	Internal L _{eq}		26.8	28.8	32.8	36.8	42.8	37.8	37.8	28.8	45.8
	Internal L _{max}		42.6	45.6	47.6	48.6	53.6	48.6	48.6	42.6	56.8
Vents	38 Dne,w: Trickle: Acoustic: Typical	D _{ne,w}	29	30	33	38	37	36	40	35	
	B		0.00155	0.00123	0.00062	0.00019	0.00025	0.00031	0.00012	0.00039	
	Internal L _{eq}		13.9	14.9	15.9	14.9	21.9	17.9	13.9	9.9	24.7
	Internal L _{max}		29.7	31.7	30.7	26.7	32.7	28.7	24.7	23.7	35.8
Windows	10/12/6 double glazing	R _{wi}	21	26	27	34	40	38	46	40	
	C		0.00607	0.00192	0.00152	0.0003	7.6E-05	0.00012	1.9E-05	7.6E-05	
	Internal L _{eq}		22.8	19.8	22.8	19.8	19.8	16.8	8.8	5.8	23.9
	Internal L _{max}		41.6	39.6	40.6	34.6	33.6	30.6	22.6	22.6	38.7
Wall	Example Wall from BS8233 (Brick and Block)	R _{ew}	36	40	44	45	51	56	58	50	
	D		0.00019	7.6E-05	3E-05	2.4E-05	6.1E-06	1.9E-06	1.2E-06	7.6E-06	
	Internal L _{eq}		7.8	5.8	5.8	8.8	8.8	-1.2	-3.2	-4.2	11.4
	Internal L _{max}		26.6	25.6	23.6	23.6	22.6	12.6	10.6	12.6	25.9
Louvre	None/Infinite	R _{ew}	100	100	100	100	100	100	100	100	
	E		0	7.6E-11							
	Internal L _{eq}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Internal L _{max}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	10 log (B+C+D+E) = F		-21.1	-24.9	-26.6	-32.8	-34.8	-33.6	-38.4	-33.3	
	Total Internal L_{eq}		23.9	22.1	24.3	22.2	26.1	22.3	17.5	13.7	29.3
	Total Internal L_{max}		42.7	41.9	42.1	37.0	39.9	36.1	31.3	30.5	43.6

Table B-3: Plot 4 – Ground Floor Lounge

Label	Parameter	Label	Octave Band Centre Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	
	Leq	Spectrum	-21	-16	-14	-9	-2	-7	-16	-22	58.4
		Noise Level	37.4	42.4	44.4	49.4	56.4	51.4	42.4	36.4	
	Lmax	Spectrum									
		Noise Level									
Overheating	Openable Windows	Level Diff	13	13	13	13	13	13	13	13	
	Internal L _{eq}		24.4	29.4	31.4	36.4	43.4	38.4	29.4	23.4	45.4
	Internal L _{max}		-13	-13	-13	-13	-13	-13	-13	-13	-6
Vents	31 Dne,w: Trickle: Non Aco: More Complex	D _{ne,w}	29	30	31	31	32	28	31	25	
	B		0.00155	0.00123	0.00098	0.00098	0.00078	0.00195	0.00098	0.00389	
	Internal L _{eq}		10.4	14.4	15.4	20.4	26.4	25.4	13.4	13.4	30
	Internal L _{max}		-27.0	-28.0	-29.0	-29.0	-30.0	-26.0	-29.0	-23.0	-19.7
Windows	6/12/6 double glazing	R _{wi}	14	20	19	29	38	36	45	40	
	C		0.02748	0.0069	0.00869	0.00087	0.00011	0.00017	2.2E-05	6.9E-05	
	Internal L _{eq}		25.9	24.9	27.9	22.9	20.9	17.9	-0.1	-1.1	26
	Internal L _{max}		-8.5	-14.5	-13.5	-23.5	-32.5	-30.5	-39.5	-34.5	-19.3
Wall	Example Wall from BS8233 (Brick and Block)	R _{ew}	36	40	44	45	51	56	58	50	
	D		0.00017	6.9E-05	2.7E-05	2.2E-05	5.5E-06	1.7E-06	1.1E-06	6.9E-06	
	Internal L _{eq}		3.9	4.9	2.9	6.9	7.9	-2.1	-13.1	-11.1	9.9
	Internal L _{max}		-30.5	-34.5	-38.5	-39.5	-45.5	-50.5	-52.5	-44.5	-38
Louvre	None/Infinite	R _{ew}	100	100	100	100	100	100	100	100	
	E		0	6.9E-11							
	Internal L _{eq}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Internal L _{max}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	10 log (B+C+D+E) = F		-15.3	-20.9	-20.1	-27.3	-30.5	-26.7	-30.0	-24.0	
	Total Internal L_{eq}		26.2	25.7	28.4	26.2	30.0	28.8	16.5	16.5	33.8
	Total Internal L_{max}		-8.2	-13.7	-13.0	-20.2	-23.4	-19.6	-22.9	-16.9	-12.7

Table B-4: Plot 4 – 1st Floor Bedroom 1

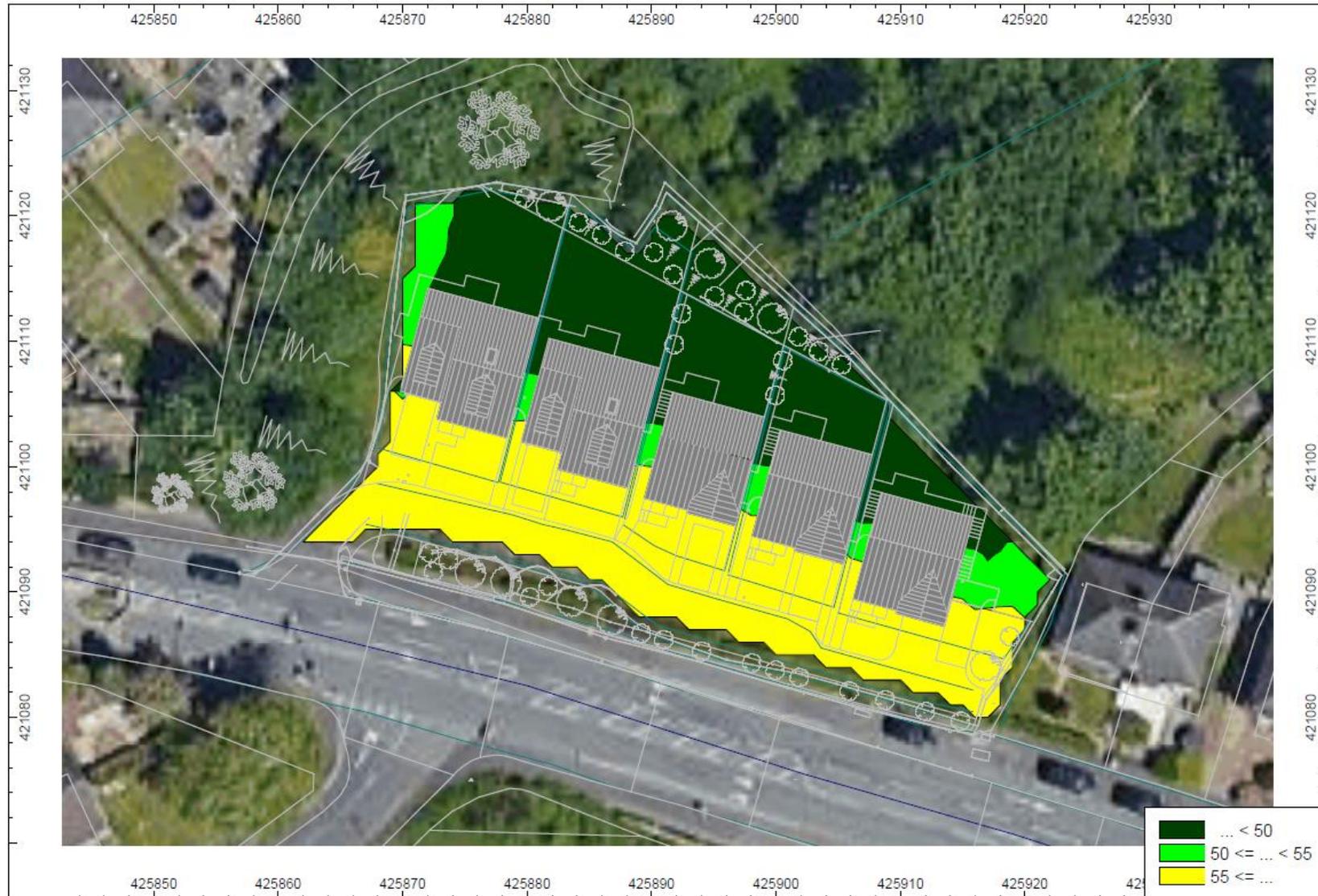
Label	Parameter	Label	Octave Band Centre Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	
	Leq	Spectrum	-19	-17	-13	-9	-3	-8	-8	-17	58.4
		Noise Level	39.4	41.4	45.4	49.4	55.4	50.4	50.4	41.4	
	Lmax	Spectrum	-14.2	-11.2	-9.2	-8.2	-3.2	-8.2	-8.2	-14.2	69
		Noise Level	54.8	57.8	59.8	60.8	65.8	60.8	60.8	54.8	
Overheating	Openable Windows	Level Diff	13	13	13	13	13	13	13		
	Internal L _{eq}		26.4	28.4	32.4	36.4	42.4	37.4	37.4	28.4	45.4
	Internal L _{max}		41.8	44.8	46.8	47.8	52.8	47.8	47.8	41.8	56
Vents	38 Dne,w: Trickle: Acoustic: Typical	D _{ne,w}	29	30	33	38	37	36	40	35	
	B		0.00155	0.00123	0.00062	0.00019	0.00025	0.00031	0.00012	0.00039	
	Internal L _{eq}		13.5	14.5	15.5	14.5	21.5	17.5	13.5	9.5	24.3
	Internal L _{max}		28.9	30.9	29.9	25.9	31.9	27.9	23.9	22.9	35
Windows	10/12/6 double glazing	R _{wi}	21	26	27	34	40	38	46	40	
	C		0.00607	0.00192	0.00152	0.0003	7.6E-05	0.00012	1.9E-05	7.6E-05	
	Internal L _{eq}		22.4	19.4	22.4	19.4	19.4	16.4	8.4	5.4	23.5
	Internal L _{max}		40.8	38.8	39.8	33.8	32.8	29.8	21.8	21.8	37.9
Wall	Example Wall from BS8233 (Brick and Block)	R _{ew}	36	40	44	45	51	56	58	50	
	D		0.00019	7.6E-05	3E-05	2.4E-05	6.1E-06	1.9E-06	1.2E-06	7.6E-06	
	Internal L _{eq}		7.4	5.4	5.4	8.4	8.4	-1.6	-3.6	-4.6	11
	Internal L _{max}		25.8	24.8	22.8	22.8	21.8	11.8	9.8	11.8	25.1
Louvre	None/Infinite	R _{ew}	100	100	100	100	100	100	100	100	
	E		0	7.6E-11							
	Internal L _{eq}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Internal L _{max}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	10 log (B+C+D+E) = F		-21.1	-24.9	-26.6	-32.8	-34.8	-33.6	-38.4	-33.3	
	Total Internal L_{eq}		23.5	21.7	23.9	21.8	25.7	21.9	17.1	13.3	28.9
	Total Internal L_{max}		41.9	41.1	41.3	36.2	39.1	35.3	30.5	29.7	42.8

Table B-4: Plot 4 – 1st Floor Bedroom 4

Label	Parameter	Label	Octave Band Centre Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	
	Leq	Spectrum	-19	-17	-13	-9	-3	-8	-8	-17	58.4
		Noise Level	39.4	41.4	45.4	49.4	55.4	50.4	50.4	41.4	
	Lmax	Spectrum	-14.2	-11.2	-9.2	-8.2	-3.2	-8.2	-8.2	-14.2	69
		Noise Level	54.8	57.8	59.8	60.8	65.8	60.8	60.8	54.8	
Overheating	Openable Windows	Level Diff	13	13	13	13	13	13	13		
	Internal L _{eq}		26.4	28.4	32.4	36.4	42.4	37.4	37.4	28.4	45.4
	Internal L _{max}		41.8	44.8	46.8	47.8	52.8	47.8	47.8	41.8	56
Vents	38 Dne,w; Trickle: Acoustic: Typical	D _{ne,w}	29	30	33	38	37	36	40	35	
	B		0.0015	0.00119	0.0006	0.00019	0.00024	0.0003	0.00012	0.00038	
	Internal L _{eq}		15.1	16.1	17.1	16.1	23.1	19.1	15.1	11.1	25.9
	Internal L _{max}		30.5	32.5	31.5	27.5	33.5	29.5	25.5	24.5	36.6
Windows	10/12/6 double glazing	R _{wi}	21	26	27	34	40	38	46	40	
	C		0.00695	0.0022	0.00175	0.00035	8.8E-05	0.00014	2.2E-05	8.8E-05	
	Internal L _{eq}		24.8	21.8	24.8	21.8	21.8	18.8	10.8	7.8	25.9
	Internal L _{max}		43.2	41.2	42.2	36.2	35.2	32.2	24.2	24.2	40.3
Wall	Example Wall from BS8233 (Brick and Block)	R _{ew}	36	40	44	45	51	56	58	50	
	D		0.00022	8.8E-05	3.5E-05	2.8E-05	7E-06	2.2E-06	1.4E-06	8.8E-06	
	Internal L _{eq}		9.8	7.8	7.8	10.8	10.8	0.8	-1.2	-2.2	13.3
	Internal L _{max}		28.2	27.2	25.2	25.2	24.2	14.2	12.2	14.2	27.4
Louvre	None/Infinite	R _{ew}	100	100	100	100	100	100	100	100	
	E		0	8.8E-11							
	Internal L _{eq}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Internal L _{max}		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	10 log (B+C+D+E) = F		-20.6	-24.6	-26.2	-32.5	-34.8	-33.6	-38.5	-33.3	
	Total Internal L_{eq}		25.7	23.8	26.1	23.9	27.6	23.8	18.9	15.1	30.7
	Total Internal L_{max}		44.1	43.2	43.5	38.3	41.0	37.2	32.3	31.5	44.7

Appendix C – Noise Contour Plot

Figure C-1 – Outdoor Amenity Spaces





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