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Proposed Residential Development Land to the South of Barrow Road, Barton-upon-Humber

Noise Impact Assessment

**For:
Strata**

25th July 2025

Ref: NIA-10832-23-10964-v4 Barrow Road, Barton
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1 Introduction

1.1 Overview

Environmental Noise Solutions has been commissioned by Strata to carry out a noise impact assessment for a proposed new residential development at land to the south of Barrow Road, Barton-upon-Humber (hereafter referred to as 'the site').

The objectives of the noise impact assessment were to:

- Determine external noise levels at the site
- Assess the potential impact of the external noise climate on the proposed residential development with reference to relevant guidelines
- Provide recommendations for a scheme of sound attenuation works, as necessary, to protect future occupants of the proposed residential development from a loss of amenity due to noise

This report details the methodology and results of the assessment and provides recommendations for the building envelope (fenestration and ventilation) and boundary treatments. It has been prepared to accompany Planning Application ref: PA/2023/1607 submitted to North Lincolnshire Council.

The report has been prepared for Strata for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult Strata and ENS as to the extent to which the findings may be appropriate for their use.

The author of this report is a Member of the Institute of Acoustics (MIOA) and ENS is a specialist acoustic consultancy and a corporate member of the Association of Noise Consultants.

A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

1.2 Site Description and Proposed Development

The site is located to the south-east of Barton-upon-Humber, as shown in Figure 1.1 below.

Figure 1.1: Location of Development



The site is bound by:

- The A1077 Barrow Road to the north
- Existing residential properties to the west
- Agricultural land to the south and east

A new link road is to be constructed directly through the site leading from the A1077 Barrow Road whereby a new roundabout is also to be formed. This link road is to be delivered by the Council in accordance with planning permission PA/2023/1981.

For reference, a Transport Assessment for the site has been produced by Local Transport Projects. The TA includes traffic flow data for the proposed link road.

Development proposals are for 196 no. dwellings with associated access roads and landscaping (see Appendix 3 for site layout plan). A layout plan indicates that the residential development footprint is set back circa **10 metres** from the nearside kerb of the A1077 Barrow Road. The nearest proposed dwelling façades are also set back at least **7 metres** from the nearside kerb of the link road.

The noise environment at the site is dominated by road traffic on the A1077 Barrow Road.

2 Assessment Guidance

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)¹ was updated in December 2024 and sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 187 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of.....noise pollution'.

Paragraph 198 advises that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should.....mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England² (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

The NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur

According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

'...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.'

1 National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2023)

2 Government Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. March 2010.

2.3 Planning Practice Guidance on Noise

Planning Practice Guidance³ (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL.

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

'Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed'.

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. The following guidance documents provide some meaningful context.

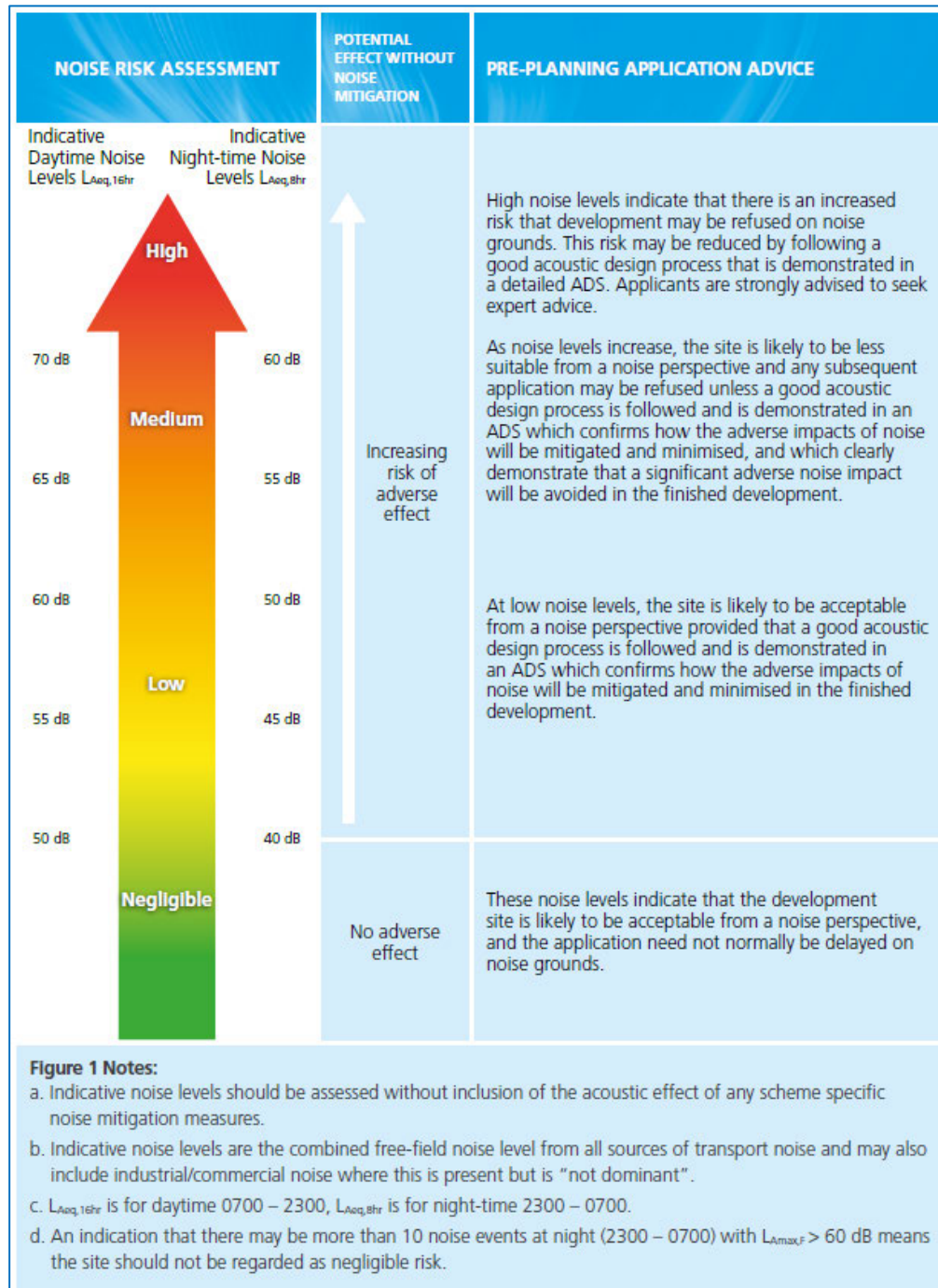
3 Planning Practice Guidance on Noise: <http://planningguidance.planningportal.gov.uk/blog/guidance/noise/>

2.4 ProPG Planning and Noise: New Residential Development

ProPG Planning and Noise: New Residential Development (ProPG)⁴ promotes a systematic two-stage, risk-based approach to noise assessments that inform planning applications for new residential developments.

Stage 1 consists of an initial noise risk assessment, as summarised in Figure 2.1 below.

Figure 2.1: ProPG Initial Site Noise Risk Assessment



⁴ 'ProPG Planning and Noise: New Residential Development (ProPG)', 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

Stage 2 requires consideration of four key elements, as follows:

- Element 1 – demonstrating a “Good Acoustic Design Process”
- Element 2 – observing internal “Noise Level Guidelines”
- Element 3 – undertaking an “External Amenity Area Noise Assessment”
- Element 4 – consideration of “Other Relevant Issues”

With regard to Element 1, ProPG requires evidence that a good acoustic design process has been followed, and that the following aspects have been considered:

- Check the feasibility of relocating, or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ (BS 8233), as summarised below.

Table 2.1: Indoor Ambient Noise Levels for Dwellings

Activity	Location	Indoor Ambient Noise Levels	
Resting	Living Room	35 dB L_{Aeq} (0700-2300)	-
Dining	Dining Room/Area	40 dB L_{Aeq} (0700-2300)	-
Sleeping (daytime resting)	Bedroom	35 dB L_{Aeq} (0700-2300)	30 dB L_{Aeq} (2300-0700) 45 dB L_{AFMax} (2300-0700)

Note 4 to the above table states: ‘A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.’

Note 5 to the above table states: ‘Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7’.

This is consistent with the guidance contained within the PPG, which states that:

‘... consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations’.

On the basis of the above, the following criteria (with windows closed and an alternative means of ventilation provided) are considered appropriate for the site:

- ≤ 35 dB L_{Aeq} (0700-2300) in habitable rooms during the daytime
- ≤ 30 dB L_{Aeq} (2300-0700) in bedrooms during the night-time
- 45 dB L_{AFMax} not regularly exceeded in bedrooms during the night-time

With regard to external amenity (Element 3), ProPG reflects the advice given in BS 8233 as follows:

'The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.'

'These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.'

2.5 Approved Document O

Approved Document O, 2021 is written in support of Part O of Schedule 1 to the Building Regulations 2010. The approved document details methods of addressing overheating of residential dwellings and is applicable only across England.

The approved document has the following relevant guidance in Section 3 regarding noise ingress into buildings:

'In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).'

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)
- 55dB L_{Amax} , more than 10 times a night (between 11pm and 7am)'

3 Noise Survey

3.1 Overview

In order to establish external noise levels at the site, baseline noise surveys were undertaken on Tuesday 14th March 2023 and on Monday 14th July, Wednesday 16th July and Thursday 17th July 2025.

For the purpose of the assessment, the following noise monitoring positions were adopted (the approximate locations of the noise monitoring positions are shown in Appendix 2 for reference):

- MP1 was located at circa 10 metres back from the nearside kerb of the A1077 Barrow Road
- MP1A was located at circa 20 metres back from the nearside kerb of the A1077 Barrow Road
- MP2 was located at the western boundary of the site
- MP3 was located at the southern boundary of the site

Noise measurements were made in a free field environment at 4 metres above ground level using a Bruel & Kjaer 2250 and NTi XL3 Type 1 integrating sound level meters. Each meter was connected to a windshield covered microphone positioned at the locations detailed above. The calibration of each measurement system was verified immediately before and after the survey using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted.

Measurements consisted of A-weighted broadband parameters, together with linear octave band L_{eq} levels.

The noted weather conditions during the survey were dry with wind speeds < 5 m/s. Weather conditions were therefore considered appropriate for noise monitoring. See Table 3.1 for detailed weather data. For reference, wind speeds were measured periodically using a Kaindl Windmaster 2 anemometer.

3.2 Summary

Table 3.1 overleaf presents a summary of the noise data for each measurement session, at each measurement position, rounded to the nearest decibel. Appendix 6 contains the full raw data and Appendix 7 contains equipment calibration details.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	Comment	Weather
MP1	14/03/23	1012–1057	66	55	69	Dominated by road traffic on A1077 Barrow Road	Wind 4 m/s westerly, 8°C, scattered cloud cover, dry
		1057–1125	66	55	69		
		1213–1258	65	54	68		
		1258–1344	65	56	68		
	14/07/25	0400–0500	59	35	63	Dominated by road traffic on A1077 Barrow Road	Wind 2-3 m/s easterly, 18°C, cloudy, dry
		0500–0600	64	52	68		
		0600–0700	66	56	71		
		1001–1101	64	52	69	Dominated by road traffic on A1077 Barrow Road	Wind 2-3 m/s southerly, 24°C, cloudy, dry
		1101–1201	64	53	69		
		1201–1301	66	54	70		
	16/07/25	1155–1255	65	55	70	Dominated by road traffic on A1077 Barrow Road	Wind 3 m/s northerly, 21°C, cloudy, dry
		1255–1355	65	56	70		
		1355–1455	66	58	70		
	17/07/25	0400–0500	60	38	65	Dominated by road traffic on A1077 Barrow Road	Wind 0.5 m/s westerly, 12°C, clear, dry
		0500–0600	65	53	70		
		0600–0700	66	56	71		
		1118–1218	65	55	69	Dominated by road traffic on A1077 Barrow Road	Wind 2 m/s southerly, 23°C, scattered cloud cover, dry
		1218–1318	65	55	69		
1318–1418		64	55	69			
MP1A	14/03/23	1400–1415	59	54	61	Road traffic on A1077	Wind 4 m/s westerly, 8°C, scattered cloud cover, dry
MP2	14/03/23	1435–1535	49	44	52	Distant road traffic on A1077 Barrow Road	Wind 4 m/s westerly, 8°C, scattered cloud cover, dry
MP3	14/03/23	1538–1643	50	46	53		

3.3 Analysis

The noise environment at the site was controlled by road traffic on the A1077 Barrow Road. Noise levels between the March 2023 and July 2025 surveys were consistent (within 1–2 dB in the L_{Aeq} and L_{A10} parameter) which illustrates that traffic flows are relatively steady.

For the prediction of daytime road traffic noise, the Department of Transport’s Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using L_{A10 (3 hour)} as the arithmetic mean of the three consecutive values of hourly L_{A10}, the L_{A10 (18 hour)} can be calculated from the equation:

$$L_{A10 (18 \text{ hour})} = L_{A10 (3 \text{ hour})} - 1 \text{ dB}$$

A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled ‘Converting the UK Traffic Noise Index L_{A10} (18 hour) to EU Noise Indices for Noise Mapping’ presents a methodology for calculating daytime L_{Aeq} (0700-2300) and night-time L_{Aeq} (2300-0700) ambient noise levels based on the L_{A10} (18 hour) noise levels, as follows:

$$L_{Aeq} (0700-2300) = \frac{10 * \log \left(\left[\frac{10^{((0.95 * L_{A10} (18 \text{ hour}) + 1.44)/10)*12}}{16} \right] + \left[\frac{10^{((0.97 * L_{A10} (18 \text{ hour}) - 2.87)/10)*4}}{16} \right] \right)}{16}$$

$$L_{Aeq} (2300-0700) = 0.90 * L_{A10, 18 \text{ hour}} - 3.77$$

Based on the above formulae, the daytime and night-time ambient noise levels at MP1 are calculated at **65 dB L_{Aeq} (0700-2300)** and **57 dB L_{Aeq} (2300-0700)** respectively.

Following consultation with the Environmental Protection Team at NLC, it was discussed that the approach taken above to predict night-time ambient noise levels may result in an underestimation of the noise levels. A study undertaken by the Institute of Acoustics entitled ‘The Use of Short Duration Night-Time Noise Measurements to Estimate L_{Aeq} 8 hour’ determined that the final 3 hours of the night-time (0400 to 0700 hours) correlated most closely to the 8-hour night-time L_{Aeq} , with a slight overprediction of +1.5 dB(A) on average.

Applying a -1.5 dB(A) correction to the measured night-time data between 0400 and 0700 hours, the night-time ambient noise level at MP1 is calculated at **63 dB L_{Aeq} (2300-0700)**. This higher noise level is robustly adopted for the purposes of the assessment.

Maximum noise levels due to passing vehicles were typically **78 dB L_{AFMax}** during the night-time at MP1.

Ambient noise levels reduced with increasing distance to the A1077, with comparative distance measurements at MP1 and MP1A illustrating point-source propagation of -6 dB per doubling of distance.

Dwellings Fronting Towards the Proposed Link Road

Phase 1 of the proposed link road will run north to south through the site. The nearest proposed dwelling façades are set back at least 7 metres from the nearside kerb of the road.

The noise level associated with the link road may be determined using the CRTN, which includes standard procedures for calculating noise levels from road traffic. The calculation methods use a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles, type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground. CRTN predicts the L_{10} (18hour) dB(A) or L_{10} (1hour) dB(A) noise level for any receptor point at a given distance, up to 300 m, from the road.

Based on the 18-hour AAWT traffic flow figure provided by the transport assessor, and assuming a 30 mph speed limit, the calculated noise level at the nearest proposed dwelling façade is \leq **57 dB L_{A10} (18 hour)**.

Based on the TRL Limited formulae detailed above, the daytime and night-time ambient noise levels at façades directly fronting towards the link road are calculated at **55 dB L_{Aeq} (0700-2300)** and **48 dB L_{Aeq} (2300-0700)** respectively.

4 Noise Assessment

4.1 Initial Site Risk Assessment

Daytime and night-time ambient noise levels across the site have been measured/calculated at ≤ 65 dB L_{Aeq} (0700–2300) and ≤ 63 dB L_{Aeq} (2300–0700) respectively. With respect to Figure 2.1, this equates to medium to high risk site in accordance with ProPG. At these levels ProPG requires a detailed assessment of the noise.

4.2 ProPG Detailed Stage 2 Assessment

Element 1 – Good Acoustic Design Process

Paragraph 2.23 of ProPG provides a checklist of 7 aspects which should be considered with regard to good acoustic design. These aspects are listed below, along with preliminary considerations with respect to the site.

Table 4.1: ProPG Good Acoustic Design Aspects

Aspect	Preliminary Considerations
Check the feasibility of relocating, or reducing noise levels from relevant sources.	The dominant noise source is Barrow Road, which cannot be relocated. Boundary screening is unlikely to be feasible from a visual perspective and would be ineffective for upper floor windows.
Consider options for planning the site or building layout.	Reducing noise from Barrow Road via increasing stand-off is not viable due to the large separation distances required.
Consider the orientation of proposed building(s).	Dwellings will predominantly front towards Barrow Road in order to maximise the screening attenuation of the built form and protect gardens.
Select construction types and methods for meeting building performance requirements.	Glazing/ventilation options are considered in Element 2.
Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.	Typical noise control measures (glazing/ventilation and boundary screening) are usually acceptable in terms of ventilation, fire regulation, health & safety, cost and CDM.
Assess the viability of alternative solutions.	No relevant alternative solutions.
Assess external amenity area noise.	External amenity is considered in Element 3.

The dominant noise source across the site is Barrow Road, which cannot be relocated.

Boundary screening is unlikely to be feasible from a visual perspective and would be ineffective at screening upper floor windows.

Maximum noise levels at MP1 (10m from Barrow Road) were circa **78 dB $L_{AFM_{ax}}$** during the night-time. Assuming point-source propagation characteristics for discrete events (-6 dB per doubling of distance), the first row of dwellings would need to be set back at least **80 metres** from Barrow Road in order to allow internal noise levels to be met with a partly open window⁵.

As well as rendering the development unviable due to the loss of plots, it would also be wholly inconsistent with the existing dwellings along Barrow Road, all of which front directly onto the road.

5 The World Health Organisation's Guidelines for Community Noise (1999) state 'At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB $L_{AFM_{ax}}$ so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 decibels.'

Element 2 – Internal Noise Level Guidelines

Design noise levels for dwellings within 45 metres of Barrow Road are as follows:

- ≤ **65 dB** L_{Aeq} (0700-2300) during the daytime
- ≤ **63 dB** L_{Aeq} (2300-0700) during the night-time
- ≤ **78 dB** L_{AFMax} during the night-time

Design noise levels at plots set back at least 45 metres from the A1077 Barrow Road and/or fronting towards the proposed link road are as follows:

- ≤ **52 dB** L_{Aeq} (0700-2300) during the daytime
- ≤ **50 dB** L_{Aeq} (2300-0700) during the night-time
- ≤ **65 dB** L_{AFMax} during the night-time

Noise levels throughout the remainder of the site (set back from the A1077 Barrow Road and link road) are lower due to increased distance to the roads and will reduce further once the scheme is built out due to screening afforded by the dwellings themselves.

In order to calculate the sound insulation requirements of the building envelope for habitable rooms throughout the development, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used. This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, typical room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} and L_{AFMax} in this case).

Plots Adjacent to Barrow Road

Due to elevated noise levels from Barrow Road, it is recommended that dwellings within 45 metres of the A1077 Barrow Road (Plots 128–130 and Plots 178–185) are provided with a system of decentralised mechanical extract ventilation (dMEV) using continuously-running kitchen and bathroom extracts on a ‘trickle’ rate.

Approved Document F ‘Ventilation’ (ADF) states that where dMEV is used, background ventilators of at least 4000 mm² EA must be provided to each habitable room, with 1 no. ventilator required per bedroom and 2 no. ventilators required in living rooms. Background ventilators are not required where an MVHR system is employed.

Road-fronting bedrooms of Plots 128–130 and Plots 175–184 should be fitted with enhanced laminated glazing rated at least **35 dB** $R_w + C_{tr}$ (such as 6 mm glass / 16 Argon / 8.8 mm Pilkington Optiphon) in conjunction with 1 no. acoustic wall vent rated at least **41 dB** $D_{n,e,w} + C_{tr}$ per 4000 mm² EA (vent open), such as the Ryton AAC125HP, or equivalent.

Road-fronting bedrooms of Plots 172–174 and Plot 185 (set back from Barrow Road) should be fitted with enhanced glazing rated at least **29 dB** $R_w + C_{tr}$ (such as 8 mm glass / 6–20 mm cavity / 4 mm glass) in conjunction with acoustic wall vents rated at least **41 dB** $D_{n,e,w} + C_{tr}$ per 4000 mm² EA (vent open).

Road-fronting living rooms of Plots 128–130 and Plots 178–185 should be fitted with enhanced glazing rated at least **29 dB** $R_w + C_{tr}$ in conjunction with acoustic wall vents rated at least **41 dB** $D_{n,e,w} + C_{tr}$ per 4000 mm² EA (vent open).

Habitable rooms on the rears of Plots 128–130 and Plots 178–185 may be fitted with standard glazing rated at least **25 dB** $R_w + C_{tr}$ in conjunction with standard wall vents or trickle vents rated at least **33 dB** $D_{n,e,w} + C_{tr}$ per 4000 mm² EA (vent open).

Remaining Plots

Remaining habitable rooms throughout the site may be fitted with double glazing rated at least **25 dB R_w+C_{tr}** in conjunction with standard trickle vents or wall vents rated at least **33 dB $D_{n,e,w}$** per 5000 mm² EA (vent open) such as the Greenwood 5000EA or equivalent.

General Points

See Appendix 3 for scheme of sound attenuation and Appendix 5 for selected BRE Calculation Spreadsheets.

The ceilings (and side cheeks to the dormer windows) in any room-in-roof bedrooms requiring enhanced glazing should be double boarded, with 100 mm (minimum) mineral wool insulation above. The glazing requirements are also applicable to 'Velux' windows.

The following points should be noted:

- The glazing recommendations apply to the window within a sealed unit. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.
- When selecting a glazing system to satisfy the requirements outlined above, it is important to ensure that the $R_w + C_{tr}$ value is achieved (rather than simply the R_w value). Published R_w values tend to be higher than corresponding $R_w + C_{tr}$ values; therefore, incorrect selection could result in an overestimation of sound reduction performance which in turn could result in higher internal noise levels.
- The opening and free area of the ventilation units should be checked by a mechanical service engineer before designs are finalised. Should the equivalent open area be insufficient to meet the minimum requirements of ADF, it may be necessary to increase the number of units per habitable room. Where this applies, the required sound reduction of the ventilation units may need to be increased accordingly
- Internal noise levels due to mechanical ventilation plant should not exceed 26 dB(A) in bedrooms and 30 dB(A) in living rooms

Element 3 – External Amenity Area Noise Assessment

Daytime ambient noise levels at the façades of dwellings adjacent to Barrow Road were measured at circa **65 dB LAeq (0700–2300)**.

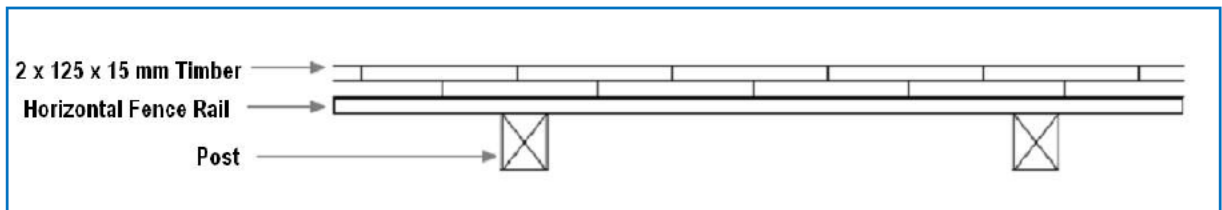
The site layout indicates that the majority of dwellings adjacent to Barrow Road will ‘front onto’ the road, such that gardens of these plots will be screened by the dwellings themselves.

In order to reduce garden levels as low as practicable, where gardens are not situated to the rear, it is recommended that they are provided with circa 2400 mm high solid timber fences or brick walls (see Appendix 3 for barrier locations).

A brick wall of any construction is appropriate, providing there are no gaps in the construction.

If a solid timber fence is installed, then it should be ensured that it has a mass per unit area of ≥ 10 kg/m². The fence should have no gaps or holes and should be fully sealed at the ground (i.e. include a gravel board).

An indicative acoustic fence detail is illustrated below. The double-thickness solid timber construction is considered robust and appropriate.



Element 4 – Assessment of Other Relevant Issues

Paragraph 2.56 of ProPG provides a checklist of 5 aspects which should be considered with regard to other relevant issues. These aspects are listed below, along with preliminary considerations with respect to the site.

Table 4.2: ProPG Other Relevant Issues

Aspect	Preliminary Considerations
Compliance with relevant national and local policy	With regard to national policy, the assessment aligns with the aims of the NPPF, NPSE and PPG, as detailed in Section 2.00.
Magnitude and extent of compliance with ProPG	Given the external noise levels impacting the site, there are no anticipated issues with regards to meeting internal or external noise levels.
Likely occupants of the development	This is not considered relevant to this development.
Acoustic design v unintended adverse consequences	The likely noise control measures (acoustic glazing/ventilation and boundary screening) should not result in unintended adverse consequences are conflict with wider planning objectives.
Acoustic design v wider planning objectives	

5 Mitigation of Overheating

For reference, Paragraph 2.72 (h) of ProPG requires a detailed assessment of the overheating condition, including:

(i) the alternative design measures considered / applied to reduce noise impact on occupants, (ii) the expected internal noise levels when windows / ventilators are opened to provide relief from overheating, and (iii) an estimate of the amount of time that windows are likely to be open to provide relief from overheating

It should be noted that since publication of ProPG, Approved Document O (ADO) has come into force to address overheating in residential dwellings.

ADO supersedes the ProPG overheating assessment and simplifies the assessment of noise levels during the overheating condition by setting fixed noise thresholds and stating that bedroom windows must be assumed to be closed during night-time hours (2300–0700 hours) where these limits are exceeded.

This information is then provided to the overheating assessor for the site, in order to determine the extent of additional mitigation required to comply with ADO.

ADO states that for moderate risk locations (i.e. outside of London) the minimum free area of the open window should be at least 4% of the floor area of the room.

As the open area varies as a function of the floor area, for a typical floor-to-ceiling height of 2.4m, a free area of 4% of the floor area equates to an external to internal noise reduction of 10 dB.

With reference to the internal targets contained in ADO, it is assumed that open windows can form the overheating mitigation strategy with no additional ventilation or cooling, providing the external noise levels outside bedrooms at night do not exceed **50 dB $L_{Aeq}(2300-0700)$** and **65 dB L_{AFMax}** .

Based on noise measurements undertaken at the site, road-fronting bedroom windows of plots within 45 metres of the A1077 Barrow Road are assumed to be closed during night-time hours (see Appendix 4 for façade locations where bedroom windows are assumed to be closed during night-time hours).

For remaining bedrooms, windows may be opened to the minimum open area of 5% of the floor area, meaning that the overheating mitigation strategy is not constrained by acoustics.

6 Summary and Conclusions

A noise impact assessment has been undertaken for the proposed residential development at land to the south of Barrow Road, Barton-upon-Humber.

The noise environment at the site was observed to be dominated by road traffic on the A1077 Barrow Road, with no other significant noise sources noted. Noise from the proposed link road has also been taken into account.

A scheme of sound attenuation works (enhanced glazing/ventilation) and boundary treatments has been developed to protect the proposed residential development from the ambient noise climate.

Appendix 1 – Abbreviations and Definitions

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μ Pa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μ Pa).

A-weighting

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night-time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF \max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

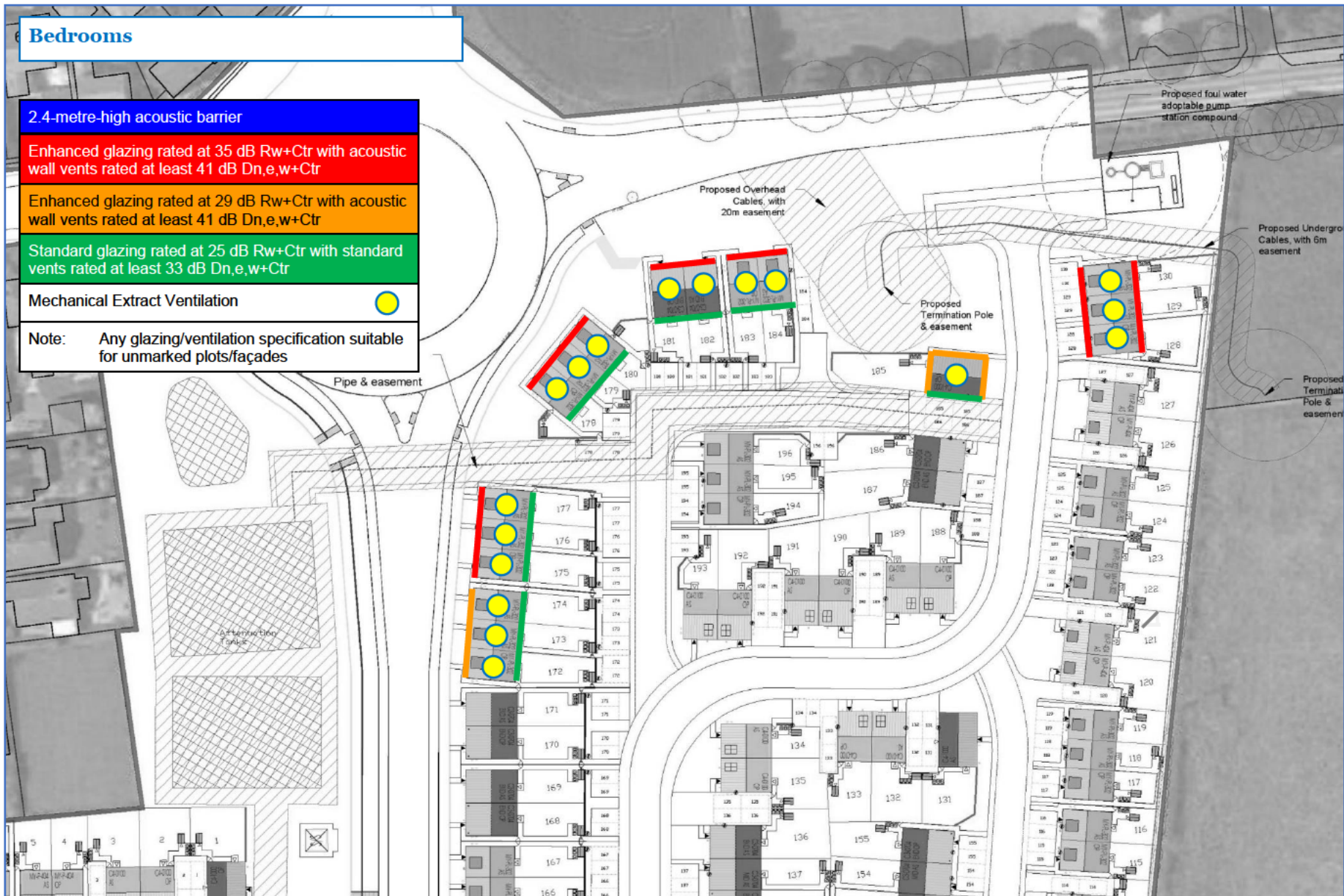
Weighted Sound Reduction Index (R_w)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_w is used to characterise the insulation of a material or product that has been measured in a laboratory).

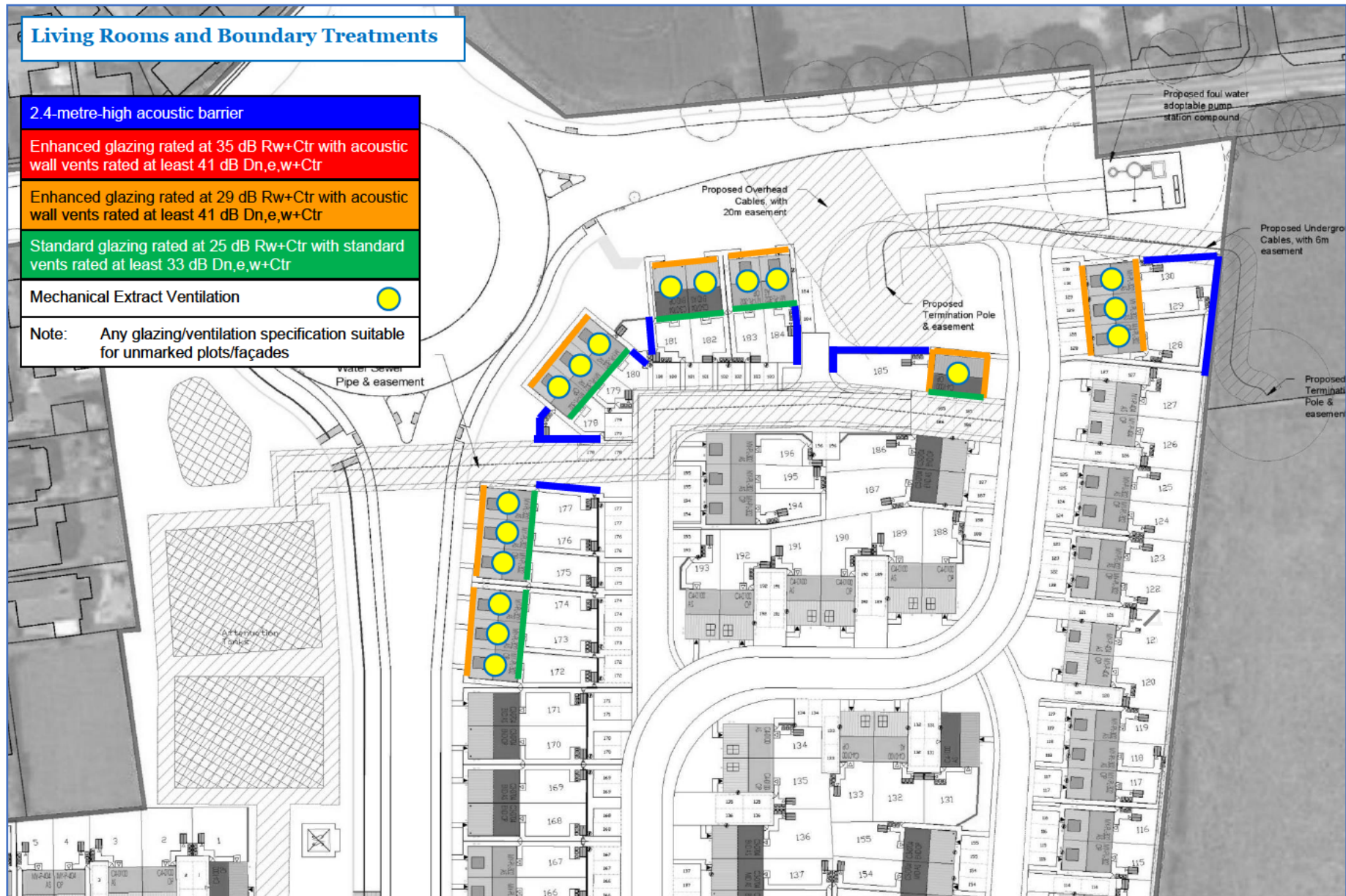
Appendix 2 – Measurement Positions



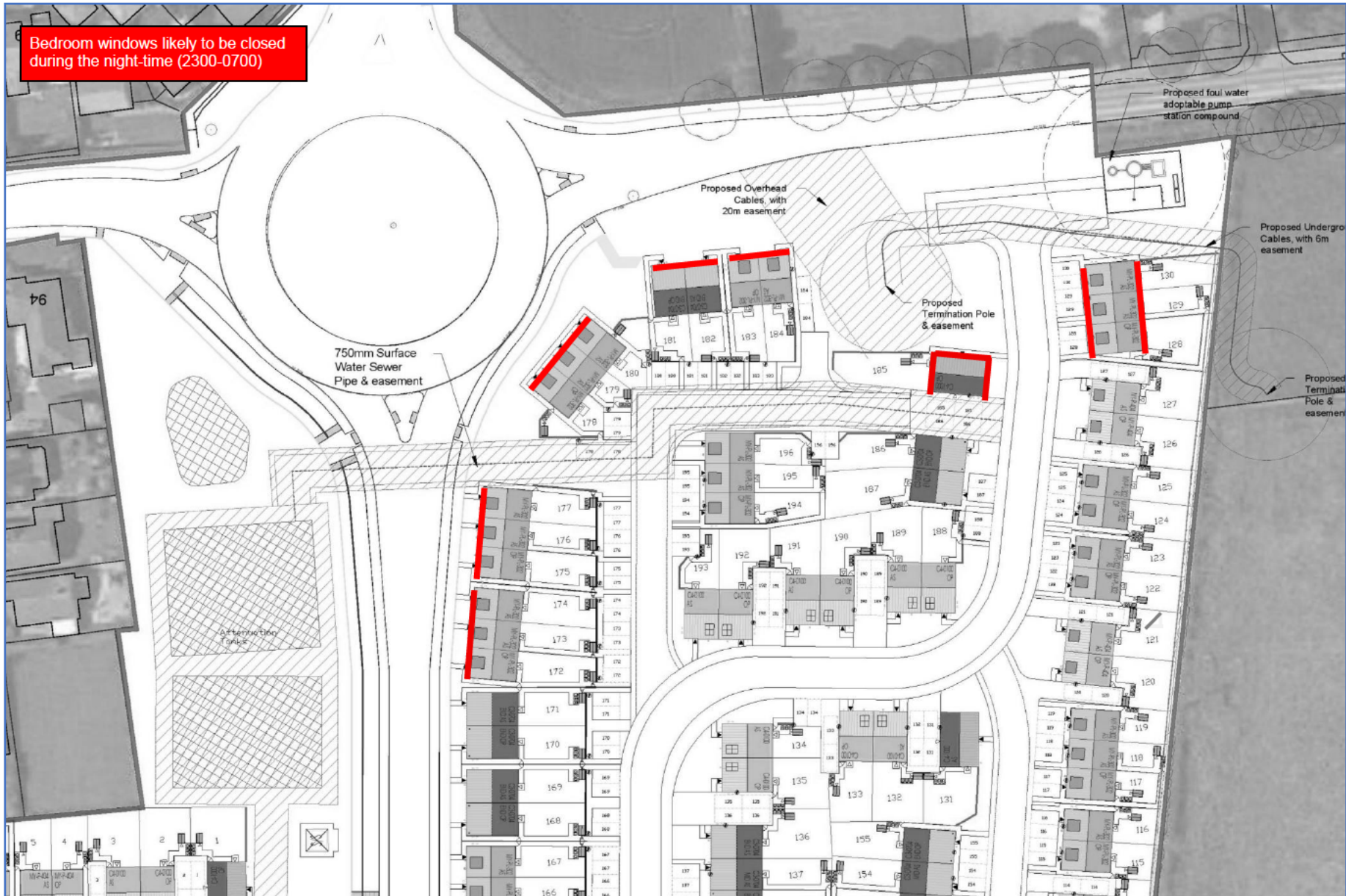
Appendix 3 – Scheme of Sound Attenuation



Appendix 3 – Scheme of Sound Attenuation



Appendix 4 – Approved Document O Assessment



Bedroom windows likely to be closed during the night-time (2300-0700)

Appendix 5 – BRE Calculation Spreadsheet Examples

Bedrooms fronting toward Barrow Road – Daytime Ambient Noise Level

<p>BRE</p> <p>1) Enter room dimensions or volume</p> <p><input type="radio"/> Use dimensions</p> <p>x <input type="text"/> m</p> <p>y <input type="text"/> m</p> <p>z <input type="text"/> m</p> <p>Volume <input type="text"/> m³</p> <p>OR</p> <p><input checked="" type="radio"/> Use volume</p> <p><input type="text" value="29"/> m³</p>	<p>Building Envelope Insulation</p> <p>2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents.</p> <p style="text-align: right;">HELP</p> <table border="1"> <thead> <tr> <th></th> <th>Surface area OR number of vents</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Wall 1</td> <td>Brick/block cavity</td> <td>5 m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> </tr> <tr> <td>Window 1</td> <td>6/16/8.8 Phon</td> <td>1 m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> </tr> <tr> <td>Roof/Ceiling</td> <td>None</td> <td></td> </tr> <tr> <td>Vent 1</td> <td>Ryton AAC125HPCWL</td> <td>1 m²</td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">View/Edit Data</p>		Surface area OR number of vents	Unit	Wall 1	Brick/block cavity	5 m ²	Wall 2	None		Window 1	6/16/8.8 Phon	1 m ²	Window 2	None		Door	None		Roof/Ceiling	None		Vent 1	Ryton AAC125HPCWL	1 m ²	Vent 2	None		<p>4) Select exterior sound level type</p> <p>Option (A) <input checked="" type="radio"/> User defined spectrum</p> <p><input type="text" value="65 dB LAeq (Day)"/> View/Edit Data</p> <p>Option (B) <input type="radio"/> Spectrum shape</p> <p>Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz)</p> <p>L_{Aeq} <input type="text" value="65"/> dB</p> <p><input type="text" value="ISO 717 - 1 (Ctr)"/> View Data</p>
		Surface area OR number of vents	Unit																										
Wall 1	Brick/block cavity	5 m ²																											
Wall 2	None																												
Window 1	6/16/8.8 Phon	1 m ²																											
Window 2	None																												
Door	None																												
Roof/Ceiling	None																												
Vent 1	Ryton AAC125HPCWL	1 m ²																											
Vent 2	None																												
<p>3) Enter reverberation time of the room.</p> <p><input type="text" value="0.5"/> seconds</p>		<p>Internal sound level</p> <p>L_{Aeq} <input type="text" value="26.9"/> dB</p>																											

Bedrooms fronting toward Barrow Road – Night-Time Ambient Noise Level

<p>BRE</p> <p>1) Enter room dimensions or volume</p> <p><input type="radio"/> Use dimensions</p> <p>x <input type="text"/> m</p> <p>y <input type="text"/> m</p> <p>z <input type="text"/> m</p> <p>Volume <input type="text"/> m³</p> <p>OR</p> <p><input checked="" type="radio"/> Use volume</p> <p><input type="text" value="29"/> m³</p>	<p>Building Envelope Insulation</p> <p>2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents.</p> <p style="text-align: right;">HELP</p> <table border="1"> <thead> <tr> <th></th> <th>Surface area OR number of vents</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Wall 1</td> <td>Brick/block cavity</td> <td>5 m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> </tr> <tr> <td>Window 1</td> <td>6/16/8.8 Phon</td> <td>1 m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> </tr> <tr> <td>Roof/Ceiling</td> <td>None</td> <td></td> </tr> <tr> <td>Vent 1</td> <td>Ryton AAC125HPCWL</td> <td>1 m²</td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">View/Edit Data</p>		Surface area OR number of vents	Unit	Wall 1	Brick/block cavity	5 m ²	Wall 2	None		Window 1	6/16/8.8 Phon	1 m ²	Window 2	None		Door	None		Roof/Ceiling	None		Vent 1	Ryton AAC125HPCWL	1 m ²	Vent 2	None		<p>4) Select exterior sound level type</p> <p>Option (A) <input checked="" type="radio"/> User defined spectrum</p> <p><input type="text" value="63 dB LAeq (Night)"/> View/Edit Data</p> <p>Option (B) <input type="radio"/> Spectrum shape</p> <p>Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz)</p> <p>L_{Aeq} <input type="text" value="63"/> dB</p> <p><input type="text" value="ISO 717 - 1 (Ctr)"/> View Data</p>
		Surface area OR number of vents	Unit																										
Wall 1	Brick/block cavity	5 m ²																											
Wall 2	None																												
Window 1	6/16/8.8 Phon	1 m ²																											
Window 2	None																												
Door	None																												
Roof/Ceiling	None																												
Vent 1	Ryton AAC125HPCWL	1 m ²																											
Vent 2	None																												
<p>3) Enter reverberation time of the room.</p> <p><input type="text" value="0.5"/> seconds</p>		<p>Internal sound level</p> <p>L_{Aeq} <input type="text" value="23.7"/> dB</p>																											

Appendix 5 – BRE Calculation Spreadsheet Examples

Bedrooms fronting toward Barrow Road – Night-Time Maximum Noise Level

<p>BRE</p> <p>1) Enter room dimensions or volume</p> <p><input type="radio"/> Use dimensions</p> <p>x <input type="text"/> m</p> <p>y <input type="text"/> m</p> <p>z <input type="text"/> m</p> <p>Volume <input type="text"/> m³</p> <p>OR</p> <p><input checked="" type="radio"/> Use volume</p> <p><input type="text" value="29"/> m³</p>	<p>Building Envelope Insulation</p> <p>2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents.</p> <p style="text-align: right;">HELP</p> <p style="text-align: right;">Surface area OR number of vents</p> <table border="1"> <tr> <td>Wall 1</td> <td>Brick/block cavity</td> <td>5</td> <td>m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Window 1</td> <td>6/16/8.8 Phon</td> <td>1</td> <td>m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Roof/Ceiling</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Vent 1</td> <td>Ryton AAC125HPCWL</td> <td>1</td> <td></td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> <td></td> </tr> </table> <p style="text-align: right;">View/Edit Data</p>	Wall 1	Brick/block cavity	5	m ²	Wall 2	None		m ²	Window 1	6/16/8.8 Phon	1	m ²	Window 2	None		m ²	Door	None		m ²	Roof/Ceiling	None		m ²	Vent 1	Ryton AAC125HPCWL	1		Vent 2	None			<p>Switch to Reverberation Time Calculation</p> <p>4) Select exterior sound level type</p> <p>Option (A) <input checked="" type="radio"/> User defined spectrum</p> <p><input type="text" value="78 dB LAFMax"/> View/Edit Data</p> <p>Option (B) <input type="radio"/> Spectrum shape</p> <p>Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz)</p> <p>L_{Aeq} <input type="text" value="78"/> dB</p> <p><input type="text" value="ISO 717 - 1 (Ctr)"/> View Data</p>
	Wall 1	Brick/block cavity	5	m ²																														
Wall 2	None		m ²																															
Window 1	6/16/8.8 Phon	1	m ²																															
Window 2	None		m ²																															
Door	None		m ²																															
Roof/Ceiling	None		m ²																															
Vent 1	Ryton AAC125HPCWL	1																																
Vent 2	None																																	
<p>3) Enter reverberation time of the room.</p> <p><input type="text" value="0.5"/> seconds</p>	<p>Internal sound level</p> <p>L_{AFMax} <input type="text" value="43.9"/> dB</p>																																	

Living rooms fronting toward Barrow Road – Daytime Ambient Noise Level

<p>BRE</p> <p>1) Enter room dimensions or volume</p> <p><input type="radio"/> Use dimensions</p> <p>x <input type="text"/> m</p> <p>y <input type="text"/> m</p> <p>z <input type="text"/> m</p> <p>Volume <input type="text"/> m³</p> <p>OR</p> <p><input checked="" type="radio"/> Use volume</p> <p><input type="text" value="36"/> m³</p>	<p>Building Envelope Insulation</p> <p>2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents.</p> <p style="text-align: right;">HELP</p> <p style="text-align: right;">Surface area OR number of vents</p> <table border="1"> <tr> <td>Wall 1</td> <td>Brick/block cavity</td> <td>13.2</td> <td>m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Window 1</td> <td>8 / (6-20) / 4 double glazing</td> <td>6</td> <td>m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Roof/Ceiling</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Vent 1</td> <td>Ryton AAC125HPCWL</td> <td>2</td> <td></td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> <td></td> </tr> </table> <p style="text-align: right;">View/Edit Data</p>	Wall 1	Brick/block cavity	13.2	m ²	Wall 2	None		m ²	Window 1	8 / (6-20) / 4 double glazing	6	m ²	Window 2	None		m ²	Door	None		m ²	Roof/Ceiling	None		m ²	Vent 1	Ryton AAC125HPCWL	2		Vent 2	None			<p>Switch to Reverberation Time Calculation</p> <p>4) Select exterior sound level type</p> <p>Option (A) <input checked="" type="radio"/> User defined spectrum</p> <p><input type="text" value="65 dB LAeq (Day)"/> View/Edit Data</p> <p>Option (B) <input type="radio"/> Spectrum shape</p> <p>Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz)</p> <p>L_{Aeq} <input type="text" value="65"/> dB</p> <p><input type="text" value="ISO 717 - 1 (Ctr)"/> View Data</p>
	Wall 1	Brick/block cavity	13.2	m ²																														
Wall 2	None		m ²																															
Window 1	8 / (6-20) / 4 double glazing	6	m ²																															
Window 2	None		m ²																															
Door	None		m ²																															
Roof/Ceiling	None		m ²																															
Vent 1	Ryton AAC125HPCWL	2																																
Vent 2	None																																	
<p>3) Enter reverberation time of the room.</p> <p><input type="text" value="0.5"/> seconds</p>	<p>Internal sound level</p> <p>L_{Aeq} <input type="text" value="35.0"/> dB</p>																																	

Appendix 6 – Baseline Noise Measurement Data

March 2023

Position	Date	Time	L _{Aeq} (dB)	L _{A10} (dB)	L _{AFMax} (dB)
MP1	14/03/23	1012–1027	66	70	79
		1027–1042	66	70	83
		1042–1057	65	69	81
		1057–1112	66	69	79
		1112–1125	66	70	80
		1213–1228	65	69	77
		1228–1243	64	68	78
		1243–1258	64	68	78
		1258–1313	65	69	77
		1313–1328	64	68	75
		1328–1343	65	69	77
		1343–1344	66	70	79
MP1A	14/03/23	1400–1415	59	61	68
MP1B	14/03/23	1417–1432	55	58	63
MP2	14/03/23	1435–1450	52	54	66
		1450–1505	48	51	62
		1505–1520	47	50	57
		1520–1535	47	50	59
MP3	14/03/23	1538–1553	51	54	67
		1553–1608	53	56	64
		1608–1623	50	52	60
		1623–1638	49	50	60
		1638–1643	48	50	53

July 2025

Date / Time	L _{Aeq} (15 min) (dB)	L _{A90} (15 min) (dB)	L _{A10} (15 min) (dB)	L _{AFMax} (dB)
2025-07-14 04:00:00	51.8	56.2	32.6	74.9
2025-07-14 04:15:00	58.9	62.4	35.4	79.3
2025-07-14 04:30:00	59.8	63.9	38.3	77.1
2025-07-14 04:45:00	59.2	64.3	39.4	78.0
2025-07-14 05:00:00	60.6	66.1	44.7	75.4
2025-07-14 05:15:00	61.5	66.1	52.7	77.0
2025-07-14 05:30:00	65.2	69.5	57.6	80.2
2025-07-14 05:45:00	65.0	69.9	54.5	77.6
2025-07-14 06:00:00	64.2	69.4	52.8	81.7
2025-07-14 06:15:00	66.0	70.7	57.2	83.4
2025-07-14 06:30:00	67.3	71.5	60.1	80.5
2025-07-14 06:45:00	66.0	70.4	55.7	83.4
2025-07-14 10:01:00	64.6	69.8	52.2	78.6
2025-07-14 10:15:00	64.0	69.0	54.5	77.0
2025-07-14 10:30:00	63.0	68.5	49.5	77.2
2025-07-14 10:45:00	63.7	68.6	53.8	78.4
2025-07-14 11:00:00	64.1	68.6	51.9	83.0
2025-07-14 11:15:00	64.4	69.2	53.3	80.2
2025-07-14 11:30:00	63.1	68.2	51.5	78.6
2025-07-14 11:45:00	64.1	69.1	54.9	82.9
2025-07-14 12:00:00	67.5	69.5	54.8	91.3
2025-07-14 12:15:00	65.6	70.2	53.9	86.9
2025-07-14 12:30:00	63.9	69.3	53.1	76.3
2025-07-14 12:45:00	64.2	69.2	54.7	81.9
2025-07-14 13:00:00	63.9	69.0	53.4	79.1
2025-07-16 11:55:00	65.3	70.5	56.7	80.4
2025-07-16 12:00:00	64.3	69.3	54.9	81.4
2025-07-16 12:15:00	63.9	69.1	53.3	79.9
2025-07-16 12:30:00	65.2	70.4	56.9	77.4
2025-07-16 12:45:00	65.2	69.6	57.6	79.2
2025-07-16 13:00:00	64.2	69.4	55.3	78.3
2025-07-16 13:15:00	65.2	70.2	57.3	77.1
2025-07-16 13:30:00	65.3	70.3	55.3	78.1
2025-07-16 13:45:00	64.3	69.3	56.0	76.4
2025-07-16 14:00:00	65.5	70.1	56.3	78.1
2025-07-16 14:15:00	65.9	70.3	56.2	88.2
2025-07-16 14:30:00	64.9	68.9	60.0	77.4
2025-07-16 14:45:00	66.3	70.0	61.7	78.0

Date / Time	L _{Aeq} (15 min) (dB)	L _{A90} (15 min) (dB)	L _{A10} (15 min) (dB)	L _{AFMax} (dB)
2025-07-17 04:00:00	60.1	65.2	37.7	76.6
2025-07-17 04:15:00	58.0	62.4	37.3	75.4
2025-07-17 04:30:00	60.6	65.5	38.5	77.6
2025-07-17 04:45:00	61.2	65.4	38.3	84.3
2025-07-17 05:00:00	63.1	69.6	44.8	77.1
2025-07-17 05:15:00	63.7	68.7	53.8	77.0
2025-07-17 05:30:00	66.6	71.0	60.3	77.7
2025-07-17 05:45:00	65.9	71.1	57.1	82.2
2025-07-17 06:00:00	64.1	70.0	52.6	77.8
2025-07-17 06:15:00	66.0	70.9	56.9	77.4
2025-07-17 06:30:00	67.9	72.1	59.8	85.9
2025-07-17 06:45:00	65.5	70.8	56.1	79.3
2025-07-17 11:18:00	64.5	69.1	54.3	81.5
2025-07-17 11:30:00	63.5	68.7	54.2	78.3
2025-07-17 11:45:00	64.8	69.4	55.8	80.4
2025-07-17 12:00:00	65.2	69.6	54.3	83.6
2025-07-17 12:15:00	64.3	69.6	54.6	80.5
2025-07-17 12:30:00	63.2	68.2	54.6	75.0
2025-07-17 12:45:00	65.2	70.1	55.1	86.1
2025-07-17 13:00:00	64.9	69.7	54.8	79.8
2025-07-17 13:15:00	64.5	69.4	54.0	78.9
2025-07-17 13:30:00	65.2	69.9	54.4	81.5
2025-07-17 13:45:00	64.0	68.7	54.7	80.6
2025-07-17 14:00:00	64.2	69.1	55.5	77.2
2025-07-17 14:15:00	63.2	67.9	55.3	76.2

Appendix 7 – Equipment Calibration Details

Survey	Item	Serial Number	Certificate	Date of expiration of calibration
March 2023	Bruel & Kjaer 2250 SLM	3011420	051012-1	30/09/2023
	Bruel & Kjaer 4231 Calibrator	2524639	05825/1	20/07/2023
July 2025	NTi XL3 SLM	A3A-01534-F0	UK-25-051	25/04/2027
	Bruel & Kjaer 4231 Calibrator	2463809	2024-0820	15/08/2025

Calibration Report

Certificate No.:051012-1

Brüel & Kjær Type: 2250 Serial no: 3011420

Customer: Environmental Noise Solutions Ltd
Address: Suite 24
 Doncaster Business Innovation Centre
 Ten Pound Walk
 Doncaster
 DN4 5HX

Microphone :	Brüel & Kjær	Type: 4966	Serial no: 3271207	Sens:-25.26dB
Preamplifier	Brüel & Kjær	Type: ZC0020	Serial no: 30122	
Attenuator	Brüel & Kjær	Type: ZF 0023	Serial no:	Sens:20dB
Wind screen	Brüel & Kjær	Type: UA 0237 (90 mm 1/2")		

Measurement Results:

Noise Test - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Input Amplifier Test: Gain Test / Attenuator setting - IEC 60651, Clause 6.3	Passed
Level Linearity Test - IEC 60651, Clause 7.9 & 7.10	Passed
Weighting Network Test: A Network - IEC60651 Clause 9.2.2	Passed
Weighting Network Test: B Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test: C Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test: Flat Network - IEC 60651 Clause 9.2.2	Passed
Overload Detector Test: A-Network - IEC 60651 Clause 9.3.1	Passed
Overload Detector Test: Square wave - IEC 60651 Clause 9.3.1	Passed
F/S/M/Peak Test: Steady State Response - IEC 60651 Clause 7.4	Passed
Fast-Slow Test: Overshoot test - IEC 60651 Clause 9.4.1	Passed
Impulse Test: Continuous Sine Wave Burst - IEC 60651 Clause 9.4.3	Passed
Impulse Test: Single Sine Wave Burst - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Impulse Decay Time Test - IEC 60651 Clause 7.3	Passed
Peak Detector Test, single square wave burst - IEC 60651 Clause 9.4.4	Passed
RMS Detector Test: Crest Factor Test - IEC 60651 Clause 9.4.2	Passed
RMS Detector Test: Continuous Sine Wave Burst - IEC 60651 Clause 9.4.2	Passed
Time Averaging Test: Pulse Range - IEC 60804 Clause 9.3.4	Passed
Time Averaging Test: Averaging Functions - IEC 60804 Clause 9.3.2	Passed
Linearity Test - IEC 804 Clause 9.3.3	Passed

Environmental conditions:

Pressure: 100.229 kPa Temperature: 22.7 °C Relative humidity: 48.8 %RH

Date of calibration: 23/09/2021
 Date of issue: 30/09/2021

Supervisor: M
 Engineer


M. Batty

Software version: 6.0



pennineinstrumentservicesltd

82-86 Upper Allen Street, SHEFFIELD S3 7GW
 (0114) 273 0534 www.pennineinstruments.co.uk

<h1 style="margin: 0;">Certificate of Calibration</h1> <p style="margin: 0;">Issued by University of Salford (Acoustic Calibration Laboratory)</p>	
Page 1 of 2	
<p>APPROVED SIGNATORIES</p> <p>Claire Lomax [x] Sean Furlong []</p> <p>Gary Phillips [] Danny McCaul []</p>	
<p>acoustic calibration laboratory</p> <p><small>The University of Salford, Salford, Greater Manchester, M5 4WT, UK http://www.acoustics.salford.ac.uk t 0161 295 3030/0161 295 3319 f 0161 295 4456 e c.lomax1@salford.ac.uk</small></p>	

Certificate Number: 05825/1

Date of Issue: 20 July 2022

CALIBRATION OF A SOUND CALIBRATOR

FOR: Environmental Noise Solutions (ENS) Limited
Doncaster Business Innovation Centre
Ten Pound Walk
Doncaster
DN4 5HX

FOR THE ATTENTION OF: David Poulton

DESCRIPTION: Calibrator with housing for one-inch microphones
and adaptor type UC 0210 for half-inch
microphones.

MANUFACTURER: B&K

TYPE: 4231

SERIAL NUMBER: 2524639

DATE RECEIVED: 19 July 2022

DATE OF CALIBRATION: 20 July 2022

LOCATION OF CALIBRATION: Acoustic Calibration Laboratory,
Newton G31, University of Salford.

TEST PROCEDURE: CTP06 (Laboratory Manual)

Test Engineer (initial):	GP	Name:	Gary Phillips
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Results in this certificate relate only to instruments tested.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to the units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

Certificate of Calibration

Issued by University of Salford (Acoustic Calibration Laboratory)

Page 2 of 2

Certificate Number: 05825/1

Date of Issue: 20 July 2022

MEASUREMENTS

The sound pressure level generated by the calibrator was measured using a calibrated, WS2P condenser microphone as specified in this certificate. The calibration was carried out with the calibrator in the half-inch configuration.

Five determinations of the sound pressure level, frequency and total distortion were made.

The results have been corrected to the reference pressure of 101.325 kPa using manufacturer's data.

RESULTS

Coupler configuration: Half-inch
Microphone type: GRAS 40AG
Output level (dB re 20 μ Pa): 94.00 dB \pm 0.12 dB
Frequency (Hz): 999.96 Hz \pm 0.12 Hz
Total Distortion (%): 0.34 % \pm 0.22 %

Average environmental conditions at the time of measurement were:

Pressure: 100.938 kPa \pm 0.014 kPa
Temperature: 22.6 °C \pm 0.4 °C
Relative humidity: 47.7 % \pm 2.7 %

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

All measurement results are retained at the acoustic calibration laboratory for at least four years.

-----END OF CERTIFICATE-----



ENS 182

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

No pattern approval is available for this sound level meter configuration.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL3	S/N	A3A-01534-F0
Firmware	V1.46		
Microphone Model	M2230		
Preamplifier	MA220	S/N	15078
Microphone Capsule	MC230A	S/N	A30704
Performance class	Class 1		
Customer Inventory Nr.			

Customer

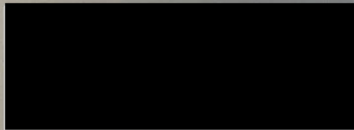
Environmental Noise Solutions Ltd
Doncaster Business Innovation Centre
Ten Pound Walk
Doncaster
DN4 5HX

Date 25 April 2025

Certificate UK-25-051

Results **PASSED**
(for detailed report see next pages)

Operator



NTi Audio UK Ltd • Office 33C Julians Road • Stevenage
Hertfordshire, SG1 3ES, UK • uk@nti-audio.com

CERTIFICATE OF CALIBRATION

ISSUED BY	Gracey & Associates	BSI CERTIFICATE	FS 25913
DATE OF ISSUE	21 August 2024	CERTIFICATE NUMBER	2024-0820
DATE OF CALIBRATION	20 August 2024		
CALIBRATION INTERVAL	12 months		PAGE 1 OF 2



Gracey & Associates
 Barn Court Shelton Road
 Upper Dean PE28 0NQ
 Tel: 01234 708835
 www.gracey.co.uk

TEST ENGINEER	APPROVING SIGNATORY
Jamie Bishop	Greg Rice

Equipment	B&K 4231, s/n: 2463809
Description	Calibrator - Acoustic - Class 1, Hottinger Bruel & Kjaer UK Ltd
Customer	Environmental Noise Solutions Limited Suite 24, Doncaster Business Innovation Centre, Ten Pound Walk, Doncaster, DN4 5HX

Standards	Conditions
BS EN 60942	Atmospheric Pressure 100.2kPa
	Temperature 23.7°C
	Relative Humidity 51.1%

Calibration Data

Output Level	94.0 dB
Frequency	1000.0 Hz

Calibration Reference Sources

Equipment	S/N	Equipment	S/N
B&K 4134 L	1935995	Druck DPI 141	479
HP 34401	3146A16728	Nor 1253	22456
Stanford DS36	33213	Vaisala HMP23	S2430007

Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to reference sources calibrated to National Standards. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2015 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection. The uncertainties are for a confidence probability of not less than 95%. Copyright of this certificate is owned by Gracey & Associates and may not be reproduced other than in full except with their prior written approval.

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 Hire and calibration of noise and vibration instruments under a BSI ISO 9001 quality management system, Cert No. FS 25913.