



Residential Development at 185 Manchester Road, Rochdale:

Noise Assessment

CS Manchester Rd Limited (T/A City-Side)

2 July 2025

This report has been prepared for Cityside Developments, in respect of the proposed residential development of land at 185 Manchester Road, Rochdale. This report must not be re-distributed for use in whole or part for any other project without the written authorization of EnviroSolution which retains all intellectual property rights over original data and the report contents.

The report has been prepared using data and information, relevant at the time of the report's preparation, provided by the client or other third parties at the client's instruction and EnviroSolution accepts no responsibility of liability for errors arising out of incorrect information provided by those other parties or where materially significant changes to the information provided occur after the date of the report's preparation. In such cases we reserve the right to review and re-assess the information provided and to alter the findings of the report if appropriate.

Should any one wish to use or rely upon the data and information provided in this report, they must seek written authority to do so from EnviroSolution and agree to EnviroSolution for any and all loss or damage resulting from any such use. EnviroSolution accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned nor for any adverse consequences arising out of the unauthorised use of this document.

Action:	Signatory:	Date:
Report prepared by:	M Potts	02/07/2025
Signature:		
Report reviewed by:	W Chambers	02/07/2025
Signature:		
Report authorised by:	W Chambers	02/07/2025
Signature:		

EXECUTIVE SUMMARY

The results of a noise measurement survey and desk-based assessment of noise are presented, with respect to the proposed residential development of land at 185 Manchester Road, Rochdale, Greater Manchester.

The assessment shows that the site is principally affected by elevated levels of traffic noise from Manchester Road, adversely affecting habitable rooms at the front of the building with windows facing Manchester Road.

The assessment shows that habitable rooms with windows facing towards the rear of the property, will be subject to suitable levels of internal noise even with windows open.

The assessment also identified a potential for fixed plant equipment noise associated with the proposed building, to adversely affect neighbouring properties; a suitable noise limit value, for all plant equipment, is recommended.

Suitable mitigation measures are recommended to ensure that the residential amenity of future residents of the development will be suitably protected and the assessment concludes that, with these measures in place and assuming compliance with the plant noise limit value, noise need not be a reason for refusal of planning permission.

Contents

1. INTRODUCTION..... 1

2. GUIDANCE 3

3. METHODOLOGY 11

4 DATA, RESULTS, ASSESSMENT & DISCUSSION..... 14

5 CONCLUSION 19

APPENDIX A: Glossary of acoustic terms 20

APPENDIX B: Data..... 21

APPENDIX C: Example glazing specifications 35

1. INTRODUCTION

- 1.1 EnviroSolution Ltd was commissioned by CS Manchester Rd Limited (T/A City-Side) to undertake an assessment of noise affecting the proposed residential (care home) development at 185 Manchester Road, Rochdale, Greater Manchester.
- 1.2 The site is currently occupied by a large detached house, set back from the edge of Manchester Road. The front (western aspect) of the site is delineated by Manchester Road; residential properties are to the north and south of the site and the Castleton Crown Green Bowling Club is to the rear (eastern aspect).
- 1.3 The sit area, in the context of its surroundings, is presented in Figure 1.

Figure 1: Application site boundary and surroundings



- 1.4 The proposals are for the construction of a single residential care consisting of 21 dementia care beds, 48 nursing bedrooms and 5 respite bedrooms., as shown in Figure 2.

[illegible]

- 02/07/2025
EnviroSolution Ltd

2. GUIDANCE

Noise – national and local policy guidance

- 2.1 Planning policies are set at both a national and local level. With respect to national policy, assessment of the suitability of a site for residential development is guided by the National Planning Policy Framework (NPPF), issued in March 2012 and last updated in 2023.
- 2.2 With regard to noise, the NPPF (“the Framework”) does not provide specific noise policies or defined noise limits, but rather is intended to enable the planning system to support the Government’s aims and objectives with respect to sustainable development, and provides “*a framework within which locally-prepared plans for housing and other development can be produced*” and “*requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise*”.
- 2.3 None of the current local or national planning policies preclude residential development of the site.
- 2.4 Additional national planning guidance is provided in the Government’s Noise Policy Statement for England (NPSE – “the Noise Policy”), to which the Framework makes specific reference as the main source of national guidance specifically on planning and noise.
- 2.5 The Noise Policy has a long term vision to “*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*”. The vision is supported by three key aims intended to promote sustainable development with respect to noise so that “*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
- *avoid significant adverse impacts on health and quality of life;*
 - *mitigate and minimise adverse impacts on health and quality of life; and*
 - *where possible, contribute to the improvement of health and quality of life*”.
- 2.6 Health is defined by the World Health Organisation as “*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being*” and the Noise Policy makes “*a distinction between ‘quality of life’ which is a subjective measure that refers to people’s emotional, social and physical well being and ‘health’ which refers to physical and mental well being*”.
- 2.7 However, the Noise Policy recognises that it is not currently possible to define a single objective noise level having specific effects on people, hence the emphasis on “promoting” improvements to health and quality of life through effective management of noise, considered in the context of the wider environment and factors other than noise.
- 2.8 Additional guidance is given in the Planning Practice Guidance Note (PPG) on noise, issued in March 2014, alongside the NPPF and updated in 2018 and July 2019. This “*advises on how planning can manage potential noise impacts in new development*”. The PPG suggests the following noise exposure hierarchy, based on average responses to noise:

Table 1: PPG noise exposure and response hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
<i>No Observed Effect Level (NOEL)</i>			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
<i>Lowest Observed Adverse Effect Level (LOAEL)</i>			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
<i>Significant Observed Adverse Effect Level (SOAEL)</i>			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non- auditory	Unacceptable Adverse Effect	Prevent

2.10 Beyond this, however, the guidance is relatively generic. It avoids specifying 'acceptable' environmental noise levels as the acceptability of a source of is both subjective and context-dependant.

2.11 Local planning policy is defined in the Council's Core Strategy (CS), adopted in October 2016.

- 2.12 Paragraph 10.63 under Policy **G9 - Reducing the impact of pollution, contamination and land instability** (which replaced Policy EM/3 **Noise and new development** of the Unitary Development Plan), the CS states:

“Noise, including transport noise, is an increasing problem which can affect quality of life and health. Careful consideration of this should take place when new developments are being designed. Measures to reduce noise from new development and the impact of existing noise on new development could include planting buffers, noise barriers, banking, careful placement of traffic calming measures and careful consideration of building materials and road surfaces”.

- 2.13 Policy **DM1 - General development requirements** states:

“All development proposals, including changes of use of land and buildings, extensions and alterations, will be expected to demonstrate that they:

- a. Are of high quality design and take the opportunity to enhance the quality of the area;*
- b. Are compatible with surrounding land uses, both in terms of its impact upon those uses and the impact of the surrounding land uses upon the amenities of future residents / users;*
- c. Do not adversely affect the amenity of residents or users through visual intrusion, overbearing impact, overshadowing or loss of privacy; d. Mitigate against any impacts due to noise, air, dust, light and odour pollution, traffic generation or inadequate access, where such mitigation is identified as being necessary ...”.*

- 2.14 Nothing in local planning policy precludes the proposed development.

Noise – technical guidance

- 2.15 In May 2017, a Working Group consisting of representatives of the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH) produced a Professional Practice Guidance (Pro PG) document¹. The guidance was produced *“to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England”* and *“which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise”*. Its primary aim is *“to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise”*.
- 2.16 The guidance identifies that *“Good acoustic design is about more than the numbers. It is a holistic design process that creates places that are both comfortable and attractive to live in, where acoustics is considered integral to the living environment.*
- Good acoustic design can involve, for example, careful site layouts and better orientation of rooms within dwellings. Good acoustic design does not mean “gold plating” or significantly increasing costs. This guidance seeks to encourage and promote design outcomes that are proportionate and reasonable in the particular circumstances of each development site”.*
- 2.17 It should be noted that the Pro PG *“does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate”*.

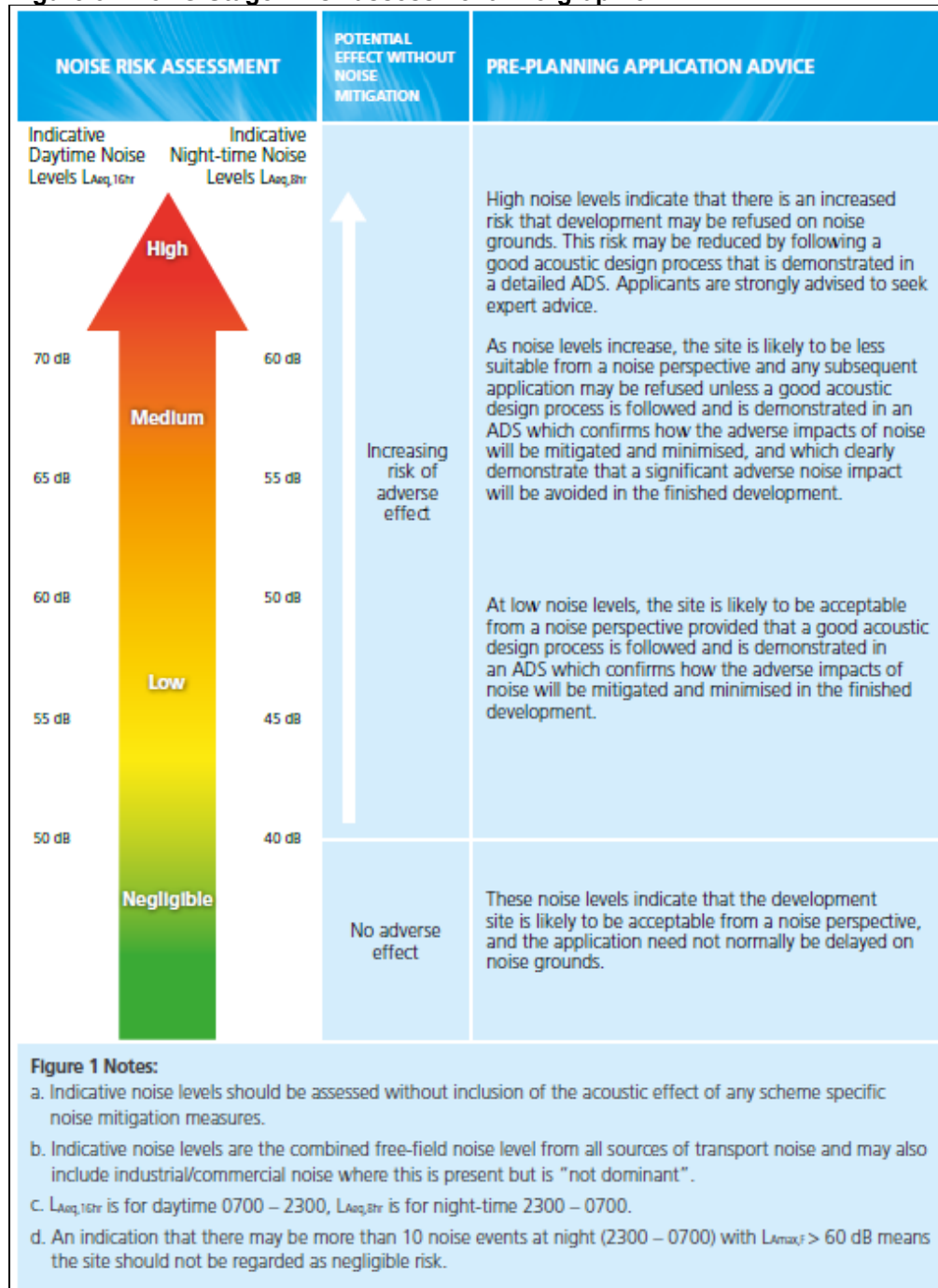
¹ ANC, IOA & CIEH (2017) *Pro PG: Planning & Noise Professional Practice Guidance on Planning & Noise: New Residential Development*

2.18 The guidance “advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging”. The two sequential stages are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

2.19 Figure 1 of the guidance provides a useful graphical overview of the Stage 1 risk assessment considerations, reproduced as Figure 3.

Figure 3: ProPG Stage 1 risk assessment info-graphic



- 2.20 The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:
- Element 1 – demonstrating a “*Good Acoustic Design Process*”;
 - Element 2 – observing internal “*Noise Level Guidelines*”;
 - Element 3 – undertaking an “*External Amenity Area Noise Assessment*”; and
 - Element 4 – consideration of “*Other Relevant Issues*”.
- 2.21 *“The approach is underpinned by the preparation and delivery of an “Acoustic Design Statement” (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk”.*
- 2.22 With respect to noise affecting residential amenity, BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* gives recommendations for internal noise levels for residential dwellings in order to protect residential amenity, based on health-based research, as follows:
- Living rooms during the day 35 dB $L_{Aeq,16hour}$
 - Dining rooms during the day 40 dB $L_{Aeq,16hour}$
 - Bedrooms during the day 35 dB $L_{Aeq,16hour}$
 - Bedrooms during the night 30 dB $L_{Aeq,8hour}$
- 2.23 These values can be taken to be broadly equivalent with the LOAEL in the PPG. Note that these are not specific criteria or ‘target’ noise levels, merely indicative recommendations which will be context-dependant. However, most Local Authorities tend to apply the recommended noise levels as strict criteria.
- 2.24 In most standard modern properties, the walls and roof provide relatively high levels of sound insulation of greater than 40 dB; the weakest part of a building facade, with respect to noise, is generally the windows. Modern construction methods for new residential properties incorporate standard thermal double-glazing which, the standard suggests, will provide approximately 33 dB R_w of sound attenuation when closed. The standard does not specifically give sound attenuation values for partially open windows, although the worked example (G.1) at Annex G of the Standard indicates that a partially open window would provide 15 dB of sound attenuation.
- 2.25 For calculation of noise ingress through a closed window, this requires that the external measured/calculated sound pressure level is a ‘façade’ level i.e. subject to the addition of façade-reflected sound energy; this requires the addition of 3 dB to any measured/calculated ‘free-field’ levels.
- 2.26 Conversely, calculation of noise ingress through a partially open window, requires that the external measured/calculated sound pressure level is a ‘free-field’ level i.e. without the addition of façade-reflected sound energy; this requires the subtraction of 3 dB from any measured/calculated ‘façade’ levels.
- 2.27 With regard to night time maximum (L_{AFmax}) noise levels, BS 8233 (Note 4) states the following:
“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. 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”.

- 2.28 Other recent guidance² states “it is considered that if, in bedrooms at night, the $L_{Amax,F}$ from individual noise events (from all sources) would not normally exceed 45dB more than 10 times a night, then this represents a reasonable threshold below which the effects of individual noise events on sleep can be regarded as negligible”. Consequently, the 10th highest measured night time maximum noise level is used.
- 2.29 With respect to noise from fixed plant equipment, such as air cooling units, kitchen extraction etc., assessment is generally undertaken with respect to the guidance in BS 4142: 2014 + A1: 2019 *Methods for rating and assessing industrial and commercial sound*. This guidance provides a method for determining the sound (noise) arising from industrial or commercial sounds, as it affects the outside of potentially noise-sensitive buildings. Significantly, the standard makes no determination of suitability of commercial sound, with respect to disturbance of residential amenity, and makes no determination of internal sound within future dwellings.
- 2.30 Significantly, the standard makes use of the ‘background’ sound level (dB L_{A90} or 90th percentile level) as measured or calculated outside a building, usually a residential property or other noise-sensitive receptor, against which is compared the commercial/industrial ‘rating’ sound level (dB $L_{Ar,Tr}$). This, in turn, relies on the background sound level being free from the influence of the commercial or industrial sound in question.
- 2.31 Section 9 of the standard describes how the rating sound of the industrial or commercial activity under investigation is derived by applying a ‘character correction’ to tonal, impulsive and intermittent sounds, as separate entities. The simplest method is a subjective assessment with a sliding scale of up to +6 dB for tonal sound, up to +9 dB for impulsive sound and +3 dB for intermittency. The objective methods provided only allow for the assessment of tonal sound. The rating sound level is then compared with the ‘background’ sound level as measured or calculated outside a building, usually a residential property.
- 2.32 The standard indicates significance of sound impacts according to varying degrees of “adverse impact”: a difference between the background sound level and industrial (“rating”) sound level of +10 dB “is likely to be an indication of a significant adverse impact, depending on the context” whilst “a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context” and that “the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context”.
- 2.33 The Standard includes a specific requirement that assessments should take account of “context” in determining the significance of any predicted impact, which is critical in providing a reasoned and pragmatic assessment, avoiding rigid adherence to limit values to the exclusion of any other considerations.
- 2.34 The assessment also makes reference to the recently published Approved Document (AD) O of the Building Regulations 2010 “*Overheating*”. This is applicable to new dwellings and, whilst, technically, an issue for Building Control determination at a later stage in the development process, the requirements for ventilation affect the noise mitigation provided by the building envelope and its design; hence, it is necessary to consider the implications of the AD at the Planning Stage.

² ANC, IOA & CIEH (2017) Pro PG: Planning & Noise Professional Practice Guidance on Planning & Noise: New Residential Development

2.35 Requirement 01 of the AD “Overheating mitigation” states that:

(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel (“residences”) to-

(a) limit unwanted solar gains in summer;

(b) provide an adequate means to remove heat from the indoor environment.

(2) In meeting the obligations in paragraph (1)-

(a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and

(b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it”.

2.36 With respect to categorising residential buildings, the document provides a “Simplified method” under which this site would be categorised as being a “moderate risk location” for overheating; this applies to all properties in “England, excluding high risk parts of London in (b)”.

2.37 Paragraph 1.4 states:

“For the purposes of following the simplified method, it should be identified whether the dwellinghouse or each residential unit, shared communal room and common space is able to have cross-ventilation, i.e. it has openings on opposite façades”. Openings on adjacent facades is insufficient.

2.38 The significance of referencing the AD is demonstrated in Section 2 of the document:

“2.10 Excess heat should be removed from the residential building by any of the following means.

a. Opening windows (the effectiveness of this method is improved by cross-ventilation).

b. Ventilation louvres in external walls.

c. A mechanical ventilation system.

d. A mechanical cooling system

2.11 The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings”.

2.39 In other words, any requirement for windows to remain closed to achieve suitable (guideline) internal noise conditions, may affect the overheating/cooling strategy and, subsequently, the design of the building(s). This is clarified further on in Section where it is stated that:

“In the Secretary of State’s view, requirement O1(2)(a) is met in a new residential building if the building’s overheating mitigation strategy for use by occupants takes account of all of the following.

a. Noise at night – paragraphs 3.2 to 3.4.

b. Pollution – paragraph 3.5.

c. Security – paragraphs 3.6 and 3.7.

d. Protection from falling – paragraphs 3.8 to 3.10.

e. Protection from entrapment – paragraph 3.11”.

2.40 Section 3 of the AD provides the following noise-specific guidance:

“Noise

3.2 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).

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

a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)”.

2.41 Unusually, these values are not in accordance with those provided in BS 8233, which are 5 to 10 dB lower. Consequently, this assessment, conservatively, references the BS 8233 values.

3. METHODOLOGY

- 3.1 The assessment incorporated a noise measurement survey comprising the use of 2 sound level meters, one located at the front boundary of the property overlooking Manchester Road (free-field noise levels), and one at the rear of the property against the rear wall (façade noise levels).
- 3.2 The meters recorded continuous, consecutive 1-minute and 5-minute sound pressure levels between 1:40pm on Monday 9 October and 3:00pm on Tuesday 10 October 2023. Additionally, the meters recorded 1/3rd octave band acoustic frequency data for every 5-minute measurement sample and the meter at Position 1 generated a continuous audio recording throughout the survey.
- 3.3 The measurement positions are shown in Figures 4, 5 and 6.

Figure 4: Noise measurement position



Figure 5: Meter at Position 1



Figure 6: Meter at Position 2



- 3.4 The measurements were undertaken using Class 1 (IEC 61672: 2013) integrating, averaging sound level meters; at Position 1, this was a Casella CEL 633C meter and at Position 2, this was an NTI XL2.
- 3.5 The meters were placed in locked, weatherproof cases with the microphones mounted on tripods. The microphones were protected by proprietary wind-shields.
- 3.6 The meters were field-calibrated before and after the survey and no variation in calibration tone was observed. The weather during the survey was dry and warm with negligible wind.
- 3.7 Measurement position 1 was 5 metres from the edge of Manchester Road; the proposed building façade will be approximately 15 metres from the edge of the road. Consequently, the measured levels must be adjusted to account for the additional attenuation, due to distance, of the traffic noise. This requires the subtraction of 3.4 dB for the ambient noise levels and 6.8 dB for the night time maximum value.
- 3.8 The assessment was undertaken principally with respect to the requirements of the ProPG, BS8233 and BS 4142.

4 DATA, RESULTS, ASSESSMENT & DISCUSSION

Survey results

- 4.1 The recorded measurement data, rounded to the nearest whole integer, for the day time (7:00am to 11:00pm) and night time (11:00pm to 7:00am) periods, are summarised in Table 2; the 2 partial daytime data sets were combined to produce a single day time data set at each position and the data at Position 1 were adjusted for distance, as described in paragraph 3.7. The 90th percentile (L_{A90}) data are the modal (most frequently occurring) level and the maximum (L_{AFmax}) is the 10th highest level.

Table 2: Measurement data

Position	Period	Measured noise (dB)		
		L_{A90} *	L_{Aeq}	L_{AFmax} **
P1***	Day	66	71	-
	Night	38	66	79
P2	Day	48	53	-
	Night	37	48	61

* *Modal value*

** *10th highest*

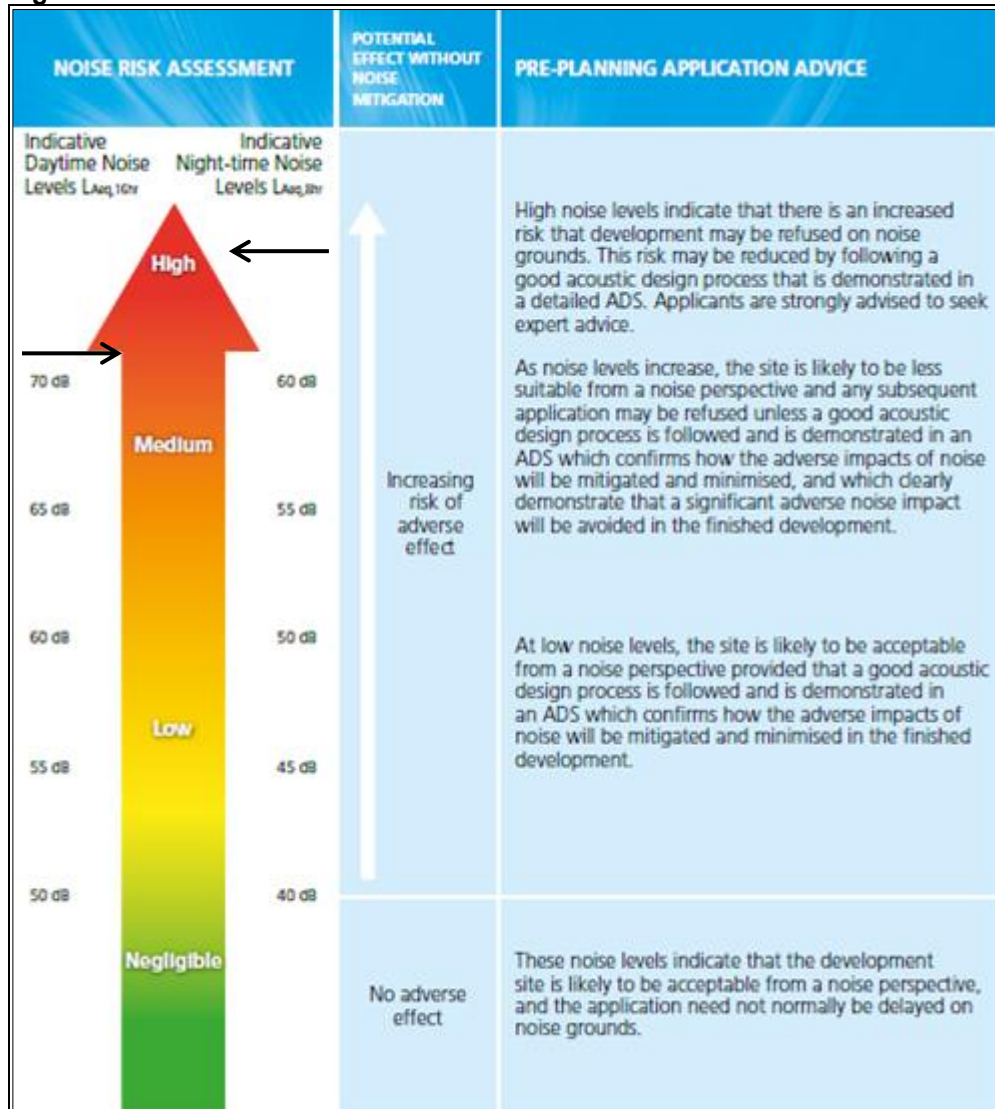
*** *Adjusted for distance from roadside edge*

- 4.2 The 5-minute data are presented in tabular format at Appendix B but the 1-minute data are too numerous to present in this report in tabular format - these data are available on request as are the audio recordings.

External noise: Pro-PG risk assessment

- 4.3 With respect to the Pro PG Stage 1 risk assessment (Figure 7), the data show that the western aspect of the proposed building, fronting Manchester Road, site is at a “medium” to “high” noise risk during the day time and at a “high” risk during the night time; this assessment is provided as the Acoustic Design Statement (ADS) for the development as a consequence of which further detailed, technical assessment is required, particularly for the front facades of the existing and new detached properties.

Figure 7: Site ProPG risk assessment levels



External noise: BS8233 internal noise assessment

- 4.4 Table 3 presents the calculated internal noise levels in habitable rooms closest to, and facing, the road and commercial uses, assuming 15 dB and 33 dB R_w of sound attenuation through an open and closed window, respectively; the calculation of noise ingress through a closed window, the free-field noise data recorded at Position 1 were subject to the addition of 3 dB to derive a façade level, and, for calculation of noise ingress through a partially open window, the façade noise data recorded at Position 2 were adjusted to a free-field level by the subtraction of 3 dB, as described in paragraph 2.25 and 2.26.

Table 3: Internal noise calculations

Position	Period	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
Windows closed			
P1	Day	41	-
	Night	36	49
P2	Day	20	-
	Night	15	28
Windows open			
P1	Day	56	-
	Night	51	64
P2	Day	35	-
	Night	30	43

* 10th highest value

- 4.5 Relative to the BS 8233 guideline values, the data in Table 3 show that, with windows closed, the BS 8233 guideline values will be exceeded, at the front of the property, by:
- 6 dB during the day and night time, with respect to the ambient (L_{Aeq}) noise levels in living rooms and bedrooms.
 - 4 dB, with respect to the maximum (L_{Amax}) noise level, for bedrooms at night.
- 4.6 At the rear of the property, the noise levels are predicted to be significantly below the BS 8233 guideline levels.
- 4.7 With windows partially open, the data show that the BS 8233 guideline levels will be significantly exceeded at the front of the property whilst levels at the rear will be commensurate with the BS 8233 guideline levels.
- 4.8 Consequently, glazing for habitable rooms at the front of the building, facing Manchester Road, will need to achieve a sound insulation value of 39 dB $R_w + C_{tr}$ to achieve the BS 8233 guideline values for living areas and bedrooms; C_{tr} is a correction factor that provides additional protection against low frequency noise arising from the operation of diesel engines, heavy goods vehicles and buses etc.
- 4.9 An example glazing specification, obtained from Pilkington's online glazing specification tool³, is presented at Appendix C.
- 4.10 Habitable room windows facing towards or at the rear of the property may be opened and the BS 8233 guideline values achieved.
- 4.11 It is evident, therefore, that habitable rooms at the front of the building and facing Manchester Road, will also require the provision of sufficient levels of both background and cooling ventilation without the need to open windows, in accordance with the requirements of Approved Documents F and O of the Building Regulations 2010, whilst ensuring that the BS 8233 guideline internal noise levels are achieved.
- 4.12 Background ventilation *may* be achieved through the use of acoustically-attenuating trickle ventilation units, specified to achieve a minimum performance of at least 39 dB $D_{n,e,w} + C_{tr}$, when open. This, however, may not provide sufficient levels of cooling ventilation which may require the provision of a mechanical ventilation strategy which must, therefore, form part of a wider overheating mitigation and ventilation strategy; the project is not yet sufficiently

³ <https://spectrum.pilkington.com> (accessed 24/10/2023)

- 4.15 The positioning of cooker and dryer extraction vents has not yet been determined; this will occur later in the development once an M&E Contractor has been commissioned.
- 4.16 However, it is evident that there is a potential for extraction units to emit noise which might affect the neighbouring properties, particularly the rear façade of 183 Manchester Road; it is unlikely, given the layout, that fixed plant noise will adversely affect the front façade of the neighbouring property.
- 4.17 As the various extraction systems are currently unknown, it is not possible to calculate their potential noise emissions. However, as the 90th percentile (background) noise levels have been measured at the rear of 185 Manchester Road, it is possible to set a limit value, at the closest noise sensitive receptor, that any equipment must not exceed. The principal concern is with noise affecting the rear, more-sheltered, façade of the neighbouring property (183 Manchester Road).
- 4.18 Typically, Local Authorities require a 'rating sound level' from plant equipment to not exceed a level 5 dB below the existing/pre-development 'background sound level' (dB L_{A90}).
- 4.19 Based on the data in Table 2, it is recommended that the total noise from all plant equipment associated with the proposed building, affecting the rear external façade of the adjacent property, should not exceed a rating sound level of:
- 43 dB L_{Ar,1h} during the day time.
 - 32 dB L_{Ar,15min} during the night time.
- 4.20 This can be enforced through the application of a suitably-worded planning condition.

5 CONCLUSION

- 5.1 The assessment has shown that the site is principally affected, during the day and night time, by traffic noise from Manchester Road.
- 5.2 The site is noted to be at a “medium” to “high” risk from noise during the day time and at a “high” risk from noise at night, according to the requirements of the ProPG.
- 5.3 The assessment calculated that noise levels in habitable rooms with windows at the front of the building, facing Manchester Road, with the windows closed, will be greater than the BS 8233 guideline values. For these rooms, windows would need to remain closed to achieve the guideline levels and alternative means of providing both background and cooling ventilation will be required; the use of acoustically-attenuating trickle ventilation is offered as a means of providing background ventilation and the assessment notes that mechanical ventilation may be required to provide suitable levels of cooling ventilation. However, the assessment notes that these considerations must form part of a wider overheating mitigation and ventilation strategy. A suitably worded planning condition is recommended to provide for this whilst ensuring compliance with the internal (habitable room) noise levels provided in BS 8233.
- 5.4 For habitable rooms with windows facing towards the rear of the property, these may be opened for ventilation and the BS 8233 guideline levels achieved.
- 5.5 With respect to fixed plant equipment associated with the proposed building, as it might affect the rear façade of the neighbouring property, a rating sound level (dB L_{Ar,Tr}) for the day and night time has been recommended. This can be achieved through the use of a suitably-worded planning condition.
- 5.6 The assessment concludes, therefore, that with these mitigation measures in place and assuming compliance with the conditioned rating sound level for fixed plant equipment, the residential amenity of future residents of the development will be suitably protected and that noise need not be a reason for refusal of planning permission.

APPENDIX A

Glossary of acoustic terms

Ambient noise: the noise from all sources, both near and far, at any given time. Conventionally defined using the A-weighted equivalent continuous noise level (L_{Aeq}) [see below].

Background noise level (dB L_{A90}): In the UK, the 90th percentile noise level (L_{A90}) is generally used to define 'background' noise. This is a statistical parameter describing the noise level that is exceeded for 90% of the measurement or assessment time. Its value lies in the fact that it is a statistical value, towards the lower end of a measured range of data, and which is relatively 'stable' i.e. not adversely affected by occasional high-energy noise events.

Decibel (dB): a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 micro-Pascals (μPa), the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A) / A-weighting: decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change (in steady noise) of 3 dB(A) is the minimum perceptible under normal conditions and a change of 10 dB(A) corresponds roughly to halving or doubling the *loudness* of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

$L_{Aeq,T}$: the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). L_{Aeq} is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} : the maximum single-event noise level attained during a measurement period.

Noise: any audible sound. Often defined as unwanted sound. Can be damaging to hearing if it is too loud or can be just annoying if it interferes with the normal enjoyment of others.

Sound / sound pressure: a fluctuation in air pressure over the static ambient pressure.

Sound pressure level: the sound pressure relative to a standard reference pressure of 20 μPa (20×10^{-6}) on the decibel scale.

APPENDIX B: Data

Table 4: Measured 5-minute noise data at Position 1

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	13:40	66	75	85
09/10/2023	13:45	65	75	86
09/10/2023	13:50	66	75	84
09/10/2023	13:55	67	75	83
09/10/2023	14:00	65	74	83
09/10/2023	14:05	66	74	84
09/10/2023	14:10	64	74	81
09/10/2023	14:15	59	73	82
09/10/2023	14:20	64	74	83
09/10/2023	14:25	65	74	84
09/10/2023	14:30	63	72	85
09/10/2023	14:35	66	75	82
09/10/2023	14:40	67	75	84
09/10/2023	14:45	65	74	84
09/10/2023	14:50	63	74	84
09/10/2023	14:55	62	74	88
09/10/2023	15:00	67	74	87
09/10/2023	15:05	66	74	87
09/10/2023	15:10	64	74	83
09/10/2023	15:15	67	74	83
09/10/2023	15:20	67	74	82
09/10/2023	15:25	67	76	96
09/10/2023	15:30	66	74	85
09/10/2023	15:35	67	73	83
09/10/2023	15:40	66	74	83
09/10/2023	15:45	65	74	81
09/10/2023	15:50	65	73	83
09/10/2023	15:55	67	74	83
09/10/2023	16:00	65	74	86
09/10/2023	16:05	66	74	85
09/10/2023	16:10	66	73	82
09/10/2023	16:15	66	73	80
09/10/2023	16:20	64	71	79
09/10/2023	16:25	66	73	82
09/10/2023	16:30	67	76	92
09/10/2023	16:35	65	74	85
09/10/2023	16:40	68	75	84
09/10/2023	16:45	66	74	82
09/10/2023	16:50	66	75	91
09/10/2023	16:55	68	74	82
09/10/2023	17:00	66	77	97
09/10/2023	17:05	68	76	99
09/10/2023	17:10	66	75	92

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	17:15	65	71	82
09/10/2023	17:20	64	73	85
09/10/2023	17:25	64	74	82
09/10/2023	17:30	60	74	82
09/10/2023	17:35	63	76	85
09/10/2023	17:40	66	75	84
09/10/2023	17:45	67	75	89
09/10/2023	17:50	64	75	83
09/10/2023	17:55	67	74	84
09/10/2023	18:00	64	74	84
09/10/2023	18:05	67	74	84
09/10/2023	18:10	65	75	83
09/10/2023	18:15	65	82	107
09/10/2023	18:20	65	75	83
09/10/2023	18:25	65	75	82
09/10/2023	18:30	65	74	85
09/10/2023	18:35	67	74	83
09/10/2023	18:40	66	74	83
09/10/2023	18:45	65	74	82
09/10/2023	18:50	65	74	90
09/10/2023	18:55	67	74	84
09/10/2023	19:00	64	74	84
09/10/2023	19:05	66	75	84
09/10/2023	19:10	62	74	88
09/10/2023	19:15	65	74	84
09/10/2023	19:20	64	74	82
09/10/2023	19:25	66	74	86
09/10/2023	19:30	62	74	84
09/10/2023	19:35	65	74	83
09/10/2023	19:40	65	74	86
09/10/2023	19:45	61	75	89
09/10/2023	19:50	64	74	85
09/10/2023	19:55	62	73	84
09/10/2023	20:00	62	74	83
09/10/2023	20:05	66	74	84
09/10/2023	20:10	64	74	85
09/10/2023	20:15	61	73	83
09/10/2023	20:20	63	72	83
09/10/2023	20:25	62	73	82
09/10/2023	20:30	64	73	84
09/10/2023	20:35	62	73	84
09/10/2023	20:40	64	73	83
09/10/2023	20:45	62	74	85
09/10/2023	20:50	59	70	84
09/10/2023	20:55	59	73	82
09/10/2023	21:00	61	73	93

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	21:05	62	72	84
09/10/2023	21:10	58	78	102
09/10/2023	21:15	63	73	83
09/10/2023	21:20	62	72	81
09/10/2023	21:25	60	73	86
09/10/2023	21:30	60	72	83
09/10/2023	21:35	60	72	84
09/10/2023	21:40	61	73	92
09/10/2023	21:45	61	72	83
09/10/2023	21:50	58	72	83
09/10/2023	21:55	60	72	84
09/10/2023	22:00	58	78	103
09/10/2023	22:05	57	72	82
09/10/2023	22:10	59	72	87
09/10/2023	22:15	51	70	82
09/10/2023	22:20	58	71	82
09/10/2023	22:25	56	70	82
09/10/2023	22:30	56	71	84
09/10/2023	22:35	55	70	83
09/10/2023	22:40	51	70	86
09/10/2023	22:45	60	71	86
09/10/2023	22:50	59	70	81
09/10/2023	22:55	55	69	84
09/10/2023	23:00	52	70	82
09/10/2023	23:05	58	72	86
09/10/2023	23:10	58	70	82
09/10/2023	23:15	56	70	83
09/10/2023	23:20	50	67	80
09/10/2023	23:25	56	70	82
09/10/2023	23:30	54	69	85
09/10/2023	23:35	53	71	90
09/10/2023	23:40	49	68	84
09/10/2023	23:45	52	72	89
09/10/2023	23:50	46	69	82
09/10/2023	23:55	51	69	85
10/10/2023	00:00	51	70	84
10/10/2023	00:05	51	68	85
10/10/2023	00:10	41	66	82
10/10/2023	00:15	44	68	82
10/10/2023	00:20	50	67	82
10/10/2023	00:25	38	67	83
10/10/2023	00:30	38	63	80
10/10/2023	00:35	46	67	81
10/10/2023	00:40	43	67	83
10/10/2023	00:45	41	68	91
10/10/2023	00:50	38	63	79

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	00:55	46	66	82
10/10/2023	01:00	43	63	81
10/10/2023	01:05	35	66	81
10/10/2023	01:10	31	63	85
10/10/2023	01:15	41	65	83
10/10/2023	01:20	35	65	83
10/10/2023	01:25	35	65	83
10/10/2023	01:30	42	66	82
10/10/2023	01:35	32	60	79
10/10/2023	01:40	34	65	83
10/10/2023	01:45	33	65	82
10/10/2023	01:50	43	66	84
10/10/2023	01:55	34	62	81
10/10/2023	02:00	39	65	78
10/10/2023	02:05	33	63	81
10/10/2023	02:10	35	64	80
10/10/2023	02:15	32	62	82
10/10/2023	02:20	42	66	85
10/10/2023	02:25	42	65	84
10/10/2023	02:30	33	62	82
10/10/2023	02:35	32	61	79
10/10/2023	02:40	37	61	79
10/10/2023	02:45	38	62	80
10/10/2023	02:50	43	61	80
10/10/2023	02:55	29	60	80
10/10/2023	03:00	29	66	85
10/10/2023	03:05	32	63	80
10/10/2023	03:10	31	60	77
10/10/2023	03:15	39	64	80
10/10/2023	03:20	31	61	79
10/10/2023	03:25	29	63	84
10/10/2023	03:30	29	56	77
10/10/2023	03:35	34	62	82
10/10/2023	03:40	30	64	82
10/10/2023	03:45	28	59	80
10/10/2023	03:50	30	62	80
10/10/2023	03:55	33	68	88
10/10/2023	04:00	38	66	84
10/10/2023	04:05	34	63	81
10/10/2023	04:10	38	67	86
10/10/2023	04:15	38	67	83
10/10/2023	04:20	34	64	83
10/10/2023	04:25	33	65	83
10/10/2023	04:30	37	67	85
10/10/2023	04:35	44	68	86
10/10/2023	04:40	36	66	83

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	04:45	33	69	86
10/10/2023	04:50	36	67	82
10/10/2023	04:55	44	67	83
10/10/2023	05:00	40	65	81
10/10/2023	05:05	35	68	85
10/10/2023	05:10	35	67	82
10/10/2023	05:15	37	71	84
10/10/2023	05:20	52	70	85
10/10/2023	05:25	44	70	86
10/10/2023	05:30	52	72	83
10/10/2023	05:35	56	72	84
10/10/2023	05:40	57	73	83
10/10/2023	05:45	54	72	85
10/10/2023	05:50	55	72	84
10/10/2023	05:55	53	72	85
10/10/2023	06:00	58	73	83
10/10/2023	06:05	55	71	82
10/10/2023	06:10	59	73	85
10/10/2023	06:15	55	73	86
10/10/2023	06:20	56	75	85
10/10/2023	06:25	60	74	85
10/10/2023	06:30	63	74	84
10/10/2023	06:35	63	75	85
10/10/2023	06:40	59	76	86
10/10/2023	06:45	60	74	83
10/10/2023	06:50	62	77	97
10/10/2023	06:55	63	74	83
10/10/2023	07:00	62	75	84
10/10/2023	07:05	62	75	83
10/10/2023	07:10	64	75	84
10/10/2023	07:15	65	76	83
10/10/2023	07:20	66	75	84
10/10/2023	07:25	66	75	84
10/10/2023	07:30	68	75	82
10/10/2023	07:35	65	76	82
10/10/2023	07:40	64	74	82
10/10/2023	07:45	62	71	84
10/10/2023	07:50	66	70	80
10/10/2023	07:55	66	72	83
10/10/2023	08:00	66	73	85
10/10/2023	08:05	64	72	82
10/10/2023	08:10	64	73	83
10/10/2023	08:15	62	73	83
10/10/2023	08:20	64	75	85
10/10/2023	08:25	66	74	84
10/10/2023	08:30	66	74	84

Date	Time	Measured noise (dB)		
		LA90	LAeq	LAfmax
10/10/2023	08:35	64	76	88
10/10/2023	08:40	62	75	83
10/10/2023	08:45	62	75	85
10/10/2023	08:50	68	76	86
10/10/2023	08:55	66	75	84
10/10/2023	09:00	68	76	88
10/10/2023	09:05	67	75	83
10/10/2023	09:10	65	75	84
10/10/2023	09:15	64	74	83
10/10/2023	09:20	65	75	83
10/10/2023	09:25	64	75	90
10/10/2023	09:30	66	74	95
10/10/2023	09:35	65	74	86
10/10/2023	09:40	66	75	83
10/10/2023	09:45	66	73	81
10/10/2023	09:50	64	74	84
10/10/2023	09:55	65	74	86
10/10/2023	10:00	67	74	84
10/10/2023	10:05	64	73	83
10/10/2023	10:10	61	74	85
10/10/2023	10:15	66	74	83
10/10/2023	10:20	65	74	85
10/10/2023	10:25	62	74	82
10/10/2023	10:30	67	75	85
10/10/2023	10:35	64	73	82
10/10/2023	10:40	66	74	83
10/10/2023	10:45	66	75	84
10/10/2023	10:50	65	74	83
10/10/2023	10:55	67	74	85
10/10/2023	11:00	65	75	86
10/10/2023	11:05	66	74	82
10/10/2023	11:10	66	74	83
10/10/2023	11:15	61	75	84
10/10/2023	11:20	65	74	86
10/10/2023	11:25	63	74	84
10/10/2023	11:30	65	74	84
10/10/2023	11:35	63	74	83
10/10/2023	11:40	66	74	84
10/10/2023	11:45	66	74	81
10/10/2023	11:50	67	74	82
10/10/2023	11:55	65	74	85
10/10/2023	12:00	67	75	85
10/10/2023	12:05	67	74	85
10/10/2023	12:10	64	73	89
10/10/2023	12:15	67	74	89
10/10/2023	12:20	66	73	83

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	12:25	67	73	81
10/10/2023	12:30	67	73	85
10/10/2023	12:35	67	73	82
10/10/2023	12:40	68	74	84
10/10/2023	12:45	67	74	84
10/10/2023	12:50	66	74	84
10/10/2023	12:55	65	74	86
10/10/2023	13:00	63	72	82
10/10/2023	13:05	65	74	82
10/10/2023	13:10	66	74	88
10/10/2023	13:15	65	74	83
10/10/2023	13:20	67	74	86
10/10/2023	13:25	67	74	81
10/10/2023	13:30	67	74	81
10/10/2023	13:35	67	75	84
10/10/2023	13:40	66	73	85
10/10/2023	13:45	65	74	88
10/10/2023	13:50	67	75	85
10/10/2023	13:55	68	74	82
10/10/2023	14:00	67	74	89
10/10/2023	14:05	67	73	83
10/10/2023	14:10	67	74	81
10/10/2023	14:15	65	73	83
10/10/2023	14:20	66	74	86
10/10/2023	14:25	67	74	83
10/10/2023	14:30	68	74	84
10/10/2023	14:35	64	73	82
10/10/2023	14:40	67	74	83
10/10/2023	14:45	65	74	83
10/10/2023	14:50	68	75	86
10/10/2023	14:55	67	74	85

Table 5: Measured 5-minute noise data at Position 2

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	13:50	48	53	59
09/10/2023	13:55	49	53	58
09/10/2023	14:00	48	53	58
09/10/2023	14:05	48	53	58
09/10/2023	14:10	46	52	58
09/10/2023	14:15	45	52	59
09/10/2023	14:20	46	53	58
09/10/2023	14:25	47	53	58
09/10/2023	14:30	47	52	59
09/10/2023	14:35	48	53	58

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	14:40	48	53	58
09/10/2023	14:45	46	53	58
09/10/2023	14:50	45	52	57
09/10/2023	14:55	44	53	62
09/10/2023	15:00	48	52	61
09/10/2023	15:05	47	53	60
09/10/2023	15:10	46	52	58
09/10/2023	15:15	49	53	62
09/10/2023	15:20	49	53	59
09/10/2023	15:25	49	54	68
09/10/2023	15:30	48	53	58
09/10/2023	15:35	48	52	70
09/10/2023	15:40	48	53	62
09/10/2023	15:45	48	53	63
09/10/2023	15:50	47	52	61
09/10/2023	15:55	48	52	60
09/10/2023	16:00	48	54	69
09/10/2023	16:05	48	52	59
09/10/2023	16:10	46	52	58
09/10/2023	16:15	47	52	59
09/10/2023	16:20	46	53	80
09/10/2023	16:25	47	52	57
09/10/2023	16:30	50	56	75
09/10/2023	16:35	47	53	60
09/10/2023	16:40	48	54	61
09/10/2023	16:45	49	54	68
09/10/2023	16:50	49	53	61
09/10/2023	16:55	48	53	61
09/10/2023	17:00	48	60	83
09/10/2023	17:05	50	57	83
09/10/2023	17:10	48	54	64
09/10/2023	17:15	47	52	65
09/10/2023	17:20	46	52	64
09/10/2023	17:25	47	53	59
09/10/2023	17:30	44	53	58
09/10/2023	17:35	44	54	60
09/10/2023	17:40	48	54	63
09/10/2023	17:45	50	54	59
09/10/2023	17:50	47	54	59
09/10/2023	17:55	48	54	66
09/10/2023	18:00	47	53	58
09/10/2023	18:05	49	53	58
09/10/2023	18:10	47	54	58
09/10/2023	18:15	46	58	79
09/10/2023	18:20	47	53	58
09/10/2023	18:25	48	53	58

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	18:30	48	53	59
09/10/2023	18:35	49	53	59
09/10/2023	18:40	48	53	59
09/10/2023	18:45	46	52	58
09/10/2023	18:50	46	54	79
09/10/2023	18:55	49	53	58
09/10/2023	19:00	46	53	61
09/10/2023	19:05	48	53	60
09/10/2023	19:10	45	53	65
09/10/2023	19:15	47	53	58
09/10/2023	19:20	46	60	82
09/10/2023	19:25	49	58	84
09/10/2023	19:30	44	52	58
09/10/2023	19:35	46	53	58
09/10/2023	19:40	47	55	78
09/10/2023	19:45	44	54	65
09/10/2023	19:50	46	52	59
09/10/2023	19:55	44	53	78
09/10/2023	20:00	44	52	59
09/10/2023	20:05	47	52	57
09/10/2023	20:10	45	52	58
09/10/2023	20:15	43	52	60
09/10/2023	20:20	44	51	57
09/10/2023	20:25	44	51	57
09/10/2023	20:30	44	52	58
09/10/2023	20:35	44	51	58
09/10/2023	20:40	46	52	57
09/10/2023	20:45	45	51	60
09/10/2023	20:50	41	50	58
09/10/2023	20:55	44	51	57
09/10/2023	21:00	44	52	66
09/10/2023	21:05	43	52	66
09/10/2023	21:10	39	57	77
09/10/2023	21:15	45	51	65
09/10/2023	21:20	43	52	77
09/10/2023	21:25	41	52	74
09/10/2023	21:30	43	50	59
09/10/2023	21:35	41	50	58
09/10/2023	21:40	43	51	66
09/10/2023	21:45	42	50	57
09/10/2023	21:50	40	50	57
09/10/2023	21:55	41	51	60
09/10/2023	22:00	40	54	77
09/10/2023	22:05	40	51	57
09/10/2023	22:10	39	51	60
09/10/2023	22:15	35	49	58

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
09/10/2023	22:20	38	49	56
09/10/2023	22:25	39	51	60
09/10/2023	22:30	38	49	59
09/10/2023	22:35	38	50	59
09/10/2023	22:40	34	50	59
09/10/2023	22:45	42	50	57
09/10/2023	22:50	40	49	57
09/10/2023	22:55	36	48	56
09/10/2023	23:00	33	48	58
09/10/2023	23:05	37	50	62
09/10/2023	23:10	39	49	58
09/10/2023	23:15	38	50	63
09/10/2023	23:20	32	47	56
09/10/2023	23:25	37	48	57
09/10/2023	23:30	35	47	61
09/10/2023	23:35	34	48	62
09/10/2023	23:40	36	47	56
09/10/2023	23:45	38	50	61
09/10/2023	23:50	36	47	56
09/10/2023	23:55	36	48	57
10/10/2023	00:00	37	48	59
10/10/2023	00:05	35	45	56
10/10/2023	00:10	37	46	56
10/10/2023	00:15	38	46	54
10/10/2023	00:20	38	45	55
10/10/2023	00:25	35	48	59
10/10/2023	00:30	28	42	53
10/10/2023	00:35	31	45	55
10/10/2023	00:40	30	46	57
10/10/2023	00:45	30	47	65
10/10/2023	00:50	29	43	54
10/10/2023	00:55	29	47	57
10/10/2023	01:00	28	41	53
10/10/2023	01:05	27	44	56
10/10/2023	01:10	28	43	57
10/10/2023	01:15	34	44	57
10/10/2023	01:20	28	42	54
10/10/2023	01:25	29	43	58
10/10/2023	01:30	29	44	56
10/10/2023	01:35	27	38	50
10/10/2023	01:40	29	45	58
10/10/2023	01:45	28	44	54
10/10/2023	01:50	29	46	64
10/10/2023	01:55	26	40	51
10/10/2023	02:00	29	44	59
10/10/2023	02:05	27	40	53

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	02:10	30	43	52
10/10/2023	02:15	27	43	56
10/10/2023	02:20	29	43	56
10/10/2023	02:25	29	43	54
10/10/2023	02:30	27	40	52
10/10/2023	02:35	27	41	53
10/10/2023	02:40	27	42	55
10/10/2023	02:45	27	42	54
10/10/2023	02:50	28	41	51
10/10/2023	02:55	24	39	53
10/10/2023	03:00	24	43	57
10/10/2023	03:05	26	40	51
10/10/2023	03:10	26	40	52
10/10/2023	03:15	28	43	54
10/10/2023	03:20	25	38	51
10/10/2023	03:25	24	40	55
10/10/2023	03:30	24	34	48
10/10/2023	03:35	26	41	53
10/10/2023	03:40	25	43	57
10/10/2023	03:45	24	39	52
10/10/2023	03:50	26	41	52
10/10/2023	03:55	28	44	61
10/10/2023	04:00	30	43	54
10/10/2023	04:05	30	42	54
10/10/2023	04:10	31	45	59
10/10/2023	04:15	32	44	55
10/10/2023	04:20	32	42	57
10/10/2023	04:25	32	43	56
10/10/2023	04:30	33	45	57
10/10/2023	04:35	35	45	57
10/10/2023	04:40	33	43	54
10/10/2023	04:45	31	45	58
10/10/2023	04:50	31	44	54
10/10/2023	04:55	33	44	54
10/10/2023	05:00	32	44	54
10/10/2023	05:05	33	46	56
10/10/2023	05:10	31	44	54
10/10/2023	05:15	31	47	56
10/10/2023	05:20	37	47	60
10/10/2023	05:25	37	46	57
10/10/2023	05:30	38	49	58
10/10/2023	05:35	40	50	57
10/10/2023	05:40	41	50	57
10/10/2023	05:45	41	49	57
10/10/2023	05:50	42	50	59
10/10/2023	05:55	43	50	58

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	06:00	46	51	58
10/10/2023	06:05	44	49	57
10/10/2023	06:10	45	52	60
10/10/2023	06:15	44	51	58
10/10/2023	06:20	46	53	58
10/10/2023	06:25	47	53	64
10/10/2023	06:30	50	53	58
10/10/2023	06:35	49	53	59
10/10/2023	06:40	48	54	63
10/10/2023	06:45	49	54	59
10/10/2023	06:50	50	56	74
10/10/2023	06:55	50	54	59
10/10/2023	07:00	50	54	62
10/10/2023	07:05	50	54	59
10/10/2023	07:10	50	54	66
10/10/2023	07:15	51	55	59
10/10/2023	07:20	52	55	60
10/10/2023	07:25	52	55	60
10/10/2023	07:30	52	54	58
10/10/2023	07:35	51	55	60
10/10/2023	07:40	50	54	58
10/10/2023	07:45	48	53	59
10/10/2023	07:50	50	53	64
10/10/2023	07:55	50	54	61
10/10/2023	08:00	49	53	59
10/10/2023	08:05	49	53	59
10/10/2023	08:10	48	53	63
10/10/2023	08:15	47	53	58
10/10/2023	08:20	49	54	61
10/10/2023	08:25	50	54	60
10/10/2023	08:30	50	54	62
10/10/2023	08:35	49	55	62
10/10/2023	08:40	49	55	63
10/10/2023	08:45	49	55	60
10/10/2023	08:50	50	55	61
10/10/2023	08:55	51	54	59
10/10/2023	09:00	52	55	65
10/10/2023	09:05	52	55	59
10/10/2023	09:10	53	55	60
10/10/2023	09:15	51	54	59
10/10/2023	09:20	50	54	59
10/10/2023	09:25	50	54	64
10/10/2023	09:30	50	54	64
10/10/2023	09:35	49	54	59
10/10/2023	09:40	52	55	59
10/10/2023	09:45	52	54	63

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	09:50	52	55	61
10/10/2023	09:55	51	54	59
10/10/2023	10:00	51	54	63
10/10/2023	10:05	52	54	59
10/10/2023	10:10	49	53	60
10/10/2023	10:15	51	54	58
10/10/2023	10:20	51	54	63
10/10/2023	10:25	49	54	59
10/10/2023	10:30	50	54	60
10/10/2023	10:35	48	53	58
10/10/2023	10:40	50	55	68
10/10/2023	10:45	49	53	58
10/10/2023	10:50	47	53	62
10/10/2023	10:55	50	54	59
10/10/2023	11:00	50	54	62
10/10/2023	11:05	49	53	62
10/10/2023	11:10	50	54	59
10/10/2023	11:15	47	53	64
10/10/2023	11:20	47	53	62
10/10/2023	11:25	48	53	60
10/10/2023	11:30	48	53	58
10/10/2023	11:35	47	53	57
10/10/2023	11:40	50	54	60
10/10/2023	11:45	49	54	63
10/10/2023	11:50	49	53	57
10/10/2023	11:55	49	53	57
10/10/2023	12:00	50	54	59
10/10/2023	12:05	50	53	59
10/10/2023	12:10	48	52	62
10/10/2023	12:15	49	53	62
10/10/2023	12:20	49	53	58
10/10/2023	12:25	50	53	58
10/10/2023	12:30	49	53	65
10/10/2023	12:35	49	52	63
10/10/2023	12:40	51	54	66
10/10/2023	12:45	49	53	59
10/10/2023	12:50	49	52	62
10/10/2023	12:55	47	52	61
10/10/2023	13:00	48	52	56
10/10/2023	13:05	49	53	60
10/10/2023	13:10	50	54	71
10/10/2023	13:15	50	53	59
10/10/2023	13:20	50	53	60
10/10/2023	13:25	51	54	64
10/10/2023	13:30	51	54	70
10/10/2023	13:35	51	54	70

Date	Time	Measured noise (dB)		
		L _{A90}	L _{Aeq}	L _{AFmax}
10/10/2023	13:40	49	53	59
10/10/2023	13:45	50	53	63
10/10/2023	13:50	50	54	58
10/10/2023	13:55	50	53	58
10/10/2023	14:00	50	53	61
10/10/2023	14:05	50	53	58
10/10/2023	14:10	51	53	58
10/10/2023	14:15	49	53	63
10/10/2023	14:20	50	54	67
10/10/2023	14:25	51	54	61
10/10/2023	14:30	52	55	59
10/10/2023	14:35	51	54	60
10/10/2023	14:40	51	54	59
10/10/2023	14:45	51	54	59
10/10/2023	14:50	51	54	61
10/10/2023	14:55	51	54	58

Appendix C: Example glazing specifications (alternative specifications, achieving the same sound reduction values, may be used)

Figure 9: Example glazing specification to achieve 39 dB $R_w + C_{tr}$

