



Residential Noise Assessment

Site Address: Land Off Greenhill Road / Smethurst Street, Middleton, M24 2BB

Client Name: J Walker Homes

Project Reference No: NP-010599



Authorisation and Version Control

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a new build residential development ('the Proposed Development') at Land Off Greenhill Road / Smethurst Street, Middleton, M24 2BB ('the Site').

The applicant has submitted planning application No. 23/01162/FUL 'Residential development for the erection of 24 dwellings following demolition of existing outbuildings', to Rochdale Borough Council. This report has been compiled to accompany the planning application to the Local Planning Authority ('the LPA').

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development. The findings have been subsequently used to assess the suitability of the site for residential use. Measures required to mitigate noise impacts for the proposed development have been assessed in accordance with the relevant performance standards, legislation, policy, and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy, and guidance have been considered to ensure good acoustic design in the assessment:

- The LPAs comments.
- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- British Standard BS8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'.
- ProPG: 'Planning and Noise 2017' (including supplementary documents 1 & 2).
- Approved Document O: Overheating (2021).
- Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO Guide).

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for the demolition of the existing outstanding buildings and the erection of 24 No. dwellings with associated access roads, car park and external amenities. The figure below shows the proposed development.



Figure 1 – Proposed Development

1.3 Local Planning Authority & Background

The following comment has been made by the LPA:

“Given the close proximity to the existing industrial unit (brewery) and the train network this section cannot support the application in its current form, to allow full consideration we would require a noise impact assessment to undertaken to inform the design of the flat to ensure the following internal noise levels can be achieved:

- 35 dB(A) Leq (16 hour) in the bedrooms with windows shut and other means of ventilation provided between 7 am and 11pm;
- 30dB(A) Leq 8 hour in the bedrooms with windows shut and other means of ventilation provided between 11pm and 7am;
- 35 dB(A) Leq (16 hour) in the living room/s with windows shut and other means of ventilation provided between 7 am and 11pm;
- 40dB(A) Leq (16 hour) in other habitable rooms with windows shut and other means of ventilation provided at all times.
- Noise in external amenity areas shall not exceed 55 dB(A).”

The Agent of Change Principle

Whilst the acoustic environment across the proposed development site is dominated by anonymous transport noise emissions, industrial/commercial noise emissions from the neighbouring brewery are audible at times. As such, the 'Agent of Change' principle must be considered. Paragraph 193 of the NPPF comments:

"Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of a development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of uses) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Given the above, attended and unattended monitoring has been conducted to ensure the character and variety of the industrial/commercial noise is understood. Consequently, the assessment will duly consider whether the introduction of new residential will harm the viability and future growth of the existing business.

2. Environmental Noise Survey

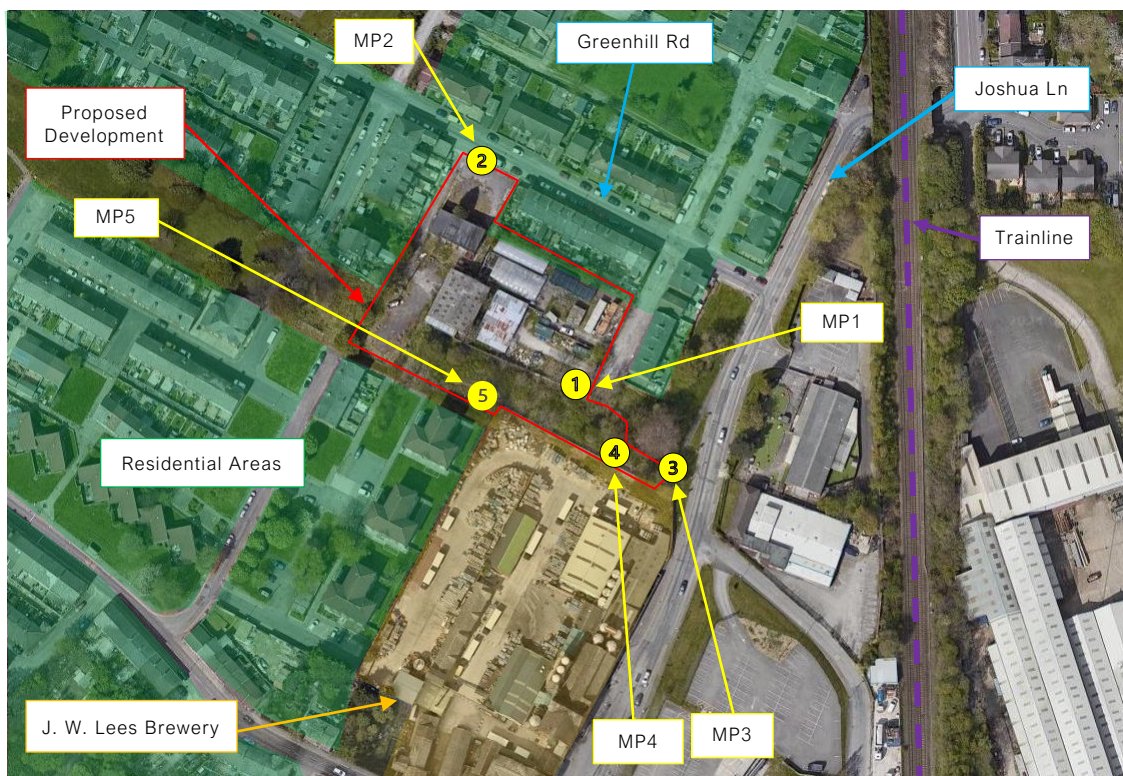
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. A 130mm windshield was installed to all microphones.

Location	Survey Dates	Measurement Particulars
MP1	29-30/01/2024	Equipment mounted on a tripod pole at a height of 3.5m and at least 3.5m from any other large reflective surface at the edge of the proposed site.
MP2	29-30/01/2024	Equipment mounted on a lamppost at a height of 4m and at least 3.5m from any other large reflective surface on Greenhill Road.
MP3	29-30/01/2024	Equipment mounted on a lamppost at a height of 4m and at least 3.5m from any other large reflective surface (free field) on Joshua Lane.
MP4 (Spot)	30/01/2024	A spot measurement was carried out at the southern boundary of the site, adjacent to J. W. Lees Brewery and approximately 20m from Joshua Lane. The microphone was attached to a tripod at 1.5m above the ground and at least 3.5m from any other large reflective surface.
MP5 (Spot)	29/01/2024 & 30/01/2024	A spot measurement was carried out at the southwestern boundary of the site, adjacent to J. W. Lees Brewery. The microphone was attached to a tripod at 1.5m above the ground and at least 3.5m from any other large reflective surface.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2024 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2024

Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The immediate area surrounding the proposed development site is mixed in nature, comprising of residential dwellings to the north, southwest and west and 'J. W. Lees Brewery' to the south. The brewery is understood to operate on weekdays from 09:00 to 17:00 hours, however, fixed plant operates 24/7 as part of the production processes and storage. The brewery also includes a pub 'JW Lees' which is assumed to operate until around 00:00 hours on the weekends.

The acoustic environment across the site is dominated by road traffic noise emissions from Joshua Lane and frequent train pass-bys from the railway line (approx. 100m west of the site) that joins Mills Hill (Manchester) with Moston train stations are clearly audible. An embankment separates the proposed development site from the brewery and provides a degree of acoustic screening. Noise emissions generated by the neighbouring brewery were only audible at MP4 and MP5 during prolonged lulls in the road traffic noise emissions, and less perceptible at MP1.

MP4 and MP5 were measurement positions situated at the proposed site boundary atop of the embankment with direct line of the sight to the brewery and its facilities; these measurement positions are deemed to present a 'worst-case' scenario at the very end of the gardens. MP1 is deemed representative of the acoustic environment behind the embankment at first-floor height of the proposed dwellings.

Further subjective impressions are detailed in the proceeding sections.

2.3 Environmental Noise Survey Results

The following section outlines the measured sound levels during the survey. The time history results can be found in Appendix D. The 'typical' $L_{AFmax,1min}$ is the $L_{AFmax,1min}$ exceeded 10 times or fewer per night.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, $L_{eq,T}$, dB)							$L_{Aeq,T}$ (dB)	'Typical' $L_{AFmax,1min}$ (dB)
		63	125	250	500	1k	2k	4k		
MP1	$L_{eq,16hr}$ (Day)	60	54	51	49	52	48	40	55	--
	$L_{eq,1hr}$ (Day)	61	58	54	52	53	49	42	57	
	$L_{eq,8hr}$ (Night)	52	46	44	42	44	40	36	47	65
	$L_{eq,1hr}$ (Night)	57	51	49	47	50	45	39	53	
MP2	$L_{eq,16hr}$ (Day)	63	60	57	57	56	55	49	61	--
	$L_{eq,1hr}$ (Day)	65	62	56	56	58	57	51	62	
	$L_{eq,8hr}$ (Night)	54	46	44	44	46	43	35	49	71
	$L_{eq,1hr}$ (Night)	61	51	48	48	50	46	37	53	
MP3	$L_{eq,16hr}$ (Day)	71	66	67	67	72	65	61	74	--
	$L_{eq,1hr}$ (Day)	73	69	68	69	73	67	63	75	
	$L_{eq,8hr}$ (Night)	62	57	59	59	64	58	50	66	84
	$L_{eq,1hr}$ (Night)	66	61	63	64	69	63	54	71	
MP4	30/01/2024: 13:42 – 14:42	60	54	54	54	52	49	50	65	--
MP5	29/01/2024: 14:51 – 15:51	59	51	48	48	51	45	37	53	--
MP5	30/01/2024: 14:45 – 15:45	60	50	44	43	46	40	31	49	--

Table 2 – Sound Level Results Summary

Discussion:

The noise survey time histories (see Appendix D) show a diurnal pattern which is typical in locations that are dominated by anonymous transport noise. This supports the subjective impression that the noise emissions from the brewery were second in nature against the residual noise climate (emissions from all other noise sources). However, this does not mean that the brewery is entirely inaudible. At MP1 which is deemed to be representative of the acoustic environment at the proposed dwellings below the embankment, the noise profile was also dominated by road traffic noise emissions and the brewery operations were barely audible; however, the impulsive metallic impact noise emissions from the movement of beer barrels were occasionally just perceptible.

The figure below shows the noise survey time history recorded at MP1.

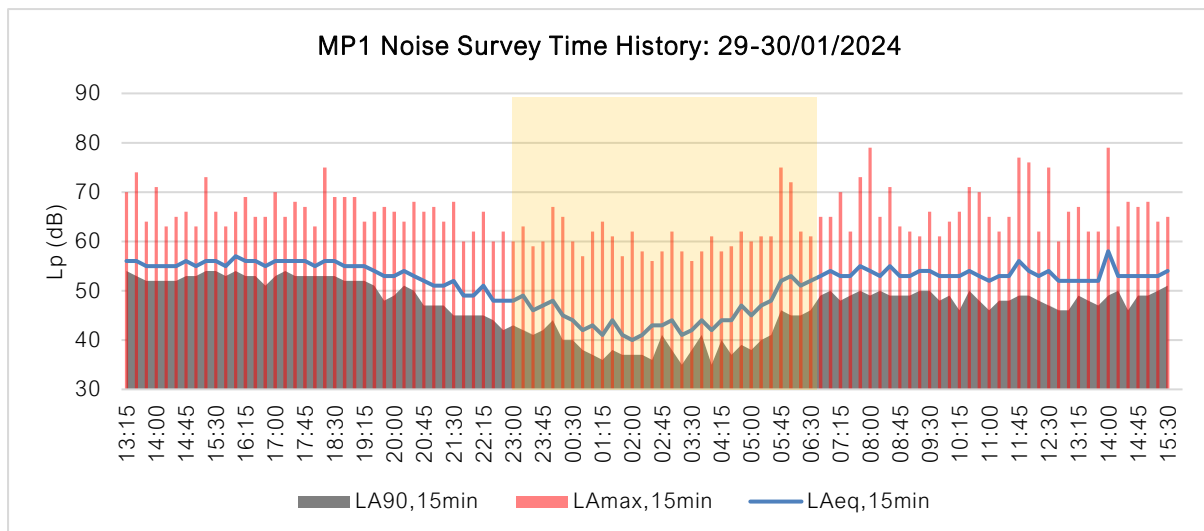


Figure 3 – MP1 Noise Survey Time History

The time history for MP1 above shows a clear diurnal pattern. The $LA_{90,15min}$ fluctuates randomly during the night-time period (amber) rather remaining flat or cyclic which is typical when the measurement location is influenced by fixed plant noise emissions. This supports the subjective impression that fixed plant noise emissions were inaudible at MP1 (first-floor height).

It should also be recognised that the brewery has been surrounded by other residential developments for a number of years. It is assumed that the site is suitable for residential development should a 'good acoustic design' strategy be implemented.

3. Noise Break-in Assessment and Sound Insulation Scheme

3.1 Internal Noise Level Criteria

The following table outlines the internal acoustic design criteria prescribed in BS8233.

BS8233:2014 Acoustic Design Criteria			
Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$ / NR30	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$ / NR35	--
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$ / NR30	30 dB $L_{Aeq,8hr}$ / NR25 45 dB L_{AFmax} *

*NOTE 1: The maximum criteria have been taken from the World Health Organisation (WHO) Guidelines for Community Noise.

*NOTE 2: ProPG:2017 which is relevant to 'New Residential' states; "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. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability, and regularity of noise events".

Note 3: BS8233:2014 states: "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved".

Note 4: BS8233:2014 states: "The levels shown in Table 4 (criteria shown above) are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g., 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 4.

Note 5: BS8233:2014 states: "If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

Table 3 – Internal Acoustic Design Criteria

Whilst the time histories indicate diurnal pattern, the noise emissions from beer barrel movements are at times just perceptible. Consequently, to ensure the residential amenity of future occupants is fully protected, the noise break-in assessment considers a shorter reference period (1-hour) as a 'robust' approach as per Note 4 in the table above.

3.2 Noise Modelling

The environmental noise survey has allowed the sound levels at the proposed development to be modelled within SoundPlan 9.0. The modelling particulars are outlined in Appendix F. The sound maps showing the daytime $L_{Aeq,t}$, night-time $L_{Aeq,t}$ and night time $L_{AFmax,1min}$ sound levels incident upon the proposed development can be seen in the figures below.

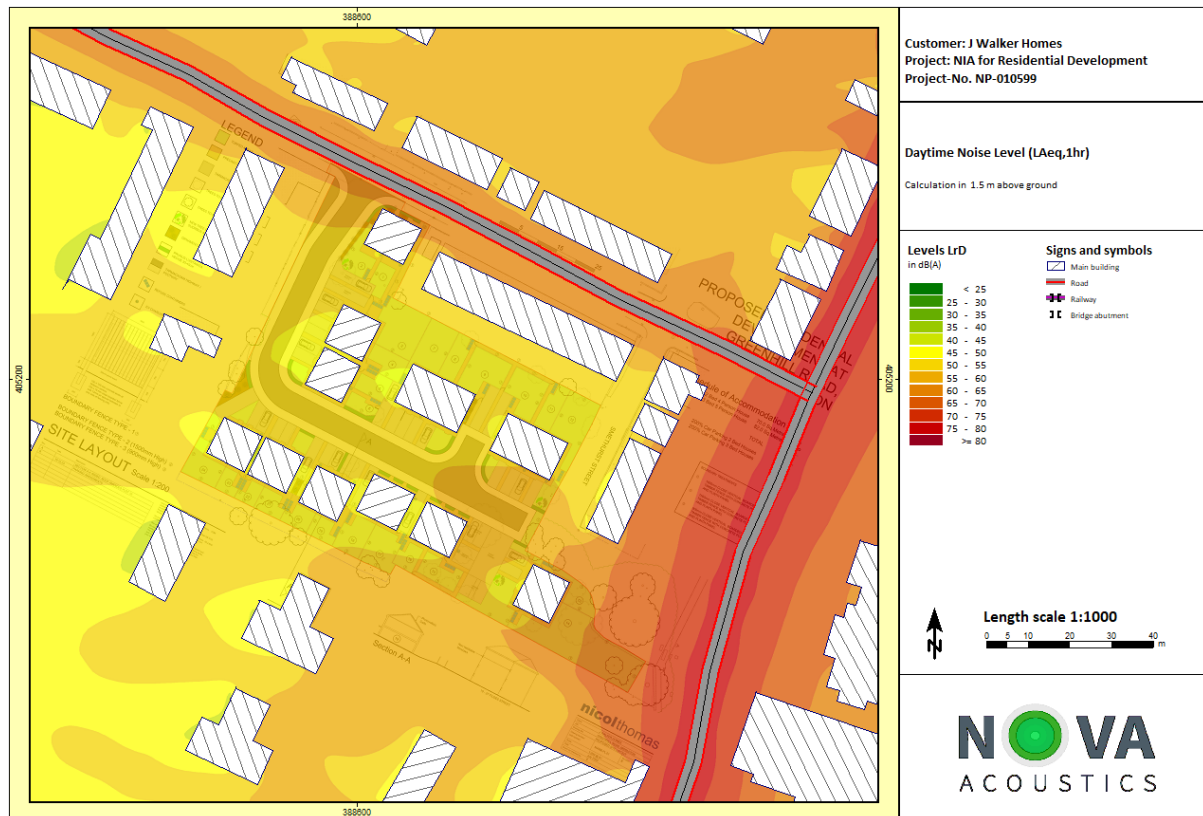
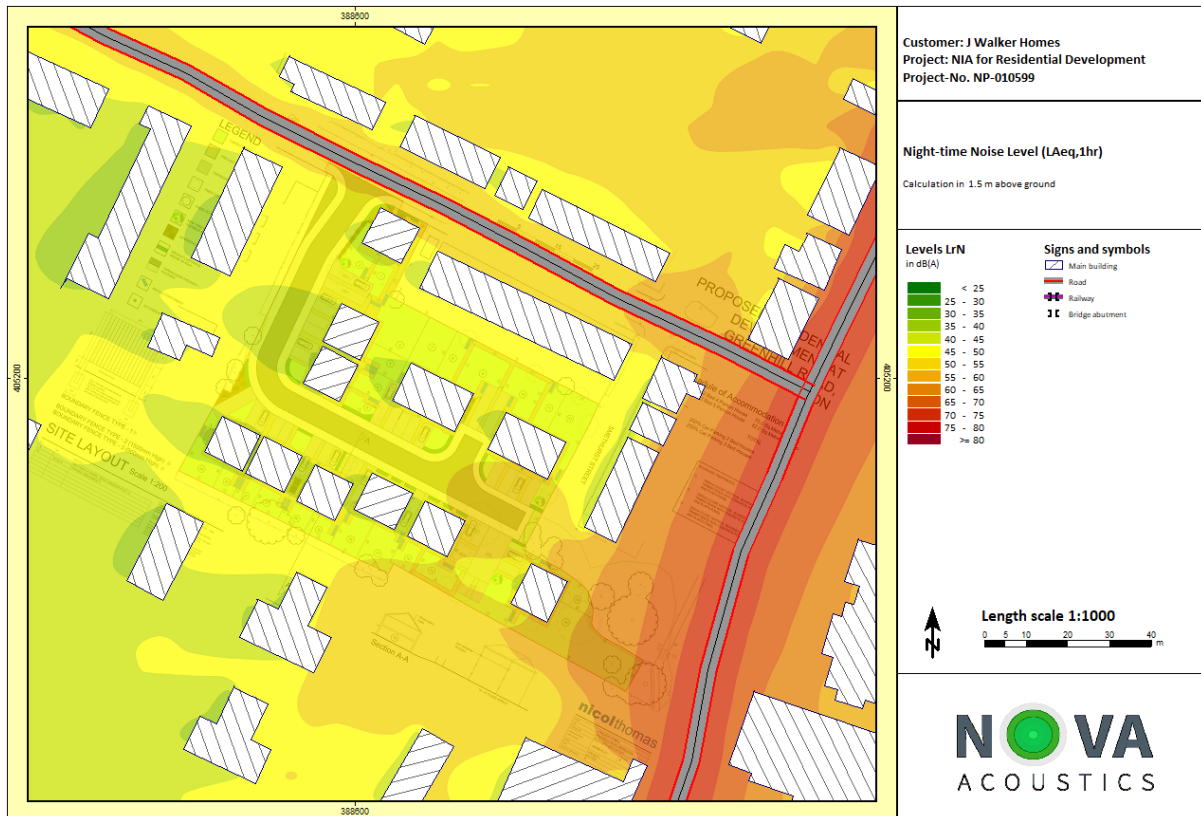
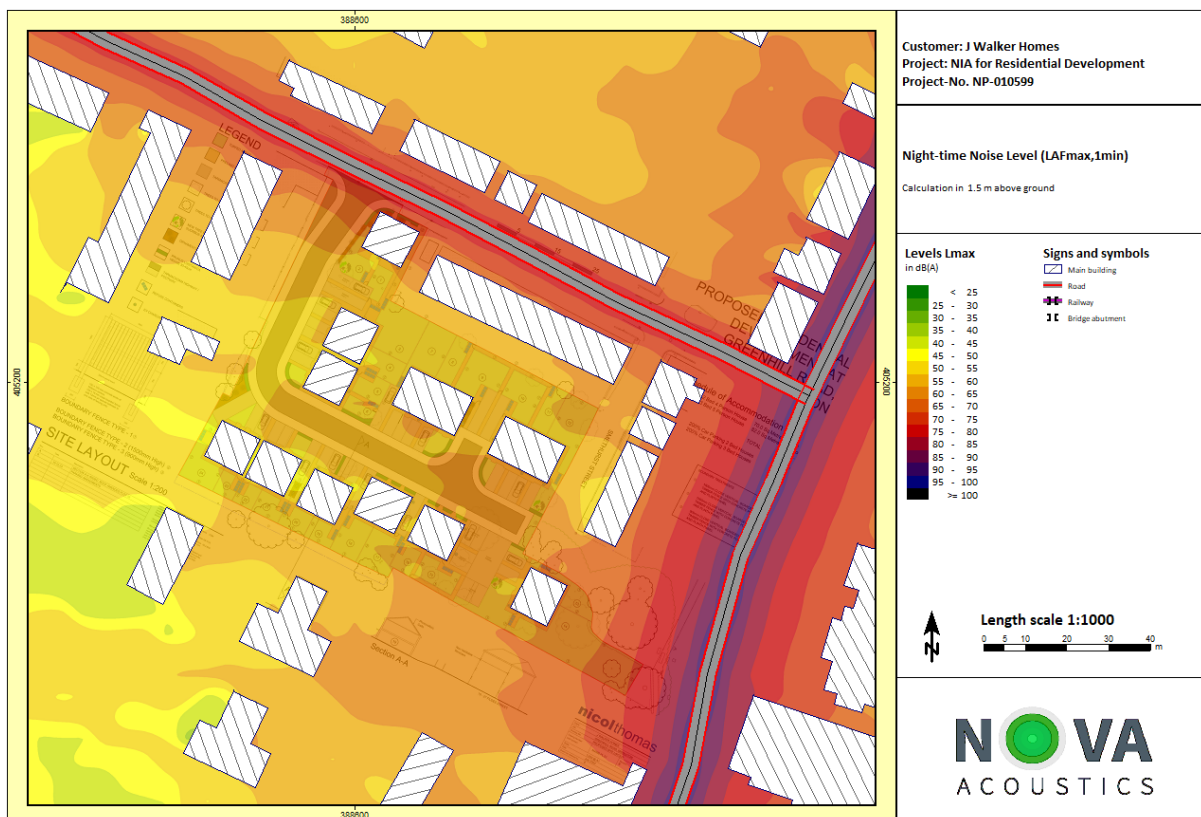


Figure 4 – Daytime $L_{Aeq,1hr}$ Ambient Sound Map

Figure 5 – Night-time $L_{Aeq,1hr}$ Ambient Sound MapFigure 6 – Night-time $L_{AFmax,1min}$ Sound Map

Red Façades										
Rooms	Description	Octave Frequency Band (Hz, dB)							Overall (dB)	
		63	125	250	500	1k	2k	4k		
Glazing										
Living Rooms and Bedrooms	6mm Glass / 16mm Air Cavity / 4mm Glass	20	21	20	26	38	37	39	31 (R _W)	27 (R _W + C _{tr})
Background Trickle Ventilation										
Living Rooms and Bedrooms	Titon V75 + C75 (Trickle Ventilation)	--	37	37	36	47	49	55	44 (D _{n,e})	41 (D _{n,e,W} + C _{tr})

Table 4 – Glazing and Ventilation Specification – Red Façades

Amber & Green Façades										
Rooms	Description	Octave Frequency Band (Hz, dB)							Overall (dB)	
		63	125	250	500	1k	2k	4k		
Glazing										
Living Rooms and Bedrooms	4mm Glass / 16mm Air Cavity / 4mm Glass	19	21	17	25	35	37	31	29 (R _w)	25 (R _w + C _{tr})
Background Trickle Ventilation										
Living Rooms and Bedrooms	Titon Standard Vent + C25 (Trickle Ventilation)	--	36	38	36	32	37	39	35 (D _{n,e})	33 (D _{n,e,w} + C _{tr})

Table 5 – Glazing and Ventilation Specification – Amber & Green Façades

Any other window specification capable of providing this attenuation will be suitable provided the glazing suppliers can provide an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.

4. Open Window Noise Break-in Assessment

4.1 Internal Noise Levels with Open Windows Criteria

The AVO Guide advises that if windows are open regularly to provide higher rates of ventilation to mitigate overheating, this will lead to elevated internal noise levels which could lead to undesirable living conditions. If windows are opened rarely the occupants may be able to tolerate elevated noise levels due to the inherent benefits of natural ventilation. This assessment will firstly assess whether the internal noise level criteria can be achieved with open windows. The AVO Guide provides criteria for both daytime and night-time periods which shown below.

Windows	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	AVO Guide Table 3-3 Example Outcomes	AVO Guide Table 3 – 2 Recommendation for Level 2 Assessment
Rarely Open	50 dB $L_{Aeq,16hour}$	42 dB $L_{Aeq,8hour}$ Normally Exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g., having to keep windows closed most of the time	Recommended
Increasing Noise Level			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	Optional
Often Open	40 dB $L_{Aeq,16hour}$	35 dB $L_{Aeq,8hour}$ Normally Exceeds 45 dB $L_{AF,max}$	Noise can be heard, but does not cause any change in behaviour	Not Required

Table 6 – AVO Guide Open Window Criteria

To advise if openable windows can be used as the ventilation strategy (whilst maintaining reasonable internal noise levels), an open window assessment will be provided. The suitability of the internal noise levels will be based upon the internal noise criteria above and an open window providing 13 dB attenuation. If required, an alternative ventilation strategy compliant with Approved Document F will be proposed.

4.2 Open Window Assessment

This assessment will firstly consider whether the internal noise level criteria from Table 3 – 3 of the AVO Guide can be achieved with open windows. Please note that the assessment below is based on the noise sound maps seen in Figures 4 to 6.

Location	External Noise Levels	AVO Guide Windows Open Often	Exceedance	AVO Guide Windows Rarely Open	Exceedance
Red Façades	64 $L_{Aeq,1hr}$ (Day)	53	+11	63	+1
	60 $L_{Aeq,1hr}$ (Night)	48	+12	55	+5
	70 L_{AFmax} (Night)	58	+12	78	-8
Amber Façades	59 $L_{Aeq,1hr}$ (Day)	53	+6	63	-4
	53 $L_{Aeq,1hr}$ (Night)	48	+5	55	-2
	62 L_{AFmax} (Night)	58	+4	78	-16
Green Façades	51 $L_{Aeq,1hr}$ (Day)	53	-2	63	-12
	45 $L_{Aeq,1hr}$ (Night)	48	-3	55	-10
	57 L_{AFmax} (Night)	58	-1	78	-21

Table 7 – Open Window Assessment

For red façades, the external noise levels exceed the AVO Guides 'Rarely Open' criteria, which means that windows should not be used for the primary means of mitigating the overheating condition. An alternate ventilation strategy is required that is capable of a higher rate of ventilation. A mechanical extract ventilation system should be installed to provide 'Whole Dwelling Ventilation' in accordance with Approved Document F. It is understood that continuous MEV extract fans installed in accordance with the specified trickle ventilators to allow the ingress of fresh air will be adequate. The ventilation system should be designed by an appropriately qualified person to ascertain compliance with the relevant Building Regulations. Special consideration should be given to 1.5 to 1.7 of Approved Document F to assist in the design of the ventilation system and to ensure the self-generated noise levels from the MEV extract fans do not exceed the specified criteria.

Good acoustic design has been considered and additional screening has been modelled. A 2m earth bund with a 1.8m tall acoustic fence on top would result in the façade noise map below.

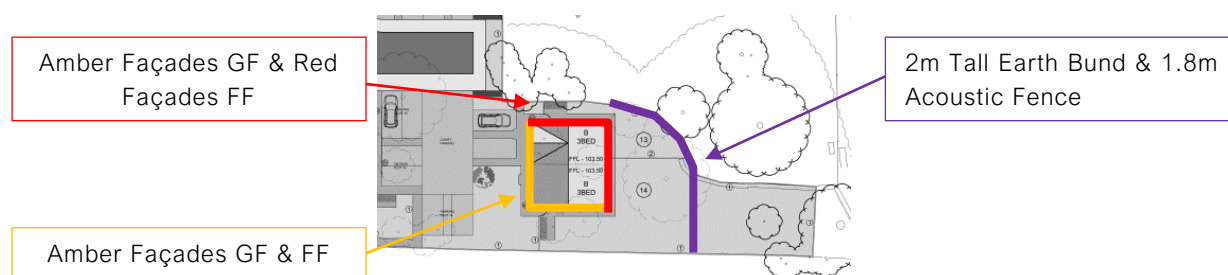


Figure 8 – Façade Colour Allocation Map – Good Acoustic Design Plot No. 13 & 14

The Figure above shows that the introduction of the earth bund and acoustic fencing allows the ground floors to be in the amber category, however, the upper floors would remain in the red as they would exceed the 'windows rarely open criteria' (55 dBA) by 2 dB.

For the amber façades, the external noise levels exceed the AVO Guides 'Windows Open Often' criteria which means that windows being used for the primary means of ventilation (whilst maintaining reasonable internal noise levels) could vary dependent on the outcome of a TM59 overheating assessment. To assist in the design of the alternative ventilation strategy a TM59 overheating assessment should be undertaken to ascertain how frequently open windows will be required to mitigate overheating. The TM59 assessor should be provided with this report to base their study. If the outcome of the overheating assessment states that windows will be open often mitigate the overheating condition, an alternative ventilation strategy as per the red façades would be required. If the TM59 is not undertaken, the same ventilation strategy as proposed for the red facades should be implemented throughout the entire development.

For the green facades, the external noise levels do not exceed the AVO Guide's 'Windows Open Often' criteria which means that windows can be used as the primary means of ventilation to mitigate overheating, subject to the proceeding section.

4.3 The 'AoC', Open Windows, Alternative Ventilation Strategy & Good Acoustic Design

The 'Agent of Change' must be considered to ensure unreasonable restrictions are not imposed on the neighbouring business' should residential be developed.

Where noise from a business is audible inside (with windows open) or in an external amenity area of a proposed dwelling there is potential for the occupant to complain to the LPA regarding the noise generated by the business. As such 'virtual inaudibility' must be considered the criteria. Inaudibility is defined as:

"Noise is considered to be inaudible when it is at a sufficiently low level such that it is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question (DEFRA)".

In addition to audibility, the likelihood of complaints must also be considered. The likelihood of complaints is subjective and is primarily be based upon the level of audibility, dominance, attention grabbing features, spectral distribution, regularity, change in level, duration, and time of day the sound is occurring. It is noted that there is no definitive objective criterion that can be applied to nuisance, or the likelihood of complaints and each scenario requires individual investigation. Typically, the lower the BS4142 impact the less likelihood there are for complaints; this is thought to duly consider the 'agent of change'.

BS4142 Noise Impact Assessment

An indicative BS4142 noise impact assessment has been conducted below. The $L_{A90,15min}$ histogram used to derive the background sound level can be found in Appendix D. The BS4142 assessment is focused on the beer barrel movements as they were the only perceptible noise source from the brewery at the proposed dwelling locations.

Specific noise emissions of beer barrel drops have been obtained from measurements at 2m undertaken by NOVA Acoustics. An $L_{Aeq,2s}$ of a beer barrel drop was measured as 96 dB which equates to an SEL of 99 dBA at 2m. A 1-hour time corrected sound power level has been calculated accounting for 10 barrel drops over one reflective plane (Q2).

The BS4142 noise impact assessment is seen in the table on the overleaf.

Daytime BS4142 Noise Impact Assessment		
Description	1/1 Octave Frequency Band (Hz, dB)	Overall (dBA)
	Notes	
Sound Power Level of 10 No. Beer Barrel Drops ($L_{W,1hr}$)		87
Propagation Loss to Most Exposed Plot	(25m, Q2)	-36
Acoustic Screening	Partial screening provided by embankment	-5
Specific Sound Level at Most Exposed Plot		46
Acoustic Feature Correction	A +3 dB penalty has been applied for 'just perceptible' impulsivity from the beer barrel drops and movements.	+3
Rating Sound Level ($L_{A,r,Tr}$)		49
Background Sound Level	Lowest 'typical' $L_{A90,15min}$ recorded at MP2.	47
Exceedance		+2
BS4142 Assessment Outcome	A low likelihood of 'Adverse Impact, dependent on context'.	
NPPF & NPSE Outcome	The assessment indicates between 'No Observed Effect Level' ('NOEL') and 'No Observed Adverse Effect Level' ('NOAEL') in accordance with the NPPF and NPSE.	

Table 8 – BS4142 Noise Impact Assessment

As can be seen in the indicative BS4142 assessment above, the rating sound level is predicted to be 2 dB above the background sound level at the most exposed plot. It should be recognised that the assessment is indicative and has focused on the concerning commercial noise source identified during the attended monitoring. Furthermore, the background sound level is derived at a surrogate location (MP2), which is thought to offer marginally lower $L_{A90,15min}$ measurements (in the absence of brewery noise emissions); therefore, indicating the extent of the impact from beer barrel movements.

It is stated that at NOAEL: "noise can be heard, but does not cause any change in behaviour, attitude or other physiological response". In addition, noise at this level "can slightly affect the acoustic character of the area but not such that there is a change in the quality of life".

It is thought that providing a 'good acoustic design' strategy is implemented, openable windows may be permissible, given the presence of other residential developments in similar proximity to the brewery, and the outcome of the BS4142 assessment.

Good Acoustic Design Strategy

The ProPG supplementary document 2 provides the following 'Good Acoustic Design' hierarchy of noise management measures which LPAs should encourage. These are shown in the table below in descending order of preference:

Order of Preference	Noise Management Measure
1	Reduction of the noise generated at source by redesign, relocation or containment. *
2	Maximising the spatial separation of noise source(s) and receptor(s).
3	Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.
4	Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.
5	Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
6	Using the layout of the scheme to reduce noise propagation across the site.
7	Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
8	Using the building envelope to mitigate noise to acceptable levels.

Table 9 – Hierarchy of Noise Management Measures

*Not from ProPG

The following good acoustic design measures should be considered:

- Erect a 1.8m tall acoustic screen on the embankment along the boundary separating the site from the brewery. The screen may be of close-board timber construction, have a minimum surface mass of 15 kg/m² and not contain any holes or gaps.
- The dwellings should be laid out as so less noise sensitive spaces face the brewery, e.g., bathrooms and offices on the upper floors.
- In plots adjacent to the brewery, all habitable windows perpendicular to the brewery should be hinged closest to the brewery as so the window itself provides additional screening.
- Construct a 2m earth bund with a 1.8m acoustic fence on top around the perimeter of the gardens for plots No. 13 & 14.

Considering the outcome of the BS4142 assessment, openable windows are thought to be appropriate, however, it is at the LPAs discretion as to whether the low likelihood of adverse impact poses enough of a risk to warrant forced closed windows.

If windows are forced closed, an alternate ventilation strategy will be required that is capable of a higher rate of ventilation. A mechanical extract ventilation system should be installed to provide 'Whole Dwelling Ventilation' in accordance with Approved Document F. It is understood that continuous MEV extract fans installed in accordance with the specified trickle ventilators to allow the ingress of fresh air will be

adequate. The ventilation system should be designed by an appropriately qualified person to ascertain compliance with the relevant Building Regulations. Special consideration should be given to 1.5 to 1.7 of Approved Document F to assist in the design of the ventilation system and to ensure the self-generated noise levels from the MEV extract fans to not exceed the specified criteria.

5. External Noise Level Assessment

5.1 External Noise Level Criteria

The following table outlines the external acoustic design criteria requested by the LPA that is used in the following assessment: this criterion is in line with the upper limit of BS8233:2014.

Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
External Amenity Areas	55 dB $L_{Aeq,16hr}$	--

Table 10 – External Acoustic Design Criteria

5.2 External Noise Level Assessment

The following figure shows the daytime $L_{Aeq,1hr}$ sound levels predicted within the proposed external amenity areas. It should be recognised that the $L_{Aeq,1hr}$ sound levels recorded at MP1, MP2 and MP3 during the daytime are only 1 dB greater than the $L_{Aeq,16hr}$ ambient sound levels.

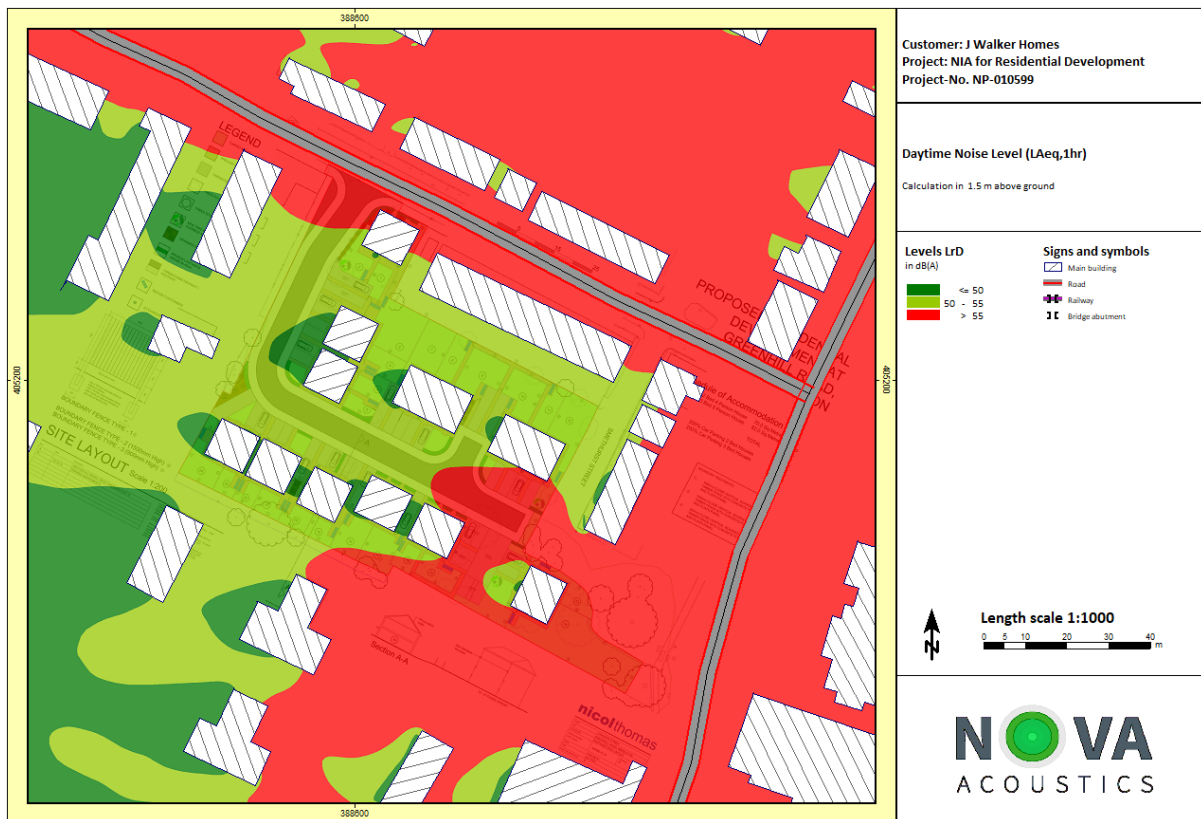


Figure 9 – $L_{Aeq,1hr}$ External Amenity Area Ambient Sound Map

As can be seen in the figure above, the ambient noise levels across the majority of the proposed development do not exceed the LPA criteria of 55 dB, however, the criterion is exceeded with plots 13, 14 & 15.

5.3 Recommendations & Mitigation Measures

Section 4.3 outlined an indicative BS4142 noise impact assessment and subsequent good acoustic design strategy. As part of that strategy, it is recommended to erect a 1.8m tall acoustic screen on the embankment between the site and brewery.

In addition to the above, the following hierarchy of mitigation plan should be followed:

1. Engineering – reduction of the noise generated at source by redesign, relocation or containment.

This is not deemed feasible as the concerning noise sources are transport based and out of the client's control.

2. Design and layout – maximise the distance between noise source and receptor, using existing topography or existing structures or purpose-built barriers to screen the proposed development site from significant sources of noise.

Reorientation of the external amenity area for plots 13 and 14 was considered, however, this is not feasible at this stage of the development.

Acoustic fencing has been modelled around the external amenity areas of plots 13 to 15 up to heights of 2.4m, however, only a marginal reduction in external noise levels were predicted for heights above 1.8m. As such, it is advised that a 2m tall earth bund with a 1.8m tall acoustic fence on top is erected around the garden of plots 13 and 14, and further fencing is erected around plot No. 15; the locations can be found in Appendix C. The fencing should be of close-board construction, have a minimum surface mass of 15 kg/m² and not contain any holes or gaps.

The above mitigation measures result in a predicted noise level of 56 dBA in the centre of the external amenity areas for plots 13 and 14, and 55 dBA in plot 15. The 1 dB exceedance predicted in plot 13 and 14 is thought to be negligible given the $L_{Aeq,1hr}$ sound levels used in the assessment are 1 dB greater than the measured $L_{Aeq,16hr}$.

6. Conclusion and Action Plan

The proposed development has been assessed against the acoustic design criteria and a sound insulation scheme has been provided to ensure the criteria has been achieved.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. The proposed glazing and background ventilation system, or a suitable alternative, should be installed as shown in Sections 3 & 4.
2. For facades heightened in red in Section 4, an alternate ventilation strategy is required that is capable of a higher rate of ventilation. A mechanical extract ventilation system should be installed to provide 'Whole Dwelling Ventilation' in accordance with Approved Document F. It is understood that continuous MEV extract fans installed in accordance with the specified trickle ventilators to allow the ingress of fresh air will be adequate. The ventilation system should be designed by an appropriately qualified person to ascertain compliance with the relevant Building Regulations. Special consideration should be given to 1.5 to 1.7 of Approved Document F to assist in the design of the ventilation system and to ensure the self-generated noise levels from the MEV extract fans to not exceed the specified criteria.
3. A TM59 assessment should be undertaken for those plots highlighted in amber in Section 4. Alternatively, a mechanical extract ventilation system should be installed as per point No. 2 above.
4. The good acoustic design strategy outlined in Section 4.3 & 5.3 should be adhered to.
5. Considering the outcome of the BS4142 assessment, openable windows facing the brewery are thought to be appropriate, however, it is at the LPAs discretion as to whether the low likelihood of adverse impact poses enough of a risk to warrant forced closed windows. If forced closed windows are implemented, it is up to the LPAs description as to whether this provides a suitable living condition. If windows are forced closed, an alternate ventilation strategy will be required that is capable of a higher rate of ventilation. A mechanical extract ventilation system should be installed to provide 'Whole Dwelling Ventilation' in accordance with Approved Document F.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Background Sound	Underlying level of sound over a period, T , which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T , has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for $N\%$ of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10 \log_{10}(p/p_0)^2$. Where: p is the root-mean-square sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy, and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 180, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

Paragraph 191 states:

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:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes, and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 191 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy 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.

To achieve this vision the Statement identifies the following three aims:

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:
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

This is further expanded using the updated “Noise Exposure Hierarchy Table” which includes an additional level of impact referred to as the ‘No Observed Adverse Effect Level’ (‘NOAEL’). It is stated that at this level: *“noise can be heard, but does not cause any change in behaviour, attitude or other physiological response”*. In addition, noise at this level *“can slightly affect the acoustic character of the area but not such that there is a change in the quality of life”*.

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 ‘Guidance on Sound insulation and noise reduction for buildings’

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, ‘WHO Guidelines on Community Noise, 1999’. The Guidelines on Community Noise (1999) document defines community noise to include noise from “industries” and “construction”. The desirable criteria levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below.

BS8233:2014 Internal Ambient Noise Level Criteria			
Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{AFmax}^*

Table 11 – BS8233:2014 Internal Ambient Noise Level Criteria

**ProPG:2017 states that's good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 time a night within noise sensitive rooms such as bedrooms. However, where it is not reasonably practicable to achieve the guideline then the judgment of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number distribution, predictability, and regularity of noise events.*

It is noted, however, that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the ‘LOAEL’ as defined in the NPSE in Appendix B.

B.4 – Approved Document O: Overheating (2021)

Approved Document O states the following in relation to noise:

1. 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).
2. 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).
3. Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020).B.6 - Acoustics Ventilation and Overheating – Residential Design Guide 2020

B.5 – Acoustics Ventilation and Overheating – Residential Design Guide 2020

It is suggested that the desirable internal noise criteria within BS8233:2014 should be achieved considering adequate ventilation as defined by Building Regulations 'Approved Document F' ('ADF') whole dwelling ventilation. However, for a whole dwelling ventilation system such as MVHR it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.

The 'Institute of Acoustics' ('IOA') and the 'Association of Noise Consultant's' ('ANC') have published 'The AVO Guide: 2020' document 2020. It provides guidance for those acousticians involved in the design of buildings to prevent noise ingress to and achieve reasonable internal levels. This provides valuable guidance on ventilation and overheating in support of the "Good Acoustic Design" principle advocated by ProPG. Along with guidance showing an acoustic assessment during the overheating condition, the AVO Guide (2020) provides a framework that has a two-level assessment procedure to estimate the potential impact on occupants:

Level 1 Risk Assessment

AVO 'Level 1' risk assessment criteria guide based on external free field ambient noise levels for dwellings relying on purge ventilation (e.g., opening windows) to prevent summertime overheating. AVO Guide Table 3-2 detailed in the figure below. To assess the possibility of overheating it is reasonable to relax the BS 8233:2014 internal ambient noise levels from opening a window by 5 decibels (5 dB). Also, it is assumed that a partially open window will provide a sound reduction of 13 dB. Therefore, to achieve internal noise levels in line with BS 8233:2014 the façade external noise levels should fall inside the levels shown in Table 3-2.

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
LAeq,T ^[Note 3] during 07:00 - 23:00 LAeq,8hr during 23:00 - 07:00 High 65 dB 55 dB Medium 60 dB 50 dB Low 55 dB 50 dB Negligible 50 dB 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Table 3-2 of AVO Guide (2020)

Figure 10 – AVO Guide Level 1 Risk Category

The AVO Guide (2020) seeks to determine the level of risk associated with overheating in a new residential development based on the existing noise climate. The AVO risk categories are detailed in the table below with clearer categorisation.

AVO Guide (2020) Level 1 Risk Assessment			
Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Risk Category	Mitigation
≥ 63 dB $L_{Aeq,16hour}$	≥ 55 dB $L_{Aeq,8hour}$	High Risk	Level 2 assessment recommended. Windows which are unopenable on grounds of noise will inevitably create issues for the overheating strategy.
57 – 62 dB $L_{Aeq,16hour}$	52 – 54 dB $L_{Aeq,8hour}$	Medium Risk	Level 2 assessment optional to give more confidence regarding the suitability of internal noise conditions.
54 – 56 dB $L_{Aeq,16hour}$	49 – 51 dB $L_{Aeq,8hour}$	Low Risk	
≤ 53 dB $L_{Aeq,16hour}$	≤ 48 dB $L_{Aeq,8hour}$	Negligible Risk	None required – openable windows suitable for ventilation

Table 12 – AVO Guide (2020) Level 1 Risk Assessment

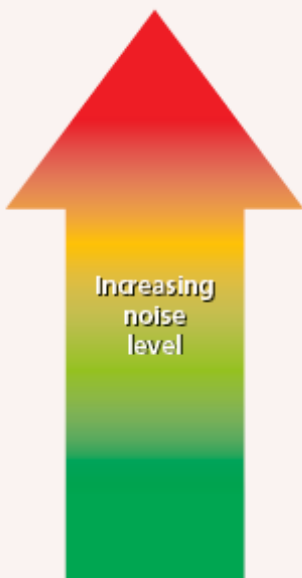
Level 2 Risk Assessment:

A 'Level 2' assessment of noise is recommended where a dwelling using purge ventilation (e.g., open windows) reaches Level 1 'High Risk' or 'Medium Risk'. The Level 2 assessment guidance comments that where internal ambient noise levels are >50 dB $L_{Aeq,16hr}$ (day) or >42 dB $L_{Aeq,8hr}$ (night) then the outcome might be that the noise causes a material change in behaviour, e.g., having to keep windows closed for the majority of the time, or there is the potential for sleep disturbance.

To conduct a Level 2 assessment, the following minimum information is required:

- Statement of the overheating criteria being applied.
- Description of the provisions for meeting the stated overheating criteria. This should include, where relevant, the area of façade opening.
- Details of the likely internal ambient noise levels whilst using provisions for mitigating overheating, and the method used to predict these.
- Estimation of how frequently and for what duration such provisions are required to mitigate overheating.
- Consideration of the effect of individual noise events.
- Assessment of the adverse effect on occupants.

The figure below outlines the AVO Guide (2020) guidance for a Level 2 assessment of noise from transport sources relating to the Overheating Condition.

Internal ambient noise level ^[Note 2]			Examples of Outcomes ^[Note 5]	
$L_{Aeq,T}$ ^[Note 3] during 07:00 – 23:00 ^[Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 ^[Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{A,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. 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.
 Increasing noise level			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. ^[Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{A,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response ^[Note 9] . Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Table 3-3 of AVO Guide (2020)

Figure 11 – AVO Guide Level 2 Internal Ambient Noise Levels

B.7 – British Standard BS4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{A,r,T}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where “the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied.”

d) Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a ‘typical’ background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- “Typically, the greater this difference, the greater the magnitude of the impact.”
- “A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”
- “A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”
- “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 negligible impact, depending on the context.”

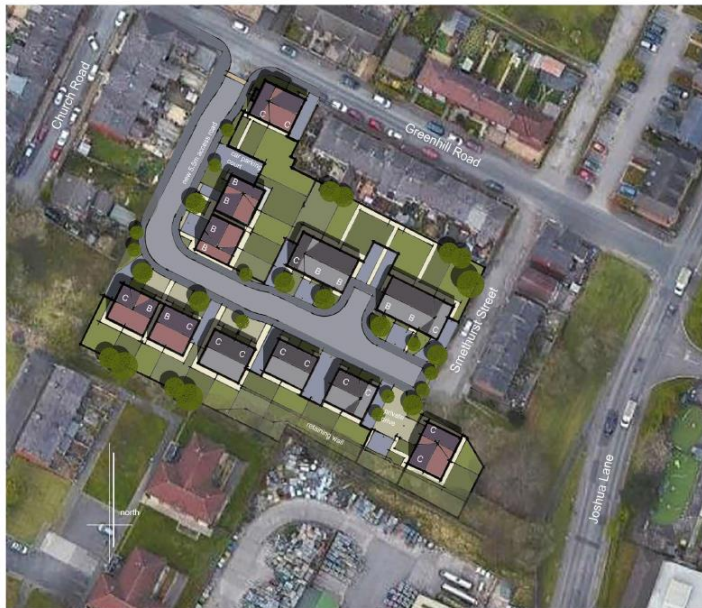
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix C – Location Plans

Proposed residential development at Greenhill Road Middleton



schedule of accommodation

ref	accommodation	area sqm	no	total sqm
B	2 bedroom 4 person house	70.0	10	700
C	3 bedroom 5 person house	82.0	14	1148
total no. dwellings			24	1848
car parking		generally 200%		
		200%		

proposed site layout scale 1:500

location plan

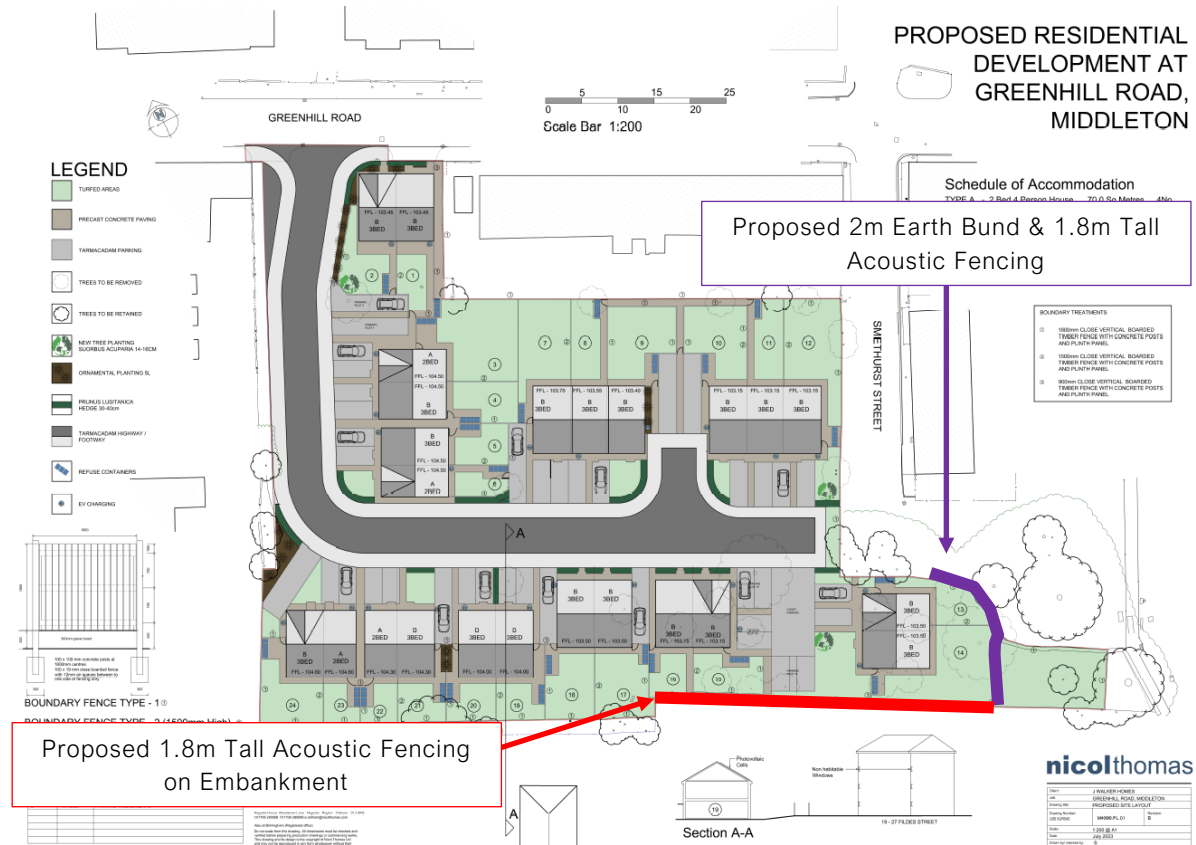


nicol thomas

Revision	Date	Details

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Client	Walker Homes
Job	Greenhill Road Middleton
Drawing No.	M4996 sk 03
Scale	1:500 at A2
Date	July 2022
Drawn by	GRF



Appendix D – Environmental Survey

D.1 – Time History Noise Data

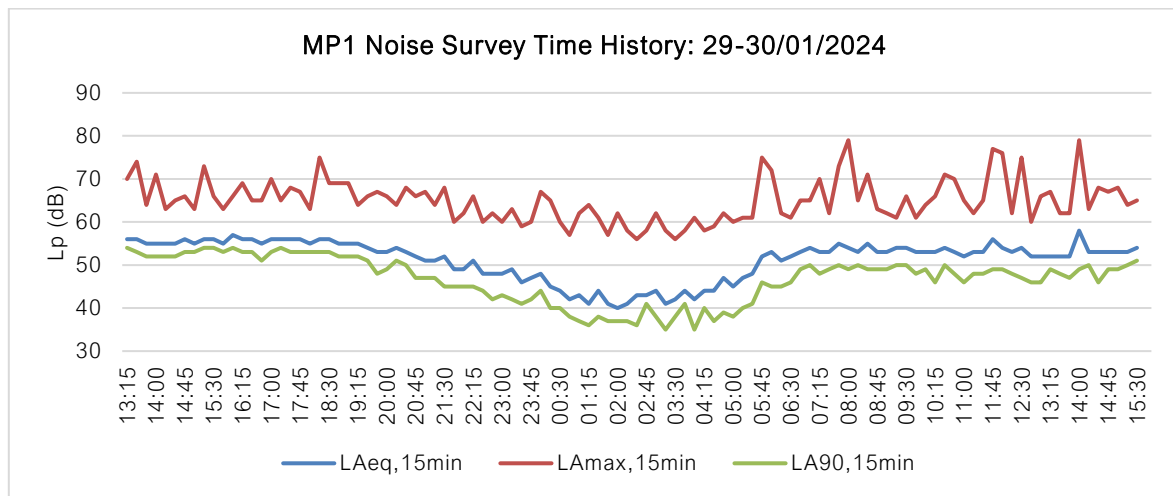


Figure 12 – MP1 Noise Survey Time History

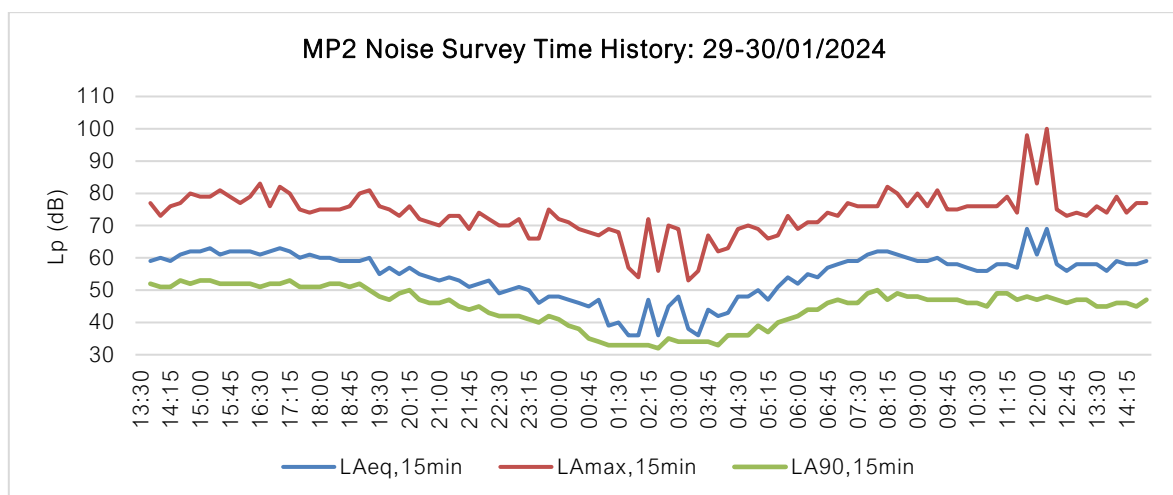


Figure 13 – MP2 Noise Survey Time History

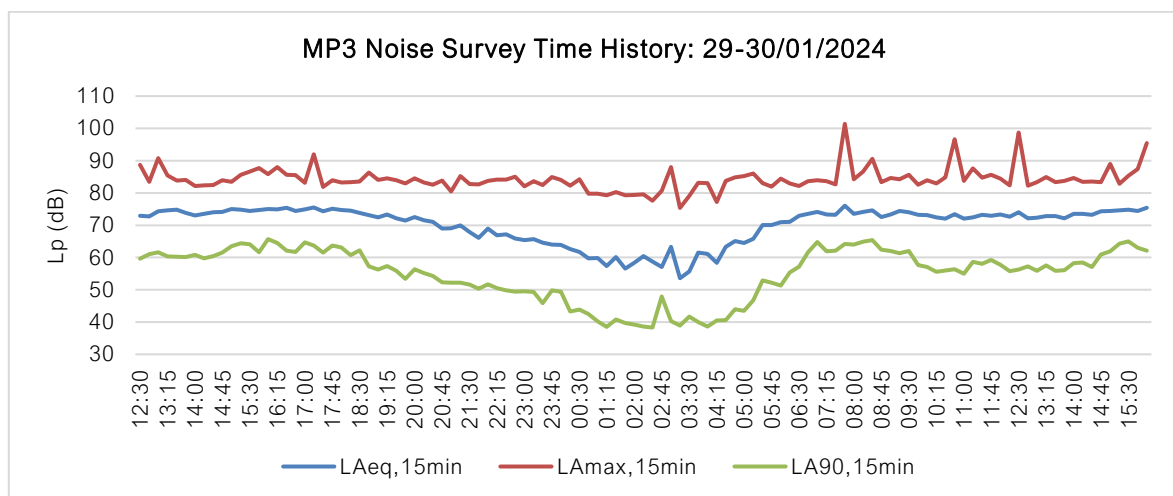


Figure 14 – MP3 Noise Survey Time History

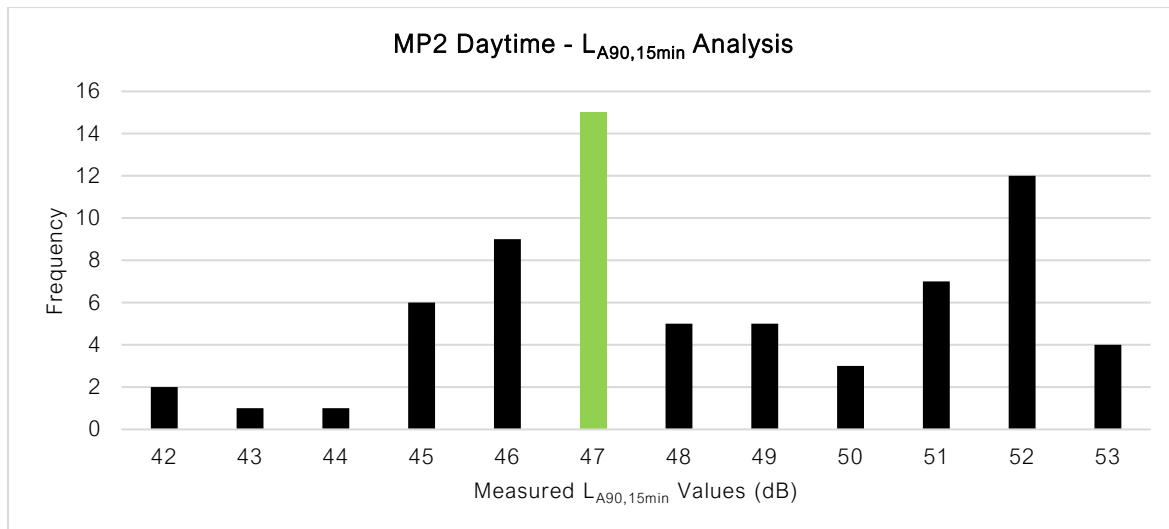


Figure 15 – MP2 LA90,15min Histogram

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC250 Class 1 Sound Level Meter	T252917	≤0.1
CESVA CB011 Class 1 Calibrator	T251945	
CESVA SC250 Class 1 Sound Level Meter	T252860	≤0.3
CESVA CB011 Class 1 Calibrator	T251945	
CESVA SC250 Class 1 Sound Level Meter	T252915	≤0.1
CESVA CB011 Class 1 Calibrator	T251945	
Svantek SV307 Class 1 Sound Level Meter	87871	≤0.1
Svantek SV33B Class 1 Calibrator	125695	

Table 13 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.3 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of

the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Chadderton (Approx. 1.5km E of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
29/01/24: 00:00 – 23:59	7.6 – 11.0	0.0 – 2.8	SSE	0.0 – 2.6
30/01/24: 00:00 – 23:59	2.1 – 10.7	0.0 – 0.4	W	0.0 – 3.5

Table 14 – Weather Conditions

Appendix E – Noise Break-in Calculations

The façade sound reduction and predicted internal noise levels are calculated assuming the following:

- The calculation method for façade sound reduction is in accordance with BS8233:2014 and BS EN 12354-3.
- The reverberation time is typically 0.5 and 0.3 seconds across the relevant frequency range for a furnished living room and bedrooms in the UK, respectively.
- Based on the technical drawings provided to NOVA Acoustics, window areas of 1.8m² and room volumes of 53.5m³ are used in the calculations for bedrooms as a worst-case scenario. For living rooms, the calculations are based on a window area of 4.0m² and room volume of 91.2m³ as a worst-case scenario.
- The acoustic performance of the façade elements is taken from the relevant manufacturers' technical information, or the sound reduction has been predicted using INSUL 9.0.
- The glazing and trickle ventilation specifications are as per Tables 4 & 5.
- For background trickle ventilation a total Equivalent Area of 5000mm² per habitable room has been used in the calculations, which equates to 2 No. trickle vents (2500mm² each).

It should be noted that assessment against the equivalent Noise Rating (NR) curves are included in the noise break calculations. Slight exceedances of the NR criteria are deemed acceptable if the single-figure values (as provided in BS8233) are achieved.

Living Room (Red Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	64	61	56	57	57	62	55	51
Glazing Noise Ingress	25	33	27	29	23	16	10	4
Ventilation Noise Ingress	23	17	17	20	21	19	15	8
Wall Noise Ingress	5	18	8	7	-3	1	-6	-10
Roof Noise Ingress								
Room Absorption Correction		2	2	2	1	1	1	0
Total Noise Ingress	32	39	33	35	30	25	20	13
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-3	-20	-15	-4	-3	-5	-6	-11

Bedroom (Red Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	64	61	56	57	57	62	55	51
Glazing Noise Ingress	27	36	30	32	26	19	13	7
Ventilation Noise Ingress	29	23	23	26	27	25	21	14
Wall Noise Ingress	4	18	8	7	-3	1	-6	-10
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	31	36	31	33	29	26	21	13
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-4	-23	-17	-6	-4	-4	-5	-11

Bedroom (Red Facades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	60	56	51	53	53	58	52	44
Glazing Noise Ingress	23	31	25	28	22	15	10	0
Ventilation Noise Ingress	25		18	22	23	21	18	7
Wall Noise Ingress	0	13	3	3	-7	-3	-9	-17
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	27	31	26	29	25	22	18	6
NR25	30	55	43	35	28	25	21	19
Exceedance of Criteria	-3	-24	-17	-6	-3	-3	-3	-13

Bedroom (Red Facades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Lmax Spectrum	70	66	61	63	63	68	62	54
Glazing Noise Ingress	33	41	35	38	32	25	20	10
Ventilation Noise Ingress	35		28	32	33	31	28	17
Wall Noise Ingress	10	23	13	13	3	7	1	-7
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	37	41	36	39	35	32	28	16
NR40	45	67	56	49	43	40	37	34
Exceedance of Criteria	-8	-26	-20	-10	-8	-8	-9	-18

Living Room (Amber Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	59	56	51	52	52	57	50	46
Glazing Noise Ingress	22	29	22	27	19	14	5	7
Ventilation Noise Ingress	25		14	13	15	24	12	6
Wall Noise Ingress	0	13	3	2	-8	-4	-11	-15
Roof Noise Ingress								
Room Absorption Correction		2	2	2	1	1	1	0
Total Noise Ingress	31	35	28	32	25	29	17	13
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-4	-24	-20	-7	-8	-1	-9	-11

Bedroom (Amber Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	59	56	51	52	52	57	50	46
Glazing Noise Ingress	24	32	25	30	22	17	8	10
Ventilation Noise Ingress	31		20	19	21	30	18	12
Wall Noise Ingress	-1	13	3	2	-8	-4	-11	-15
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	31	32	26	30	24	30	18	12
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-4	-27	-22	-9	-9	0	-8	-12

Bedroom (Amber Facades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	53	49	44	46	46	51	45	37
Glazing Noise Ingress	18	25	18	24	16	11	3	1
Ventilation Noise Ingress	25		13	13	15	24	13	3
Wall Noise Ingress	-7	6	-4	-4	-14	-10	-16	-24
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	25	25	19	24	18	24	13	3
NR25	30	55	43	35	28	25	21	19
Exceedance of Criteria	-5	-30	-24	-11	-10	-1	-8	-16

Bedroom (Amber Facades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Lmax Spectrum	62	58	53	55	55	60	54	46
Glazing Noise Ingress	27	34	27	33	25	20	12	10
Ventilation Noise Ingress	34		22	22	24	33	22	12
Wall Noise Ingress	2	15	5	5	-5	-1	-7	-15
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	34	34	28	33	27	33	22	12
NR40	45	67	56	49	43	40	37	34
Exceedance of Criteria	-11	-33	-28	-16	-16	-7	-15	-22

Living Room (Green Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	51	48	43	44	44	49	42	38
Glazing Noise Ingress	14	21	14	19	11	6	-3	-1
Ventilation Noise Ingress	17		6	5	7	16	4	-2
Wall Noise Ingress	-8	5	-5	-6	-16	-12	-19	-23
Roof Noise Ingress								
Room Absorption Correction		2	2	2	1	1	1	0
Total Noise Ingress	23	27	20	24	17	21	9	5
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-12	-32	-28	-15	-16	-9	-17	-19

Bedroom (Green Facades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	51	48	43	44	44	49	42	38
Glazing Noise Ingress	16	24	17	22	14	9	0	2
Ventilation Noise Ingress	23		12	11	13	22	10	4
Wall Noise Ingress	-9	5	-5	-6	-16	-12	-19	-23
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	23	24	18	22	16	22	10	4
NR30	35	59	48	39	33	30	26	24
Exceedance of Criteria	-12	-35	-30	-17	-17	-8	-16	-20

Bedroom (Green Facades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Leq,T Spectrum	45	41	36	38	38	43	37	29
Glazing Noise Ingress	10	17	10	16	8	3	-5	-7
Ventilation Noise Ingress	17		5	5	7	16	5	-5
Wall Noise Ingress	-15	-2	-12	-12	-22	-18	-24	-32
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	17	17	11	16	10	16	5	-5
NR25	30	55	43	35	28	25	21	19
Exceedance of Criteria	-13	-38	-32	-19	-18	-9	-16	-24

Bedroom (Green Facades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k
Corrected Lmax Spectrum	57	53	48	50	50	55	49	41
Glazing Noise Ingress	22	29	22	28	20	15	7	5
Ventilation Noise Ingress	29		17	17	19	28	17	7
Wall Noise Ingress	-3	10	0	0	-10	-6	-12	-20
Roof Noise Ingress								
Room Absorption Correction		-2	-3	-3	-3	-3	-4	-5
Total Noise Ingress	29	29	23	28	22	28	17	7
NR40	45	67	56	49	43	40	37	34
Exceedance of Criteria	-16	-38	-33	-21	-21	-12	-20	-27

Appendix F – Noise Modelling Particulars

The SoundPlan 9.0 noise model has been setup with the following inputs and assumptions:

- To accurately model the land surrounding the development the topographical data has been taken from the EAs 'National LIDAR Programme' on the DEFRA Data Services Platform.
- For the purpose of the assessment, the ground between the source and receiver is considered to consist primarily of acoustically 'soft' surfaces.
- The sound map grid height has been set to 1.5m, however, the noise levels used in the assessment will be taken from the most exposed point on each NSR façade.
- All buildings and any intervening objects have been modelled according to the technical drawings provided by the applicant, and those provided by the LIDAR data.
- The noise levels presented in Table 2 have been used to calibrate the noise model.



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