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New Residential Development, Land North of Blackmoorfoot Road, Crossland Moor, Huddersfield

Noise Assessment Report

For:
Redrow Homes Limited

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1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) has been commissioned by Redrow Homes Limited to undertake a noise survey and perform a noise assessment in relation to the proposed residential development at the Land North of Blackmoorfoot Road, Crossland Moor, Huddersfield (hereafter referred to as 'the site').

Proposals comprise the construction of 87 no. new build houses on the site of an existing caravan sales forecourt (to be demolished).

This report details:

- The methodology and results of the noise survey undertaken at the site
- The relevant noise and acoustics guidance and standards applicable to the site
- Recommendations for suitable facade, glazing, and ventilation sound insulation performance requirements

This report should be suitable for submission to Kirklees Council (KC) in relation to the planning application for the site.

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

This report is necessarily technical in nature, as such a glossary of the acoustic terms used in the main body of the text is contained in Appendix A.

1.2 Site Description

The Site is accessed from Blackmoorfoot Road which bounds The Site along the south east, with the nearest proposed new dwelling approximately 8m from the kerb of Blackmoorfoot Road. To the north and north east of the site are existing residential premises. With regard to industrial and commercial premises, there is an existing quarry / stone mill to the south east of the site on the opposite side of Blackmoorfoot Road and an existing fireworks packaging and distribution facility to the north west of the site.

A plan showing the site in relation to its surroundings is provided in Figure 1.1.

Figure 1.1: Location of Proposed Development

2 Policy Context and Assessment Guidance

2.1 Local Authority Criteria

KC's criteria relating to noise are set out within the West Yorkshire Planning Consultation Guidance document for Noise and Vibration (PCGNV)[1].

The PCGNV requires, with regard to the control of anonymous noise sources (e.g. road traffic), that internal ambient noise level criteria set out within BS8233 should be achieved within the habitable spaces. The PCGNV also requires that maximum noise events do not exceed 45 dB L_{AFmax} within bedrooms during the night time period (23:00-07:00).

The standards which are referred to in the above and other relevant guidance are discussed in the following sections.

2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[2] sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 170 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

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

Paragraph 180 advises that:

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

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

2.3 Noise Policy Statement for England

The Noise Policy Statement for England[3] (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

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

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

[1] West Yorkshire Planning Consultation Guidance – Noise and Vibration (May 2016)
[2] National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2019)
[3] Noise Policy Statement for England. Government Department for Environment, Food and Rural Affairs (2010)

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

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

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

2.4 Planning Practice Guidance on Noise

Planning Practice Guidance[4] (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

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

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

'...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation'.

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

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

With regard to the mitigation of extant environmental noise at a proposed residential development, the guidance states that:

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

[4] Planning Practice Guidance on Noise: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/

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

2.5 Noise Assessment Guidance

British Standard 8233

BS8233[5] provides recommendations for the control of noise both in and around buildings and suggests upper guideline values appropriate to their function. For dwellings, the main considerations are:

- Bedrooms - the effect of noise upon sleep
- Other habitable rooms - the effect of noise upon resting, listening and communicating

It is desirable that the internal ambient noise level does not exceed the guideline values as replicated in Table 2.1.

Table 2.1: Indoor Ambient Noise Levels for Dwellings - BS8233:2014

Activity	Location	07:00 – 23:00	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 $L_{Aeq,8hour}$

BS8233 states:

'If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.'

For traditional external areas that are used for amenity space, such as gardens, BS8233 states that:

'.....it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

ProPG Planning and Noise: New Residential Development

'ProPG Planning and Noise: New Residential Development' (ProPG)6 recommends compliance with indoor noise level targets in residential dwellings based on the guidance contained in BS8233 (see Table 2.1).

ProPG states within note 7 to the table recommending compliance with BS8233:

[5] British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. BSI (2014)
[6] ProPG Planning and Noise: New Residential Development (ProPG), 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

'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. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable".....Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally'.

Additionally, with regard to individual noise events, ProPG states:

'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_{AFmax} , depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 times a night.'

However, ProPG also advises that:

'It normally requires noise levels higher than 45 dB L_{AFmax} before significant adverse effects such as behavioural awakenings, difficulty getting to sleep, premature awakening or difficulty getting back to sleep generally occur (and the latest field research on rail and aircraft noise suggest that it requires internal L_{AFmax} noise levels of around 65 dB before noise induced awakenings become distinguishable from spontaneous awakenings).'

ProPG acknowledges that the internal target noise levels may only be practically achieved with windows closed in certain areas (e.g. in urban areas or sites adjacent to transportation noise sources) and states that:

'In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide 'whole dwelling ventilation' in accordance with Building Regulations Approved Document F (e.g. trickle ventilators in the open position).

ProPG also states that:

'It should also be noted that the internal noise level guidelines are generally not applicable under 'purge ventilation' conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).'

Building Regulations - Approved Document F

Building Regulations Approved Document F 'Ventilation' (2010 version incorporating 2013 amendments)[7] states:

'For mainly naturally ventilated buildings, it is common to use a combination of ventilators (e. g. for dwellings it is common to use intermittent extract fans for extract ventilation, trickle ventilators for whole dwelling ventilation and windows for purge ventilation).

...Purge ventilation throughout the building to aid the removal of high concentrations pollutants and water vapour released from occasional activities such as painting and decorating and or accidental releases such as smoke and burnt food or spillage of water. Purge ventilation is intermittent i.e. required only when such activities occur. Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under Building Regulations.'

[7] The Building Regulations 2010 Approved Document F 'Ventilation' (2013)

It is therefore evident that, whilst ventilation may also provide a means to aid thermal comfort, this is not controlled under Building Regulations.

British Standard 4142

BS4142[8] presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors.

A BS4142 assessment involves the determination of a rating noise level, $L_{Ar,Tr}$ (dB), for the operation of plant. The assessment may include character corrections for tonality and impulsiveness, if these acoustic features are present, and comparing this rating level to the background noise level, L_{A90} (dB) at the nearest sensitive receptors.

BS4142 recommends identification of a 'typical' background sound level, based on the statistical distribution of the measured L_{A90} sound levels over the assessment periods. Where new plant associated with the scheme have the potential to operate 24 hours per day, separate noise limits apply during daytime and night time hours. As such, the 'typical' background sound levels have been determined for the daytime (07:00 hrs – 23:00 hrs) and night time (23:00 hrs – 07:00 hrs) periods.

Section 11 of BS4142 provides guidance on assessment the impact of the operational plant, based on the arithmetic difference between the rating level and background noise level. This guidance is set out below:

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

BS4142 requires separate analysis for day and night time periods, evaluating the Rating level over an appropriate reference time interval (T_r) of:

- 1 hr during the day (between 07:00 - 23:00 hrs)
- 15 min during the night (between 23:00 - 07:00 hrs)

[8] British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, BSI (2019)

3 Noise Survey and Results

3.1 Overview

In order to quantify the external noise affecting the proposed development site noise monitoring was carried out between Thursday 20th and Friday 21st May 2021.

The adopted noise monitoring positions (shown in Appendix B) were as follows:

- Position 1 – 1m from the facade of the existing building on the south corner of the site overlooking Blackmoorfoot Road. Microphone was positioned approximately 4m above the ground. Measurements at this location are considered to be facade levels.
- Position 2 – South corner of the site adjacent to Blackmoorfoot Road.
- Position 3 – South east edge of the site overlooking Blackmoorfoot Road.
- Position 4 – East corner of the site at the junction between Blackmoorfoot Road and Crossland Hill Road.
- Position 5 – Northwest corner of the site adjacent to the entrance of the fireworks packaging site.

All measurements were undertaken using two Bruel & Kjaer 2250 Type 1 integrating sound level meters. Each meter was connected to a windshield covered microphone.

The microphone at measurement positions 1-5 was positioned 1.5m above the ground and at least 10 m from the nearest significant vertical reflective surface. As such, measurements at these positions are considered to be free-field.

The measurement system calibration was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted for all meters.

Measurements consisted of A–weighted broadband parameters including L_{Aeq}, L_{A10}, L_{A90} and L_{AFmax} together with linear third octave band data.

The noted weather conditions during the survey were dry and cloudy. Wind speeds were noted to be low. These weather conditions were therefore considered appropriate for noise monitoring.

3.2 Noise Monitoring Results

Table 3.1 presents a summary of the noise data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1: Summary of Noise Measurement Data – Noise Monitoring Positions

Position	Start Date / Time	Duration, T (hh:mm)	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)[1]	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Notes
1	20/05/2021 08:57	14:02	61	86	64	52	Noise climate at the site was dominated by road traffic along Blackmoorfoot Road.
	20/05/2021 23:00	08:00	54	76	56	46	
	21/05/2021 07:00	03:43	61	82	65	52	
2	20/05/2021 09:04	00:15	67	81	72	51	
	20/05/2021 10:15	00:15	65	81	70	51	
	20/05/2021 11:25	00:16	66	83	71	51	
	21/05/2021 07:59	00:17	69	80	74	54	
	21/05/2021 09:39	00:15	67	81	71	54	
3	20/05/2021 10:37	00:21	57	79	59	48	
	20/05/2021 11:44	00:17	58	67	61	55	
	21/05/2021 08:19	00:16	59	70	62	55	
	21/05/2021 09:58	00:17	55	67	59	51	
4	20/05/2021 09:34	00:15	62	87	66	51	
	20/05/2021 11:05	00:16	61	80	65	51	
	20/05/2021 12:08	00:15	62	77	66	54	
	21/05/2021 08:38	00:15	62	73	65	56	
	21/05/2021 10:19	00:15	59	72	63	50	
5	20/05/2021 09:57	00:15	48	62	50	45	
	21/05/2021 08:58	00:34	49	66	51	45	

Note 1 – The highest L_{AFmax} event during the measurement.

3.3 Coronavirus Travel Restrictions

Data produced by the Department for Transport (DFT)[9] , show that during the time of the survey overall traffic volumes were circa 93% of typical flows. Using the methodology in the CRTN, a 7 % reduction in traffic volumes equates to less than a 1 dB reduction in noise levels – therefore the noise levels during the survey are considered to represent 'normal' traffic flows.

3.4 Industrial Noise Measurements

The Johnsons Wellfield Ltd quarry and stone milling site (JL site) is located on the opposite side of Blackmoorfoot Road to the development site. Noise emanating from the JL site was not noted to be a significant influence on the noise climate at the site over and above the prevailing road traffic noise.

Notwithstanding this, measurements were undertaken to identify the key noise sources at the JL site and the associated noise levels of these activities. Noise emanating from the stone mill workshop, highlighted in blue in Figure 3.1 was the only noise source associated with the JL site that was noted by the site survey engineer and was noted to be noticeable only during periods of low traffic flows along Blackmoorfoot Road. Low traffic flows along this stretch of road are infrequent during the daytime. Other noise sources, which include deliveries to the JL site, observed to take place along Thewlis Lane, benefited from significant distance attenuation to the site and screening attenuation from the presence of the JL site buildings and were not noted to significantly influence the noise climate at the site.

[9] https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic

Figure 3.1: Location of Proposed Development

The results of the specific noise source measurements are presented in Table 3.2. During all measurements presented in Table 3.2, there were no vehicle passes along Blackmoorfoot Road however distant road traffic noise from the surrounding road network was significant.

Table 3.2: Summary of Noise Measurement Data – Stone Sawing

Measurement reference and brief description of conditions	Measured Sound Pressure Level, L_p (dB), at octave band centre frequency (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
3a - 20/05/2021 10:41 (44s duration)	52	47	43	44	43	42	39	31	48
3b - 20/05/2021 11:47 (10s duration)	55	48	47	51	51	51	44	33	56
3c - 20/05/2021 11:47 (29s duration)	55	47	47	51	50	49	43	32	55

The site survey engineer noted that the stone sawing activities were faintly audible at the measurement position. However, that during periods of traffic flows noise from these activities was insignificant relative to noise from vehicle passes.

4 Industrial Noise Assessment

4.1 Overview

Based on the results of the noise survey, an assessment of noise from the nearby JL site has been undertaken. The previously measured noise levels are detailed in Section 3.4.

The operating hours of the JL site are understood to be 07:30 – 17:00 hrs Monday to Friday and 07:30 – 12:00 hrs on Saturday.

4.2 Source Noise Levels

For a robust assessment, the source noise levels presented in Table 3.2 for measurement 3b are used as the specific noise levels emanating from the JL site. For the purposes of the assessment, it has been conservatively assumed that the stone sawing activities could take place continuously for a full one hour period.

4.3 Background Sound Levels

For the purposes of the assessment, the representative background noise levels from the measurements at Position 1 have been used, on the basis that noise from the JL site was not audible at this position, with the noise climate also influenced by similar noise sources otherwise (road traffic along Blackmoorfoot Road).

The representative background sound level at Position 1 has been determined based on the lowest of two statistical parameters of the 15-minute contiguous background sound level measurements, $L_{A90,15min}$; the mode, and the average. The results of this analysis indicate that the representative background sound level at the areas of the site overlooking Blackmoorfoot Road were 52 dB L_{A90} during the daytime.

4.4 BS4142 Assessment

Table 4.1 details the BS4142 calculation procedure based on the background and specific noise levels detailed above.

A +3 dB correction for intermittency has been allowed for, in line with the requirements for BS4142. This correction has been made on the basis that the noise source concerned is only noticeable only during low traffic flows, for which periods of low traffic flows are intermittent.

Table 4.1: BS4142 Assessment – Front Garden/Bedroom Window

Noise Parameter	Value	Comments
(A) Specific Noise Level	56 dB $L_{Aeq,T}$	Calculated operational noise level at receptor
(B) Acoustic Feature Correction(s)	+3 dB	Intermittency correction.
(C) Rating Level (A + B)	59 dB $L_{Ar,Tr}$	
(D) Background Noise Level	52 dB $L_{A90,T}$	As measured, see Section 4.3.
Excess of Rating Over Background Noise Level (D – E)	+7 dB(A)	BS4142 assessment of 'likely to be an indication of an adverse impact, depending on the context'

Contextual Analysis

The proposed development site is located approximately 8 m from Blackmoorfoot Road, a relatively busy road heading southwest out from Huddersfield. As such, the noise levels at the site are dominated by road traffic along Blackmoorfoot Road, with some influence from the wider road network.

The results of the BS4142 assessment indicate a +7 dB excess of the rating level over the existing background sound levels at the site depending on the location. This rating level is 2 dB below the prevailing ambient sound levels at the site from road traffic noise.

It is noted that all the proposed facades and gardens at the site which overlook Blackmoorfoot Road will experience noise levels from the prevailing road traffic which require noise mitigation. The measures for which are discussed in Section 5. As such, with the provision of these noise mitigation measures, the rating noise levels internally within the dwellings and the gardens will be equal to or below the BS8233 criteria, and thus resulting in a low impact.

5 Noise Mitigation Strategy

5.1 External Noise Levels

The noise survey comprised a mix of facade and free-field measurement positions. For ease of reference, the predicted external noise levels used to calculate the noise mitigation strategy specifications are shown in Figure 5.1 with reference to Table 5.1 in terms of free-field noise levels.

Table 5.1: Predicted External Noise Levels – Facades and Gardens

Zone / Facade Area (See Figure 5.1)	Predicted External Noise Level (dB)		
	Daytime (07:00-23:00) $L_{Aeq,16hour}$	Night time (23:00-07:00) $L_{Aeq,8hour}$	Night Max[A] L_{AFmax}
	58	51	70
	56	48	67
	52	45	64
	≤48	≤41	≤60

Figure 5.1: Predicted External Noise Levels

5.2 Facade Sound Insulation Specification

Minimum sound reduction requirements for the facade, glazing and ventilation have been determined on the assumption that the preferred ventilation strategy in this instance is for predominantly natural ventilation, with intermittent mechanical extract ventilation to the bathrooms/kitchen cooker hoods. Where an alternative ventilation strategy is employed, alternative sound reduction performances may be appropriate for glazing.

Calculations have incorporated the measured external noise level data on site and the noise ingress calculation methodology outlined in BS8233.

The following has been assumed for assessment purposes:

- Proposed new dwelling locations as per supplied site plan drawing[10]
- Provision of a single ≥5000 mm² trickle ventilator to each room. Where additional trickle ventilators are required, see Table 5.3.
- Typical room size and glazing provisions
  - Bedroom: 10 m² floor area, 25 m³ volume, 2.4m² glazing
  - Living/dining room: 20 m² floor area, 60 m³ volume, 4.8 m² glazing
- Room reverberation time of 0.5 seconds within a fully furnished habitable room
- Typical facade construction: minimum 200mm solid masonry; or, cavity blockwork wall formed of one layer of standard thickness brick either side of a minimum 50 mm cavity

In order to satisfy the internal noise criteria, it is necessary to incorporate mitigation measures in the form of appropriate glazing and background ventilation with the minimum specifications presented in Table 5.2 (with reference to the facade locations indicated in Figure 5.1).

Table 5.2: Ventilation / Glazing – Minimum Required Sound Reduction Performance

Facade Location (See Figure 5.1)	Room type	Trickle Vents[A], $D_{n,e,w} + C_{tr}$	Glazing, $R_w + C_{tr}$
Red[B]	Bedroom	32	27
	Living room	32	25
Yellow, Green	Bedroom	32	25
	Living room	-[B]	-[B]
Blue	Bedroom	-[B]	-[B]
	Living room	-[B]	-[B]
Note A – Sound insulation performance applies with the ventilator(s) in the open position Note B – Openable windows can be used			

Guidance on Facade Sound Insulation Performances

When selecting a glazing system to satisfy the requirements outlined in Table 5.2, it is important to ensure that the $R_w + C_{tr}$ value is achieved (rather than simply the R_w value). Published R_w values are generally higher than corresponding $R_w + C_{tr}$ values; therefore, incorrect selection could result in an overestimation of sound reduction performance which in turn could result in higher internal noise levels.

The opening and free area of the ventilation unit should be checked by a mechanical service engineer before designs are finalised. Should the equivalent open area be insufficient to meet the minimum requirements of Part F of the Building Regulations, it may be necessary to increase the number of units per habitable room. Where more than one trickle ventilator is required the performance of each individual ventilator needs to increase by the values given in Table 5.3.

[10] Drawing No. BRCM-16-02-01 Proposed Planning Layout (issued by Redrow Homes Limited, dated 4th June 2021)

Table 5.3: Minimum Performance Increases for the Presence of Additional Trickle Vents

Number of ventilators serving room	Increase in individual vent performance (dB)
1	0 (performances as indicated in Table 5.2)
2	3
3	5
4	6

For guidance, example configurations of glazing, ventilators and doors that are compatible with achieving the sound insulation performances are provided below:

Glazing:

- Sound insulation performance of up to 27 dB $R_w + C_{tr}$ can be achieved with the provision of a 6 mm/12 mm/4 mm double glazing configuration.
- Sound insulation performances of up to 25 dB $R_w + C_{tr}$ can be achieved with the provision of a 4 mm/12 mm/4 mm double glazing configuration.

Trickle ventilators:

- Sound insulation performances of up to 32 dB $D_{n,e,w} + C_{tr}$ can be achieved with a standard unattenuated trickle vent such as such as the Titon Trimvent Select Xtra S13

5.3 External Amenity

It is generally accepted that gardens should have an area within which noise levels are below the lower guideline value of ≤ 50 dB $L_{Aeq,T}$ to provide a suitable climate for external amenity areas. However, it is not necessarily essential for the entire garden to achieve this, nor is it often practical in environments with relatively high prevailing noise levels to do so. As such, it is normally considered reasonable to provide mitigation measures to protect external amenity where external noise levels would otherwise exceed 50-55 dB $L_{Aeq,T}$ on the basis that part of the garden will achieve these levels.

The predicted external ambient noise levels within the garden areas vary across the site, as indicated in the mark-up in Figure 5.1. Without the provision of any mitigation measures, the ambient noise levels within the gardens nearby Blackmoorfoot Road are predicted to be at or exceed the upper guideline value of 55 dB $L_{Aeq,T}$. As such, it is recommended that noise mitigation in the form of acoustic fencing is employed to reduce the noise levels within the gardens to below 55 dB $L_{Aeq,T}$ and in most areas to below 50 dB $L_{Aeq,T}$.

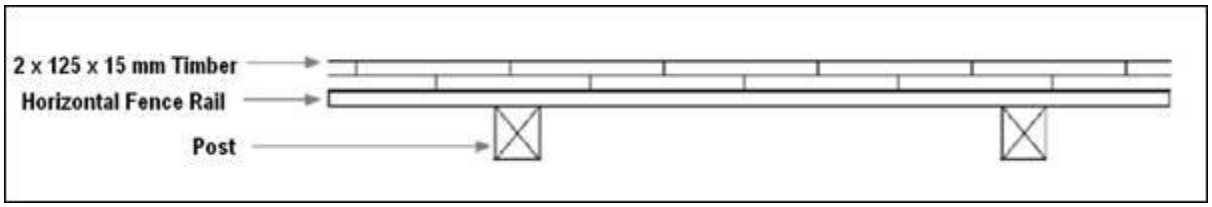
Screening to Gardens and External Amenity Areas

It is recommended that the gardens that are predicted to experience noise levels above 55 dB $L_{Aeq,T}$ are provided with a 2 m tall acoustic barrier at the boundaries that have direct line of sight to Blackmoorfoot Road. The recommended locations for these barriers are shown in Blue in Figure 5.3.

For an acoustic barrier of this type, the sound insulation of the barrier material must be sufficient such that the performance of the barrier is limited by the noise going over the barrier rather than direct transmission though the barrier itself. This is typically achieved where the mass per unit area is at least 13 kg/m². Provided that the necessary mass per unit area is satisfied, the barrier material may take any practical form (e.g. close-boarded timber or blockwork). Where timber is preferred, barriers should be designed so that gaps do not develop between abutting panels through warping or shrinkage (e.g. through the use of cover strips).

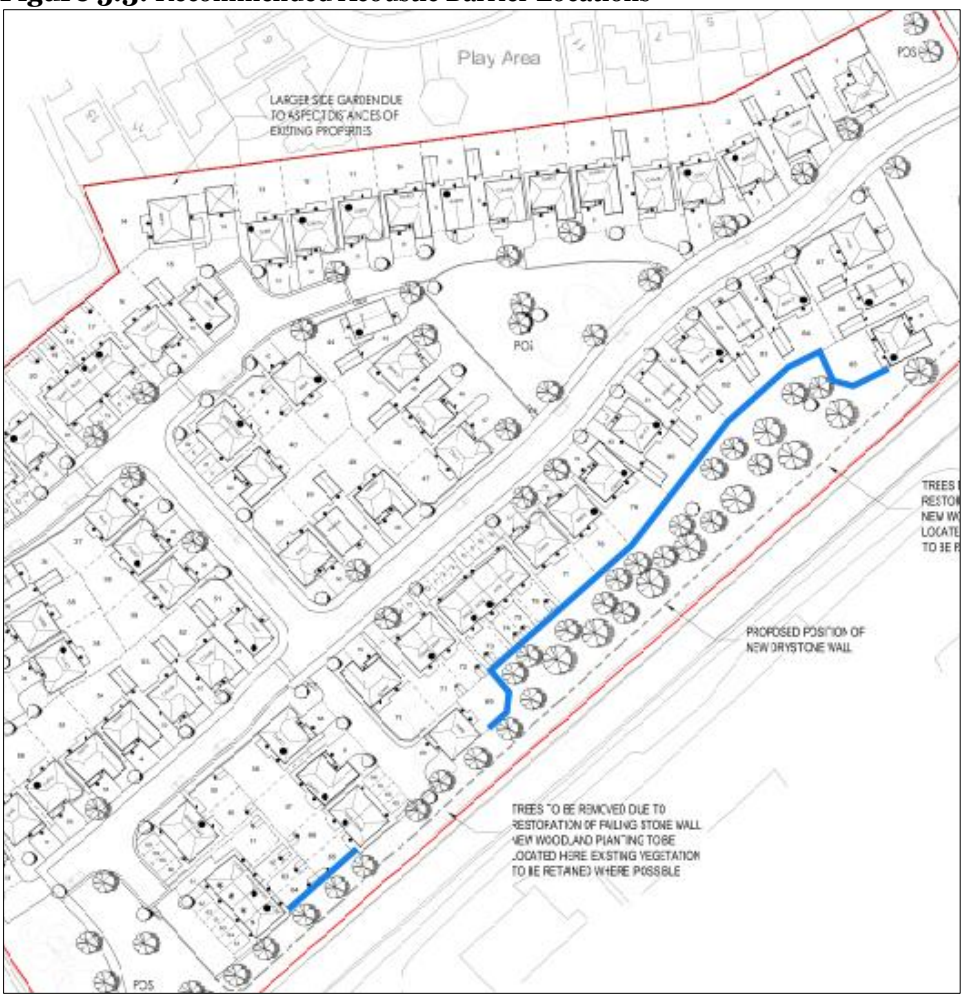
An appropriate construction for the acoustic fence is double-thickness solid timber as illustrated in Figure 5.2. The barrier should have no gaps or holes (cover strips should also be used to prevent gaps forming over time) and should be fully sealed at the ground (i.e. include a gravel board).

Figure 5.2: Recommended Acoustic Barrier Construction



The above treatment would normally be expected to reduce noise propagation, to areas adjacent to the fence, by circa 10 – 15 dB.

Figure 5.3: Recommended Acoustic Barrier Locations



A larger version of the above mark-up drawing is provided in Appendix C.

With the provision of the above treatment, it would be expected that all gardens would experience noise levels below the upper guideline value of ≤ 55 dB $L_{Aeq,T}$ and in most instances below the lower guideline value of ≤ 50 dB $L_{Aeq,T}$.

6 Summary and Conclusions

A noise survey and planning noise assessment have been undertaken in relation to the proposed new residential development at the Land North of Blackmoorfoot Road, Crossland Moor, Huddersfield.

Noise monitoring was carried out between Thursday 20th and Friday 21st May 2021 to determine the level of external noise affecting the proposed development site.

Section 5.2 provides a noise mitigation strategy to protect potential future residents at the site from the existing noise climate using BS8233 / ProPG.

Appendix A – Abbreviations and Definitions

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

$L_p = 20 \log10(p/p_o)$

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

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

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

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

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

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

Weighted Elemental Level Different ($D_{n,e,w}$)
Single number quantity which characterises the airborne sound insulation properties of a small building element (such as a vent) over a defined range of frequencies.

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

Spectrum adaptation term (C_{tr})

The C_{tr} spectrum adaptation term increases the significance airborne sound insulation at low frequencies.

Appendix B – Measurement Positions

Appendix C – Noise Mitigation Strategy

Location	Acoustic Requirements
	Bedrooms & Living Rooms: 25 dB $R_w + C_{tr}$ glazing (e.g. 4/12/4 double), 32 dB $D_{n,e,w} + C_{tr}$ trickle vents (5000mm²)
	Bedrooms: 25 dB $R_w + C_{tr}$ glazing (e.g. 4/12/4 double), 32 dB $D_{n,e,w} + C_{tr}$ trickle vents (5000mm²) Living Rooms: N/A - Suitable internal ambient noise levels can be achieved with partially open windows
	N/A - Suitable internal ambient noise levels can be achieved with partially open windows
	2m tall noise barrier (≥13kg/m²)