



AGILITY ACOUSTICS

Proposed Residential Development

Plot W, Kingsway Business Park, Rochdale

Environmental Noise Assessment

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Client: Barratt & David Wilson Homes North West
Author: David Sproston BSc MIOA MCIEH

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1. Introduction

- 1.1 Agility Acoustics Ltd has been commissioned by Barratt & David Wilson Homes North West to carry out a noise assessment in connection with a full planning application for a proposed residential development at Silverhill Farm, Lower Lane / Broad Lane, Rochdale. The site extends to approximately 2.3 hectares (ha), which includes Plot W of the Kingsway Business Park Development, as well as the Grade II Listed Silverhill Farmhouse and Barn. The site falls within the administrative boundary of Rochdale Borough Council (RBC).
- 1.2 This report has been requested to assesses the potential impact of road traffic noise and other nearby existing and approved non-residential land uses on the proposed development and determine the mitigation measures necessary to achieve the aims of relevant planning policy and guidance in order to secure a reasonable degree of residential amenity for future incoming residents.

Existing Site and Environs

- 1.3 The Kingsway Business Park Development was granted outline planning permission in August 2014 (RBC Planning ref: 14/00542/OUT), which was varied in 2016 (RBC Planning ref: 16/01085/VRCON) and 2018 (RBC Planning ref: 18/00943/VRCON). The approved Parameters Plan (Drawing ref. 2013-233/102 Rev A, as reproduced in Figure 1.1) identifies Plot W as suitable for *"small scale uses appropriate to the setting of the Listed Building"*. Pre-application advice from RBC has confirmed that residential development of the site would only be considered acceptable where it is *"in keeping with the established character of the area,"* is of high-quality design, and is compatible with the existing and ongoing development of Kingsway Business Park.
- 1.4 Plots J1 and Plot J2 of Kingsway Business Park adjoin the eastern and northern site boundaries (respectively). The approved Parameters Plan (Drawing ref. 2013-233/102 Rev A) identifies Plots J1 and J2 as suitable for B1/B2/B8 use.
- 1.5 Condition 23 of the outline planning permission, retained in subsequent permissions up to and including planning ref 18/00943/VRCON, provides objective limits for *'Noise emitted from any building within the site or from anything attached to any building or from plant and machinery used in connection with any building...'*. The Condition restricts cumulative operational free-field noise from non-residential land uses of the Kingsway Business Park outside the façade of pre-existing noise-sensitive properties. Within the curtilage of the proposed development site (Plot W), the noise level limits are 49dB $L_{Aeq,15min}$ in the day (07:00-23:00hrs) and 45 dB $L_{Aeq,5min}$ at night (23:00-07:00hrs).
- 1.6 Reserved matters approval (RBC Planning ref: 11/D53761) was granted by RBC in 2011 for the erection of Asda Rochdale Chilled Distribution Centre (CDC) (Use Class B8 and B2) on Plot J1. The CDC is now fully developed and operates 24hrs a day. A visitor and staff car park occupy land closest to the eastern site boundary of Plot W, whilst principle distribution operations are carried out further away from the site boundary and to the east of the car park, elevated behind a very tall (at least 5m in height) timber noise barrier. As such noise from HGVs, shunters and trailer refrigeration units are very well screened. Fixed plant and equipment are located in Energy Centre to the north-facing elevation of the CDC building which is inaudible within the curtilage of the Plot W due to acoustic screening provided by the CDC building and underlying noise climate from distant road traffic, predominantly from the M62, some 450m to the south-east of the site.
- 1.7 Full planning permission (RBC Planning ref: 21/00608/FUL) was granted by RBC in June 2021 for the development of Plot J2 to the north of the site for storage of operational vehicles (small delivery vans), including site levelling, drainage and resurfacing, formation of access, associated parking for 665 vans, 2.5m high acoustic and security fencing, retaining walls, guard hut, welfare building, substations, landscaping, lighting columns and all related engineering and infrastructure works. Development has not yet commenced; however, various planning conditions have been recently discharged. Figure 1.2 shows the approved layout and the 2.5m high noise barrier along the western and southern boundaries (shown in blue). A noise assessment and supplementary technical notes were prepared by BWB, submitted with the application, with pertinent extracts referenced in this report where necessary. The case officers' report to the Planning and Licensing Committee states that this now approved development would *'result in a lower overall impact to surrounding residential occupiers and the local landscape character than the extant outline planning permission allows for.'*

- 1.8 Existing dwellings and their rear gardens adjoin the southern boundary. To the west is Broad Lane, a cul-de-sac providing access to existing dwellings. Traffic flow on Broad Lane is therefore very low and not a significant source of noise.

Proposed Development

- 1.9 The proposed residential development layout is shown in Figure 1.3¹ and includes a total of 64 dwellings and associated infrastructure. Access to the site will be gained from Lower Lane and a new junction on Broad Lane. Within the site boundary a 15m landscape buffer is proposed between dwellings and Plot J2 to the north.
- 1.10 The proposed layout shows some private rear gardens backing onto the boundary with the CDC car park to the east, and the landscape buffer zone in the north of the site. A 2.5m high acoustic screen is proposed around the outer rear boundaries of rear gardens in the north of the site, and a 1.8m high acoustic screen is proposed along the eastern boundary with the CDC site, or around the outer boundaries of rear gardens as indicated in Figure 1.3.
- 1.11 We understand that standard thermal double glazing and in/over-frame passive ventilators are proposed and that a higher standard of façade sound insulation and/or alternative ventilation will be incorporated into dwellings where needed to reduce noise ingress to an acceptable level.

Assessment Scope

- 1.12 This noise assessment has included;
- Noise surveys to measure existing weekday noise levels at various locations around the site;
 - Analysis of the measured noise levels to determine the day and night-time noise exposure levels;
 - The prediction of future operational noise from the approved use of Plot J2;
 - Assessment of the measured noise levels with respect to relevant guidance and standards;
 - Recommending a scheme of sound insulation measures capable of achieving a reasonable degree of amenity for the future incoming residents of the proposed development.
- 1.13 This report is based on the layout shown in Figure 1.3 as provided by the client at the time of the assessment. The findings and recommendations in this report should be checked should there be any future amendments to the layout.
- 1.14 A glossary of acoustic terminology used in this report is provided in Appendix A. Noise levels in the body of this report have been rounded to the nearest whole number since fractions of decibels (dB) are imperceptible. All data are sound pressure levels in dB re 20µPa. Noise data reported in terms of an A-weighting (denoted by a subscript 'A') approximate the frequency response of the human ear. This report is provided in connection with noise/acoustics only, and other aspects (structural/fire/visual, etc.) should be checked by others.

¹ Drawing ref: Sketch 21, dated 17 Jan 2022

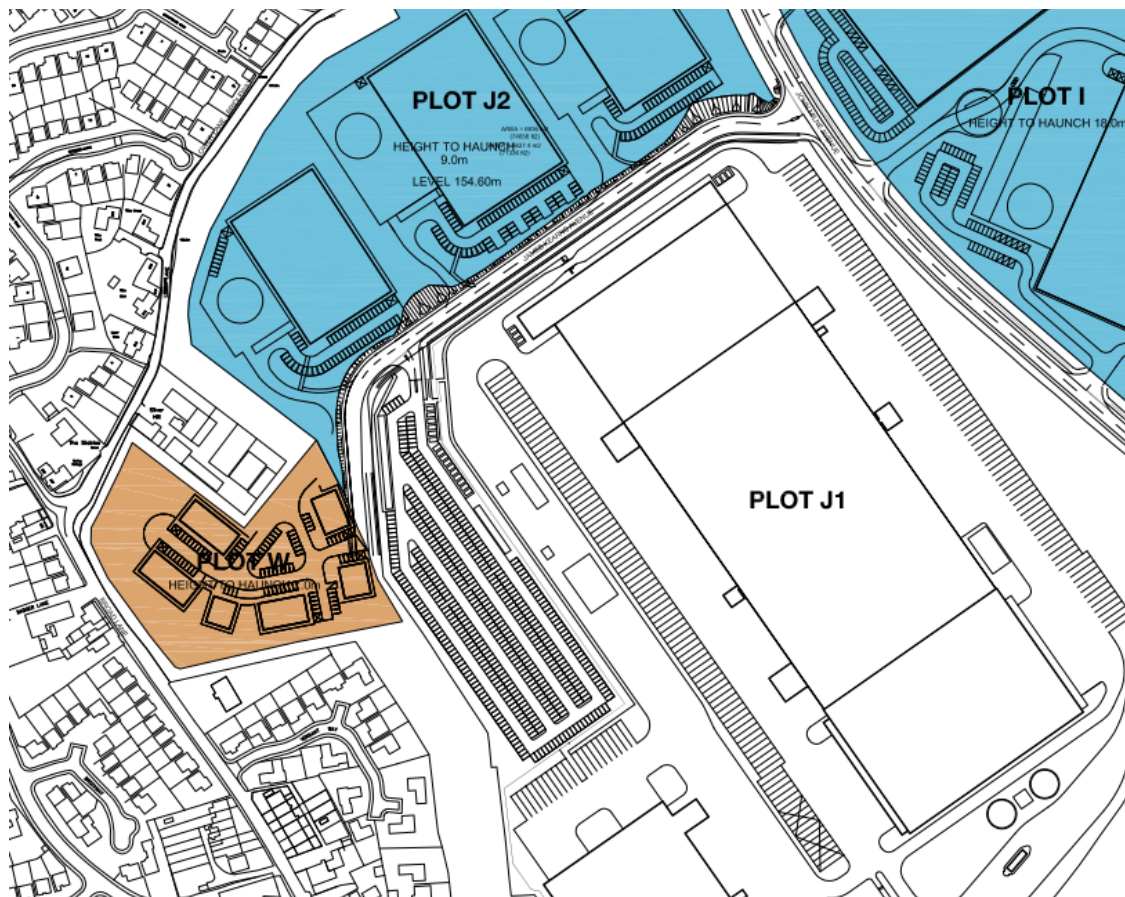
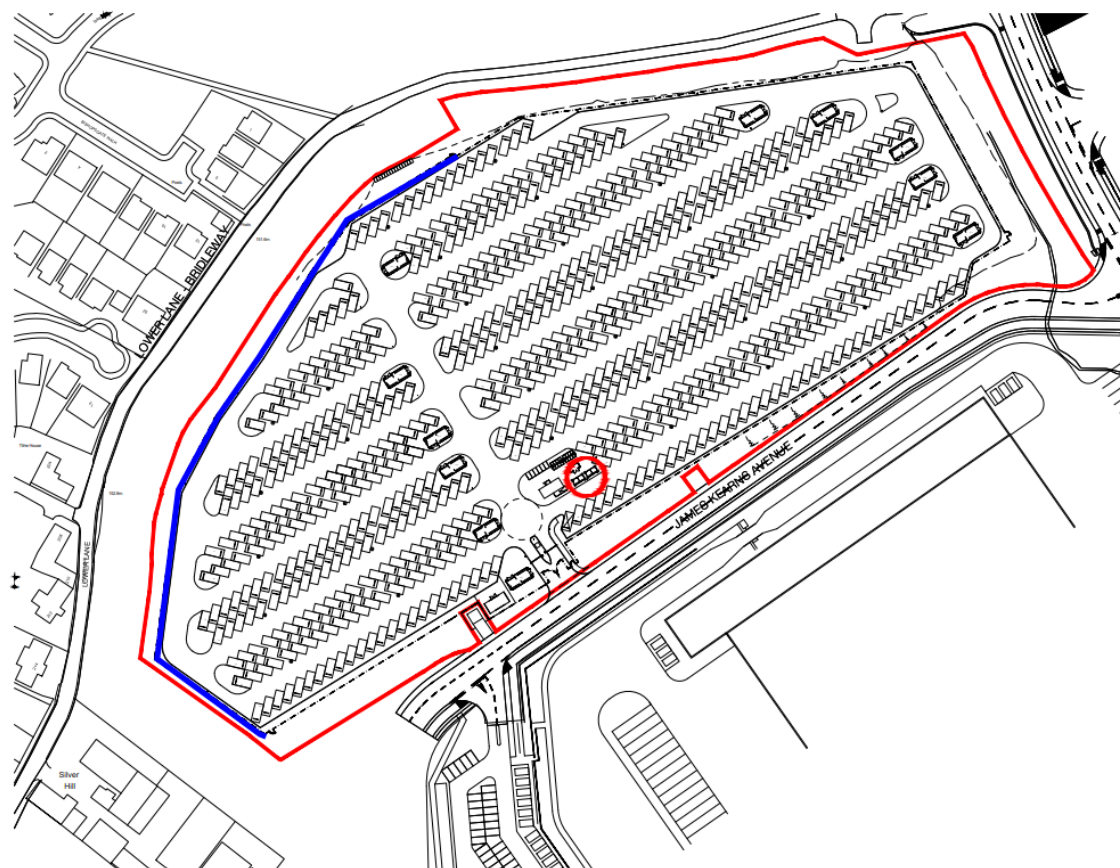
Figure 1.1: Kingsway Business Park Parameters Plan (Parameters Plan (Drawing ref. 2013-233/102 Rev A))**Figure 1.2: Approved Layout, Plot J2, Kingsway Business Park (Drawing ref. 2021-017 085 Rev D)**

Figure 1.3: Proposed Residential Layout and Noise Monitoring Locations (NMLs)



2. Planning Policy, Guidance and Standards

- 2.1 The following Policy, Guidance, and Standards have been considered, with pertinent extracts summarised below.

Planning Policy & Qualitative Guidance

Noise Policy Statement for England (NPSE, 2010)

- 2.2 The NPSE, published in March 2010, by the Department for Environment, Food and Rural Affairs (DEFRA), the body responsible for British Government noise policy provides qualitative planning guidance and clarity to noise-related policies and practices and seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance relating to environmental and neighbourhood noise.
- 2.3 The long-term vision of Government noise policy is to 'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.' The three aims of the NPSE² are to:
- 1 - '**Avoid** significant **adverse impacts** on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - 2 - **Mitigate and minimise adverse impacts** on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - 3 - Where possible, **contribute to the improvement of health and quality of life** through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.'
- 2.4 The explanatory note to the NPSE references the concepts of NOEL (No Observed Effect Level) and LOAEL (Least Observed Adverse Effect Level), and SOAEL (Significant Observed Adverse Effect Level), as follows:
- NOEL** - is in the most simplistic terms, the level below which there is no detectable effect on health and quality of life due to the noise source/s under consideration. As noise exposure increases, above the NOEL it becomes noticeable but '*does not cause any change in behaviour or attitude*' and whilst changing the acoustic character of an area does not introduce a '*perceived change in quality of life*'.
- LOAEL** - defined as the noise exposure level above which noise starts to give rise to changes in behaviours and attitude and adverse effect on health and quality of life can begin to be detected.
- SOAEL** - defined as the noise exposure level above which significant adverse effects on health and quality of life occur and results in a material change in behaviour and is undesirable.
- 2.5 The explanatory note then further relates the effect levels to its aims. The first aim states that significant adverse effects on health and quality life should be avoided, with noise impact being defined as being at or above the SOAEL. The second aim states that '*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development*, i.e. where the noise impact lies somewhere between the LOAEL and SOAEL. The third aim seeks, where possible, to improve health and quality of life through proactive management of noise. The NPSE also includes the concept of NOEL (No Observed Effect Level) - the level below which there are no detectable effects on health and quality of life (See WHO GCN below).

² NPSE Para. 1.7

- 2.6 As the guidance is qualitative, specific NOEL, LOAEL and SOAEL values are absent, with the NPSE stating that:

*'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise so as to provide the necessary policy flexibility until further evidence, and suitable guidance is available.'*³

- 2.7 Consequently, other guidance and standards are needed to be referenced to convey objective standards for the assessment of noise with respect to the NOAEL, LOAEL, and SOAEL, whilst considering the context and circumstances of a proposed development.

National Planning Policy Framework (NPPF, 2021)

- 2.8 The NPPF, published in 2012 and last revised in June 2019 by the Department for Communities and Local Government (DCLG), and replaces PPG 24⁴, formerly the main planning guidance document used to determine the suitability of proposed residential development.

- 2.9 The NPPF again provides qualitative guidance on noise impact and acknowledges that the purpose of the planning system is to contribute to the achievement of sustainable development⁵ and sets interdependent objectives needed to be 'pursued in mutually supportive ways', which are:

- a) **'an economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
- b) **a social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and,
- c) **an environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'

- 2.10 These interdependent objectives 'are not criteria against which every decision can or should be judged' and that 'Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.'⁶

- 2.11 The NPPF provides guidance to Local Planning Authorities in the policy and decision-making process and states⁷;

'Planning policies and decisions should contribute to and enhance the natural and local environment by;

- e. 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.'

- 2.12 With regards to pollution, the NPPF states ;

³ NPSE Para 2.22

⁴ Planning Policy Guidance 24: Planning and Noise, The Department for Communities and Local Government , September 1994

⁵ Section 2. Achieving sustainable development, Para 8

⁶ Section 2. Achieving sustainable development, Para 9

⁷ Section 15. Conserving and enhancing the natural environment, Para. 174

‘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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life ⁸.’*

Planning Practice Guidance: Noise (PPG-N, 2014)

2.13 PPG-N was issued and amended in 2014 by the DCLG and requires noise to be considered ‘when development may create additional noise or would be sensitive to the prevailing acoustic environment.’⁹, which can override other planning concerns but is not expected to be considered in isolation to other social, economic and environmental factors¹⁰. Paragraph 002 requires planning authorities to take account of the acoustic environment in plan-making and decision-taking and in doing so consider;

- ‘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; and
- whether or not a good standard of amenity can be achieved.’

2.14 PPG-N also uses the concepts NOEL, LOAEL and SOAEL¹¹ and accords with NPSE in such that adverse impacts cease to arise below the LOAEL threshold. In relation to how local planning authorities can recognise how noise could be a concern, the following table is provided, relating the NOEL, LOAEL and SOAEL to behavioural outcomes, as well as advising the recommended action, but adds the 'Unacceptable Adverse Effect Level' (UAEL), above which PPG-Noise requires that unacceptable adverse effects be prevented.

Table 2.1: Noise exposure hierarchy, based on the likely average response (PPG-N 2014).

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

⁸ see Explanatory Note to the Noise Policy Statement for England

⁹ PPG-N Para. 001 Reference ID: 30-001-20140306

¹⁰ PPG-N Para .002 Reference ID: 30-002-20140306

¹¹ PPG-N Para 005 Reference ID: 30-005-20140306

	loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory.		
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2.15 PPG-N also states that due to the subjective nature of noise:

"..., 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.

These factors include:

- *the source and absolute level of the noise together with the time of day it occurs...*
- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*
- *the spectral content of the noise...and the general character of the noise."*

2.16 More specific factors to consider when relevant include:

"...the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;

whether adverse internal effects can be completely removed by closing windows..."

2.17 In relation to the mitigation the adverse effects of noise, PPG-N states that:

"In general, for noise-making developments, there are 4 broad types of mitigation:

- *engineering: reducing the noise generated at source and/or containing the noise generated;*
- *layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose-built barriers, or other buildings.;*
- *using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;*
- *mitigating the impact on areas likely to be affected by noise, including through noise insulation when the impact is on a building."*

2.18 In relation to the identifying areas of tranquillity, PPG-N states that:

"There are no precise rules, but for an area to be protected for its tranquillity, it is likely to be relatively undisturbed by noise from human-caused sources that undermine the intrinsic character of the area."

Quantitative Standards and Guidance

World Health Organisation (WHO) and 'Guidelines for Community Noise' (1999)

2.19 WHO document 'Guidelines for Community Noise' (1999, GCN) provides guidance to environmental health authorities and practitioners tasked with protecting people from the harmful effects of noise. WHO defines 'health' as a 'state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' and clearly states that 'the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being...'

2.20 The guidance provides a series of recommended internal and external noise exposure levels to protect people from the harmful effects of noise, and are set, based on the lowest levels of noise that affect health, and which therefore equate to the LOAEL.

- 2.21 The Guidelines apply to external noise ‘*without a specific character*’ (previously termed ‘*anonymous noise*’) such as that associated with road and rail traffic. Noise has a ‘*specific character*’ if it contains features such as distinguishable discrete and continuous tone/s, is irregular to attract attention, or has a strong low-frequency content, in which case lower noise limits might be appropriate. When considering noise impact on dwellings, the Guidelines go on to state that ‘*lower levels may be annoying, depending on the nature of the noise source.*’
- 2.22 GCN also states that a noise measures based only on the L_{Aeq} noise level alone is not enough to characterize most noise environments and that ‘*It is equally important to measure the maximum values of noise fluctuations, preferably combined with a measure of the number of noise events.*’¹²
- 2.23 The effects of noise in residential dwellings, typically, are sleep disturbance, annoyance, and speech interference. For bedrooms, the critical effect is sleep disturbance.
- 2.24 For a reasonable degree of internal amenity in dwellings, GCN states¹³;
- ‘In dwellings, the critical effects of noise are on sleep, annoyance and speech interference. To avoid sleep disturbance, indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for single sound events.’*
- ‘At night, sound pressure levels at the outside facades should of the living spaces should not 45 dB L_{Aeq} and 60 dB L_{AFmax} , so that people may sleep with bedroom windows open.’*
- To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq} .’*
- 2.25 The WHO guideline values are summarised in Table 2.2.

BS 8233: 2014, ‘Guidance on sound insulation and noise reduction for buildings’.

- 2.26 BS 8233 carries the full weight of an adopted British Standard and provides acoustic design criteria guidance for new dwellings and is supported by guidance contained within the GCN.

Internal Noise

- 2.27 The guideline noise design criteria of BS 8233 apply to external noise ‘*without a specific character*’ (previously and sometimes termed or referred to as ‘*anonymous noise*’) such as that associated with road and rail traffic and states that it under these conditions, it is desirable that the internal ambient noise level does not exceed the guideline values shown in Table 2.2.
- 2.28 Guidance on reasonable acoustic design criteria for individual noise events are also provided and states¹⁴
- ‘Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$, depending on the character and number of events per night’.*
- 2.29 The standard also allows for a small exceedance of the guideline $L_{Aeq,T}$ values¹⁵;

¹² WHO, GCN, Paragraph 4.3

¹³ WHO GCN, Paragraph 4.3.1

¹⁴ BS 8233:2014, Table 4, Note 4

¹⁵ BS 8233:2014, Table 4, Note 7

'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.'

External Spaces

- 2.30 With regards to noise in external amenity spaces (i.e. private rear gardens) BS 8233 states¹⁶;

'For traditional external areas that are used for amenity space, such as gardens and patios, 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 recognised 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.'

Institute of Acoustics ProPG: Planning and Noise (2018)

- 2.31 ProPG is a guidance document jointly published by the Institute of Acoustics (IOA), the Chartered Institute of Environmental Health (CIEH) and the Association of Noise Consultants (ANC) to encourage the delivery of sustainable development and promote good health and well-being through the effective management of noise, such as that impacting upon new residential developments. ProPG complements and supplements the NPPF, NPSE and PPG-N, BS 8233 and WHO Guidance.
- 2.32 ProPG indicates that where external noise exposure levels are more than 15 dB higher than the internal noise level target, openable windows should ideally not be relied upon as the sole means of ventilation and some form of acoustically attenuated ventilation may be required. This equates to an external noise level of 45 dB $L_{Aeq,T}$ / 60 dB L_{AFmax} during the night or 50 dB $L_{Aeq,T}$ during the day (the same as those in WHO GCN). In situations where noise levels are higher, supplementary, or alternative ventilation should be considered.

Adopted Noise Design Criteria

- 2.33 Noise design criteria should have regard to the stated aims of NPSE and the NPPF. Under most circumstances, planning is refused where the noise impact on sensitive receptors exceeds SOAEL, however mitigating factors such as the local authority's on-going support of local regeneration will be taken into consideration, and normally recommend conditions to mitigate noise impacts where the noise levels exceed the LOAEL but are below than the SOAEL criterion in noise-critical spaces. As road traffic is the main source of existing and future environmental noise at the site, the guideline values of BS 8233 and WHO GCN (summarised in Table 2.2) have been adopted to determine the measures needed to secure a reasonable degree of amenity for the future incoming residents, and meet the aims of the NPPF and NPSE.

Table 2.2: Adopted noise design criteria

Room / Location	Transportation Noise	
	Daytime (07:00-23:00hrs)	Night-time (23:00-07:00hrs)
Living Room	35 dB $L_{Aeq,16hr}$	-
Bedroom		30 dB $L_{Aeq,8hr}$ not regularly exceeding 45dB L_{AFmax}
Dining Room	40 dB $L_{Aeq,16hr}$	-
Rear Gardens	≤55 dB $L_{Aeq,16hr}$	-

¹⁶ BS 8233:2014, Para 7.7.3.2

3. Noise Survey

Survey Details

- 3.1 Part attended noise monitoring has been undertaken in 2019 to quantify the existing noise exposure levels at two locations on the site considered representative of proposed dwellings and rear gardens closest to the Asda CDC of Plot J1.
- 3.2 The survey was undertaken within years of the date of this report, was not affected by the Covid-19 pandemic, and as there have been no changes to surrounding land uses since the survey was undertaken, the results are considered to remain valid for the purpose of this assessment.
- 3.3 The survey dates, times, observed weather conditions in Table 3.1.

Table 3.1: Survey dates, times, and observed weather conditions

Survey Details			Observed Weather				
Period	Date	Time	Wind (Speed) (Dir.)		Rain	Temp. (Deg. C)	Cloud Cover (Okta)
Night 1	Wed 13 November 2019	01:15-07:00	<3m/s	N/NE	0mm	2-5	0-5
Day 1		07:00-23:00				5-8	5-8

- 3.4 Weather conditions during the surveys were observed to be calm, dry and mild throughout. Road surfaces were also dry and without any known atypical local traffic conditions (e.g. roadworks or temporary speed limits). The prevailing local conditions were therefore judged to be acceptable for the purposes of the survey and subsequent assessment.

Equipment

- 3.5 Noise monitoring was undertaken using fully calibrated Class 1 instrumentation as described in defined in BS EN 61672-1:2013, calibrated to traceable standards within 2 years of the surveys, as shown in Table 3.2.
- 3.6 Prior to and following the noise measurements acoustic field-calibration of the sound level meters and microphones used in the survey was performed using a 1kHz tone at 114dB, using an acoustic calibrator that itself had been calibrated within the preceding 12 months. No significant drift (i.e. >0.1dB) in the field-calibrated noise level was observed. Measurement microphones were fitted with suitable windshields for the duration of the noise monitoring and were time synchronised.

Table 3.2: Equipment details

Equipment	Make	Model	Serial	Date of Calibration
Sound level meter	NTi	XL2-TA	A2A-11111-E0	06/09/2019
Pre-amplifier		MA220	6908	
Microphone		MC230A	A14423	
Sound level meter	NTi	XL2-TA	A2A-15860-E0	20/02/2019
Pre-amplifier		MA220	8102	
Microphone		MC230A	A16445	
Acoustic calibrator	Larson Davis	CAL 200	14154	04/09/2019

Monitoring Locations

- 3.7 Measurements were carried out in terms of broadband and octave-band noise levels and the locations shown in Figure 1.3. Details of the noise monitoring locations (NMLs) are summarised in Table 3.3.

Table 3.3: Description of noise monitoring locations

Monitoring Location	Description	Condition	Purpose
NML1	3m from site boundary with Asda CDC car park	Free-field, 1.4m above local ground	To measured road traffic noise, and any noise from Asda CDC. Representative of gardens and windows of elevations closest to the Asda CDC site.
NML2	2m from site boundary with Asda CDC car park	Free-field, 1.4m above local ground	

Monitoring Results

- 3.8 Noise monitoring was undertaken during the periods shown in Table 3.4. Broadband and spectral noise levels were logged in 0.1s intervals, with audio recording to assist with source identification and analysis of the measured noise data.
- 3.9 The results of the noise monitoring have been used to determine the daytime and night-time noise levels at each measurement location and are summarised in Table 3.4. Full results are provided in Appendix B.

Table 3.4: Summary of measured free-field noise exposure levels

Monitoring Location	Period	Measurement Duration, t (hh:mm)	dB L _{Aeq,t}	dB L _{Aeq,16hr}
NML1	Night	5:45 (01:15-07:00)	54	-
	Day	16:00 (07:00-23:00)	55	
NML2	Night	5:10 (01:45-07:00)	53	-
	Day	06:00 (07:00-13:00)	53	51 ¹⁷

- 3.10 The results of the noise monitoring have been analysed and are summarised as follows:

NML1

- Steady and distant road traffic (M62) is the main source of noise in the day, and at night.
- The measured daytime road traffic noise exposure level is 55dB L_{Aeq,16hr}.
- The night-time road traffic noise exposure level is taken as being 54dB L_{Aeq,8hr}.
- Noise from the Asda CDC was generally low in absolute level, infrequent, was below the imposed noise level limits, but included;
 - faint and infrequent noise from HGVs (with trailer refrigeration units) manoeuvring around the site that were discernible against the underlying road traffic noise at night, but were undiscernible in the day;
 - infrequent and faint impact noise from HGVs hooking up to awaiting trailers (57-63dB L_{AFmax});
 - cars arriving/departing the site are typically faintly identifiable audible against distant road traffic and with measured L_{AFmax} level of 60-63dB).
 - infrequent car doors closing (62-63dB L_{AFmax}) close to the site boundary;
 - infrequent daytime peaks in noise from overhead aircraft, generally <66dB L_{AFmax}.
 - in the daytime, one car was noted backfiring and giving rise to a peak noise level of 71dB L_{AFmax}.
 - a car horn in the daytime (79dB L_{AFmax});
 - peaks in noise from the Asda CDC site therefore typically below 65dB L_{AFmax}.
- Noise from Asda CDC site lacked any significant plant noise and is therefore considered to be best characterised as road traffic.

¹⁷ Calculated using the shortened CRTN method (Section III of Calculation of Road Traffic Noise (CRTN) HMSO: 1998) and the measured L_{A10} between 10:00-13:00hrs

NML2

- Steady and distant road traffic (M62) is the main source of noise in the day and at night.
- The measured daytime road traffic noise exposure level is $\leq 53\text{dB } L_{Aeq,16hr}$
- The night-time road traffic noise exposure level is taken as being $51\text{dB } L_{Aeq,8hr}$.
- Noise from the Asda CDC was low, infrequent, was well below the imposed noise level limits, but included;
 - cars arriving/departing the site are typically faintly identifiable against distant road traffic;
 - faint and infrequent noise from HGV and trailer refrigeration units manoeuvring around the site that are just discernible against the underlying road traffic noise at night, but were undiscernible in the day;
 - infrequent and faint impact noise from HGVs hooking up to awaiting trailers ($<54\text{dB } L_{AFmax}$);
- Peaks in noise from overhead aircraft were generally $<65\text{dB } L_{AFmax}$.
- The majority of measured L_{AFmax} noise levels were attributable to birdsong.

4. Future Noise from Plot J2

Approved Use and Noise Constraints

- 4.1 The approved use of Plot J2 to the north, as proposed and controlled by extant Conditions is;
- restricted to the parking/storage of vehicles in association with the operation of the distribution warehouse at Plot H, Kingsway Business Park, John Milne Avenue, Rochdale and in full accordance with the details set out in the submitted Planning Statement (Condition 3).
 - shall not be brought into use until the security and acoustic fencing as indicated on drawing no.2021-017 803 Rev. E - 'Fencing Details' has been erected in accordance with the approved details. The structures shall thereafter be retained. (Condition 10).
 - No goods, materials, waste products or containers shall be stored on land outside the building or designated enclosures at any time, without the prior written consent of the Local Planning Authority. (Condition 18).
 - Operational hours are restricted between 05:00-23:00hrs on any day (Condition 17).
- 4.2 Two technical notes and a noise assessment were prepared by BWB submitted in support of the planning application for Plot J2 in 2021. The first of these¹⁸ relates to the site generated traffic for the wider approved Kingsway Business Park Development, concludes that fully operational traffic flows should not exceed those used in the 2014, and is not relevant to this assessment.
- 4.3 Pertinent detail contained within The Environmental Noise Assessment¹⁹ states that;
- the proposal is based on delivering storage for 100% EV vans in due course.
 - noise sources associated with the proposed development are vehicle movements, including van storage area usage and potential noise from fixed building services plant noise.
 - indicates that van storage, van movements and car movements are unlikely to give rise to an adverse noise impact at the existing noise sensitive receptors during the daytime and night-time over weekday and weekend periods; and,
 - the site is, in principle, suitable for the proposed use, based on the general assumptions regarding van storage area movements and operations and that noise need not be a determining factor in the granting of planning permission for the proposed development.
- 4.4 RBC's Environmental Health Department did not respond to a request to agreement of the assessment methodology proposed by BWB, and the noise assessment progressed and was submitted. Following submission of the application, the dealing Environmental Health Officer requested that noise from reverse warning alarms be included in the assessment, in turn providing the operator with the option to fit vans with warning alarms (despite not being immediately planned for), and a subsequent Technical Noise²⁰ was submitted for consideration prior to planning approval.
- 4.5 Given the application has been approved, the approach adopted by BWB is deemed to have been accepted by RBC and has been adopted when predicting operational noise from Plot J2 on Plot W.

Fixed Plant and Equipment

- 4.6 In the absence of detailed information, BWB have recommended in their Environmental Noise Assessment¹⁹ cumulative free-field rated noise level limits at the nearest existing dwellings of 35dB L_{A,T}. This is a very low level of noise, is below the underlying noise climate, and despite being applicable at the nearest existing dwelling, is sufficiently low such that noise

¹⁸ BWB document ref: KPJ-BWB-GEN-XX-RP-TR-0001-TN, dated 15/03/2021

¹⁹ BWB document number: JKP-BWB-ZZ-ZZ-RP-LA-0001_NIA_S0_P02, dated 15/04/20210

²⁰ BWB document number: LDA2943/TN/MM/000/20210602, dated 03/06/2021

from fixed plant and equipment is expected to be sufficiently low so as not to result in a materially adverse impact on future incoming residents of the proposed residential development within Plot W.

- 4.7 road traffic is the main source of noise across the site in both the day and at night, with some occasional noise from the neighbouring Asda CDC site which was below the imposed noise level limits and can be characterised as road traffic noise. Noise from the permitted use of Plot J2 during the busiest hour at the nearest and most exposed dwelling in Plot W is 38dB outside ground floor windows, and 47dB LAeq,1hr outside first-floor windows, with typical peaks in noise expected to be $\leq 65\text{dB LAFmax}$.

Operational Noise

- 4.8 Table 4.2 of the BWB Technical note²⁰ (reproduced in the table below) shows that peak night-time movements will be between 06:00-07:00hrs, and peak daytime trips will be between 16:00-18:00hrs.

Table 4.1: Estimated Trip Generation, Plot J2

Period	Arrive	Depart	Two-way
05:00-06:00	109	148	256
06:00-07:00	162	222	384
07:00-08:00	162	222	384
08:00-09:00	53	73	126
16:00-17:00	222	162	384
17:00-18:00	222	162	384
18:00-19:00	221	162	382

- 4.9 Noise from vehicle movements were split into three elements;
- the arrival and parking of a vehicle, engine off, door slams;
 - a boot slam, a door slam, engine being turned on and the vehicle departing from a space; and
 - van reverse warning alarm
- 4.10 Source noise data attributable to these elements contained within the BWB Technical Note²⁰ are reproduced in the following table.

Table 4.2: Vehicle Movement Noise Level Data

Source	Sound Event Level (SEL) at 10m, dB(A)	Combined SEL, dB(A)	Corresponding LAeq,1 hour at 10m, 55 spaces
Vehicle pulls up, engine off, 1 door slam	64.7	75.9	57.7
1 boot slam, 1 door slam, engine start, drive off	71.8		
Van reverse alarms	73.2		

- 4.11 Operational noise from Plot J2 has been calculated in general accordance with the methodology adopted by BWB, using the source noise data in the table above, in that the noise from the worst-case 1hr period for the day and night has been calculated by distributing the trips during each period across the approved van storage area evenly, into 7 groups of 55 vehicles (a total of 385 two-way trips), at varying distances from the nearest proposed dwelling in Plot W. Figure 4.1 shows the distributed sources used in the calculation. Noise levels have been calculated at boundary of the nearest proposed dwellings to Plot J2 (Plot 64, 15m from the northern boundary of Plot W with Plot J2).

- 4.12 Noise levels have been calculated at ground floor level and assume a nominal -10dB correction to account for the reduction in propagated noise provided by the approved (within the curtilage of Plot J2) and/or proposed (within Plot W) 2.5m timber acoustic screens. Noise levels have also been calculated at upper floor levels and exclude a correction for acoustic screening.
- 4.13 The results for Plot 64 of Plot W are presented in Table 4.3, with the total noise level rounded to the nearest dB.
- 4.14 The resulting noise level outside proposed dwellings closest to the northern boundary (Plots 15, 34-39, and 63 of the layout shown in Figure 1.3), will be comparable or slightly lower. At dwellings further away from the boundary, noise levels will be comparable to lower than that which has been predicted by BWB for existing dwellings to the west of Plot J2. Should electric vans use the site, noise levels are expected to be lower and therefore the predictions are considered a reasonable worst-case.
- 4.15 Typical peaks in noise at night are expected to be no higher than as measured at NML1 (i.e. $\leq 65\text{dB L}_{\text{AFmax}}$).

Figure 4.1: Distribution of Source Noise Across Plot J2

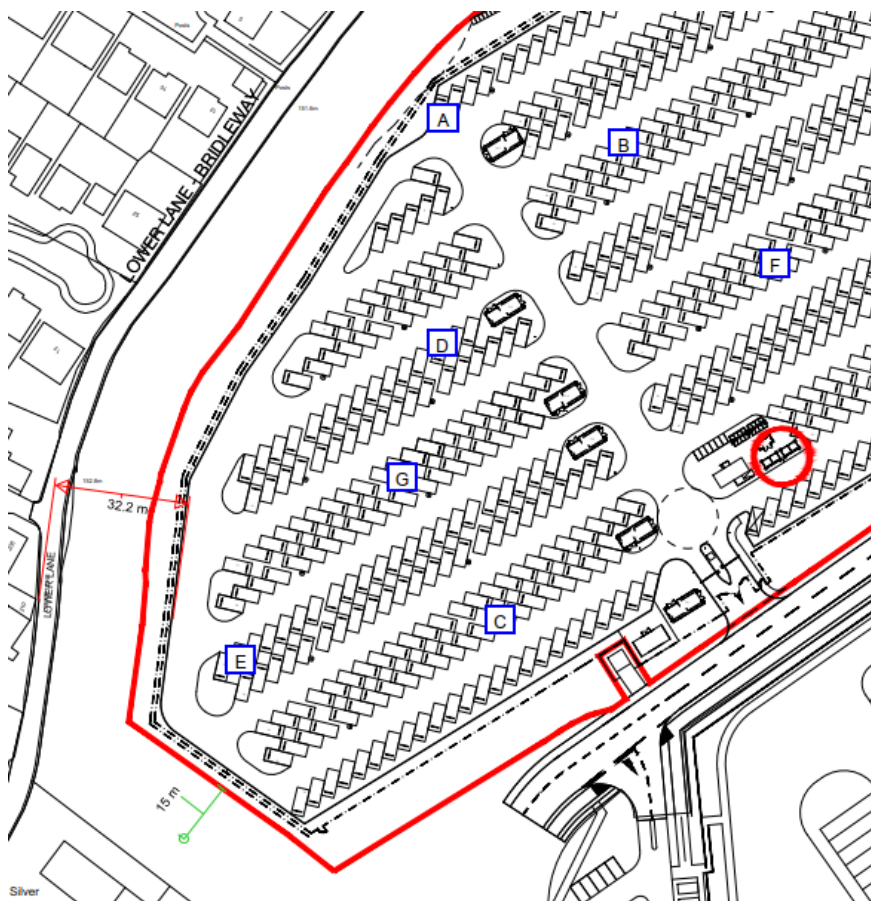


Table 4.3: Predicted Noise Level due to Van Storage Area at Plot 64

Period	Source	Distance to Plot 64	Ground Floor	Upper Floor
Worst-case 1hr period, day (07:00-23:00) and night (05:00-07:00)	A	182	22.5	32.5
	B	191	22.1	32.1
	C	88	28.8	38.8
	D	125	25.8	35.8
	E	42	35.2	45.2
	F	191	22.1	32.1
	G	95	28.1	38.1

	Total, dB $L_{Aeq,1hr}$	38	48
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5. Assessment and Recommendations

Internal Noise

- 5.1 Distant road traffic is the main source of existing noise across the open site in both the day and at night, with some occasional noise from the neighbouring Asda CDC site which was below the imposed noise level limits. Free-field noise from the permitted use of Plot J2 during the busiest hour at the nearest and most exposed dwelling in Plot W is 38dB outside ground floor windows, and 48dB $L_{Aeq,1hr}$ outside first-floor windows, with typical peaks in noise expected to be $\leq 65dB L_{AFmax}$.
- 5.2 Based on the measured noise exposure levels, and the predicted noise levels from Plot J2, resulting internal noise in some rooms of dwellings, particularly upper floor bedrooms is unlikely to meet the adopted noise criteria and the $L_{Aeq,T}$ internal noise design criteria (assuming a 13dB reduction of noise ingress for a partially open window), which can therefore only be met with windows closed in these dwellings.
- 5.3 Consequently, noise ingress calculations have been carried out in accordance with the rigorous methodology of BS 8233:2014 (equivalent to the method set out in BS EN 12354-3:2000) to determine if any acoustic glazing or ventilation is required to meet the adopted noise design criteria. The calculations assume the following:
- New external walls to be brick and block as stated in BS 8233:2014.
 - Standard thermal double glazing (4mm - 10-20mm cavity - 4mm glass) and in/over frame trickle vents
 - Living rooms and kitchen/dining rooms have two trickle vents with an indirect air path.
 - Bedrooms will have one trickle vent with an indirect air path.
 - Standard cold roof construction (400mm mineral wool above plasterboard ceiling).
 - Rooms in the roof will have a warm roof construction (100mm foil faced insulation between rafters, 9mm plywood with and 62.5mm laminated insulated plasterboard under with an additional 15mm wallboard).
 - Each room has a reverberation time typically associated with a reasonably well-furnished room.
 - Windows and external doors tightly closed.
- 5.4 In warm summer months, it is not uncommon for windows to be open at night. Based on the measured noise data, peaks in noise from Asda CDC and Plot J2 could exceed the adopted L_{AFmax} criteria in terms of level and number of occurrences in bedrooms on upper floors of dwellings in closest proximity to the respective boundaries. Under the 'Agent of Change' principle and in order to meet the aims of the NPPF, NPSE etc. it is appropriate that the impact of this aspect of noise is mitigated by the agent (i.e. the developer) of Plot W.

Recommendation

- 5.5 Although acoustically enhanced glazing is not considered necessary, it is recommended that in order to achieve planning aims and the adopted L_{Aeq} and L_{AFmax} noise criteria, alternative mechanical ventilation is provided to bedrooms along the eastern and northern boundaries as shown in Figure 5.1, and in lieu of in/above-frame vents. The ventilation requirements of the Council should be checked, but it is envisaged that a MVRH/PIV or local (i.e. room specific) ventilation system would be appropriate.

External Amenity Areas (private rear gardens)

- 5.6 Existing daytime noise exposure levels at the eastern boundary with the Asda CDC site were found to be below 55dB $L_{Aeq,16hr}$ in the absence of any noise mitigation. The proposed 1.8m high acoustic screen will further reduce daytime noise exposure levels to below 50dB $L_{Aeq,16hr}$ and the adopted noise criteria will be achieved.
- 5.7 Similarly, in gardens of dwellings closest to the northern boundary with Plot J2, daytime noise levels from the future use of this Plot are predicted to be below 50dB $L_{Aeq,1hr}$ with the proposed 2.5m high acoustic screen, and the adopted noise criteria should be achieved.
- 5.8 Consequently, additional noise mitigation measures for private rear gardens is not considered necessary.

- 5.9 It is noted that central, southern, and westernmost areas of the site will benefit from acoustic screening by the proposed dwellings and therefore daytime noise exposure levels in the majority of gardens within the site boundary are expected to be below 50dB LAeq,16hr.

Recommendations

- 5.10 Acoustic screening timber fencing must;
- be imperforate (i.e. have no holes or gaps),
 - incorporate suitable partially buried gravel boards to seal the gap at the base of the fence,
 - achieve a surface mass of at least 18kg/m² and be at least 20mm thick,
 - with a height relative to the garden, and,
 - have an appropriate life span.

Figure 5.1: Dwelling Bedrooms Recommended for Alternative Ventilation



6. Conclusion

- 6.1 Agility Acoustics Ltd has been commissioned by Barratt & David Wilson Homes North West to carry out a noise assessment in connection with a full planning application for a proposed residential development at Silverhill Farm, Lower Lane / Broad Lane, Rochdale. The site extends to approximately 2.3 hectares (ha), which includes Plot W of the Kingsway Business Park Development, as well as the Grade II Listed Silverhill Farmhouse and Barn. The site falls within the administrative boundary of Rochdale Borough Council (RBC).
- 6.2 This report has been requested to assesses the potential impact of road traffic noise and other nearby non-residential land uses on the proposed development and determine the mitigation measures necessary to achieve the aims of relevant planning policy and guidance in order to secure a reasonable degree of residential amenity for future incoming residents.
- 6.3 A noise survey has been undertaken to establish and assess existing noise exposure levels associated at locations representative of building elevations most exposed to noise from surrounding land uses and roads in the absence of any noise mitigation. The main source of noise through the survey was distant road traffic from the M62 to the south-east. Peaks in noise from the CDC site are significant at night.
- 6.4 Future noise from an approved van storage in Plot J2 of the Kingsway Business Park Development has been predicted, based on source noise data used in an assessment submitted in support of the now approved development.
- 6.5 Noise design criteria based on WHO GCN and BS 8233 have been adopted to ensure that a reasonable degree of amenity is capable of being secured for future incoming residents of the proposed residential development.
- 6.6 Mechanical ventilation is recommended for some bedrooms (or whole-house type if desirable) to achieve both thermal and acoustic comfort and secure a reasonable degree of amenity for future incoming residents of the proposed residential development.
- 6.7 The measured daytime noise exposure level was 53-55dB $L_{Aeq,16hr}$, and the predicted daytime noise from Plot J2 was well below 50dB $L_{Aeq,16hr}$, and therefore the adopted noise criteria for private rear gardens can be met without any additional noise mitigation measures.
- 6.8 Therefore, whilst noise is a material consideration in the planning process for the proposed development, it is not considered a valid reason for planning refusal in this instance, and the need to ensure that suitable mitigation is incorporated into the design and use of the site can be secured by a suitably worded planning condition, if necessary.
- 6.9 In conclusion, the assessment has shown that the site is suitable for residential development and that a reasonable degree of noise amenity is capable of being secured for future incoming residents provided some rooms of dwellings around the site boundary are provided with mechanical ventilation.

Appendix A: Glossary of acoustic terminology

Term	Description
dB	The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. When measuring sound (or noise) levels, it usually ranges from 0 dB (the threshold of hearing) to 140 dB (the threshold of pain).
dB(A)	Decibels measured using a sound level meter with a frequency rating which relates sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) generally agree with people's assessment of loudness.
C_{tr}	The A-weighted urban traffic noise spectrum adaptation term. Can be added to some insulation descriptors take account of different source spectra such as low frequency sound.
$D_{ne,w}$	The weighted element-normalized level difference, a single figure rating used to describe the sound insulation of small building elements such as trickle vents, as defined in BS EN ISO 717-1: 1997.
$L_{A10,T}$	The A-weighted noise level exceeded for 10% of a measurement period, T.
$L_{Aeq,T}$	The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period.
L_{AFmax}	The maximum A-weighted noise level measured during a period of measurement, using a fast response time.
R_w	The Weighted Sound Reduction Index, and is a number used to quantify the effectiveness of a soundproofing system or material as defined in BS EN ISO 717-1: 1997.

Appendix B: Results of weather survey

NML1

Start hh:mm	Duration	L _{AFmax}	L _{Aeq}	L _{A10}	Comments
13/11/2019 01:15	00:45:00	57.2	46.5	48.7	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = HGV Trailer hook-up.
02:00	1:00:00	58.2	48.9	51.4	Distant road traffic. Occasional car arriving/departing Asda CDC.
03:00	1:00:00	58.8	50.9	53.3	Distant road traffic. Occasional car arriving/departing Asda CDC.
04:00	1:00:00	58.9	50.9	54.1	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = scrapping ice from car window at Asda CDC.
05:00	1:00:00	67.2	57.7	60.1	Distant road traffic. Occasional car arriving/departing Asda CDC.
06:00	1:00:00	70.7	56.1	58.1	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car door Asda CDC.
07:00	1:00:00	63.4	56.6	59.6	Distant road traffic. Occasional car arriving/departing Asda CDC.
08:00	1:00:00	63.7	54.5	56.6	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car door Asda CDC.
09:00	1:00:00	62.0	54.3	55.7	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car door Asda CDC.
10:00	1:00:00	65.8	53.1	54.5	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = aircraft.
11:00	1:00:00	59.6	53.2	54.7	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car door Asda CDC.
12:00	1:00:00	65.2	53.2	54.7	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = noisy bike departing Asda CDC.
13:00	1:00:00	79.1	53.3	54.7	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car horn at Asda CDC.
14:00	1:00:00	60.9	53.5	55.2	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = birdsong
15:00	1:00:00	60.3	52.9	55.0	Distant road traffic. Occasional car arriving/departing Asda CDC.
16:00	1:00:00	72.8	57.2	58.5	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = aircraft.
17:00	1:00:00	65.7	56.4	58.2	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = aircraft.
18:00	1:00:00	64.9	57.0	58.4	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = motorbike departing Asda CDC.
19:00	1:00:00	66.3	56.7	58.5	Distant road traffic. Occasional car arriving/departing Asda CDC.
20:00	1:00:00	64.2	55.4	57.0	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = aircraft.
21:00	1:00:00	64.1	54.2	55.9	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = aircraft.
22:00	1:00:00	63.6	52.5	54.5	Distant road traffic. Occasional car arriving/departing Asda CDC.

Sample data

Marker	Start hh:mm	Duration	L _{AFmax}	L _{Aeq}
Car horn (1)		0:00:25	79.1	60.4
Car horn	13/11/2019 13:14	0:00:25	79.1	60.4
Aircraft (7)		0:02:35.6	72.8	59.9
Aircraft	13/11/2019 07:39	0:00:45	61.8	56.8
Aircraft	13/11/2019 10:01	0:00:28.6	65.8	57.8
Aircraft	13/11/2019 10:57	0:00:35	62.7	56.2
Aircraft	13/11/2019 16:26	0:00:32	72.8	64.6
Aircraft	13/11/2019 20:32	0:00:05	62.6	56.8
Aircraft	13/11/2019 20:33	0:00:05	64.2	59.2
Aircraft	13/11/2019 21:08	0:00:05	64.1	55.8
Vehicle at Asda CDC Car Park (3)		0:00:38.6	70.7	60.6
Vehicle at CDC CP	13/11/2019 06:10	0:00:18.2	70.7	63.0

Vehicle at CDC CP	13/11/2019 21:31	0:00:15	62.6	55.6
Vehicle at CDC CP	13/11/2019 22:02	0:00:05.4	60.2	56.1
HGV Hook up (3)		0:00:10	63.2	53.5
HGV Hook up	13/11/2019 01:51	0:00:04	56.7	51.2
HGV Hook up	13/11/2019 01:51	0:00:03	57.2	50.7
HGV Hook up	13/11/2019 21:07	0:00:03	63.2	56.5
Car Door at Asda CDC Car Park (4)		0:00:03.6	63.0	56.8
Car Door	13/11/2019 22:02	0:00:00.9	61.9	56.5
Car Door	13/11/2019 22:02	0:00:01	61.8	56.6
Car Door	13/11/2019 22:02	0:00:00.6	63.0	58.1
Car Door	13/11/2019 22:02	0:00:01.1	62.4	56.5

NML2

Start hh:mm	Duration	L _{AFmax}	L _{Aeq}	L _{A10}	Comments
01:45	0:15:00	55.0	46.4	48.5	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = HGV Trailer hook-up.
02:00	1:00:00	57.6	49.2	51.7	Distant road traffic. Occasional car arriving/departing Asda CDC.
03:00	1:00:00	59.2	50.2	52.6	Distant road traffic. Occasional car arriving/departing Asda CDC.
04:00	1:00:00	61.9	51.4	55.1	Distant road traffic. Occasional car arriving/departing Asda CDC.
05:00	1:00:00	62.1	56.3	58.5	Distant road traffic. Occasional car arriving/departing Asda CDC. L _{AFmax} = car door at Asda CDC.
06:00	1:00:00	63.6	54.0	56.3	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.
07:00	1:00:00	70.0	54.1	56.5	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.
08:00	1:00:00	71.4	52.4	54.2	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.
09:00	1:00:00	66.0	52.4	54.0	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.
10:00	1:00:00	65.4	51.4	53.1	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = aircraft.
11:00	1:00:00	65.8	52.3	54.4	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.
12:00	1:00:00	64.3	52.1	54.0	Distant road traffic. Occasional car arriving/departing Asda CDC. Birdsong. L _{AFmax} = birdsong.

Sample data

Marker	Start hh:mm	Duration	L _{AFmax}	L _{Aeq}
Aircraft (3)		0:02:03.6	65.4	56.6
Aircraft	13/11/2019 07:39	0:01:00	62.0	56.7
Aircraft	13/11/2019 10:01	0:00:28.6	65.4	57.1
Aircraft	13/11/2019 10:57	0:00:35	60.4	55.9
HGV Hook up (2)		0:00:07	54.1	50.1
HGV Hook up	13/11/2019 01:51	0:00:04	53.8	50.3
HGV Hook up	13/11/2019 01:51	0:00:03	54.1	49.7