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ENVIRONMENT

Avant Homes (England) Ltd and
Pennine Property Partnership

Former St. Luke's Hospital,
Huddersfield

Noise Impact Assessment

LDP2217

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Former St. Luke's Hospital, Huddersfield

Noise Impact Assessment

Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Cambridge
14-16 High Street, Histon, Cambridge
CB24 9JD
T: 01223 235 173

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
4th Floor Carvers Warehouse, 77 Dale Street
Manchester, M1 2HG
T: 0161 233 4260

Market Harborough
12a Woodcock House, Compass Point Market Harborough, Leicestershire, LE16 9HW
T: 01858 455020

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

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1	28/08/2018	Draft	Lucy Elmer BA (Hons), MSc, AMIOA	Mike Barrett BSc (Hons), PGDip, MIOA	Mike Barrett BSc (Hons), PGDip, MIOA / Jim MacQueen BA (Hons)
2	29/08/2018	Draft	Lucy Elmer BA (Hons), MSc, AMIOA	Mike Barrett BSc (Hons), PGDip, MIOA	Mike Barrett BSc (Hons), PGDip, MIOA / Jim MacQueen BA (Hons)

Notice

EXECUTIVE SUMMARY

This noise assessment has been produced to support a reserved matters application for a proposed residential development at Land at the former St. Luke's Hospital, Huddersfield.

The existing noise environment is dominated by road traffic on the surrounding road network.

A baseline noise survey was undertaken at the Site in June 2014. The results of the survey, and subsequent assessment work, have been assessed in accordance with current standards and guidance.

The assessment shows that, with appropriate consideration to noise mitigation measures, including the provision of appropriate glazing and ventilation to the façades facing directly onto Blackmoorfoot Road, Nabcroft Lane, and the proposed access road, an appropriate level of protection could be afforded to future noise sensitive receptors on the Site.

For proposed dwellings located closest to Blackmoorfoot Road, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27dB. Standard trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 29 dB would be required.

For the proposed dwellings located closest to Nabcroft Lane, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum Rw + Ctr of 27dB. Acoustic trickle ventilators, which achieve a minimum performance of Dn,e,w + Ctr 35dB would be required.

For dwellings set further back from Nabcroft Lane, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum Rw + Ctr of 27dB. Standard trickle ventilators, which achieve a minimum performance of Dn,e,w + Ctr 29dB would be required.

For rooms with no angle of view onto the roads, it is likely that internal noise levels will be achieved with open windows.

A 2.5m high barrier is required between the proposed access road and existing dwellings on Chapel Terrace, to ensure that noise from vehicles on the access road do not cause a significant impact at existing sensitive receptors.

Based on the results of the assessment, it has been demonstrated that the Site is suitable for residential development. It is therefore considered that noise need not be a determining factor in the granting of full planning approval for the Proposed Development.

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1. INTRODUCTION

Appointment & Background

1.1 BWB Consulting Ltd was appointed by Avant Homes (England) Ltd and Pennine Property Partnership to undertake an environmental noise assessment for a proposed residential development at Land at the former St. Luke's Hospital, Huddersfield. The assessment supports the following applications on the named development:

1. Reserved Matters Application for the residential development of 200 dwellings in pursuant of application Ref 2016/91337; and

2. Full application for the residential development of 26 dwellings and onsite open space.

1.2 This assessment has been undertaken based on the results of a baseline noise survey on the Site. The results of the survey have been assessed in accordance with current standards and guidance.

1.3 Where appropriate, consideration has been given to noise mitigation measures to demonstrate how an appropriate level of protection could be afforded to future and existing noise sensitive receptors on the Site.

1.4 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Setting

1.5 The proposed development site is located to the south west of Huddersfield, and currently comprises derelict land, and is the site of the former St. Luke's Hospital. To the north east, the site is bordered by existing residential dwellings off Chapel Terrace, with Nabcroft Lane beyond. To the south east, the site is bordered by Nabcroft Lane with existing dwellings off Nabcroft Lane and an industrial estate beyond. To the south, the site is bordered by Sunningdale Road with existing residential dwellings beyond. To the south west, the site is bordered by Oak CE(VC) Primary School and associated outdoor space. To the north west, the site is bordered by existing residential dwellings, with Blackmoorfoot Road beyond.

1.6 **Figure 1.1** shows the Site location.

Figure 1.1: Site Location Plan

1.7 It is understood that the site has outline planning consent for up to 200 residential dwellings; retail units (A1); accommodation for potential neighbourhood uses (A2/D1/D2/sui generis); restaurant/public house (A3/A4); and petrol filling station (sui generis) which was granted in December 2015 (Ref 2014/60/93099/W).

Proposed Development

1.8 The proposed development will comprise the construction of up to 226 residential dwellings and associated infrastructure. The proposed commercial elements are the subject of a separate planning application, and as such are not considered as part of the following assessment.

1.9 A planning layout is shown below in **Figure 1.2.**

Figure 1.2: Planning Layout

2. STANDARDS AND GUIDANCE

National Planning Policy Framework (NPPF)

2.1 Published in July 2018, this document sets out the Government's planning policies for England and supersedes the previous NPPF published in 2012. It makes the following reference to noise in the section entitled *Conserving and enhancing the natural environment*:

"170. 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."

2.2 It also makes the following references to noise in the Section entitled *Ground conditions and pollution*:

"180. 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[60];

> b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

[60] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

BS 8233:2014: Guidance On Sound Insulation and Noise Reduction for Buildings

2.3 This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

2.4 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is

desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2.1** below:

Table 2.1: Summary of Internal Ambient Noise Levels to be achieved in Habitable Rooms when Assessed in Accordance with BS 8233

Activity	Location	Period	
		07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night-time
Resting	Living Room	35 dB $L_{Aeq, 16\ Hour}$	-
Dining	Dining Room/area	40 dB $L_{Aeq, 16\ Hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\ Hour}$	30 dB $L_{Aeq, 8\ Hour}$

2.5 Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: *Guidelines for Community Noise* below.

2.6 With respect to external amenity space such as gardens and patios it is stated that it is desirable that the 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. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

World Health Organisation (WHO) 1999: Guidelines for Community Noise

2.7 As with the 'good' and 'reasonable' criteria in BS8233, the L_{AFmax} criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance: 1999: *Guidelines for community noise*. This document draws upon guidance from Vallet and Vernay, which states:

> "For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"

The Design Manual for Roads and Bridges (DMRB): Volume 11: Environmental Assessment

2.8 Section 3 Part 7 of this document is pertinent to noise and vibration and was first published by the Department of Transport in 1993 with subsequent amendments, the latest of which is November 2011 (reference HD213/11 Revision 1). This document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic. In particular, Section 3 Part 7 describes a method for assessing the severity of a noise impact, in terms of the number of people who will be bothered by any noise increases/decreases due to a new road scheme. When undertaking a DMRB assessment, the methodology contained within the

Department for Transport 1988 document Calculation of Road Traffic Noise (CRTN) should be used to calculate levels of road traffic noise.

2.9 Although the DMRB strictly applies to new road schemes, the principles of the approach contained within the document can also be applied to the assessment of noise from road traffic in general. The Proposed Development has the potential to affect road traffic noise levels along existing roads, hence there is a need for such an assessment.

2.10 The DMRB assessment methodology suggests that the magnitude of noise changes from a project should be classified into levels of impact. Section 3 Part 7 considers how the magnitude of change can be affected by whether a noise level change occurs in the short term (e.g. as a result of a sudden opening of a scheme), or in the long term (e.g. gradually over time, such as that associated with natural traffic growth).

2.11 The example classification scale for short term changes, which is the most stringent is presented below:

Table 2.2: Classification of Magnitude of Noise Changes in the Short Term

Noise Change, $L_{A10, 18h}$, dB	Magnitude of Change
0	No Change
0.1 to 0.9	Negligible
1.0 to 2.9	Minor / Low
3.0 to 4.9	Moderate / Medium
5.0+	Major / High

In accordance with DMRB, the magnitude of impact is assessed against the criteria found in **Table 2.3** below.

Table 2.3: Magnitude of Noise Impacts

Magnitude of Impact	Magnitude of Change
High	≥ 5
Medium	3 to <5
Low	1 to <3
Very Low	<1

Consultation with Kirklees Council

2.12 Consultation was undertaken with Mr. Richard Hume, Environmental Health Officer at Kirklees Council (KC), to agree that the noise levels measured during the baseline noise survey to support the outline planning application can be used as a basis for the

following noise assessment. Mr. Hume replied via email on 17th August 2018 to confirm the approach.

2.13 In addition, a number of issues were raised regarding the development generated road traffic assessment undertaken to support the original outline planning application. Mr. Hume stated that he understood that the majority of the points raised were previously resolved. However, Mr. Hume asked that any new noise assessment addressed the issues raised.

2.14 The comments provided by Kirklees Council regarding the previous noise assessment, relate mainly to the development generated traffic assessment undertaken for Blackmoorfoot Road and Nabcroft Lane, where the indicative masterplan at the time showed the site access being taken from Blackmoorfoot Road and Nabcroft Lane. However, the planning layout has since been revised and the site access will now be taken from Blackmoorfoot Road only. Updated traffic data has been provided by the Transport Consultant reflecting this, and therefore a reassessment of the potential noise impact from development generated road traffic at existing and proposed noise sensitive receptors has been considered. This should address the issues initially raised by Kirklees Council, and meet their requirements.

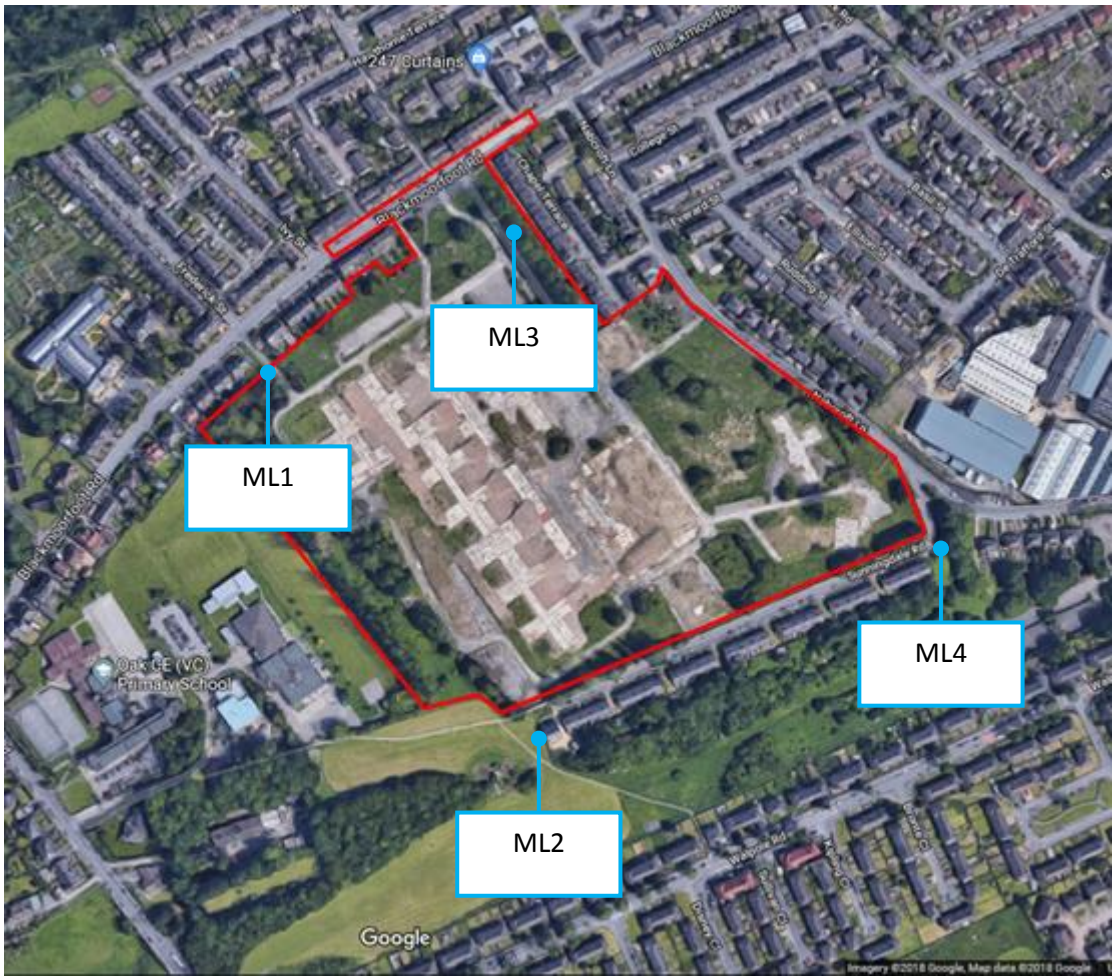
3. BASELINE NOISE MONITORING

3.1 In agreement with KC, the results of the baseline noise survey, undertaken to support the outline planning application for the site, are to be used as a basis for the following assessment.

Noise Monitoring Locations

3.2 A baseline noise survey was undertaken in June 2014. During the survey, noise monitoring was undertaken at four Monitoring Locations (MLs). The MLs are shown in **Figure 3.1**. All noise levels were measured at a height of 1.8m above ground level and in free-field conditions.

Figure 3.1-Noise Monitoring Locations



3.3 It is considered that the dominant source of noise across the proposed development site is road traffic on the surrounding road network. Therefore, noise levels measured at ML1 and ML4 have been used in the following assessment as they are closest to the local road network. The noise levels measured at ML3 have been used to inform the assessment of development generated road traffic at existing receptors in the vicinity of the proposed access road.

ML1

3.4 ML1 was at the rear gardens of the nearest residential properties on Blackmoorfoot Road. Noise monitoring was undertaken to cover a 24-hour period between 5th and 6th June 2014.

Site observations indicate that road traffic is the dominant source of noise at ML1 throughout the daytime and night-time periods.

ML3

3.5 ML3 is considered representative of existing dwellings on Chapel Terrace. Short term noise monitoring was undertaken during the daytime and night-time periods on 5th and 6th June. The noise levels measured during the daytime on 5th June have been discarded as it is understood that they were affected by nearby construction noise.

ML4

3.6 ML4 was on Sunningdale Road and is considered as being representative of proposed dwellings closest to Nabcroft Lane. Short-term noise monitoring was undertaken during the evening (2240-2300 hours), night-time (2300-2325 hours) and daytime (1050-1135 hours) on 5th and 6th June 2014.

3.7 The noise climate at ML4 is characterised by road traffic on the local road network.

Equipment

3.8 Noise measurements were carried out using two Larson Davis 824 sound analysers and a Larson Davis CAL200 calibrator. No significant drift in the calibrated noise level was observed.

Meteorological Conditions

3.9 The weather during the survey consisted of dry and sunny conditions with a light north-westerly breeze at the start of the survey, and a light south-westerly breeze at the end of the measurement period.

Survey Results

3.10 The survey results, and representative noise levels are summarised in **Tables 3.1 to 3.2** below.

Table 3.1: Representative daytime and night-time noise levels at ML1

Period	Sound Pressure Levels		
	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
Daytime (07:00hrs – 23:00hrs)	57	49	-
Night Time (23:00hrs – 07:00hrs)	50	42	67

Table 3.2: Summary of daytime and night-time noise levels at ML3 and ML4

ML	Period	Sound Pressure Levels		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
ML3	2340-2355	55	41	67
	2355-0010	54	40	63
	0010-0025	53	40	66
	1000-1015	60	47	80
	1015-1030	58	47	71
	1030-1045	57	45	69
ML4	2240-2255	47	39	62
	2255-2310	42	38	55
	2310-2325	47	39	65
	1050-1105	48	44	-
	1105-1120	50	44	-
	1120-1135	48	44	-

4. ASSESSMENT

4.1 The results of the baseline noise survey, undertaken in June 2014, have been used as a basis for the noise assessment of the Site's suitability for residential development. The assessment considers noise from the surrounding road network on proposed receptors and development generated road traffic on proposed and existing sensitive receptors.

Noise Model

4.2 A detailed noise model has been generated in order to calculate the daytime and night-time noise propagation across the site from Blackmoorfoot Road. The following prediction methodologies were adopted for the modelling exercise;

- The noise model was set up to apply the noise prediction methodology set out in the 1988 Department of Transport and the Welsh Office document Calculation of Road Traffic Noise for road traffic noise sources;
- The noise data collected at ML1 was used to calibrate the road traffic noise from Blackmoorfoot Road;
- Mapping of the Site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points;
- Indicative ground topography was approximated using OS 2m LIDAR information freely available online;
- Off-site buildings which would provide screening to the Site have been incorporated as reflective façades;
- To reflect the local ground cover, ground absorption was set to G = 0.5 (50% acoustically absorptive ground); and
- The model was set to include second order reflected noise from solid structures.

4.3 ML1 has been included into the model and the resultant road traffic noise has been adjusted until the model is equal to the noise levels at ML1 for the daytime and night-time periods.

Noise from road traffic on Blackmoorfoot Road

4.4 ML1 is considered representative of the free-field noise levels incident on the proposed building façades closest to Blackmoorfoot Road. The measured noise levels have been used in the following assessment of noise from road traffic on Blackmoorfoot Road.

External Daytime Noise Levels

4.5 The measured daytime noise level at ML1, in the northern part of the site is 57dB $L_{Aeq,16h}$. This level is marginally above the upper guideline value of 55dB $L_{Aeq,T}$ as recommended in BS8233 and WHO guidance. Therefore, mitigation will be required to reduce noise levels in outdoor living areas located closest to Blackmoorfoot Road in the northern part of the site.

Internal Noise Levels

4.6 To assess the internal daytime and night-time noise levels, the measured noise levels from ML1 have been used for proposed dwellings located closest to Blackmoorfoot Road. For the daytime period, a free-field measured level of 57dB $L_{Aeq,16h}$ has been used.

For the night-time period, the measured level of 50dB $L_{Aeq,8h}$, and the measured night-time L_{AFmax} level of 67dB have been used.

4.7 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 42dB $L_{Aeq,16h}$ and 35dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 52dB L_{AFmax} during the night-time. This will exceed the criteria of 35dB for the daytime and 30dB and 45dB for the night-time, assuming partially opened windows.

Noise from road traffic on Nabcroft Lane

4.8 ML4 is considered representative of the free-field noise levels in the eastern part of the site, near to Nabcroft Lane.

4.9 To account for the difference between ML4 and the nearest proposed dwellings to Nabcroft Lane, a line source distance attenuation correction, which does not take into account any ground absorption, has been undertaken to correct the measured $L_{Aeq,T}$ noise levels. To correct the $L_{AF,max}$ levels, a point source distance attenuation correction has been used.

4.10 The corrected daytime and night-time noise levels have been used in the assessment of noise from Nabcroft Lane at proposed dwellings in the eastern and south eastern part of the site.

External Daytime Noise Levels

4.11 The corrected noise level at ML4, in the eastern part of the site is 53dB $L_{Aeq,16h}$. This is below the upper guideline value of 55dB, $L_{Aeq,T}$ as recommended in BS8233 and WHO guidance. Furthermore, the planning layout, shown in **Figure 1.2** shows boundary mitigation for gardens that have a direct line of sight to Nabcroft Lane, with the majority of garden areas located on the screened side of dwellings. Therefore, the noise levels in garden areas is likely to be less than those stated above.

Internal Noise Levels

4.12 To assess the internal daytime and night-time noise levels, the measured noise levels from ML4 have been used for proposed dwellings located closest to Nabcroft Lane. For the daytime period, a corrected level of 53dB $L_{Aeq,16h}$ has been used. For the night-time period, the corrected level of 51dB $L_{Aeq,8h}$, and the corrected night-time L_{AFmax} level of 73dB have been used.

4.13 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 38dB $L_{Aeq,16h}$ and 36dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 58dB L_{AFmax} during the night-time. This will exceed the criteria of 35dB for the daytime and 30dB and 45dB for the night-time, assuming partially opened windows. Consideration has been given to mitigation in Section 5.

Development generated road traffic

4.14 An increase in road traffic due to the proposed development has the potential to increase the noise levels at proposed sensitive receptors (PSRs) and existing sensitive receptors (ESRs) in the vicinity of the Site.

4.15 The basic noise level (BNL), as referenced in Calculation of Road Traffic Noise (CRTN), has been calculated for Blackmoorfoot Road, to predict the change in noise level between 2023 future year without the development, including committed developments, and 2023 future year with development including committed developments.

4.16 The results of the traffic assessment have been used as the basis for determining the change in road traffic noise levels that would result from development generated traffic.

4.17 Road traffic noise calculations have been carried out in accordance with CRTN, and have been undertaken for a notional receptor location 10m from the edge of the carriageway of Blackmoorfoot Road, and 1.5m above ground level. A notional receptor has been used because the change in traffic noise level adjacent to any given road will be the same at all distances where noise from that route is dominant. Traffic noise calculations have been undertaken to establish the change in the weekday daytime noise level.

4.18 To quantify short term effects, calculations have been undertaken for the future year 2023 both with and without the proposed development. Road traffic speeds have been applied based on the speed limits applicable to each link. The traffic data supplied has included for other committed developments for the assessment year. The results are presented in **Table 4.1**.

Table 4.1: Development generated road traffic noise assessment, dB(A)

Road Link	2023 no development BNL	2023 with development BNL	Increase in noise due to the Proposed Development
Blackmoorfoot Road (East of access)	68.5	68.8	+0.3
Blackmoorfoot Road (West of access)	68.2	68.2	0

4.19 The predicted increase in noise level is less than 1dB. In accordance with DMRB, there is predicted to be a negligible effect as a result of the additional road traffic at existing sensitive receptor on Blackmoorfoot Road.

4.20 It is considered that there will therefore be no significant impact on existing receptors off Blackmoorfoot Road from development generated road traffic noise based on this assessment and no further consideration of mitigation is warranted at this stage.

Proposed Access Road

4.21 The site access has been included within the detailed noise model, to predict the noise levels in the vicinity of existing and proposed sensitive receptors. The results of the noise model predict a noise level of 57dB $L_{A10,18h}$ at the façade of the nearest dwellings off Chapel Terrance. Using the following equation, found in BS8233, the daytime $L_{Aeq,16h}$ can be calculated.

$L_{Aeq\text{-}16h} = L_{A10,18h} - 2$

4.22 The night-time $L_{Aeq,8h}$ can be calculated using the following equation, in accordance with the methodology found within the Transport Research Laboratory (TRL) document 'Method for converting the UK road traffic noise index $L_{A10,18h}$ to the EU noise indices for road noise mapping'.

$L_{night} = 0.9 \times L_{A10,18h} – 3.77$ dB

4.23 This results in a daytime level of 55dB $L_{Aeq,16hr}$ at the façade of the nearest dwellings off Chapel Terrace. Measurements undertaken at ML3 indicate that the existing noise level at these dwellings is 57dB L_{Aeq}. Therefore, there is likely to be an increase of 2dB at existing dwellings off Chapel Terrace due to noise from road traffic on the proposed access road. In accordance with DMRB this will cause a low impact as a result of the additional road traffic. A low impact would not usually be justification for mitigation measures. However, the resultant noise level in external living areas from noise from the proposed access road, is likely to result in some dwellings experiencing levels in excess of the upper guideline value of 55dB, where in the past the level will have been below this. Therefore, it is appropriate to consider mitigation. Consideration has been given to mitigation in Section 5.

4.24 The predicted noise level at the façade of the nearest proposed dwelling is 56dB $L_{Aeq,16h}$ during the daytime and 48dB $L_{Aeq,8h}$ during the night-time. Assuming a 15dB loss through a partially opened window, this would result in internal levels of 41dB $L_{Aeq,16hr}$ and 33dB $L_{Aeq,8h}$ during the night-time. This will exceed the criteria of 35dB for the daytime and 30dB for the night-time, assuming partially opened windows. Therefore, consideration has been given to mitigation in section 5.

Proposed Commercial Premises

4.25 It is understood that the outline application, from which the site benefits, included both residential and commercial elements. It is understood that the commercial element of the proposals is subject to a separate planning application and is not being considered as part of this application. The decision notice associated with the outline planning application contained a number of Planning Conditions relating to the commercial elements of the proposals. These were included to protect the amenity of existing and proposed residential dwellings.

4.26 The Planning Conditions related specifically to the delivery hours and operating times of the commercial premises and the rating levels to be achieved by any proposed plant. In addition, Planning Condition 15 relates to the installation of acoustic barriers, which must be installed prior to the commercial premises becoming occupied. It is therefore considered that, providing the Planning Conditions are enforced and discharged as appropriate, noise from the commercial premises will not have a detrimental impact on

the proposed residential dwellings, and does not need to be considered further within this assessment.

5. MITIGATION

5.1 In Section 4, it has been determined that consideration should be given to mitigation measures for external and internal habitable areas of the Proposed Development to provide a commensurate level of protection against road traffic for future occupants.

Road Traffic Noise – Blackmoorfoot Road

External Daytime Noise Levels

5.2 Noise levels in outdoor living areas located closest to, and with a direct line of sight to Blackmoorfoot Road are predicted to exceed the recommended guideline noise level. Therefore, mitigation is required to reduce noise levels from road traffic to within acceptable levels as recommended in BS8233 and WHO.

5.3 The planning layout, shown in **Figure 1.2**, shows the locations of proposed acoustic barriers which vary in height between 1.5 metres and 1.8 metres. The proposed site layout, shown in **Figure 1.2**, has been incorporated into the noise model. The proposed barriers have been included in the model, at these locations and heights. Noise contours have been calculated showing the daytime, external, free-field 16-hour noise level in external areas at 1.5m above local ground, for dwellings located closest to Blackmoorfoot Road. The results of the noise modelling show that noise levels in outdoor living areas will be below the desirable guideline value as detailed in BS8233 and WHO guidance, with the proposed mitigation in place. The noise contour plan, showing the external noise levels with the proposed garden fences in place, is shown in **Appendix B1**.

5.4 It is understood that there is an existing wall that runs along the boundary between the proposed development site and the existing dwellings off Blackmoorfoot Road. This wall has not been included within the model, as the height is not known. However, if this wall is above 1.5m in height, it is likely that the noise levels in outdoor living areas will be less than those shown in **Appendix B1**.

5.5 Any acoustic fence should have a minimum surface density of 15kg/m^2 and form a continuous unbroken barrier with no gaps at the bottom. This could be achieved with a suitably designed close boarded timber fence, meeting this minimum specification.

5.6 It is considered that for proposed garden areas further into the site, the mitigation requirements will be less than those stated above, as garden areas will be located at a greater distance from Blackmoorfoot Road and will be acoustically screened by the development itself. The guideline noise levels in these gardens is likely to be achieved without any mitigation in place.

Internal Living Areas

5.7 It is widely considered that first amelioration measure available to an occupant will be to close windows. Therefore, in order to assess the noise mitigation required to ensure an adequate level of protection against noise, it is appropriate to explore in the first instance the protection that could be afforded by the sound insulation performance of the external building fabric, and in particular the glazing elements.

5.8 Detailed noise break-in calculations have been undertaken in accordance with the rigorous method from section G.2 from BS 8233 based on the frequency spectra measured on-site and the following dimension:

- Room dimensions of 3m (width) x 4.4m (depth) x 3m (height);
- Double glazed window dimensions of 1.0m (width) x 2.5m (height);
- A reverberation time of 0.5 seconds; and,
- 1No. ventilator per habitable room.

5.9 To achieve the daytime internal noise criterion of 35dB $L_{Aeq,16h}$ adopted for this assessment, based on the façade closest to Blackmoorfoot Road experiencing 57dB $L_{Aeq,16h}$ free-field at the facade, a reduction of 22dB(A) would be required for habitable rooms. To achieve the internal criteria of 30dB $L_{Aeq,8h}$ and 45dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 22dB(A) would be required for habitable rooms.

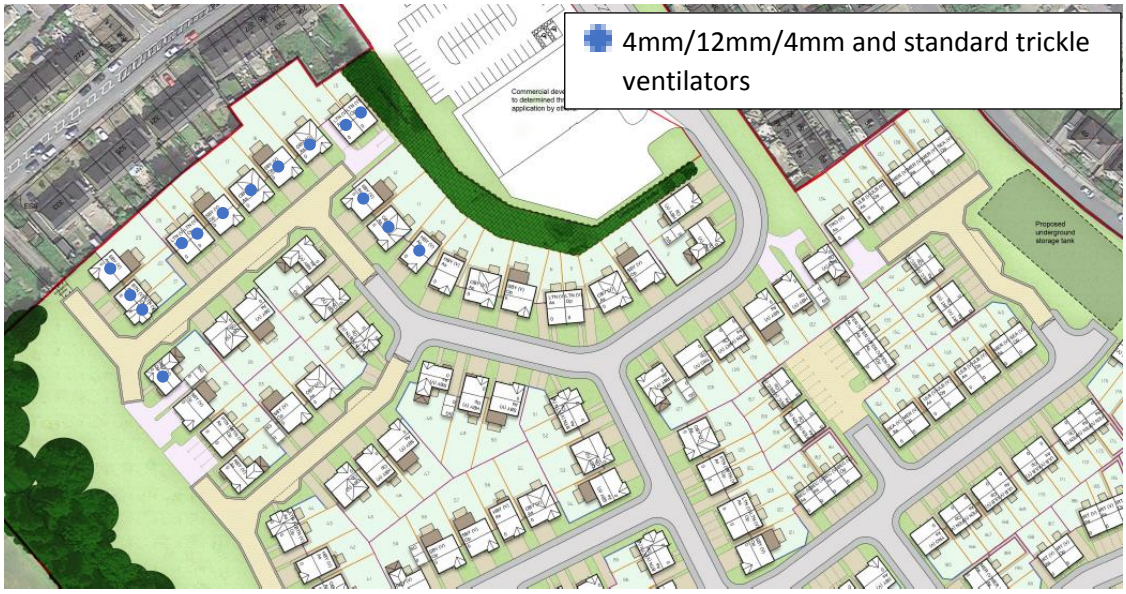
5.10 For the proposed dwellings located closest to Blackmoorfoot Road, all criteria would be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27dB. Standard trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 29dB would be required, such as the Greenwood 8000HD vent.

5.11 For dwellings which do not have a direct line of sight to the road, all criteria should be achieved with standard double glazing and partially open windows.

5.12 The above presents solutions to satisfy the proposed internal ambient noise limits within habitable rooms during normal ventilation conditions to meet Part F minimum ventilation.

5.13 **Figure 5.1** shows the proposed dwellings which would require uprated ventilation to reduce noise from road traffic.

Figure 5.1 – Dwellings requiring specific glazing and ventilation



Road Traffic Noise – Nabcroft Lane

Internal Living Areas

5.14 To achieve the daytime internal noise criterion of 35dB $L_{Aeq,16h}$ adopted for this assessment, based on the façade closest to Nabcroft Lane experiencing 53dB $L_{Aeq,16h}$ free-field at the facade, a reduction of 18dB(A) would be required for habitable rooms. To achieve the internal criteria of 30dB $L_{Aeq,8h}$ and 45dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 28dB(A) would be required for habitable rooms.

5.15 For the proposed dwellings located closest to Nabcroft Lane, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35dB would be required.

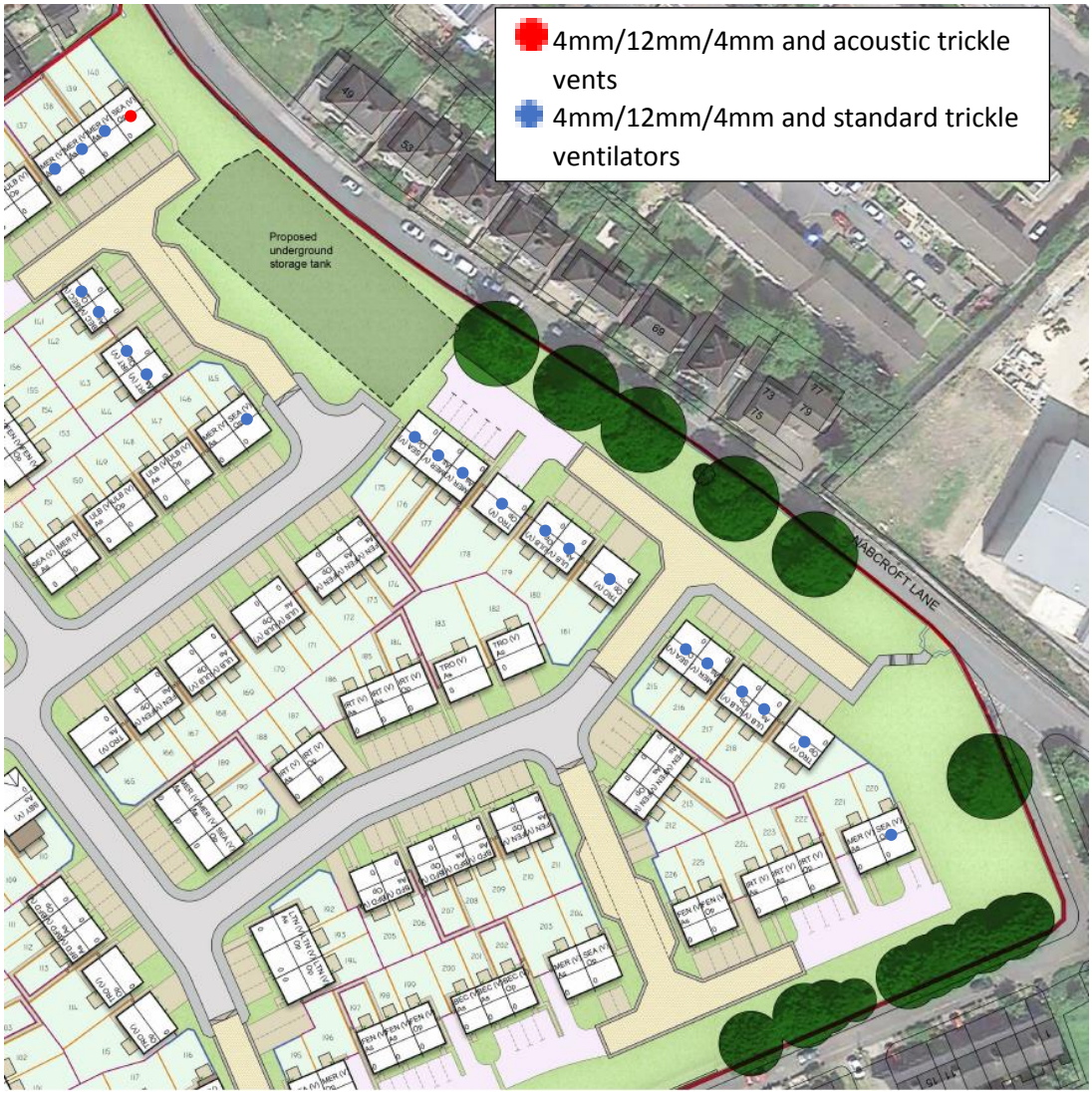
5.16 For dwellings set further back from Nabcroft Lane, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27dB. Standard trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 29dB would be required, such as the Greenwood 8000HD vent.

5.17 For dwelling that do not have a direct line of sight to the road, all criteria should be achieved with standard double glazing and partially open windows.

5.18 The above presents solutions to satisfy the proposed internal ambient noise limits within habitable rooms during normal ventilation conditions to meet Part F minimum ventilation.

5.19 **Figure 5.2** shows the proposed dwellings which would require uprated ventilation to reduce noise from road traffic.

Figure 5.2 – Dwellings requiring specific glazing and ventilation



Development generated road traffic

Existing Dwellings

5.20 The assessment of the potential noise impact from development generated road traffic on Blackmoorfoot Road indicates that the increase in noise level will be less than 1dB. This equates to a negligible effect and therefore further mitigation is not considered warranted.

5.21 The assessment of noise from the proposed access route shows a predicted increase of 2dB at existing receptors off Chapel Terrace. The resultant noise level in external living areas from noise from the proposed access road, is likely to result in some dwellings experiencing levels in excess of the upper guideline value of 55dB, where in the past the level will have been below this. Therefore, it is appropriate to consider mitigation.

5.22 Installing a 2m high barrier between the proposed access road and the existing dwellings off Chapel Terrace will reduce noise in garden areas from road traffic on the

access road to below the 'desirable' guideline noise level as recommended by BS8233. Furthermore, the predicted internal noise level at the existing dwellings will be below the recommended guideline levels with windows partially open. Therefore, it is considered with mitigation in place, the impact from development generated road traffic will be negligible.

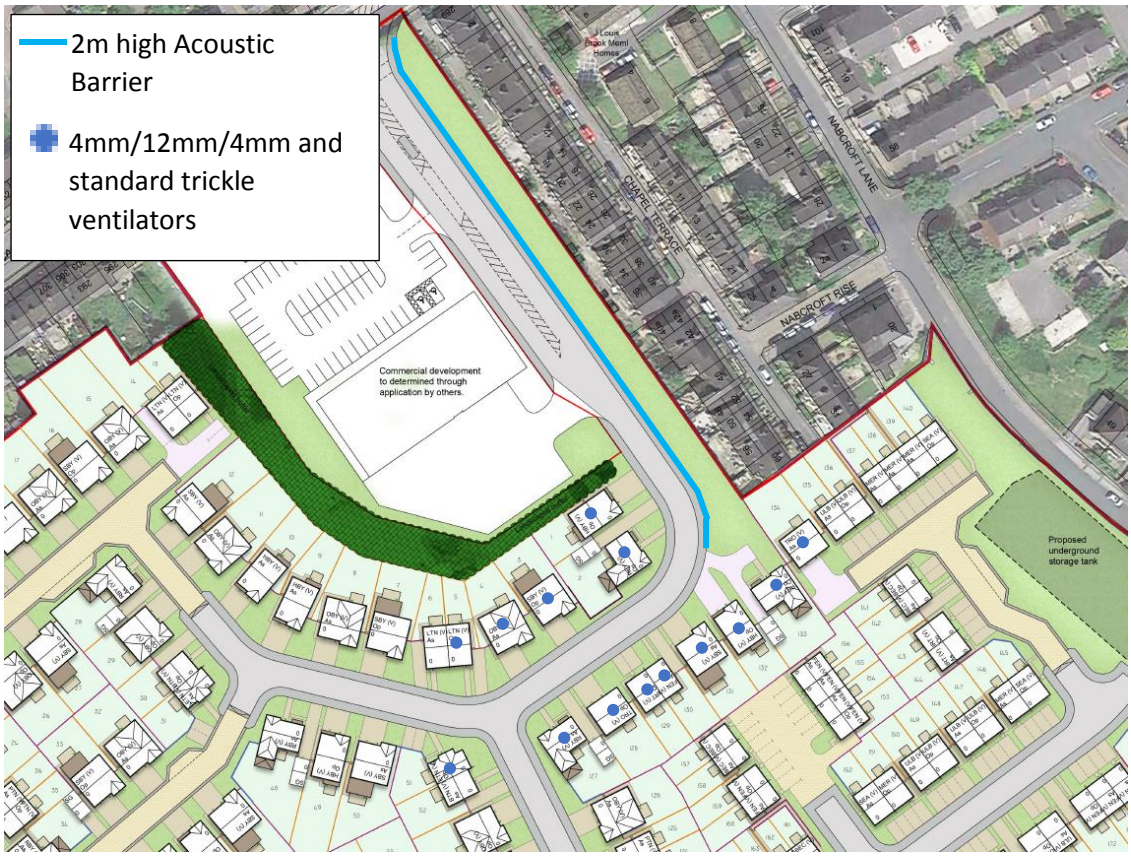
5.23 The location of the acoustic barrier is shown in **Figure 5.3**. Any fence should have a minimum surface density of 15kg/m^2 and form a continuous unbroken barrier with no gaps at the bottom. This could be achieved with a suitably designed close boarded timber fence, meeting this minimum specification.

Proposed Dwellings

5.24 It is also considered that mitigation will be required for proposed dwellings located closest to the access road. The planning layout, shown in **Figure 1.2**, shows garden areas located on the screened side of dwellings, and proposed barriers around garden areas, which vary in height between 1.5 metres and 1.8 metres. Therefore, it is considered that guideline noise levels in garden areas will be achieved.

5.25 For dwellings located closest to the access road, all criteria should be achieved with standard thermal double glazing such as a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27dB. Standard trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 29dB would be required, such as the Greenwood 8000HD vent.

Figure 5.3 – Location of acoustic barrier and dwellings requiring specific glazing and ventilation



6. CONCLUSION AND RECOMMENDATIONS

6.1 BWB Consulting Ltd was appointed by Avant Homes (England) Ltd and Pennine Property Partnership to undertake an environmental noise assessment for a proposed residential development at Land at the former St. Lukes Hospital, Huddersfield.

6.2 This assessment has been undertaken based on the results of a baseline noise survey on the Site. The results of the survey have been assessed in accordance with current standards and guidance.

6.3 The noise assessment shows that with appropriate consideration to noise mitigation measures, a commensurate level of protection can be afforded to future noise sensitive receptors on the site.

6.4 Based on the results of the assessment, it has been demonstrated that the Site is suitable for residential development. It is therefore considered that noise need not be a determining factor in the granting of planning permission for the proposed development.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

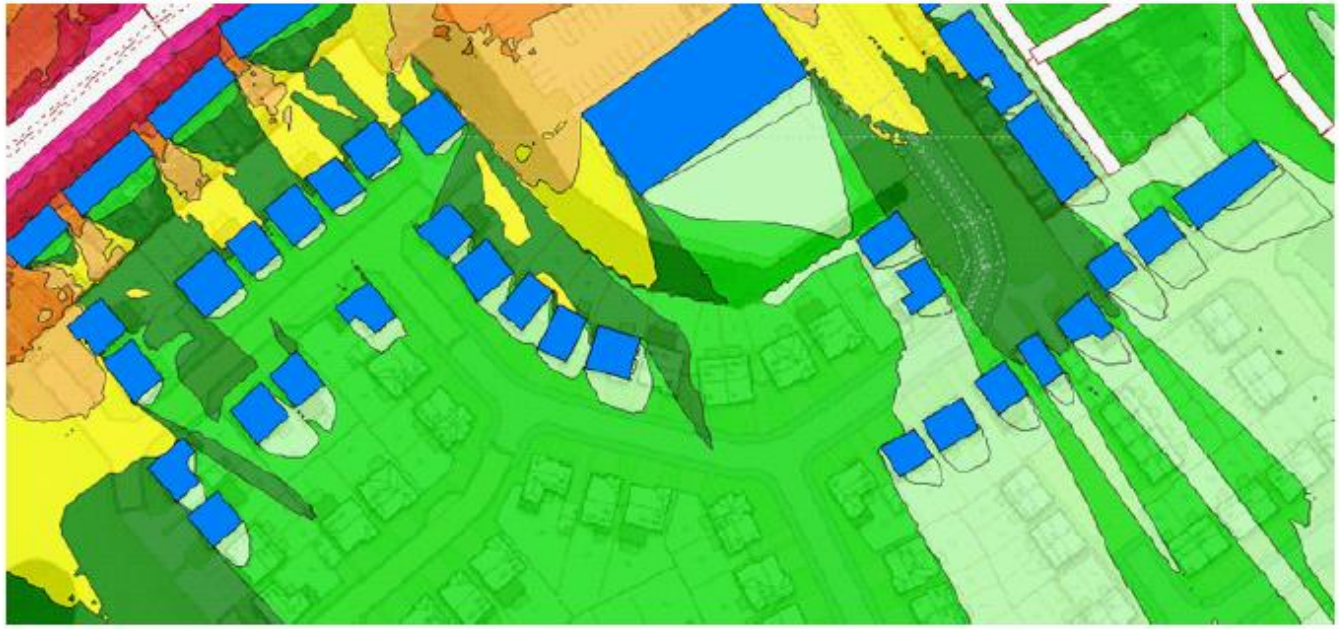
The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

PPENDIX B: Noise Contour Plot



Key

- ... < 35
- 35 <= ... < 40
- 40 <= ... < 45
- 45 <= ... < 50
- 50 <= ... < 55
- 55 <= ... < 60
- 60 <= ... < 65
- 65 <= ... < 70
- 70 <= ... < 75
- 75 <= ... < 80
- 80 <= ... < 85

Drawing Number:
LDP2217/182308/LAE

Figure B1
Title: Daytime $L_{Aeq,16h}$ Noise Contours, dB(A), 1.5m above local ground

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