College Farm, Shortstown, Bedford

Preliminary Noise & Vibration Assessment

February 2020

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Client Name: Gallagher Developments Group Ltd
Document Reference: WIE15761-104-R-1.1.3
Project Number: WIE15761

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

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Comments

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1. Introduction

Waterman Infrastructure & Environment Ltd (hereafter Waterman) has been commissioned to undertake a preliminary noise and vibration assessment of the suitability of land, referred to as College Farm, Shortstown (hereafter the Site), for residential development and to identify potential constraints and opportunities to development. The Site is located within the administrative boundary of Bedford Borough Council (BBC) and has been designated for residential use within the council's Local Plan.

This preliminary noise and vibration assessment is desk based, the findings of which will be incorporated into the 'Vision Document' being produced by Barton Wilmore (Planning Consultant).

A glossary of the acoustic terminology used within this report is presented as **Appendix A**.

1.1 Noise & Vibration Considerations

From study of aerial imagery and Extrium noise maps, the dominant noise source incident on the Site is road traffic noise from the A421 to the north and the A600 to the east. It is noise from these sources which pose potential constraint to development. Consideration has also been given to noise emissions from occasional use of the Cardington Air Shed (The Sheds), which have extant planning permission allowing for industrial (B2/B8) and film making use, which Waterman have assessed for three residential development proximate to The Sheds; namely eastern, southeastern and western land parcels.

2. Planning Policy & Guidance

The principle guidance documents within England regarding planning noise and vibration are the National Planning Policy Framework (NPPF)[1], the Noise Policy Statement for England (NPSE)[2] and Noise Planning Practice Guidance (NPPG)[3].

The NPPF was revised and published 19th February 2019. With regard to noise the NPPF still promotes '*good design*' as part of '*sustainable development*' and advocates '*preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of …….noise pollution…*'

Paragraph 180 of NPPF states '*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

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

Paragraph 182 of the NPPF introduces the '*Agent of change principle*'. '*Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*'

The NPPF reflects advice within NPSE in that they promote the avoidance of significant adverse impacts and reduction of other adverse impacts on health and quality of life; set within the context of the Government's policy on sustainable development.

None of these planning documents provide specific noise criteria with regard to planning, noise and vibration.

2.1 Residential Amenity - Noise

With regard to residential amenity and noise, the most relevant and credited guidance covering desirable levels of environmental noise for indoor and outdoor environments are the World Health Organisation (WHO), 1999 'Guidelines for Community Noise'[4], 2009 WHO 'Night Noise Guidelines for Europe[5]', BS 8233:2014[6] and ProPG 2017[7]. These documents set out guideline internal and external noise limits which should be met by all residential developments to ensure the critical effects of noise on sleep, annoyance and speech interference are guarded against. Further to this, ProPG advocates a holistic approach with good acoustic design being a key consideration which is not just reliant on achieving the required guideline noise limits.

In 2018 WHO published 'Environmental Noise Guidelines for the European Region[8], which provides advice based on the health effects of noise taking account of research done since the publishing of Guidelines for

[1] Department for Communities and Local Government (DCLG) (2019); '*The National Planning Policy Framework'*, TSO.
[2] Department for Environment, Food and Rural Affairs (DEFRA) (2010); '*Noise Policy Statement for England*', DEFRA.
[3] DCLG (2014); '*Planning Practice Guidance website*', DCLG. (http://planningguidance.planningportal.gov.uk/)
[4] World Health Organisation (WHO) (1999); '*Guidelines for Community Noise'*, WHO, Geneva.
[5] World Health Organisation (WHO) (20099); '*Night Noise Guidelines for Europe''*, WHO
[6] BSI (2014) BS8233 '*Guidance on sound insulation and noise reduction in buildings'*. BSI.
[7] ProPG: (May 2017); Professional Practice Guidance on Planning & Noise. New Residential Development.
[8] WHO. (2018); '*Environmental Noise Guidelines for the European Region'. WHO.*

Community Noise and Night Noise Guideline for Europe. It recommends environmental noise guideline values based on individual transportation sources (road, rail and air) in terms of the L_{den} and L_{night} parameters. Although the 2018 WHO Environmental Noise Guidelines for the European Region supersedes the WHO's Guidelines for Community Noise and compliments WHO's Night Noise Guidelines for Europe, it recommends that all the indoor guideline values within Guidelines for Community Noise should remain valid. Notwithstanding this, the latest WHO guidance on external noise levels is yet to be transported into UK standards, policy or guidance.

Table 1 presents a summary of guideline values currently used in the assessment of residential amenity in England, drawn from BS8233:2014 and ProPG.

Table 1: Summary of Recommended Noise Levels – Residential Amenity (ProPG)

Activity	Location	Noise Level	
		Day time	Night-time
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedrooms	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$ 45 dB $L_{Amax,F}$ (note 1)
Relaxing, Enjoyment	Private gardens	50-55dB $L_{Aeq,16h}$	-

Note: Not to be exceeded for more than 10 times within the night-time period.

When considering external amenity spaces such as gardens, balconies and terraces, the guidance provided in BS 8233 and reproduced in ProPG is:

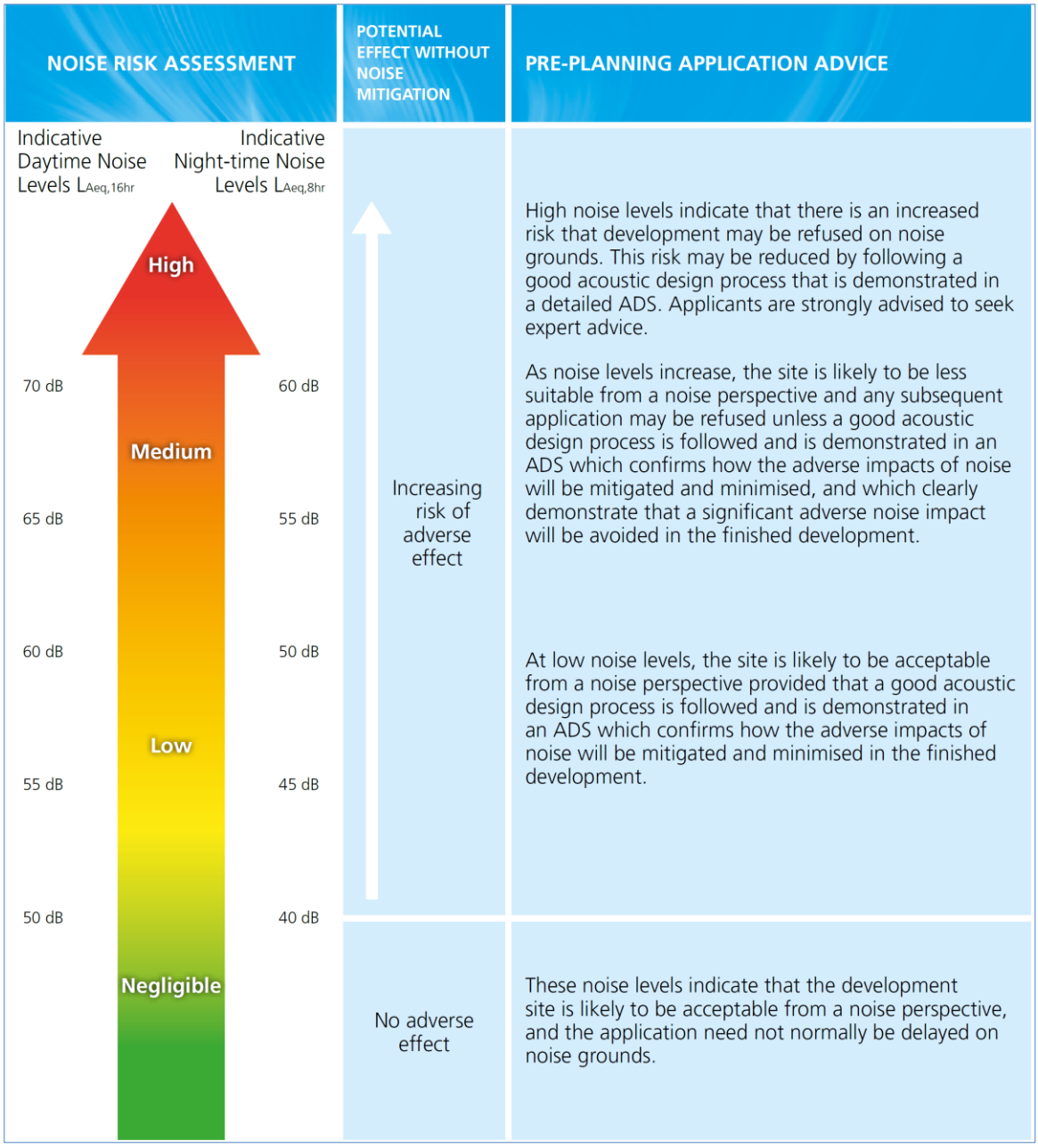
"the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16h}$. These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited."

2.1.1 ProPG – New Residential Development

ProPG provides a methodology for undertaking a preliminary noise assessment of a proposed development site. The Stage 1 ProPG Initial Noise Risk Assessment is based on the prevailing day (07:00-23:00) and night-time (23:00-07:00) noise levels at the site, established through either measurement or prediction, without any new or additional mitigation. This provides an indication of the likely risk of adverse effects from noise were no subsequent mitigation be included as part of the development proposals. It should indicate whether the Site is considered to pose a negligible, low, medium or high risk from a noise perspective. It is on this basis that the preliminary noise assessment of the Site will be undertaken.

Figure 1 has been reproduced from ProPG illustrating the associated noise risks based on the prevailing noise levels. It is important to note that the assessment of noise risk serves to provide an indication as to the initial suitability of the site for residential development and as to what the acoustic issues are likely to be.

Figure 1: ProPG Stage 1 Initial Site Noise Risk Assessment



Note:

a). Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b). Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is “not dominant”.

c) $L_{Aeq,16h}$ is for daytime 0700-2300, $L_{Aeq,8hr}$ is for night-time 2300-0700.

d) An indication that there may be more than 10 noise events at night (2300-0700) with $L_{Amax,F}$>60dB means the site should not be regarded as negligible

3. Environmental Baseline Noise Conditions

A 3-dimensional noise model has been developed of the Site and surrounds using OS Open Data and LiDAR data. Noise from the A421, A600 and A6 has been derived from traffic count data available from the Department for Transports website[9] to allow estimation of daytime and night-time noise emissions from these roads. Further details on this is presented in **Appendix B**.

3.1 Road Traffic Noise

Figure 2 presents the predicted daytime noise contours at 1.5m above ground level and **Figure 3** presents the predicted night-time noise contours at 4.0m above ground level, which reflects the location of residents during these time periods (daytime ground floor/garden; night-time first floor level bedroom). Both contour plots have been derived from the predicted dB $L_{A10,18h}$ noise level and converted to a daytime and night-time dB $L_{Aeq,T}$ noise level using Transport Research Laboratories[10] conversion factors.

During both the day and night-time period the noise risk for the largest land parcel is predominantly low from road traffic noise with some medium noise risks adjacent to the A600. The noise risk for the two smaller land parcels north of Shortstown are predominantly medium noise risk.

With regard to external amenity, a daytime noise level of ≤55dB $L_{Aeq,16h}$ is generally the accepted approach based on current credited guidance within ProPG and BS8233. **Figure 2**, indicates that this condition is likely to be satisfied within the majority of the largest land parcel, except proximate to the A600 and northern area facing the A421. It should be borne in mind that when the site is built-out the first row of houses would provide screening to road traffic noise resulting in lower noise emissions to houses located further into the development area. Mitigation considerations are discussed within Section 4.

The noise level of ≤55dB $L_{Aeq,16h}$ is exceeded within the two smaller land parcels which are nearer to the A421. As previously stated, this does not take account of screening that would be provided by the first row of houses nearest the A421. Mitigation considerations for both internal and external residential amenity are discussed within Section 4.

3.2 The Sheds

Consideration has also been given to the potential intermittent noise contribution from The Sheds based on noise source data and operations used by Waterman in the 2019 ES. In summary these comprise of:

- Day: Shed 1 operational (internal reverberant noise level of 68dB L_{Aeq}, sound insulation of building 30dB R_w). Shed 2 operational (internal reverberant noise level of 80db L_{Aeq}, sound insulation of building 30dB Rw). Loading bay doors on the north eastern façade of Shed 1 open at all times and the large doors on the southwestern façade of Shed 2 also open at all times.
- Night: Shed 1 not operational. Shed 2 operational (internal reverberant noise level of 80dB L_{Aeq}, sound insulation of building 30dB R_w) large doors on the southwestern façade of Shed 2 open at all times.

Figure 4 and **Figure 5** presents the predicted noise contour plot resultant from The Sheds operations only (not including road traffic noise) for the day and night-time periods respectively. The results indicate that noise emissions from The Sheds during the daytime period is unlikely to be a constraint to development and is significantly lower than that predicted to arise from road traffic noise. During the night-time period the noise emissions from The Sheds at 4m above ground level (equivalent to bedrooms) would result in exceedance of guideline IANLs with windows open within the larger land parcel proximate to the A600. This is also predicted to be the case due to road traffic noise from the A600. During the night-time period,

[9] https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints [accessed 13/02/2020]
[10] PG Abott, PM Nelson (2002) Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping. Project Report PR/SE/451/02. TRL.

based on predicted noise levels, noise emissions from The Shed is likely to increase the overall noise level (The Sheds + road traffic noise) by 1dB. A slight enhancement of glazing and ventilation performance is therefore likely to be required for bedrooms within this area of the site facing The Sheds.

Figure 2: Daytime Noise Contour Plot dB $L_{Aeq,16h}$ (1.5m agl)

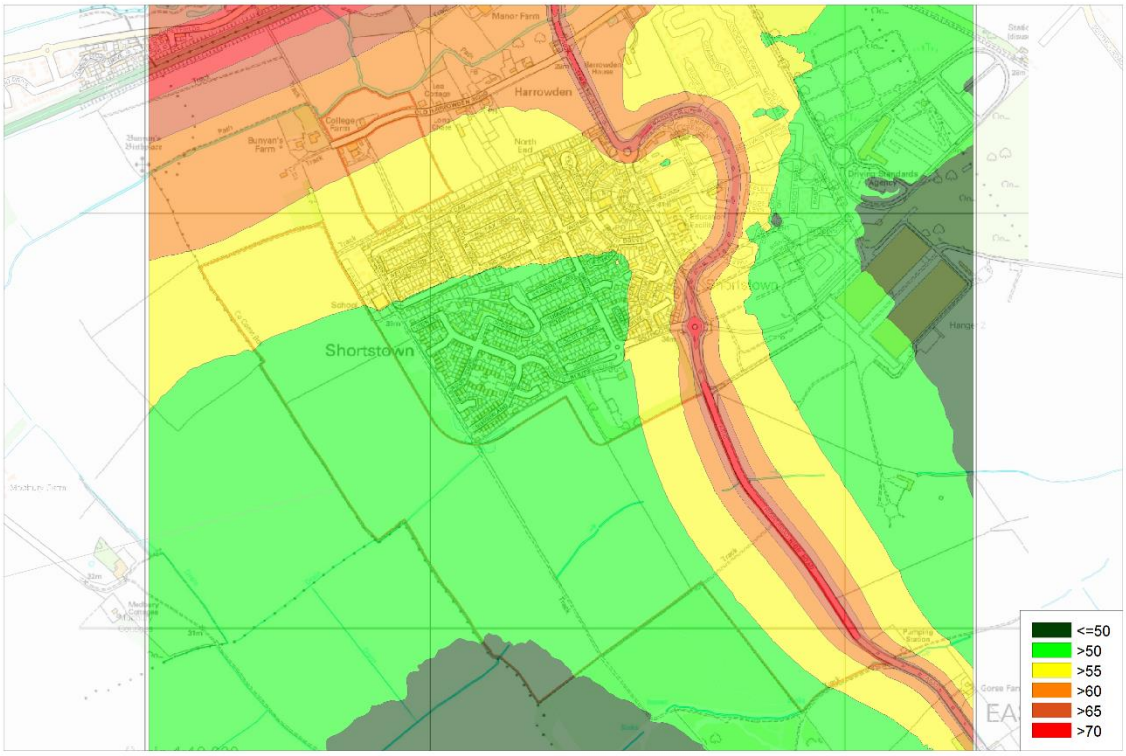


Figure 3: Night-Time Noise Contour Plot dB $L_{Aeq,8h}$ (4.0m agl)

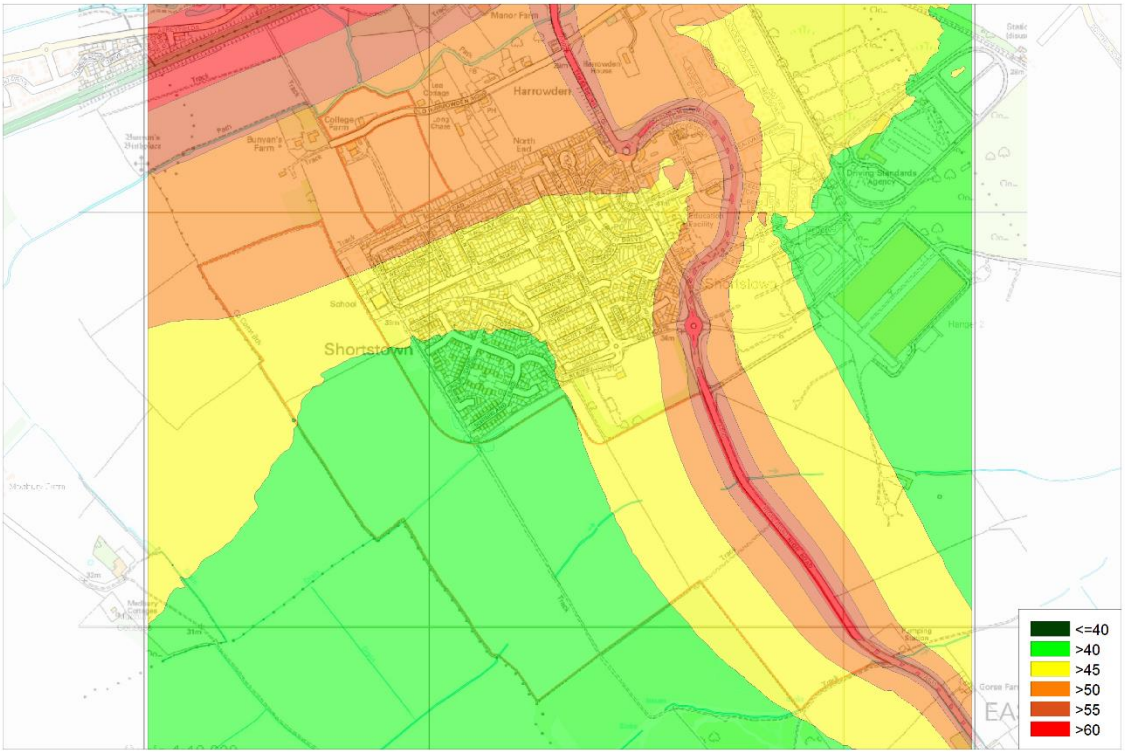
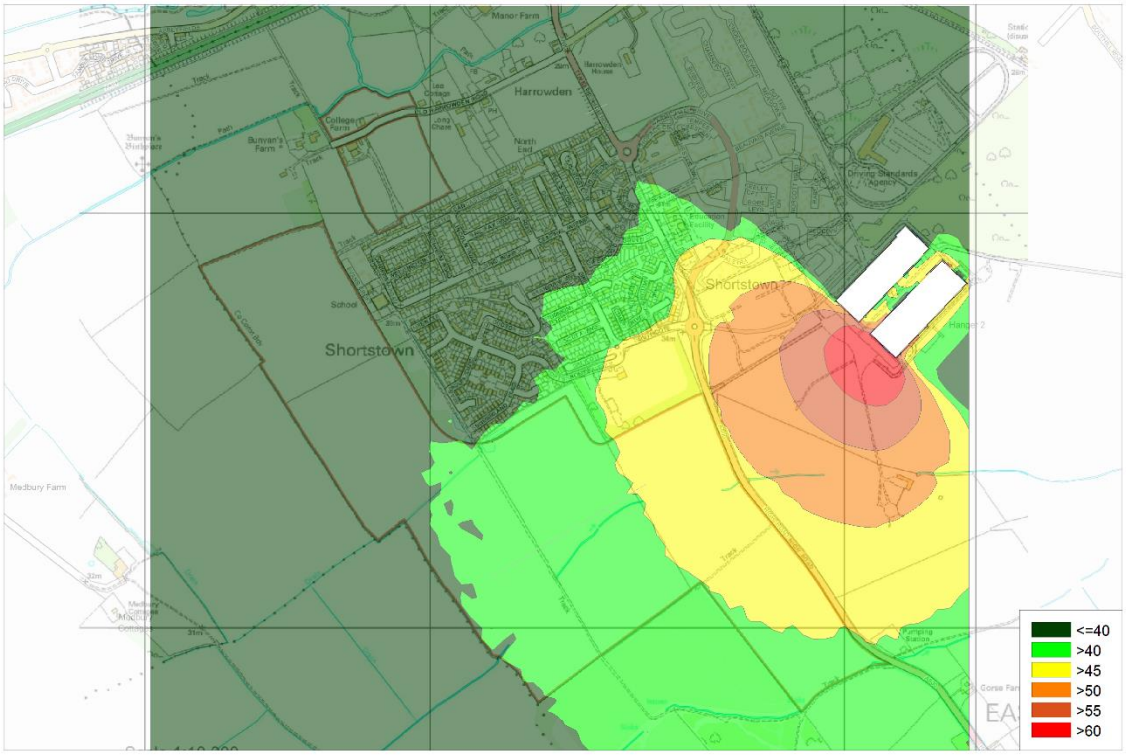


Figure 4: Predicted Daytime Noise Emissions From The Sheds (dB $L_{Aeq,T}$ 1.5m agl)

Figure 5: Predicted Night-Time Noise Emission From The Sheds (dB $L_{Aeq,T}$ 4.0m agl)



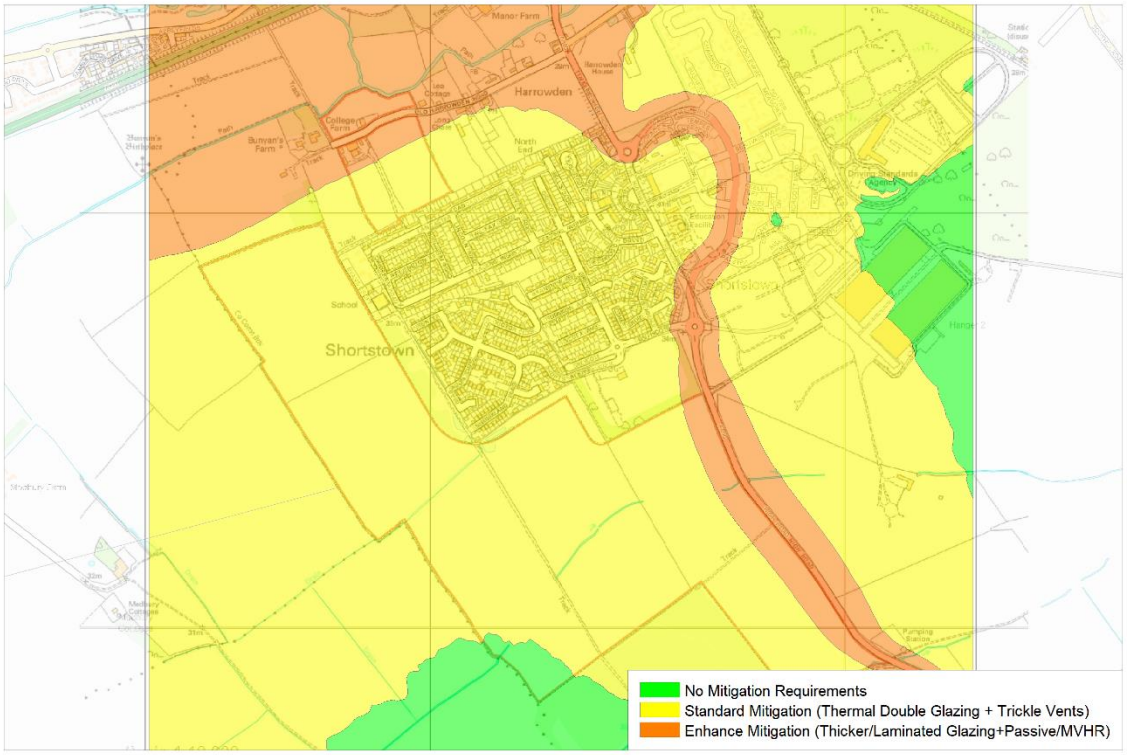
4. Mitigation Considerations

4.1 Baseline Conditions

4.1.1 Internal Ambient Noise Levels

The prevailing baseline noise conditions at the Site indicate that suitable IANLs could be achieved predominantly through provision of standard thermal double glazing with trickle vents, refer to **Figure 6**. Within the nearest land parcel to the A421 and land area proximate to the A600, enhanced mitigation is likely to be required. Potential mitigation requirements are presented as **Table 3**.

Figure 6: Indicative Mitigation Zones



When the Site is built-out however, due to screening afforded by the intervening buildings, the mitigation zoning and requirements to achieve guideline IANLs will change, with an increase in the area of 'No Mitigation Requirements' (green) anticipated.

Emission from The Sheds would have no effect on the required mitigation strategy during the daytime period but will slightly increase that required during the night-time period for the area of land proximate to the A600 facing The Sheds should this area be developed for residential use.

Table 2: Mitigation Measures

Mitigation Zone (See Figure 6)	Mitigation Measures
No Specific Mitigation	None
Standard Mitigation Required	Strategic layouts to maximise screening from noise sources via intervening buildings, in particular for external amenity areas. Passive ventilation scheme to reduce requirement for residents to open windows for other than purge ventilation. Standard thermal glazing
Enhanced Mitigation Required	Maximise setback of residential buildings from dominant noise source in the area. Strategic layouts to maximise screening from noise sources via intervening buildings, in particular for external amenity areas. Passive or MVHR ventilation scheme to reduce requirement for residents to open windows for other than purge ventilation. Acoustically enhanced glazing (see **Table 4**). Acoustic-grade garden fencing may have to be considered for external amenity areas very close to dominant noise sources, where screening is not viable.

Table 3: Acoustic Specification for Glazing and Ventilation (*Transportation noise only*)

External Noise Level Not Exceeding		Acoustic Performance Requirement	
Day dB L_{Aeq}	Night dB L_{Aeq} (dB L_{AFmax})	Windows dB R_w+C_{tr}	Ventilators dB $D_{n,ew}+C_{tr}$
<50	<45 (<60)	No requirement	
57	52 (67)	26 (Standard Thermal Glazing)	32 (Standard Window Mounted Trickle Ventilator)
60	55 (70)		
63	58 (73)	29	35
66	61 (76)	32	38
69	64 (79)	35	41
72	67 (82)	38	44

4.1.2 External Ambient Noise Levels

As indicated in **Figure 2**, the prevailing daytime noise levels across the majority of the Site, namely the larger parcel of land, are suitable for external residential amenity. Proximate to the A600 and within the two smaller land parcels the guideline value of 55dB $L_{Aeq,16h}$ is predicted to be exceeded. Although the requirements would change when the Site is built-out, the following good acoustic design measures should be considered:

- Strategic layout of development to maximise screening to road traffic noise sources;
- Maximise set-backs to the build line, although the first row of houses can act as an effective screening to noise depending on massing and layout;
- Location of main garden areas to the rear of buildings facing into the site away from the A421 and A600;
- Where required provision of acoustic grade garden fences; and
- Orientation of sensitive rooms away from noise sources or windows facing away from the noise source and/or the size of windows facing the source minimised.

4.2 Future Baseline Conditions

4.2.1 Future Baseline Noise

With development of the Site, traffic flow on the A600 is anticipated to increase as will noise from this source. A doubling of the traffic volume would be required for a +3dB increase in noise from this source, which is normally taken as just being perceptible if this is a gradual increase over time. Changes in road traffic noise on both the A600 and A421 will need to be taken into account when providing preliminary advice on the glazing and ventilation strategy for development areas proximate to these sources.

5. Conclusions

The conclusions are as follows:

- The dominant noise source at the Site is road traffic noise from the A421 to the north and A600 to the east.
- Intermittent noise from use of The Sheds (located to the east) is unlikely to be a constraint to design based on daytime predicted levels but will need to be a consideration for bedrooms proximate to the A600 and facing The Sheds. Preliminary indication is that only a slight uplift in glazing and ventilation performance is likely to be required for bedrooms proximate to the A600 facing The Sheds.
- Prevailing daytime noise levels are suitable for residential amenity within the majority of the large parcel of land which forms part of the Site.
- External daytime noise levels within the northern area of the Site facing the A421 and proximate to the A600 exceed the guideline noise criteria for residential amenity and therefore consideration of mitigation will be required in these areas to provide suitable conditions. A number of mitigation options have been outlined within the report.
- For the majority of the Site standard thermal double glazing with trickle vents should allow guideline IANLs to be satisfied. For areas proximate to the A600 and A421, enhanced glazing and ventilation is potentially required.
- Increase in road traffic noise levels will need to be a consideration when determining the required glazing and ventilation strategy for areas proximate to the A600 and A421 to ensure future proofing of the development.

In summary, mitigation will be a requirement for land areas within the Site proximate to the A600 and land areas facing the A421. The predicted noise levels are such that although mitigation needs to be considered at the early design stage, it would not make development unfeasible.

APPENDICES

A. Glossary of Acoustic Terminology

Ambient sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
A-weighting	A frequency weighting applied to measured or predicted sounds levels in order to compensate for the non-linearity of human hearing.
Background noise	Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Broadband	Containing the full range of frequencies.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound that is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day sounds:
dB(A): **A-weighted decibels**	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3 dB).
L_{Amax} noise level	This is the maximum noise level recorded over the measurement period.
L_{Amin} noise level	This is the lowest level during the measurement period.
$L_{Aeq,T}$ noise level	This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in British Standard 7445 as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'. It is a unit commonly used to describe construction noise, noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise.

Four engine jet aircraft at 100m	120 dB
Riveting of steel plate at 10m	105 dB
Pneumatic drill at 10m	90 dB
Circular wood saw at 10m	80 dB
Heavy road traffic at 10m	75 dB
Telephone bell at 10m	65 dB
Male speech, average at 10m	50 dB
Whisper at 10m	25 dB
Threshold of hearing, 1000 Hz	0 dB

L_{A90} noise level	This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.
L_{A10} noise level	This is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise.
Sound Reduction Index (R)	The sound reduction index is a single-number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.
Weighted Sound Reduction Index (R_W)	Single number rating used to describe the **laboratory** airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
C_{TR}	An adjustment to the Rw scale to take account of the lower performance against a typical spectrum of road traffic noise dominated by low frequencies.
$D_{ne,W}$	Weighted element normalised level difference.
VDV	This is the vibration dose value, a measure of vibration exposure; the fourth root of the integral, over the measurement period, of the fourth power of the frequency-weighted and time-varying acceleration.

B. Department of Transport Traffic Count Data

Link	Dft Count Point ID	Year	AADF	% HGVs	Speed Used (kph)
A421 (A6 to A600)	99313	2018	68418	7.7	97 (CRTN dual carriage way)
A600	81517	2018	15651	2.3	64 north of Shortstown, 48 south of Shortstown
A6	90324	2018	16776	4.8	97 (CRTN dual carriage way)

UK and Ireland Office Locations