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ACOUSTIC AIR



Land East of Lutterworth Road, Burbage
Acoustics Assessment
June 2023

Report Ref: 25254-ENV-0401 Rev A

Land East of Lutterworth Road, Burbage

Acoustics Assessment

June 2023

REPORT REF: 25254-ENV-0401 Rev A

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1.0 INTRODUCTION

- 1.1 Mewies Engineering Consultants Limited (M-EC), has been commissioned by Davidsons Developments Limited (hereafter referred to as 'the Client') to undertake an Acoustics Assessment for a proposed residential development at Land East of Lutterworth Road, Burbage (hereafter referred to as 'the Site').

Assessment Scope

- 1.2 This assessment seeks to establish existing sound levels at the Site, and using acoustic calculations, determine the risk of potential impacts from noise on the future occupants and, where necessary, propose suitable mitigation measures. The following scope of works has been undertaken:
- An Environmental Sound Survey has been undertaken within the Site in order to determine the prevailing acoustic conditions;
 - An acoustic model has been created in order to predict sound levels across the Site based upon the measured sound level data;
 - Where required, embedded façade mitigation measures in the form of glazing and whole-dwelling ventilation specifications have been provided to demonstrate compliance with the guidance contained within ProPG¹ and BS 8233²;
 - Following the assessment of typical conditions, an indicative overheating assessment has been undertaken to determine the number of dwellings that can achieve internal sound levels outlined in AVOG³.

Disclaimer

- 1.3 M-EC has completed this report for the benefit of the individuals referred to in Paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from M-EC.
- 1.4 M-EC accepts no responsibility or liability for:
- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
 - The issue of this document to any third party with whom approval for use has not been agreed.

¹ Professional Practice Guidance on Planning and Noise, May 2017.

² BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

³ Acoustics Ventilation and Overheating, Residential Design Guide, V1.1. January 2020.

2.0 SITE DESCRIPTION

Existing Site

- 2.1 The Site comprises arable land use, and lies approximately 2.6km to the south east of Hinckley Town Centre. The Site is bounded to the north by an existing residential development; to the east by farmland; to the south by the M69 and Graham Atkinson & Sons Limited Haulage Contractor; and to the west by Lutterworth Road and existing residential receptors.
- 2.2 An approximate red line boundary is presented in Figure 2.1.

Figure 2.1: Approximate Redline Boundary



Development Proposals

- 2.3 Development proposals for the Site consists of the erection of approximately 135 dwellings with associated access and infrastructure.
- 2.4 Following discussions with the Client, embedded acoustic mitigation as part of the development includes a 4m high boundary screening fence along the southern border of the Site, adjacent to the M69. All modelling, calculations and assessment outcomes presented herein are on the basis of this barrier being included within the proposed development.
- 2.5 The proposed development plan is provided in **Appendix A**.

3.0 STANDARDS AND GUIDANCE

General

3.1 An acoustic glossary is provided in **Appendix B** to assist the reader.

Summary of Guidance and Standards

3.2 The guidance and standards relevant to the assessment are presented below:

- National Planning Policy Framework (NPPF) 2021;
- Noise Policy Statement for England (NPSE) 2010;
- Professional Practice Guidance on Planning and Noise (ProPG) 2017;
- BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*'; and
- Acoustics Overheating and Ventilation Guide (AVOG) 2020.

3.3 For conciseness, the guidance and standards most appropriate to this assessment are summarised in this section.

ProPG

3.4 ProPG seeks to secure good acoustic design for new residential developments. The guidance includes a framework to enable situations where noise is not an issue but to help identify the extent of risk at noisier sites. The guidance does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy.

3.5 The guidance is restricted to sites that are exposed predominantly to noise from transportation sources. Where industrial or commercial noise is present on the site but is "not dominant", its contribution may be included in the noise level used to establish the degree of risk. However, if the industrial/commercial source is dominant, an assessment in accordance with BS 4142 should be conducted.

3.6 A two-stage approach is considered whereby:

- Stage 1 – an initial noise risk assessment of the proposed development site is undertaken;
- Stage 2 – a systematic consideration of internal and external noise levels is considered ensuring good acoustic design and consideration of other relevant issues is recognised.

3.7 ProPG also references the World Health Organisation (WHO) guidance on maximum noise levels at night. Guidance from the WHO states that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night. ProPG indicates that individual noise events do not exceed 45 dB L_{AFmax} more than 10 times a night and therefore this is considered as criteria in addition to that outlined in Table 3.1.

3.8 Whilst ProPG does not define a measurement interval for the assessment of L_{AFmax} levels, research⁴ has been undertaken which indicates that, for Maximum Event Level assessments, a sampling interval of

⁴ Paxton et al., Assessing L_{max} for residential development: The AVO Guide Approach, Institute of Acoustics, 2019

between 1 and 3 minutes relates most closely to how awakening events are experienced by people in reality when compared to longer sampling periods.

- 3.9 For brevity, within the study, the majority of people (circa 75-85%) under test returned to a sleep state by approximately 2.5 minutes after the initial awakening event.
- 3.10 In summary, a longer sampling period can result in the under assessment of the 10th highest maximum level, therefore, based upon research and the recommendation of the Institute of Acoustics (IOA), a sample measurement of 2 minutes has been used to inform this assessment.
- 3.11 Upon completion of the ProPG's Stage 1 and 2 assessments, the findings should enable one of four possible recommendations to be presented to the decision maker, namely to grant permission without conditions, grant with conditions, 'avoid' or 'prevent'.

BS 8233

- 3.12 BS 8233 provides recommendations for the control of noise in and around buildings.
- 3.13 The guidance provided includes appropriate internal and external noise level criteria which are applicable to residential buildings exposed to steady external noise sources. It is stated in the British Standard that it is desirable for internal ambient noise levels to not exceed the criteria set out in Table 3.1.

Table 3.1: BS 8233: 2014 Table 4 – Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 – 23:00 L _{Aeq, 16hr} dB	23:00 – 07:00 L _{Aeq, 8hr} dB
Resting	Living Room	35	-
Dining	Dining Room/Area	40	-
Sleeping (daytime resting)	Bedroom	35	30

- 3.14 Additional guidance in BS 8233 indicates that appropriate ventilation should be provided, if relying on closed windows to meet the guide values, and that such ventilation should not compromise the façade insulation and resulting noise levels.
- 3.15 BS 8233 additionally includes guidance on external amenity areas whereby it states that external noise levels should not exceed 50 dB L_{Aeq, T} with an upper guideline of 55 dB L_{Aeq, T} which would be acceptable in noisier environments.
- 3.16 The guidance also indicates that where developments are considered necessary or especially desirable, the internal targets may be relaxed by up to 5 dB with reasonable conditions still achieved.

AVOG

- 3.17 AVOG outlines a methodology for the assessment of airborne sound during overheating conditions, and emphasises the co-dependency of acoustics, ventilation and overheating design.

- 3.18 Many developments require closed windows to provide good internal acoustic conditions which is in direct contrast to residents opening windows to keep a building cool. These opposing requirements are becoming a significant issue in residential building design as only one environmental comfort is then possible: either comfortable noise levels with windows closed or thermal comfort with windows open.
- 3.19 AVOG prescribes a two-level assessment procedure, the first stage is based upon external sound levels and provides a risk of adverse acoustic conditions during periods of overheating. The second stage is a formal assessment which considers both internal acoustic conditions and increased ventilation during overheating concurrently. A Level 2 AVOG assessment is typically reserved for detailed design stage as the Level 1 assessment would inform any future required works for reserved matters.
- 3.20 It should be noted, that whilst AVOG is typically applicable at planning stage, with the introduction of AD-O⁵ for Building Control purposes, which contains acoustic criteria for bedrooms during the night-time, a detailed AVOG assessment is likely to be required at some point in the project cycle.
- 3.21 However, as AD-O is required at Building Control stage and not necessarily for planning, an AVOG assessment for night-time is also presented in this report, to give context to the environment and the potential risk of internal acoustic conditions during periods of overheating. It should however be noted that the requirement to provide a suitable Overheating strategy that considers internal acoustic conditions is a Building Control matter or something that can be considered in more detail at reserved matters stage.
- 3.22 This report considers an AVOG Level 1 assessment only.

⁵ The Building Regulations 2010, Overheating, Approved Document 'O'.

4.0 ENVIRONMENTAL SOUND SURVEY

Methodology

- 4.1 Existing sound levels at the Site have been established by undertaking an Environmental Sound Survey. The survey has been undertaken in full accordance with the guidance set out in BS 7445⁶.
- 4.2 Sound Level Meters (SLM) were installed at two locations within the Site area as follows:
- Continuous Measurement 1 (CM1): positioned approximately 9m from Lutterworth Road; and
 - Continuous Measurement 2 (CM2): positioned approximately 78m from the carriageway edge of the M69.
- 4.3 The continuous measurements were undertaken between 13:00 on Monday 23rd January and 10:00 on Monday 30th January 2023.
- 4.4 The measurement positions are identified in Figure 4.1.

Figure 4.1: Measurement Positions



⁶ BS 7445-1:2003 'Description and measurement of environmental noise, Part 1: Guide to quantities and procedures.'

Equipment

- 4.5 Measurements were taken using Class 1 integrating/averaging SLMs housed in environmental protection apparatus. The SLMs were field calibrated before and after the survey using a Class 1 calibrator, with no significant drift in calibration noted.
- 4.6 The SLMs were installed in a free field position at a height of 1.5m above local ground level and were set up to capture the following parameters at a minimum: L_{Aeq} , L_{A10} , L_{A90} and L_{AFmax} values.
- 4.7 Full details of the equipment used to undertake the survey are presented in Table 4.1.

Table 4.1: Equipment and Calibration Details

Measurement Position	Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
CM1	Sound Level Meter	Type NOR140	1407599	04/09/2024
	Pre-Amplifier	Type 1209	22646	
	Microphone	Type 1225	384571	
	Calibrator	Norsonic 1255	125525494	04/09/2023
CM2	Sound Level Meter	Type NOR140	1407773	18/11/2023
	Pre-Amplifier	Type 1209	23168	
	Microphone	Type 1225	413180	
	Calibrator	Norsonic 1255	125525772	20/11/2023

Meteorological Conditions

- 4.8 During equipment setup on Monday 23rd January, weather conditions were cool, dry and sunny with a north-easterly wind measured at 0.4 m/s. During equipment collection on Monday 30th January, weather conditions were cool, clear and sunny with a south-westerly wind measured at 0.7m/s.
- 4.9 It can therefore be concluded that there were no adverse meteorological conditions that could influence the survey outcome.

Observations

- 4.10 Site observations indicated that at CM1, the dominant source of noise was road traffic using Lutterworth Road with the M69 still audible to the south.
- 4.11 At CM2 the dominant source of noise was traffic from the M69.
- 4.12 No other significant sources of noise were noted during site visits and walkovers.

Results

4.13 The measured survey results are presented in Table 4.2 for CM1.

Table 4.2: Summary of Measured Sound Levels, CM1

Date	Daytime 07:00 – 23:00 L _{Aeq} , 16hr dB	Night-time 23:00 – 07:00 L _{Aeq} , 8hr dB	Typical Maximum Event Level ^(a) L _{AFmax} , 2min dB
23 rd January	62 ^(b)	59	74
24 th January	61	56	73
25 th January	61	58	74
26 th January	63	58	74
27 th January	64	53	74
28 th January	58	52	72
29 th January	59	56	74
30 th January	59 ^(c)	-	-
(a) Maximum noise level not exceeded more than ten times per night. (b) T = 10hr (c) T = 3hr			

4.14 Based on the measured levels at CM1, presented in Table 4.2, the following levels have been considered representative for assessment and will be used to calibrate the 3D acoustic model.

- Daytime, L_{Aeq}, 16hr – 64 dB;
- Night-time, L_{Aeq}, 8hr – 59 dB; and
- Night-time, L_{AFmax}, 2min – 74 dB.

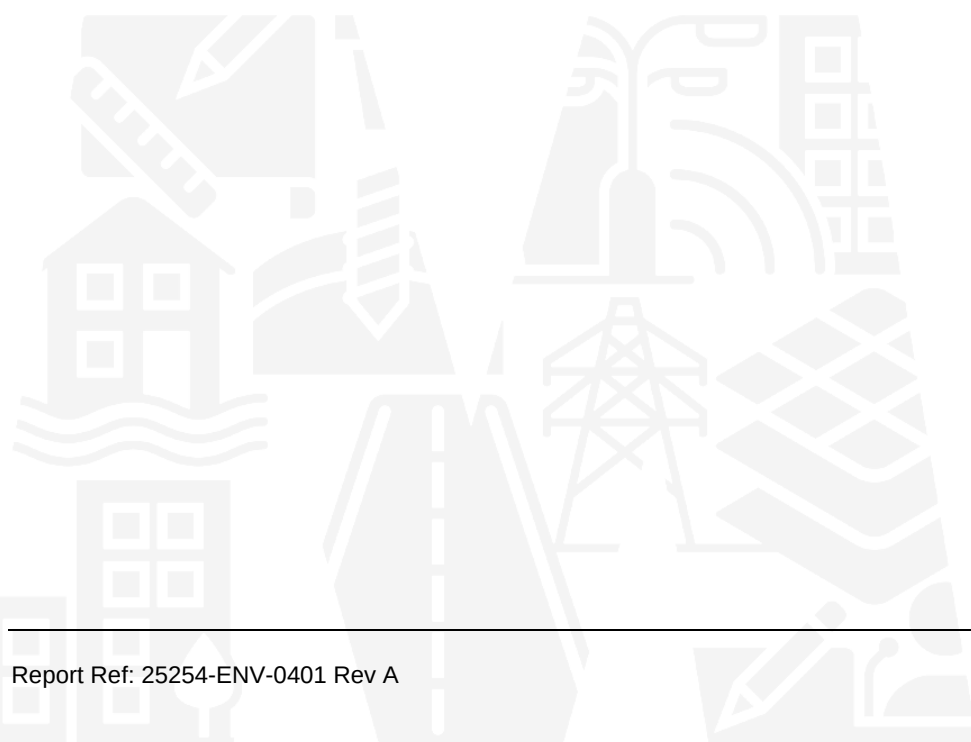
Table 4.3: Summary of Measured Sound Levels, CM2

Date	Daytime 07:00 – 23:00 L _{Aeq} , 16hr dB	Night-time 23:00 – 07:00 L _{Aeq} , 8hr dB	Typical Maximum Event Level ^(a) L _{AFmax} , 3min dB
23 rd January	64 ^(b)	61	71
24 th January	63	58	68
25 th January	62	56	64
26 th January	62	57	68
27 th January	63	54	64
28 th January	59	56	66
29 th January	63	58	68
30 th January	61 ^(c)	-	-
(a) Maximum noise level not exceeded more than ten times per night. (b) T = 10hr (c) T = 3hr			

4.15 Based on the measured levels at CM2, presented in Table 4.3, the following levels have been considered representative for assessment and will be used to calibrate the 3D acoustic model.

- Daytime, $L_{Aeq, 16hr}$ – 63 dB;
- Night-time, $L_{Aeq, 8hr}$ – 58 dB; and
- Night-time, $L_{AFmax, 3min}$ – 68 dB.

4.16 A copy of the measured survey data is provided in **Appendix C**.



5.0 METHODOLOGY

Acoustic Modelling

- 5.1 An acoustic model of the Site and environs has been generated in Datakustik CadnaA® modelling software. The model was generated to determine noise levels across the Site and noise source emissions have been informed by survey data.
- 5.2 CadnaA® considers various inputs, including topography, buildings and road noise sources, and calculates sound levels in accordance with national and international standards; in this case, the relevant UK standards are the procedures set out within ISO 9613-2⁷.
- 5.3 The modelling assumptions and input information for the acoustic model are as follows:
- Digital Terrain Model – Lidar 1m (Environment Agency, downloaded on 16th January 2023);
 - Open Street Map data (publicly available);
 - Ground absorption for the Site = 0.5 (mixed ground);
 - Building heights estimated following site observations or based upon masterplan;
 - First order reflections included in the modelling;
 - Temperature set to 10°C; and
 - Relative humidity set to 70%.
- 5.4 With reference to the noise criteria outlined in Section 3.0 the acoustic model has been used to predict sound levels across the Site in the following scenarios:
- Daytime $L_{Aeq,16hr}$ external sound levels at ground floor (1.5m) height;
 - Night-time $L_{Aeq,8hr}$ external sound levels at first floor (4m) height;
 - Night-time $L_{AFmax, 2min}$ external sound levels at first floor (4m) height.
- 5.5 Sound level contour maps are presented in **Appendix D**.

⁷ ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.'

6.0 ACOUSTICS ASSESSMENT

6.1 For conciseness, this report tabulates the most exposed receptors to give context to the most stringent mitigation measures. All other receptors are assessed through the various sound level contour and mitigation reference drawings presented in the various appendices to this report.

6.2 Using the Site layout, the most exposed proposed receptors for the Site are Plot 2 (adjacent to Lutterworth Road) and Plots 79 – 82 (a maisonette block most exposed to the M69).

ProPG Initial Noise Risk Assessment

6.3 An Initial Noise Risk Assessment (INRA) as required by the ProPG, for Plot 2 and 79 - 82, is presented in Table 6.1.

Table 6.1: Initial Site Noise Risk Assessment

Risk	Negligible		Low		Medium		High	
Period	Day	Night	Day	Night	Day	Night	Day	Night
Pro PG Threshold ^(a)	< 50	< 40	50 – 60	40 – 50	60 – 70	50 – 60	> 70	> 60
Plot 2 ^(a)					62	59		
Risk Assessment					Medium			
Plots 79 – 82 ^(a)					60	56		
Risk Assessment					Medium			
^(a) L _{Aeq, 16hr} dB for daytime assessment purposes and L _{Aeq, 8hr} dB for night-time assessment purposes.								

6.4 Based on the predicted sound levels at the most exposed receptors to both Lutterworth Road (Plot 2) and the M69 (Plots 79 – 82), the dwellings fall within the risk category of 'Medium' for both daytime and night-time conditions, for which the guidance states the Site should follow a good acoustic design process which demonstrates how the potential adverse impacts of noise will be mitigated and minimised.

BS 8233 External Amenity Areas

6.5 For traditional dwellings, BS 8233 recommends an external amenity area guideline sound level of between 50 – 55 dB L_{Aeq}, 16hr.

6.6 The Site in general follows a good acoustic design process, whereby a large separation distance from the dwellings to the dominant source of noise (the M69) is provided, along with a 4m boundary barrier, and the majority of dwellings are orientated such that the external amenity area is located behind the associated dwelling, thus screening the area from sound emanating from the sources of noise. This is in accordance with the guidance outlined in ProPG, wherein the development should be designed to achieve the lowest practicable noise levels in external amenity spaces.

- 6.7 Outdoor sound levels for the majority of new dwellings will satisfy the criterion, as shown on drawing 25254_04_120_01 in **Appendix D**.
- 6.8 For those garden areas with an unscreened angle of view towards the M69, drawing 25254_04_120_01 in **Appendix D** shows that even with the use of acoustic fencing of up to 2.5m in height, external sound levels of between 55 – 60 dB are predicted for a select few dwellings (plots 87, 96, and 101 - 103) that have garden areas with an exposed angle of view towards the M69. Predicted sound levels are shown in 2.
- 6.9 However, this needs to be considered against the caveats expressed in Paragraph 3.13, namely, that “... it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”.
- 6.10 Whilst it may be possible to reduce noise levels within these select few garden areas further through the use of increased fence heights, a balanced approach between what is practicable, and what is feasible, needs to be considered. Any increases in fence height would likely be viewed as visually obtrusive by a new occupant and therefore, a compromise should be sought in relation to the marginal exceedance of the external criterion, and the overall height of the acoustic fence.

Table 6.2: Predicted Sound Levels (Plots 87, 96 and 101-103)

Plot Number	Predicted Sound Level (dB(A))	Exceedance of the criteria of 55(dB)
87	55.5	+0.5
96	56.0	+1.0
101	56.6	+1.6
102	56.5	+1.5
103	55.3	+0.3

- 6.11 The exact heights and locations are provided in drawings in **Appendix D** and **Appendix E**.

Detailed Internal Assessment

- 6.12 Historically, acoustics assessments have typically relied upon closed window mitigation strategies to achieve criteria outlined in BS 8233 and ProPG.
- 6.13 This strategy is still typically required across many residential developments in the UK, however, as whole-dwelling ventilation can be provided through window mounted trickle ventilators with windows closed,

ventilation required outlined in AD-F⁸ can still be satisfied as there are no acoustic considerations during brief periods of 'purge' ventilation.

- 6.14 However, with the introduction of AVOG, consideration is still required for internal acoustic conditions when increased ventilation is required to combat overheating. In this instance, increased acoustic criteria is permitted, as outlined in Section 3.0, due to the limited period of the year where overheating occurs.
- 6.15 Initially, the required external to internal reduction provided by the façade to achieve BS 8233 and ProPG criteria should be determined.
- 6.16 Table 6.3 presents the required external to internal reduction requirements for the most exposed plot at the Site.

Table 6.3: Required Façade Performance

Receptor	Parameter	External Level (dB)	Internal Criteria (dB)	Required Reduction ^(a) (dB)
Plot 2	Daytime Ambient L _{Aeq,16hr}	62	35	27
	Night-time Ambient L _{Aeq,8hr}	59	30	29
	Night-time Maximum L _{AFmax,2min}	75	45	30
Plots 79 - 82	Daytime Ambient L _{Aeq,16hr}	59	35	24
	Night-time Ambient L _{Aeq,8hr}	56	30	26
	Night-time Maximum L _{AFmax,2min}	66	45	21
^(a) External to internal reduction to achieve BS 8233 and ProPG criteria.				

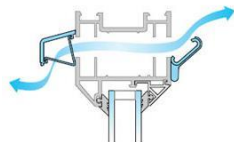
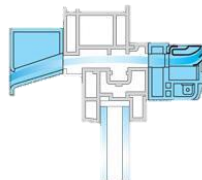
- 6.17 To summarise Table 6.3, it can be seen that for dwellings most exposed to Lutterworth Road night-time maximum levels will drive the acoustic design for bedrooms and an external to internal reduction of 30 dB is required to achieve internal criteria. For all other habitable rooms, a reduction of 27 dB is required.
- 6.18 For dwellings most exposed to the M69, night-time ambient levels will drive the acoustic design for bedrooms and an external to internal reduction of 26 dB is required to achieve internal criteria. For all other habitable rooms, a reduction of 24 dB is required.
- 6.19 These reductions can be typically found in standard thermal double glazing with acoustically rated window mounted trickle ventilators for AD-F ventilation purposes.

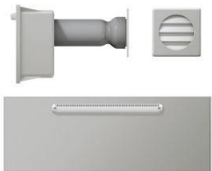
⁸ The Building Regulations 2010, Ventilation, Approved Document 'F'.

7.0 MITIGATION SUMMARY

- 7.1 Acoustic modelling has demonstrated potential façade sound levels and, in accordance with BS 8233 and ProPG, sound reduction performance requirements of the façade have been determined.
- 7.2 In terms of acoustics, windows and ventilation strategies are the ‘weakest’ acoustic point in any façade and subsequently, the composite sound reduction performance, of the façade, is typically dominated by these elements. Therefore, minimum performance requirements to be provided by the glazing and ventilation elements at all dwellings are presented herein.
- 7.3 Table 7.1 provides typical solutions across the Site in order to provide the required external to internal reduction to achieve sound level criteria in accordance with BS 8233, ProPG and the whole-dwelling ventilation rates outlined in AD-F.
- 7.4 Table 7.1 should be read in conjunction with the mitigation reference drawings in **Appendix F**, which show corresponding colour coded mitigation references.
- 7.5 All bedrooms should follow the mitigation specifications in drawing reference 25254_04_120_04 and all other habitable rooms should follow the mitigation specifications in drawing reference 25254_04_120_05.

Table 7.1: Suggested Internal Mitigation Measures

Mitigation Ref.	Example Glazing Solution	Example Whole Dwelling Ventilation Solution (AD-F)
Ref. A-1	4mm pane 12mm air space 4mm pane	Standard Non-Acoustic Trickle Vent Slots typically located in the window frame.
Ref. A-2	Approx. $R_w + C_{tr} = 27$ dB	 Approx. $D_{n,e,w} + C_{tr} = 32$ dB
Ref. B	8mm pane 12mm air space 10mm pane Approx. $R_w + C_{tr} = 33$ dB	Acoustically Rated Trickle Vent Slots typically located in the window frame with more torturous path and acoustic lining  Approx. $D_{n,e,w} + C_{tr} = 36$ dB

Mitigation Ref.	Example Glazing Solution	Example Whole Dwelling Ventilation Solution (AD-F)
Ref. C	6mm pane 18mm air space 9.5mm laminated pane Approx. $R_w + C_{tr} = 36$ dB	<u>Acoustically Rated Through Wall Trickle Vent</u> Through wall trickle vent with torturous airpath.  Approx. $D_{n,e,w} + C_{tr} = 42$ dB

Overheating Considerations

- 7.6 The above mitigation measures are based upon typical conditions, i.e., where increased ventilation to combat overheating is not required. However, an AVOG Level 1 assessment, for the most exposed plots, is presented below to give context as to whether an open windows acoustics strategy is likely permissible to satisfy the planning requirements of AVOG.

Table 7.2: AVOG Level 1 Assessment

Plot	Parameter	External Level	Level 1 Risk Grading	Level 2 Advised?
2	Daytime $L_{Aeq, 16hr}$ dB	62	Medium	Recommended
	Night-time $L_{Aeq, 8hr}$ dB	59	High	Recommended and will be required under AD-O
79 – 82	Daytime $L_{Aeq, 16hr}$ dB	59	Medium	Recommended
	Night-time $L_{Aeq, 8hr}$ dB	56	High	Recommended and will be required under AD-O

- 7.7 The results of the AVOG Level 1 assessment demonstrate that for the most exposed receptors that an AVOG Level 2 assessment is recommended for both day and night-time purposes. It should also be noted that an overheating assessment will be required for night-time purposes at the Building Control stage, to satisfy the requirements of AD-O.

8.0 CONCLUSIONS

- 8.1 Mewies Engineering Consultants Limited, has been commissioned by Davidsons Developments Limited to undertake an Acoustics Assessment for a proposed development Land East of Lutterworth Road, Burbage.
- 8.2 Detailed assessments of the Site, during typical conditions, have been undertaken in accordance with BS 8233 and ProPG criteria whilst giving consideration to typical condition ventilation requirements in AD-F.
- 8.3 For external amenity areas, the Site layout largely follows a good acoustic design and with the mitigation measures outlined within this report included in the Site design, all external amenity areas will satisfy the upper criteria outlined in BS 8233.
- 8.4 Embedded façade mitigation measures have been suggested in order to achieve internal criteria in line with BS 8233 and ProPG. Measures include standard thermal double glazing for all habitable rooms across the Site with acoustically rated window mounted trickle vents to achieve whole-dwelling ventilation outlined in AD-F.
- 8.5 Initial considerations have been given to internal acoustic conditions during periods of overheating which, in accordance with AVOG, shows a medium to high risk across the most exposed proposed dwellings.
- 8.6 Therefore, in summary, based upon the assessment presented within this report, the Site is suitable for residential development provided the mitigation measures are followed.



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APPENDICES



APPENDIX A



- Legend**
- Traditional Streetlights
 - Integrated Streetlights
 - Tree Mounted Streetlights
 - Integrated Rail Box
 - Neighbouring Drive
 - Neighbouring Drive (New and Existing)
 - Neighbouring Drive (New and Existing)

House Type Schedule	No. of Houses	No.
2 Bedroom		
2 Bedroom Semi Detached	19	19
2 Bedroom Semi Detached	2	2
2 Bedroom Semi Detached	2	2
3 Bedroom		
3 Bedroom Semi Detached	6	6
3 Bedroom Semi Detached	7	7
3 Bedroom Semi Detached	1	1
3 Bedroom Semi Detached	8	8
3 Bedroom Semi Detached	1	1
3 Bedroom Semi Detached	15	15
3 Bedroom Semi Detached	1	1
3 Bedroom Semi Detached	3	3
3 Bedroom Semi Detached	4	4
4 Bedroom		
4 Bedroom Detached	1	1
4 Bedroom Detached	1	1
4 Bedroom Detached	1	1
4 Bedroom Detached	1	1
4 Bedroom Detached	4	4
4 Bedroom Detached	3	3
4 Bedroom Detached	3	3
4 Bedroom Detached	5	5
5 Bedroom		
5 Bedroom Detached	5	5
5 Bedroom Detached	2	2
5 Bedroom Detached	6	6
Sub Total:		106
APPROXIMATE:		
APPROXIMATE:	1 Bedroom Semi Detached	6
APPROXIMATE:	2 Bedroom Semi Detached	9
APPROXIMATE:	3 Bedroom Semi Detached	4
APPROXIMATE:	3 Bedroom Semi Detached	3
APPROXIMATE:	4 Bedroom Semi Detached	1
Sub Total:		27
Total:		133

- LEGEND**
- Proposed Trees
 - Existing Trees to be Retained
 - RPA
 - Screen Wall (SW) - 1.0m High
 - Screen Fence (SF) - 1.0m High Close Boarded
 - Indicate standard GPP chimney (shown on the house)
 - Indicate Standard Chimney Removed
 - Indicate Traditional Chimney (shown on the house)
 - Drain Pipe (DP)
 - Bin Collection Points
 - Bin Via Signs
 - Articulated Road
 - Shared Ownership
 - Key Buildings
 - EV Charger
 - Neighbouring Drive
 - Solar Panel
 - Proposed Site Boundary
 - Assessment

100	1000000	1000000
100	1000000	1000000
100	1000000	1000000

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Land East Of Lutterworth Road Bypass			
Planning Layout (Sheet 1)			
Planning	CS	MS	
June 2022	1:500	IP	P02
BURB_100			



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APPENDICES



APPENDIX B

GLOSSARY OF TECHNICAL TERMS

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 measurements, 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.

Typical sound levels found in the environment

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside a factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft taking off
140 dB(A)	Threshold of pain

Descriptor	Terminology
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting (db(A))	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq, T}$	A noise level index called the equivalent continuous noise level over the time period, T . This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{AFmax, T}$	A noise level index defined as the maximum noise level during the measurement period. L_{Max} is sometimes used for the assessment of discrete loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. It is typically measured using the 'fast' sound level meter response.
$L_{90, T}$	A noise level index. The noise level exceeded for 90% of the time over the period, T . L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10, T}$	A noise level index. The noise level exceeded for 10% of the time over the period, T . L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building facade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit
One-third Octave Band	A frequency band in which the upper limit is $2^{1/3}$ times the frequency of the lower limit.
Rating Level	The specific sound level, plus any adjustment for characteristic feature of sound in BS 4142.
Specific Sound Level	The A-weighted L_{eq} sound level produced by a sound source during a specified period of time. Commonly known as the sound source under investigation as defined in BS 4142.
Typical Maximum Level	The 90 th percentile maximum event level (L_{AFmax}) measured during a period. Used for assessing night-time maximum levels under typical and overheating conditions.



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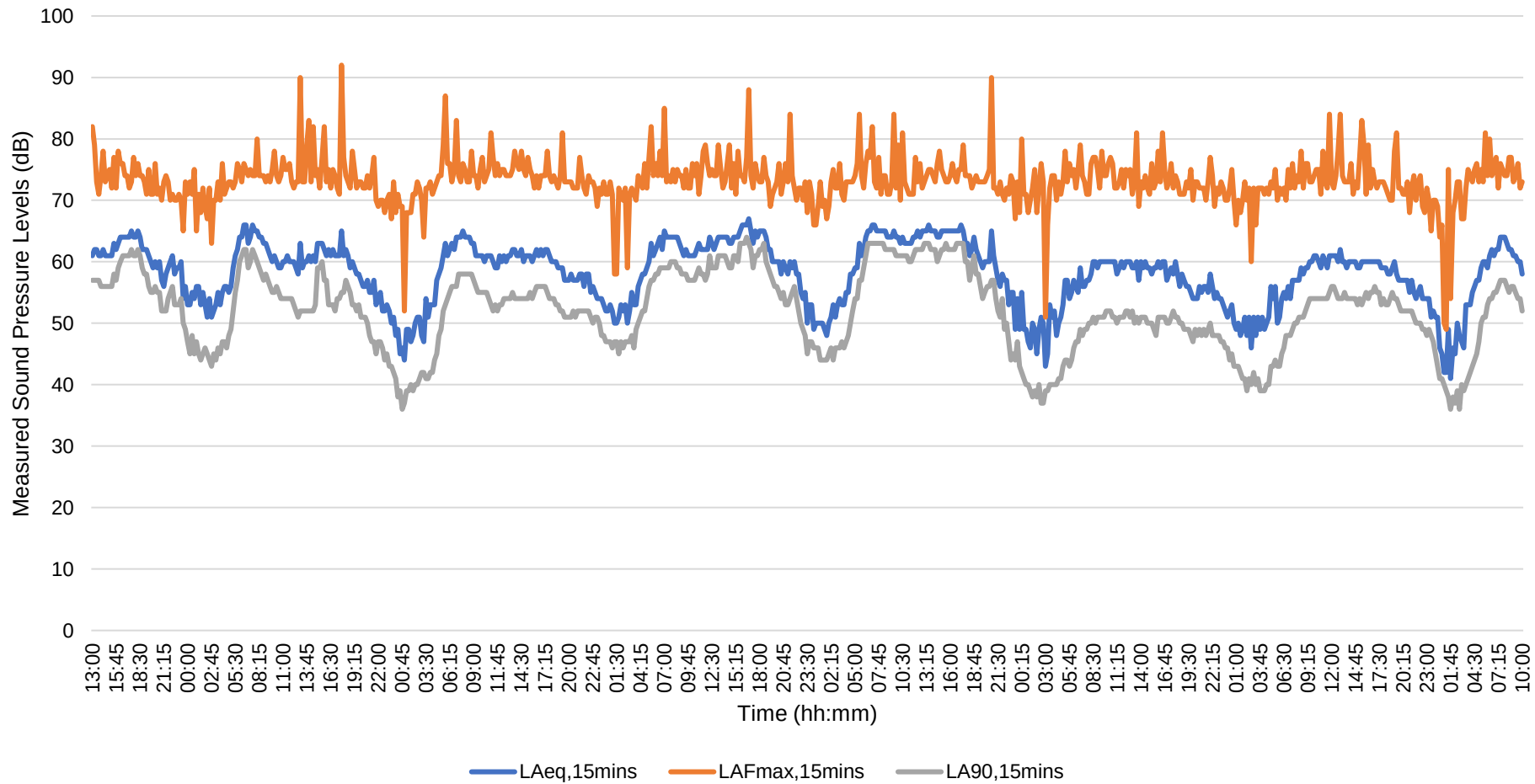
APPENDICES



APPENDIX C

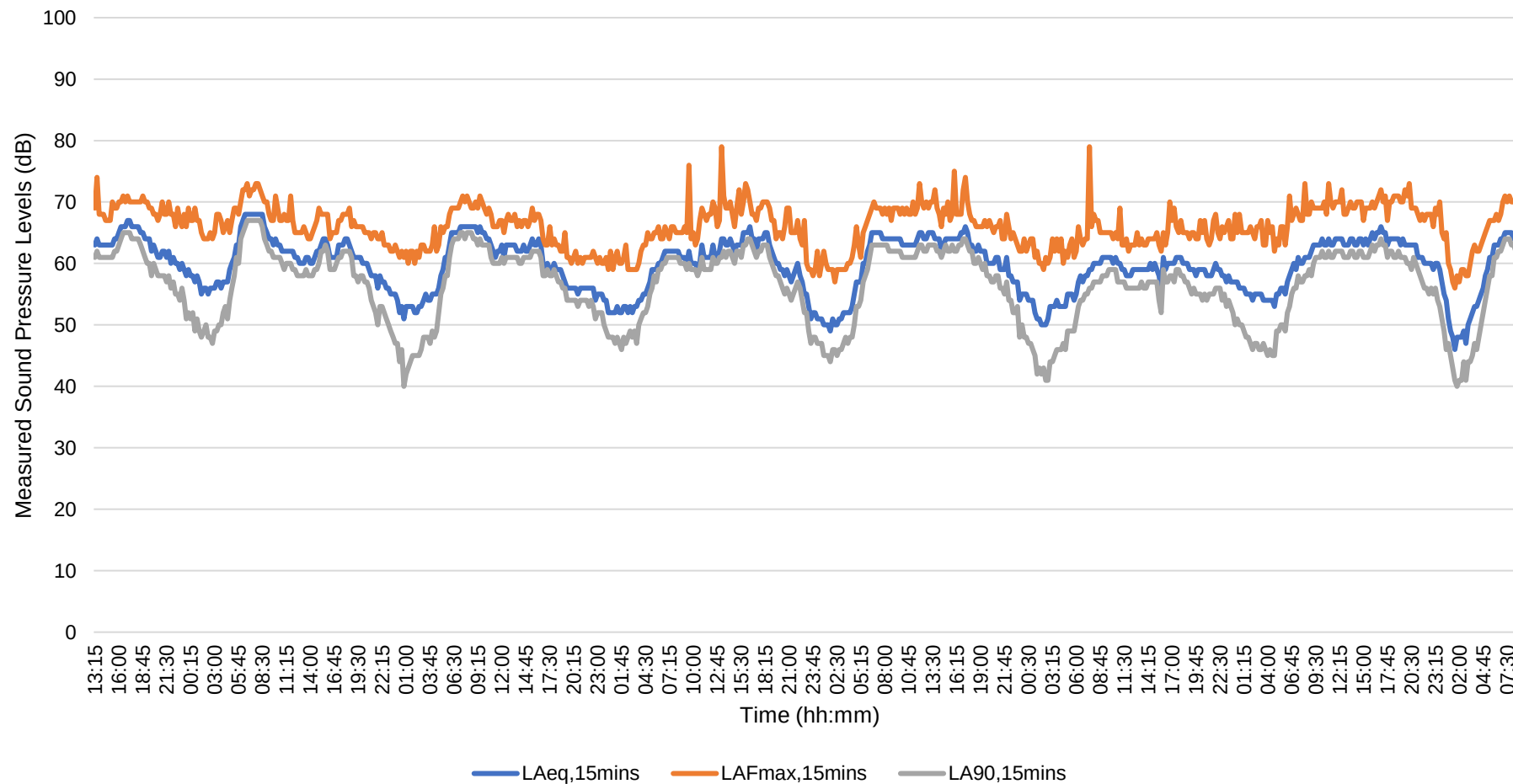
Lutterworth Road, Burbage - CM1
Environmental Sound Monitoring Survey Results

$L_{Aeq,15mins}$, $L_{AFmax,15mins}$ & $L_{A90,15mins}$ - 23rd - 30th January 2023



Lutterworth Road, Burbage - CM2
Environmental Sound Monitoring Survey Results

$L_{Aeq,15mins}$, $L_{AFmax,15mins}$ & $L_{A90,15mins}$ - 23rd - 30th January 2023





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APPENDICES



APPENDIX D



NOTES:
1. DO NOT SCALE THIS DRAWING.

KEY

	0-50dB(A)
	50-55dB(A)
	55-60dB(A)
	60-65dB(A)
	65-70dB(A)
	70-75dB(A)
	75-80dB(A)
	>80dB(A)
	2.2m Acoustic Fencing
	2.5m Acoustic Fencing
	4m Acoustic Fencing

REV:	Updated Fence Heights	EW	DN	AW	01.08.23
REV:	AMENDMENTS:	EW	DN	AW	10.03.23
REV:	AMENDMENTS:	DN	CHK	APP	DATE:

PROJECT: LAND EAST OF LUTTERWORTH ROAD, BURBAGE

DRAWING TITLE: DAYTIME AMBIENT SOUND LEVELS, LAeq,16hour

CLIENT: DAVIDSONS DEVELOPMENTS LIMITED

DRAWING NUMBER: 25254_04_120_01

REVISION:	SHEET SIZE:	SCALE:
A	A3	NTS

STATUS: FOR INFORMATION

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Printed: 02.06.2023



NOTES:

1. DO NOT SCALE THIS DRAWING.

KEY

- 0-50dB(A)
- 50-55dB(A)
- 55-60dB(A)
- 60-65dB(A)
- 65-70dB(A)
- 70-75dB(A)
- 75-80dB(A)
- >80dB(A)
- 2.2m Acoustic Fencing
- 2.5m Acoustic Fencing
- 4m Acoustic Fencing

A	Updated Fence Heights	EW	DN	AW	01.08.23
REV	AMENDMENTS:	EW	AW	AB	10.03.23
		DRN	CHK	APP	DATE:
PROJECT: LAND EAST OF LUTTERWORTH ROAD, BURBAGE					
DRAWING TITLE: NIGHT-TIME AMBIENT SOUND LEVELS, LAeq,8hour					
CLIENT: DAVIDSONS DEVELOPMENTS LIMITED					
DRAWING NUMBER: 25254_04_120_02					
REVISION:	SHEET SIZE:		SCALE:		
A	A3		NTS		
STATUS: FOR INFORMATION					
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NOTES:

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KEY

- 0-50dB(A)
- 50-55dB(A)
- 55-60dB(A)
- 60-65dB(A)
- 65-70dB(A)
- 70-75dB(A)
- 75-80dB(A)
- >80dB(A)
- 2.2m Acoustic Fencing
- 2.5m Acoustic Fencing
- 4m Acoustic Fencing

A		Updated Fence Heights		EW	DN	AW	01.08.23
REV		AMENDMENTS:		EW	DN	AW	10.03.23
				DRN	CHK	APP	DATE:
PROJECT: LAND EAST OF LUTTERWORTH ROAD, BURBAGE							
DRAWING TITLE: NIGHT-TIME MAXIMUM SOUND LEVELS, LAFmax,T							
CLIENT: DAVIDSONS DEVELOPMENTS LIMITED							
DRAWING NUMBER: 25254_04_120_03							
REVISION: A		SHEET SIZE: A3		SCALE: NTS			
STATUS: FOR INFORMATION							
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APPENDICES



APPENDIX E



- NOTES:
1. DO NOT SCALE THIS DRAWING.
 2. Please refer to report reference 25254-ENV-0401 for the details on the proposed glazing and ventilation references.

KEY

Ref. A-1

Ref. A-2

Ref. B

2.2m Acoustic Fencing

2.5m Acoustic Fencing

4m Acoustic Fencing

A Updated Fence Heights			EW	DN	AW	01.08.23
REV:	AMENDMENTS:		EW	AW	AB	10.03.23
			DRN	CHK	APP	DATE:
PROJECT: LAND EAST OF LUTTERWORTH ROAD, BURBAGE						
DRAWING TITLE: MITIGATION REFERENCE FOR HABITABLE BEDROOMS						
CLIENT: DAVIDSONS DEVELOPMENTS LIMITED						
DRAWING NUMBER: 25254_04_120_04						
REVISION: A		SHEET SIZE: A3		SCALE: NTS		
STATUS: FOR INFORMATION						
			Telephone: 01530 264 753 Email: group@m-ec.co.uk Website: www.m-ec.co.uk ORDNANCE SURVEY © CROWN COPYRIGHT 2015. ALL RIGHTS RESERVED. LICENCE NUMBER 100055865.			

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NOTES:

- DO NOT SCALE THIS DRAWING.
- Please refer to report reference 25254-ENV-0401 for the details on the proposed glazing and ventilation references.

KEY

Ref. A-1

Ref. A-2

Ref. B

2.2m Acoustic Fencing

2.5m Acoustic Fencing

4m Acoustic Fencing

A	Updated Fence Heights	EW	DN	AW	01.08.23
REV	AMENDMENTS	EW	AW	AB	10.03.23
		DRN	CHK	APP	DATE

PROJECT: LAND EAST OF LUTTERWORTH ROAD, BURBAGE

DRAWING TITLE: MITIGATION REFERENCE FOR ALL OTHER HABITABLE ROOMS (NON-BEDROOMS)

CLIENT: DAVIDSONS DEVELOPMENTS LIMITED

DRAWING NUMBER: 25254_04_120_05

REVISION: A SHEET SIZE: A3 SCALE: NTS

STATUS: FOR INFORMATION

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