BWB

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ENVIRONMENT

The Feoffees of Old Swinford Hospital
Land at Worcester Lane, Stourbridge

Noise Assessment

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Notice

EXECUTIVE SUMMARY

BWB Consulting was instructed by The Feoffees of Old Swinford Hospital to undertake a Noise Assessment for a proposed residential development at Land at Worcester Lane, Stourbridge.

This assessment has been undertaken based on the results of a baseline noise and vibration survey undertaken in June 2022 on the site. The results of the survey have been assessed in accordance with current standards and guidance.

At this stage, the exact layout of the dwellings within Proposed Development has yet to be determined. Consequently, this noise assessment demonstrates the feasibility of the site for residential use, by assuming dwellings would be located at a reasonable notional set-back distance of 10m from the site boundary most affected by the existing noise climate.

To reduce the road traffic noise impact in the nearest proposed gardens to the eastern site boundary to within acceptable limits, it is recommended that gardens are placed on the screened side of dwellings. Where this is not possible, it is considered likely that mitigation in the form of localised acoustic barriers will be required, which remove line of sight to the road as a minimum.

For the facades facing onto Worcester Lane, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 29 dB $R_w + C_{tr}$ (example configuration: 4mm / 12mm / 6mm). Acoustic trickle ventilators, which achieve a minimum performance of 35 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

For the facades facing onto the railway line, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 25 dB $R_w + C_{tr}$ (example configuration: 4mm / 12mm / 4mm). Trickle ventilators with an indirect air path, which achieve a minimum performance of 32 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

For dwellings which would be set further back from both the road and the railway line (i.e. located further into the development, it is likely that a certain amount of screening would be afforded by dwellings located nearest to the railway line. For any such dwellings, the proposed mitigation requirements set out above may be reduced.

The measured groundborne vibration levels on the western boundary fall below the threshold criteria for 'low probability of adverse comment' set out in BS 6472:2008.

Based on the results of the assessment, it has been demonstrated that the site is suitable for residential use from a noise and vibration perspective.

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1. INTRODUCTION

Appointment & Background

1.1 BWB Consulting (BWB) was instructed by The Feoffees of Old Swinford Hospital (the Client) to undertake a Noise Assessment for a proposed residential development at Land at Worcester Lane, Stourbridge (the Site).

1.2 This assessment has been undertaken based on the results of a baseline noise and vibration survey at 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 proposed dwellings within 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**.

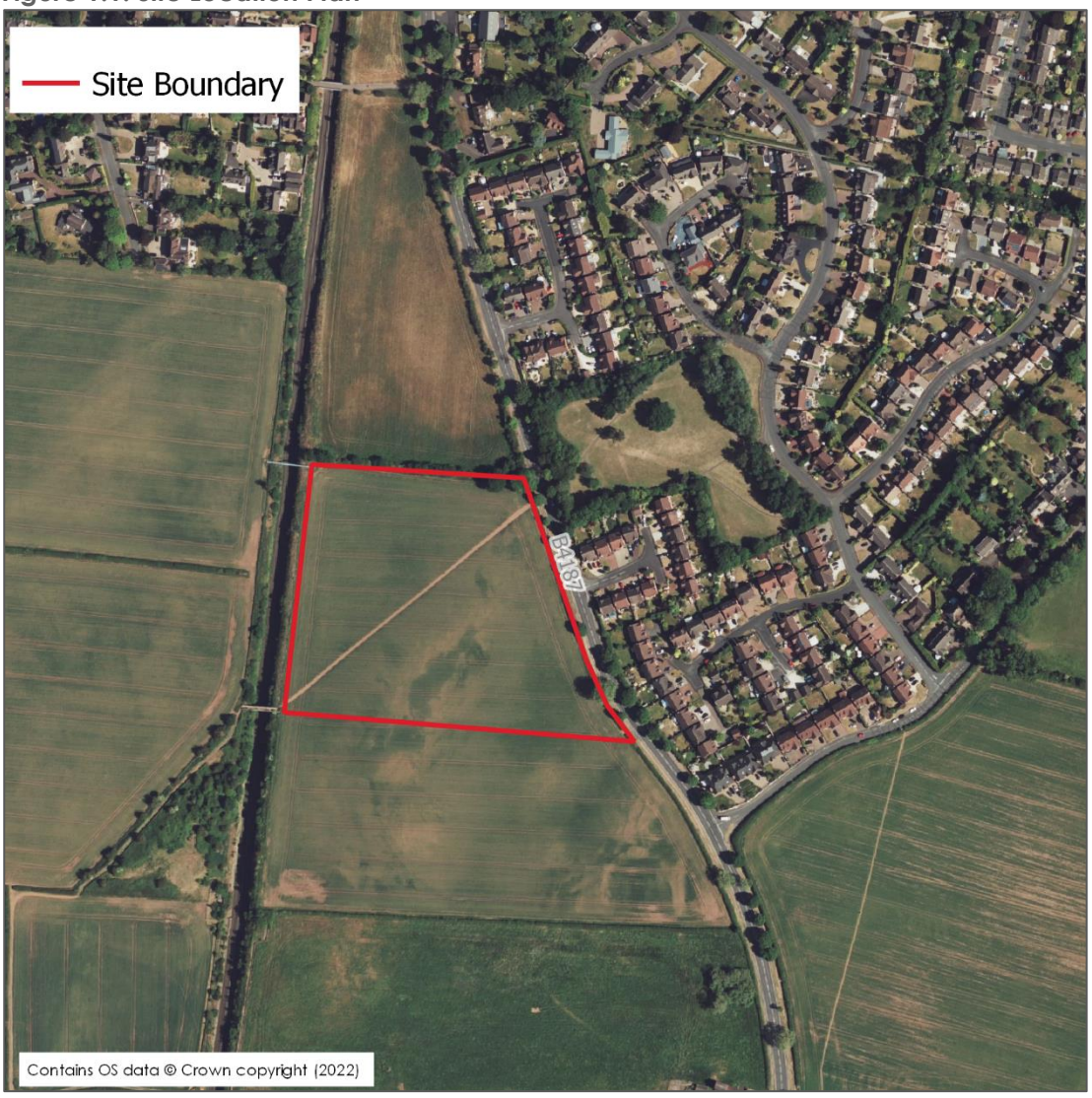
Site Setting

1.5 The Site is located off Worcester Lane, within the administrative area of Dudley Metropolitan Borough Council (DMBC).

1.6 The Site currently comprises open agricultural land. To the north and south, the Site is bound by open farmland, to the east the Site is bordered by Worcester Lane and to the west lies an existing rail line.

1.7 The location of the site is shown in **Figure 1.1** overleaf.

Figure 1.1: Site Location Plan



Proposed Development

1.8 It is understood that the proposed development is to comprise of a residential development with associated infrastructure and landscape areas.

2. STANDARDS AND GUIDANCE

National Planning policy Framework (NPPF)

2.1 Published in July 2021, 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:

"*174. 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:

"*185. 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)."

And

"*187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. 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."

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 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"

BS 6472-1: 2008: 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other Than Blasting'

2.8 Vibration from passing trains can manifest itself as tactile vibration and/or structure-borne noise. Tactile vibration is that which is perceived as mechanical motion. BS 6472-1: 2008: '*Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other Than Blasting*' provides procedures for assessing the potential human response to vibration.

2.9 Vibration is assessed in terms of the equivalent '*vibration dose value'* (VDV in m/s1.75), which relates to the level and duration of vibration, and effectively accumulates the vibration energy received over the daytime or night-time period in question. Present knowledge indicates the VDV indices to correspond most closely to the response of people to vibration inside a building. It is important to note, however, that people exhibit wide variations of vibration tolerance. Specific values are dependent upon social and cultural factors, psychological attitudes and expected degree of intrusion.

2.10 The guide VDVs set out in BS 6472-1 for evaluating the various probabilities of adverse comment within residential buildings relevant to the proposed Development are presented in **Table 2.2**. The criteria are presented as ranges to reflect the differing susceptibility to vibration evident among members of the population.

Table 2.2: BS 6472-1:2008 Probability of Adverse Comment Due to Vibration

Vibration dose values (VDV in m/s1.75) above which might result in various degrees of adverse comment within residential buildings			
Place and Time	**Low Probability of Adverse Comment**	**Adverse Comment Possible**	**Adverse Comment Probable**
Residential Buildings 16hr daytime	0.2 - 0.4	0.4 – 0.8	0.8 – 1.6
Residential Buildings 8hrs night-time	0.1 - 0.2	0.2 – 0.4	0.4 – 0.8

2.11 VDVs in the different room spaces of the Development shall not exceed the minimum low probability of adverse comment value presented in **Table 2.2**, when assessed in accordance with BS 6472:2008.

3. BASELINE NOISE MONITORING

Summary

3.1 A baseline noise and vibration survey has been undertaken to determine the noise and vibration environment at the Site. Monitoring was undertaken at the measurement locations detailed in **Figure 3.1.**

Figure 3.1: Baseline Noise Measurement Locations

*Source; Google Maps (2022) with MLs as described below.

Survey Methodology

Measurement Location 1

3.2 ML1 was adopted to determine noise and vibration levels at a location representative of the worst affected dwellings to the railway line to the west of the site.

Noise Monitoring

3.3 Noise monitoring was undertaken at Measurement Location 1 (ML1) over a 24-hour period commencing at 17:00 on 14th June 2022. Vibration monitoring was undertaken at ML1 over a 48-hour period commencing at 17:30 on the 15th June 2022..

3.4 The microphone was established in free-field conditions at a height of 1.5m and at approximately 10m back from the nearest railway track.

3.5 The noise climate at ML1 was noted to be dominated by natural sounds between intermittent pass-bys on the adjacent railway line.

3.6 Noise levels measured at ML1 are considered representative of the prevailing noise climate at the closest proposed noise sensitive receptors to the rail line.

Vibration Monitoring

3.7 Vibration monitoring was undertaken at ML1 over a 48-hour period commencing at 17:30 on the 15th June 2022.

3.8 and the vibration monitoring was undertaken using a ground mounted tri-axial transducer approximately 10m back from the nearest railway track.

Measurement Location 2

3.9 Noise monitoring was undertaken at Measurement Location 2 (ML2) over a 24-hour period commencing at 16:30 on 14th June 2022. ML2 was adopted to determine noise levels from Worcester Lane which runs adjacent to the eastern site boundary. The microphone was established in free-field conditions at a height of 1.5m and at a distance of 8 m from the nearside kerb edge of the road.

3.10 The noise climate at ML2 was noted to be dominated by road traffic noise from Worcester Lane.

3.11 Noise levels measured at ML2 are considered representative of the prevailing noise climate at the closest proposed noise sensitive receptors to the proposed development site.

Measurement Equipment

3.12 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3.1**. Equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to traceable standards at an accredited laboratory within the 24 months prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.1: Noise Measurement Equipment

Location	Equipment	Make and Model	Serial Number	Calibration Due Date
1	Sound Level Meter	Svantek SVAN 971	80344	25/05/2024
	Microphone	Aco Pacific 7052E	69566	
	Pre-amplifier	Svantek SV18	71577	
	Vibration Level Meter	Vibrock V901	0908	21/01/2024
2	Sound Level Meter	01 dB Fusion	11327	18/06/2023
	Microphone	Grass 40CE	259479	
	Pre-amp	01 dB PRE 22	1605201	
1 and 2	Calibrator	01dB-Stell Cal 21	34675335	14/02/2023

3.13 Details of the vibration equipment can be provided upon request.

Meteorological Conditions

3.14 The weather was generally conducive to environmental noise measurement, it being generally dry with low wind speeds.

Measurement Results

Noise

3.15 A summary of the measured noise levels to be used within the assessment are provided below. Full measurement results for the whole period are presented in **Appendix B**.

Table 3.2: Summary of Measured Sound Pressure Levels at ML1

Start Date and Time	Period	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$
14/06/2022 17:00	Daytime[1]	-	50	35[2]
14/06/2022 23:00	Night-time	77[3]	45	32[2]

[1] Includes periods between 17:00 and 23:00 on 14/06/2022 and between 07:00 and 17:00 on 15/06/2022.
[2] Taken to be the mean of measured $L_{A90,15min}$ values.
[3] Highest $L_{AFmax,}$ noise level measured during the night-time period.

Table 3.3: Summary of Octave Band Day and Night-time Sound Pressure Levels at ML1

Period	Octave Band Sound Pressure Levels (L_{eq})								dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Daytime	63	58	49	44	45	41	39	38	50
Night-time	53	47	43	39	41	37	35	33	45

Table 3.4: Summary of Measured Sound Pressure Levels at ML2

Start Date and Time	Period	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$
14/06/2022 16:30	Daytime[1]	-	65	46[2]
14/06/2022 23:00	Night-time	76[3]	57	30[2]

[1] Includes periods between 16:30 and 23:00 on 14/06/2022 and between 07:00 and 16:30 on 15/06/2022.
[2] Taken to be the mean of measured $L_{A90,15min}$ values.
[3] 10th Percentile of L_{AFmax} noise levels measured during the night-time period.

Table 3.5: Summary of Octave Band Day and Night-time Sound Pressure Levels at ML2

Period	Octave Band Sound Pressure Levels (L_{eq})								dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Daytime	63	60	60	59	63	56	44	29	65
Night-time	54	49	50	50	55	49	37	22	57

Vibration

3.16 A summary of the measured vibration levels are provided below.

Table 3.6: Summary of Measured VDVs

Description	Measurement Start Date and Time	Measured VDV in each axis ($ms^{-1.75}$)		
		x-axis	y-axis	z-axis
Daytime (07:00 – 23:00)	15/06/2022 17:30	0.046	0.051	0.035
Night-time (23:00 – 07:00)	15/06/2022 23:00	0.036	0.044	0.023
Daytime (07:00 – 23:00)	16/06/2022 07:00	0.047	0.050	0.037
Night-time (23:00 – 07:00)	16/06/2022 23:00	0.041	0.043	0.026
Daytime (07:00 – 23:00)	17/06/2022 07:00	0.045	0.051	0.034

4. ASSESSMENT

4.1 The results of the baseline noise survey undertaken in June 2022 have been used as a basis for the noise assessment of the Site's suitability for residential development.

4.2 In the absence of a masterplan, it has been assumed that the nearest boundary of the developable area (and by extension, the nearest potential location of any future dwellings) will be a minimum distance of 10m back from the site boundary, in order to demonstrate the principle for development.

Noise Model

4.3 A detailed noise model has been generated in order to calculate the daytime and night-time noise propagation across the site from measured road and rail traffic sources. 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 the road traffic noise source, and ISO9613-2 *Attenuation of sound during propagation outdoors — Part 2: General method of calculation* for the rail source.

4.4 In addition to the noise measurement data obtained via the survey, which have been used to calibrate the noise source, the model has been informed by the following sources of data:

- Satellite Imagery of the Site and the surrounding area, taken from Google Maps, was calibrated into the noise model based on known Ordinance Survey grid reference points;
- Lidar data, publicly available from the DEFRA Website[1];

4.5 The following assumptions were adopted for the modelling exercise:

- 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);
- The model was set to include second order reflected noise from solid structures;
- Noise levels in outdoor amenity spaces have been predicted with the grid height set at 1.5m;
- Incident noise levels at windows of habitable rooms have been predicted at 4m; and,
- The red line boundary has been incorporated into the model, and the free-field level at the nearest boundary of the proposed developable area has been calculated. Noise contours have been calculated across the Proposed Development assuming an open (no buildings) site. The predicted noise levels have been used to inform the assessment.

[1] https://environment.data.gov.uk/DefraDataDownload/?Mode=survey, accessed on 13/05/2022

Noise from Road Traffic

4.3 Worcester Lane to the east of the Site has been inputted as a road source and calibrated using the measured sound pressure level at ML2.

External Daytime Noise Levels

4.4 The modelling results indicate that, although the vast majority of the site will meet the upper guideline value of 55 dB $L_{Aeq,T}$ as stated within the BS 8233 and WHO guidance, for dwellings closest to Worcester Lane, outdoor living areas are likely to exceed this. Therefore, further consideration to mitigation will need to be given.

Internal Noise Levels

4.5 Noise levels measured at ML2 have been used as the basis for the assessment of road traffic noise from Worcester Lane.

4.6 The results of the noise modelling indicate that at 10m from the eastern site boundary, proposed dwellings would be exposed to free-field levels of 62dB $L_{Aeq,16hr}$ and 56dB $L_{Aeq,8hr}$ for daytime and night-time, respectively. The typical L_{AFmax} level has been calculated as a point source and the free-field level at the façade has been predicted as 74dB. This is based on the 10th highest measured night-time L_{AFmax} level of 76dB.

4.7 Assuming a 15 dB loss through a partially opened window, this would result in internal ambient noise levels of 47dB $L_{Aeq,16h}$ and 41dB $L_{Aeq,8h}$ for daytime and night-time, respectively. With regard to maximum noise levels, a partially opened window would also result in an internal level of 58dB L_{AFmax} during the night-time. Therefore, the criteria of 35dB for the daytime, 30dB for the night-time and 45 dB for the night-time L_{AFmax} stated in the BS8233, are likely to be exceeded, assuming partially opened windows. As such, consideration has been given to appropriate forms of mitigation in **Section 5.**

Rail Traffic Noise

4.8 The railway line to the west of the Site has been inputted as a rail line source and calibrated using the measured sound pressure level at ML1. It has been assumed for the purposes of the assessment that the ambient noise levels measured at ML1 are solely the result of noise from the rail line, thus providing a worst-case source level for the rail line.

External Daytime Noise Levels

4.9 The modelling results indicate that for dwellings located closest to the railway line, outdoor living areas will be below the upper guideline value of 55 dB $L_{Aeq,T}$ as stated within the BS 8223 and WHO guidance. Therefore, no further consideration to mitigation will need to be given.

Internal Noise Levels

4.10 The results of the noise modelling indicate that at 10m from the western site boundary, proposed dwellings would be exposed to free-field levels of 51dB $L_{Aeq,16hr}$ and 47dB $L_{Aeq,8hr}$ for daytime and night-time, respectively. The highest L_{AFmax} level has been used to inform the assessment due to a low number of passbys on the railway line during the baseline noise survey. This has been calculated as a point source and the free-field level at the façade has been predicted as 70dB. This is based on the highest measured night-time L_{AFmax} level of 77dB.

4.11 Assuming a 15dB loss through a partially opened window, this would result in internal ambient noise levels of 36dB $L_{Aeq,16h}$ and 32dB $L_{Aeq,8h}$ for daytime and night-time, respectively. With regard to maximum noise levels, a partially opened window would also result in an internal level of 37 dB L_{AFmax} during the night-time. Therefore, the criteria of 35 dB for the daytime and 30 dB for the night-time stated in the BS8233, are likely to be exceeded, assuming partially opened windows. As such, consideration has been given to appropriate forms of mitigation in **Section 5.**

4.12 **Groundborne Vibration from the Rail Line**

4.13 Vibration levels as detailed in **Table 3.6** would result in a maximum VDV of 0.05 $m/s^{1.75}$ (y-axis) during the daytime period, and a maximum VDV of 0.04$m/s^{1.75}$ (y-axis) during the night-time period. Comparing these levels against the values in **Table 2.2**, they fall below the threshold criteria for 'low probability of adverse comment' set out in BS 6472:2008. Therefore it is considered that, from a groundborne vibration perspective, the site is suitable for residential development and no consideration to mitigation is warranted.

5. MITIGATION

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

External Noise Levels

5.2 For proposed dwellings located closest to Worcester Lane noise levels in outdoor living are above the recommended guideline noise level due to an increase in road traffic. Therefore, it has been determined that mitigation would be required to reduce noise levels from road traffic to within acceptable levels as recommended in BS8233 and WHO.

5.3 To reduce the noise impact, in the nearest proposed gardens to Worcester Lane, to within acceptable limits, it is recommended that gardens are placed on the screened side of dwellings. Where this is not possible, it is considered likely that mitigation in the form of localised acoustic barriers will be required, which remove line of sight to the road as a minimum. It is widely accepted that any barrier which removes line of sight to the source will provide a reduction of approximately 10dB. The barriers must extend from ground level to at least the specified height, be solid i.e., imperforate and have a minimum superficial mass of 15kg/m^2. Any penetrations or junctions should be treated to maintain acoustic integrity.

Internal Living Areas

5.4 It is considered that first and most natural way to ameliorate impacts from external noise sources would be for occupants to close the most affected windows. Therefore, in order to assess the noise mitigation which is likely to provide 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, in particular the glazing elements.

5.5 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 assumptions:

- Room Dimensions of 3m W x 4m D x 2.5m H with a glazing area of 2.5m^2;
- The construction of the façade comprises 2x103mm brick (75mm gap + plaster);
- habitable spaces have an assumed reverberation time of 0.5 seconds; and,
- A single 2500mm^2 ventilator has been assumed per habitable space.

5.6 The break-in calculations have been undertaken for the 1st floor, to provide a worst-case scenario.

5.7 To achieve the daytime internal noise criterion of 35 dB $L_{Aeq,16h}$ adopted for this assessment, based on a notional façade closest to Worcester Lane experiencing 62 dB $L_{Aeq,16h}$ external noise level, a reduction of 27 dB(A) would be required for habitable rooms. To achieve the internal criteria of 30 dB $L_{Aeq,8h}$ and 45 dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 29 dB(A) would be required for habitable rooms.

5.8 For the facades facing onto Worcester Lane, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 29 dB $R_w + C_{tr}$ (example configuration (*but not limited to*): 4mm / 12mm / 6mm). Acoustic trickle ventilators, which achieve a minimum performance of 35 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

5.9 To achieve the daytime internal noise criterion of 35 dB $L_{Aeq,16h}$ adopted for this assessment, based on a notional façade closest to the railway line experiencing 51 dB $L_{Aeq,16h}$ external noise level, a reduction of 16 dB(A) would be required for habitable rooms. To achieve the internal criteria of 30 dB $L_{Aeq,8h}$ and 45 dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 25 dB(A) would be required for habitable rooms.

5.10 For the facades facing onto the railway line, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 25 dB $R_w + C_{tr}$ (example configuration (*but not limited to*): 4mm / 12mm / 4mm). Trickle ventilators with an indirect air path, which achieve a minimum performance of 32 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

5.11 For dwellings which would be set further back from both the road and the railway line (i.e., located further into the development, it is likely that a certain amount of screening would be afforded by dwellings located nearest to the railway line. For any such dwellings, the proposed mitigation requirements set out above may be reduced.

5.12 The glazing and ventilation performances set out above are considered likely to satisfy the internal noise criteria for habitable spaces during normal ventilation conditions. Note that for the limited occasions where purge ventilation is required, Approved Document F advises that it is acceptable to open windows.

5.13 It is recommended that further assessment works is undertaken at a later detailed design stage to determine final mitigation requirements.

6. CONCLUSION

6.1 BWB Consulting was instructed by The Feoffees of Old Swinford Hospital to undertake a Noise Assessment for a proposed residential development at Land at Worcester Lane, Stourbridge.

6.2 This assessment has been undertaken based on the results of a baseline noise and vibration survey undertaken in June 2022 on the site. The results of the survey have been assessed in accordance with current standards and guidance.

6.3 At this stage, the exact layout of the dwellings within Proposed Development has yet to be determined. Consequently, this noise assessment demonstrates the feasibility of the site for residential use, by assuming dwellings would be located at a reasonable notional set-back distance of 10m from the site boundary most affected by the existing noise climate.

6.4 To reduce the road traffic noise impact in the nearest proposed gardens to the eastern site boundary to within acceptable limits, it is recommended that gardens are placed on the screened side of dwellings. Where this is not possible, it is considered likely that mitigation in the form of localised acoustic barriers will be required, which remove line of sight to the road as a minimum.

6.5 For the facades facing onto Worcester Lane, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 29 dB $R_w + C_{tr}$ (example configuration: 4mm / 12mm / 6mm). Acoustic trickle ventilators, which achieve a minimum performance of 35 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

6.6 For the facades facing onto the railway line, all internal noise level criteria are likely to be achieved with a standard thermal double-glazing unit with a minimum sound insulation performance of 25 dB $R_w + C_{tr}$ (example configuration: 4mm / 12mm / 4mm). Trickle ventilators with an indirect air path, which achieve a minimum performance of 32 dB $D_{n,e,w} + C_{tr}$, are also likely to be required.

6.7 For dwellings which would be set further back from both the road and the railway line (i.e. located further into the development, it is likely that a certain amount of screening would be afforded by dwellings located nearest to the railway line. For any such dwellings, the proposed mitigation requirements set out above may be reduced.

6.8 The measured groundborne vibration levels on the western boundary fall below the threshold criteria for 'low probability of adverse comment' set out in BS 6472:2008.

6.9 Based on the results of the assessment, it has been demonstrated that the site is suitable for residential use from a noise and vibration perspective.

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.

APPENDIX B: Full Survey Result

Figure B.1: Measured Noise Levels at ML1

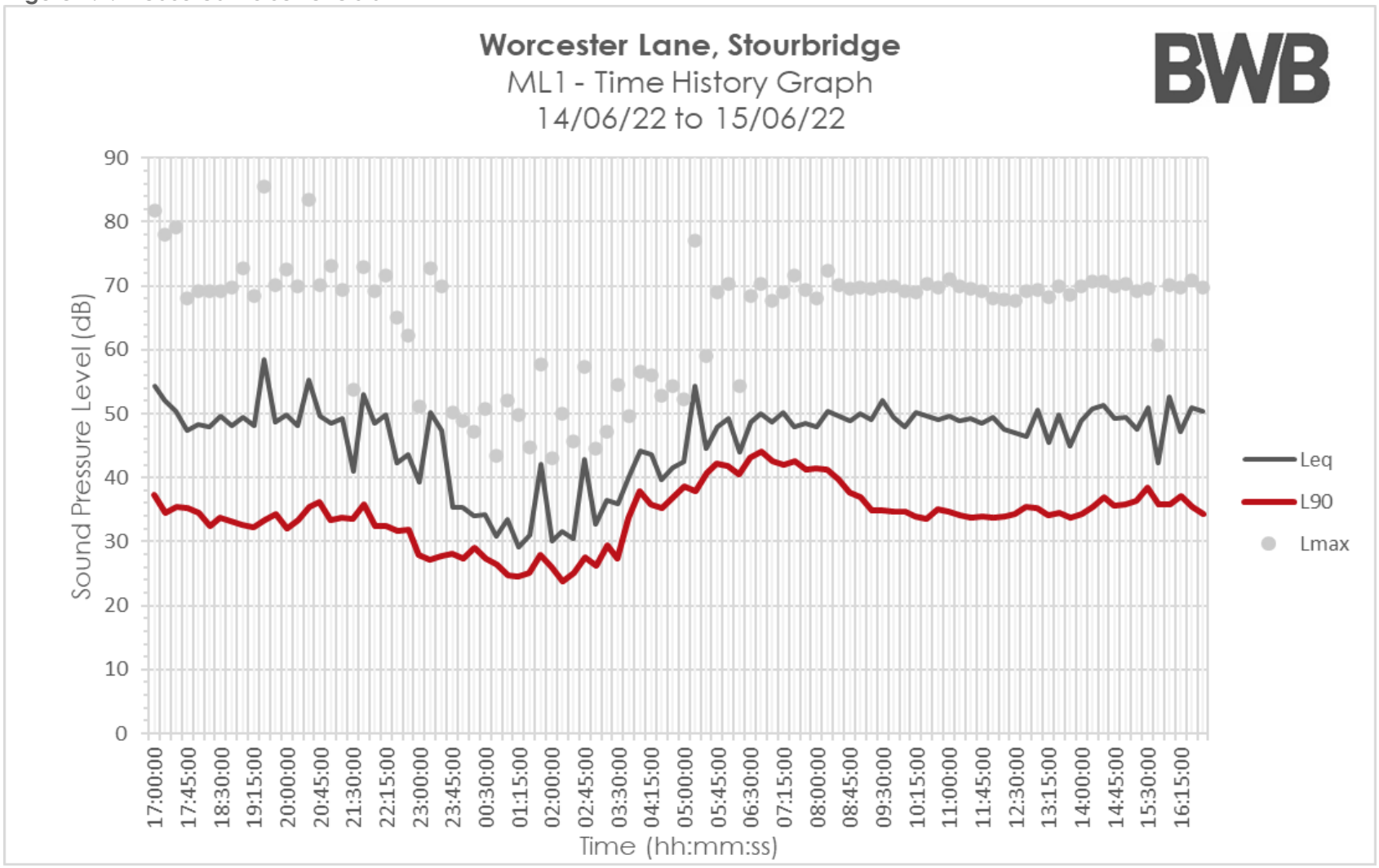


Figure B.2: Measured Vibration Levels, Daytime, 15/06/2022

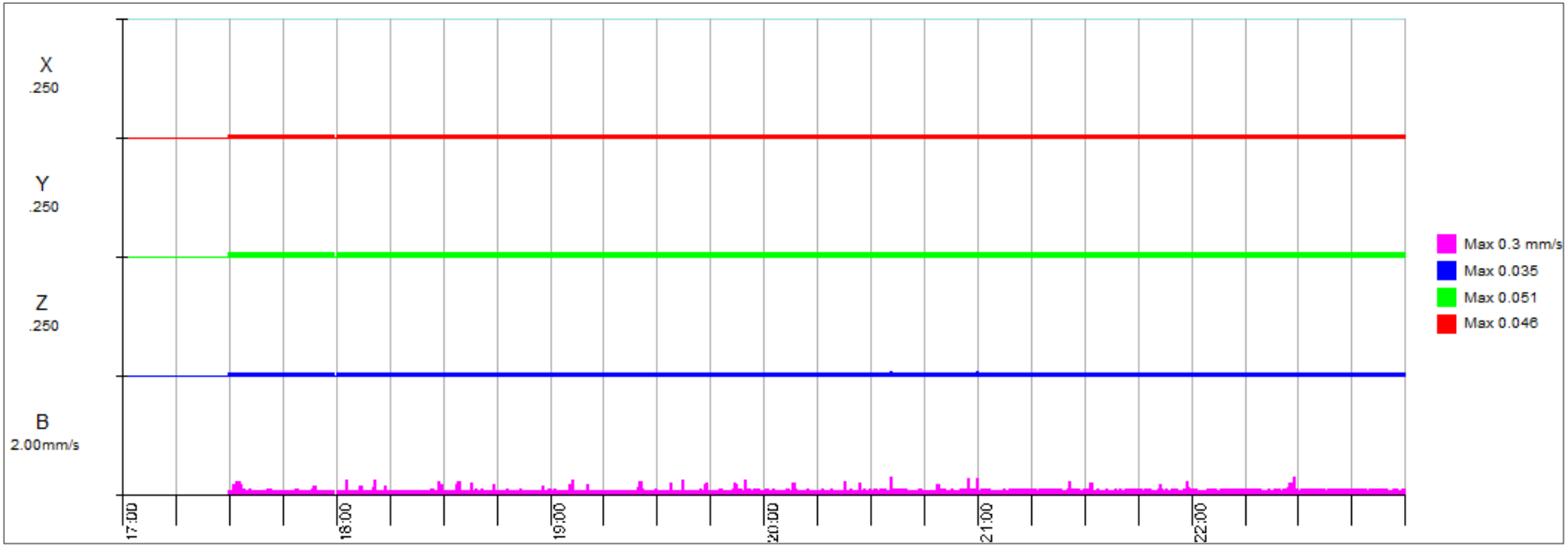


Figure B.3: Measured Vibration Levels, Night-time, 15/06/2022

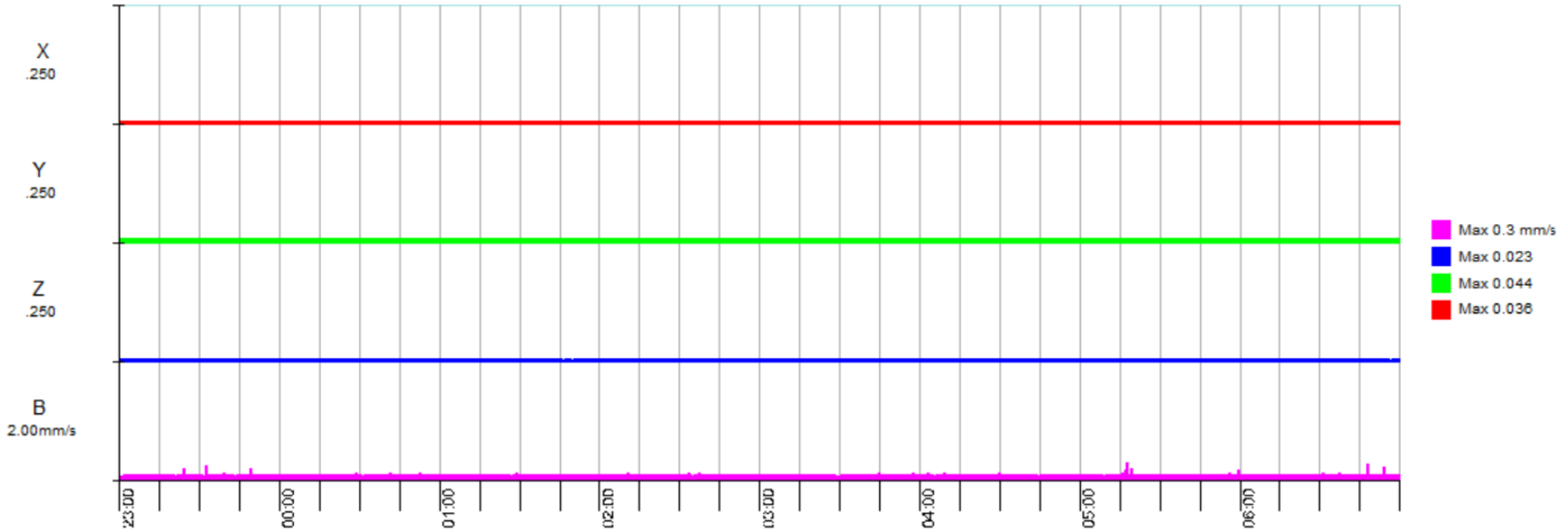


Figure B.4: Measured Vibration Levels, Daytime, 16/06/2022

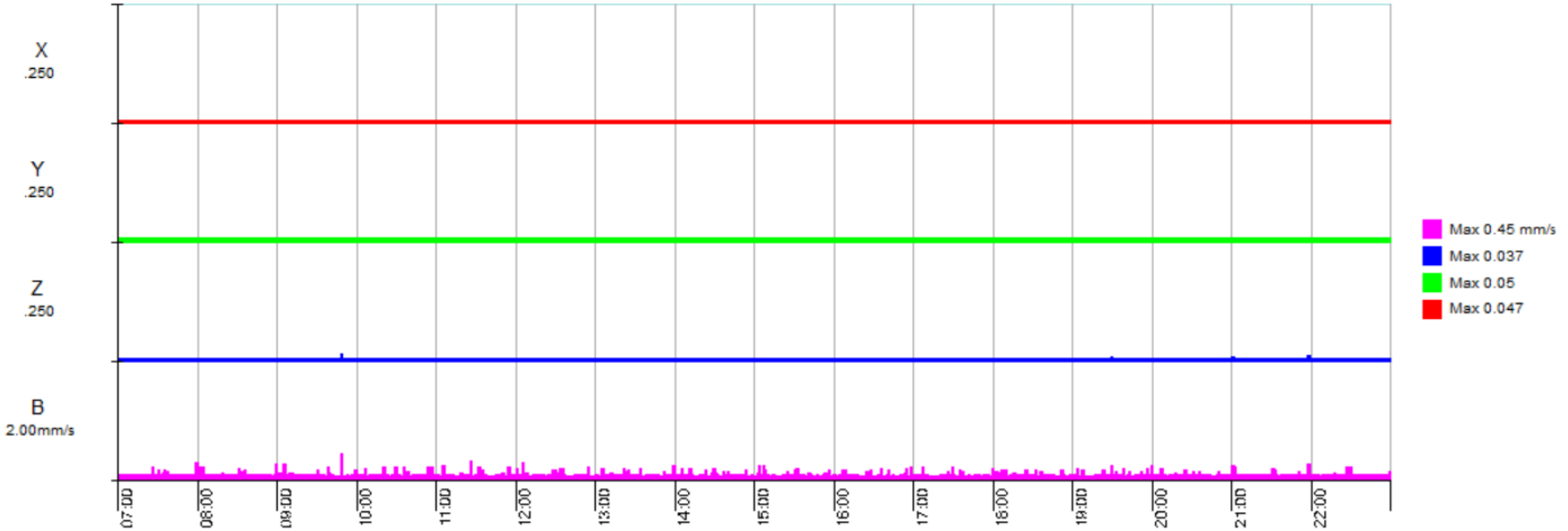


Figure B.5: Measured Vibration Levels, Night-time, 16/06/2022

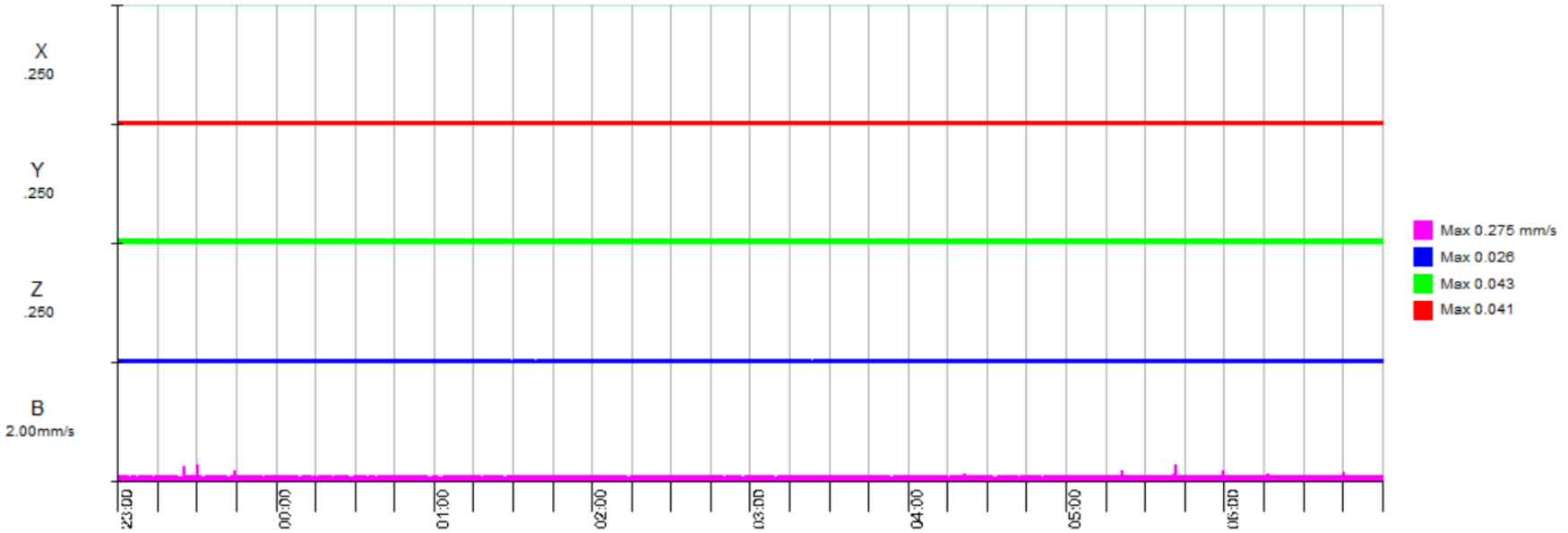


Figure B.6: Measured Vibration Levels, Daytime, 17/06/2022

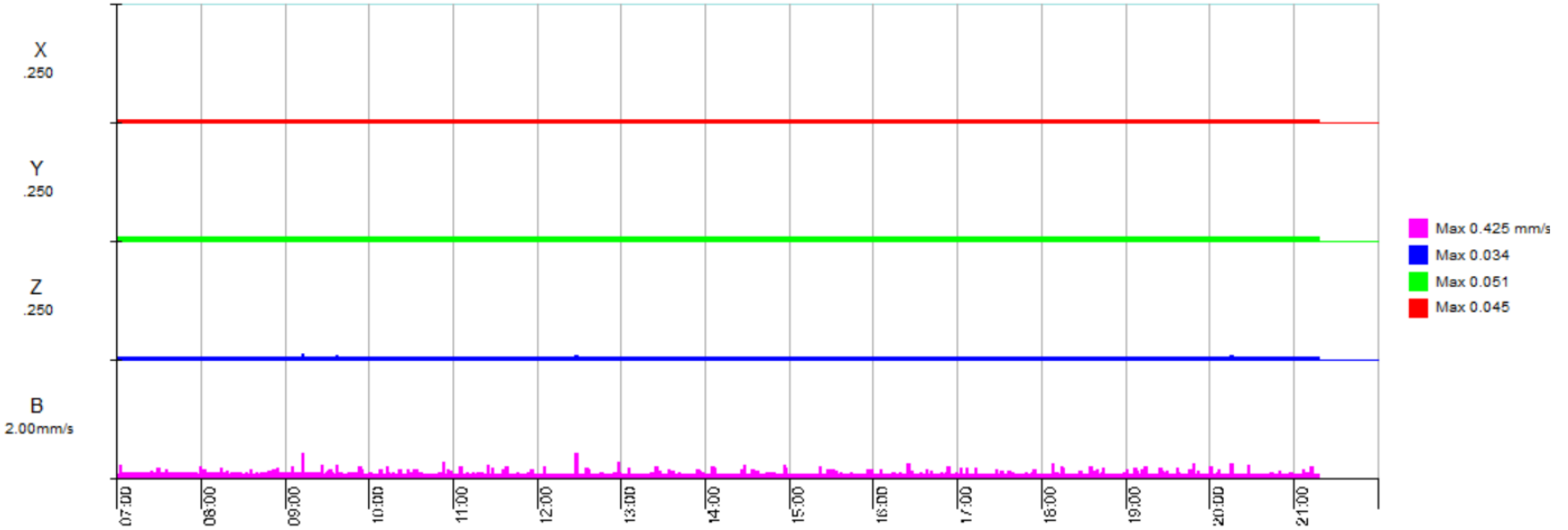
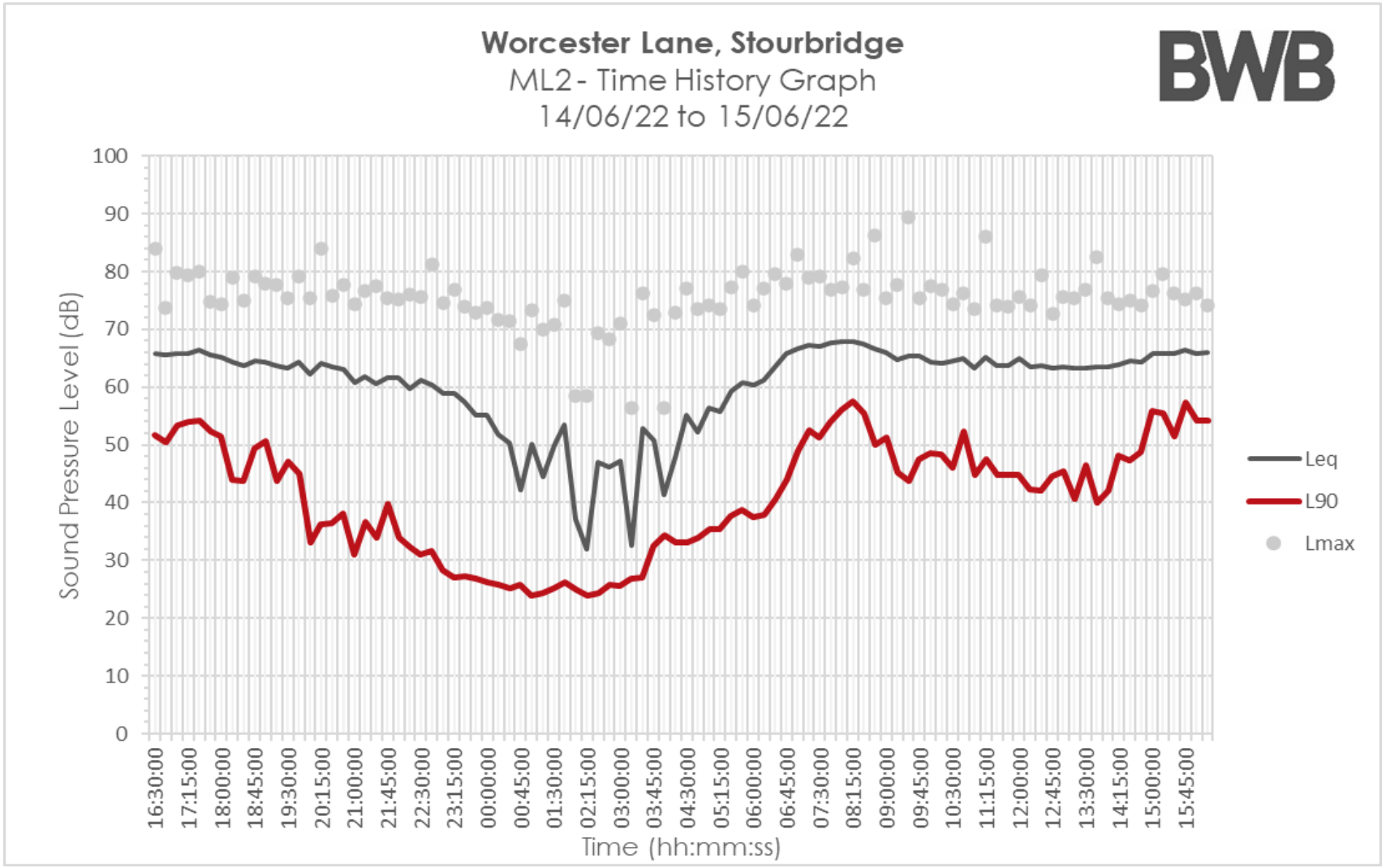


Figure B.6: Measured Noise Levels at ML2



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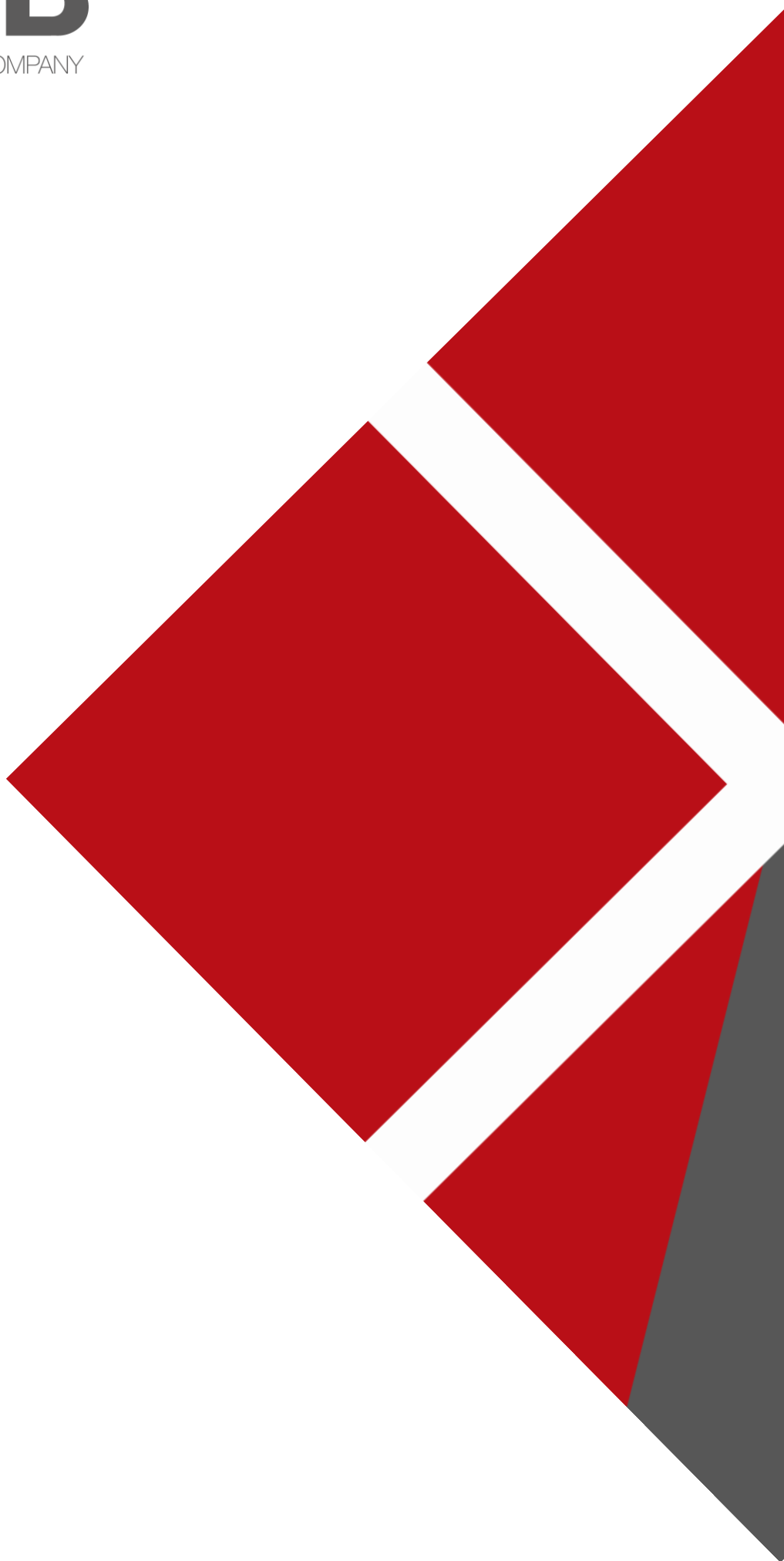

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