

ENVIRONMENT

Liberty Care Developments Limited

Yew Tree Care Home,
Northern Moor

Noise Impact Assessment

220454

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Northern Moor

Noise Impact Assessment

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EXECUTIVE SUMMARY

BWB Consulting was instructed by Liberty Care Developments Limited to undertake a Noise Impact Assessment for a proposed care home development at Yew Tree Lane, Northern Moor.

A baseline noise survey was undertaken in April 2022 and the subsequent assessment work has been undertaken in accordance with current standards and guidance, following consultation with Manchester City Council.

This assessment considers the impact of road traffic on the proposed care home and its future residents and where necessary, consideration has been given to mitigation measures.

The assessment demonstrates that all external criteria should be achieved with no mitigation in place.

Based on the proposed masterplan, all internal criteria should be achieved with standard double glazing such as configuration of 4mm pane/12mm pane/4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 25dB. Trickle ventilators with an indirect air path, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ of 32dB would be required.

Fixed noise limits have been set at nearby receptors to which any fixed plant items should meet, based on the results of the baseline noise survey.

The assessment shows that, with appropriate consideration to noise mitigation measures, including the provision of appropriate glazing and ventilation to all facades, an appropriate level of protection could be afforded to future noise sensitive receptors on the Site.

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1. INTRODUCTION

Appointment & Background

- 1.1 BWB Consulting (BWB) was instructed by Liberty Care Developments Limited (the Client) to undertake a Noise Impact Assessment for a proposed care home development located north of Yew Tree Lane, Northern Moor (the Site).
- 1.2 A baseline noise survey was undertaken in April 2022 and the subsequent assessment work has been undertaken in accordance with current standards and guidance, following consultation with Manchester City Council.
- 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 Noise Sensitive Receptors (NSRs) 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 within the administrative area of Manchester City Council (MCC).
- 1.6 The existing Site currently comprises an existing nursing home which is to be demolished and replaced with the proposed care home outlined in this report. The Site is bound to the north and west by existing residential, with the M60 situated at distance to the north. To the east, the Site is bordered by Willenhall Road with Princess Parkway situated at distance to the east and to the south by Yew Tree Lane, beyond which lies existing residential dwellings.
- 1.7 The location of the Site is shown in **Figure 1.1**.

Figure 1.1: Site Location



©Source: Google Maps Satellite Imagery

Proposed Development

- 1.8 The proposals comprise the demolition of the existing building and the construction of a 59-bedroom residential care home and associated car parking and outdoor amenity areas. The proposed masterplan is detailed in **Figure 1.2**.

Figure 1.2: Proposed Masterplan



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2. STANDARDS AND GUIDANCE

National Planning policy Framework (NPPF)

- 2.1 Published in 2012, and most recently revised in July 2021, this document sets out the Government's planning policies for England. 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 life⁶⁰;

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

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

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

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

- 2.4 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2.1** below:

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

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

- 2.5 Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or LA_{Fmax} 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 LAeq,T, with an upper guideline value of 55 dB LAeq,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 LA_{Fmax} 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 LA_{Fmax} more than 10-15 times per night”

Manchester City Council – Planning and Noise Technical Guidance

- 2.8 In the context of government policy, the Council require that developments aim for:

“1. A noise level between the No Observed Effect Level (this is the level of noise exposure below which no effect at all on health or quality of life can be detected) and the Lowest Observed Adverse Effect Level (this is the level of noise exposure above which adverse effects on health and quality of life can be detected). Conditions may be attached.

If point 1 cannot be achieved, then:

2. If the assessment results in a level between the Lowest Observed Adverse Effect Level and the Significant Observed Adverse Effect Level (this is the level of noise exposure above which significant adverse effects on health and quality of life occur), mitigation will be necessary to reduce the level and thus conditions will be attached.

If points 1 & 2 cannot be achieved, then:

3. If the assessment results in a Significant Observed Adverse Effect Level after mitigation, the application will be recommended for refusal."

2.9 Paragraph 3.7.1 of the MCC guidance states the following:

"The NPPF, NSPE and NPPG do not present absolute noise level criteria which define SOAEL, LOAEL and NOAEL which is applicable to all sources of noise in all situations in a planning context.

One of the aims of this document, therefore, is to address this ambiguity and provide a suite of noise level design targets for typical developments (which are in accordance with current policies and standards).

Where certain developments are not specifically covered, the applicant/consultant is encouraged to contact us with a view of discussing the best that can be achieved for the given situation (in the context of the scenarios listed in Section 3.6 of the guidance document)."

2.10 In regard to residential developments, the MCC guidance aligns with the criteria set out in BS 8233 and WHO as detailed above.

2.11 The MCC Planning & Noise guidance also outlines specific criteria in relation to deriving fixed plant limits. A reference is made to Appendix A, within the guidance which demonstrates the expectation of how to calculate a 'typical' background level. The guidance states the following:

"The noise assessment should be based on BS4142, and any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'"

Consultation with Manchester City Council

2.12 Consultation was undertaken with the Environmental Health Department at MCC by email in April 2022, seeking opinion on the specific requirements of a noise impact assessment and to agree an assessment methodology.

- 2.13 A response was received from Sharon McAndrew, Environmental Protection Officer at MCC on 29th April 2022 and the following was discussed;

"The scope looks fine, but please ensure that the assessment / report is done in accordance with our Noise and Planning Guidance which can be found at https://www.manchester.gov.uk/downloads/download/5199/information_for_developers . Can I draw your attention to Appendix A of the document which clarifies how we would want the typical background noise level to be calculated."

3. BASELINE NOISE MONITORING

Summary

- 3.1 A baseline noise survey has been undertaken to determine noise levels incident on the Proposed Development Site due to the passage of road traffic on Yewtree Lane to the south. Noise monitoring was also undertaken adjacent to the northern Site boundary to determine the background noise climate at a location representative of nearby noise sensitive receptors, and to determine the noise level in the northern area of the proposed development site. Noise monitoring positions adopted during the survey are identified in **Figure 3.1**.

Figure 3.1: Baseline Noise Measurement Position



Survey Methodology

Noise Measurement Position 1 (NMP1)

- 3.2 Noise monitoring was undertaken at NMP1 over a 24-hour period commencing at 13:15 on Wednesday 27th April 2022. The microphone at NMP1 was established in free-field conditions at 1.5 m above local ground level, approximately 7.5 m from the nearside kerb edge of Yewtree Lane. The noise climate at NMP1 was generally dominated by intermittent road traffic on Yewtree Lane and distant road traffic noise from the M60 circa. 275 m to the north and Princess Parkway circa. 260 m to the east.

Noise Measurement Position 2 (NMP2)

- 3.3 Noise monitoring was undertaken at NMP2 over a 24-hour period commencing at 13:00 on Wednesday 27th April 2022. The microphone at NMP2 was established at 1.5 m above local ground level and at circa. 1 m from the northern Site boundary fence (i.e façade conditions). The noise climate at NMP1 was generally dominated by distant road traffic from the M60 circa. 250 m to the north and Princess Parkway circa. 260 m to the east.
- 3.4 It should be noted that the measurement data from NMP2 shows an elevated noise level for approximately 1-hour commencing at 11:00 on 28th April 2022. This is believed to have been caused by a dog barking in the neighbouring property. Noise levels measured during these periods have therefore been excluded from this assessment.

Measurement Equipment

- 3.5 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 meter, pre-amplifier and microphone were calibrated to UKAS 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

Position	Equipment	Make & Model	Serial Number	Calibration due Date
NMP1	Sound Level Meter	SVAN 971	60745	23/08/2023
	Microphone	ACO 7052E	64535	
	Preamp	SV18	66815	
	Calibrator	B&K DB0311	449050	19/08/2022
NMP2	Sound Level Meter	Svantek 971A	113221	14/02/2024
	Microphone	Aco Pacific 7152	80629	
	Preamp	Svantek SV18A	113722	
	Calibrator	B&K DB0311	449050	19/08/2022

Meteorological Conditions

- 3.6 The weather throughout the survey remained generally conducive to environmental noise measurement, it being dry with negligible winds (<5ms⁻¹).

Measurement Results

- 3.7 A summary of daytime and night-time noise levels at NMP1 and NMP2 are presented in **Table 3.2 to Table 3.5**. A full summary of the survey data is presented in **Appendix B**.

Table 3.2: Summary of Measured Sound Pressure Level at NMP1 (free-field levels)

Period	Start Time	Period (T)	dB L _{Aeq,T}	dB L _{A90,T} ²	dB L _{AFmax} ³
Daytime	27/04/2022 13:15	16-hours	55 ¹	49	-
Night-Time	27/04/2022 23:00	8-hours	48	41	69

¹ Logarithmic average L_{Aeq,15mins} level measured between 13:15 – 23:00 on 27/04/2022 and 07:00 – 13:15 on 28/04/2022
² arithmetic average L_{A90,15mins} during measurement period
³ 10th Percentile L_{AFmax,15min} noise levels during measurement period

Table 3.3: Summary of Octave Band Day & Night-time Sound Pressure Levels at NMP1

Period	Octave Band Sound Pressure Levels (L _{eq} dB)								dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Daytime	62	56	51	51	52	45	42	38	55
Night-Time	55	48	43	43	45	40	38	34	48

Table 3.4: Summary of Measured Sound Pressure Level at NMP2 (façade levels)

Period	Start Time	Period (T)	dB L _{Aeq,T}	dB L _{A90,T} ²	dB L _{AFmax} ³
Daytime	27/04/2022 13:00	16-hours	54 ¹	50	-
Night-Time	27/04/2022 23:00	8-hours	48	42	68

¹ Logarithmic average L_{Aeq,15mins} level measured between 13:00 – 23:00 on 27/04/2022 and 07:00 – 13:00 on 28/04/2022
² arithmetic average L_{A90,15mins} during measurement period
³ 10th Percentile L_{AFmax,15min} noise levels during measurement period

Table 3.5: Summary of Octave Band Day & Night-time Sound Pressure Levels at NMP2

Period	Octave Band Sound Pressure Levels (L _{eq} dB)								dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Daytime	61	53	50	50	52	44	39	38	54
Night-Time	55	45	42	43	44	36	41	39	48

4. ASSESSMENT

- 4.1 The results of the baseline noise survey have been used as a basis for the noise assessment of the Site's suitability for a care home. The assessment considers noise from road traffic on proposed receptors.

Noise from Road Traffic

External Daytime Noise Levels

- 4.2 The noise levels measured at NMP2 are considered to be representative of the proposed outdoor amenity areas as shown in **Figure 1.2**. Therefore, this indicates that noise levels in outdoor amenity areas will be below the lower guideline value of 55dB $L_{Aeq,T}$, when considering noise from road traffic, in line with BS8233 and WHO guidance. Therefore, mitigation for outdoor amenity areas has not been considered further in this assessment.

Internal Noise Levels

- 4.3 The noise levels measured at NMP1 have been corrected for distance using a simple line source correction. This indicates that the nearest proposed façade to Yew Tree Lane would be exposed to free-field levels of 50dB $L_{Aeq,16hr}$ during the daytime. During the night-time, the nearest proposed façade would be exposed to a noise level of 44dB $L_{Aeq,8h}$. The night-time L_{AFmax} level of 69dB has been corrected for distance to the nearest façade, assuming a simple point source correction from the nearside kerb edge, which results in a level of 65dB L_{AFmax} .
- 4.4 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 35dB $L_{Aeq,16h}$ and 29dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 50dB L_{AFmax} during the night-time. Therefore, the criteria of 45dB L_{AFmax} for the night-time, is likely to be exceeded, assuming partially opened windows.
- 4.5 As NMP2 was under façade conditions, 3dB has been subtracted from the measured levels in accordance with BS8233:2014. The northern façade of the proposed care home would be exposed to free-field levels of 51dB $L_{Aeq,16hr}$ during the daytime. During the night-time, the northern façade would be exposed to a noise level of 45dB $L_{Aeq,8h}$. The night-time L_{AFmax} level at the façade would be 65dB.
- 4.6 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 36dB $L_{Aeq,16h}$ and 30dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 50dB L_{AFmax} during the night-time. Therefore, the criteria of 35dB $L_{Aeq,16h}$ during the daytime and 45dB L_{AFmax} for the night-time, is likely to be exceeded, assuming partially opened windows. Therefore, consideration to mitigation has been given in **Section 5**.

Noise from fixed plant

- 4.7 It is anticipated that there may be fixed plant and equipment associated with the proposed development that may have the potential to generate noise. However, at

this stage details of the proposed type, number, and precise location of any such plant or the nature of its operation are not available at this stage. In the absence of detailed information, it is appropriate to specify suitable noise control limits to which any plant and equipment should conform. These limits should include any appropriate corrections for acoustic characteristics, in accordance with BS 4142.

- 4.8 It is considered that the rating level of fixed plant noise sources should not exceed the prevailing background sound level when measured at the nearest receptors. The cumulative effect of all external plant should be specified so that the rating level is less than or equal to the prevailing background noise level.
- 4.9 Noise from external plant on the development site should achieve the following noise level limits, shown in **Table 4.1**.

Table 4.1: Noise Limits from Fixed Plant

Respective Measurement Location	Rating Level Limit to be Achieved at ESRs (dB L _{A,Ti})	
	Daytime (0700-2300)	Night-time (2300-0700)
NMP1 – Receptors off Yew Tree Lane	49	41
NMP2 – Receptors off Barry Road	47 ¹	39 ¹
¹ Based off calculated free-field levels		

- 4.10 The above rating level limit will apply at least 3.5 metres from the façade of any residential property i.e. in free-field conditions.
- 4.11 In accordance with BS 4142, the assessment of plant noise emissions should include appropriate rating corrections for tonal, irregular, or intermittent plant where applicable, before comparison with the above limits.
- 4.12 Once the detailed nature of such future uses is confirmed, noise from any fixed plant can be considered to ensure that the limits can be met.
- 4.13 It should be noted that the derived rating level limits would be applicable to the total noise from the simultaneous operation of all external plant serving the Proposed Development. As such, noise emissions from individual items of plant will need to be lower than the given limit, although the exact limit for each individual item of plant will be dependent upon its type, noise characteristics, location etc.

5. MITIGATION

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

Internal Living Areas

- 5.2 It is widely considered that first amelioration measure available to an occupant will be to close windows. Therefore, in order to assess the noise mitigation required to ensure an adequate level of protection, it is appropriate to explore in the first instance the protection that could be afforded by the sound insulation performance of the external building fabric, and in particular the glazing elements.
- 5.3 Detailed noise break-in calculations have been completed in accordance with the rigorous method from section G.2 BS 8233:2014, based on the frequency spectra measured on Site, the measured room dimensions of W3.6m x L5.6m, and the following assumptions
- Assumed room height of 3.15m;
 - Glazed area of 3.2m²
 - A reverberation time of circa 0.5 seconds;
 - External building fabric elements shall achieve a sound reduction performance of at least $R_w + C_{tr}$ 48dB;
 - 1 no. of vents per room.
- 5.4 The break-in calculations have been undertaken for the 3rd floor, to provide a worst-case scenario, using the detailed plans provided by the client.
- 5.5 To achieve the daytime internal noise criterion of 35 dB $L_{Aeq,16h}$ adopted for this assessment, based on the worst affected façade experiencing 51dB $L_{Aeq,16h}$ free-field at the façade, a reduction of 16dB(A) would be required for habitable rooms. To achieve the internal criteria of 45 dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 20 dB(A) would be required for habitable rooms.
- 5.6 All criteria should be achieved with standard double glazing such as configuration of 4mm pane/12mm pane/4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 25dB. Trickle ventilators with an indirect air path, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ of 32dB would be required.
- 5.7 As the measured noise levels at NMP1, to the front of the Site and NMP2, to the rear of the Site were similar in value, it is recommended that the above mitigation is applied to all facades of the proposed care home.
- 5.8 **Table 5.1** shows the resultant internal noise levels in the worst affected room.

Table 5.1 – Predicted external and internal noise levels, dB

Room	Predicted External Noise Level, free field			Resultant Internal Noise Level		
	L _{Aeq,16h}	L _{Aeq,8h}	L _{AFmax}	L _{Aeq,16h}	L _{Aeq,8h}	L _{AFmax}
Bedroom	51	44	65	23	16	37

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

6. CONCLUSION AND RECOMMENDATIONS

- 6.1 BWB Consulting was instructed by Liberty Care Developments Limited to undertake a Noise Impact Assessment for a proposed care home development at Yew Tree Lane, Northern Moor.
- 6.2 A baseline noise survey was undertaken in April 2022 and the subsequent assessment work has been undertaken in accordance with current standards and guidance, following consultation with Manchester City Council.
- 6.3 This assessment considers the impact of road traffic noise on the proposed care home and its future residents and where necessary, consideration has been given to mitigation measures.
- 6.4 The assessment demonstrates that all external criteria should be achieved with no mitigation in place.
- 6.5 Based on the proposed masterplan, all internal criteria should be achieved with standard double glazing such as configuration of 4mm pane/12mm pane/4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 25dB. Trickle ventilators with an indirect air path, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ of 32dB would be required.
- 6.6 Fixed noise limits have been set at nearby receptors to which any fixed plant items should meet, based on the results of the baseline noise survey.
- 6.7 The assessment shows that, with appropriate consideration to noise mitigation measures, including the provision of appropriate glazing and ventilation to all facades, an appropriate level of protection could be afforded to future noise sensitive receptors on the Site.

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

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 (2×10^{-5} Pa).
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 1 m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Full Survey Results

Figure B1: Summary of Results from NMP1

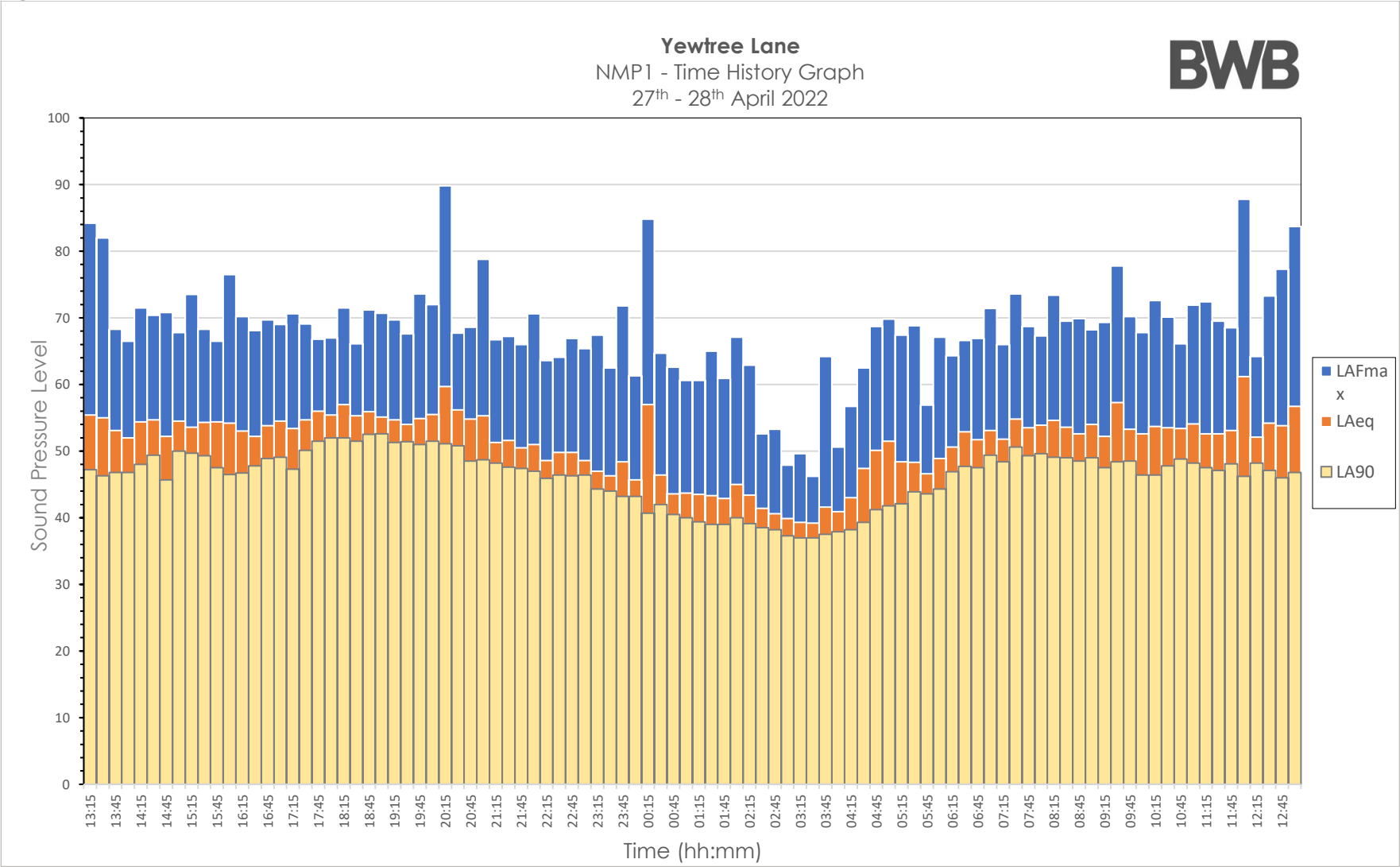


Figure B2: Summary of Results from NMP2

