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Date: 31st May 2024
Reference: R10590-1 Rev 1

RE: Land at Station Hill, Botley - Preliminary Noise and Vibration Summary

Please see below our preliminary findings, following noise and vibration surveys undertaken at the site.

1. Introduction and Site Description

1.1 24 Acoustics Ltd has been instructed Foreman Homes, to undertake a preliminary noise and vibration assessment for a development located at Land at Station Hill, Botley. It is proposed to develop the site for a residential scheme.

1.2 The site is bounded by the railway line to the north, Station Hill (A334) to the west and the A3051 to the south. Other potential noise sources in the area include the Railway Inn public house adjacent to the north-west corner of the site and a Car Wash on the south-west corner of the site.

1.3 Figure 1 shows the existing site location.

1.4 24 Acoustics has undertaken on-site measurements to assess noise from Station Hill and the A3051 as well as noise and vibration from the railway.

2. Assessment Criteria

BS 8233:2014 and WHO Guidelines

2.1 BS 8233:2014 provides design guidance for dwelling houses, flats and rooms in residential use and recommends that internal noise levels in dwellings do not exceed 35 dB $L_{Aeq,16\ hour}$ in living rooms and bedrooms during the day and 30 dB $L_{Aeq,8\ hour}$ in bedrooms at night. Based on WHO guidance, a maximum night-time internal level of 45 dB $L_{Amax,f}$ should also apply in bedrooms for regular events.

2.2 BS 8233:2014 proposes an upper guideline value of 55 dB $L_{Aeq,T}$ for external amenity space. The standard recognises that the desirable noise levels for external amenity areas are not always achievable in certain locations.

Approved Document O (ADO)

2.3 Approved Document O (ADO) came into effect in June 2022 and requires all new dwellings to provide mitigation to control overheating. Section 3 of the approved document provides thresholds for night-time noise levels within bedrooms. The document states:

> *"Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:*
>
> *a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
>
> *b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)."*

Professional Practice Guidance on Planning & Noise (ProPG)

2.4 The Professional Practice Guidance on Planning and Noise (ProPG) was published jointly by the Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health in May 2017. The guidance relates to the consideration of existing sources of transportation noise upon proposed new residential development.

2.5 The ProPG guidance describes a recommended approach for new residential development, which includes four key elements of the assessment process, identified below:

(i) Good acoustic design process;
(ii) Internal noise level guidelines;
(iii) External amenity area noise assessment;
(iv) Assessment of other relevant issues.

British Standard BS 6472: 2008 - Vibration

2.6 The assessment of human response to vibration within buildings is currently guided by British Standard BS 6472:2008 (Guide to Evaluation of Human Exposure to Vibration in Buildings, Part 1: Vibration Sources Other than Blasting). Human response to vibration in buildings is assessed in terms of VDVs defined over daytime and night-time periods.

2.7 The standard defines values of VDV which are likely to cause varying degrees of adverse comment and these are summarised in Table 1.

Place and Time	**Vibration Dose Value, $m/s^{1.75}$**		
	Low Probability Of Adverse Comment	**Adverse Comment Possible**	**Adverse Comment Probable**
Residential 16 hr day (07:00 to 23:00)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential 8 hr night (23:00 to 07:00)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Table 1: Vibration Dose Values and Subjective Response

2.8 Vibration within buildings can also create re-radiated noise, and this is an important consideration in the design of new buildings close to railways or other sources of ground-borne vibration. There are no fixed standards for re-radiated noise within buildings, although values in the order of 35 dB $L_{Amax, slow}$ are often used for design purposes.

3. Environmental Noise and Vibration Surveys

3.1 Environmental noise and vibration surveys were undertaken at the site during the period 14th to 21st May 2024.

3.2 Noise measurements were undertaken at the following locations representative of proposed dwellings, all at a height of approx. 1.5m above local ground level:

- Location 1 – West boundary of the site adjacent to Station Hill and close to the public house;
- Location 2 – Northern site boundary approximately 15m from the centre of the railway line and 1m from the north site boundary;
- Location 3 – South boundary of the site adjacent to the A3051 and close to the car wash;
- Location 4 – Towards the North of the site, approximately 35m from the centre of the railway line.

3.3 Vibration measurements were also undertaken, in each of the three orthogonal axes of motion, at Location 2 and Location 4.

3.4 The noise and vibration monitoring Locations are shown in Figure 1.

Results - Noise

3.5 The noise measurement results are shown in Appendix B and summarised in Table 2 below.

Measurement Location	**Period and Sound Pressure Level, dB**		
	Day (07:00 – 23:00) dB $L_{Aeq, 16\ hour}$	**Night (23:00 – 07:00) dB $L_{Aeq, 8\ hour}$**	**Night (23:00 - 07:00) Typical dB $L_{Amax,f}$**
Location 1 (Station Hill)	69	63	84
Location 2 (Railway)	60	56	78
Location 3 (A3051)	60	52	69

Table 2: Summary of Measured Noise Levels.

3.6 The measured noise levels at Location 1 were controlled by noise from road traffic using Station Hill. Location 3 was controlled by noise from road traffic using the A3051. No significant noise was noted from the car wash at Location 3.

3.7 Noise from passing trains determined the measured noise levels at Location 2. Analysis of train timetable data confirms that there were some freight train movements as well as regular passenger trains, during daytime and night-time periods.

Results - Vibration

3.8 Vibration measurement results are summarised in Table 3 below, in terms of the overall daytime and night-time VDVs in the most-affected (vertical) axis.

Measurement Location	Vibration Dose Values ($m/s^{1.75}$)	
	Day (07:00 – 23:00)	**Night (23:00 – 07:00)**
Location 2 (approx. 15m from from the centre of the railway line)	0.10	0.08

Table 3: Summary of Vibration Levels (vertical axis), Location 3.

3.9 Short-term measured vibration levels at location 4 were in the order of 0.03 $m/s^{1.75}$ VDV.

3.10 During the site visits, vibration from train pass-bys was not perceptible at Locations 2 or 4.

4. Rail Vibration - Preliminary Assessment

4.1 Whilst the measured vibration levels (VDVs) on the undeveloped site are below the 'low probability of adverse comment' under BS 6472, in practice the vibration level inside the building will not be the same as that measured on the undeveloped site. This will depend upon the nature of the construction, foundation types, the materials used and the mass and stiffness of individual building elements. Because of this, it is difficult to reliably predict the likely internal vibration levels from external measurements without using a detailed vibration model.

4.2 In some circumstances, vibration levels can be amplified by the building elements, which can result in higher levels of vibration being experienced within the building itself. Levels up to 4 times the free field ground level can occur and if this were the case here, night-time vibration levels in close proximity to the railway line would be within the range of "adverse comment possible" category.

4.3 It should also be noted that there would be a risk of adverse re-radiated ground-borne noise within dwellings close to the railway line, depending on the type of construction materials and foundations.

4.4 Given the measured vibration levels and the close proximity of the development to the railway line, it is recommended to allow for a buffer zone of at least 15m between the site boundary with the railway line and proposed residential properties (see Figure 2).

4.5 If residential properties were proposed within the 15m zone, a detailed vibration modelling assessment would be required, in order to determine whether vibration mitigation needs to be incorporated into the building design.

5. Noise Mitigation

5.1 The following advice is for preliminary purposes only and will be subject to the development of the proposed site layout.

5.2 Under the ProPG it is necessary to demonstrate that acoustic considerations have been taken into account in the design process for the proposed development.

Road and Rail Noise

5.3 The following measures are recommended to be included in the design of the development for areas of the site fronting either Station Hill, A3051 and the railway (see Figure 2):

- All dwellings are set back from Station Hill. For guidance, a minimum set back distance of 15m from the site boundary with Station Hill is recommended.
- Gardens must be located behind the houses and therefore acoustically screened from Station Hill, the railway and the A3051;
- Minimum 15m buffer zone between the site boundary with the railway line and proposed residential properties as recommended;
- Higher occupancy bedrooms facing away from the main road and the railway line;
- All gardens to be enclosed with a close-boarded fence, of minimum height of 1.8m and a minimum surface density of 12 kg/m^2.

5.4 It is also recommended that consideration be given to an acoustic barrier, e.g. 2.4m height, along the closest site boundary with the railway line (see Figure 2).

5.5 For properties fronting Station Hill, the railway line and the A3051 it will be necessary to consider acoustic glazing and acoustic ventilators (passive or mechanical) to achieve acceptable internal noise levels. Depending on the final layouts and elevations, it is anticipated that standard thermal double glazing and trickle ventilators would be sufficient to achieve the defined internal noise criteria (ref BS 8233 and WHO Guidelines) within the majority of the site further away from Station Hill, the A3051 and the railway line.

Approved Document O – Noise Requirements

5.6 It is expected that the overheating assessments for properties fronting Station Hill, the A3051 and the railway line will need to assume that bedroom windows facing the road/railway are closed at night (23:00 to 07:00 hours), in order to achieve the noise requirements of Approved Document O. Please note this does not require windows to be fixed shut.

5.7 The noise requirements under ADO apply to night-time noise levels in bedrooms only, however for good design it is also relevant to consider internal noise conditions in living rooms. On this basis, it may be appropriate to consider alternative means of controlling overheating to living rooms facing the road/railway, such that windows can be kept closed.

Railway Inn

5.8 The Railway Inn public house lies on the north-west corner of the site and includes a car park and external seating area directly north of the proposed scheme.

5.9 It is understood that the public house hosts daytime and evening live and amplified music events. No music events took place during the noise survey period.

5.10 Given the close proximity of the development site, consideration should be given to locating habitable rooms and gardens to not be directly facing the public house, subject to a detailed assessment of noise levels from entertainment and patrons.

6. Future Assessment and Design

6.1 A detailed noise modelling assessment will be required in order to determine the variation in noise levels from the various sources across the site and to determine the effectiveness of the proposed acoustic barriers.

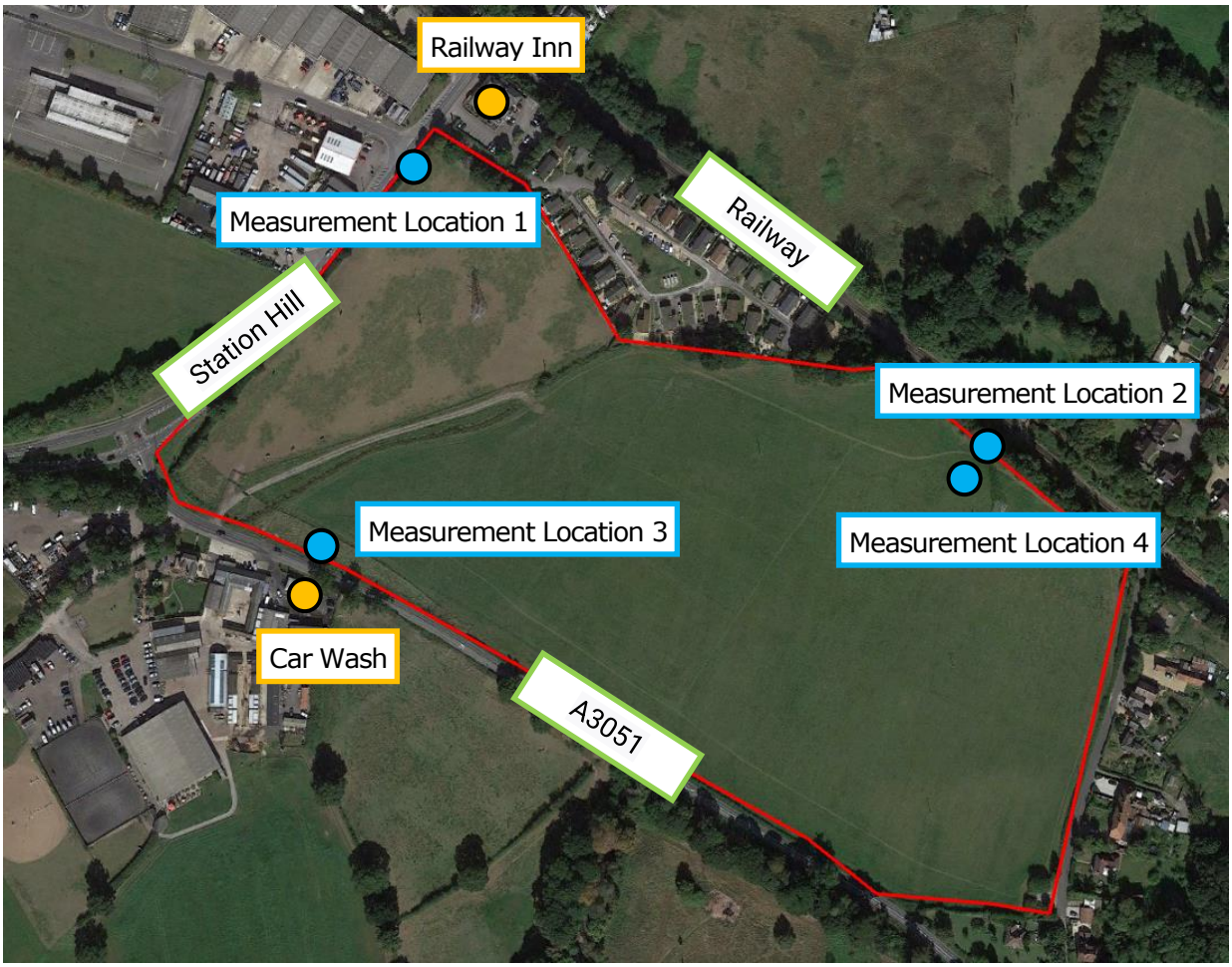
6.2 An assessment of noise levels from the public house shall be undertaken, in order to determine the implications upon the proposed development.

6.3 To finalise the assessment and to specify outline requirements for noise mitigation to dwellings, drawings showing the proposed illustrative housing layout will be required. Outline acoustic specifications for glazing and ventilation to dwellings can be provided, to ensure acceptable internal noise levels can be achieved.

I trust you will find the above satisfactory. Should you have any queries please do not hesitate to contact me.

Yours sincerely
For 24 Acoustics Ltd

Andre Pires BEng AMIOA
Consultant



Project: Land at Station Hill, Botley	**Title:** Noise Measurement Locations	
DWG No: Figure 1	**Scale:** N.T.S.	**Rev:** -
Date: May 2024	**Drawn By:** AP	**Job No:** 10590

Project: Land at Station Hill, Botley	**Title:** Recommended Mitigation		24Acoustics
DWG No: Figure 2	**Scale:** N.T.S.	**Rev:** -	
Date: May 2024	**Drawn By:** AP	**Job No:** 10590	

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

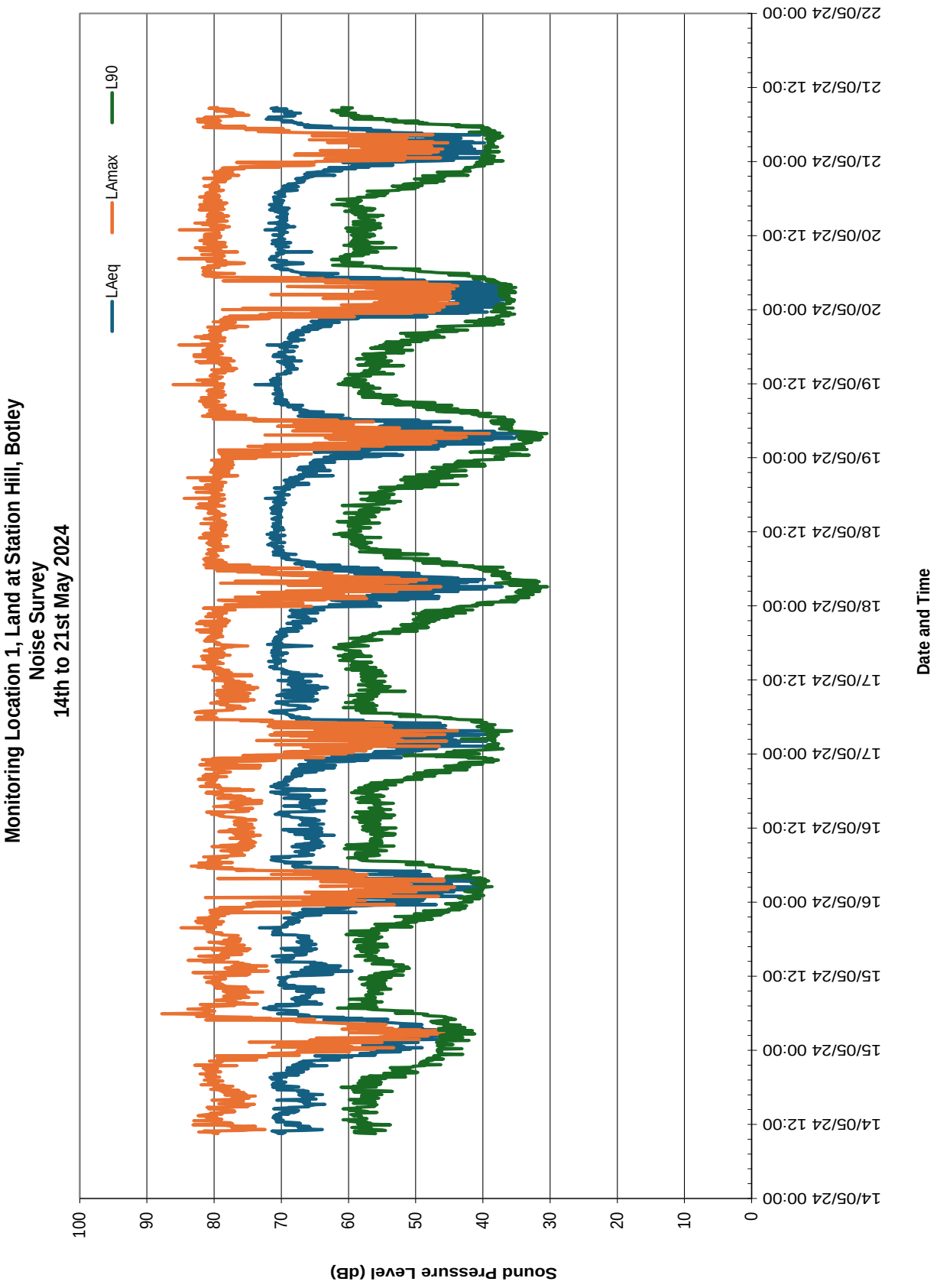
iii) The L_{A10} noise level

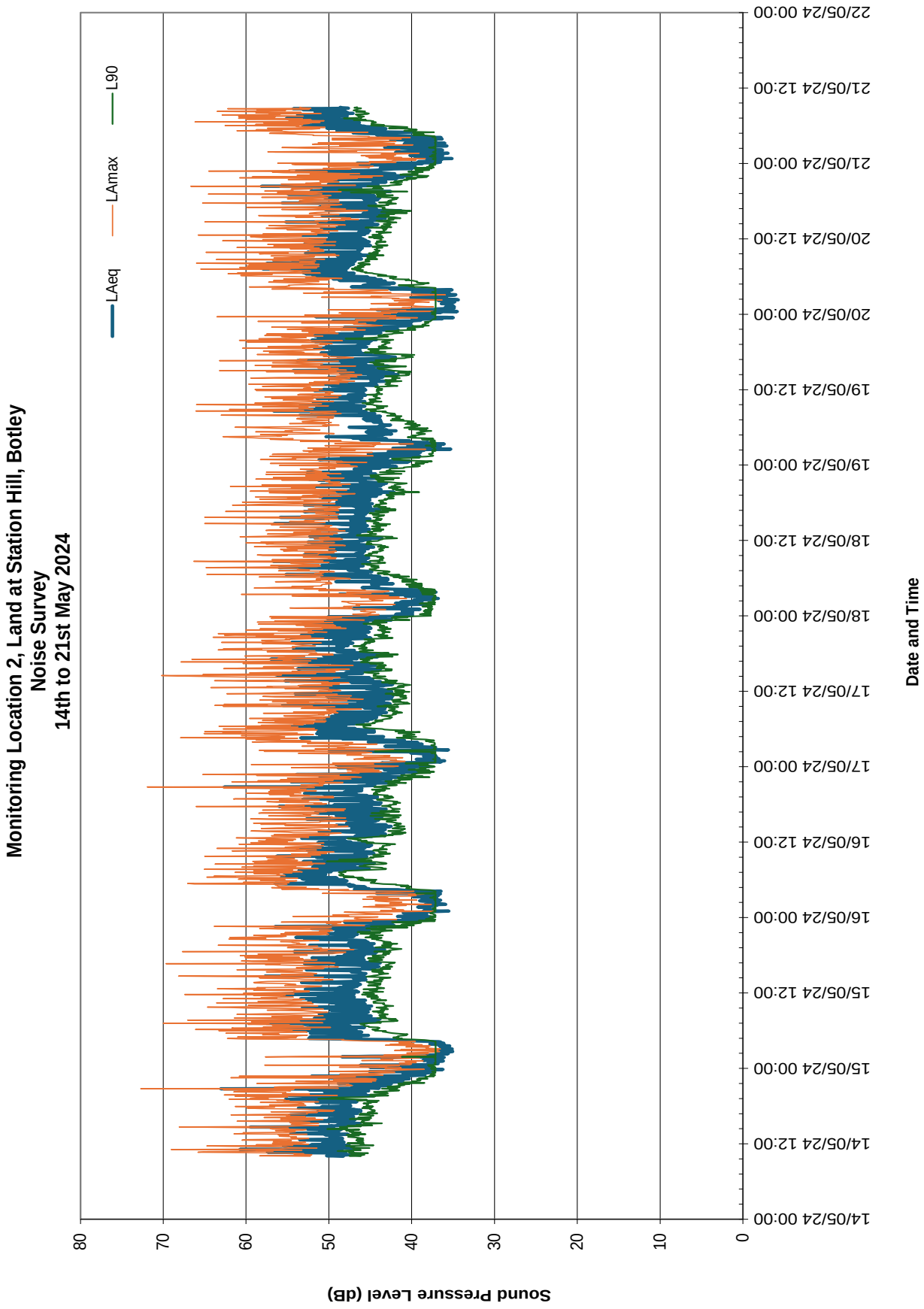
This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B: ENVIRONMENTAL NOISE MEASUREMENTS

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Noise Survey
14th to 21st May 2024
LAeq
LAmax
L90
Sound Pressure Level (dB)
0
10
20
30
40
50
60
70
80
Date and Time
14/05/24 00:00
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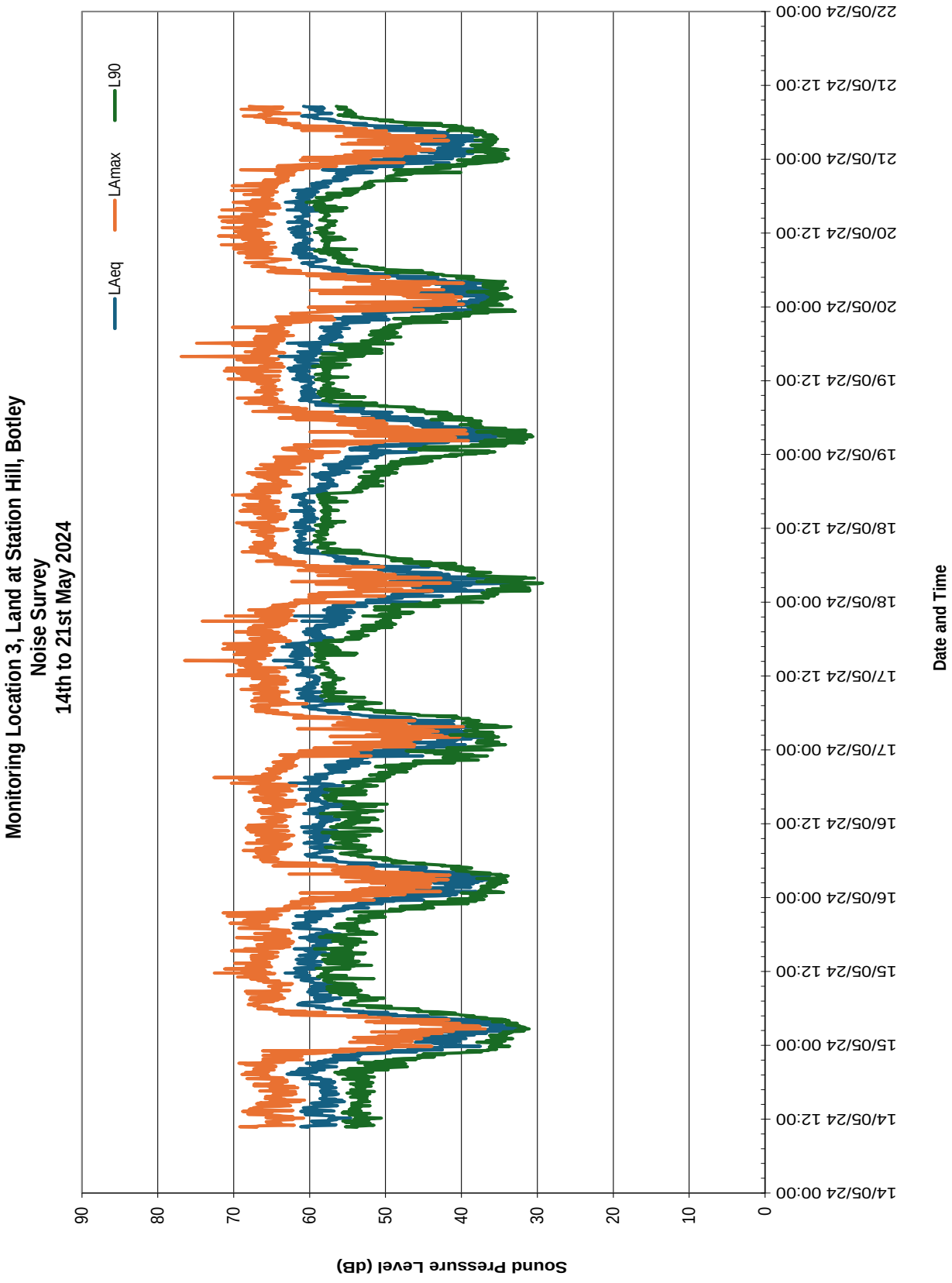
Monitoring Location 3, Land at Station Hill, Botley
Noise Survey
14th to 21st May 2024
LAeq
LAmax
L90
Sound Pressure Level (dB)
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Date and Time
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