SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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55 Argyle Street

Environmental noise survey and plant noise egress limits

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Summary

Sandy Brown has been commissioned by Heatherwick Studio to provide acoustic advice in relation to proposed refurbishments at 55 Argyle Street, London WC1H 8EE.

As part of this, an environmental noise survey has been undertaken, the purpose of which was to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 45 dB during the daytime and $L_{A90,15min}$ 42 dB at night.

Based on the requirements of the Local Authority (London Borough of Camden) and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 38 dB during the daytime, and $L_{Aeq,15min}$ 35 dB during the night.

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

Plant shall be designed and installed to meet these limits. Further assessment of plant selections and advice on attenuation measures will be provided as the design progresses.

Contents

1 Introduction

Sandy Brown has been commissioned by Heatherwick Studio to provide acoustic advice in relation to proposed refurbishments at 55 Argyle Street, London WC1H 8EE.

As part of this, an environmental noise survey has been undertaken, the purpose of which was to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, and a discussion of acceptable limits for noise emissions from building services plant. Further assessment of plant selections and advice on attenuation measures will be provided as part of the next design stage.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1.

Figure 1 Aerial view of site (courtesy of Google Earth Pro)

55 Argyle Street (blue) is located just off the intersection with Grays Inn Road. It is currently being redeveloped as a headquarters for Heatherwick Studio.

2.2 Adjacent premises

The site is surrounded by residential properties (red in Figure 1), one hostel (orange) and other commercial premises.

To the west of the site there are residential flats on Birkenhead Street with balconies that face south. There are also large residential flats on the south side of Argyle Street, along with smaller residential premises at numbers 106, 108C and 110A.

To the east on Grays Inn Road is a hostel (Clink 261) and residential properties at numbers 259, 255A and 251A.

The nearest noise sensitive receiver is 5 Hand Axe Yard (immediately to the north). This is a new build development including windows overlooking 55 Argyle Street .

3 Development proposals

55 Argyle Street is an existing commercial building over five storeys (including basement).

The existing building is to be refurbished for Heatherwick Studio's occupation. As part of this, changes are proposed to the location and specifications of external plant equipment. All external plant will be located on a new Level 2 balcony at the north end of the building. Final plant selections and layouts are not yet available; these will be reviewed against the criteria presented in this report as the design progresses.

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014:+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Local Authority criteria

In relation to the assessment of noise emissions from installed building services plant the London Borough of Camden's (LBC) *Camden Local Plan, Adoption version* (June 2017) states the following:

> *…it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion.*

5 Noise survey method

The survey included unattended and attended noise measurements.

5.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 4 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 16:12 on 22 September 2021 and 11:42 on 27 September 2021. The equipment was installed by Patrick Smith, Ciaran Maloy, and Ruthu Prem Kumar and was collected by Ciaran Maloy.

The measurement position used during the survey is indicated in Figure 2, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 3. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

The microphone was mounted on a tripod at a height of approximately 1.5 m above the floor (extending above the roof top edge wall).

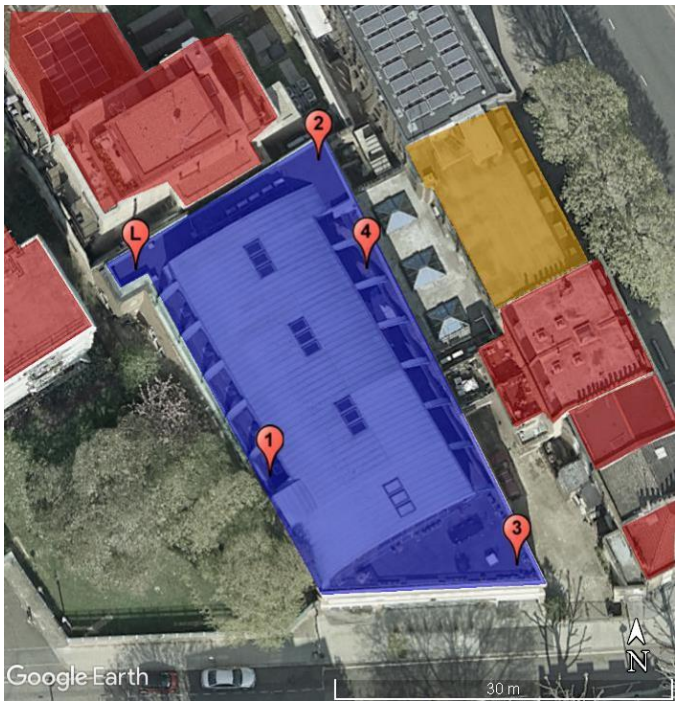

Figure 2 Measurement locations (image courtesy of Google Earth Pro)

Figure 3 Monitoring equipment setup at location 'L'

5.2 Attended measurements

Attended sample measurements were taken by Ciaran Maloy and Ruthu Prem Kumar at 4 locations around the site. These are indicated in Figure 3 as positions 1, 2, 3 and 4. The attended measurements were carried out on 22 September 2021, over 5-minute periods.

At each position the microphone was held approximately 1.2 m above the ground level and at least 1 m from any other reflective surface. Details of the equipment used and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

5.3 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Noise survey results

6.1 Observations

The dominant noise sources observed at the site during the survey were road traffic on Grays Inn Road and occupant noise from the adjacent residential apartments. Other less significant noise sources included pedestrians and road traffic on Argyle Street, wind noise (eg, rustling leaves in nearby trees), overflying aircraft, distant sirens, and plant from adjacent buildings.

6.2 Noise measurement results

6.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

Measured minimum background sound levels are given in Table 2.

All measurements at position ‘L’ are free-field.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Wednesday 22 September 2021	-	46
Thursday 23 September 2021	51	47
Friday 24 September 2021	51	47
Saturday 25 September 2021	49	47
Sunday 26 September 2021	49	48

Table 2 Minimum background sound levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB)	Night (23:00 – 07:00) $L_{A90,15min}$ (dB)
Wednesday 22 September 2021	45[1]	41
Thursday 23 September 2021	44	41
Friday 24 September 2021	44	41
Saturday 25 September 2021	44	42
Sunday 26 September 2021	44	42
Monday 27 September 2021	48[1]	-

[1] Measurement not made over full period due to monitoring start and end time.

The lowest background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the daytime and $L_{A90,15min}$ 41 dB at night.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night-time statistical analysis of representative values for the site are presented in Appendix C.

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 45 dB during the daytime and $L_{A90,15min}$ 42 dB at night.

6.2.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 3.

Measurements at positions 1 and 4 were facade measurements. Measurements at positions 2 and 3 were free-field.

Table 3 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	L_{AFmax}	$L_{A90,5min}$	
1	15:44	48	60	46	Pedestrians, sirens, wind, occupant activity (from residential)
1	15:51	48	60	46	
2	15:58	52	67	49	Traffic, wind, plant from adjacent sites
2	16:04	52	64	49	
3	16:11	58	68	50	Road traffic, pedestrians
3	16:16	58	72	51	
4	16:22	52	62	48	Road traffic, occupant activity (from residential)
4	16:27	64	81	48	

[1] Measurement at 1 m from the building facade.

[2] 30 second measurement.

6.3 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 4.

The limits apply at 1 m from the worst affected windows of the nearby noise sensitive premises and are presented as facade levels.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)[1]
Daytime (07:00-23:00)	38
Night-time (23:00-07:00)	35

[1] The limits set out in Table 4 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix D.

6.4 Plant noise assessment

All building services plant will be designed to achieve the noise limits set out above, including any corrections for attention catching features.

Further assessment of plant selections and advice on attenuation measures will be provided as the design progresses.

7 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 45 dB during the day and $L_{A90,15min}$ 42 dB during the night, free-field levels.

Based on the requirements of the Local Authority, the relevant plant noise limits at 1 m outside the windows of the nearby existing noise sensitive premises are $L_{Aeq,15min}$ 38 dB during the day, and $L_{Aeq,15min}$ 35 dB during the night, facade levels.

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied.

Further assessment of plant selections and advice on attenuation measures will be provided as the design progresses.

Appendix A

Survey details

Equipment

The unattended and attended noise measurements were taken using a Rion NL-52 sound level meter and a Brüel & Kjær 2250 sound level meter, respectively.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00242702	Rion	22 Feb 23	TCRT21/1125
Microphone	UC-59/06185	Rion	22 Feb 23	TCRT21/1125
Pre-amp	NH-25/32730	Rion	22 Feb 23	TCRT21/1125
Calibrator	SV307/76630	Svantek	16 Mar 23	00001105-1a
Sound level meter	2250/3009283	Brüel & Kjær	24 Jun 22	UCRT20/1539, UCRT20/1542
Microphone	4189/3005042	Brüel & Kjær	24 Jun 22	UCRT20/1539, UCRT20/1542
Pre-amp	ZC0032/23792	Brüel & Kjær	24 Jun 22	UCRT20/1539, UCRT20/1542
Calibrator	4231/3016124	Brüel & Kjær	23 Jun 22	UCRT20/1526

[1] Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

During the attended noise measurements, the weather was clear and dry. Wind speeds were 3 m/s with highs of 22°C.

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 12°C at night and 25°C during the day. Reported wind speeds for the area during the survey period varied between 0.5 m/s and 5 m/s, but averaged no greater than 4 m/s. Comparison between periods of relatively higher and lower wind indicates that wind did not significantly affect the results of the assessment.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at position ‘L’

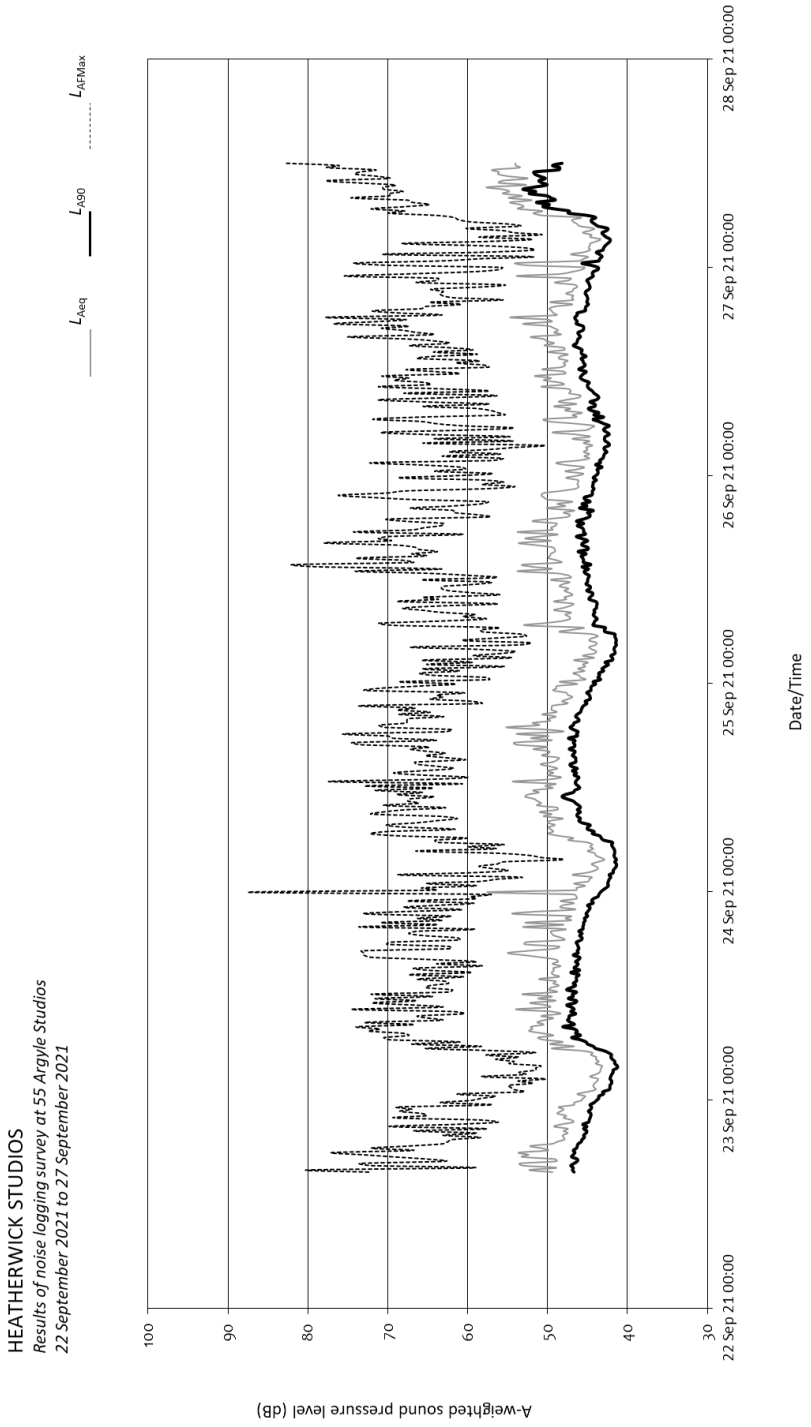

Figure 4 Results of unattended noise measurements at position 'L'

Appendix C

Statistical analysis of background sound levels at position 'L'

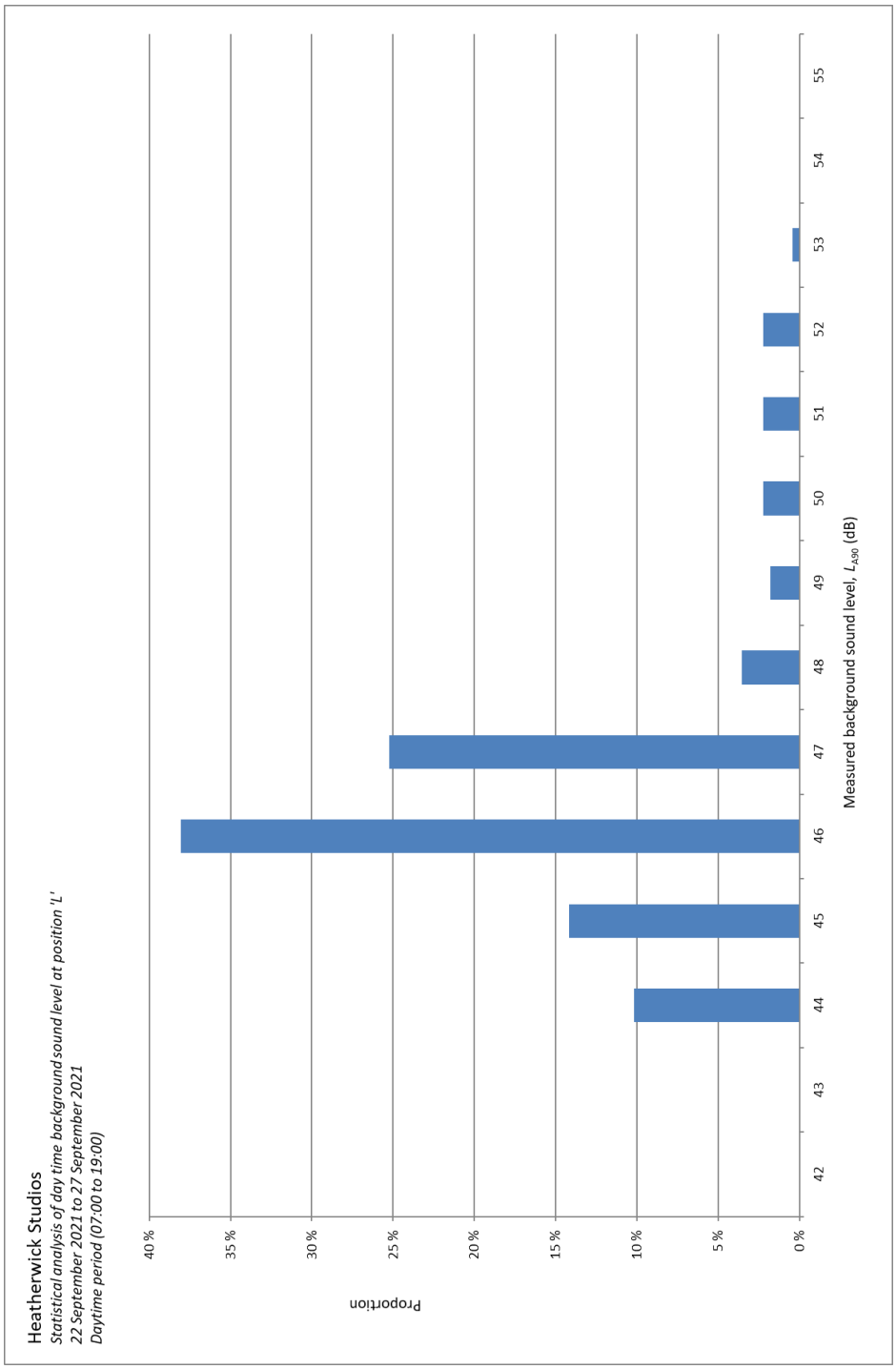

Figure 5 Statistical analysis of daytime background sound levels at position 'L'

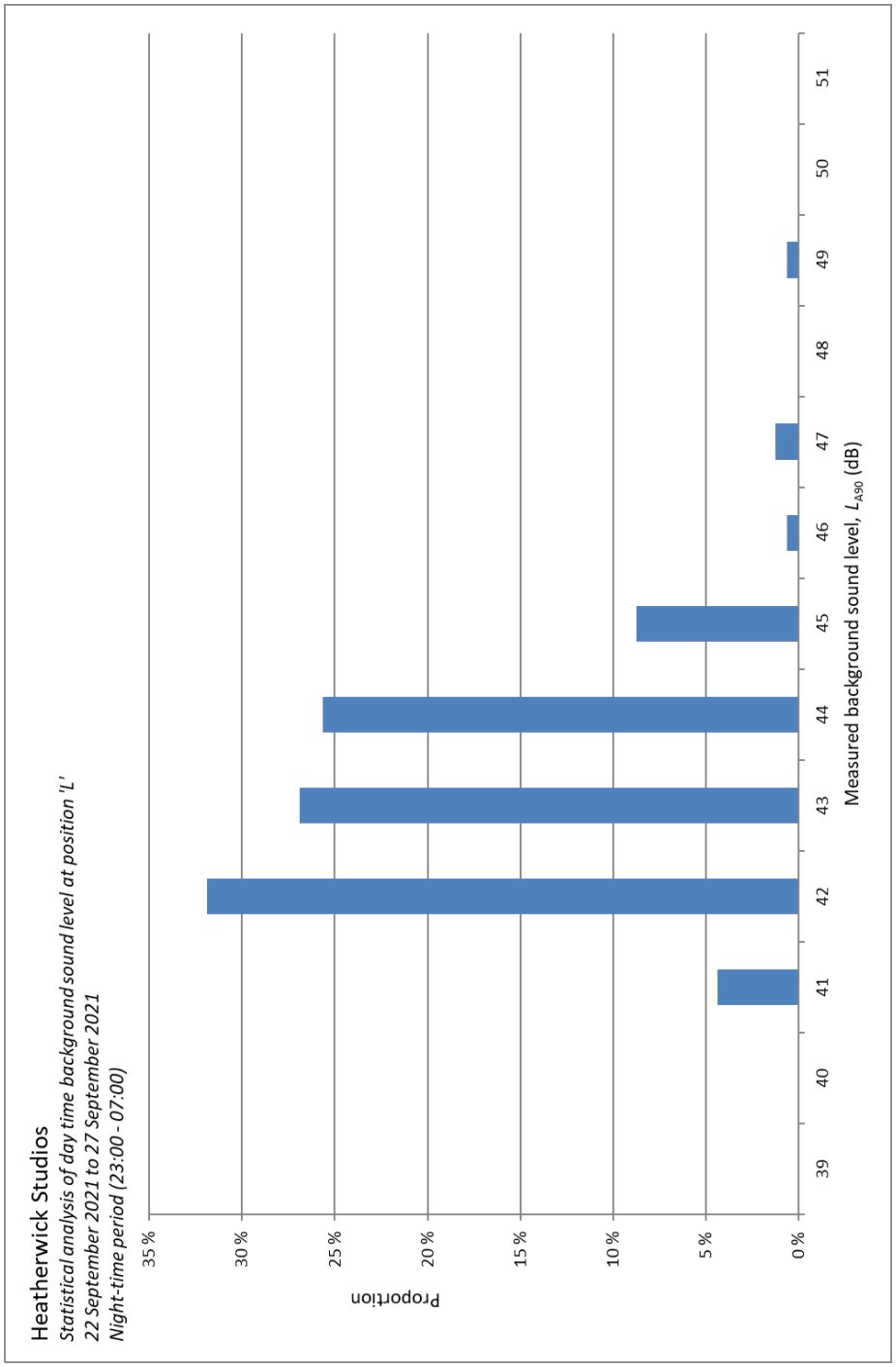

Figure 6 Statistical analysis of night-time background sound levels at position 'L'

Appendix D

Corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.