

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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27-33 King Street West and The Carriage Works, Manchester

Noise survey and plant noise egress limits

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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A	9 Feb 22		Christian Clark	Mark Howarth
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Summary

Sandy Brown has been commissioned by Property Alliance Group to provide acoustic advice in relation to the proposed development at 27-33 King Street West and The Carriage Works , Manchester.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 15:45 on 27 January 2022 and 15:30 on 2 February 2022.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 54 dB during the daytime and $L_{A90,15min}$ 47 dB at night.

Based on the requirements of Manchester City Council 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 $L_{Aeq,15min}$ 49 dB during the daytime, and $L_{Aeq,15min}$ 42 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.

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1 Introduction

Sandy Brown has been commissioned by Property Alliance Group to provide acoustic advice in relation to the proposed development at 27-33 King Street West and The Carriage Works, Manchester.

As part of this, an environmental noise survey is required, the purpose of which is 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.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1. The land is bound by King Street West, St Mary's Parsonage, Garden Lane and Smithy Lane.

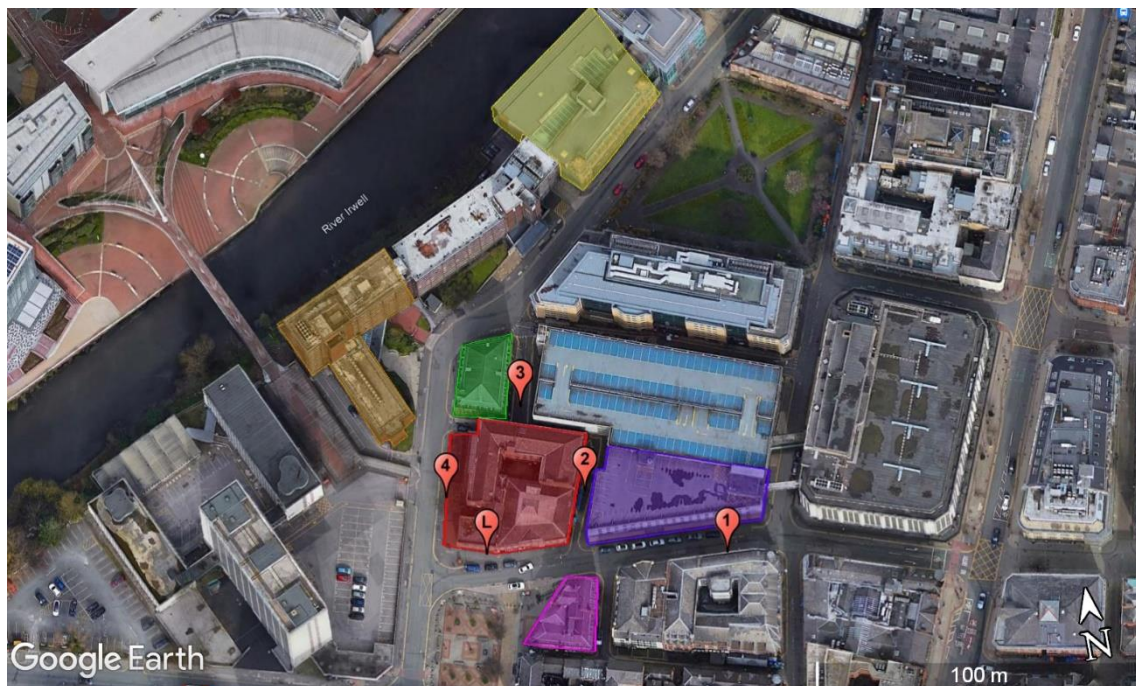


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is adjacent to the following premises:

- No 2 St Mary's Parsonage – Commercial (highlighted in green in Figure 1).
- 35 – 47 King Street West – Commercial (highlighted in purple in Figure 1).
- BetFred and The Liar's Club – Commercial (highlighted in pink in Figure 1).
- Alberton House – Commercial (highlighted in orange in Figure 1).
- Century Buildings – Residential (highlighted in yellow in Figure 1).

3 Development proposals

The development comprises erection of a 14 storey building and the refurbishment of the existing buildings at 3 Smithy Lane and Carriage Works on Garden Lane / St Mary's Parsonage with ground floor extension to comprise office accommodation (Class E) with front of house and commercial floorspace at ground floor (Class E) with associated landscaping and other works following demolition of existing buildings at 27-29 King Street West and 31-33 King Street West and link bridge from Carriage Works on Garden Lane / St Mary's Parsonage to 3 St Marys Parsonage

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 requirements

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in their *Planning and Noise Technical Guidance* document dated December 2015. The following is stipulated:

'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.'

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 6 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 15:45 on 27 January 2022 and 15:30 on 2 February 2022. The equipment was installed and collected by Christian Clark.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 2. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.



Figure 2 Photograph showing the unattended measurement position 'L'

5.2 Attended measurements

Attended free-field sample measurements were taken by Christian Clark at 4 locations around the site. These are indicated in Figure 1 as positions 1 to 4. The attended measurements were carried out on 27 January 2022, over 15 minute periods.

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At each position the microphone was mounted on a tripod approximately 1.2 m above the ground level and at least 1.5 m from any other reflective surface. Details of the equipment used and the noise indices measured are provided in Appendix A. Photographs of the measurement positions are shown in

Dominant noise sources occurring during the measurements were noted.



Figure 3 Photograph of attended measurement position 1

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Figure 4 Photograph of attended measurement position 2

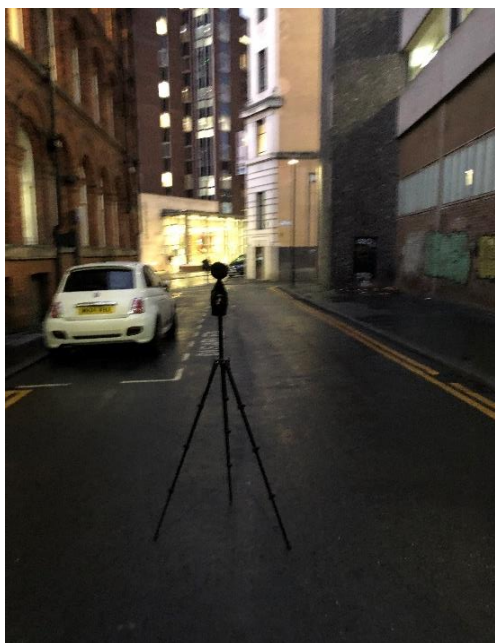


Figure 5 Photograph of attended measurement position 3



Figure 6 Photograph of attended measurement position 4

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 from road traffic on King Street West, St Mary's Parsonage and Bridge Street.

Less significant noise sources included pedestrian traffic and building services from nearby developments.

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 facade levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Thursday 27 January 2022	-	59
Friday 28 January 2022	64	62
Saturday 29 January 2022	64	65
Sunday 30 January 2022	61	61
Monday 31 January 2022	62	60
Tuesday 1 February 2022	63	61
Average	63	61

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements. Distributions of daytime and night-time measured L_{A90} values are given in Figure 7 and Figure 8.

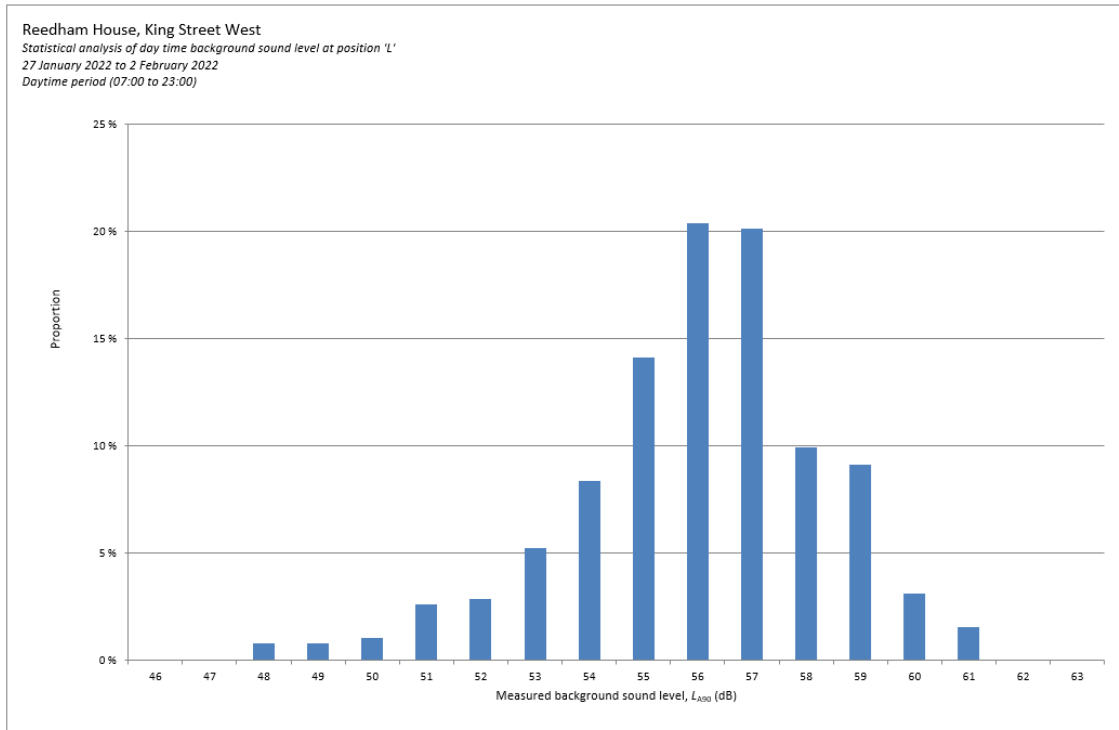


Figure 7 Daytime representative background sound levels at position 'L'

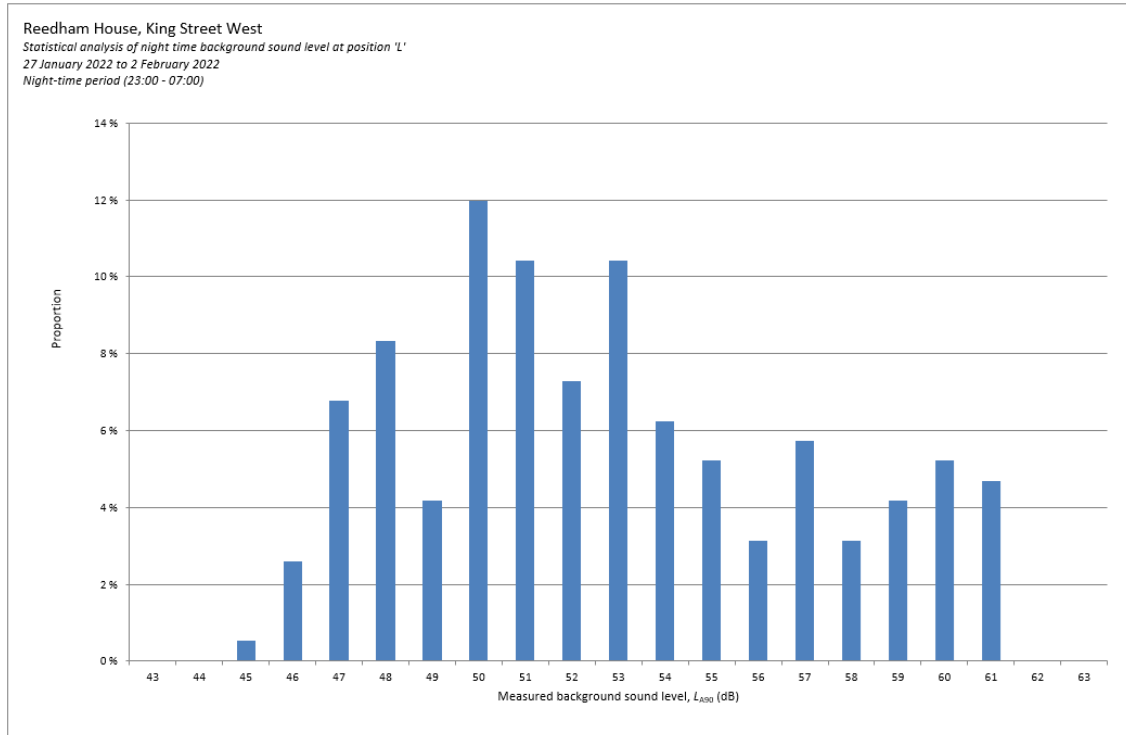


Figure 8 Night-time representative background sound levels at position 'L'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,Xmin}$ 54 dB during the daytime and $L_{A90,Xmin}$ 47 dB at night.

6.2.2 Attended measurement results

Noise levels and key sources recorded during the attended free-field measurements are summarised in Table 2.

Table 2 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	16:15	64	80	54	Road and pedestrian traffic from King Street West
2	16:30	58	72	54	Road and pedestrian traffic from King Street West Plant noise from ventilation exhaust
3	17:00	55	73	51	Road traffic from St Mary's Parsonage
4	17:30	62	85	52	Road traffic from St Mary's parsonage and Bridge Street

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 3.

The daytime limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. In this case these limits would apply at No 2 St Mary's Parsonage, 35 – 47 King Street West, Betfred and The Liars Club, Alberton House and Century Buildings. The night-time limits apply at 1 m from the worst affected windows of Century Buildings.

Table 3 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)
Daytime (07:00-23:00)	49
Night-time (23:00-07:00)	42

^[1] The limits set out in Table 3 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 C.

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. At this stage, no information is available in relation to the proposed plant. This will need to be assessed as the design progresses.

7 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 54 dB during the day, and $L_{A90,15min}$ 47 dB during the night.

Based on the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises are L_{Aeq} 49 dB during the day, and L_{Aeq} 42 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, 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.

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
<i>Unattended measurements</i>				
Sound level meter	NL-52/00932326	Rion	16 Mar 23	TCRT21/1182
Microphone	UC-59/05549	Rion	16 Mar 23	TCRT21/1182
Pre-amp	NH-25/32354	Rion	16 Mar 23	TCRT21/1182
Calibrator	NC-74/34125432	Rion	16 Mar 23	TCRT21/1181
Sound level meter	NL-52/00932326	Rion	16 Mar 23	TCRT21/1182
<i>Attended measurements</i>				
Sound level meter	2250/3011964	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Microphone	4189/3100176	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Pre-amp	ZC0032/26376	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Calibrator	4231/3019123	Brüel & Kjær	8 Sep 23	UCRT21/2086

^[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.
- $L_{A90,T}$ 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 generally clear and dry, however there was a brief period of light rain. Wind speeds were measured at each position and varied between 1 m/s and 6 m/s.

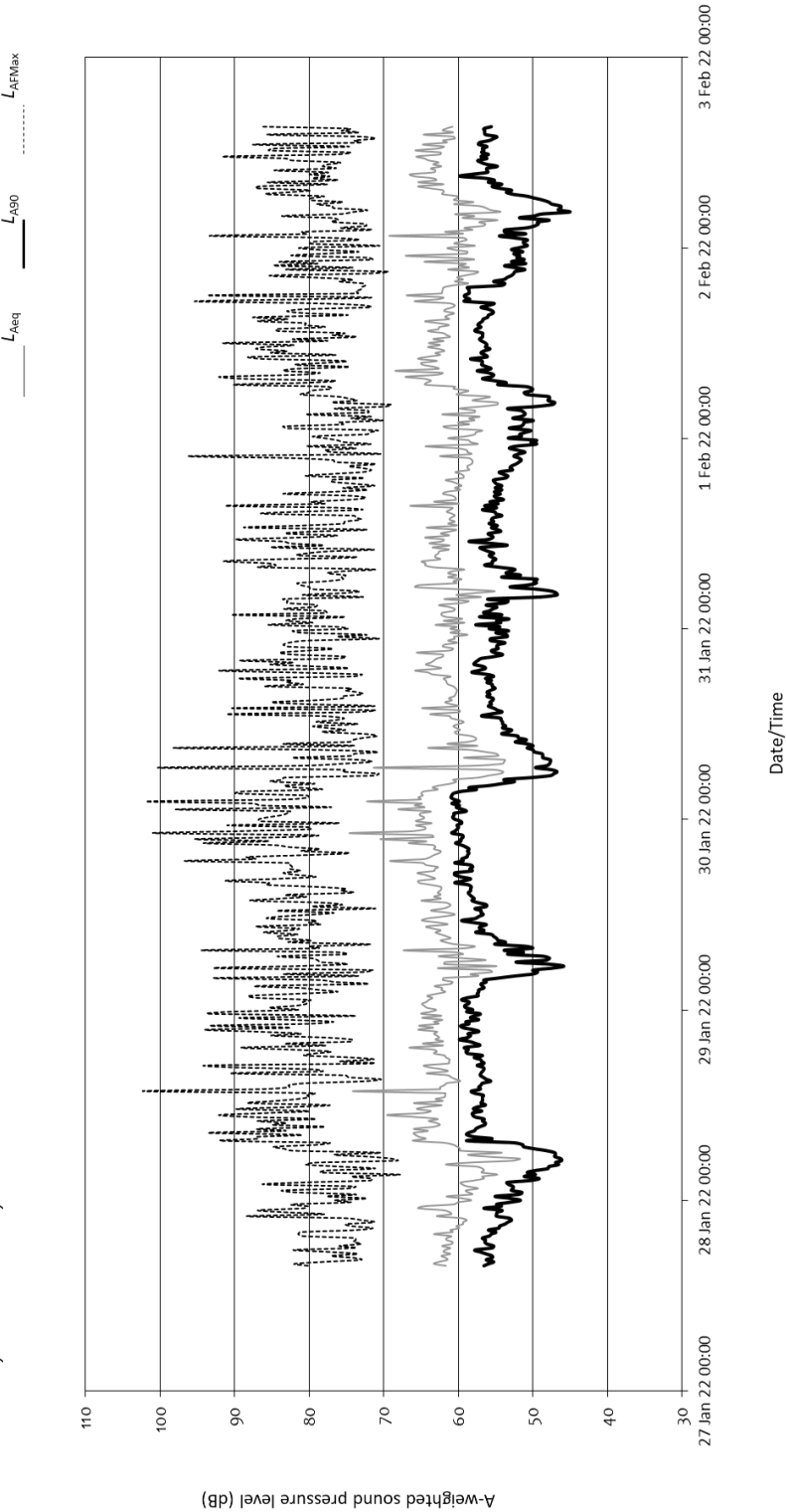
During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 2°C at night and 13°C during the day, and the wind speed was generally less than 8 m/s with some gusts up to 14 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at position 'L'

Reedham House, King Street West
Results of noise logging survey at position 'L'
27 January 2022 to 2 February 2022



Appendix C

BS 4142 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.