

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Halifax, Woking

Noise survey and plant noise egress assessment

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Version	Date	Comments	Author	Reviewer
A	15 Dec 23		Kane Mitchell	James Atha
B	27 Mar 24	Updated noise egress assessment	Jose M. Gonzalez	James Atha

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Summary

Sandy Brown has been commissioned to provide acoustic advice in relation to the proposed development at Halifax, 22 Commercial Way, Woking.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 14:55 on 1 December 2023 and 10:25 on 5 December 2023.

The representative background sound levels measured during the survey were $L_{A90,15mins}$ 57 dB from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. This reflects the operational hours of the proposed items of plant.

Based on the requirements of the Woking Borough 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 $L_{Aeq,15min}$ 50 dB from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. This limit has been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1).

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.

An assessment has been undertaken based on the proposals, which indicates that plant noise egress comply with the relevant noise egress criteria at the worst affected window. On this basis, no additional attenuation is required. It will however need to be ensured that no attention catching features are present (with reference to BS4142) and that the plant is switched off outside the proposed operational hours.

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1 Introduction

Sandy Brown has been commissioned to provide acoustic advice in relation to the proposed development at Halifax, 22 Commercial Way, Woking.

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. An assessment of plant noise egress has also been undertaken.

2 Site description

2.1 The site and its surrounding

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

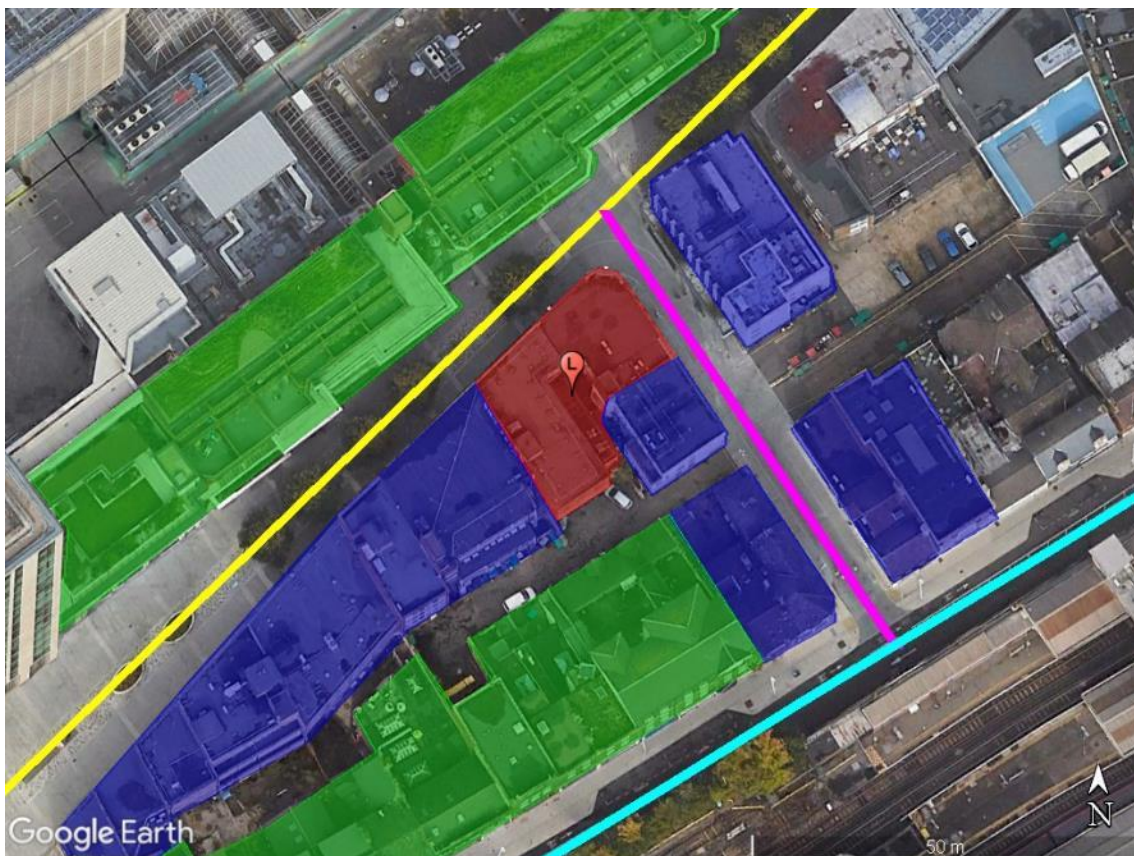


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is surrounded by various commercial premises (shown in blue in Figure 1) and mixed-use residential and commercial premises (shown in green). The site is located on Commercial Way (shown in yellow).

The nearest commercial premises are understood to be the commercial premises located on Chapel Street (shown in magenta) adjoining the site to the south-east. The nearest existing residential or mixed-use premises are understood to be the premises located on High Street (shown in cyan) to the south of the site.

It is understood that residential premises are proposed to the upper floors of 22-24 Commercial Way (shown in red), based on Woking Borough Council planning condition reference COND/2023/0064. Once the proposed change of use has been completed, these residential premises will become the nearest and most sensitive receptors to noise from the Halifax plant items. These premises have been considered as part of the plant noise egress assessment.

The worst affected receptor has been confirmed by Wates and indicated in Figure 5.

3 Development proposals

Halifax is understood to occupy 22 Commercial Way, Woking. All floors except the ground floor are to be vacated. As part of the associated works, the external building services items are being relocated from the rooftop to a courtyard within the Halifax demise.

It is understood that 4 x Mitsubishi condenser units have been installed. Noise level data for these plant items and a photograph showing the location is provided later in this report.

The plant items will be in operation from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. The proposed operational hours have been used to inform the noise egress criteria.

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 sound 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

It is understood that Woking Borough Council require building services plant to be designed to be 10 dB below the background noise level.

This criterion is understood to be applicable to residential receptors during the day (07:00-23:00) and night (23:00-07:00) and commercial receptors during the day (07:00-23:00) only.

5 Noise survey method

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 measurements were taken over 15-minute periods between 14:55 on 1 December 2023 and 10:25 on 5 December 2023.

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. The microphone was approximately 1.2 m from the room and at 3 m from other reflective surfaces. The unattended measurement results are shown as free-field levels.



Figure 2 Unattended measurement position

5.1 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 the existing plant item which was located approximately 7 m from the unattended measurement position.

Less significant noise sources included distant road traffic and aircraft noise overhead.

6.2 Noise measurement results

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

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

Table 1 Ambient noise levels measured during the unattended survey

Date	Day (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Fri 1 December 2023	58 ^[1]	40
Sat 2 December 2023	60	58
Sun 3 December 2023	50	50
Mon 4 December 2023	59	45
Tue 5 December 2023	59 ^[1]	-
Average	56	48

^[1] Measurement not made over full period due to monitoring start and end time (the measurement on 1 Dec 23 was over 8 hours, and on 5 Dec 23 over 4 hours); not included in the average.

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

The dominant noise source during the survey was the existing rooftop plant. Visual analysis of the measurement data indicates that the condenser was not in constant operation nor operating at a consistent duty. As such, the measured background noise level varied depending on the existing plant items operation.

As discussed in Section 3, the plant items will be in operation from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. The statistical analysis of representative background sound levels for these periods is given in Figure 3.

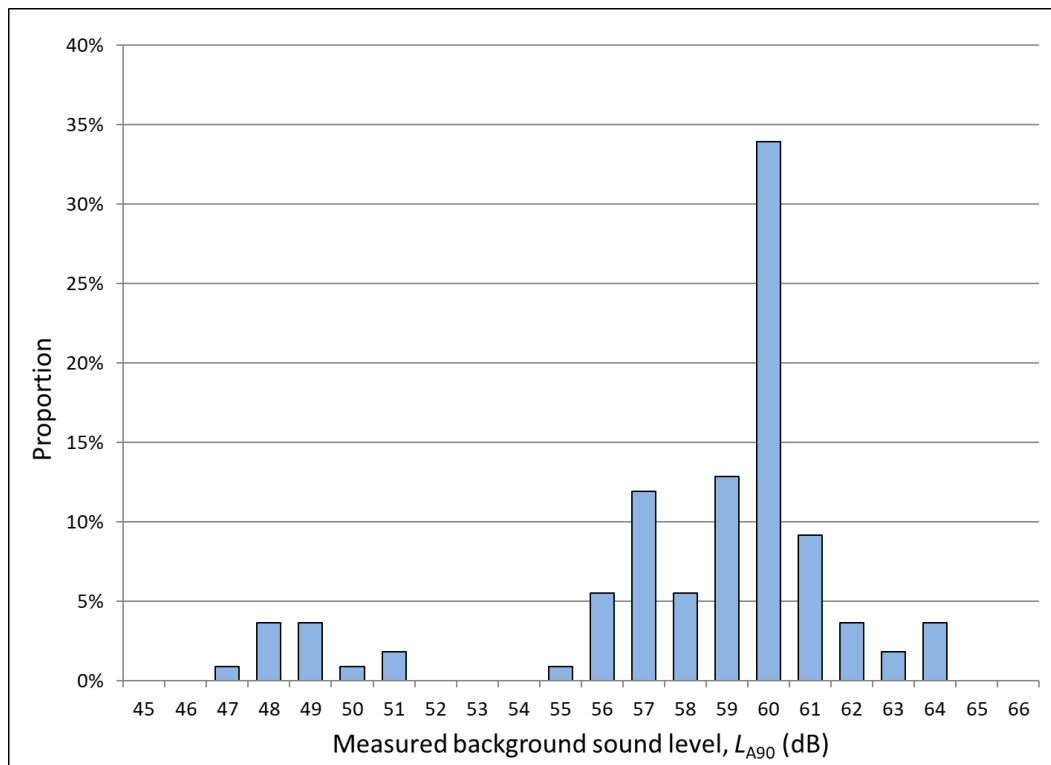


Figure 3 Measured background sound level, L_{A90} at the unattended measurement position

From this analysis, the representative background sound level measured during the survey from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays was $L_{A90,15min}$ 57 dB.

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 2. These noise limits are applicable from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. For these limits to be valid, it will need to be ensured that the plant is switched off outside of these hours.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1). In this case these limits would apply at all nearby commercial, residential and mixed-use premises.

Table 2 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)
07:00-23:00, Monday to Friday and 08:00-14:00, Saturday	50

[1] The limits set out in Table 2 do not include any attention catching features. Penalty corrections for attention catching features are discussed in Appendix C.

7 Plant noise egress assessment

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

7.1 Proposed plant items

Four condenser units have been installed within a courtyard, two units are mounted on a metal mesh floor, and two units are wall mounted at higher level as shown in Figure 4.



Figure 4 Installed condenser units

The installed condenser unit are:

- 1 x Mitsubishi MXZ-EF72VF3-E1
- 1 x Mitsubishi PUZ-M200YKA2
- 1 x Mitsubishi PUZ-ZM35VKA2
- 1 x Mitsubishi SUZ-M71VAR1.

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Octave band noise data have been received from Mitsubishi for the installed condensers. The received data are summarised in Table 3.

Table 3 Manufacturer's data for the installed condenser units

Unit type	Sound pressure level, L_p at 1 m (dB), Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Mitsubishi	63	125	250	500	1000	2000	4000	8000
MXZ-EF72VF3-E1	54	58	51	51	50	45	39	29
PUZ-M200YKA2	65	60	58	59	54	51	46	41
PUZ-ZM35VKA2 (cooling)	58	51	45	44	40	37	32	31
SUZ-M71VAR1 (heating)	55	62	57	51	50	48	40	33

Wates have confirmed that the window of the nearest noise sensitive premises are located at level 1 of the adjacent building (22-24 Commercial Way) above the low-level roof, as indicated in Figure 5.

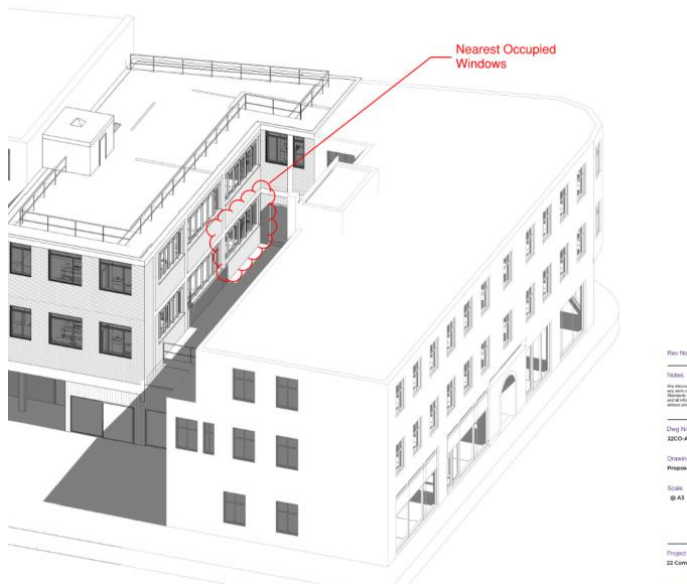


Figure 5 Location of the nearest noise sensitive premises (received from Wates)

7.2 Plant noise egress assessment

7.2.1 Basis

A noise egress assessment has been carried out from the installed condenser units to the worst affected window, the calculations take into account the following:

- Manufacturer's noise data as set out in Table 3.
- Proposed plant operation (07:00 to 19:00 on weekdays and 08:00 to 15:00 on Saturdays).
- Location of the condenser units in relation to the nearest noise sensitive window,
- Corrections have been considered based on the location of the installed units and includes, screening, distance and facade reflections from nearby courtyard surfaces
- 3 dB correction for facade reflections at the noise sensitive premises.
- 3 dB correction for plant intermittency operation
- All units in operation (worst case scenario).

7.2.2 Predicted plant noise egress levels and assessment

The predicted cumulative noise levels from the installed condenser units at 1 m from the facade of the worst affected window is L_{Aeq} 49 dB and comply with the noise egress criteria at the worst affected window. On this basis, no additional attenuation is required.

It will however need to be ensured that:

- there are no attention catching features present to comply with the criteria. These are discussed further in Appendix C.
- the plant is switched off outside the proposed operational hours of 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays.

8 Conclusion

The representative background sound levels measured during the survey were $L_{A90,15mins}$ 57 dB from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. This reflects the operational hours of the proposed items of plant.

Based on the requirements of the Woking Borough 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 $L_{Aeq,15min}$ 50 dB from 07:00 to 19:00 on weekdays and from 08:00 to 15:00 on Saturdays. This limit has been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1).

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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An assessment has been undertaken, which indicates that plant noise egress comply with the relevant noise egress criteria at the worst affected window, and no additional attenuation is required. It will however need to be ensured that no attention catching features are present (with reference to BS4142) and that the plant is switched off outside the proposed operational hours.

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Appendix A

Survey details

Equipment

The unattended noise measurements were taken using a Rion NL-52 sound level meter.

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-52/003206 33	Rion	9 Jun 24	TCRT22/1368
Microphone	UC-59/12576	Rion	9 Jun 24	TCRT22/1368
Pre-amp	NH-25/10641	Rion	9 Jun 24	TCRT22/1368
Calibrator	NC-74/341254 30	Rion	8 Jun 24	TCRT22/1361

[1] Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter 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 unattended noise measurements, weather reports for the area indicated that temperatures varied between -2°C at night and 8°C during the day, and the wind speed was less than 5 m/s.

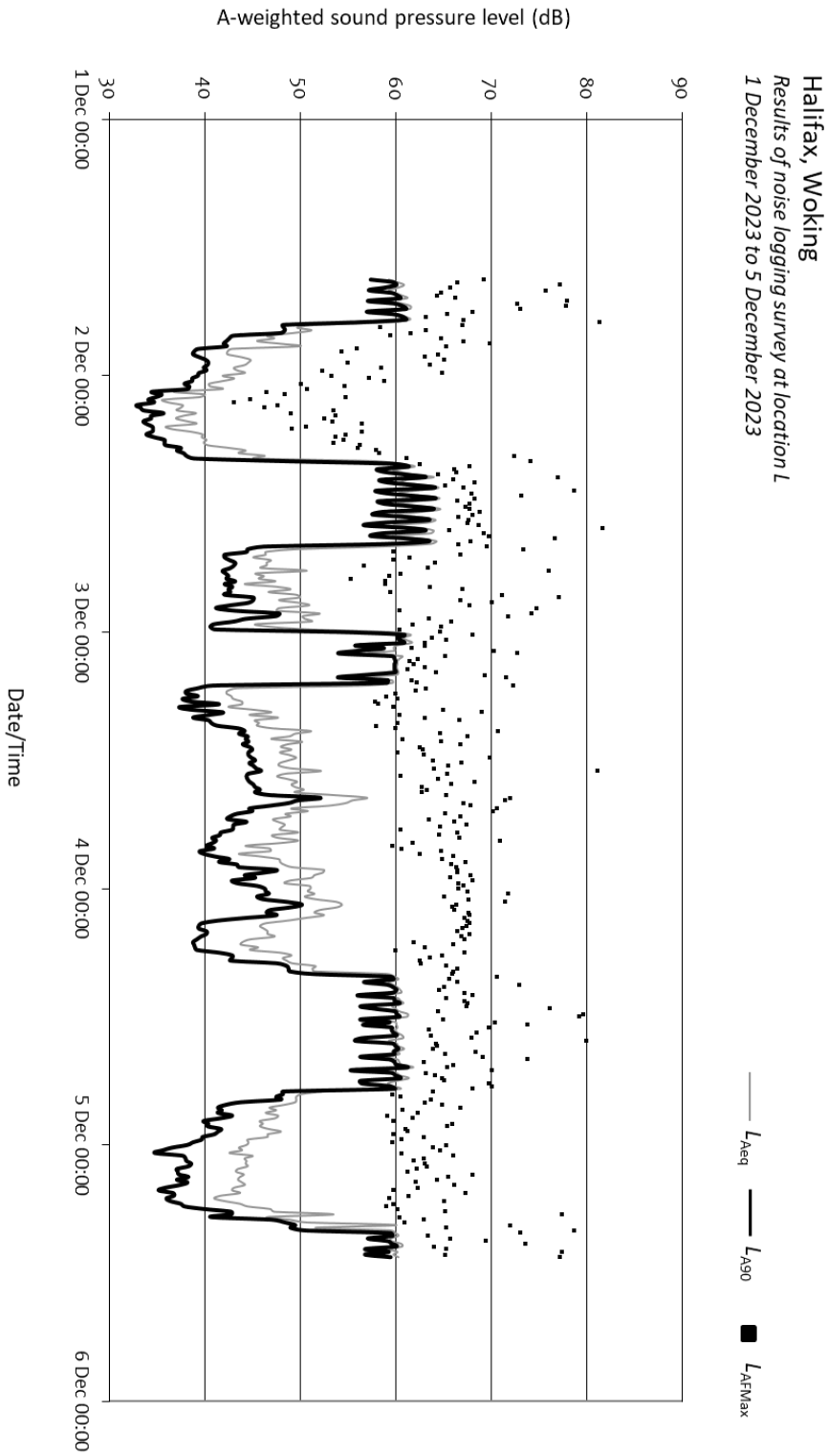
These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location L

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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.