SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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84 – 102 Daisy Bank Road

Residential planning noise report

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Summary

Sandy Brown Associates LLP (SBA) has been appointed to carry out an environmental noise survey at an existing residential site on Daisy Bank Road. The noise survey was performed between 21 November 2013 and 25 November 2013.

The lowest background noise levels measured during the survey were $L_{A90,5min}$ 39 dB during the daytime and $L_{A90,5min}$ 33 dB at night.

Based on the requirements of the MCC and on the results of the noise survey, the cumulative $L_{A90,5min}$ noise level from proposed plant at 1 m from the worst affected windows of the nearby noise sensitive premises is to be at least 5 dB below the minimum background noise level (L_{90}) measured in each octave band.

The average ambient noise levels measured during the survey were $L_{Aeq,16h}$ 55 dB during the daytime and $L_{Aeq,8h}$ 51 dB at night.

An initial facade sound insulation assessment has been carried out to determine the required acoustic performance of the facade, and provide guidance on the ventilation strategy.

In order to achieve the relevant internal noise limits, the measurements indicate that it will be necessary to use double glazing and attenuated passive ventilation strategies. Where bedrooms are located on the facade along Daisy Bank Road, it is indicated that an enhanced glazing configuration will be required.

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1 Introduction

Sandy Brown Associates LLP (SBA) has been commissioned by Njoy Student Living to undertake an environmental noise survey and assessment in relation to planning for the proposed residential development on Daisy Bank Road, Manchester.

The purpose of the survey was to establish the existing ambient and background noise levels in the vicinity of the site and nearby noise sensitive premises.

The background noise levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of Manchester City Council.

The facade sound insulation will be assessed in order to determine the necessary performance required to achieve appropriate internal noise levels for residences set in accordance with BS8233:1999 *Sound insulation and noise reduction for buildings – Code of Practice*, World Health Organisation and Manchester City Council guidelines.

This report presents the noise survey methods, the results of the survey, a discussion of acceptable limits for noise emission from building services plant and minimum sound insulation requirements for the building envelope.

2 Site description

2.1 The site and its surroundings

The site is an existing terraced residential development located on 84 - 102 Daisy Bank Road, a suburban road in Manchester. The premises are situated roughly 20 m from the road. The proposed development is to be built in the basement and ground floor of the existing residential premises.

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

- Position 1 – 6 m from Daisy Bank Rd with no screening.
- Position 2 – to the west of the terraced block, considered to be representative of the levels experienced along the west facade of the development.
- Position 3 – to the rear of the development, screened from Daisy Bank Road. These measurements are considered to be representative of those experienced to the rear of the development.
- Position 4 – to the east of the terraced block, considered to be representative of the levels experienced on the east facade of the development.



Figure 1 Existing site and measurement positions (source: Google Earth)

2.2 Adjacent premises

The surrounding area is primarily residential. Immediate residential adjacencies to the north and east of the development would be considered to be noise sensitive during the day and night. A healthcare building located to the west of the development would be considered to be noise sensitive during the day only. The nearest noise sensitive premises would depend on the position of any proposed plant.

3 Method

3.1 Unattended measurements

A four day continuous unattended noise survey was undertaken at the site to determine the existing noise levels in the vicinity of the site and nearby noise sensitive premises.

The unattended measurements were performed over 5 minute periods between 10:22 on 21 November 2013 and 11:12 on 25 November 2013.

The microphone was positioned approximately 0.4 m outside of a 1st story window of 96 Daisy Bank Road on the facade facing the road. This location was chosen to be representative of night time maximum noise levels experienced at the site.

The unattended noise measurement position used during the survey is indicated in Figure 1 denoted by the letter 'L'.

3.2 Attended measurements

Attended sample measurements were performed at a number of locations around the site. These are indicated in Figure 1 as positions 1 to 4. The attended measurements were carried out on 21 November 2013 over 5 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The locations of the attended measurements are indicated in Figure 1. In each case the microphone was mounted on a tripod approximately 1.5 m above ground level and at least 1 m from any other reflective surface.

3.3 Equipment and procedure

The unattended and attended noise measurements were performed using a Rion NL-52 sound level meter and a Norsonic 118 sound level meter, respectively.

Calibration details of the equipment used during the noise surveys are provided in Appendix A.

The sound level meters and the respective measurement chains were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant calibration deviation occurred.

3.4 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.
- $L_{Amax,T}$ The A-weighted maximum sound pressure level that occurred during a given period. Measured using the fast time weighting in accordance with the requirements of BS 8233 : 1999.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background noise level.

The L_{A90} is considered most representative of the background noise level for the purposes of complying with any local authority requirements.

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.*

3.5 Weather Conditions

During the attended measurements carried out on 21 November 2013, the weather was generally clear and dry. Wind during the measurements varied about roughly 3 m/s.

During the unattended noise measurements between 21 November 2013 and 25 November 2013, weather reports for the area indicated that temperatures varied between -4 °C at night and 7 °C during the day, and the wind speed was less than 7 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of:

- Traffic noise from Daisy Bank Road
- Passing pedestrians – conversation

Less significant noise sources included:

- Passing pedestrians – footsteps
- Intermittent birdsong
- Rustling leaves
- Distant traffic from other surrounding roads
- Distant construction works

4.2 Unattended measurement results

The results of the unattended noise measurements performed at the site are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B of this report.

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

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Thu 21 Nov 2013	-	49
Fri 22 Nov 2013	56	52
Sat 23 Nov 2013	55	53
Sun 24 Nov 2013	54	49
Average	55	51

The minimum background noise levels measured during the unattended survey are given in Table 2.

Table 2 Minimum background noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{A90,5min}$ (dB)	Night (23:00 – 07:00) $L_{A90,5min}$ (dB)
Thu 21 Nov 2013	39*	33
Fri 22 Nov 2013	40	37
Sat 23 Nov 2013	40	37
Sun 24 Nov 2013	39	33
Mon 25 Nov 2013	42*	-

* Measurement not made over full period due to logger start and end time.

The lowest background noise levels measured during the survey were $L_{A90,5min}$ 39 dB during the daytime and $L_{A90,5min}$ 33 dB at night.

The octave band sound pressure levels corresponding to the minimum background L_{A90} (dB) levels measured are provided in Table 3.

Table 3 Minimum octave band background noise levels measured during the survey

	Minimum background noise level, $L_{90,5min}$ (dB)						
Time of day	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	54	44	37	34	34	22	11
Night (23:00-07:00)	49	39	32	27	24	16	10

The maximum noise levels measured at night during the unattended survey are given in Table 4.

Table 4 Maximum noise levels measured at night

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Amax,5min}$ (dB)	$L_{Amax,5min}$ (dB)
Thu 21 Nov 2013	90	74
Fri 22 Nov 2013	90	75
Sat 23 Nov 2013	80	88
Sun 24 Nov 2013	79	74
Mon 25 Nov 2013	80	-

4.3 Attended measurement results

Attended measurements were performed at a number of locations around the site on 21 November 2013. The sound pressure levels recorded during these measurements are summarised in Table 5. The dominant noise sources noted during the measurements are also described.

Table 5 Sound pressure levels from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{Amax,5min}$	$L_{A90,5min}$	
1	10:57	55	68	45	Traffic on Daisy Bank Rd, passing pedestrians, occasional birdsong
	11:07	53	64	45	
	11:12	55	65	46	
2	11:27	54	81	47	Traffic on Daisy Bank Rd, leaves rustling, passing pedestrians
	11:32	50	60	45	
	11:38	49	59	45	
3	11:47	47	53	45	Distant traffic in all directions, intermittent birdsong
	11:52	47	56	45	
	11:57	46	53	45	
4	12:12	53	66	44	Traffic on Daisy Bank Rd, passing pedestrians, occasional car door
	12:17	53	74	46	
	12:22	53	66	46	

The average ambient noise level was $L_{Aeq,5min}$ 54 dB at position 1, $L_{Aeq,5min}$ 51 dB at position 2, $L_{Aeq,5min}$ 47 dB at position 3 and $L_{Aeq,5min}$ 53 dB at position 4.

5 Assessment criteria

5.1 NPPF and NPSE

The National Planning Policy Framework (NPPF) sets out the government planning requirements, and supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

'Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

The NPSE states that its aims are as follows:

'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.'*

As such, although neither of these documents sets out specific acoustic criteria for new residential development, the requirement to control both the effect of existing noise on the new development and the effect of noise from the development on the surroundings needs to be considered.

5.2 External noise levels – noise egress

5.2.1 Standard guidance

Standard guidance for noise emission from proposed new items of building services plant is

given in BS4142: 1997 '*Method for rating industrial noise affecting mixed residential and industrial areas*'.

BS4142 provides a method for assessing noise from items such as building services plant against the existing background noise levels at the nearest noise sensitive receptors to assess the risk of complaints occurring.

BS4142 suggests that if the rating noise level is 10 dB or more higher than the existing background noise level, complaints are likely. If the rating level is 5 dB above the existing background noise level, it is considered of marginal significance. If the rating level is 10 dB or more below the existing background noise level, this is considered a positive indication that complaints are unlikely.

If the noise contains 'attention catching features' such as tones, bangs etc, these limits should be reduced by a further 5 dB.

5.2.2 Local Authority criteria

Manchester City Council (MCC) typically stipulates the following criteria in regards to plant noise emissions:

'Externally mounted ancillary plant, equipment and servicing shall be acoustically insulated in accordance with a scheme designed so as to achieve a noise level of 5 dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.'

5.3 Internal noise limits – noise ingress

5.3.1 Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS8233 *Sound insulation and noise reduction for buildings – Code of Practice*, and is also provided by the World Health Organisation. The guidance given by BS8233 and WHO is shown in Table 8.

Table 6 Internal noise criteria for sleeping/resting

Internal space	Design range, L_{Aeq} (dB)		
	BS8233 "Reasonable"[1]	BS8233 "Good"[1]	WHO
Living rooms	40	30	30/35[2]
Bedrooms[3]	35	30	30[2]

[1] The design range given in BS8233 refers to criterion for "reasonable resting/sleeping conditions" in both living rooms and bedrooms. No time periods are specified.

[2] WHO does not differentiate between different types of living spaces, but recommends L_{Aeq} 30 dB in relation to sleep disturbance and L_{Aeq} 35 dB in relation to speech intelligibility. WHO provides a 16 hour time base when referring to speech intelligibility and an 8 hour time base when referring to sleep disturbance.

[3] BS8233 indicates that individual noise events should not normally exceed L_{Amax} 45 dB during night time, which is broadly in line with the guidance given by the WHO. However, Section 3.4 of the WHO guidelines suggests that good sleep will not generally be affected if internal levels of L_{Amax} 45 dB are not exceeded more than 10-15 times per night.

5.3.2 Local Authority requirements

It is understood that Manchester City Council typically base their standard guidance on achieving BS8233 "Good".

6 Plant noise limits – noise egress

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed 5 dB below the minimum external noise level in octave bands. These limits are set out in
Table 7.

Table 7 Plant noise limits 1m from the nearest sensitive premises

	Maximum sound pressure level at 1m from noise sensitive premises (dB)						
Time of day	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	49	39	32	29	29	17	6
Night (23:00-07:00)	45	34	27	22	19	11	5

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit 5 dB below those set out above.

At this stage, no detailed information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. However, all plant items will be designed to achieve the plant noise limits set out above.

The required attenuation measures will depend on the type and location of the plant items, but typical measures include in-duct attenuation, acoustic enclosures or screens, and acoustic louvres.

7 Facade sound insulation - noise ingress

7.1 Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS8233 *Sound insulation and noise reduction for buildings – Code of Practice*, and is also provided by the World Health Organisation. The guidance given by BS8233 and WHO is shown in Table 8.

Table 8 Internal noise criteria for sleeping/resting

Internal space	Design range, L_{Aeq} (dB)		
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7.2 Local Authority requirements

It is understood that Manchester City Council typically base their standard guidance on achieving BS8233 "Good".

8 Facade sound insulation – noise ingress

This section discusses internal noise level criteria and assesses the required facade sound insulation performance. In principle, the required facade specification depends on two factors – the external noise levels at the site, and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS8233 and by Manchester City Council, which are set out in Section 6.

8.1 External noise levels

The predicted external noise levels at the various facades of the proposed development are shown in Figure 2 and Figure 3. The corresponding key is provided in Table 9. These predictions

are based on the average ambient noise levels observed at positions 2, 3 and 4 for the west, rear and east facades respectively, and the average daytime ambient noise level measured by the logger for the facade facing Daisy Bank Road. All predictions are indicative of daytime levels, and corrections have been made where the measurements were conducted in the free field.

Table 9 External noise levels at proposed facades

Facade	Predicted external noise level, L_{Aeq} (dB)
	55
	53
	50



Figure 2 Predicted external noise level at ground floor facades

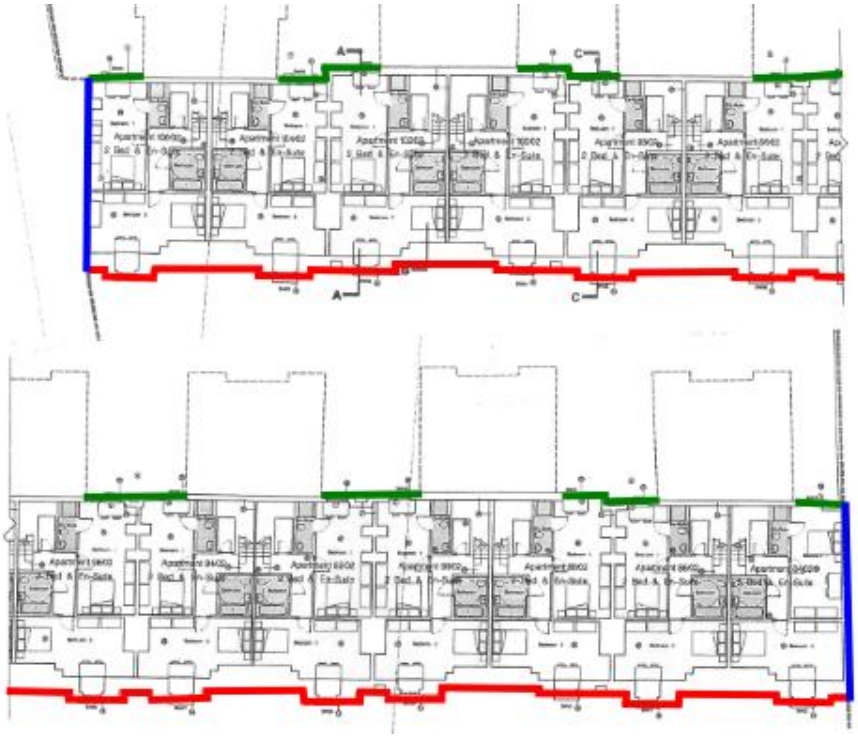


Figure 3 Predicted external noise level at basement level facades

8.2 Facade sound insulation

To achieve the BS8233 “Good” internal noise criteria provided in section 6.1 for bedrooms and other living areas, minimum facade sound insulation requirements have been determined, based on the external noise levels at each facade stated above.

The minimum sound insulation performances for the different building facades based on daytime ambient noise levels are given in Table 10.

Table 10 Facade sound insulation performance requirements

Facade	Overall sound insulation performance R'_w+C_{tr} (dB)
	30
	25
	23
	20

The maximum noise level recorded at night during the survey was 88 dB, as provided in Table 4. However, this was one of only three significantly loud individual noise events that occurred

on the night of 23 November 2013. The WHO guidelines suggest that good sleep will not generally be affected if internal levels of L_{Amax} 45 dB are not exceeded more than 10-15 times per night. Based on this and the data provided in Table 4 and Appendix B, it is proposed that a level of L_{Amax} 75 dB is taken to be a more representative maximum external noise level.

It is advised that facades to bedrooms should therefore have an overall sound insulation performance of R'_w+C_{tr} 30 dB.

The marked-up overall sound insulation performances are provided in Figure 4 and Figure 5.



Figure 4 Recommended overall sound insulation performance at ground level



Figure 5 Recommended overall sound insulation performance at basement level

8.3 Guidance on facade construction, glazing, and ventilation strategy

Table 12 and Table 11 sets out some examples of glazing build ups and ventilation strategies that could be employed to achieve the required sound insulation performance for the various elevations.

Table 12 Example glazing configurations and ventilation strategies

Sound insulation R_w+C_{tr} (dB)	Example glazing configuration	Ventilation Strategy
15-29	6 mm/12 mm/6 mm	Attenuated passive ventilation (eg, trickle vents)
30-32	6.4 mm/12 mm/6 mm	Attenuated passive ventilation

The performance required by each element will depend on the construction of the solid elements, the glazing specification, the relative areas of the solid and glazed elements, and the ventilation strategy (including the acoustic performance of the trickle ventilators and the number of ventilators required to serve individual rooms, if applicable).

As the design progresses, a more detailed facade sound insulation assessment will need to be performed, taking into account the factors listed above, to ensure that the overall performance requirements will be met.

9 Conclusion

The minimum measured background noise levels were $L_{A90,5min}$ 39 dB during the day and $L_{A90,5min}$ 33 dB at night.

On the basis of the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises have been set to be 5 dB below the minimum background noise levels (L_{A90}) in each octave band.

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 5 dB more stringent than those set out above.

In order to achieve the relevant internal noise limits, the measurements indicate that it will be necessary to use double glazing and attenuated passive ventilation strategies. Where bedrooms are located on the facade along Daisy Bank Road, it is indicated that an enhanced glazing configuration will be required.

Appendix A

Equipment calibration information

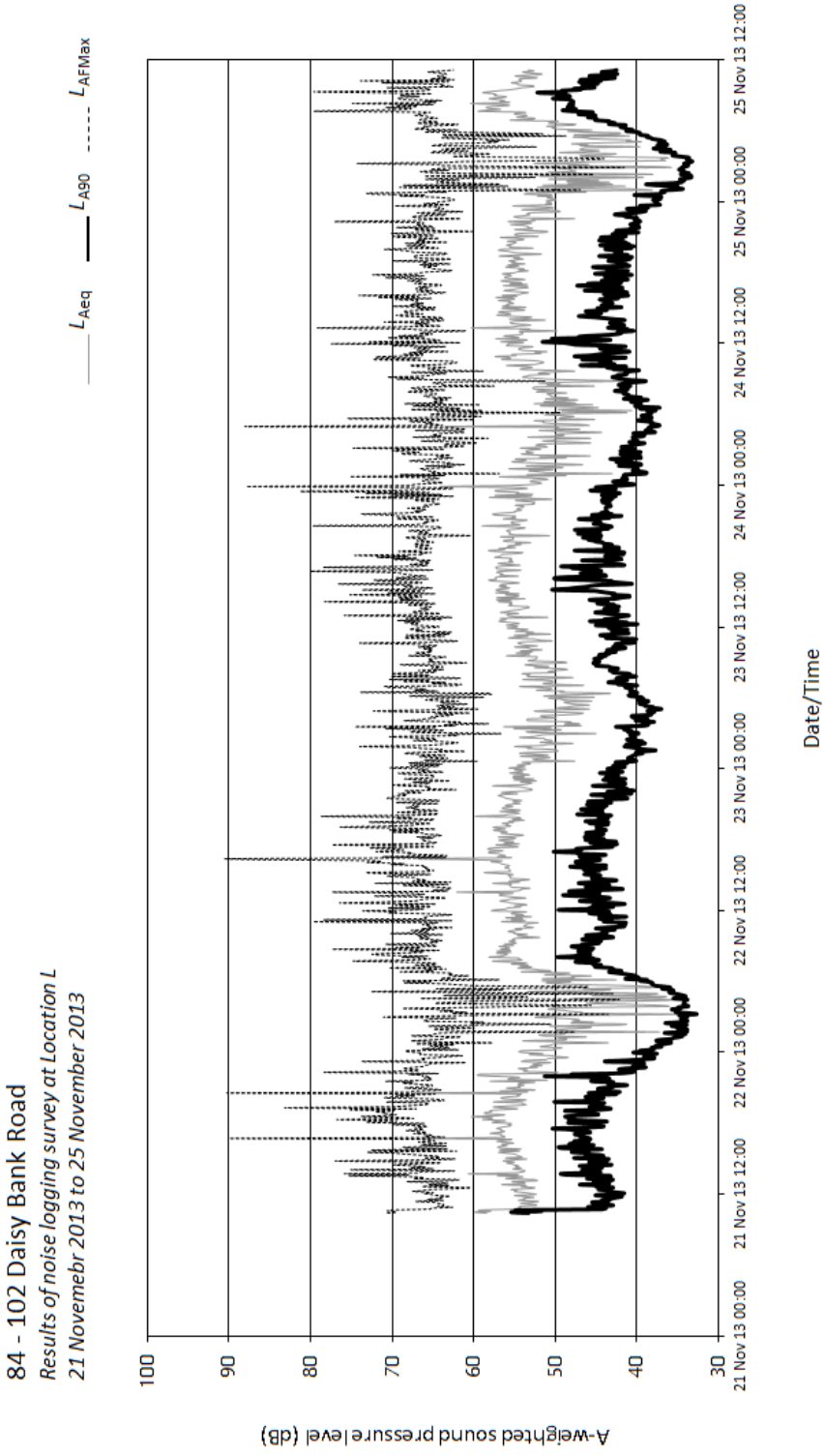
Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	Nor118/31754	Norsonic	3 July 14	1207294
Microphone	40AF/62396	Gras	3 July 14	1207294
Calibrator	1251/31322	Norsonic	3 July 14	1207293
Sound level meter	NL-52/00320635	Rion	12 April 14	1204157
Microphone	UC-59/03384	Rion	12 April 14	1204157
Calibrator	NC-74/34125432	Rion	12 April 14	1204153

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

Appendix B

Results of unattended measurements at Location L


84 - 102 Daisy Bank Road
Results of noise logging survey at Location L
21 Novemebr 2013 to 25 November 2013
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
21 Nov 13 00:00
21 Nov 13 12:00
22 Nov 13 00:00
22 Nov 13 12:00
23 Nov 13 00:00
23 Nov 13 12:00
24 Nov 13 00:00
24 Nov 13 12:00
25 Nov 13 00:00
25 Nov 13 12:00
Date/Time