SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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20 Red Lion Street, London, WC1R 4PJ

Environmental noise survey and plant noise egress assessment report

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Version	Date	Comments	Author	Reviewer
A	3 Oct 16		James Thurston	Andrew Long

Summary

Sandy Brown Associates LLP (Sandy Brown) has been commissioned by BNP Paribas as Trustees for Mayfair Capital Commercial Property Trust to provide acoustic advice in relation to the proposed new rooftop plant to be installed at 20 Red Lion Street, London, WC1R 4PJ.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and to set appropriate plant noise limits in line with the requirements of Camden Council.

The noise survey was performed between 12:45 on 15 September 2016 and 10:45 on 20 September 2016.

The representative weekday background sound levels measured during the survey were $L_{A90,15min}$ 52 dB during the daytime, $L_{A90,15min}$ 48 dB during the evening and $L_{A90,15min}$ 44 dB at night.

The representative weekend background sound levels measured during the survey were $L_{A90,15min}$ 46 dB during the daytime, $L_{A90,15min}$ 46 dB during the evening and $L_{A90,15min}$ 44 dB at night.

Based on the requirements of the London Borough of Camden (LBC), the operational hours of the plant, and 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 $L_{Aeq,15min}$ 47 dB during the daytime, $L_{Aeq,15min}$ 43 dB during the evening and emergency plant does not exceed $L_{Aeq,16hr}$ 51 dB at all times. These limits are cumulative, and apply with all plant operation under normal and emergency 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.

A plant noise egress assessment has been carried out in order to determine the sound levels experienced at the closest noise sensitive receivers should the proposed plant be installed. The details of this assessment can be found in Section 6 of this report.

It is recommended that acoustic louvres be installed around the proposed plant enclosure. This is discussed further in Section 6.2.

Contents

1 Introduction

Sandy Brown Associates LLP (Sandy Brown) has been commissioned by BNP Paribas as Trustees for Mayfair Capital Commercial Property Trust to provide acoustic advice in relation to the proposed new rooftop plant to be installed at 20 Red Lion Street, London, WC1R 4PJ.

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, results of the environmental noise survey, and a discussion of acceptable limits for noise emission from building services plant.

A plant noise egress assessment has been carried out in order to determine the sound levels experienced at the closest noise sensitive receivers should the proposed plant be installed. The details of this assessment can be found in Section 6 of this report.

2 Site description

Figure 1 Site map (courtesy of Google Earth Pro)

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. Local roads include Red Lion Street (to the west), Sandland Street (to the south) and Eagle Street (to the south west).

The adjacent premises are shown in Figure 1. The nearest noise sensitive receivers are highlighted in green, yellow and blue. This includes residences directly north, residences to the north east and residences to the west (all highlighted green). The Old Nick public house is highlighted in yellow. A large office building is located directly opposite the site across from Sandland Street and is highlighted in blue.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

Unusual weather conditions include a thunderstorm which developed during the night on 16 September 2016 which may have somewhat affected the measurements at this time. A more detailed assessment regarding the weather conditions experienced during the survey are provided in Appendix A.

3.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 6 days to determine the existing background sound levels in the vicinity of nearby noise sensitive premises.

The unattended measurements were performed over 15 minute periods between 12:45 on 15 September 2016 and 10:45 on 20 September 2016. The equipment was installed by Richard Deane and James Thurston and collected by James Thurston.

The measurement position used during the survey is indicated in Figure 1 denoted by the letter ‘L’.

Two photographs showing measurement position L are provided in both Figure 2 and Figure 3. Noise levels at this location were considered to be reasonably representative of those at the nearest noise sensitive premises.

Figure 2 Photograph showing the location of measurement position L

Figure 3 Photograph showing the location of measurement position L

Plant currently servicing the existing building was active and audible during the equipment installation. Therefore the microphone (highlighted in red) was positioned so as to be shielded from the current plant noise by the lift overrun.

The microphone was positioned approximately 1.5 m from the roof and was more than 3 m from any reflective surface.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of the active plant currently installed on the roof, plant noise from the office building to the opposite side of Sandland Street (highlighted in blue in Figure 1) and road traffic noise from Sandland Street.

Less significant noise sources included general construction activity occurring some distance to the north of the site.

4.2 Unattended measurement results

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

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

The measurements are considered to be free field.

4.2.1 Ambient noise levels

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 - 19:00) $L_{Aeq,12hr}$ (dB)	Evening (19:00 - 23:00) $L_{Aeq,4hr}$ (dB)	Night (23:00 - 07:00) $L_{Aeq,8hr}$ (dB)
Thursday 15 September	-	58	53
Friday 16 September	57	54	51
Saturday 17 September	54	51	48
Sunday 18 September	51	50	48
Monday 19 September	55	51	50
Weekday average	55	54	51
Weekend average	53	51	48

The lowest measured $L_{Aeq,15min}$ during the daytime hours was 48 dB. This was measured on Monday 19 September.

4.2.2 Background noise levels

In line with BS 4142:2014, for the purpose of analysis and establishing representative background sound levels, day, evening and night time typical levels have been quantified using statistical analysis from the continuous logging measurements.

Daytime, evening and night time statistical analysis of representative values for the site are given in Figure 4 to Figure 9.

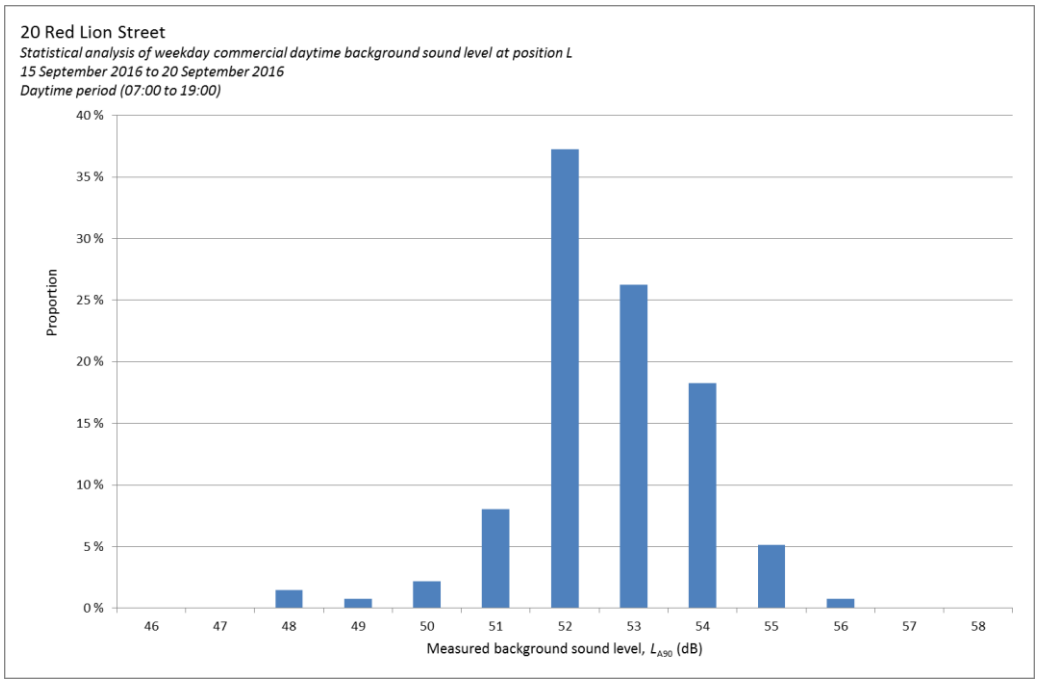


Figure 4 Statistical analysis of weekdayl daytime (07:00 to 19:00) background sound levels at position L

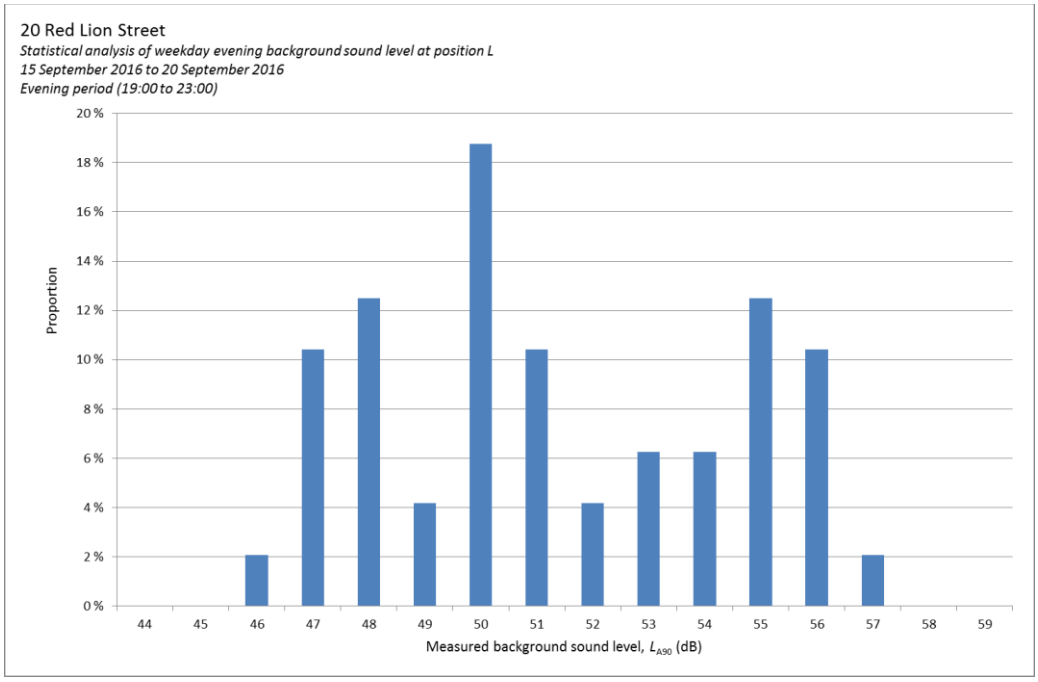


Figure 5 Statistical analysis of weekday evening (19:00 to 23:00) background sound levels at position L

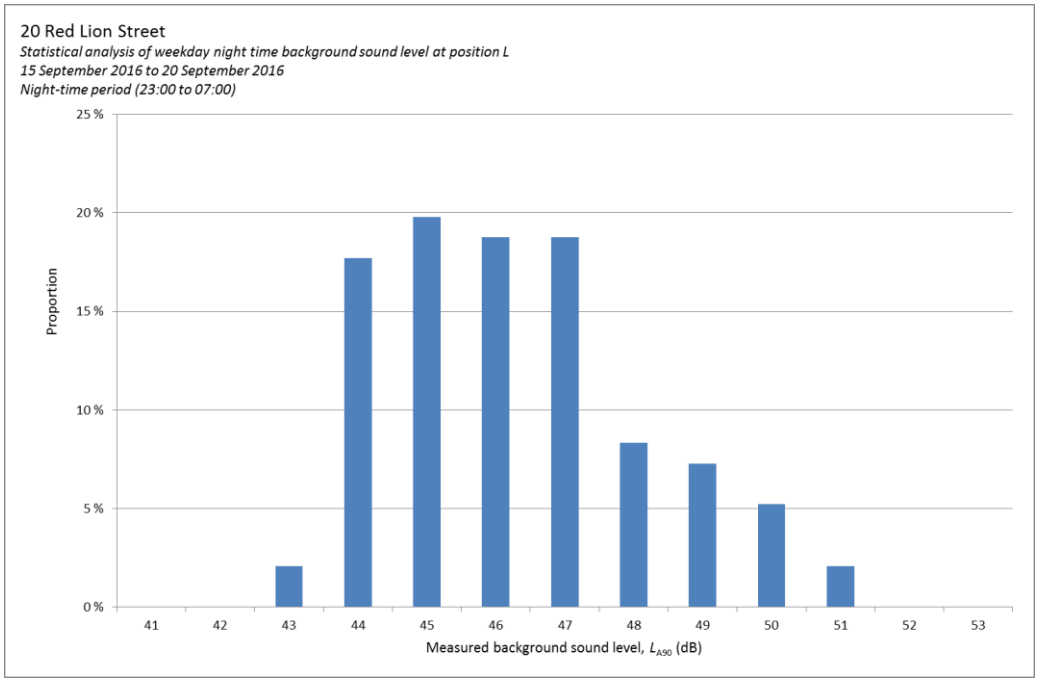


Figure 6 Statistical analysis of weekday night time (23:00 to 07:00) background sound levels at position L

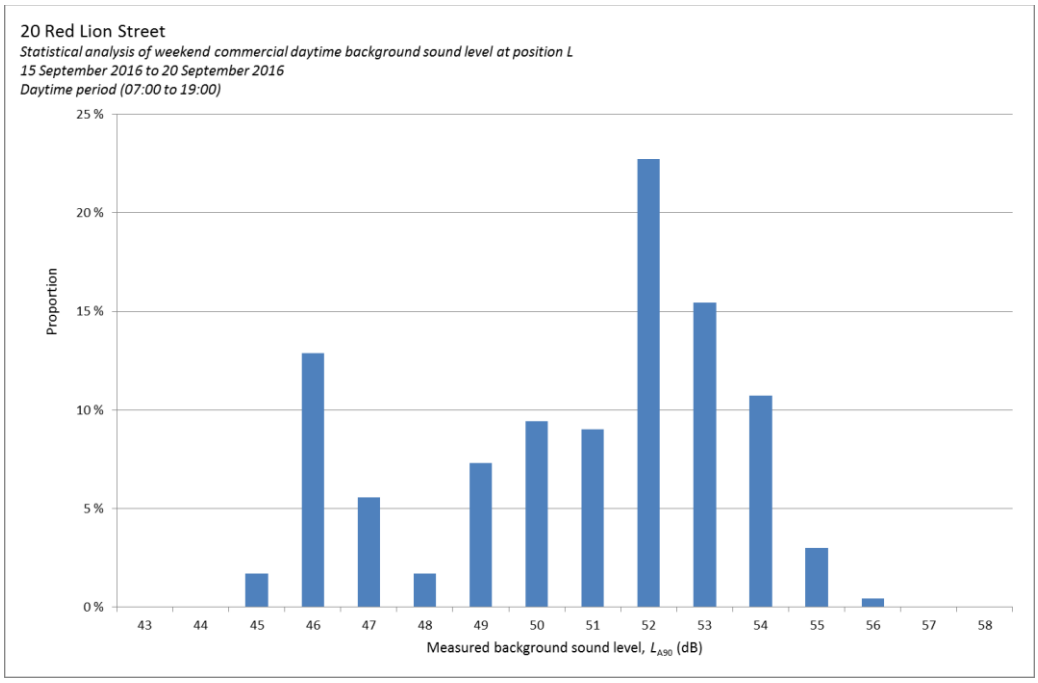


Figure 7 Statistical analysis of weekend daytime (07:00 to 19:00) background sound levels at position L

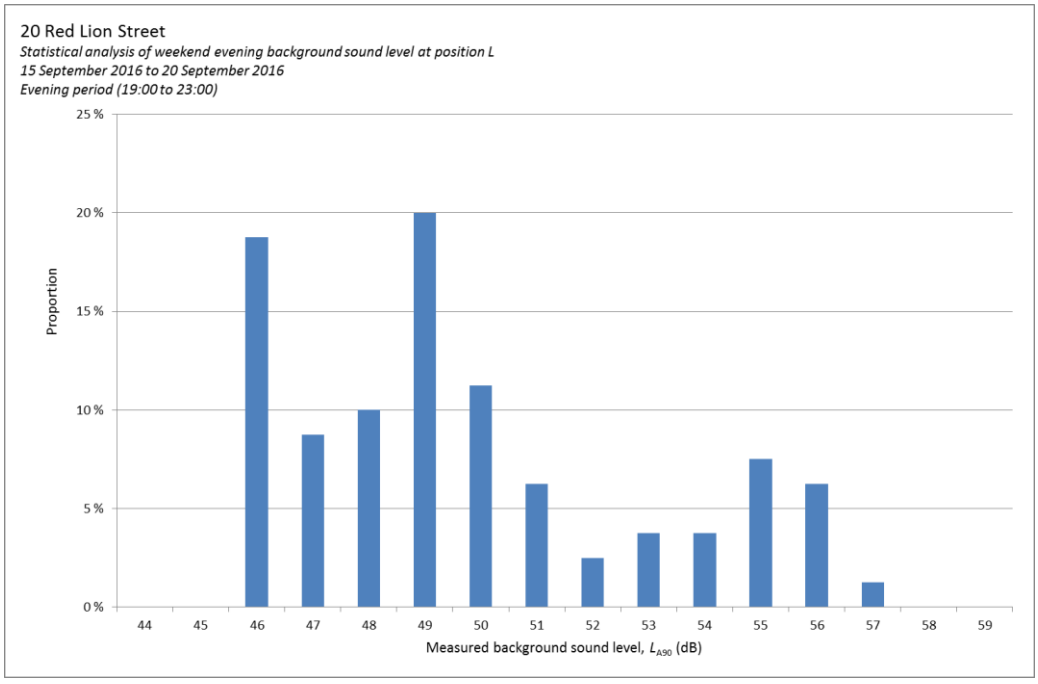


Figure 8 Statistical analysis of weekend evening (19:00 to 23:00) background sound levels at position L

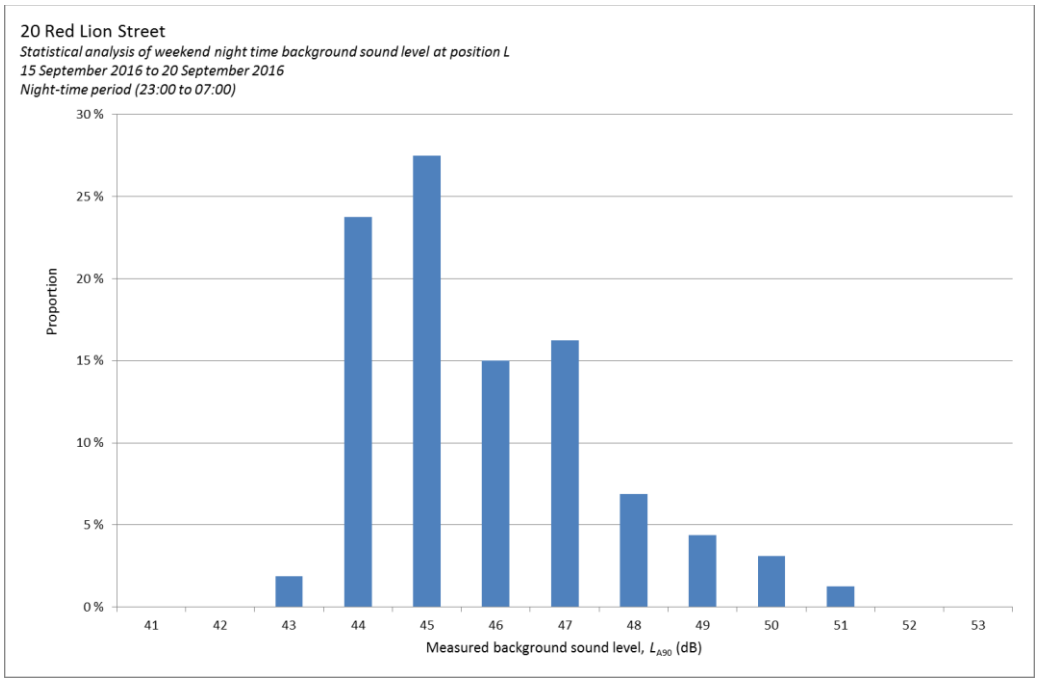


Figure 9 Statistical analysis of weekend night time (23:00 to 07:00) background sound levels at position L

From this analysis, the representative weekday background sound levels were considered to be:

- Daytime: $L_{A90,15min}$ 52 dB
- Evening: $L_{A90,15min}$ 48 dB
- Night: $L_{A90,15min}$ 44 dB

The representative weekend background sound levels were considered to be:

- Daytime: $L_{A90,15min}$ 46 dB
- Evening: $L_{A90,15min}$ 46 dB
- Night: $L_{A90,15min}$ 44 dB

5 Building services noise egress limits

5.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*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 the nearest noise sensitive.

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.

5.2 Local Authority criteria

The London Borough of Camden (LBC) requirements relating to noise emissions from building services are located in Table E of DP28, which is reproduced in Table 2.

Table 2 LBC plant noise emission limits taken from Table E of DP28

Noise description and location of measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	5 dB < L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade.	Day, evening and night	0000-2400	10 dB < L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10 dB < L_{A90}
Noise at 1 metre external to a sensitive facade where L_{A90} >60 dB	Day, evening and night	0000-2400	5 dB < L_{A90}

Further, it has also been confirmed by LBC that noise emissions from emergency plant (including life safety) should follow the following typical condition:

> *Prior to [commencement] [use] of the development, details shall be submitted to and approved in writing by the Council to confirm that noise emitted by standby or emergency generators during power outages or testing does not exceed the lowest daytime LAeq(15min) as measured or calculated according to BS4142:2014.*

5.3 Plant noise limits

5.3.1 Operational hours

The proposed plant is to run between 07:00-23:00 from Monday to Friday. Noise levels measured during these periods were not affected by adverse weather conditions and therefore the results of the survey can be used to set plant noise limits.

5.3.2 Basic limits

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 worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 3.

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 ($L_{Aeq,16hr}$ dB)
Daytime (07:00-19:00)	47
Evening (19:00-23:00)	43
Emergency	48

The limits set out in do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed further in Section 5.3.3.

5.3.3 Attention catching features

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 below those set out above, 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 taken into account 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 is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

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

6 Plant noise assessment

This section presents the assessment of noise egress from the proposed plant to the worst affected noise sensitive receivers and recommendations for noise mitigation measures where necessary.

Information regarding the proposed plant has been provided to Sandy Brown. The data have been used in order to predict the noise levels experienced at the nearest noise sensitive receivers. The assessment assumes a ‘worst case scenario’ in which all plant is active and operating at full duty.

It is understood that the generator will only operate during emergency circumstances only, hence noise egress from this plant item is accounted for in a separate calculation. This calculation has been limited by the lack of octave band noise data from the supplier and information regarding the position and orientation of inlet and exhaust flues.

6.1 Predicted noise levels

Calculations have been completed in order to provide estimated noise levels experienced at the nearest noise sensitive receivers should the proposed plant be installed.

This calculation takes into account attenuation due to hemi-spherical spreading, screening (if present) and assumes that the noise generated by the plant is neither tonal nor intermittent.

Table 4 Predicted noise level at 1 m from the nearest noise sensitive receivers

Noise sensitive receiver	Predicted noise level at 1 m from facade, L_{Aeq} (dB)
Residences (north)	49
Residences (north east)	47
Residences (west)	44
Offices (south)	52
Public house (east)	51

On the basis of the proposed plant and locations, plant noise egress is expected to not comply with the proposed plant noise limits as described in Table 3 at the nearest noise sensitive receivers without additional mitigation measures.

6.2 Potential mitigation

It is recommended that acoustic louvres be installed around the proposed plant enclosure. The noise limits as set out in Table 3 will be met if acoustic louvres capable of achieving the minimum insertion losses as presented in Table 5 are provided.

Table 5 Minimum insertion losses required for acoustic louvres

	Octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Minimum louvre insertion loss (dB)	2	4	7	10	13	16	16	16

Calculations indicate that the implementation of the above mitigation measure will achieve the requirements of LBC at the worst affected noise sensitive receivers (offices to the south).

6.2.1 Example louvre

The Galloway L-AS-300 acoustic louvre provides the minimum required insertion losses. The acoustic louvre is 300 mm deep and the insertion losses are provided in Table 6.

Table 6 Galloway L-AS-300 insertion losses

Galloway L-AS-300 acoustic louvre	Octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Insertion loss (dB)	6	6	7	12	19	19	17	16

7 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises. The representative weekday background sound levels measured during the survey were $L_{A90,15min}$ 52 dB during the daytime, $L_{A90,15min}$ 48 dB during the evening and $L_{A90,15min}$ 44 dB at night whilst the representative weekend background sound levels measured during the survey were $L_{A90,15min}$ 46 dB during the daytime, $L_{A90,15min}$ 46 dB during the evening and $L_{A90,15min}$ 44 dB at night.

On the basis of the requirements of the Local Authority and taking into account the operational hours of the plant, the relevant plant noise limits at the worst affected existing noise sensitive premises would be $L_{Aeq,15min}$ 47 dB during the daytime and $L_{Aeq,15min}$ 43 dB during the evening and emergency plant does not exceed $L_{Aeq,16hr}$ 51 dB at all times.

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 indicated in Section 5.3.2 will be applied, and the limits will be more stringent than those set out above.

An initial assessment of the proposed plant items associated with the development has been carried out. The proposed plant items would be expected to comply with the relevant noise limits should an acoustic louvre be installed around the enclosure, and this would be required to be approximately 300 mm deep.

Appendix A

Survey details

Equipment

A Svantec 957 sound level meter was used to undertake the unattended measurements. The calibration details for the equipment used during the survey are provided in Table 7.

Table 7 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
957A				
Sound level meter	SVAN957/12327	Svantek	2 Nov 17	1511575
Microphone	ACO7052H/43273	Svantek	2 Nov 17	1511575
Pre-amp	SV12L/13569	Svantek	2 Nov 17	1511575
Calibrator	SV30A/7451	Svantek	30 Oct 17	1510572

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

The sound level meter and microphone were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. 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 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.

The L_{A90} is considered most representative of the background sound 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.*

Weather conditions

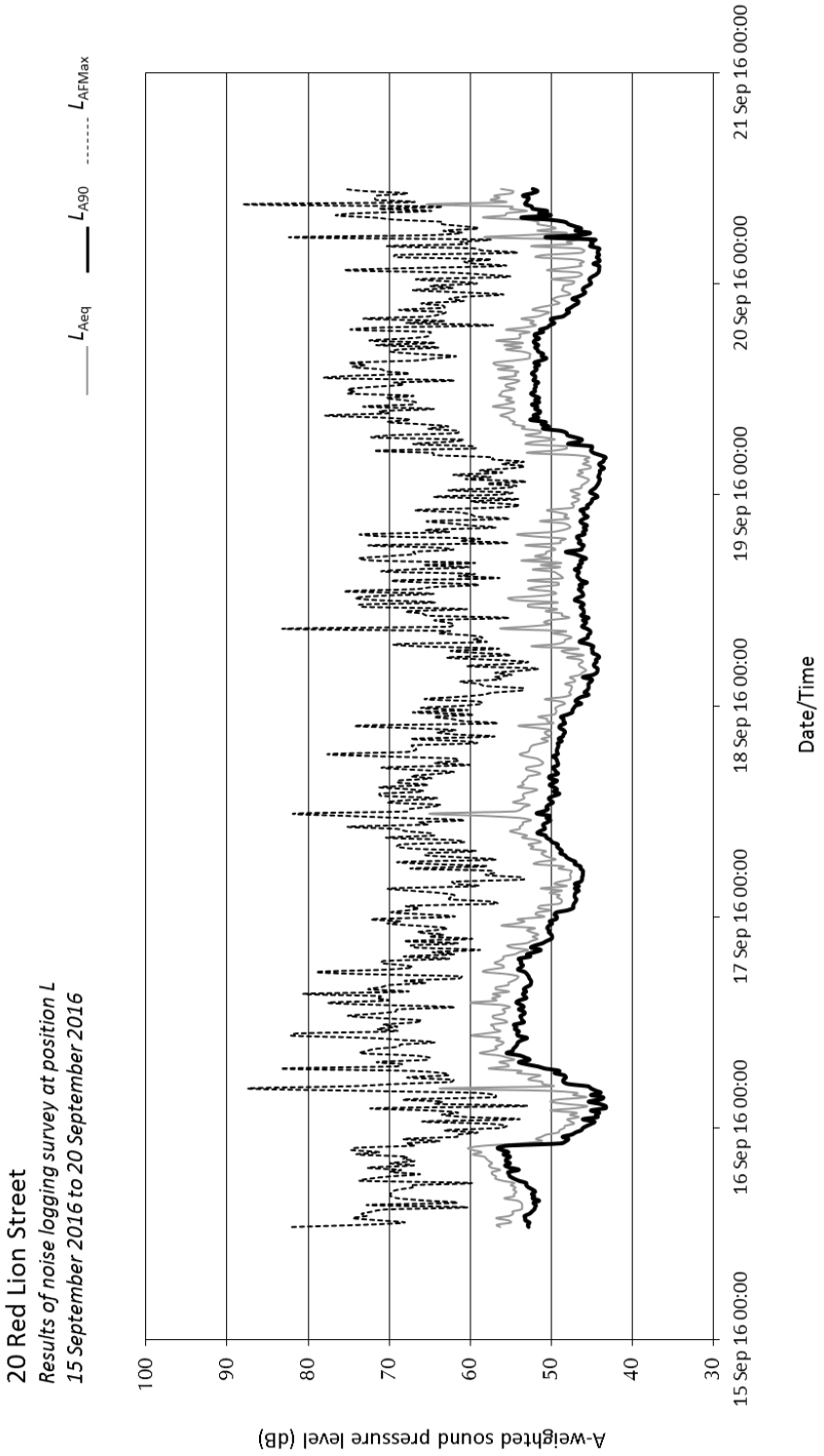
During the unattended noise measurements between 15 September 2016 and 20 September 2016, weather reports for the area indicated that temperatures varied between 30°C and 14°C, and the wind speed was generally less than 3 m/s.

A thunderstorm developed during the night on 16 September 2016 which may have somewhat affected the results during that period. Rain occurred on both 19 and 20 September 2016.

The survey duration was sufficiently long to include periods unaffected by adverse weather and no variation in noise levels was seen to correlate with the weather conditions described above. Consequently, the data obtained during the survey is considered to be representative.

Appendix B

Results of unattended measurements at position L


20 Red Lion Street
Results of noise logging survey at position L
15 September 2016 to 20 September 2016
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
15 Sep 16 00:00
16 Sep 16 00:00
17 Sep 16 00:00
18 Sep 16 00:00
19 Sep 16 00:00
20 Sep 16 00:00
21 Sep 16 00:00
Date/Time