



PREPARED: Wednesday, 26 October 2022

117 SHAFTESBURY AVENUE NOISE IMPACT ASSESSMENT

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AS12559/SP1	Indicative Site Plan
AS12559/TH1-TH4	Environmental Noise Time Histories
APPENDIX A	Acoustic Terminology
APPENDIX B	Acoustic Calculations

Project Ref:	AS12559	Title:	117 Shaftesbury Avenue, London
Report Ref:	AS12559.221019.NIA	Title:	Plant Noise Impact Assessment
Client Name:	Progress My Office		
Project Manager:	Michael Symmonds		
Report Author:	Michael Symmonds		
Clarke Saunders Acoustics Winchester SO22 5BE		This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.	

1.0 EXECUTIVE SUMMARY

- 1.1 Clarke Saunders Acoustics has conducted an assessment of atmospheric noise emissions from proposed external plant on the roof of 117 Shaftesbury Avenue, London.
- 1.2 Environmental noise survey data has been used to set criteria, following the requirements of Camden Council.
- 1.3 The external plant noise assessment demonstrates that the requirements of Camden Council should be achieved when the specified plant, extract fan enclosure and attenuator are installed.

2.0 INTRODUCTION

- 2.1 Clarke Saunders Acoustics (CSA) has been appointed to conduct an assessment of atmospheric noise emissions from proposed external plant at roof level of 117 Shaftesbury Avenue, London.
- 2.2 The assessment will be based on environmental noise survey data, the requirements of Camden Council and the proposed plant installations.
- 2.3 Please refer to Appendix A for a summary of the acoustic terminology used throughout this report.

3.0 DESCRIPTION OF SITE

- 3.1 117 Shaftesbury Avenue (the site) is located in a mixed use area of London, with food and beverage units lining the street at ground floor and a mixture of offices and residential accommodation above.
- 3.2 The roof of the site currently has a significant amount of the plant installed, including condensing units and an extract fan. The proposals involve installing a new extract fan and two additional condensers on the roof, which may be required to operate before 7am and after 11pm.
- 3.3 The attached site plan AS12559/SP1 shows the surrounding area and the identified most affected residential receptors to which the noise assessment will be made.

4.0 LOCAL AUTHORITY REQUIREMENTS

- 4.1 Camden Council adopted the new Local Plan on 3 July 2017, which describes “noise thresholds” in Appendix 3. Noise levels from commercial and industrial developments including plant and machinery noise can be found in Table C of the document. A summary of this table is presented in Table 4.1.

EXISTING NOISE SENSITIVE RECEPTOR	ASSESSMENT LOCATION	DESIGN PERIOD	LOAEL (GREEN)	LOAEL TO SOAEL (AMBER)	SOAEL (RED)
Dwellings	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day (07:00 – 23:00)	'Rating level' 10 dB* below background	'Rating level' between 9 dB below and 5 dB above background	'Rating level' greater than 5 dB above background
	Outside bedroom window (façade)	Night (23:00 – 07:00)	'Rating level' 10 dB* below background and no events exceeding 57 dB L _{Amax}	'Rating level' between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L _{Amax}	'Rating level' 5dB above background and/or events exceeding 88 dB L _{Amax}

Table 4.1 – External plant noise requirements of Camden Council

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

5.0 ENVIRONMENTAL NOISE SURVEY

5.1 EQUIPMENT AND PROCEDURE

- 5.1.1 A survey of the ambient and background noise levels was conducted in free-field conditions at 4th floor level at the position shown on the site plan AS12559/SP1.
- 5.1.2 Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 11:40 hours on Thursday 16th June and 11:25 hours on Monday 20th June 2022.
- 5.1.3 The following equipment was used during the survey:
 - Rion sound level meter type NL52;
 - Rion sound level calibrator type NC74.
- 5.1.4 The calibration of the sound level meter was verified before and after use. No significant calibration drift was detected.
- 5.1.5 The weather during the survey was noted onsite at installation and retrieval of the meter. Conditions were mostly dry with light to moderate winds, which provided sufficient periods of appropriate weather for the measurement of environmental noise.
- 5.1.6 Measurements were made following procedures in BS 7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2- Acquisition of data*

pertinent to land use and BS4142:2014 + A.1:2019 Methods for rating and assessing industrial and commercial sound.

5.2 SURVEY RESULTS

- 5.2.1 Figures AS12559/TH1-4 show the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels as time histories at the monitoring position.
- 5.2.2 The ambient noise climate is determined by existing mechanical plant noise on the roof of 117, 119 and 125 Shaftesbury Avenue and within the lightwell. Road traffic noise on Shaftesbury Avenue contributes slightly to the underlying background noise.
- 5.2.3 The measured typical lowest background (derived from the 10th percentile of the relevant L_{A90} dataset) and average noise levels from the monitoring position are presented in the following table.

MONITORING PERIOD	TYPICAL BACKGROUND $L_{A90, 5\text{MINS}}$	AVERAGE $L_{Aeq, T}$
07:00 - 23:00 hours	56 dB	58 dB
23:00 - 07:00 hours	55 dB	57 dB

Table 5.1 – Typical measured background and average free-field noise levels [dB ref. 20 μPa]

6.0 PLANT NOISE EMISSIONS CRITERIA

- 6.1 On the basis of the measured noise levels and the likelihood that the plant noise will not be perceptibly tonal at the receptor, the design criteria for new plant are as follows, targeting the LOAEL in line with Camden's standard requirements.

MONITORING PERIOD	CRITERIA
07:00 - 23:00 hours	$L_{Aeq} \leq 46 \text{ dB}$
23:00 - 07:00 hours	$L_{Aeq} \leq 45 \text{ dB}$

Table 6.1 – Plant noise emissions criteria [dB ref. 20 μPa]

7.0 EXTERNAL PLANT NOISE ASSESSMENT

7.1 PLANT PROPOSALS

- 7.1.1 The proposed new mechanical plant selections have been confirmed as follows:

- 1 no. Daikin condensing unit type RZAG71NY1;
- 1 no. Daikin condensing unit type RZAG140NY1;
- 1 no. Kitchen Extract Fan type T-Line TLL560/42-3, fitted with:
 - T-Line enclosure type TLLAE560 around fan; and
 - T-Line attenuator type TLLVA560/1500 within exhaust ductwork.

- 7.1.2 The plant could operate within the identified daytime and night-time periods.

- 7.1.3 The manufacturers have confirmed the following sound pressure levels produced by the condensers when operated at their maximum duty. Sound power level data is also provided for the extract fan when operating at its design duty.

FREQUENCY (HZ)	63	125	250	500	1K	2K	4K	8K
RZAG71NY1, L_p at 1m	53	52	46	45	40	35	29	23
RZAG140NY1, L_p at 1m	60	53	52	50	45	41	35	29
TLL560/52-3, L_w	75	79	83	82	78	74	70	65

Table 7.1 – Source noise levels for proposed plant

[L_p dB ref. 20 μ Pa, L_w dB ref. 1pW]

- 7.1.4 T-Line has also confirmed the following insertion loss data for the fan enclosure and attenuator.

FREQUENCY (HZ)	63	125	250	500	1K	2K	4K	8K
Enclosure insertion losses	2	-9	-12	-18	-26	-31	-31	-29
Attenuator insertion losses	-4	-9	-18	-30	-40	-40	-34	-24

Table 7.2 – Insertion losses for enclosure and attenuator

7.2 NOISE PREDICTIONS

- 7.2.1 Noise levels at the two identified receptors have been calculated on the basis of the acoustic data provided by the manufacturers, rooftop plant layouts provided by the building services engineers and the geometric relationship between source and receptor positions, informed by visual inspections during site visits and satellite imagery.
- 7.2.2 Whilst Receptor 2 does not benefit from acoustic screening losses, line of sight will be obscured between Receptor 1 and the proposed plant installations by the plant area parapet wall and the flank façade of the adjacent property.
- 7.2.3 Table 7.3 shows the predicted noise levels against the design criteria.

PREDICTED PLANT SOUND LEVEL	DESIGN CRITERIA
Receptor 1: L_{Aeq} 31 dB	Daytime: $L_{Aeq} \leq 46$ dB
Receptor 2: L_{Aeq} 31 dB	Night-time: $L_{Aeq} \leq 45$ dB

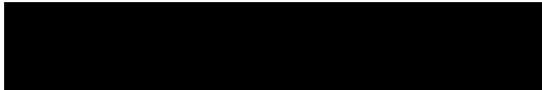
Table 7.3 – Predicted plant noise levels and criteria

[dB ref. 20 μ Pa]

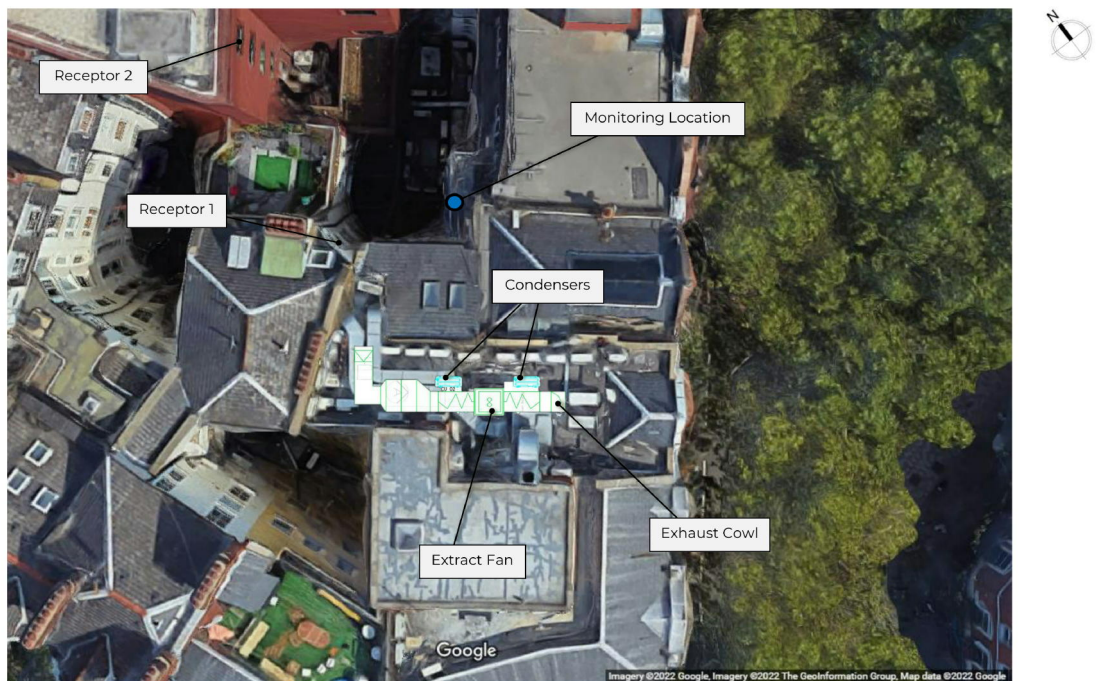
- 7.2.4 Receptor 1 is located approximately equidistant to the rooftop plant area as the monitoring position. The measured background noise levels are, therefore, representative of the conditions at this receptor position.
- 7.2.5 Owing to access constraints, it was not possible to determine the background noise levels at a position equidistant to the rooftop plant area as Receptor 2. Whilst Receptor 2 does not benefit from the screening losses of the monitoring location, it does benefit from increased distance propagation losses to the existing rooftop plant, which would offset this factor. The background level and subsequent criterion adopted are, therefore, considered to be robust for Receptor 2.
- 7.2.6 The predicted noise levels at the receptors meet the criteria by a significant margin.

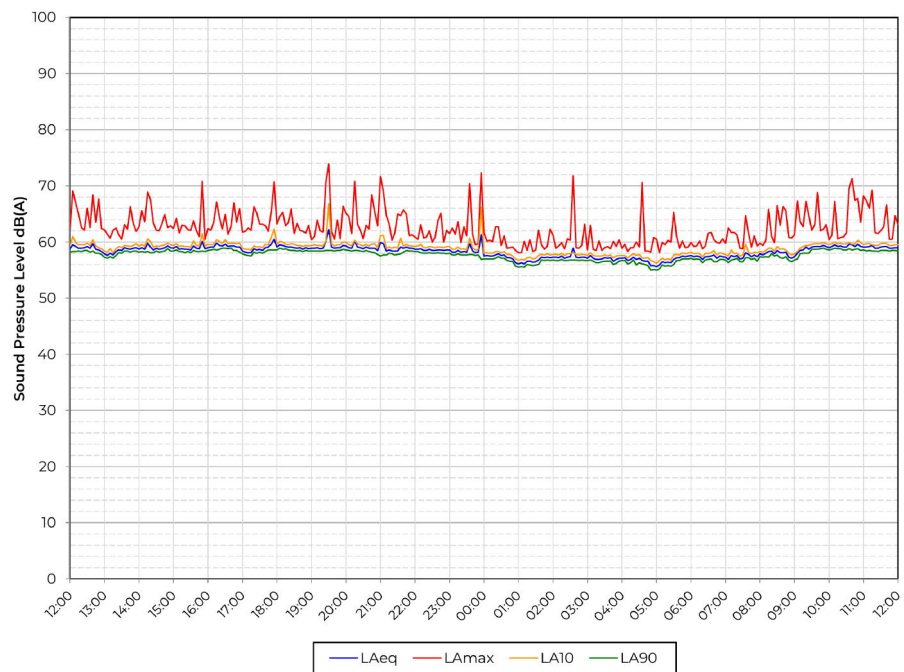
8.0 CONCLUSIONS

- 8.1 Clarke Saunders Acoustics has conducted an assessment of atmospheric noise emissions from external plant proposed at roof level of 117 Shaftesbury Avenue, London.
- 8.2 The external plant noise assessment demonstrates that the requirements of Camden Council should be achieved when the specified plant, extract fan enclosure and attenuator are installed.



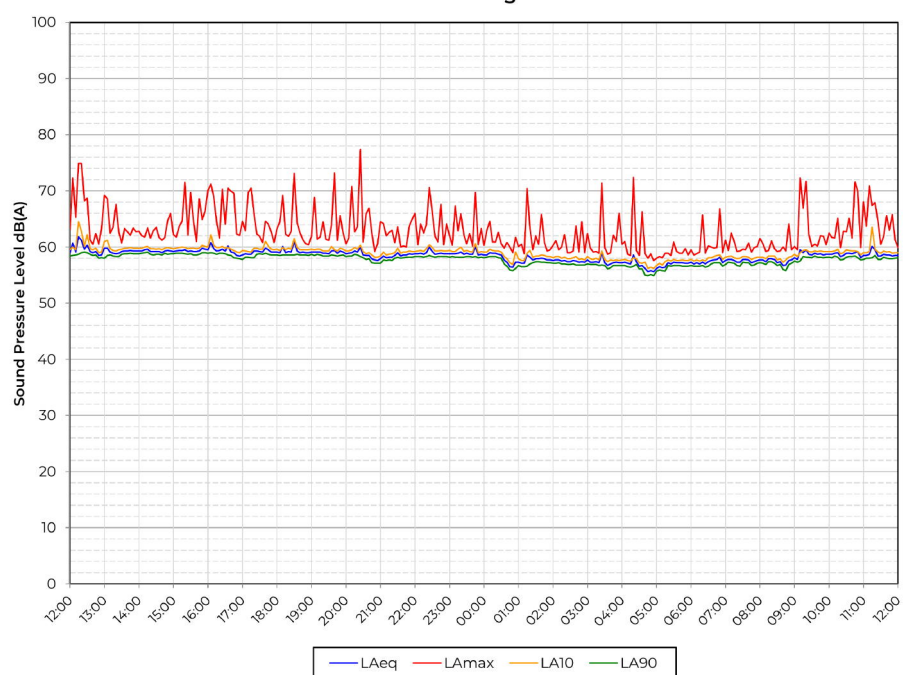
Michael Symmonds MIOA
CLARKE SAUNDERS ACOUSTICS





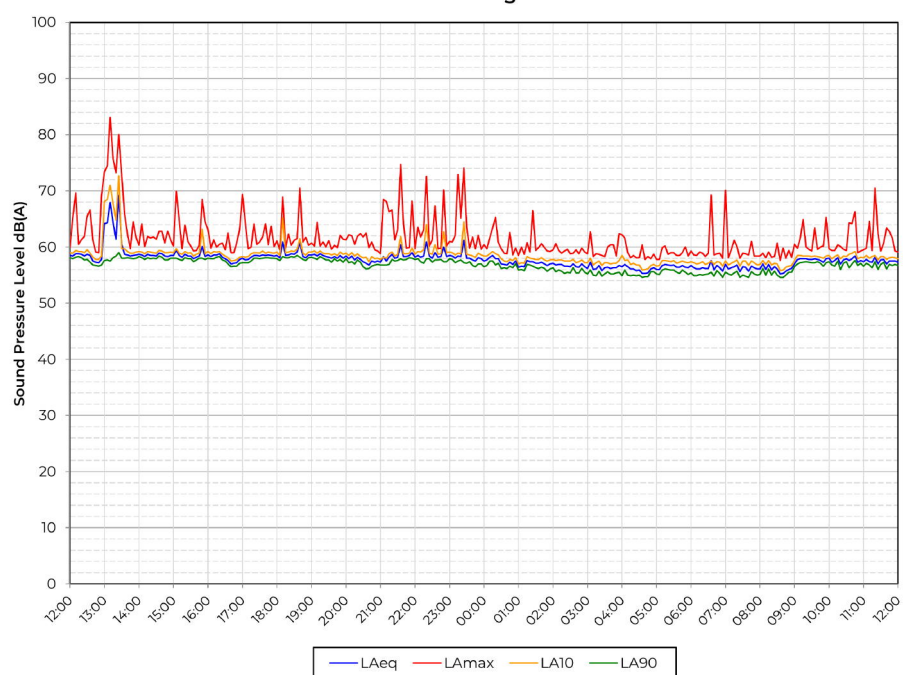
Thu 16 Jun to Fri 17 Jun

Figure AS12559/TH1



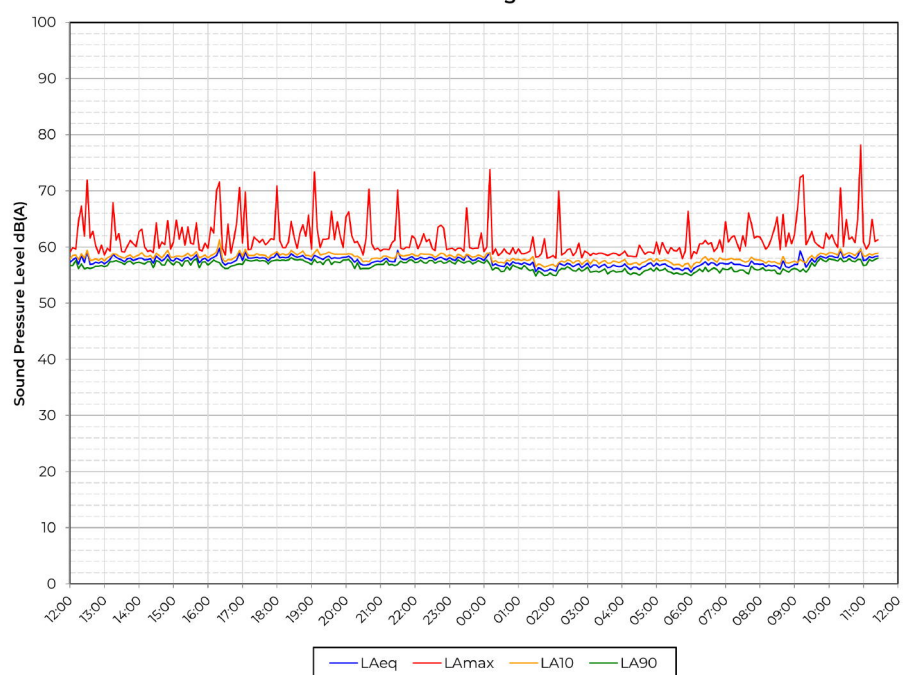
Fri 17 Jun to Sat 18 Jun

Figure AS12559/TH2



Sat 18 Jun to Sun 19 Jun

Figure AS12559/TH3



Sun 19 Jun to Mon 20 Jun

Figure AS12559/TH4

APPENDIX A

ACOUSTIC TERMINOLOGY AND HUMAN RESPONSE TO BROADBAND SOUND

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A .
L_{eq}:	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90}:	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max}:	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In

APPENDIX A

ACOUSTIC TERMINOLOGY AND HUMAN RESPONSE TO BROADBAND SOUND

these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz.

The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000
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1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

APPENDIX B
AS12559 117 Shaftesbury Avenue, London
PLANT NOISE CALCULATIONS - RECEPTOR 1

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Extract Fan Breakout	Lw	75	79	83	82	78	74	70	65	83
Enclosure and casing insertion loss		2	-9	-12	-18	-26	-31	-31	-29	
Total noise emissions		77	70	71	64	52	43	39	36	65
SWL to SPL conversion at:	10m	-32	-32	-32	-32	-32	-32	-32	-32	
Line of sight screening		-5	-5	-5	-5	-5	-5	-5	-5	
Noise Level at Receptor	L_{eq 1hr}	40	33	34	27	15	6	2	0	29

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Extract Fan Exhaust	Lw	75	79	83	82	78	74	70	65	83
Attenuator (TLLVA560/1500)		-4	-9	-18	-30	-40	-40	-34	-24	
Hemispherical Spreading		-8	-8	-8	-8	-8	-8	-8	-8	
Directivity		0	-2	-7	-11	-16	-21	-22	-22	
End Reflection		-7	-3	-1	0	0	0	0	0	
Total noise emissions		56	57	49	33	14	5	6	11	44
Distance losses	13m	-22	-22	-22	-22	-22	-22	-22	-22	
Line of sight screening		-5	-5	-5	-5	-5	-5	-5	-5	
Noise Level at Receptor	L_{eq 1hr}	29	30	22	5	0	0	0	0	17

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Condenser (RZAG71MV1)	Lp @ 1m	53	52	46	45	40	35	29	23	46
Distance losses	8m	-18	-18	-18	-18	-18	-18	-18	-18	
Line of sight screening		-5	-5	-5	-5	-5	-5	-5	-5	
Noise Level at Receptor	L_{eq 1hr}	30	29	23	22	17	12	6	0	23

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Condenser (RZAG140MV1)	Lp @ 1m	60	53	52	50	45	41	35	29	51
Distance losses	11m	-21	-21	-21	-21	-21	-21	-21	-21	
Line of sight screening		-5	-5	-5	-5	-5	-5	-5	-5	
Noise Level at Receptor	L_{eq 1hr}	34	27	26	24	19	15	9	3	25

Total Noise Level at Receptor	L_{eq 1hr}	42	37	36	30	22	17	12	7	31
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Minimum Daytime L_{A90} 56dB
Minimum Night-time L_{A90} 55dB

APPENDIX B
AS12559 117 Shaftesbury Avenue, London
PLANT NOISE CALCULATIONS - RECEPTOR 2

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Extract Fan Breakout	Lw	75	79	83	82	78	74	70	65	83
Enclosure and casing insertion loss		2	-9	-12	-18	-26	-31	-31	-29	
Total noise emissions		77	70	71	64	52	43	39	36	65
SWL to SPL conversion at:	20m	-37	-37	-37	-37	-37	-37	-37	-37	
Noise Level at Receptor	L_{eq} 1hr	40	33	34	27	15	6	2	0	28

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Extract Fan Exhaust	Lw	75	79	83	82	78	74	70	65	83
Attenuator (TLLVA560/1500)		-4	-9	-18	-30	-40	-40	-34	-24	
Hemispherical Spreading		-8	-8	-8	-8	-8	-8	-8	-8	
Directivity		0	-1	-4	-6	-10	-13	-17	-20	
End Reflection		-7	-3	-1	0	0	0	0	0	
Total noise emissions		56	58	52	37	20	13	11	13	46
Distance losses	22m	-27	-27	-27	-27	-27	-27	-27	-27	
Noise Level at Receptor	L_{eq} 1hr	30	31	25	10	0	0	0	0	20

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Condenser (RZAG71MV1)	Lp @ 1m	53	52	46	45	40	35	29	23	46
Distance losses	18m	-25	-25	-25	-25	-25	-25	-25	-25	
Noise Level at Receptor	L_{eq} 1hr	28	27	21	20	15	10	4	0	21

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Condenser (RZAG140MV1)	Lp @ 1m	60	53	52	50	45	41	35	29	51
Distance losses	20m	-26	-26	-26	-26	-26	-26	-26	-26	
Noise Level at Receptor	L_{eq} 1hr	34	27	26	24	19	15	9	3	25

Total Noise Level at Receptor	L_{eq} 1hr	41	36	35	29	22	17	11	7	31
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Minimum Daytime L_{A90} 56dB
Minimum Night-time L_{A90} 55dB