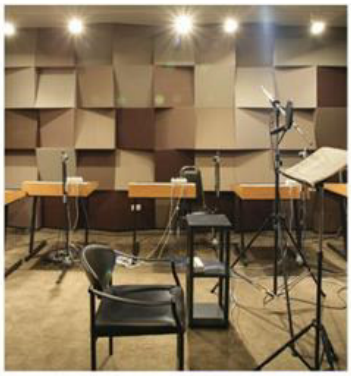
clarke saunders | acoustics
specialist consultants



REPORT AS8489.151218.NIA1.3

104 ARLINGTON ROAD
CAMDEN TOWN

NOISE IMPACT ASSESSMENT

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Lauriam
Lombard Business Park
8 Lombard Road
Wimbledon
London
SW19 3TZ

Head Office -
Westgate House
39-41 Romsey Road
Winchester
SO22 5BE
mail@clarkesaunders.com

London Office -
16 Lower Marsh
London
SE1 7RJ
london@clarkesaunders.com

Exeter Office -
Sowton Business Centre
Capital Court
Bittern Road
Sowton
Exeter
EX2 7FW
exeter@clarkesaunders.com

Tel: +44 (0) 1962 872130
mail@clarkesaunders.com

www.clarkesaunders.com

CONTENTS

List of Attachments

1.0 INTRODUCTION

Planning approval is being sought for new items of building services plant to replace ten existing plant units to the rear of 104 Arlington Road, Camden Town.

Clarke Saunders Associates has been commissioned by Lauriam to undertake an assessment of the potential impact associated with this proposal.

An environmental noise survey has been undertaken in order to measure the prevailing background noise climate at the site. The background noise levels measured will be used to determine daytime and night-time noise emission limits for new building services plant in accordance with the planning requirements of Camden Council.

2.0 SURVEY PROCEDURE & EQUIPMENT

A survey of background noise levels was undertaken at 1st floor level of the existing building at the location shown on site plan AS8489/SP1. Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 14:20 hours on Friday 23rd and 07:30 hours on Tuesday 27th October 2015.

The following equipment was used during the course of the survey:

- Rion data logging sound level meter type NA28;
- Rion sound level calibrator type NC-74.

The calibration of the sound level meter was verified before and after use. No calibration drift was detected.

The weather during the survey was dry with light winds, which made the conditions suitable for the measurement of environmental noise.

Measurements were made generally in accordance with ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

3.0 RESULTS

Figures AS8489/TH1-TH4 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement position.

4.0 DISCUSSION

The background noise climate at the property is determined by road traffic noise in the surrounding streets. The existing plant was not running at the time of the survey.

Measured average and typical background noise levels are shown in Table 4.1.

Monitoring period	Average $L_{Aeq,T}$	Typical $L_{A90,5mins}$
07:00 - 23:00 hours	54	46
23:00 - 07:00 hours	51	43

Table 4.1 - Measured average and typical background noise levels **[dB ref. 20µPa]**

5.0 DESIGN CRITERIA

5.1 Local Authority Requirements

Camden Council currently requires new plant to be 5dB below the background level. In addition, the background level must not be exceeded by more than 1dB in any octave band between 63Hz and 8kHz

> *Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the L_{A90}, expressed in dB(A).*

Therefore, the plant noise emissions criteria that should not be exceeded at the nearest noise sensitive receiver should be set to the proposed levels detailed in Table 5.1 and Table 5.2.

Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
L_{Aeq} 41 dB	L_{Aeq} 38 dB

Table 5.1 - Proposed design noise criteria **[dB ref. 20µPa]**

Freq (Hz)	63	125	250	500	1k	2k	4k	8k
Daytime Criterion	52	53	47	44	41	34	25	18
Night-time Criterion	48	52	45	40	37	31	24	16

Table 5.2 - Spectral design criterion **[dB ref. 20µPa]**

5.2 BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*

The guidance in this document indicates suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this standard are shown in the following table:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq, 16\ hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\ hour}$	30 dB $L_{Aeq, 8\ hour}$

Table 5.3 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

6.0 PREDICTED NOISE IMPACT

6.1 Proposed plant

The selected plant has been confirmed as follows, they are to be installed in two groups as shown in the attached site plan AS8489/SP1.

CU01 and CU02

- 2 no. Daikin Condensing Unit Type REYQ10T;
- 2 no. Daikin Condensing Unit Type REYQ12T;
- 1 no. Daikin Condensing Unit Type REYQ18T.

CU03

- 1 no. Daikin Condensing Unit Type RZQSG71L3V1.

The approximate locations of the plant to be installed are shown on site plan AS8489/SP1.

Noise levels generated by the proposed Daikin condensers have been confirmed by the manufacturer as follows:

Plant Unit	63	125	250	500	1000	2000	4000	8000	dB(A)
REYQ10T	62	65	57	58	52	48	41	35	59
REYQ12T	59	66	60	62	53	50	44	37	61
REYQ18T	66	65	67	64	59	55	50	44	65
RZQSG71L3V1	52	53	49	47	45	38	37	21	49

Table 6.1 - Source noise data for the Daikin condensing units **[dB ref. 20µPa]**

6.2 Predicted noise levels

Following an inspection of the site, the nearest noise sensitive receiver is identified as the neighbouring residential building, as shown on the indicative site plan AS8489/SP1. The nearest window is approximately 4 metres away from the closest proposed plant location (CU03). Installations CU01 and CU02 are 17 metres from the window.

The cumulative noise level at the nearest noise sensitive receiver has been assessed according to the guidelines of Camden Council, using the noise data above. Screening losses afforded by building edge screening provided at both plant locations has been included in the prediction of the cumulative plant noise level at the nearest receiver.

Period	Criterion	Predicted Noise Level, $L_{Aeq,T}$
Daytime	41dB	L_{Aeq} 30dB
Night-time	38dB	

Table 6.2 - Predicted noise level at nearest noise sensitive location **[dB ref. 20µPa]**

The resulting spectral noise level and the daytime and night-time spectral criteria are shown in Table 6.3.

Freq (Hz)	63	125	250	500	1k	2k	4k	8k
Daytime Criterion	52	53	47	44	41	34	25	18
Night-time Criterion	48	52	45	40	37	31	24	16
Predicted level at 1m from receiver	38	39	33	29	22	18	13	6

Table 6.3 – Predicted spectral noise levels and criteria at nearest noise sensitive location **[dB ref. 20 µPa]**

A summary of the calculations is shown in Appendix B.

All other air handling and extract plant will be fitted with acoustically specified splitter silencers in order that the cumulative noise level does not exceed the 24-hour design noise criterion. Limiting noise levels for the air handling unit to achieve the criteria at the nearest noise sensitive property have been provided in the table below.

Freq (Hz)		63	125	250	500	1k	2k	4k	8k
Casing Breakout	L_p at 1m	77	66	58	52	48	45	43	41
Intake	Induct L_w	91	77	71	71	64	59	57	55
Discharge	Induct L_w	70	64	63	64	59	54	52	50

Table 6.4 – Air handling unit limiting noise levels **[dB ref. 20 µPa]**

6.3 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 6.3 would result in an internal noise levels that would meet the level shown in Table 5.3.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 104 Arlington Road, Camden Town by Clarke Saunders Associates between Friday 23rd and Tuesday 27th October 2015.

Measurements have been made to establish the current background noise climate. This has enabled design criteria to be set for the control of plant noise emissions to noise sensitive properties, in accordance with Camden Council's requirements.

Data for the new building services plant has been used to predict the noise impact of the new plant on neighbouring residential properties.

Compliance with the noise emission design criterion has been demonstrated. No further mitigation measures are, therefore, required for external noise emissions.

Alex Arnold
Alex Arnold (May 16, 2016)

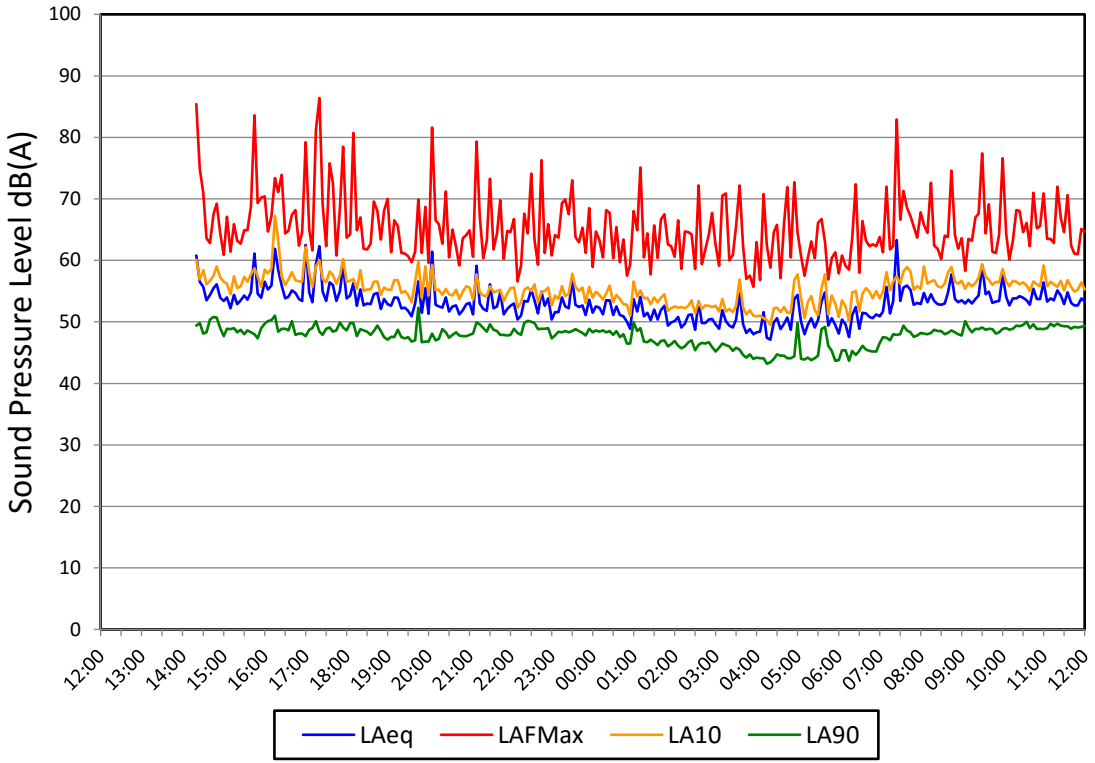
Alex Arnold AMIOA

CLARKE SAUNDERS ASSOCIATES

Figure AS8489/SP1

104 Arlington Road, Camden Town

Environmental Noise Time History

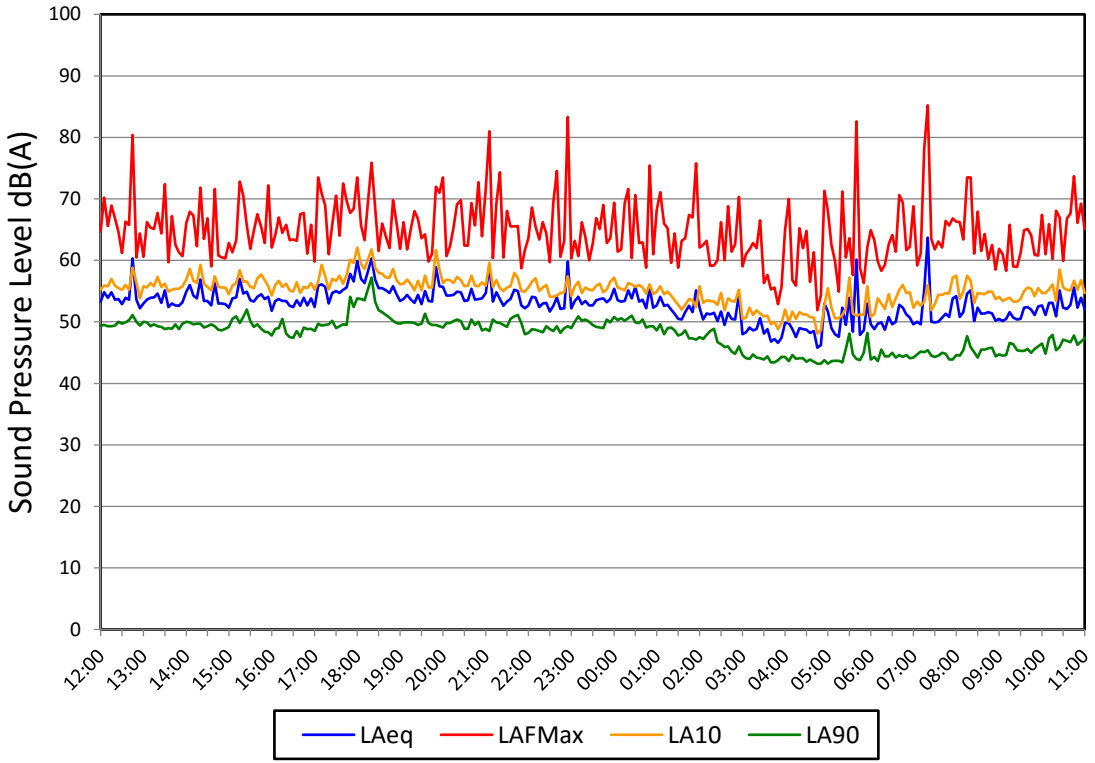


Friday 23 October to Saturday 24 October 2015

Figure AS8489/TH1

104 Arlington Road, Camden Town

Environmental Noise Time History

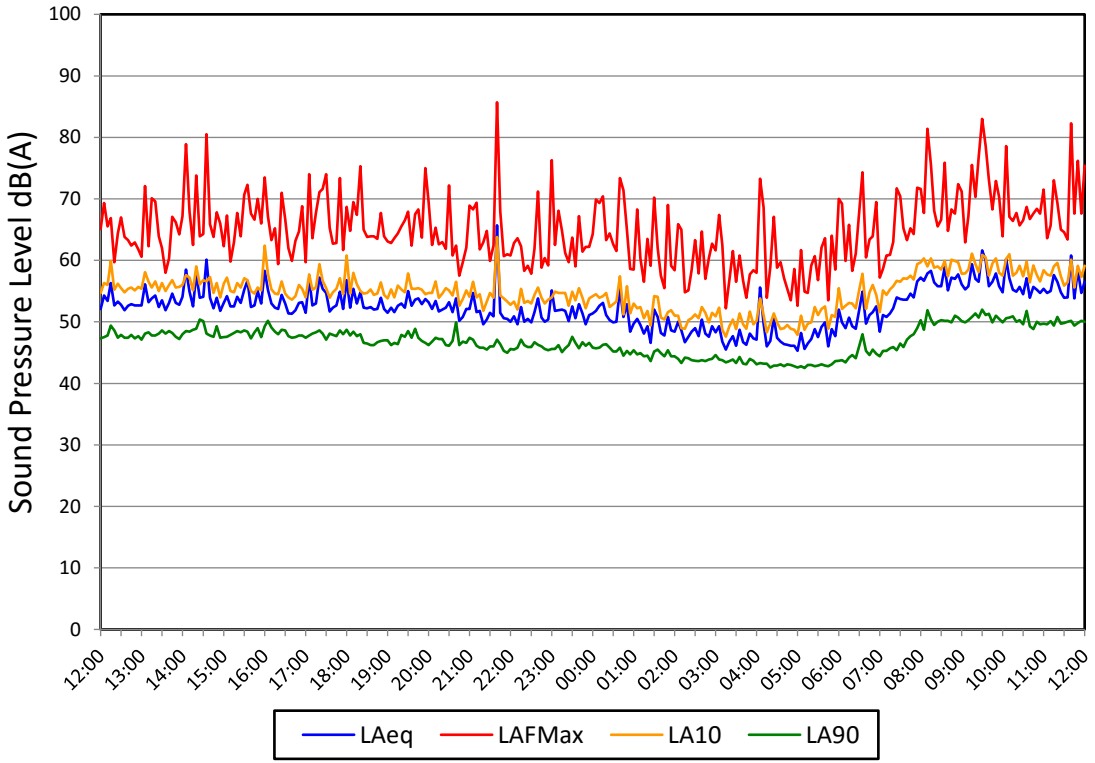


Saturday 24 October to Sunday 25 October 2015

Figure AS8489/TH2

104 Arlington Road, Camden Town

Environmental Noise Time History

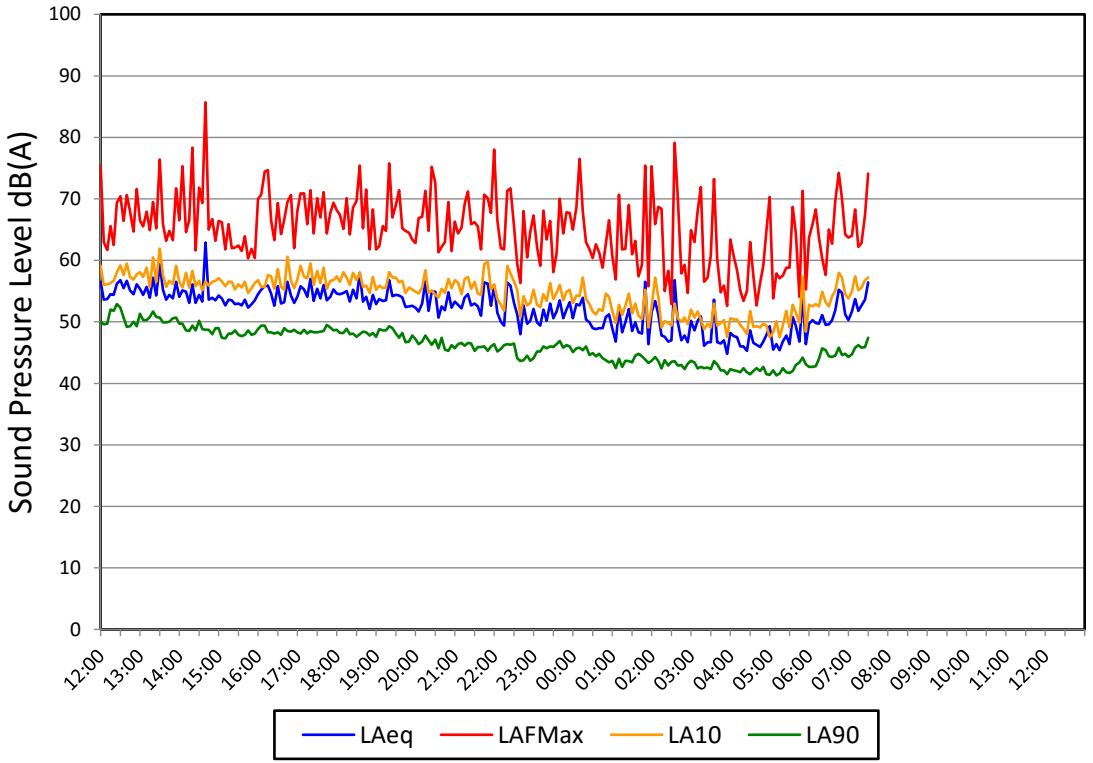


Sunday 25 October to Monday 26 October 2015

Figure AS8489/TH3

104 Arlington Road, Camden Town

Environmental Noise Time History



Monday 26 October to Tuesday 27 October 2015

Figure AS8489/TH4

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.1 Acoustic Terminology

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

dB (A): The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and 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 the `average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq}: The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as 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 use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

Because L_{eq} is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.

L_{max}: L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. *D*, is therefore simply the *level difference* in decibels between the two rooms in different frequency bands.

D_w D_w is the *Weighted Level Difference* The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.

$D_{nT,w}$ $D_{nT,w}$ is the *Weighted Standardised Level Difference* as defined in BS EN ISO 717-1 and represents the *weighted level difference*, as described above, corrected for room reverberant characteristics.

C_{tr} C_{tr} is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$, to take account of characteristics of a particular sound.

$L'_{nT,w}$ $L'_{nT,w}$ is the *Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

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 have 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 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, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

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

INTERPRETATION

Change in Sound Level dB(A)	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 noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is 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 noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.

APPENDIX B
AS8489 - 104 Arlington Road, Camden Town
Noise Impact Assessment

CU01 & CU02

To Nearest Residential Dwelling

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
REYQ10T	Lp @ 1m	61	64	56	57	51	47	40	34	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		64	67	59	60	54	50	43	37	
REYQ12T	Lp @ 1m	59	66	60	62	53	50	44	37	**61**
No. of units	2	3	3	3	3	3	3	3	3	
Total		62	69	63	65	56	53	47	40	
REYQ18T	Lp @ 1m	66	65	67	64	59	55	50	44	**65**
Cumulative		69	72	69	68	62	58	52	46	
Distance Loss	To 14m	-23	-23	-23	-23	-23	-23	-23	-23	
Screening		-10	-12	-14	-17	-18	-18	-18	-18	
Level at receiver		37	37	32	28	21	17	11	5	**29**

CU03

To Nearest Residential Dwelling

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
RZQSG71L3V1	Lp @ 1m	52	53	49	47	45	38	37	21	**49**
Distance Loss	To 4.0m	-12	-12	-12	-12	-12	-12	-12	-12	
Building Screening		-8	-9	-11	-14	-17	-18	-18	-18	
Level at receiver		32	32	25	21	16	8	7	0	**23**

Cumulative Level at Receiver	38	39	33	29	22	18	13	6	**30**

Daytime Criterion **41**

Night-time Criterion **38**