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PREPARED: Friday, 26 November 2021

62 AVENUE ROAD, LONDON;
NOISE IMPACT ASSESSMENT

CONTENTS

LIST OF ATTACHMENTS

Project Ref:	AS11122	**Title:**	62 Avenue Road, London
Report Ref:	AS11122.191213.NIA	**Title:**	Noise Impact Assessment
Client Name:	Prime London Investment (PLI) Limited		
Project Manager:	Ben Dymock		
Report Author:	Ben Dymock		

Clarke Saunders Acoustics
Winchester SO22 5BE

1.0 INTRODUCTION

1.1 Planning approval is being sought for the installation of external plant at 62 Avenue Road, London, NW8.

1.2 Clarke Saunders Acoustics (CSA) has been commissioned by Prime London Investment Limited (PLI) to undertake an environmental noise survey 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 the new building services plant, in accordance with the planning requirements of Camden Council.

2.0 SITE DESCRIPTION

2.1 The site is in a predominantly residential area in the London Borough of Camden. Residential properties lie immediately to the north and south of the site boundary, with Avenue Road to the west. The rear of the site, to the east, is mainly surrounded by the garden areas of the neighbouring residential properties

3.0 SURVEY PROCEDURE & EQUIPMENT

3.1 A survey of the existing background noise levels was undertaken at the locations shown in site plan AS11122/SP1. Measurements of L_{Aeq}, L_{Amax}, L_{A10}, and L_{A90} sound pressure levels were taken over consecutive 5-minute periods between 16:00 hours on Thursday 23rd May and 14:00 hours on Saturday 25th May 2019.

3.2 The following equipment was used during the survey:

- 2no. Svantek Noise and Vibration real time analysers type 958;
- Rion sound level calibrator type NC-74.

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

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

3.5 Measurements were made following procedures in BS7445:1991 (ISO1966-2:1987) *Description and measurement of environmental noise Part 2- Acquisition of data pertinent to land use* and BS4142:2014 *Method for rating and assessing industrial and commercial sound*.

4.0 RESULTS & ANALYSIS

4.1 Figures AS11122/TH1-6 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories on Avenue Road (Position A) and to the rear of the property (Position B).

4.2 Survey positions were in free-field conditions away from the facades of the existing building. Both measurement positions were in line with the proposed facades of the new building.

4.3 The measured daytime ($L_{Aeq,\ 16hr}$) and night time ($L_{Aeq,\ 8hr}$) noise levels are shown in the following table, as well as the typical L_{Amax} levels. These levels form the basis of the noise assessment.

MEASUREMENT LOCATION	PERIOD	AVERAGE $L_{AEQ,T}$	MAXIMUM* L_{AFMAX}	TYPICAL $L_{A90,5MIN}$
Position A (Avenue Road)	Daytime (07:00-23:00)	63 dB $L_{Aeq,16hour}$	82 dB L_{AMax}	55 dB L_{A90}
	Night-time (23:00-07:00)	59 dB $L_{Aeq,8hour}$	72 dB L_{AMax}	38 dB L_{A90}
Position B (Rear of the property)	Daytime (07:00-23:00)	46 dB $L_{Aeq,16hours}$	69 dB L_{AMax}	43 dB L_{A90}
	Night-time (23:00-07:00)	46 dB $L_{Aeq,8hours}$	67 dB L_{AMax}	36 dB L_{A90}

**Indicated by 90th percentile of night-time datasets*

4.4 During processing of the data monitored at Position B, some files became corrupt and could not be processed. These data points are presented as gaps within Figures AS11122/TH1- 6. In spite of missing data points, an appropriate set of data has been collected over the measurement period to determine typical day and night-time noise levels.

5.0 DESIGN CRITERIA

5.1 LOCAL AUTHORITY REQUIREMENTS

5.1.1 Condition 6 of planning permission ref: 2016/4931/P states the following:

'Prior to use of any external mechanical plant at the development, details shall be submitted to and approved in writing by the Council, of the external noise level emitted from plant/ machinery/ equipment and mitigation measures as appropriate. The measures shall ensure that the external noise level emitted from plant, machinery/ equipment will be lower than the lowest existing background noise level by at least 10dBA as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.'

5.1.2 Discussions with the Environmental Health department at Camden Council has confirmed that our assessment of fixed plant noise emissions does not need to be in accordance with BS4142:2014 where character penalties could be imposed. Rather, the policy requires the plant noise emissions at the nearest residential receptor to be 10 dB below the typical background noise level ($L_{A90,15min}$) during the proposed operational period, and, if tonal, 15 dB below the typical background noise level ($L_{A90,15min}$) during the proposed operational period.

5.1.3 It is not expected that tonal noise will be generated by the selected plant units. Plant noise emissions criteria applicable at the nearest noise sensitive receiver are detailed below:

	Day (07:00 - 19:00)	Night (23:00 - 07:00)
Rear of property	L_{Aeq} 33 dB	L_{Aeq} 26 dB
Front of property	L_{Aeq} 45 dB	L_{Aeq} 28 dB

6.0 PREDICTED NOISE IMPACT

6.1 PROPOSED PLANT

6.1.1 The selected plant to be installed and requiring assessment of external noise emissions has been confirmed as follows:

6.1.2 Roof top plant:

- 1no. Nuaire Extract Fan Type SQFA42-3ES;
- 1no. Air Handling Unit (AHU.03);
- 1no. Mitsubishi Condensing Unit type PUZ-ZM125VKA.UK;

6.1.3 Northern lightwell

- 2no. Mitsubishi Condensing Units type PUHY-P450YNW-A;
- 1no Mitsubishi hot water heat pump type CAHV-P500YA-HPB;
- MVHR (.01) outlet;
- AHU (.01) exhaust;
- AHU (.02) exhaust;
- Extract Fan (EF.01) exhaust;

6.1.4 Southern lightwell

- AHU (.01) Intake;
- AHU (.02) Intake;
- 1no. Nuaire fan type AM43ES Intake

6.1.5 Plant room at basement

- 2no Air Handling Units;
- 1no. Nuaire fan type AM43ES;

6.1.6 The approximate locations of the plant to be installed is shown in site plans AS11122/SP1 – SP3.

6.1.7 Sound levels generated by the plant have been confirmed by the manufacturers as follows:

FREQUENCY (Hz)		63	125	250	500	1K	2K	4K	8K
SQFA42-3ES	Induct Outlet (L_w)	81	92	77	73	77	79	76	68
	Breakout (L_w)	77	85	73	68	64	66	59	44
EF.01	Exhaust (L_w)	81	79	80	81	79	76	71	66
AHU.03	Breakout (L_w)	61	59	55	46	38	36	33	30
	Intake (L_w)	62	50	44	55	55	41	30	30
	Exhaust (L_w)	69	66	67	71	72	68	65	57
PUZ-ZM125VKA.UK	(L_p)	63	55	53	50	47	42	38	30
PUHY-P450YNW-A	(L_p)	75	64	66	65	60	55	50	45
CAHV-P500YA-HPB	(L_p)	66	60	67	60	52	50	56	48
AHU.01	Intake (L_w)	70	67	63	60	58	57	57	44
	Exhaust (L_w)	63	66	71	68	69	68	63	59
AHU.02	Intake (L_w)	68	72	68	60	56	53	55	39
	Exhaust (L_w)	72	81	76	71	70	68	61	54
MVHR.01	Outlet (L_w)	60	64	62	73	61	58	52	48
AM43ES	Intake (L_w)	75	83	78	74	66	67	64	60

6.2 PREDICTED NOISE LEVELS

6.2.1 Following an inspection of the site, the nearest noise sensitive receptors are understood to be to the north and south of the property at 60 Avenue Road and 64 Avenue Road respectively.

6.2.2 The predicted, cumulative noise level at the above locations, based on the plant being installed as per the building services drawings, has been calculated using the noise data given above.

6.2.3 Allowance has been made for silencers to be fitted to extract fans and AHUs, enclosures to be provided for a number of fan and condensing units and for a lightwell to be provided with a louvred roof, as per the specifications below:

SILENCERS								
FREQUENCY (Hz)	63	125	250	500	1K	2K	4K	8K
AHU.01 - Intake	1	2	7	10	11	9	8	7
AHU.02 - Intake	1	2	7	10	11	9	8	7
AHU.03 - Intake	1	2	7	10	-11	-9	8	7
AHU.03 - Exhaust	4	9	17	28	34	32	21	14
SQFA42-3ES – Outlet	6	13	23	37	43	44	35	20
AM43ES - Intake	2	4	9	15	17	14	10	8

ENCLOSURES								
FREQUENCY (Hz)	63	125	250	500	1K	2K	4K	8K
SQFA42-3ES	14	19	23	32	43	50	50	50
PUZ-ZM125VKA.UK	5	4	5	6	9	13	14	13

LIGHTWELL LOUVRE								
FREQUENCY (Hz)	63	125	250	500	1K	2K	4K	8K
Louvre over northern lightwell (1)	5	4	5	6	9	13	14	13

6.2.4 With the above mitigation in place, and based on plant layout, orientation and operational parameters specified by the M&E consultant, the predicted cumulative noise level of the plant at the nearest residential receptors has been calculated with allowances for distance propagation and building mass screening. The predictions are summarised below.

RECEPTOR	PREDICTED NOISE LEVEL	DESIGN CRITERION (24 HOUR)
60 Avenue Road	L_{Aeq} 26 dB	L_{Aeq} 26 dB
64 Avenue Road	L_{Aeq} 22 dB	L_{Aeq} 26 dB

Predicted noise level at nearest noise sensitive residential receptors [dB ref. 20µPa]

6.2.5 The predictions indicate that the proposed scheme, with appropriate mitigation in place, is compliant with London Borough of Camden's design noise criteria.

6.2.6 A full summary of the plant noise calculations can be found in Appendix B.

7.0 CONCLUSIONS

7.1 A noise impact assessment has been undertaken by Clarke Saunders Acoustics for the installation of new building services plant at 62 Avenue Road, London NW8.

7.2 Results of an environmental noise survey have established the current background noise climate, which has enabled noise limits to be set for the control of plant noise emissions to noise sensitive properties in accordance with the planning requirements of the London Borough of Camden.

7.3 Manufacturer's data has been used to predict the noise impact of the new plant on neighbouring receptors.

7.4 Mitigation in the form of silencers, enclosures and louvres has been incorporated into the design to meet London Borough of Camden requirements. With this mitigation in place, compliance with the noise emission design criteria has been demonstrated.

Ben Dymock
CLARKE SAUNDERS ACOUSTICS

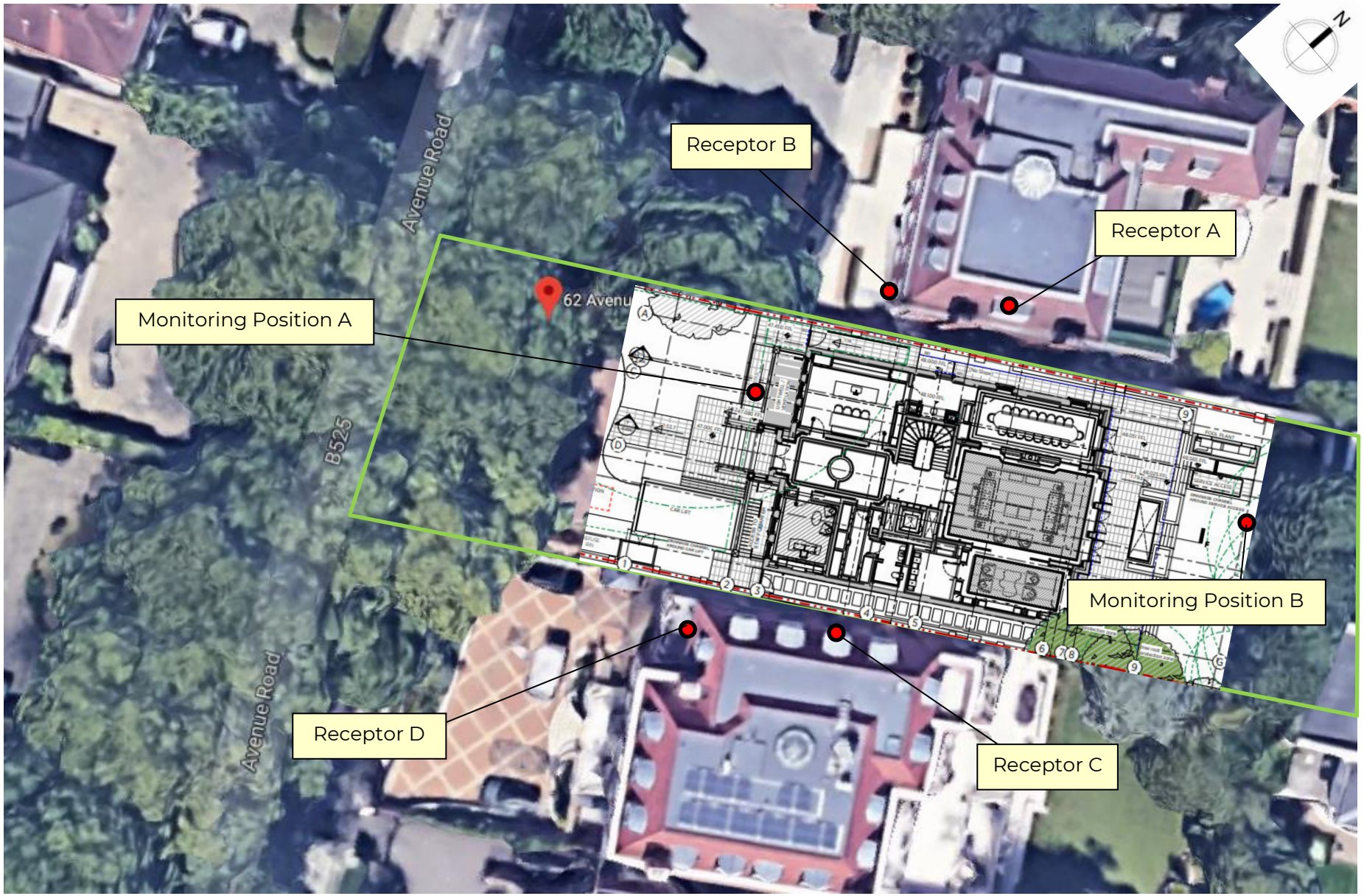

Figure AS11122/SP1

Rooftop Plant

SQFA42-3ES (Outlet)
AHU.03 (Breakout)
AHU.03 (Intake)
AHU.03 (Exhaust)
PUZ-ZM125VKA.UK

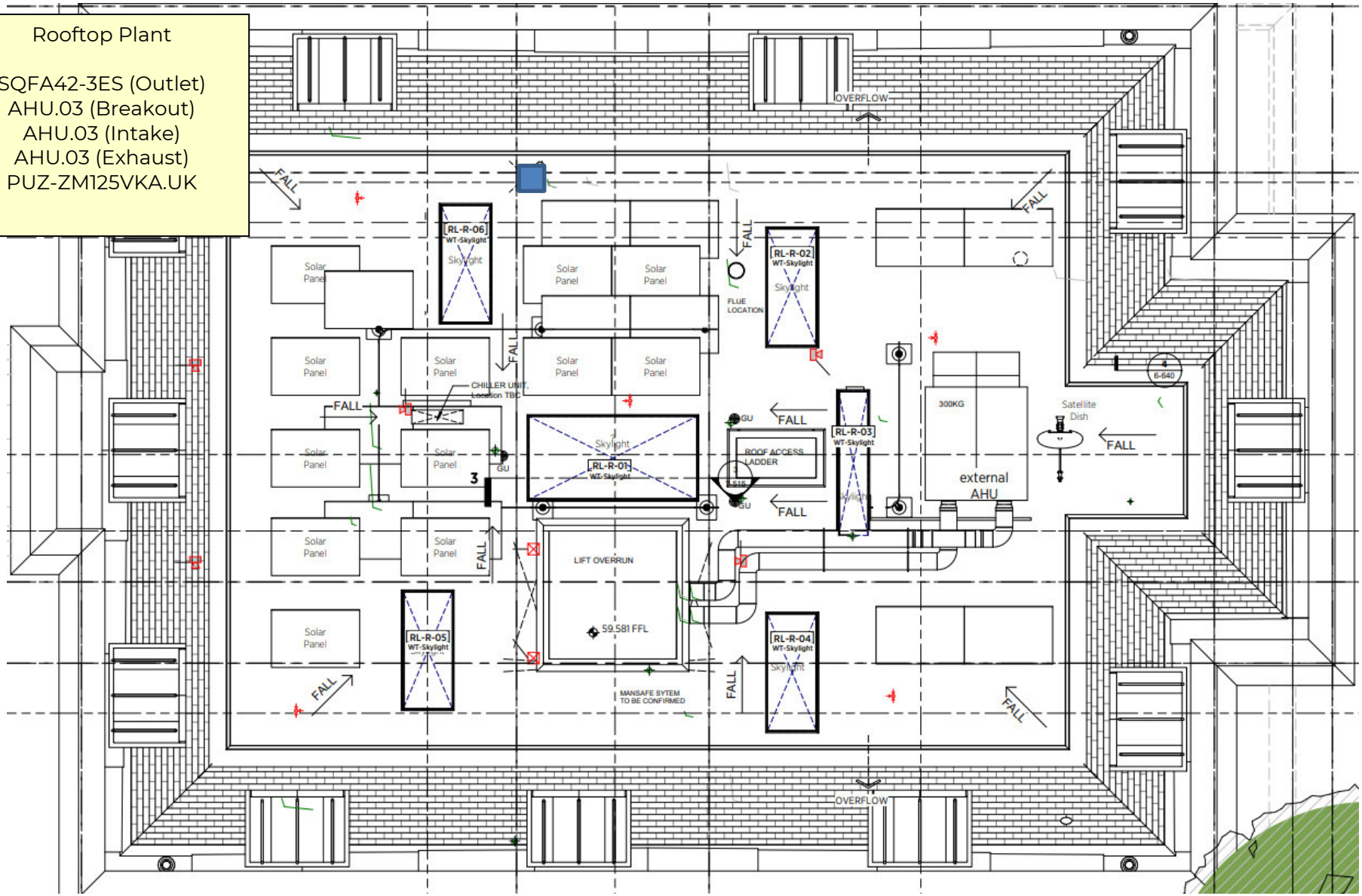

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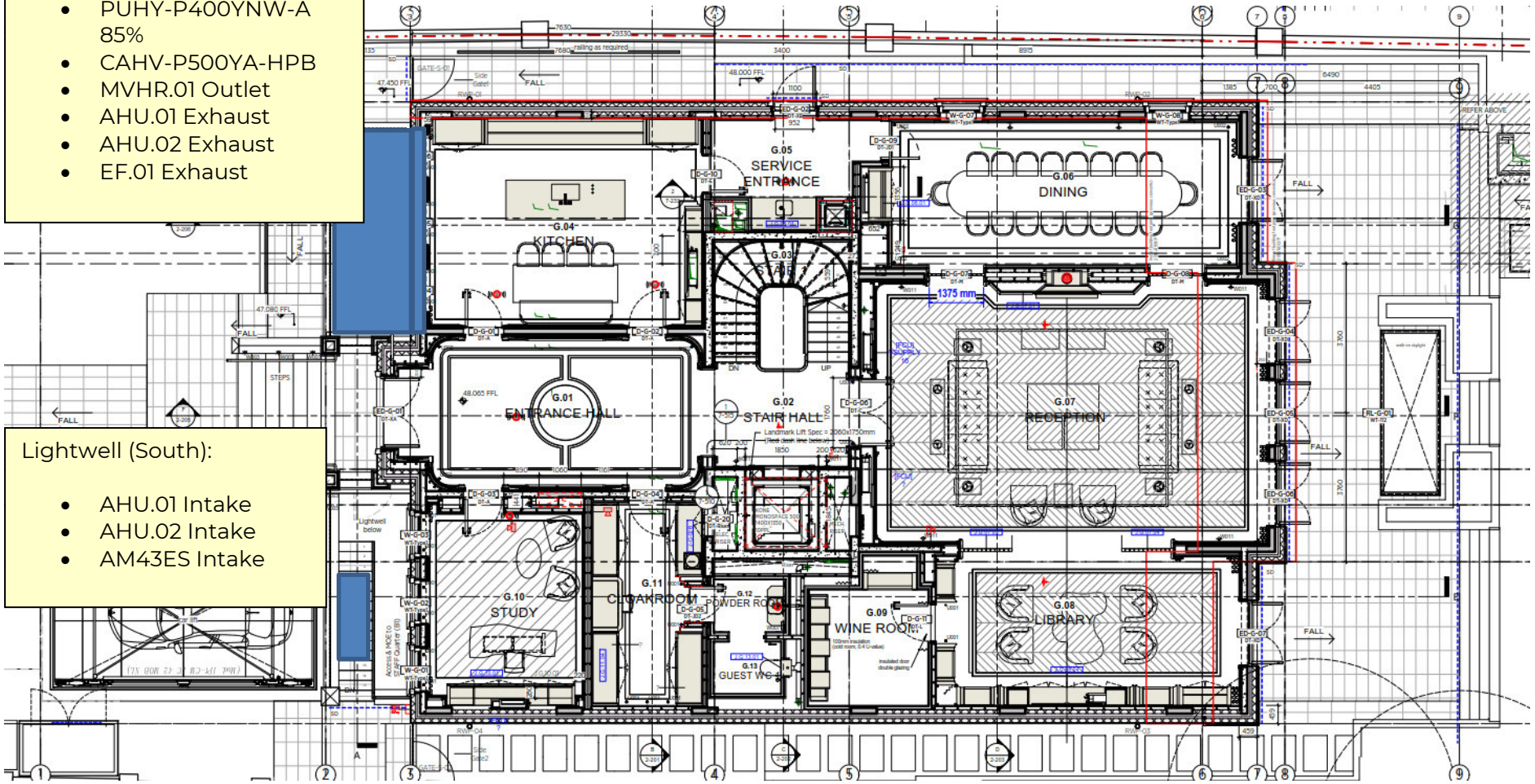
Figure AS11122/SP2

Lightwell (North):

- PUHY-P400YNW-A 85%
- CAHV-P500YA-HPB
- MVHR.01 Outlet
- AHU.01 Exhaust
- AHU.02 Exhaust
- EF.01 Exhaust

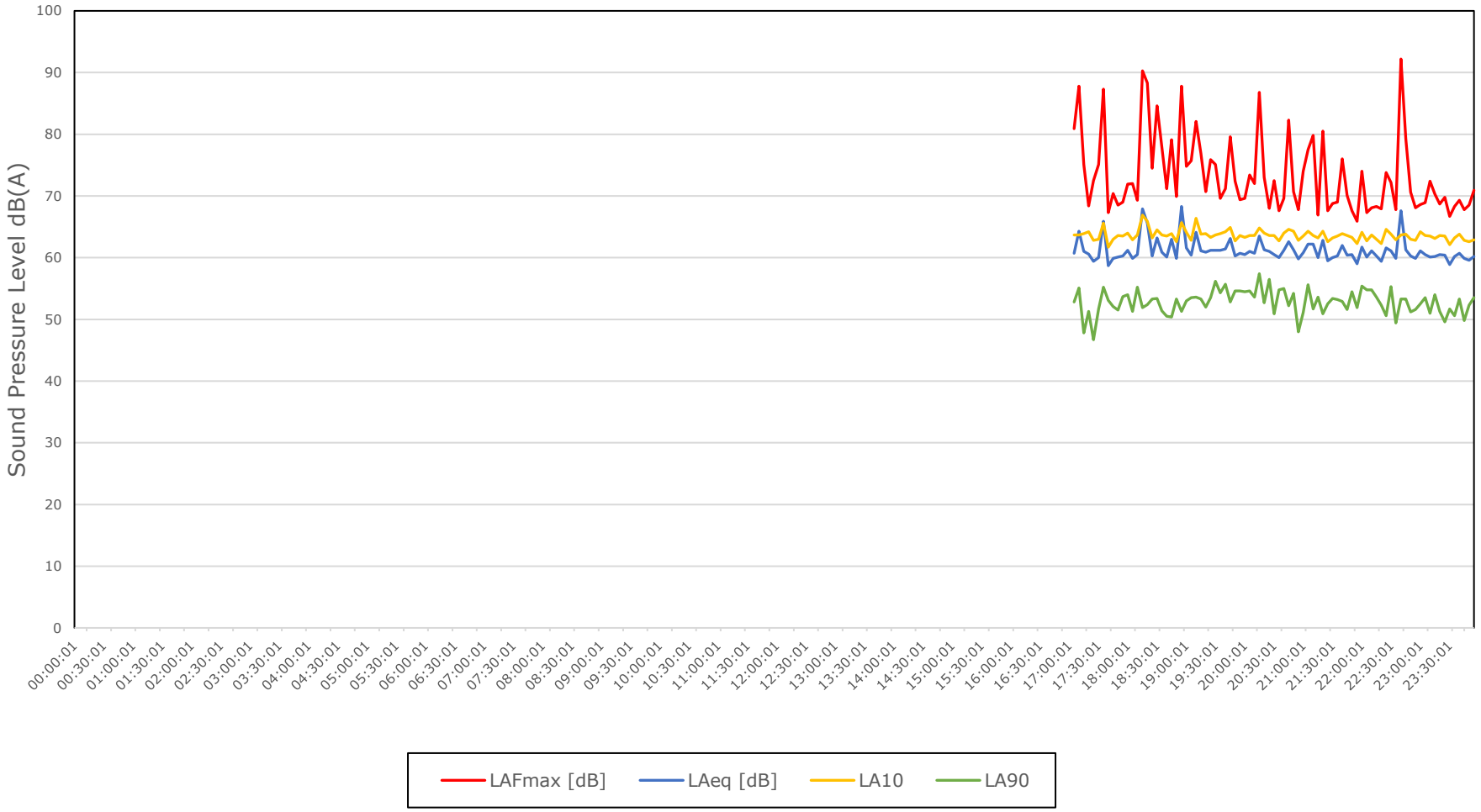
Lightwell (South):

- AHU.01 Intake
- AHU.02 Intake
- AM43ES Intake



62 Avenue Road, London

Environmental Noise Time History: Monitor A

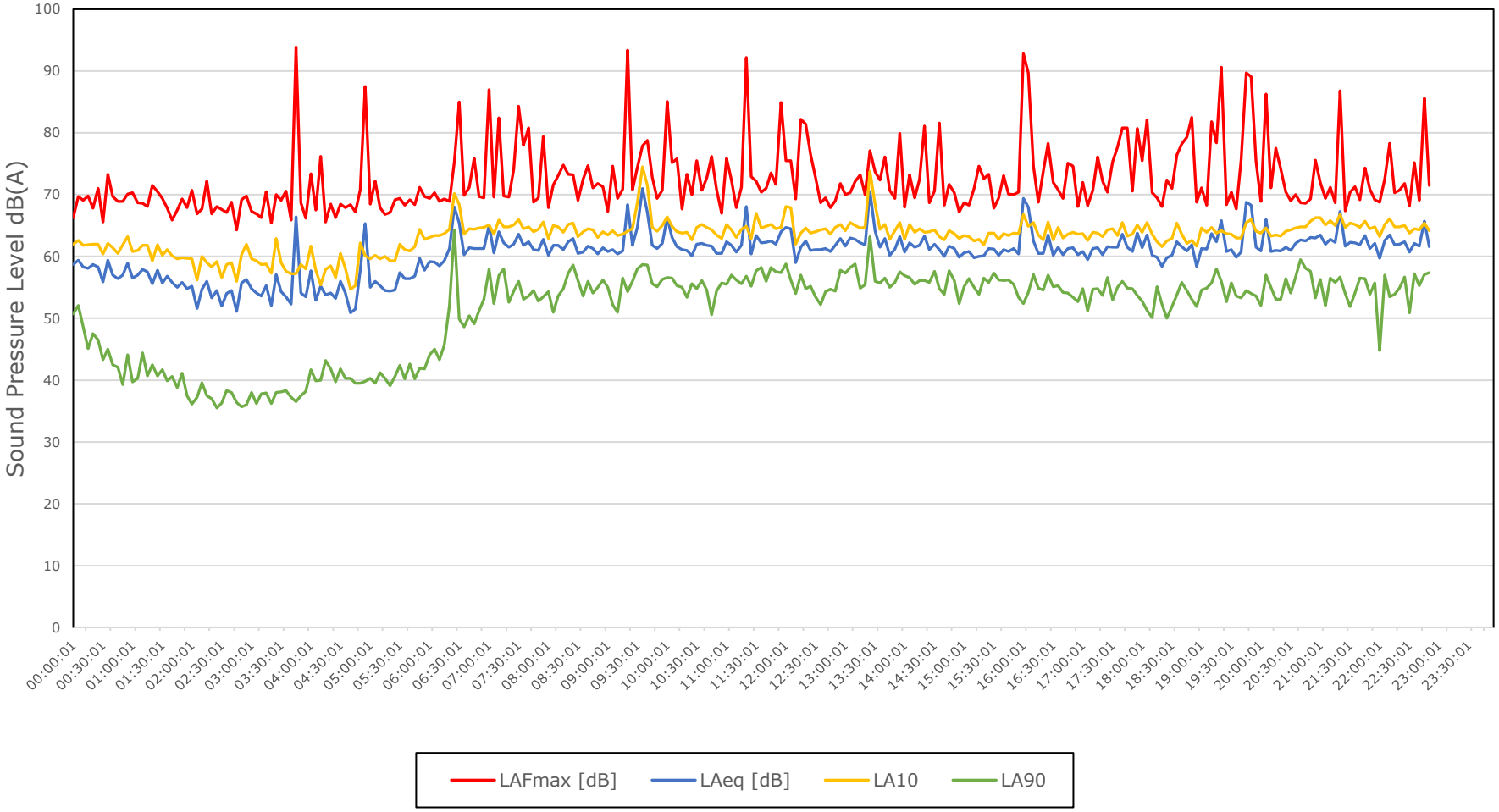


Thursday 23 May 2019

Figure AS11122/TH1

62 Avenue Road, London

Environmental Noise Time History: Monitor A

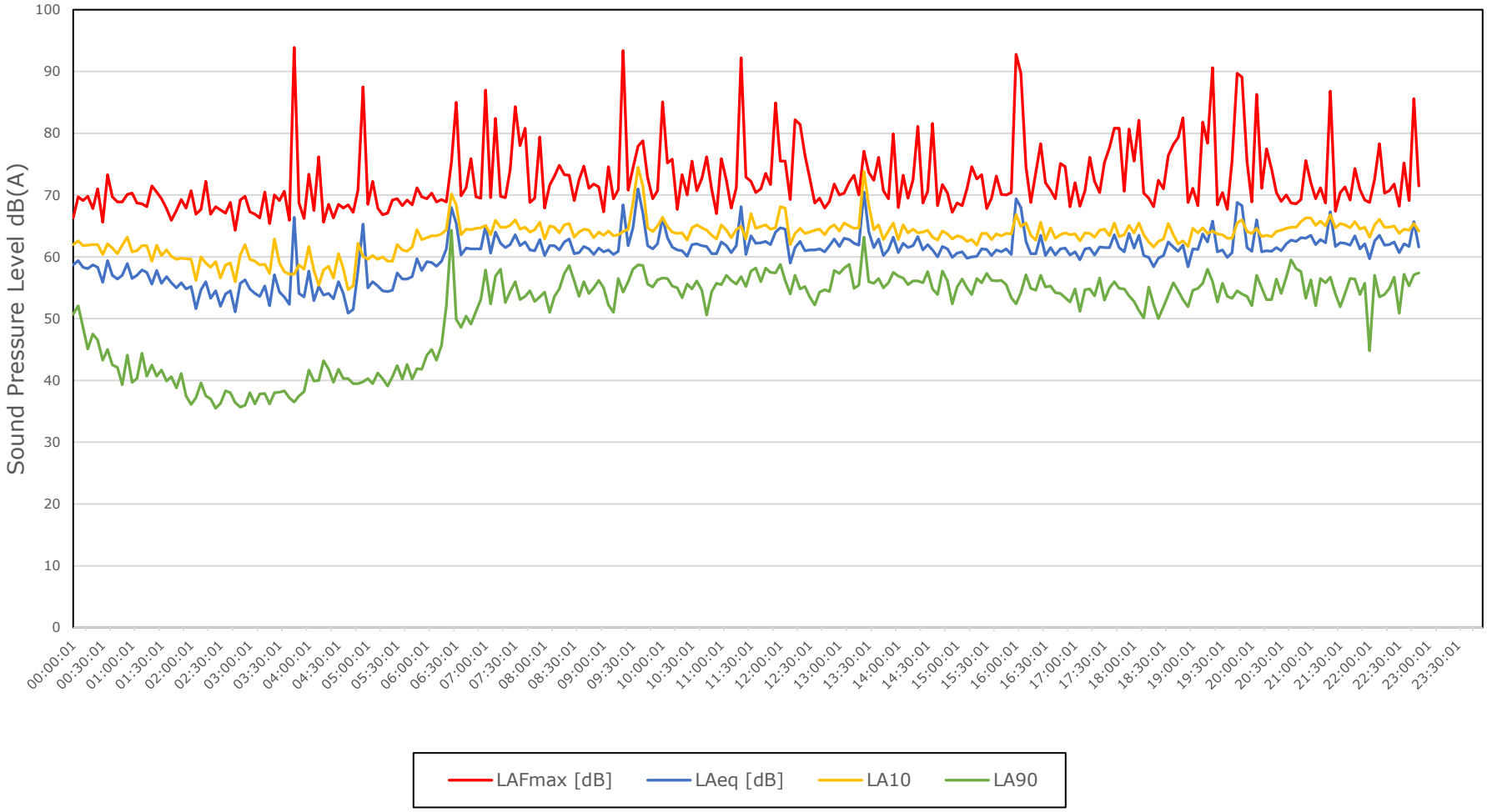


Friday 24 May 2019

Figure AS11122/TH2

62 Avenue Road, London

Environmental Noise Time History: Monitor A

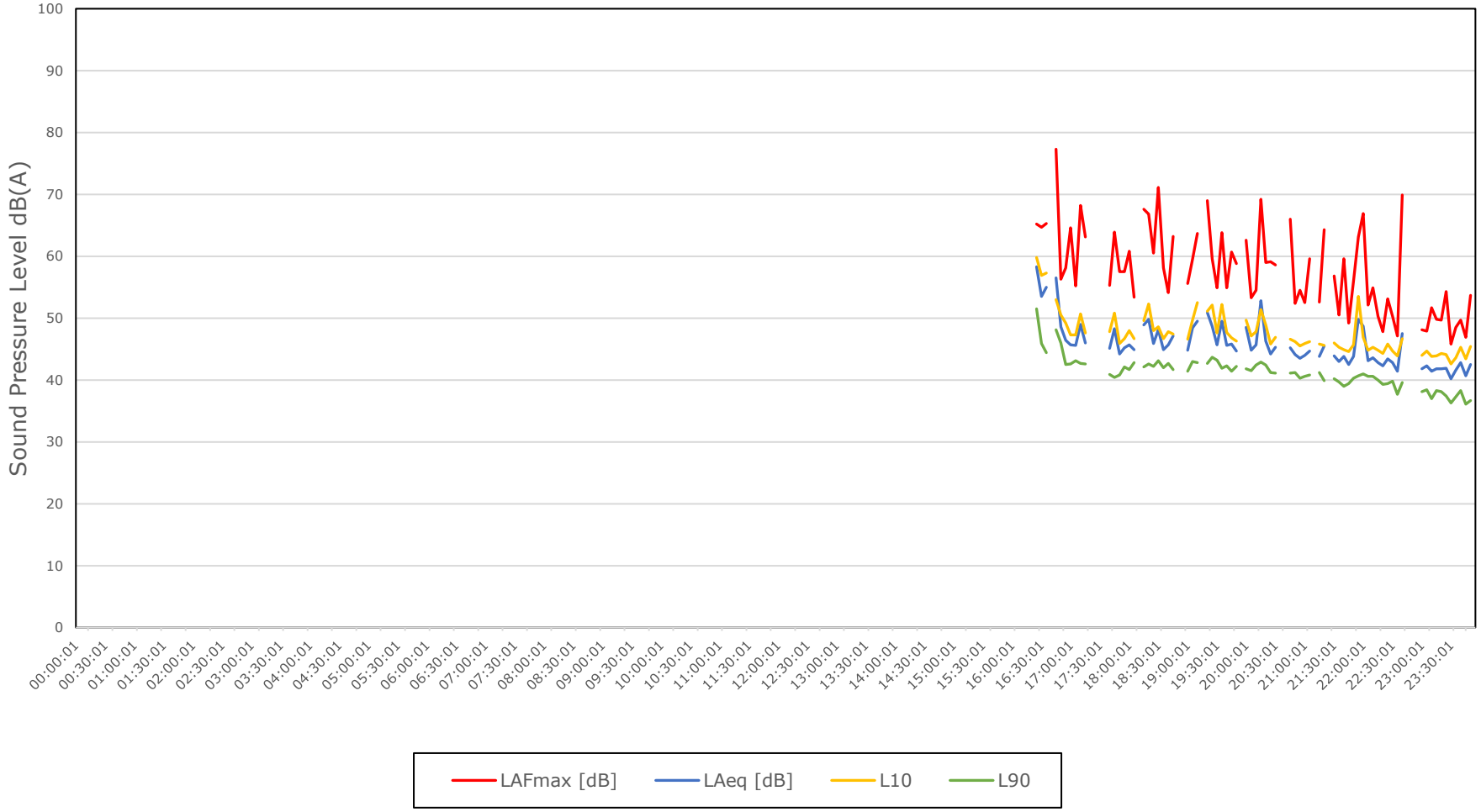


Saturday 25 May 2019

Figure AS11122/TH3

62 Avenue Road, London

Environmental Noise Time History: Monitor B

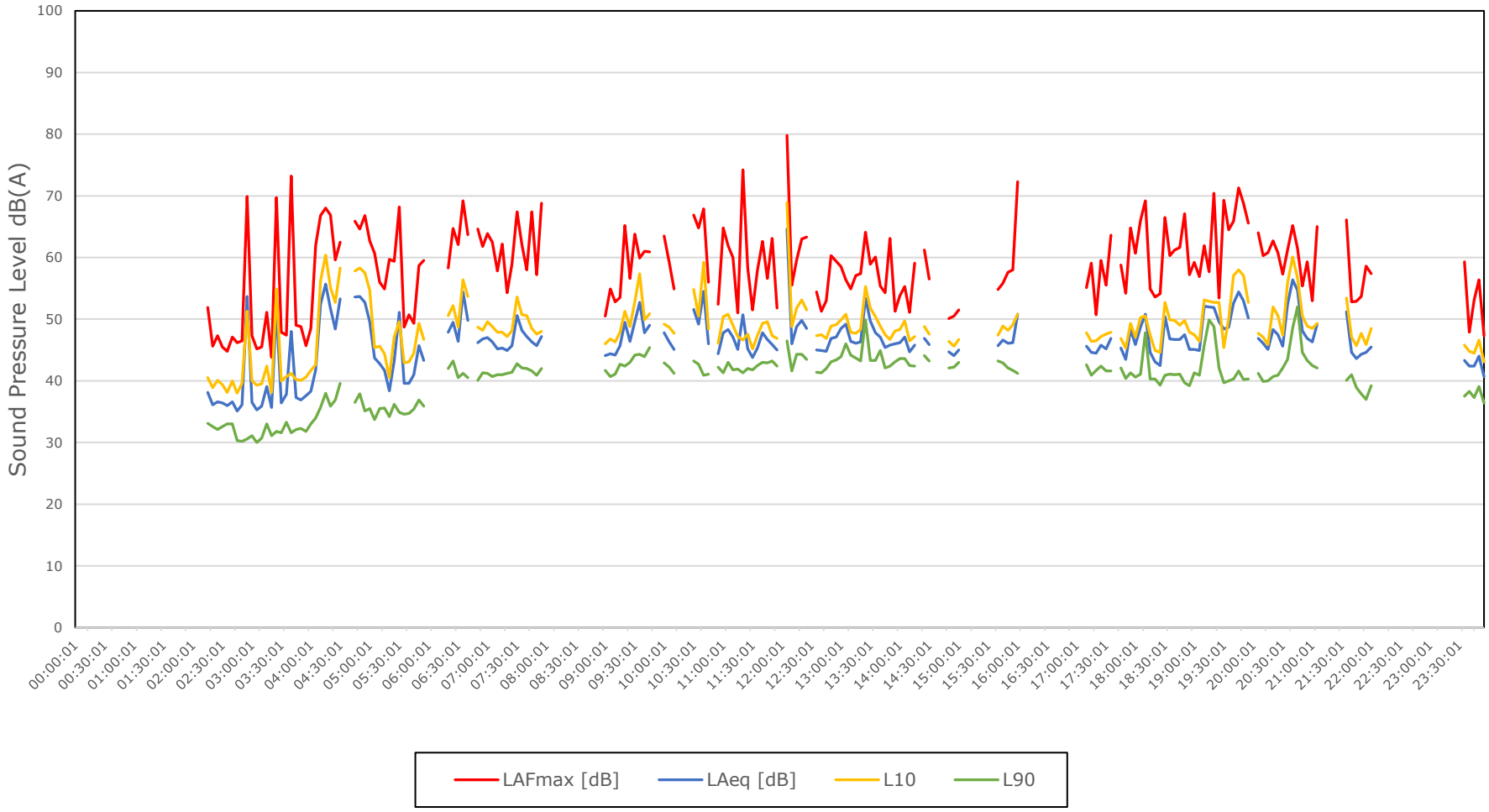


Thursday 23 May 2019

Figure AS11122/TH4

62 Avenue Road, London

Environmental Noise Time History: Monitor B

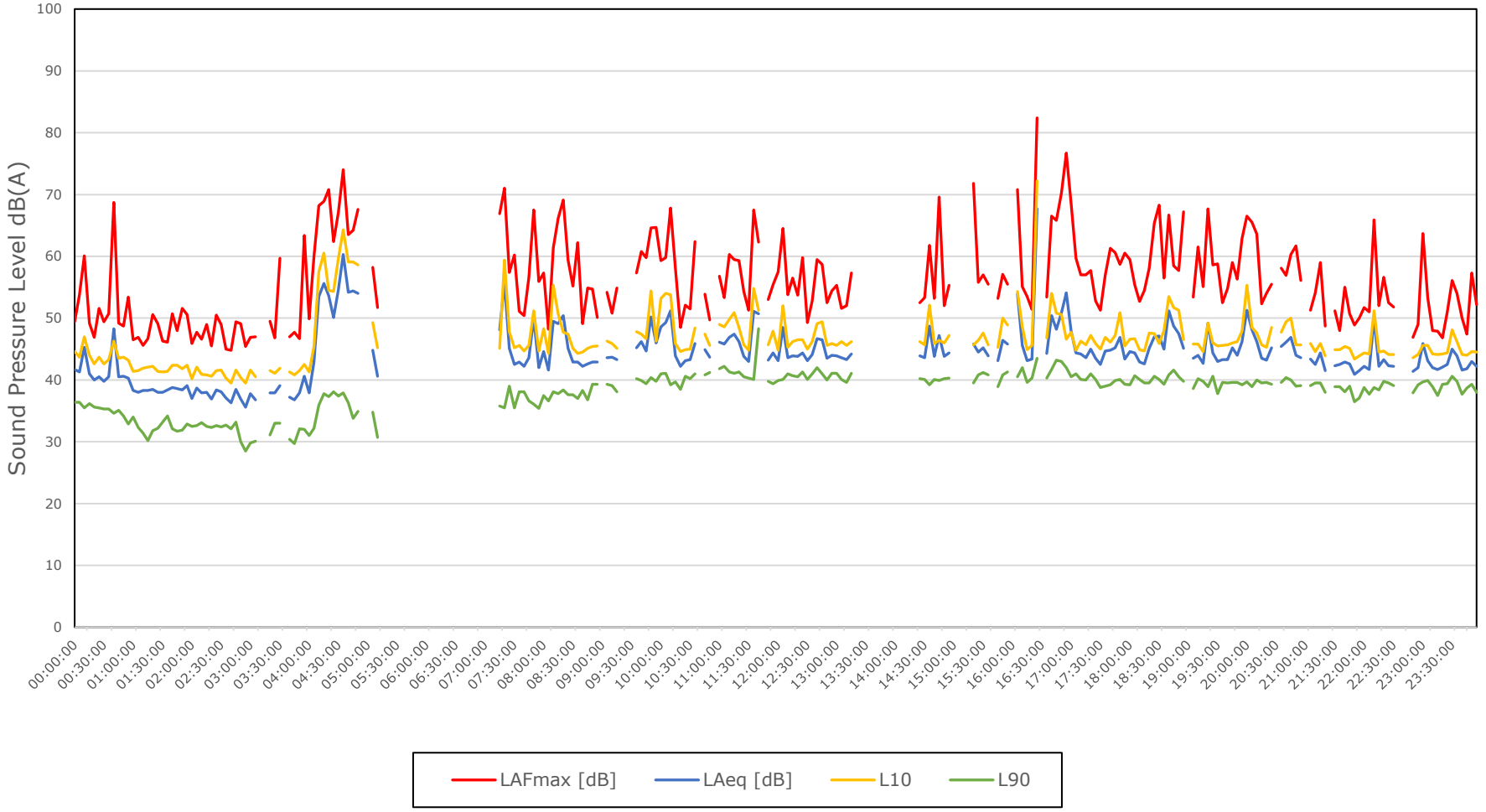


Friday 24 May 2019

Figure AS11122/TH5

62 Avenue Road, London

Environmental Noise Time History: Monitor B



Saturday 25 May 2019

Figure AS11122/TH6

APPENDIX A

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.
R_w D_w $D_{nT,w}$ $D_{n,e,w}$ $D_{n,f,w}$	Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure 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 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

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

Rooftop Plant - Receptors A & B (No. 64 Avenue Road)

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
SQFA42-3ES Outlet	Lw	81	92	77	73	77	79	76	68	**84**
End reflection		-16	-11	-6	-2	-1	0	0	0	
Silencer		-6	-13	-23	-37	-43	-44	-35	-20	
Directivity		0	0	0	0	-4	-7	-7	-7	
	Lp@1m	48	58	37	23	18	17	23	30	
Distance Loss	21m	-26	-26	-26	-26	-26	-26	-26	-26	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**22**	**31**	**11**	**0**	**0**	**0**	**0**	**4**	**16**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
SQFA42-3ES Breakout	Lw	77	85	73	68	64	66	59	44	**73**
Sound pressure level	Lp@1m	69	77	65	60	56	58	51	36	
Enclosure	SRI	-14	-19	-23	-32	-43	-50	-50	-50	
Break out Loss		-6	-6	-6	-6	-6	-6	-6	-6	
Sound level outside enclosure	Lp@1m	49	52	36	22	7	2	-5	-20	
Distance Loss	21m	-26	-26	-26	-26	-26	-26	-26	-26	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**23**	**26**	**10**	**0**	**0**	**0**	**0**	**0**	**12**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Breakout	Lw	61	59	55	46	38	36	33	30	**50**
	Lp@1m	53	51	47	38	30	28	25	22	
Distance Loss	17m	-25	-25	-25	-25	-25	-25	-25	-25	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**28**	**26**	**22**	**13**	**5**	**3**	**0**	**0**	**17**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Intake	Lw	62	50	44	55	55	41	30	30	**57**
Directivity		-1	-2	-3	-7	-9	-8	-8	-8	
Silencer		-1	-2	-7	-10	-11	-9	-8	-7	
	Lp	52	39	26	30	28	16	6	7	
Distance Loss	18m	-25	-25	-25	-25	-25	-25	-25	-25	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**27**	**13**	**1**	**5**	**2**	**0**	**0**	**0**	**9**

APPENDIX B

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Exhaust	Lw	69	66	67	71	72	68	65	57	**75**
Directivity		-1	-2	-3	-7	-9	-8	-8	-8	
Silencer		-4	-9	-17	-26	-31	-30	-23	-16	
	Lp@1m	56	48	39	30	25	22	26	25	
Distance Loss	18m	-25	-25	-25	-25	-25	-25	-25	-25	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**31**	**22**	**14**	**5**	**0**	**0**	**1**	**0**	**12**

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUZ-ZM125VKA.UK	Lp @ 1m	63	55	53	50	47	42	38	30	**52**
Directivity		-1	-1	-3	-7	-9	-9	-9	-9	
Screening		-5	-5	-5	-5	-6	-7	-8	-10	
Enclosure		-5	-4	-5	-6	-9	-13	-14	-13	
Distance Loss	17m	-25	-25	-25	-25	-25	-25	-25	-25	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**28**	**20**	**15**	**7**	**0**	**0**	**0**	**0**	**12**

Total Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**35**	**34**	**24**	**15**	**10**	**9**	**8**	**9**	**22**

Cumulative Sound level at receptor	**22**
24 hours Criterion	**26**

APPENDIX B

Rooftop Plant - Receptors C & D (No. 60 Avenue Road)

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
SQFA42-3ES outlet	Lw	81	92	77	73	77	79	76	68	**84**
End reflection		-16	-11	-6	-2	-1	0	0	0	
Silencer		-6	-13	-23	-37	-43	-44	-35	-20	
Directivity		0	0	0	-2	-7	-8	-8	-8	
	LP@1m	48	57	37	21	15	16	22	29	
Distance Loss	8m	-18	-18	-18	-18	-18	-18	-18	-18	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**29**	**39**	**19**	**3**	**0**	**0**	**3**	**10**	**23**

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
SQFA42-3ES Breakout	Lw	77	85	73	68	64	66	59	44	**73**
Sound pressure level	Lp@1m	69	77	65	60	56	58	51	36	**65**
Enclosure	SRI	-14	-19	-23	-32	-43	-50	-50	-50	
Break out Loss		-6	-6	-6	-6	-6	-6	-6	-6	
Sound level outside enclosure		49	52	36	22	7	2	-5	-20	
Distance Loss	8m	-18	-18	-18	-18	-18	-18	-18	-18	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**31**	**34**	**18**	**4**	**0**	**0**	**0**	**0**	**18**

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Breakout	Lw	61	59	55	46	38	36	33	30	**50**
Screening (Building Edge)		-5	-6	-6	-7	-9	-11	-13	-16	
	Lp@1m	48	45	41	31	21	17	12	6	
Distance Loss	12m	-21	-21	-21	-21	-21	-21	-21	-21	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**27**	**24**	**20**	**10**	**0**	**0**	**0**	**0**	**15**

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Intake	Lw	62	50	44	55	55	41	30	30	**57**
Screening (Building Edge)		-5	-5	-5	-6	-6	-8	-9	-12	
Silencer		-1	-2	-7	-10	-11	-9	-8	-7	
	Lp@1m	48	35	24	31	30	16	5	3	
Distance Loss	12m	-21	-21	-21	-21	-21	-21	-21	-21	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**27**	**14**	**3**	**10**	**8**	**0**	**0**	**0**	**12**

APPENDIX B

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
AHU.03 Exhaust	Lw	69	66	67	71	72	68	65	57	**75**
Number of Units	1	0	0	0	0	0	0	0	0	
Screening (Building Edge)		-5	-5	-5	-6	-6	-8	-9	-12	
Silencer		-4	-9	-17	-26	-31	-30	-23	-16	
	Lp@1m	52	44	37	31	27	22	25	21	
Distance Loss	12m	-21	-21	-21	-21	-21	-21	-21	-21	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**31**	**23**	**16**	**10**	**5**	**1**	**3**	**0**	**14**

_		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUZ-ZM125VKA.UK	Lp @ 1m	63	55	53	50	47	42	38	30	**52**
Number of Units	1	0	0	0	0	0	0	0	0	
Enclosure		-5	-4	-5	-6	-9	-13	-14	-13	
Screening (Building Edge)		-5	-6	-6	-7	-9	-11	-13	-16	
Distance Loss	13m	-22	-22	-22	-22	-22	-22	-22	-22	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**31**	**23**	**20**	**15**	**7**	**0**	**0**	**0**	**16**

Total Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**37**	**40**	**25**	**18**	**13**	**8**	**9**	**12**	**26**

**Barrier effect limited to 20dB*

Cumulative Sound level at receptor **26**
24 hours Criterion **26**

APPENDIX B

Lightwell (North) - Receptors A & B (No. 64 Avenue Road)

Lightwell		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
PUHY-P400YNW-A 85%	Lp@1m	66	58	59	58	52	48	42	39	**58**
Number of Units	2	3	3	3	3	3	3	3	3	
	Leq 1Hr	69	61	62	61	55	51	45	42	**61**
CAHV-P500YA-HPB	Lp@1m	66	60	67	60	52	50	56	48	**63**
	Leq 1hr	66	60	67	60	52	50	56	48	**63**
MVHR.01 Outlet	Lw	60	64	62	73	61	58	52	48	**71**
	Leq 1hr	18	22	20	31	19	16	10	6	**76**
AHU.01 Exhaust	Lw	63	66	71	68	69	68	63	59	**74**
	Leq 1hr	49	52	57	54	55	54	49	45	**60**
AHU.02 Exhaust	Lw	72	81	76	71	70	68	61	54	**75**
	Leq 1hr	58	67	62	57	56	54	47	40	**61**
EF.01 Exhaust	Lw	81	79	80	81	79	76	71	66	**84**
Number of Units	1	0	0	0	0	0	0	0	0	
Silencer		-1	-2	-7	-10	-11	-9	-8	-7	
	Leq 1hr	64	61	57	55	52	51	47	43	**58**
Combined SPL at louvre face		72	69	70	65	61	59	58	51	**68**
Convert to SWL		11	11	11	11	11	11	11	11	
Combined SWL at atrium face		73	71	71	67	63	61	59	53	
Rathe Decay		-22	-22	-22	-22	-22	-22	-22	-22	
Directivity		1	1	1	0	0	0	0	0	
Screening (Building Edge)*		-9	-11	-14	-16	-19	-20	-20	-20	
Louvre		-5	-4	-5	-6	-9	-13	-14	-13	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**38**	**35**	**31**	**22**	**13**	**6**	**3**	**0**	**26**

**Barrier effect limited to 20dB*

Cumulative Sound level at receptor **26**
24 hours Criterion **26**

APPENDIX B

Lightwell (South) - Receptors C & D (No. 60 Avenue Road)

Lightwell		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
AHU.01 Intake	Lw	70	67	63	60	58	57	57	44	**65**
Screening (Building Edge)*		-5	-5	-5	-5	-5	-6	-7	-8	
Duct Loss	13m	-13	-9	-4	-3	-3	-3	-3	-3	
	Lp	39	47	48	41	37	33	35	17	**44**
Distance Loss	12m	-22	-22	-22	-22	-22	-22	-22	-22	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**18**	**25**	**27**	**20**	**15**	**12**	**13**	**0**	**23**

Lightwell		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
AHU.02 Intake	Lw	68	72	68	60	56	53	55	39	**64**
Screening (Building Edge)*		-5	-5	-5	-5	-5	-6	-7	-8	
Duct Loss	13m	-13	-9	-4	-3	-3	-3	-3	-3	
	Lp@1m	39	47	48	41	37	33	35	17	
Distance Loss	12m	-22	-22	-22	-22	-22	-22	-22	-22	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**18**	**25**	**27**	**20**	**15**	**12**	**13**	**0**	**23**

Lightwell		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
AM43ES Intake	Lw	75	83	78	74	66	67	64	60	**76**
Screening (Building Edge)*		-5	-5	-5	-5	-5	-6	-7	-8	
Silencer		-4	-9	-17	-28	-34	-32	-21	-14	
Duct loss	18m	-11	-7	-6	-2	-2	-2	-2	-2	
	Lp@1m	44	51	40	28	14	16	23	25	
Distance Loss	12m	-22	-22	-22	-22	-22	-22	-22	-22	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**23**	**29**	**18**	**6**	**0**	**0**	**2**	**3**	**16**

Total Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**25**	**32**	**30**	**23**	**18**	**15**	**16**	**6**	**26**

**Barrier effect limited to 20dB*

Cumulative Sound level at receptor **26**
24 hours Criterion **26**