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REPORT AS10742.180924.NIA.1.2

THE HORSE HOSPITAL BUILDING, CAMDEN STABLES MARKET, LONDON

NOISE IMPACT ASSESSMENT

Prepared: 30 October 2018

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List of Attachments

1.0 INTRODUCTION

Planning approval is being sought for the relocation of existing plant and installation of additional plant inside two plant compounds at the Grade II Listed Horse Hospital building in the Camden Stables Market.

Clarke Saunders Associates has been commissioned by LabTech 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 relocated and new building services plant, in accordance with the planning requirements of Camden Council.

2.0 SITE DESCRIPTION

The Horse Hospital is located to the west of the Stables Market in Camden, London. The Stables Market is a busy and lively area, which comprises outdoor market stalls, retail stores, restaurants and bars. Many market vendors play amplified music through PA systems.

The site is encompassed by Chalk Farm Road to the north, a raised (approximately second floor level) over ground railway line to the south, of which the predominant traffic is low speed freight trains, and a petrol station to the west.

Chalk Farm Road predominantly comprises commercial units, with some residential units at upper levels.

A three metre wall bounds the north side of the Stables Market, affording significant screening at ground level from the road noise on Chalk Farm Road. This wall continues to rise in height to approximately six metres where it continues along the western boundary of the market towards Juniper Crescent.

As the market primarily consists of outdoor canvas food stands, peak numbers of patrons are expected during meal times and during better weather.

3.0 SURVEY PROCEDURE & EQUIPMENT

A survey of the existing background noise levels was undertaken at first floor level on the northern boundary wall at the location shown in site plan AS10742/SP1. This location was representative of noise levels at the nearest sensitive receptors, with noise levels being driven by road traffic and the market stalls closest to the north façade. Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 15:15 hours on Thursday, 13th September 2018 and 11:00 hours on Tuesday, 18th September 2018.

These measurements will allow suitable noise criteria to be set for the new building services plant, dependent on hours of operation.

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

- NTi data logging sound level meter type XL2;
- Rion sound level calibrator type NC-74.

The calibration of the sound level meter was verified before and after use. No significant 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 following procedures in BS 7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2- Acquisition of data pertinent to land use*.

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

4.0 RESULTS & ANALYSIS

Figures AS10742/TH1-TH5 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement position.

The background noise climate at the property is determined by road traffic noise from Chalk Farm Road, as well as self-noise from the patrons of Camden Stables Market.

Measured typical background noise levels are shown in Table 4.1 below.

Monitoring period	Typical $L_{A90,15mins}$
07:00 - 23:00 hours	58 dB
23:00 - 07:00 hours	47 dB

Table 4.1 - Typical measured background noise levels **[dB ref. 20µPa]**

**typical background calculated as 10th percentile of $L_{A90,15min}$ data measured during this period*

5.0 DESIGN CRITERIA

5.1 Local Authority Requirements

Camden Council adopted the new Local Plan on 3 July 2017 which describes 'noise thresholds' in Appendix 3.

Discussion with Edward Davis, Environmental Health Officer at Camden Council on Thursday 14th December 2017 has confirmed that:

Survey measurement procedures for fixed plant noise assessments and determination of the typical background noise level should follow the methodology set out in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*. The subsequent assessment of fixed plant noise emissions does not need to be in accordance with BS4142:2014 where character penalties could be imposed. Instead the policy requires the plant noise emissions at the nearest residential receptor to be 10dB below the typical background ($L_{A90,15min}$) during the proposed operational period, and if tonal, 15dB below the typical background ($L_{A90,15min}$) during the proposed operational period.

The assessed plant is not expected to have tonal content. On this basis, the plant noise emissions criteria are shown in Table 5.1.

Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)	24 hours
L_{Aeq} 48 dB	L_{Aeq} 37 dB	L_{Aeq} 37 dB

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

6.0 PREDICTED NOISE IMPACT

6.1 Proposed plant

The plant, which is proposed to be distributed between two 'Plant Group' areas as marked on AS10742/SP1, has been confirmed as:

Plant Group 1

- 4 no. Mitsubishi Outdoor Condensing Units Type FDC250VSA (Relocated);
- 1 no. Mitsubishi Outdoor Condensing Units Type FDC224KXE6 (Relocated);
- 4 no. Mitsubishi Outdoor Condensing Units Type PUMY-P200YKM2

Plant Group 2

- 4 no. Mitsubishi Outdoor Condensing Units Type PUMY-P200YKM2

The approximate installation locations of the plant is shown in site plan AS10742/SP1.

During the site visit it became apparent that the existing plant items had already been disconnected in anticipation of being relocated. As physical measurements were, therefore, not possible this assessment has been based on manufacturer supplied noise data for the plant items.

Highest operational noise levels on heating mode generated by the condenser units have been confirmed by the manufacturer as follows:

Plant Items	Octave Band Freq (Hz)							
	63	125	250	500	1000	2000	4000	8000
PUMY-P200YKM2 (L_p @1m)	64	61	61	58	57	52	49	41
FDC224KXE6 (L_p @1m)	70	60	56	56	53	49	44	45
FDC250VSA (L_p @1m)	88	80	73	71	72	67	61	55

Table 6.1 – Manufacturer provided source noise data

6.2 Predicted noise levels

Following an inspection of the site, the nearest noise sensitive receptors were identified along the northern side of Chalk Farm Road as marked on AS10742/SP1. The units along Chalk Farm Road are primarily commercial and retail with residential at upper floors. To present a robust assessment, two residential areas in closest proximity and/or with the most direct line of sight to the proposed plant locations have been highlighted as 'Receptor A and B', the closest windows of which are greater than 20 metres away from the proposed plant locations.

The cumulative noise levels at the nearest noise sensitive receptors have been calculated on the basis of manufacturer's plant data and drawings available at the time of writing.

Screening losses afforded by the markets external boundary wall have been included in the prediction of the cumulative plant noise level at the nearest receptor. The plant items will be located at least 0.5m away from the wall with the fans towards inside the market area.

The overall prediction is given in the table below:

Time Period	Receptor A	Receptor B
24 hours	32	30

Table 6.2 - Predicted cumulative plant noise levels at receptor L_{Aeq} dB **[dB ref. 20 µPa]**

A summary of the calculations is presented in Appendix B.

7.0 CONCLUSION

An environmental noise survey has been undertaken at the Horse Hospital building in the Camden Stables Market by Clarke Saunders Associates between Thursday, 13th September 2018 and Tuesday, 18th September 2018.

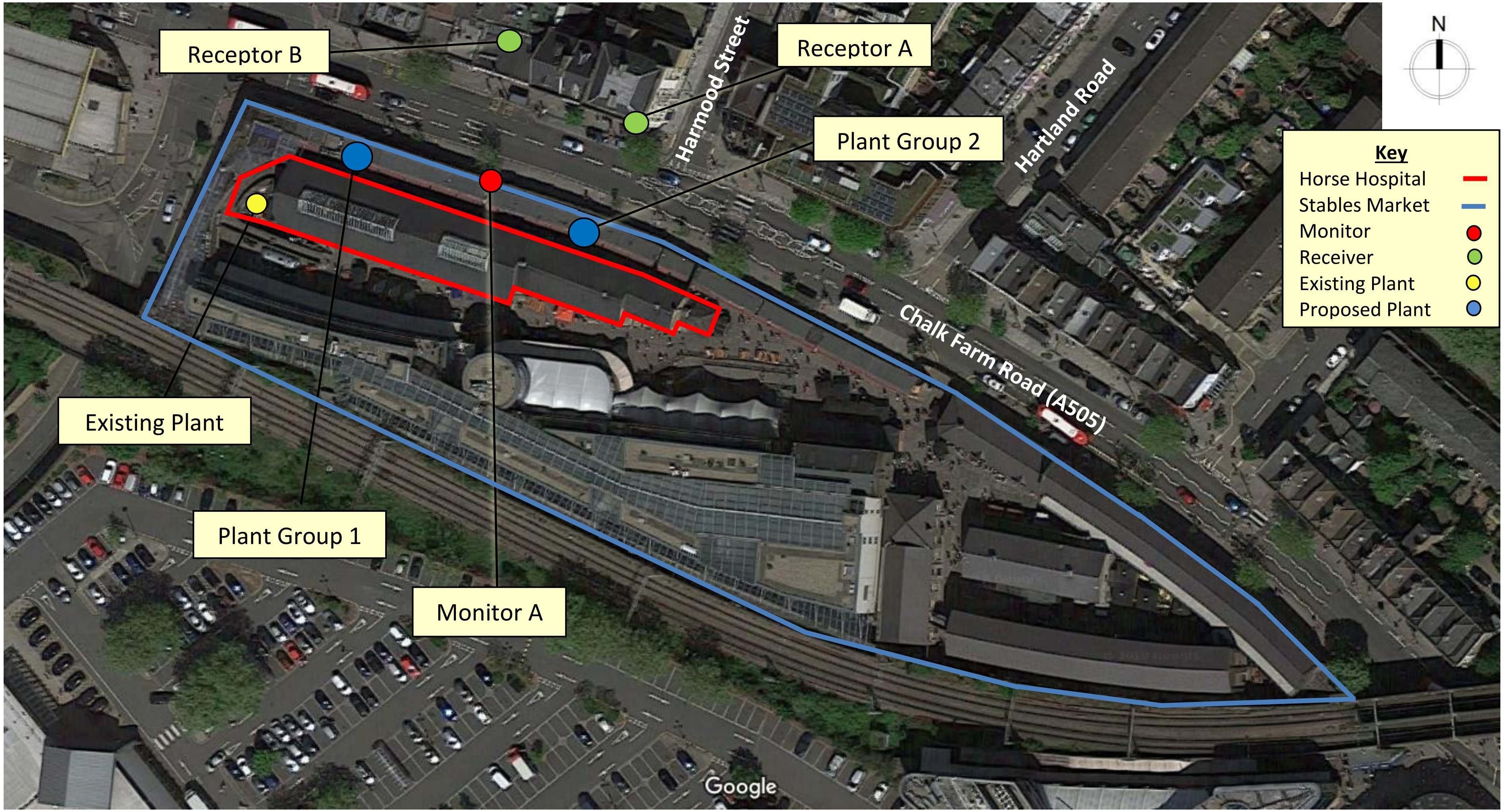
Measurements have been made to establish the current background noise climate, which has enabled a design criterion to be set for the control of plant noise emissions to noise sensitive properties, in accordance with Camden Council's requirements.

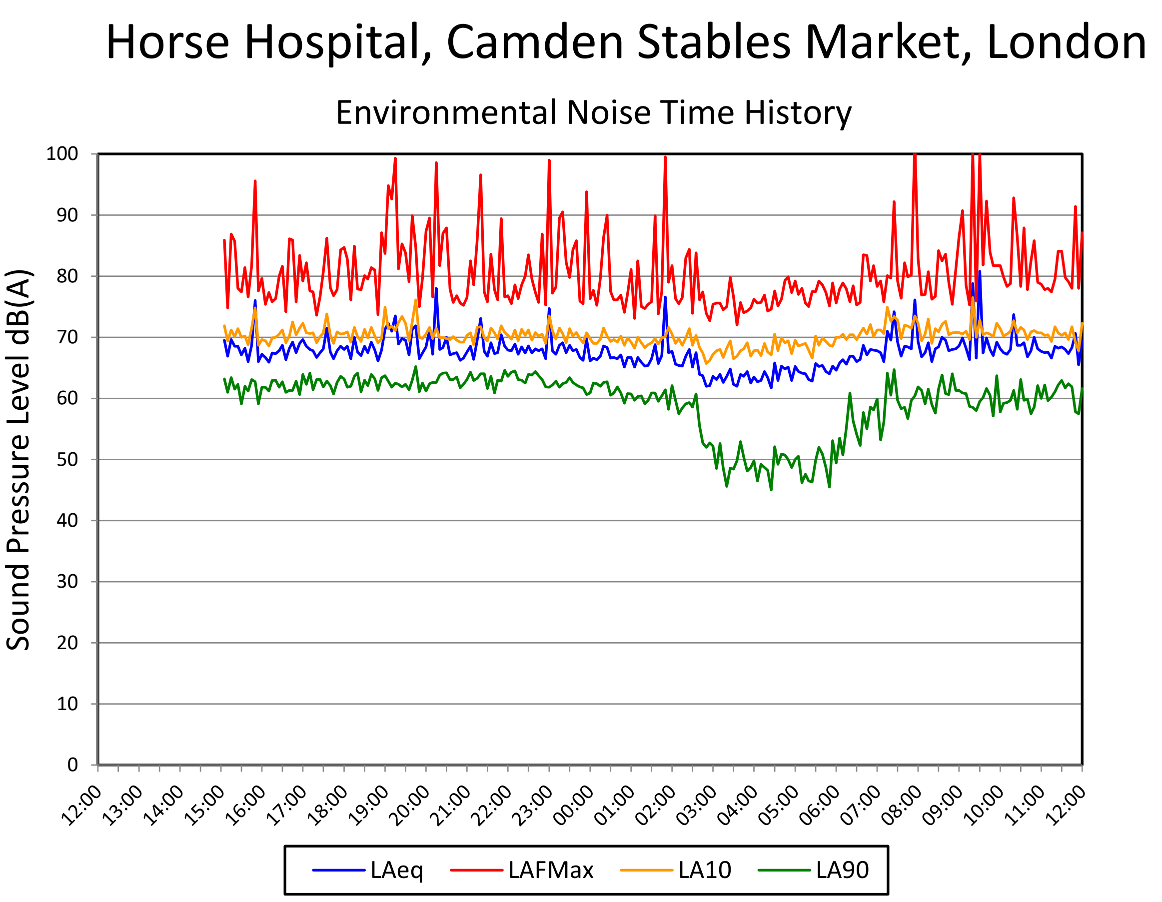
Data for the Mitsubishi condensing units has been used to predict the noise impact of the new and relocated plant on neighbouring residential properties.

Compliance with the noise emission design criterion has been demonstrated provided the plant is installed at the proposed locations. No further mitigation measures will be required for external noise emissions.

Ben Dymock MIOA

CLARKE SAUNDERS ASSOCIATES


Receptor B
Receptor A
Harmood Street
Hartland Road
Plant Group 2
N
Key
Horse Hospital
Stables Market
Monitor
Receiver
Existing Plant
Proposed Plant
Chalk Farm Road (A505)
Existing Plant
Plant Group 1
Monitor A
Google



Thursday 13 September to Friday 14 September 2018

Figure AS10742/TH1

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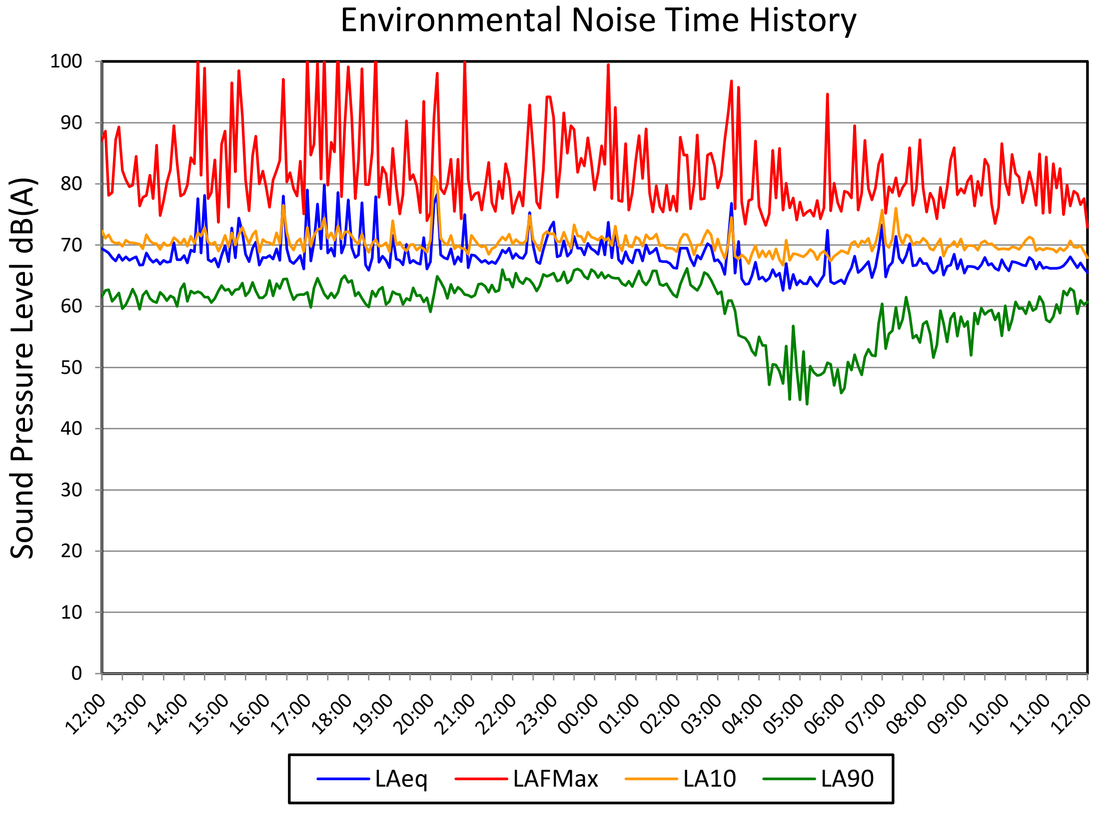
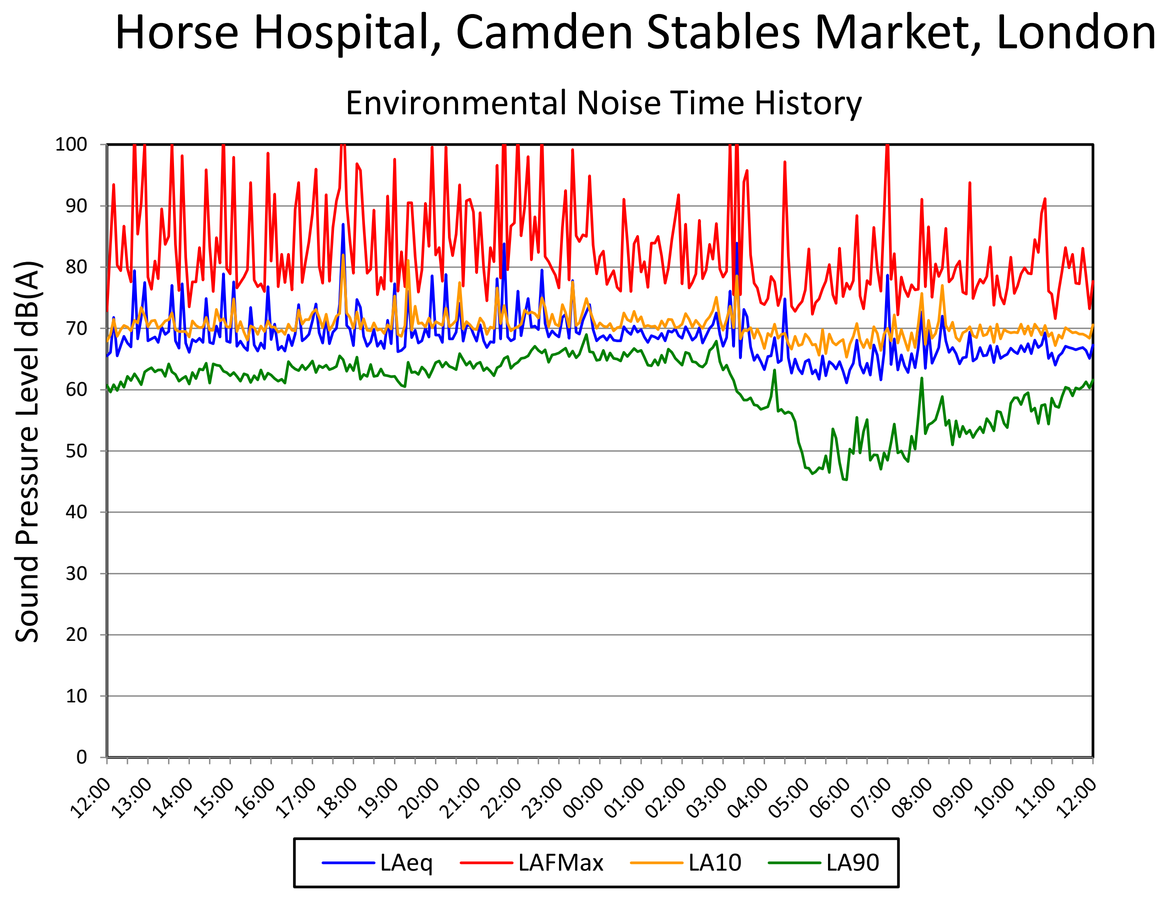
Horse Hospital, Camden Stables Market, London



Friday 14 September to Saturday 15 September 2018

Figure AS10742/TH2

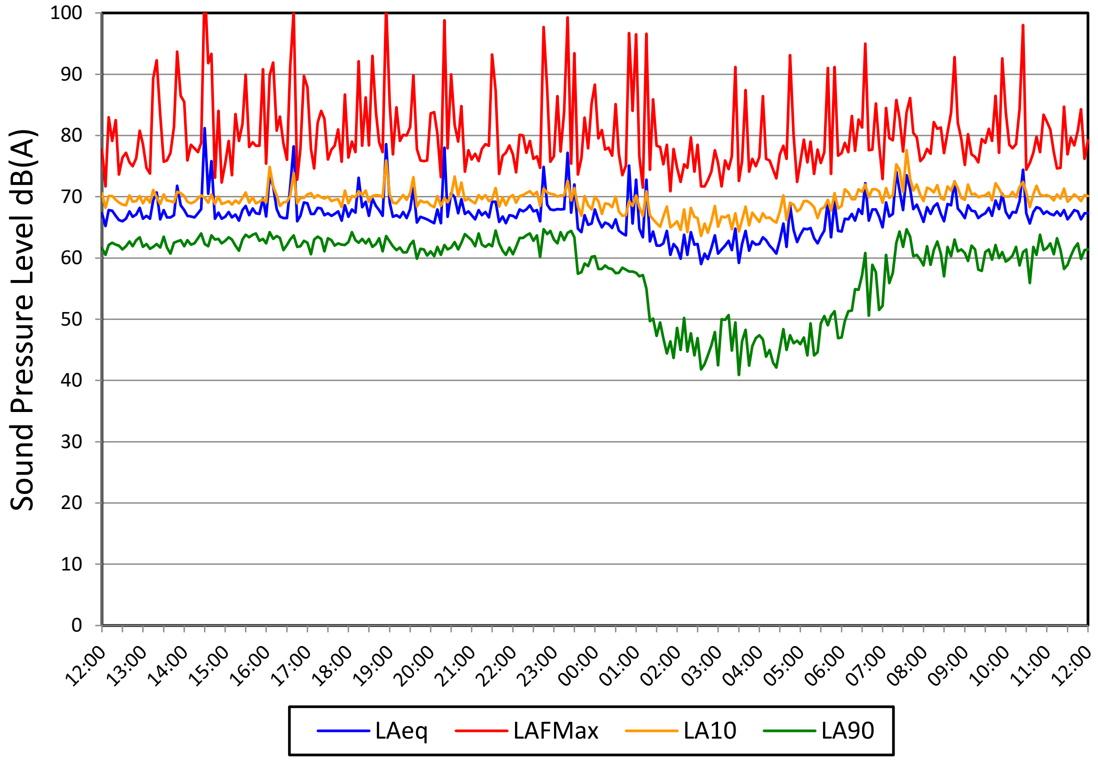


Saturday 15 September to Sunday 16 September 2018

Figure AS10742/TH3

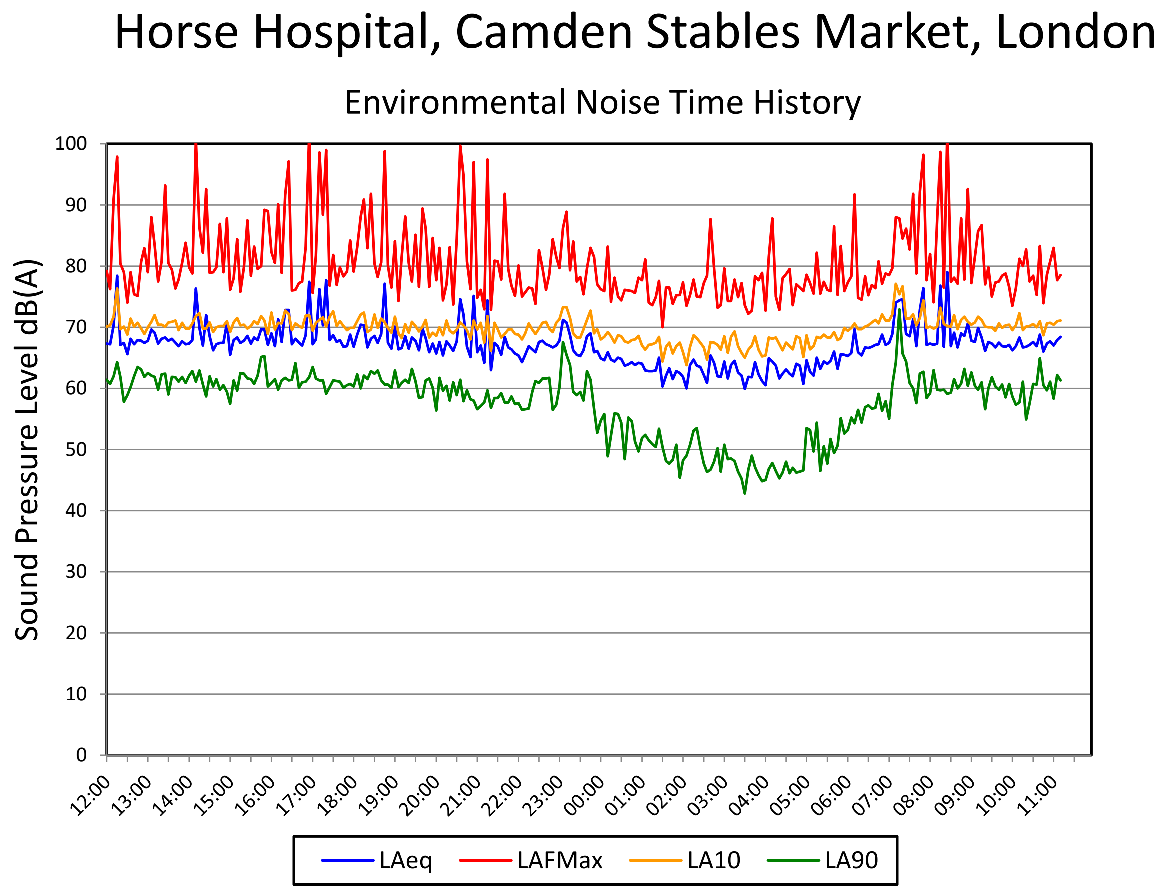
Horse Hospital, Camden Stables Market, London

Environmental Noise Time History



Sunday 16 September to Monday 17 September 2018

Figure AS10742/TH4



Monday 17 September to Tuesday 18 September 2018

Figure AS10742/TH5

APPENDIX A

ACOUSTIC TERMINOLOGY & 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 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

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND SOUND

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.

AS10742 - Horse Hospital, Camden Stables Market, London

APPENDIX B

PLANT NOISE ASSESSMENT

Residential Receptor A

Group 1

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Mitsubishi -FDC224KXE6	Lp @ 1m	70	60	56	56	53	49	44	45	**58**
Number of Units	1	0	0	0	0	0	0	0	0	
Barrier Effect		-7	-9	-11	-13	-16	-19	-20	-20	
Distance Loss	37m	-31	-31	-31	-31	-31	-31	-31	-31	
Specific Noise Level at Receptor	$L_{eq\ 1hr}$	**32**	**20**	**14**	**12**	**6**	**0**	**0**	**0**	**14**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Mitsubishi - FDC250VSA	Lp @ 1m	80	72	65	63	64	59	53	47	**68**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-7	-9	-11	-13	-16	-19	-20	-20	
Distance Loss	33m	-30	-30	-30	-30	-30	-30	-30	-30	
Specific Noise Level at Receptor	$L_{eq\ 1hr}$	**49**	**39**	**30**	**26**	**24**	**16**	**9**	**3**	**30**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUMY-P200YKM2	Lp @ 1m	64	61	61	58	57	52	49	41	**61**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-7	-9	-11	-13	-16	-19	-20	-20	
Distance Loss	30m	-30	-30	-30	-30	-30	-30	-30	-30	
Specific Noise Level at Receptor	$L_{eq\ 1hr}$	**33**	**29**	**27**	**21**	**18**	**9**	**5**	**0**	**24**

Group 2

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUMY-P200YKM2	Lp @ 1m	64	61	61	58	57	52	49	41	**61**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-7	-8	-10	-12	-15	-18	-20	-20	
Distance Loss	22m	-27	-27	-27	-27	-27	-27	-27	-27	
Specific Noise Level at Receptor	$L_{eq\ 1hr}$	**36**	**32**	**30**	**25**	**21**	**13**	**8**	**0**	**27**

Total Specific Noise Level at Receptor	$L_{eq\ 1hr}$	**49**	**40**	**34**	**29**	**27**	**18**	**12**	**7**	**32**

**Barrier effect limited to 20dB*

Cumulative Sound level at receptor 32

24 hours Criterion 37

AS10742 - Horse Hospital, Camden Stables Market, London

APPENDIX B

PLANT NOISE ASSESSMENT

Residential Receptor B

Group 1

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Mitsubishi -FDC224KXE6	Lp @ 1m	70	60	56	56	53	49	44	45	**58**
Number of Units	1	0	0	0	0	0	0	0	0	
Barrier Effect		-8	-10	-12	-14	-17	-20	-20	-20	
Distance Loss	34m	-31	-31	-31	-31	-31	-31	-31	-31	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**32**	**20**	**14**	**11**	**5**	**0**	**0**	**0**	**13**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Mitsubishi - FDC250VSA	Lp @ 1m	80	72	65	63	64	59	53	47	**68**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-8	-10	-12	-14	-17	-20	-20	-20	
Distance Loss	34m	-31	-31	-31	-31	-31	-31	-31	-31	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**48**	**38**	**29**	**24**	**22**	**14**	**8**	**2**	**29**

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUMY-P200YKM2	Lp @ 1m	64	61	61	58	57	52	49	41	**61**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-8	-10	-12	-14	-17	-20	-20	-20	
Distance Loss	30m	-30	-30	-30	-30	-30	-30	-30	-30	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**32**	**28**	**26**	**20**	**16**	**8**	**5**	**0**	**22**

Group 2

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
PUMY-P200YKM2	Lp @ 1m	64	61	61	58	57	52	49	41	**61**
Number of Units	4	6	6	6	6	6	6	6	6	
Barrier Effect		-8	-10	-12	-14	-17	-20	-20	-20	
Distance Loss	29m	-29	-29	-29	-29	-29	-29	-29	-29	
Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**32**	**28**	**26**	**20**	**17**	**8**	**5**	**0**	**23**

Total Specific Noise Level at Receptor	**$L_{eq\ 1hr}$**	**48**	**39**	**32**	**27**	**24**	**16**	**12**	**7**	**30**

**Barrier effect limited to 20dB*

Cumulative Sound level at receptor 30

24 hours Criterion 37