Regents Wharf, N1

Noise Impact Assessment

April 2017

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CONTENTS

List of Attachments

1.0 INTRODUCTION

Planning approval is being sought for the redevelopment of the site at Regents Wharf including the demolition of 14, 16 and 18 Regents Wharf; construction of a seven storey building providing Class B1 office floorspace and Class A1/A3/B1/D1/D2 floorspace at ground floor; refurbishment and extension of 10-12 Regents Wharf to provide additional Class B1 floorspace with ancillary Class A1/A3 restaurant and Class A1/B1/D1 floorspace at ground floor and associated hard and soft landscaping.

Clarke Saunders Associates has been commissioned by Regents Wharf Unit trust 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 new building services plant in accordance with the planning requirements of London Borough of Islington.

2.0 SURVEY PROCEDURE & EQUIPMENT

A survey of the existing background noise levels was undertaken at third floor level and second floor level overlooking the canal at either end of the building. Manual measurements were undertaken at 5th floor level overlooking the courtyard. A secure monitoring location was not available overlooking All Saints Street, therefore, manual measurements were undertaken.

All short and long term monitoring locations are shown in site plan AS8635/SP1. Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 12:45 hours on Friday 22nd July and 13:55 hours on Monday 25th July 2016.

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:

- Rion data logging sound level meter type NL32;
- Rion data logging sound level meter type NL52;
- Rion data logging sound level meter type NA28;
- NTi data logging sound level meter type XL2;
- Rion sound level calibrator type NC-74.

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

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

Measurements were made following procedures in BS4142:2014 *Methods for rating and assessing industrial and commercial sound* and 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 AS8635/TH1-TH7 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 distant road traffic noise in the surrounding streets.

Measured minimum background noise levels are shown in Table 3.1 below.

Monitoring Location	(07:00 – 23:00 hours)	(23:00 – 07:00 hours)
Position 1	38 dB 24/07/2016 07:20	36 dB 24/07/2016 03:55
Position 2	37 dB 24/07/2016 07:40	35 dB 25/07/2016 03:25

Table 3.1 - Minimum measured background noise levels $L_{A90,5mins}$ [dB ref. 20µPa]

Manual measurements indicate noise levels within the courtyard are 4-5 dB higher during the daytime period than the automated noise monitoring locations and similar during the night-time period.

Noise levels on All Saints Street are also similar to those at the automated monitoring locations.

4.0 DESIGN CRITERIA

4.1 Local Authority Requirements

Following discussion with London Borough of Islington's Environmental Health department, it has been advised that their external plant noise emission criteria are based upon achieving a 5dB below background rating level when assessed in accordance with BS4142:2014 *Methods for rating and assessing industrial and commercial sound.*

It is not expected that tonal noise will be generated by the proposed plant units and so 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 4.1.

Monitoring Location	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Position 1	L_{Aeq} 33 dB	L_{Aeq} 31 dB
Position 2	L_{Aeq} 32 dB	L_{Aeq} 30 dB

Table 4.1 - Proposed design noise criteria **[dB ref. 20µPa]**

Emergency plant requires acoustic design and control of the fixed plant and equipment to meet a criterion of a rating level, measured or calculated at 1m from the façade of the nearest noise sensitive premises, of not more than 5dB(A) above the existing background noise level (L_{A90}). The rating level to be determined as per the guidance provided in BS4142:2014.

Monitoring Location	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Position 1	L_{Aeq} 43 dB	L_{Aeq} 41 dB
Position 2	L_{Aeq} 42 dB	L_{Aeq} 40 dB

Table 4.2 - Proposed design noise criteria for emergency plant **[dB ref. 20µPa]**

4.2 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 4.3 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

5.0 PREDICTED NOISE IMPACT

5.1 Proposed plant

The selected plant has been confirmed as:

Roof Level – Building C

- 21 no. Daikin Condensing Units Type REYQ20T;
- 21 no. Mitsubishi Condensing Units Type PUHZ-ZRP100VKA.

6th Floor Roof Level – Building A

- 4 no. Adiabatic coolers type EP5C;
- 2 no. Mitsubishi Condensing Units Type P350-PURY;

7th Floor Roof Level – Building A

- 2 no. Generators type Powerhouse Series PHG660Pe;
- 30 no. Mitsubishi Condensing Units Type PUHZ-ZRP100VKA.

The approximate location of the plant to be installed is shown in site plan AS8635/SP1.

Noise levels generated by the Daikin condensing units type REYQ20T have been confirmed by the manufacturer as follows:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
L_p at 1m	46	51	44	48	49	45	48	43	54

Table 5.1 - Source noise data for the Daikin condensing units type REYQ20T **[dB ref. 20µPa]**

Noise levels generated by the Mitsubishi condensing units type PUHZ-ZRP100VKA have been confirmed by the manufacturer as follows:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
L_p at 1m	54	54	53	49	46	41	36	29	51

Table 5.2 - Source noise data for the Mitsubishi condensing units type PUHZ-ZRP100VKA **[dB ref. 20µPa]**

Noise levels generated by the adiabatic coolers have been confirmed by the manufacturer as follows:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Cooler	64	65	65	71	68	65	61	53	L_w

Table 5.3 - Source noise data for the adiabatic coolers **[dB ref. 20µPa]**

*Data for the 63Hz octave band was not provided.

Noise levels generated by the Mitsubishi condensing units type P350-PURY have been confirmed by the manufacturer as follows:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
L_p at 1m	74	69	65	62	56	48	43	38	63

Table 5.4 - Source noise data for the Mitsubishi condensing units type P350-PURY **[dB ref. 20µPa]**

Manufacturer's data for the specific generator model has been supplied as an overall dB(A) noise level. The spectral noise level data used in the calculation have been based on a similar sized unit, corresponding to the dB(A) level quoted by the manufacturer:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Generator	73	65	65	61	58	53	46	41	63

Table 5.5 - Source noise data for the generator (L_p at 1m) **[dB ref. 20µPa]**

5.2 Predicted noise levels

Following an inspection of the site, the nearest residential receiver to the roof level Building C plant is situated on Killick Street, and the nearest residential receiver to the 6th and 7th floor roof level Building A plant is the neighbouring property on All Saints Street, as shown on the indicative site plan AS8635/SP1. These windows are at least 40 metres and 11 metres away, respectively, from the proposed plant location.

The cumulative noise level at the nearest noise sensitive receivers have been assessed following procedures in BS4142:2014 *Methods for rating and assessing industrial and commercial sound* as guidance, using the noise data above. It is understood that the Adiabatic Coolers are 3.2 metres high above local roof level and 0.2 metres higher than the surrounding plant screen. Screening losses afforded by the proposed 3 metre high plant screen have been included in the prediction of the cumulative plant noise level at the nearest receiver. The screen should be continuous and imperforate, with a minimum mass per unit area of 15kg/m^2.

Predicted noise levels at the nearest residential receivers are shown in the tables below.

Plant Location	Predicted noise level at nearest residential receiver	Design criterion
Roof Level – Building C	L_{Aeq} 28 dB	L_{Aeq} 30 dB
Roof Level – Building A	L_{Aeq} 30 dB	

Table 5.6 - Predicted noise level and criteria **[dB ref. 20µPa]**

It should be noted that even though the design criterion at 1m from the nearest residential receivers is just achieved, the criterion is determined against the minimum background level during the whole operational period. It is unlikely that all plant would be operating at full duty at the time when the minimum background noise level occurred and thus, the noise level at these locations would most likely be lower than that indicated above in the calculations.

Predicted noise levels from emergency plant at the nearest residential receivers are shown in the tables below.

Predicted noise level at nearest residential receiver	Design criterion
L_{Aeq} 23 dB	L_{Aeq} 40 dB

Table 5.7 - Predicted noise level and criteria for emergency plant **[dB ref. 20µPa**

A summary of the calculations are 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.

5.3 Comparison to BS8233:2014 Criteria

Table 5.6 shows that predicted noise levels from the plant are within the BS8233 internal noise criteria.

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.6 would result in an internal noise levels that would be lower than the ‘good’ level shown in Table 4.3.

6.0 CONCLUSION

An environmental noise survey has been undertaken at Regents Wharf, All Saints Street, N1 by Clarke Saunders Associates between Friday 22nd July and Monday 25th July 2016.

Measurements have been made to establish the current background noise climate. This has enabled a 24-hour design criterion to be set for the control of plant noise emissions to noise sensitive properties, in accordance with London Borough of Islington requirements.

Data for the proposed cooling plant and generators have 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 including the effect of the proposed 3m high plant screen. No further mitigation measures are, therefore, required for external noise emissions.

Alex Arnold

Alex Arnold MIOA

CLARKE SAUNDERS ASSOCIATES

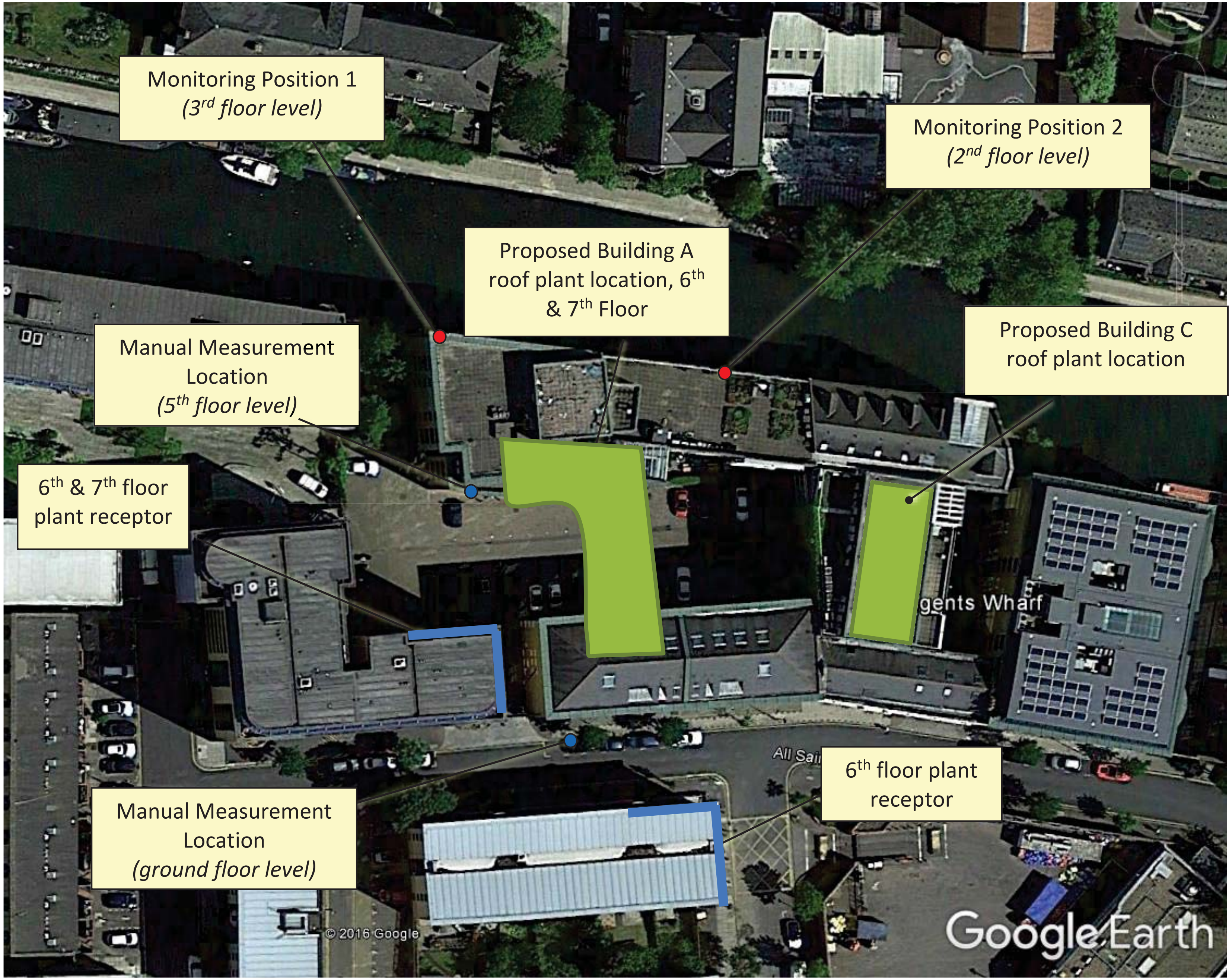
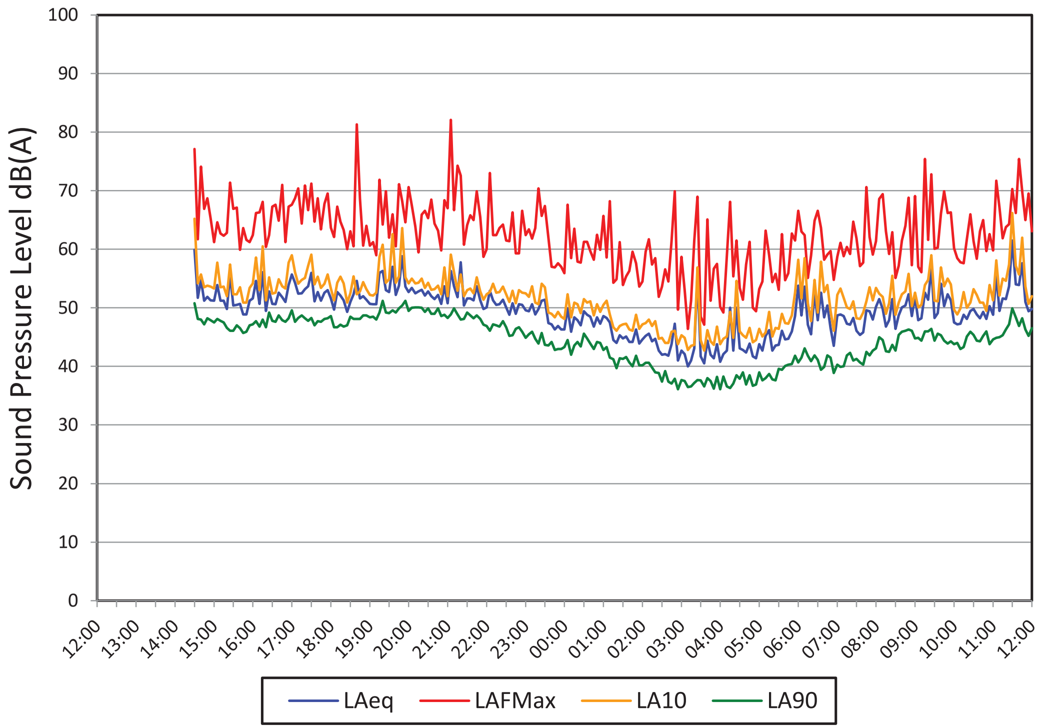


Figure AS8635/SP1

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 1

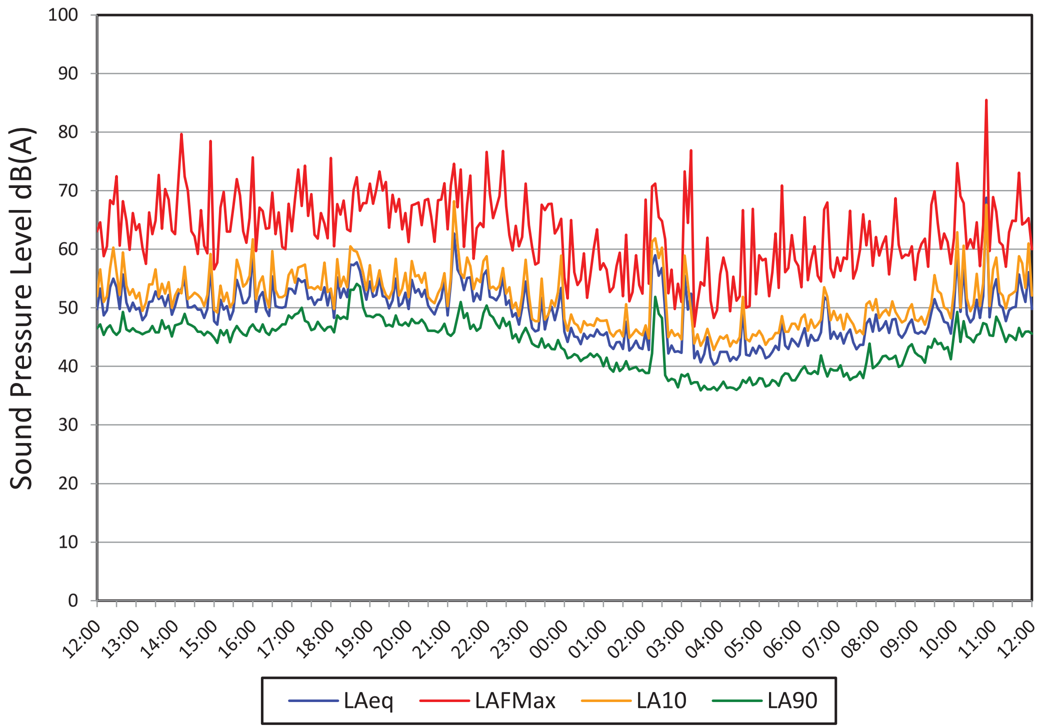


Friday 22 July to Saturday 23 July 2016

Figure AS8635/TH1

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 1

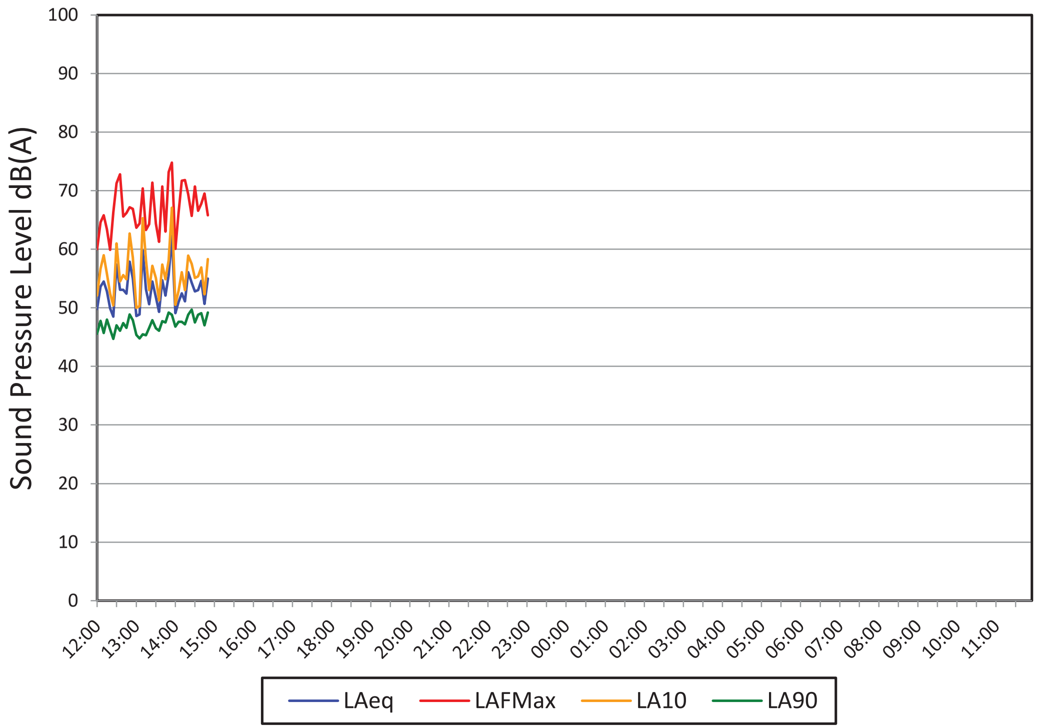


Saturday 23 July to Sunday 24 July 2016

Figure AS8635/TH2

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 1

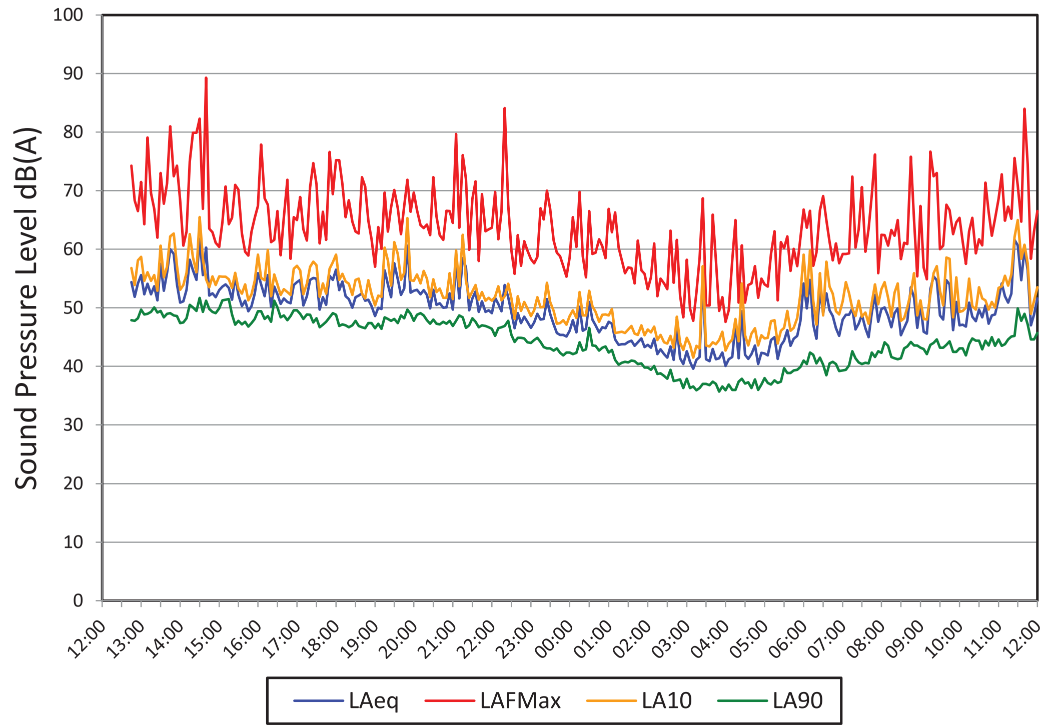


Sunday 24 July to Monday 25 July 2016

Figure AS8635/TH3

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 2

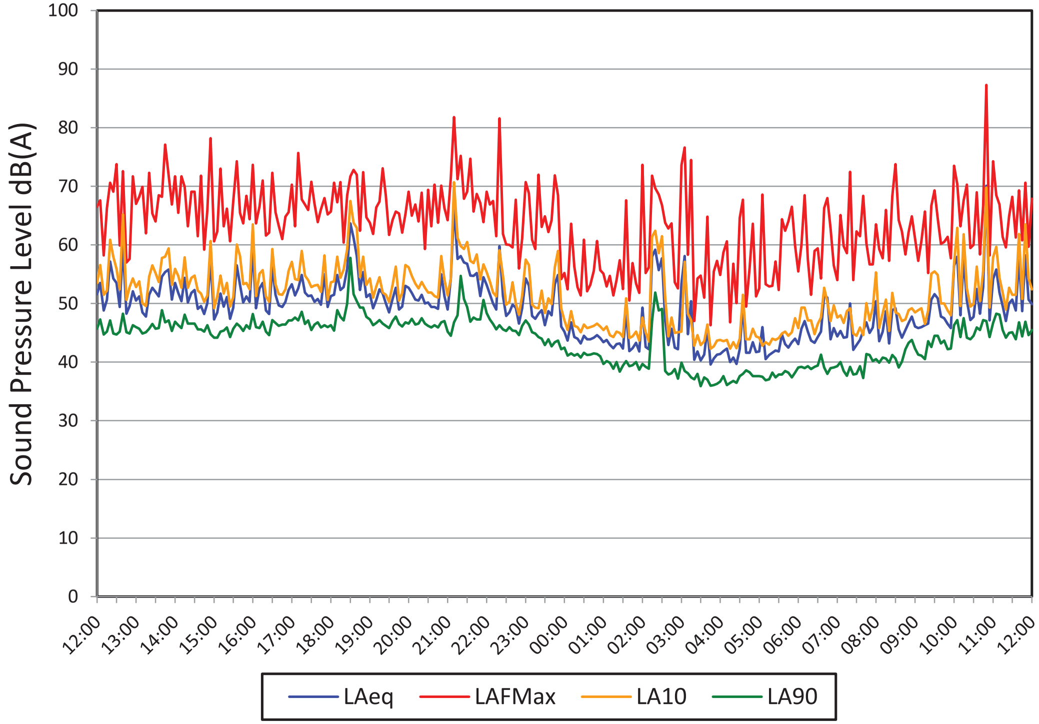


Friday 22 July to Saturday 23 July 2016

Figure AS8635/TH4

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 2

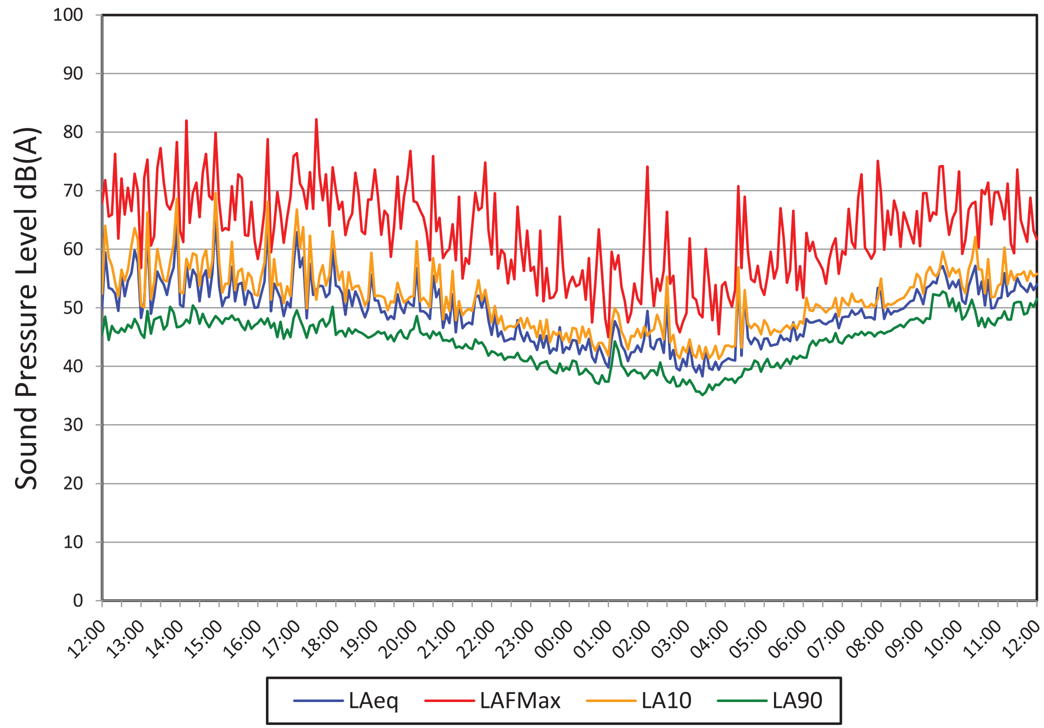


Saturday 23 July to Sunday 24 July 2016

Figure AS8635/TH5

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 2

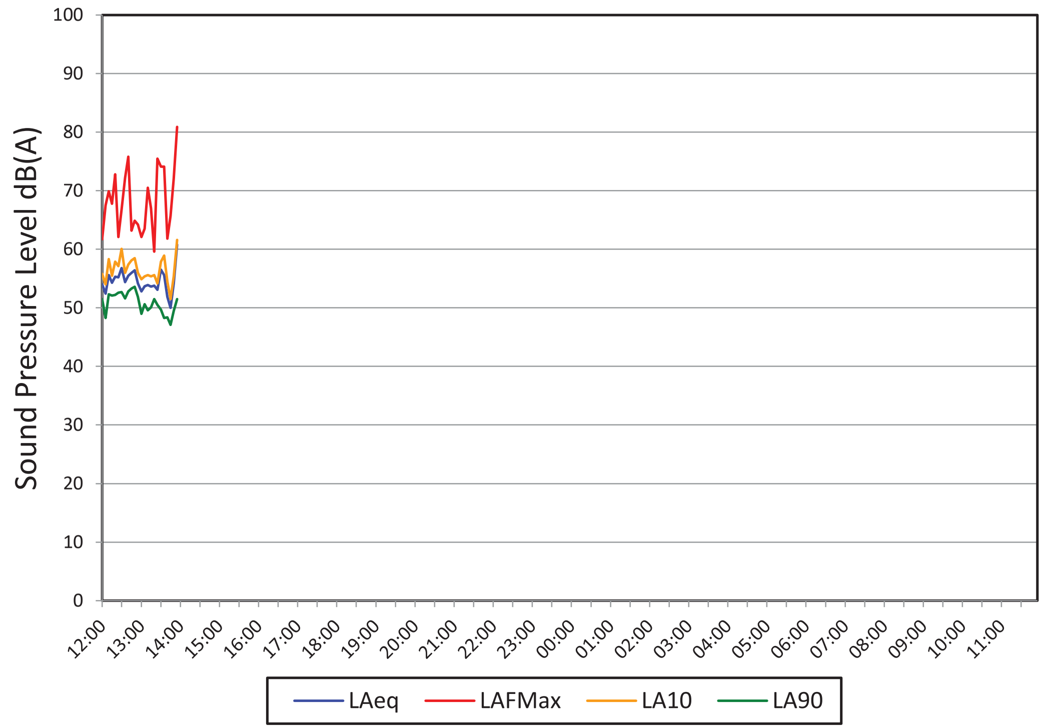


Sunday 24 July to Monday 25 July 2016

Figure AS8635/TH6

Regents Wharf, All Saints Street, N1

Environmental Noise Time History - Position 2



Monday 25 July to Tuesday 26 July 2016

Figure AS8635/TH7

APPENDIX A

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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

APPENDIX B
AS8635 - Regents Wharf, All Saints Street, N1
External Plant Noise Calculations

Roof Level Building C Plant To Nearest Residential Dwelling

RWEYQ20T		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
RWEYQ20T	Lp @ 1m	46	51	44	48	49	45	48	43	54
Number of Plant	21	13	13	13	13	13	13	13	13	
Total		59	64	57	61	62	58	61	56	
Distance Loss	To 40m	-32	-32	-32	-32	-32	-32	-32	-32	
Roof Edge Screening*		-5	-6	-6	-7	-9	-11	-13	-16	
Level at receiver		**22**	**27**	**19**	**22**	**21**	**15**	**16**	**8**	**25**

*Screening limited to 19dB

PUHZ-ZRP100VKA		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
PUHZ-ZRP100VKA	Lp @ 1m	54	54	53	49	46	41	36	29	51
Number of Plant	21	13	13	13	13	13	13	13	13	
Total		67	67	66	62	59	54	49	42	
Distance Loss	To 40m	-32	-32	-32	-32	-32	-32	-32	-32	
Roof Edge Screening*		-5	-6	-6	-7	-9	-11	-13	-16	
Level at receiver		**30**	**30**	**28**	**23**	**18**	**11**	**4**	**-6**	**25**

*Screening limited to 19dB

Cumulative Level at Receiver		31	31	29	25	23	17	16	8	**28**

Roof Level Building A Plant To Nearest Residential Dwelling

Adiabatic Cooler		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
Adiabatic Cooler		64	65	65	71	68	65	61	53	
Number of Plant	4	6	6	6	6	6	6	6	6	
Propagation Correction		-8	-8	-8	-8	-8	-8	-8	-8	
Total		62	63	63	69	66	63	59	51	
Distance Loss	To 18m	-25	-25	-25	-25	-25	-25	-25	-25	
Roof Edge Screening*		-10	-12	-15	-18	-19	-19	-19	-19	
Level at receiver		**27**	**25**	**23**	**26**	**22**	**19**	**15**	**7**	**27**

*Screening limited to 19dB

P350-PURY		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
P350-PURY	Lp @ 1m	74	69	65	62	56	48	43	38	63
Number of Plant	2	3	3	3	3	3	3	3	3	
Total		77	72	68	65	59	51	46	41	
Distance Loss	To 16m	-24	-24	-24	-24	-24	-24	-24	-24	
Roof Edge Screening*		-11	-14	-16	-19	-19	-19	-19	-19	
Level at receiver		**42**	**34**	**28**	**22**	**16**	**8**	**3**	**-2**	**25**

*Screening limited to 19dB

PUHZ-ZRP100VKA		**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dB(A)**
PUHZ-ZRP100VKA	Lp @ 1m	54	54	53	49	46	41	36	29	51
Number of Plant	30	15	15	15	15	15	15	15	15	
Total		69	69	68	64	61	56	51	44	
Distance Loss	To 14m	-23	-23	-23	-23	-23	-23	-23	-23	
Roof Edge Screening*		-14	-17	-19	-19	-19	-19	-19	-19	
Level at receiver		**31**	**29**	**26**	**22**	**19**	**14**	**9**	**2**	**24**

*Screening limited to 19dB

Cumulative Level at Receiver		42	36	31	29	24	20	16	9	**30**

Roof Level Building A Emergency Plant To Nearest Residential Dwelling

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Generator	Lp @ 1m	73	65	65	61	58	53	46	41	63
Distance Loss	To 22m	-27	-27	-27	-27	-27	-27	-27	-27	
Roof Edge Screening*		-13	-15	-18	-19	-19	-19	-19	-19	
Level at receiver		**34**	**23**	**20**	**15**	**12**	**7**	**0**	**-5**	**18**

*Screening limited to 19dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Generator	Lp @ 1m	73	65	65	61	58	53	46	41	63
Distance Loss	To 15m	-24	-24	-24	-24	-24	-24	-24	-24	
Roof Edge Screening*		-13	-15	-18	-19	-19	-19	-19	-19	
Level at receiver		**37**	**26**	**24**	**18**	**15**	**10**	**3**	**-2**	**21**

*Screening limited to 19dB

Cumulative Level at Receiver	39	28	25	20	17	12	5	0	**23**