Report VA3964.220114.NIA

The Corner Building, 91-93 Farringdon Road, Clerkenwell

Noise Impact Assessment

14 January 2022

Corner Property Limited

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Attachments

1. Introduction

As part of the refurbishment works at The Corner Building, 91-93 Farringdon Road, Clerkenwell, it is proposed to replace the existing roof plant, and create a new rooftop terrace for use by the offices within the building.

Venta Acoustics has been commissioned by Corner Property Limited to undertake an assessment of the potential noise impact of these proposals in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the background noise levels at the most affected noise sensitive receptors. These levels are used to undertake an assessment of the likely impact with reference to the planning requirements of Camden Council.

2. Design Criterion and Assessment Methodology

2.1 Camden Council Requirements

Camden Council's Local Plan (adopted June 2017), Appendix 3, provides the following guidance regarding noise from Industrial and Commercial Noise Sources

> *A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).*

Existing Noise sensitive receiver	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**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.

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted $L_{eq,5mins}$ noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

2.2 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to suitable internal noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.1.

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

3. Site Description

As illustrated on attached site plan VA3964/SP1, the site building is located on the corner of Clerkenwell and Farringdon Road.

The most affected noise sensitive receivers are expected to be the apartments overlooking the building to the west on Onslow Street.

Existing building services plant was noted on several of the neighbouring rooftops.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing background noise levels at the site, a noise survey was carried out between Wednesday 15th and Friday 17th December 2021 at roof level at the location shown in site plan VA3964/SP1. This location was chosen to be representative of the background noise level at the most affected noise sensitive receivers.

Continuous 5-minute samples of the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were undertaken at the measurement location.

The weather during the survey period was generally dry with light winds. The background noise data is not considered to have been compromised by these conditions.

Measurements were made generally in accordance with ISO 1996 2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels*.

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

Manufacturer	Model Type	Serial No	Calibration	
			Certificate No.	Date
Svantek Class 1 Integrating SLM	958A	59177	UCRT21/1107	21/1/21
Larson Davis calibrator	CAL200	13049	UCRT21/1385	22/3/21

Table 4.1 – Equipment used for the tests

The calibration of the sound level meter was verified before and after use with no significant calibration drift observed.

4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA3964/TH1-2.

The background noise level is determined by road traffic noise in the surrounding area, with a contribution from rail movements and building services on the surrounding buildings.

The typical background noise levels measured were:

Monitoring Period	Minimum $L_{A90,5min}$
07:00 – 23:00 hours	53 dB
23:00 – 07:00 hours	47 dB

Table 4.2 – Minimum background noise levels [dB ref. 20 µPa]

4.3 Plant Noise Emission Limits

On the basis of the measured noise levels and the planning requirements of the Local Authority, and considering that it is not expected that tonal noise will be generated by the proposed plant units, the following plant specific sound levels should not be exceeded at the most affected noise sensitive receivers:

Monitoring Period	Design Criterion (L_{Aeq})
07:00 – 23:00 hours	43 dB
23:00 – 07:00 hours	37 dB

Table 4.3 – Specific sound pressure levels not to be exceeded at most affected noise sensitive receivers

5. Predicted Noise Impact

5.1 Proposed plant

The following plant is proposed for installation at roof level at the location indicated on site plan VA3964/SP1. This is within an existing plant enclosure with solid sides to the north and east.

This location benefits from line of sight screening, provided by the existing plant enclosure wall, from all noise sensitive receptors.

Plant Item	Quantity	Proposed Model
Condensers	3	Daikin REYQ12U
Condenser	1	Daikin REYQ10U
Chiller	1	Airedale 30kW Ultima Compact Air Cooled Chiller
AHU	1	M&Y AHU Q11602-04-0
AHU	1	Nuaire XBoxer XBC+ 65

Table 5.1 – Indicative plant selections assumed for this assessment.

Consulting the manufacturer's datasheets, the following noise emissions levels are attributed to the proposed plant items:

Plant Item	Octave Band Centre Frequency (Hz) Sound Pressure/Power Level, L_p@xm, L_w (dB)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Daikin REYQ12U – L_p@1m	64	66	61	57	53	52	53	39	61
Daikin REYQ10U – L_p@1m	59	62	58	56	49	47	46	31	57
Airedale Chiller – L_p@10m	45	37	39	38	38	31	30	28	42
M&Y AHU: Supply – L_w	69	78	77	72	72	71	67	60	77
M&Y AHU: Exhaust – L_w	69	78	77	80	91	82	79	73	92
M&Y AHU: Breakout – L_p@1m	62	70	62	50	50	47	46	41	59
Nuaire XBC+ 65: Supply - L_w	79	79	72	66	64	59	48	34	70
Nuaire XBC+ 65: Exhaust - L_w	85	85	79	75	72	69	61	55	78
Nuaire XBC+ 65: Supply - L_w	71	69	56	51	45	41	35	20	56

Table 5.2 – Advised plant noise data used for the assessment.

5.2 Recommended Mitigation Measures

It is not envisaged that any additional mitigation measures beyond the sites inherent geometry will be required for external noise emissions.

All plant and ductwork should be fitted with anti-vibration mounts in accordance with the manufacturer guidelines. This is expected to control structureborne noise to the building to acceptable levels.

5.3 Predicted noise levels

The cumulative noise level at the most affected noise sensitive receiver has been calculated on the basis of the above information with reference to the guidelines set out in ISO 9613-2:1996 *Attenuation of sound during propagation outdoors - Part 2: General method of calculation.*

A summary of the calculations are shown in Appendix B.

Description	dB(A)
Plant noise criterion	37 dB
L_p 1m from receiver	35 dB

Table 5.3 – Predicted noise and level and design criteria at noise sensitive location

5.4 Comparison to NR35 Curve

As can been seen from the following comparison in Table 5.4, the predicted noise levels at 1m from the most affected receiver are comfortably below the NR35 curve.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
NR35	63	52	45	39	35	35	30	28
L_p 1m from receiver	39	39	35	30	32	26	21	12

Table 5.4 – Comparison of predicted noise levels against the NR35 criterion

5.5 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.3 would result in internal noise levels that achieve the guidelines shown in Table 2.1.

6. Rooftop Terrace

The refurbishment includes the conversion of the rooftop into a terrace area for use by the offices in the building, most likely to be used during office hours or early evening.

Noise propagation calculations from the terrace to the most affected noise sensitive apartment, to the north, which has a clear line of sight over to the terrace.

An assumed noise level from people on the terrace would be 75dB(A) has been used for the prediction. This would result in a noise level of 44dB(A) 1m outside the façade of the nearest apartment, which is considerably below the minimum daytime background noise level of L_{A90} 53dB measured during the survey, and hence is considered unlikely to adversely impact the existing nearby residents.

It should be noted that the assumptions are towards the pessimistic end of the scale, with the noise levels being likely to be much lower in reality.

7. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of The Corner Building, 91-93 Farringdon Road, Clerkenwell in support of a planning application for the proposed introduction of new building services plant.

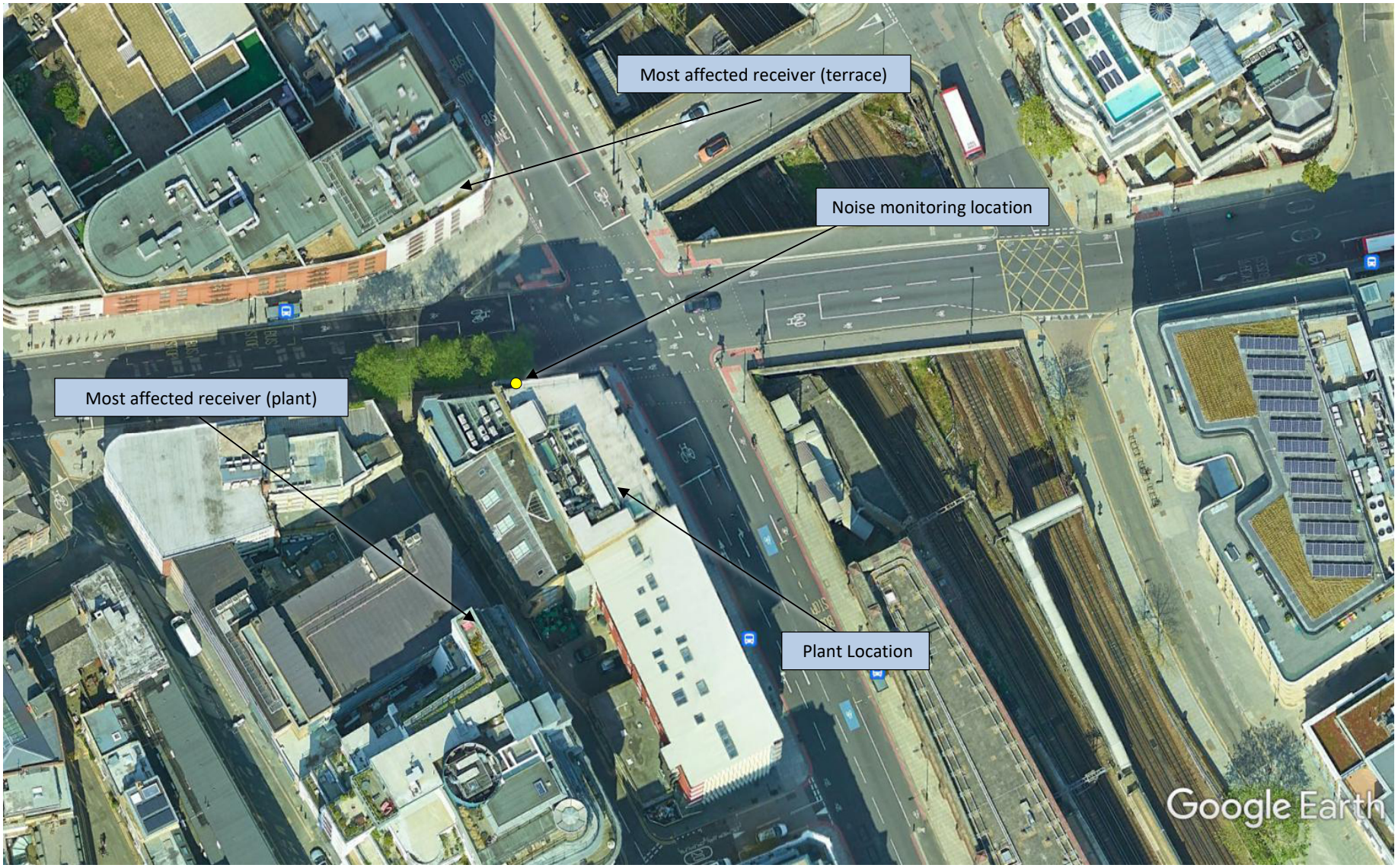
This has enabled noise emission limits to be set at the most affected noise sensitive receiver such that the proposed installation meets the requirements of Camden Council .

The cumulative noise emission levels from the proposed plant have been assessed to be compliant with the plant noise emission limits.

A discussion of the likely noise levels associated with the rooftop terrace, and in turn the chance of impact nearby residents has shown a low probability from the use of the terrace during daytime hours.

The proposed scheme is not expected to have a significant adverse noise impact and the relevant plant noise requirements have been shown to be met.

Jamie Duncan MIOA


Most affected receiver (terrace)
Noise monitoring location
Most affected receiver (plant)
Plant Location
Google Earth

The Corner Building, 91-93 Farringdon Road, Clerkenwell

Environmental Noise Time History: 1

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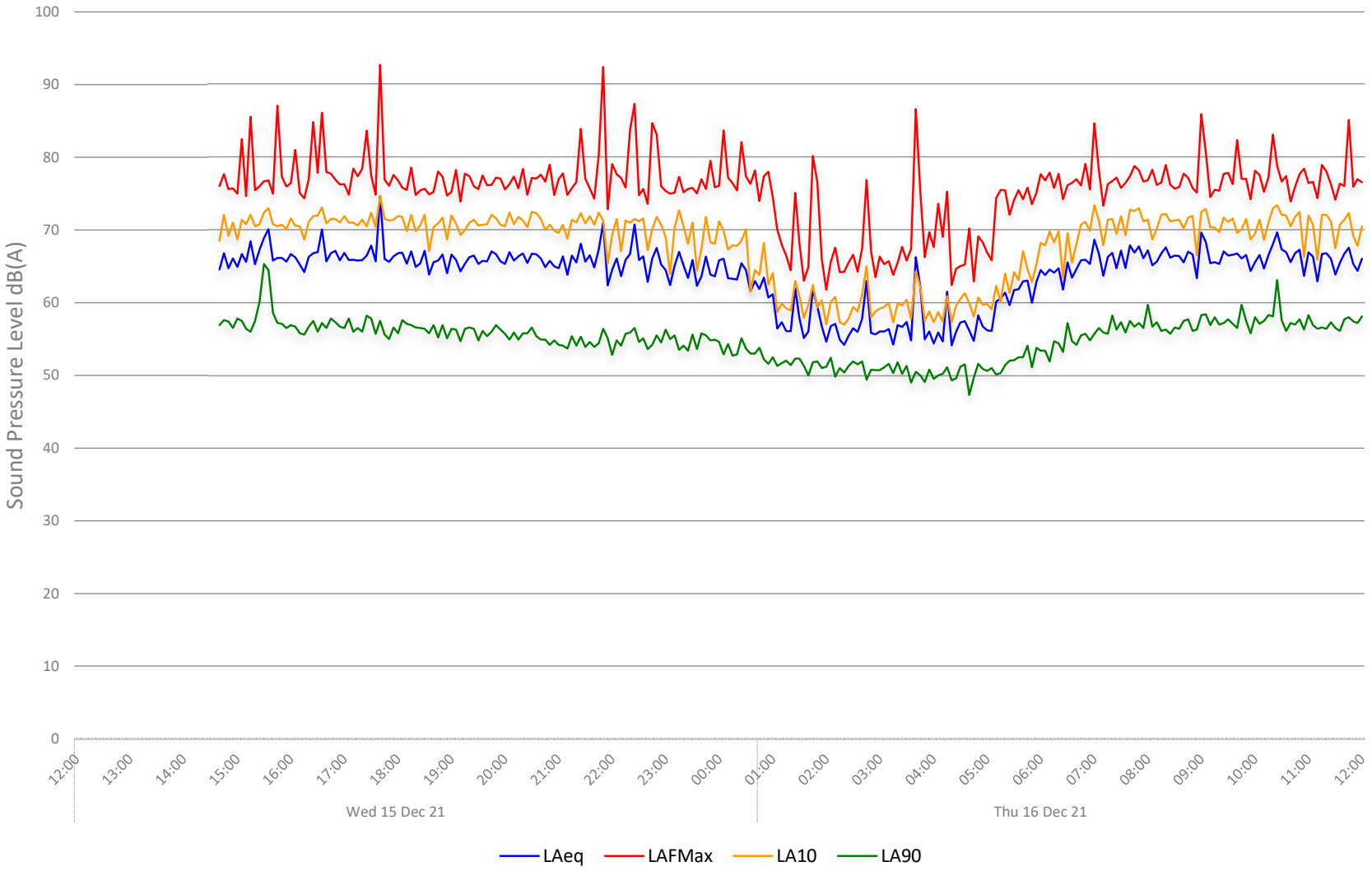
Figure VA3964/TH1



The Corner Building, 91-93 Farringdon Road, Clerkenwell

Environmental Noise Time History: 2

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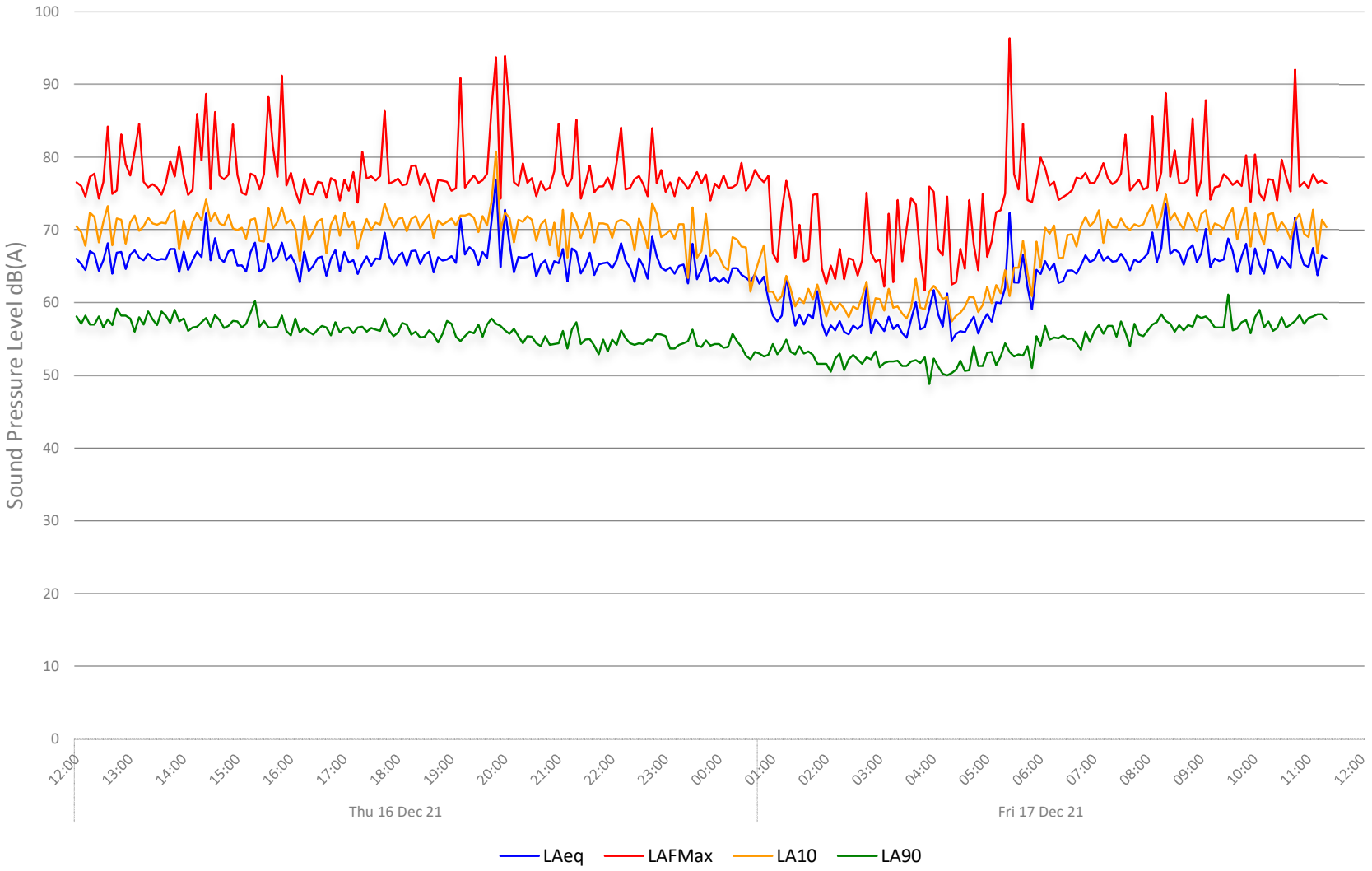
Figure VA3964/TH2



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.
R	*Sound Reduction Index.* Effectively the *Level Difference* of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.

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.

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

VA3964 - The Corner Building, 91-93 Farringdon Road, Clerkenwell

Noise Impact Assessment

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Airedale 30kW Ultima Chiller	Lp @ 10m	45	37	39	38	38	31	30	28	**41**
Distance Loss	To 33m	-10	-10	-10	-10	-10	-10	-10	-10	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Level at receiver		**28**	**19**	**19**	**16**	**13**	**3**	**2**	**0**	**17**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ12U	Lp @ 1m	64	66	61	57	53	52	53	39	**61**
Number of Plant	3	5	5	5	5	5	5	5	5	
Distance Loss	To 25m	-28	-28	-28	-28	-28	-28	-28	-28	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Level at receiver		**34**	**35**	**28**	**22**	**15**	**11**	**12**	**-2**	**25**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ10U	Lp @ 1m	59	62	58	56	49	47	46	31	**57**
Distance Loss	To 30m	-30	-30	-30	-30	-30	-30	-30	-30	
Screening loss*		-7	-8	-10	-13	-15	-18	-18	-18	
Level at receiver		**23**	**24**	**18**	**14**	**4**	**-1**	**-2**	**-17**	**15**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
M&Y AHU - Supply (option 4)	Lw	69	78	77	72	72	71	67	60	**77**
Distance Loss	To 35m	-31	-31	-31	-31	-31	-31	-31	-31	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Screening loss*		-5	-5	-5	-6	-7	-8	-10	-12	
Level at receiver		**25**	**34**	**33**	**27**	**27**	**24**	**19**	**9**	**32**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
M&Y AHU - Exhaust (option 4)	Lw	69	78	77	80	91	82	79	73	**92**
Distance Loss	To 35m	-31	-31	-31	-31	-31	-31	-31	-31	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Level at receiver		**15**	**23**	**20**	**21**	**29**	**18**	**14**	**8**	**30**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
M&Y AHU - Breakout (option 4)	Lp @ 1m	62	70	62	50	50	47	46	41	**59**
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 35m	-31	-31	-31	-31	-31	-31	-31	-31	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Level at receiver		**16**	**23**	**13**	**-1**	**-4**	**-9**	**-11**	**-16**	**10**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Nuaire Xboxer XBC+ 65 - Supply	Lw	79	79	72	66	64	59	48	34	**70**
Distance Loss	To 38m	-32	-32	-32	-32	-32	-32	-32	-32	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Level at receiver		**33**	**31**	**23**	**14**	**10**	**2**	**-10**	**-24**	**19**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Nuaire Xboxer XBC+ 65 - Exhaust	Lw	85	85	79	75	72	69	61	55	**78**
Distance Loss	To 38m	-32	-32	-32	-32	-32	-32	-32	-32	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Level at receiver		**31**	**29**	**22**	**15**	**10**	**4**	**-5**	**-11**	**19**

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Nuaire Xboxer XBC+ 65 - Breakout	Lw	71	69	56	51	45	41	35	20	**56**
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 38m	-32	-32	-32	-32	-32	-32	-32	-32	
Screening loss*		-7	-8	-10	-12	-15	-17	-18	-18	
Level at receiver		**25**	**21**	**7**	**-1**	**-9**	**-16**	**-23**	**-38**	**7**

* Screening loss limited to 18dB

Cumulative plant noise level at receiver 35 dB(A)