Report VA3259.210513.NIA2

7abc Bayham Street, Camden, London

Noise Impact Assessment

14 May 2021

Camden Lifestyle (UK) Limited
17 Portland Place
London
W1B 1PU

VENTA ACOUSTICS

01962 461016
0203 8650332
mail@ventaacoustics.com

registered company no. 10139494

Contents

1. Introduction 1
2. Design Criterion and Assessment Methodology 1
   - 2.1 Camden Council Requirements 1
   - 2.2 BS8233:2014 2
3. Site Description 2
4. Environmental Noise Survey 3
   - 4.1 Survey Procedure & Equipment 3
   - 4.2 Results 3
   - 4.3 Plant Noise Emission Limits 4
5. Predicted Noise Impact 4
   - 5.1 Proposed plant 4
   - 5.2 Recommended Mitigation Measures 5
   - 5.3 Predicted noise levels 6
   - 5.4 Comparison to NR35 Curve 7
   - 5.5 Emergency Generator Noise 7
   - 5.6 Comparison to BS8233:2014 Criteria 8
6. Conclusion 8

Attachments

VA3259/SP1	Indicative Site Plan
VA3259/TH1-TH8	Environmental Noise Time Histories
VA3259/NM1-NM3	Noise Maps
Appendix A	Acoustic Terminology

1. Introduction

It is proposed to install plant to service new building at 7abc Bayham Street, Camden, London.

Venta Acoustics has been commissioned by Camden Lifestyle (UK) 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 VA3259/SP1, the site building is located in a mixed area both office and residential uses adjacent. To the north, south and north-west are residential dwellings, which would be expected to be the most affected receivers.

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

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 Monday 21st and Thursday 24th September 2020 at the locations shown in site plan VA3259/SP1. These locations were 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 each of the measurement locations.

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
NTi Class 1 Integrating SLM	XL2	A2A-11461-E0	UCRT18/06369	12/6/18
NTi Class 1 Integrating SLM	XL2	A2A-15993-E0	FL-19-122	14/3/19
Larson Davis calibrator	CAL200	13049	UCRT19/1501	18/4/19

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 VA3259/TH1-4 for position 1 and VA3259/TH5-8 for position 2.

The background noise level is determined by road traffic noise in the surrounding area.

The minimum background noise levels measured were:

Monitoring Period	Minimum $L_{A90,5min}$	
	Position 1	Position 2
07:00 – 23:00 hours	38 dB	41 dB
23:00 – 07:00 hours	31 dB	37 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})	
	Position 1	Position 2
07:00 – 23:00 hours	28 dB	31 dB
23:00 – 07:00 hours	21 dB	27 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 ground floor, first floor and roof level at the location indicated on site plan VA3259/SP1.

Plant Item	Quantity	Proposed Model	Notes
AHU	1	EAB1525	Basement – fresh air inlet at 1st floor level in rear lightwell, exhaust at lower ground level on Bayham Street
Substation	1	500kVA Substation	Ground floor enclosure
Emergency Generator	1	PHG 500kVA	First floor enclosure – emergency use only
VRF Condensers	1	Daikin RZAG35A	3rd floor roof level
VRF Condensers	2	Daikin REYQ8U	Night time, run at 70% duty (quiet mode 1) - 3rd floor roof level
VRF Condensers	2	Daikin REQY12U	Night time, one unit at 70% one at 75% duty - 3rd floor roof level
VRF Condensers	3	Daikin REYQ10U	Night time, run at 77% duty - 3rd floor roof level
ASHP	2	Mitsubishi ESA30HE	5th Floor roof level
Kitchen Extract	2	Nuaire SQF61	
Toilet Extract	1	Nuaire AVT-R	
AHU	1	EAB1525r1	

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@1m, L_w (dB)								dB(A)
		63	125	250	500	1k	2k	4k	8k	
EAB1525 - Inlet	L_w	59	73	68	63	62	60	60	46	68
EAB1525 – Exhaust	L_w	66	79	75	75	72	68	65	62	77
500kVA Substation	L_w	70	70	61	50	38	32	28	27	57
PHG 500kVA	L_p@1m	70	62	62	57	53	52	48	41	60
Daikin RZAG35A	L_w	65	65	62	62	57	51	45	39	63
Daikin REYQ8U – 100%	L_p@1m	63	64	59	55	50	45	45	36	57
Daikin REYQ8U – 70%	L_p@1m	61	55	49	48	48	46	43	35	53
Daikin REQY12U – 100%	L_p@1m	59	63	58	56	49	47	46	36	57
Daikin REQY12U – 70%	L_p@1m	56	50	48	47	47	45	43	34	52
Daikin REQY12U – 75%	L_p@1m	62	56	50	49	49	47	44	37	54
Daikin REYQ10U – 100%	L_p@1m	64	66	62	57	53	52	54	44	61
Daikin REYQ10U – 77%	L_p@1m	56	50	48	47	47	45	43	34	52
Nuaire AVT-R	L_w	75	71	73	73	70	67	61	54	75
Nuaire SQF61 - Exhaust	L_w	81	82	79	78	71	72	72	58	80
Nuaire SQF61 - Breakout	L_w	69	76	71	64	53	55	48	36	67
Mitsubishi ESA30HE	L_w	83	67	63	64	62	59	55	55	67
EAB1525r1 – Inlet	L_w	61	76	71	66	66	64	65	52	72
EAB1525r1 – Exhaust	L_w	66	78	74	74	71	68	64	61	76
EAB1525r1 - Breakout	L_w	48	59	53	32	25	23	22	19	47

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

5.2 Recommended Mitigation Measures

The plant areas will need to be enclosed with solid sided plant screens, with the third floor roof plant area containing the VRF units being at least the same height as the top of the units, and the roof top plant being the same height as the top of the units. This should be formed of a continuous and imperforate material with a minimum mass per unit area of 12kg/m^2.

As highlighted in Table 5.1, the VRF units will automatically switch to a lower duty, and hence lower noise level, mode during the night-time hours.

The air source heat pumps are to be located in a bespoke enclosure, with the top discharge louvre venting horizontally to the north.

Air handling plant will require attenuators to be fitted to the atmospheric side ductwork, details of which are shown in Table 5.3.

Attenuation Component	Octave Band Centre Frequency (Hz) Acoustic Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
ASHP Enclosure	13	16	20	21	19	21	23	24
EAB1525 Inlet	4	7	13	19	23	23	16	13
EAB1525 Exhaust	4	7	13	19	23	23	16	13
EAB1525r1 Inlet	10	20	35	48	50	50	50	37
EAB1525r1 Exhaust	18	33	50	50	50	50	50	50
Toilet Extract	12	24	42	50	50	50	50	50
Kitchen Extract	12	24	42	50	50	50	50	50

Table 5.3 – Minimum insertion losses required for atmospheric side ductwork / enclosures

Should the above insertion loss by achieved using multiple silencers, these should be separated from each other by a distance of minimum 3-4 x D, where D is the largest internal dimension of the duct work (e.g. D is 0.5m, so a minimum of 1.5-2m apart). Attenuators should be fitted as close to the fan as possible, and attached to the ductwork using flexible connections.

In addition to this the motors/bodies of the AHU, kitchen extract fan and toilet extract fan will need enclosing to control noise breakout. Minimum sound reduction values required for these are summarised in Table 5.4

Attenuation Component	Octave Band Centre Frequency (Hz) Sound Reduction Performance (dB)							
	63	125	250	500	1k	2k	4k	8k
Rooftop AHU	3	6	10	13	17	22	33	38
Toilet Extract	3	6	10	13	17	22	33	38
Kitchen Extract	8	17	22	28	33	38	40	40

Table 5.4 – Minimum sound reduction required from motor enclosures

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.

Please note that the above recommendations relate to acoustic issues only. It is recommended that professional advice confirming the suitability of these measures be sought from others with regards to issues such as airflow, structural stability and visual impact.

5.3 Predicted noise levels

The cumulative noise level at the nearby affected noise sensitive receivers have been calculated on the basis of the above information and assuming the recommended mitigation measures, with reference to the guidelines set out in ISO 9613-2:1996 *Attenuation of sound during propagation outdoors - Part 2: General method of calculation.*

Due to the complexity of the building interaction in this locale and the likelihood of noise both reflecting off and being screened by the surrounding buildings, 3D noise mapping was implemented to ensure the most accurate prediction of plant noise levels at the nearest noise sensitive receivers.

This process uses several different calculation protocols to derive accurate noise analysis predictions. Noise propagation and barrier attenuation are calculated in accordance with ISO 9613-1:1993 *Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere* and ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*.

The noise map is appended to the report with the reference VA3259/NM1 (daytime), VA3259/NM2 (night-time),VA3259/NM3 (emergency plant).

Table 5.5 shows the predicted noise levels at the most affected receiver, in this case the top floor apartment of the adjacent building to the south.

Period	Cumulative L_p 1m from receiver	Plant noise criterion
07:00 – 23:00 hours	27 dB	28 dB
23:00 – 07:00 hours	21 dB	21 dB

Table 5.5 – 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 5.6, 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
Daytime Level	16	21	21	20	16	12	11	0

Table 5.6 – Comparison of predicted noise levels against the NR35 criterion

5.5 Emergency Generator Noise

The generator is to be located at first floor level within a closed off room, with attenuated openings for the supply located in the roof, and exhaust air venting into the open stair core. The unit will only be used for emergency purposes and will be tested periodically as required during normal office hours on weekdays (09:00 – 17:00).

Due to the emergency nature of the equipment, it is understood that the requirement for noise is to be no greater than 10dB above background when tested, which in this case is 40dB(A).

The output from the noise mapping exercise for this item is shown in VA3259/NM3, with the highest noise level at the most affected receiver summarised below against the noise criterion.

Cumulative L_p 1m from receiver	Plant noise criterion
46 dB(A)	51 dB(A)

Table 5.7 – Predicted noise and level and design criteria at noise sensitive location – emergency plant

5.6 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.5 would result in internal noise levels that achieve the guidelines shown in Table 2.1.

6. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of 7abc Bayham Street, Camden, London 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, with necessary mitigation measures specified.

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

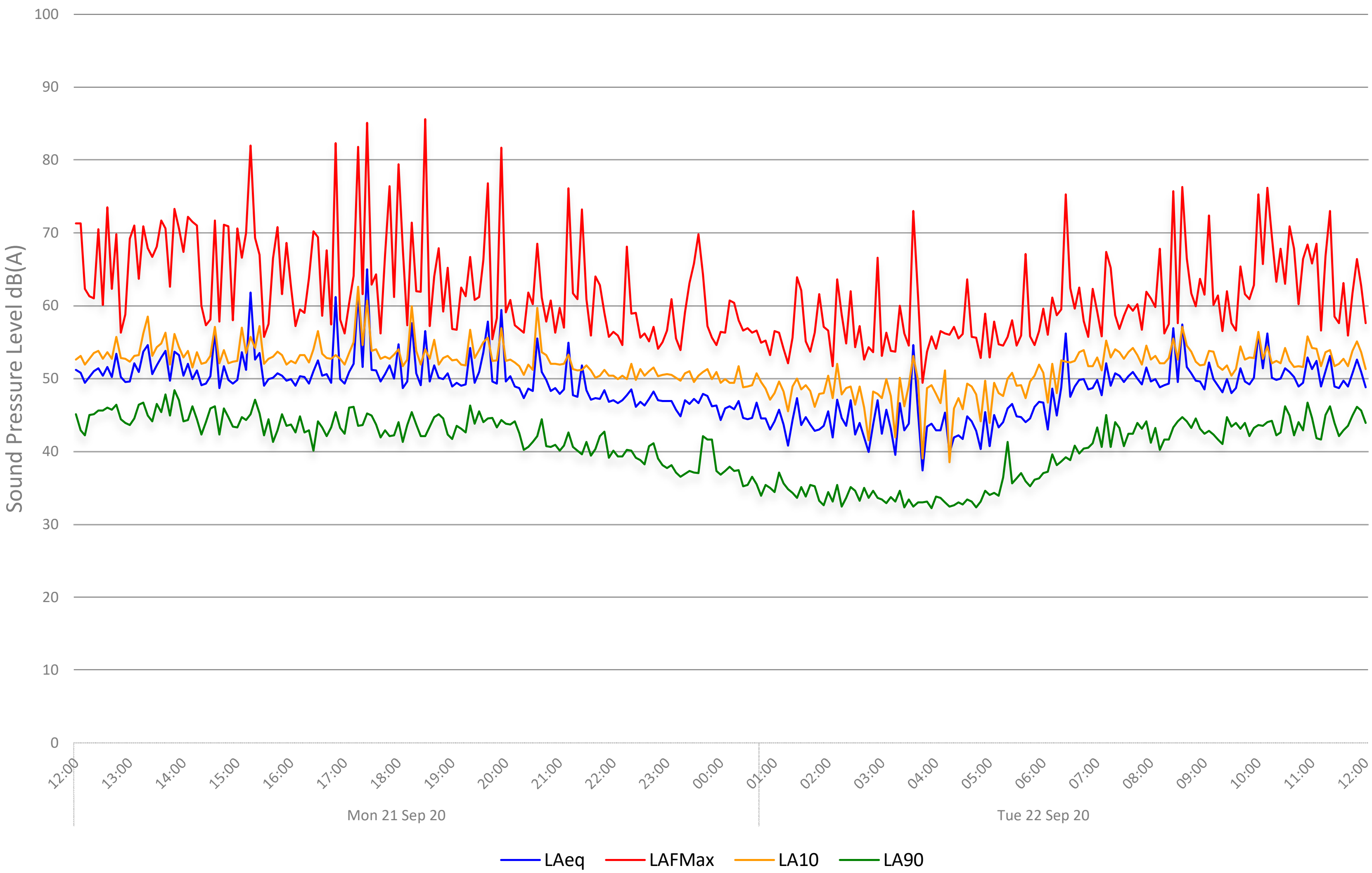

NO PARKING
EXIT
Noise monitoring location 2
Noise monitoring location 1
© 2021 Google
Google Earth

7abc Bayham Street, Camden, London

Environmental Noise Time History: 1

Position 1

Figure VA3259/TH1

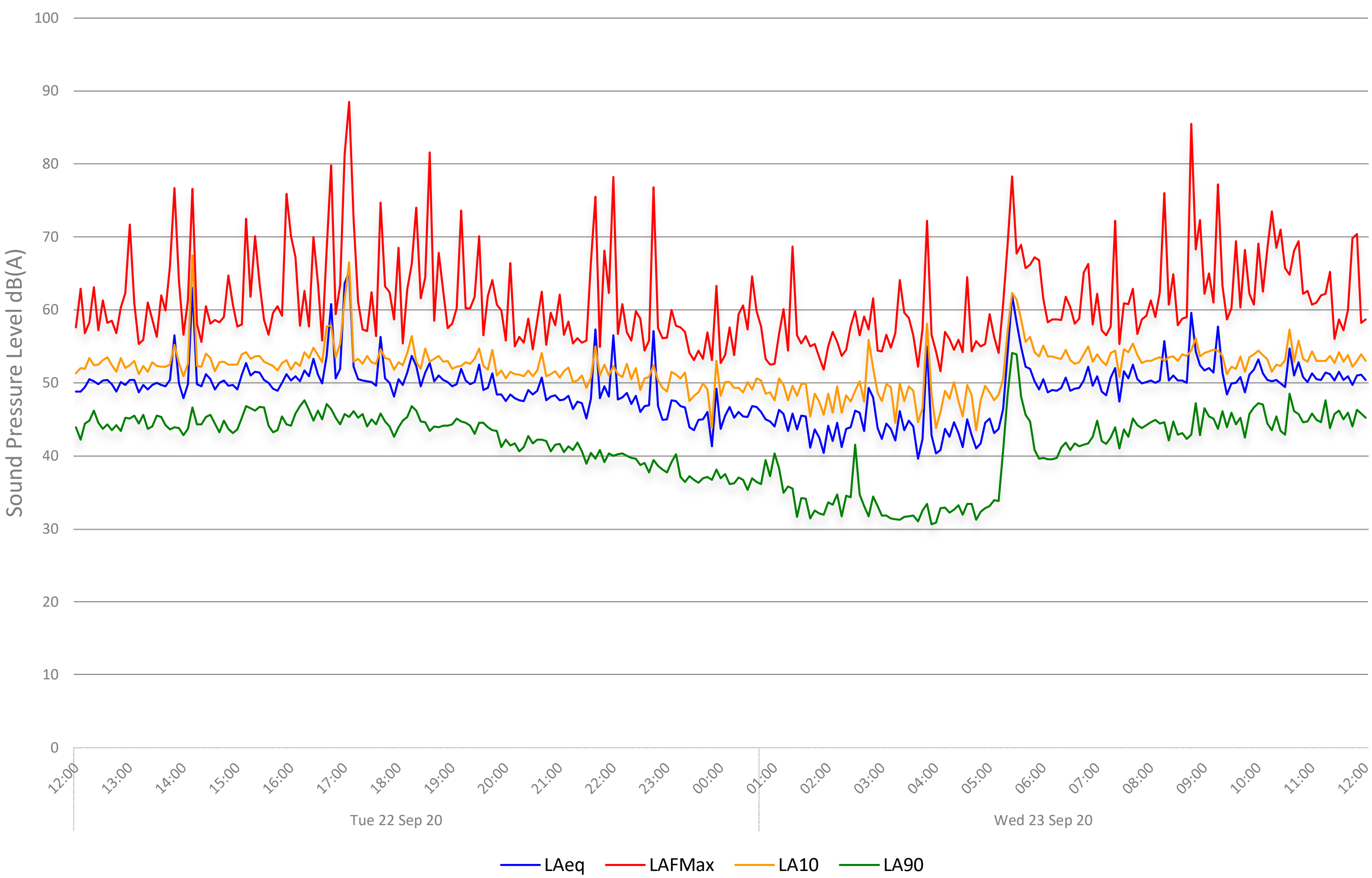


7abc Bayham Street, Camden, London

Environmental Noise Time History: 2

Position 1

Figure VA3259/TH2



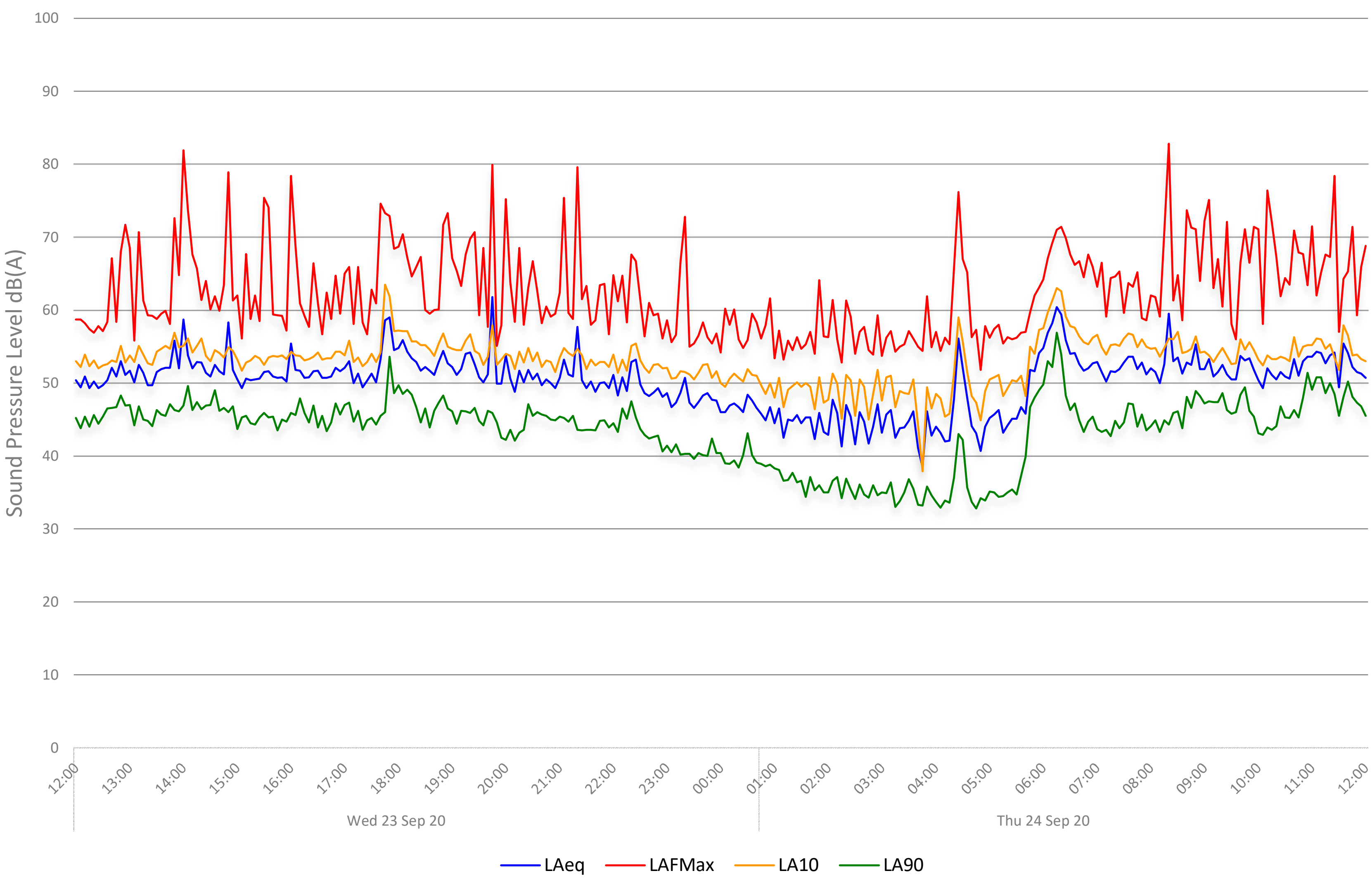
7abc Bayham Street, Camden, London

Environmental Noise Time History: 3

Position 1

VENTA ACOUSTICS

Figure VA3259/TH3

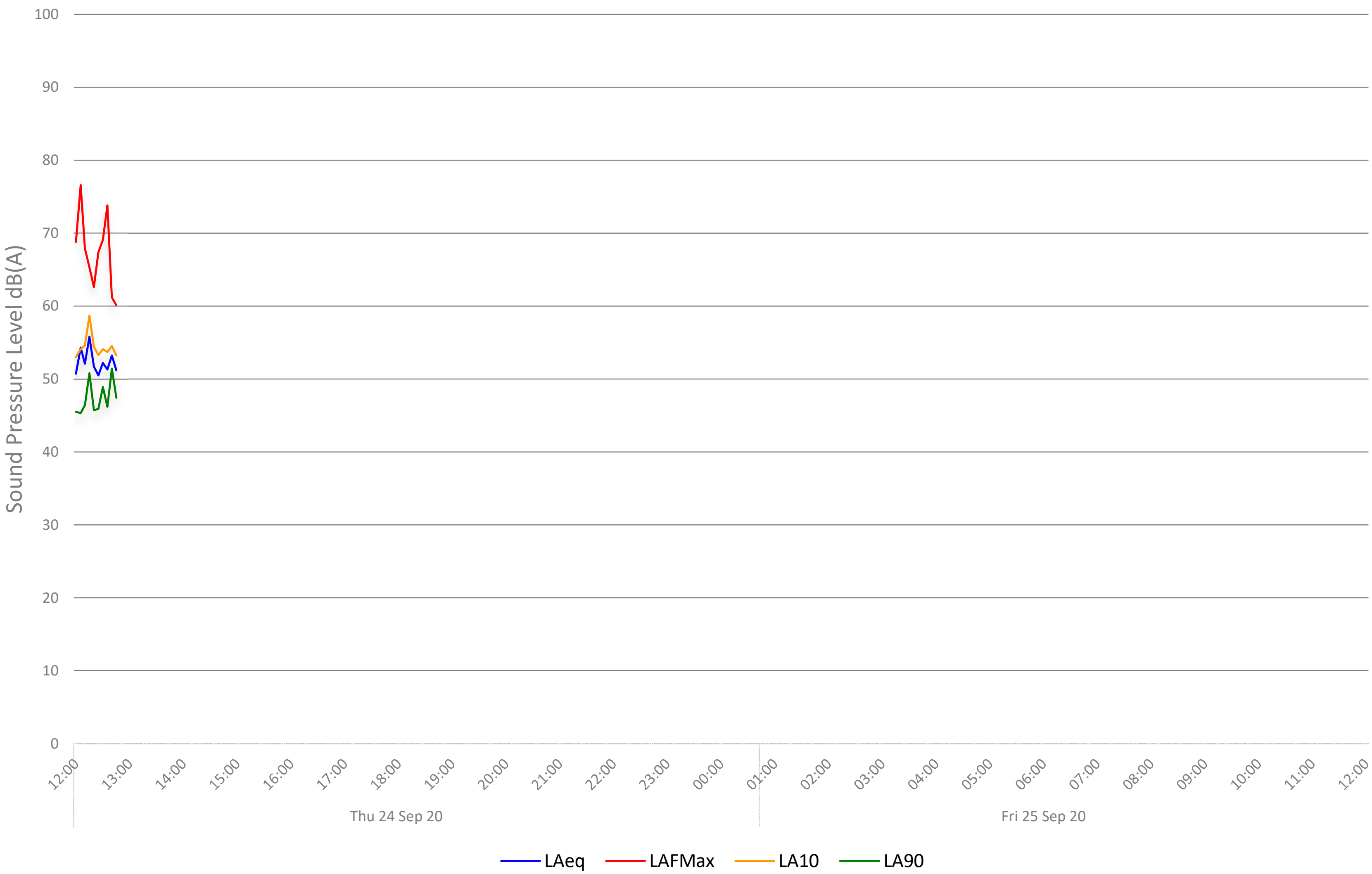


7abc Bayham Street, Camden, London

Environmental Noise Time History: 4

Position 1

Figure VA3259/TH4



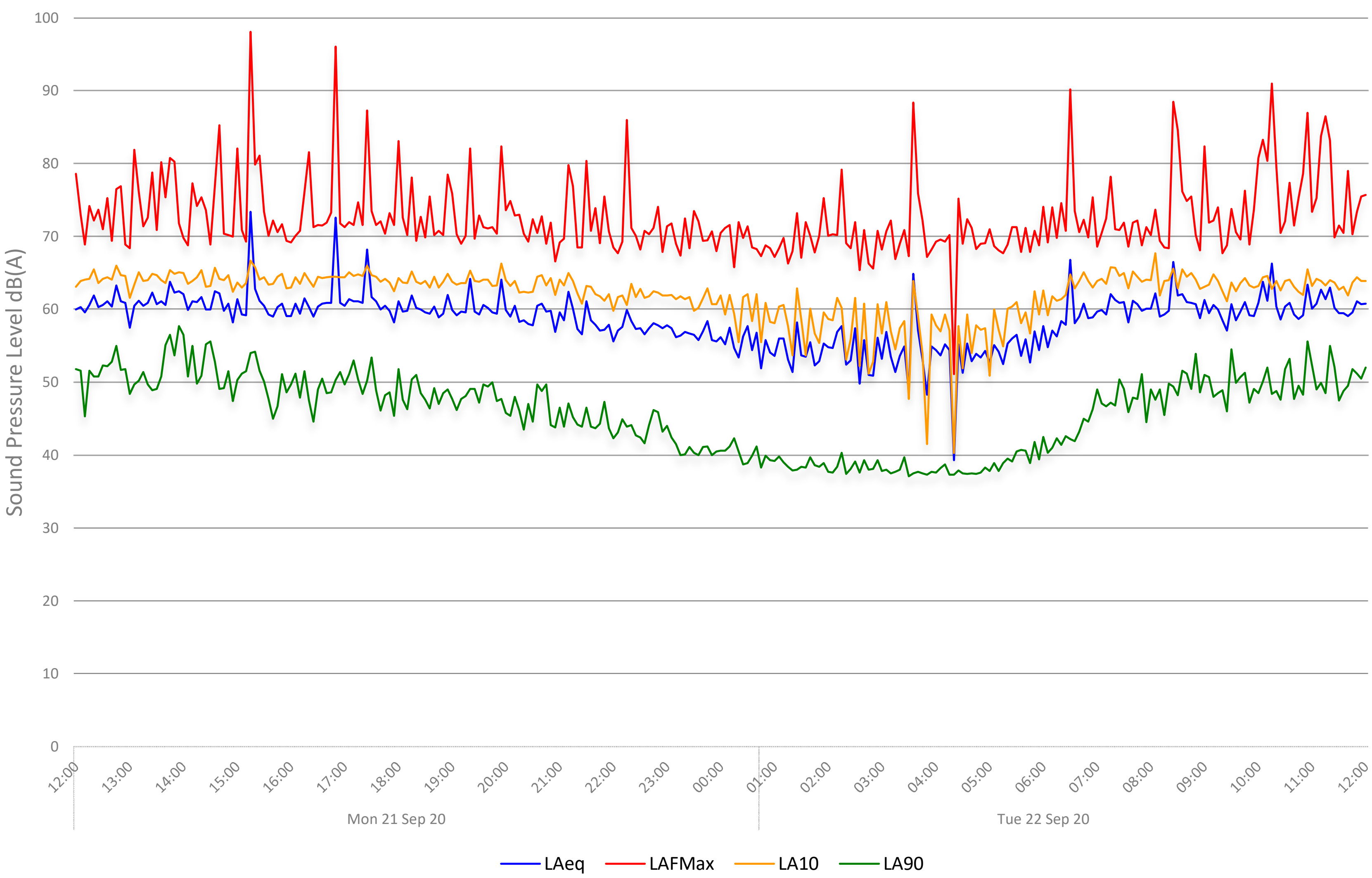
7abc Bayham Street, Camden, London

Environmental Noise Time History: 9

Position 2

VENTA ACOUSTICS

Figure VA3259/TH9

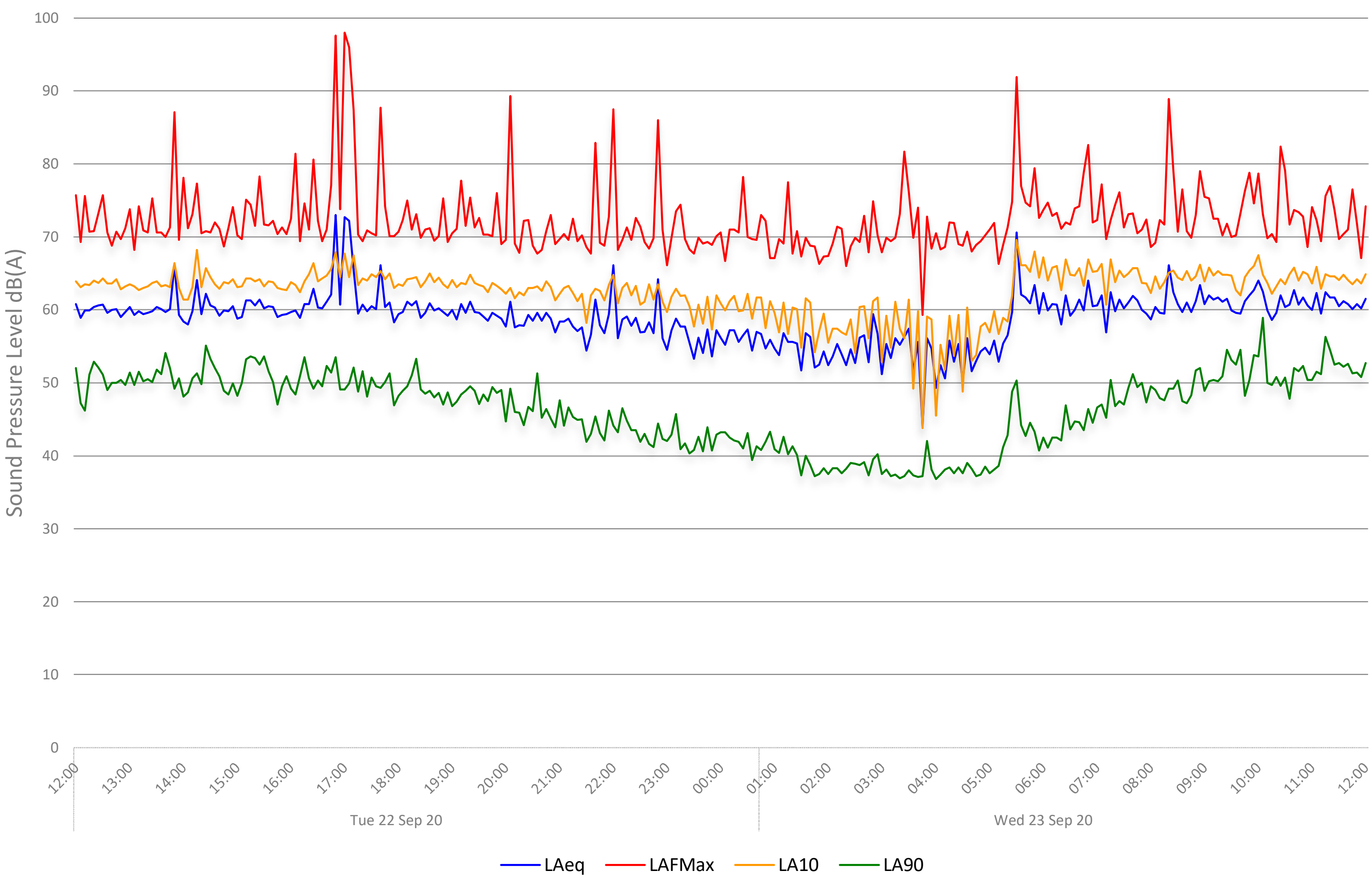


7abc Bayham Street, Camden, London

Environmental Noise Time History: 10

Position 2

Figure VA3259/TH10



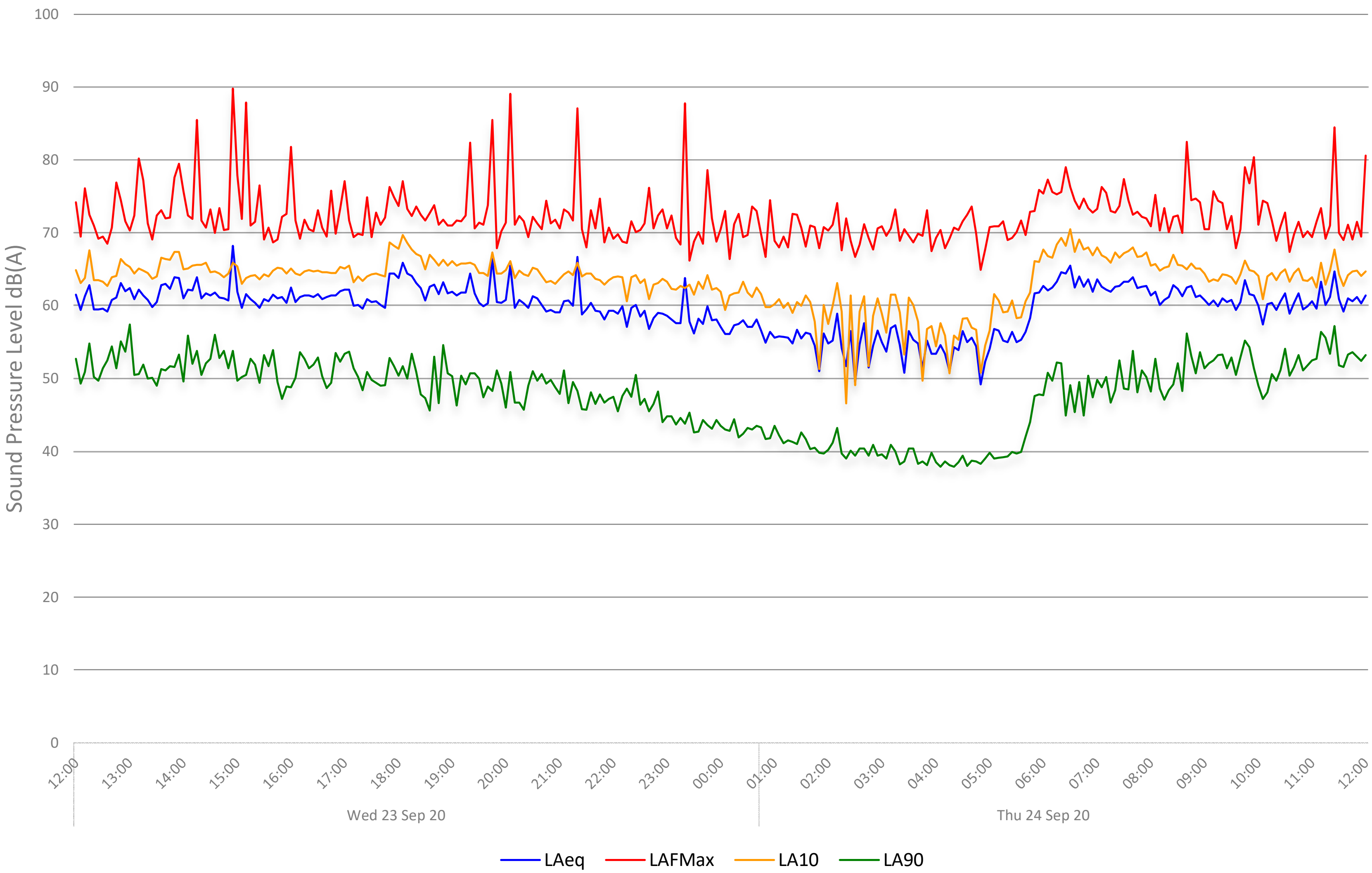
7abc Bayham Street, Camden, London

Environmental Noise Time History: 11

Position 2

VENTA ACOUSTICS

Figure VA3259/TH11

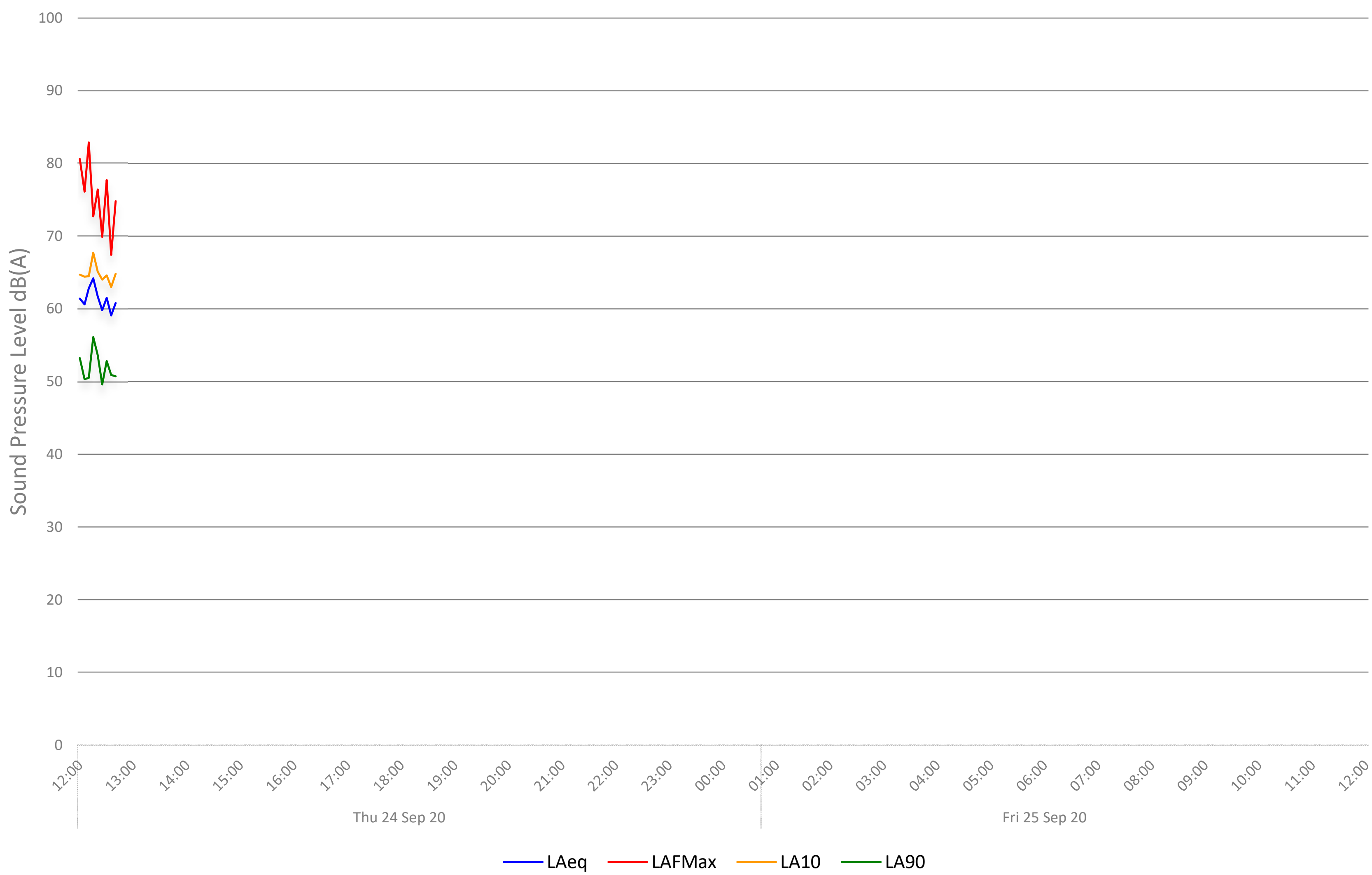


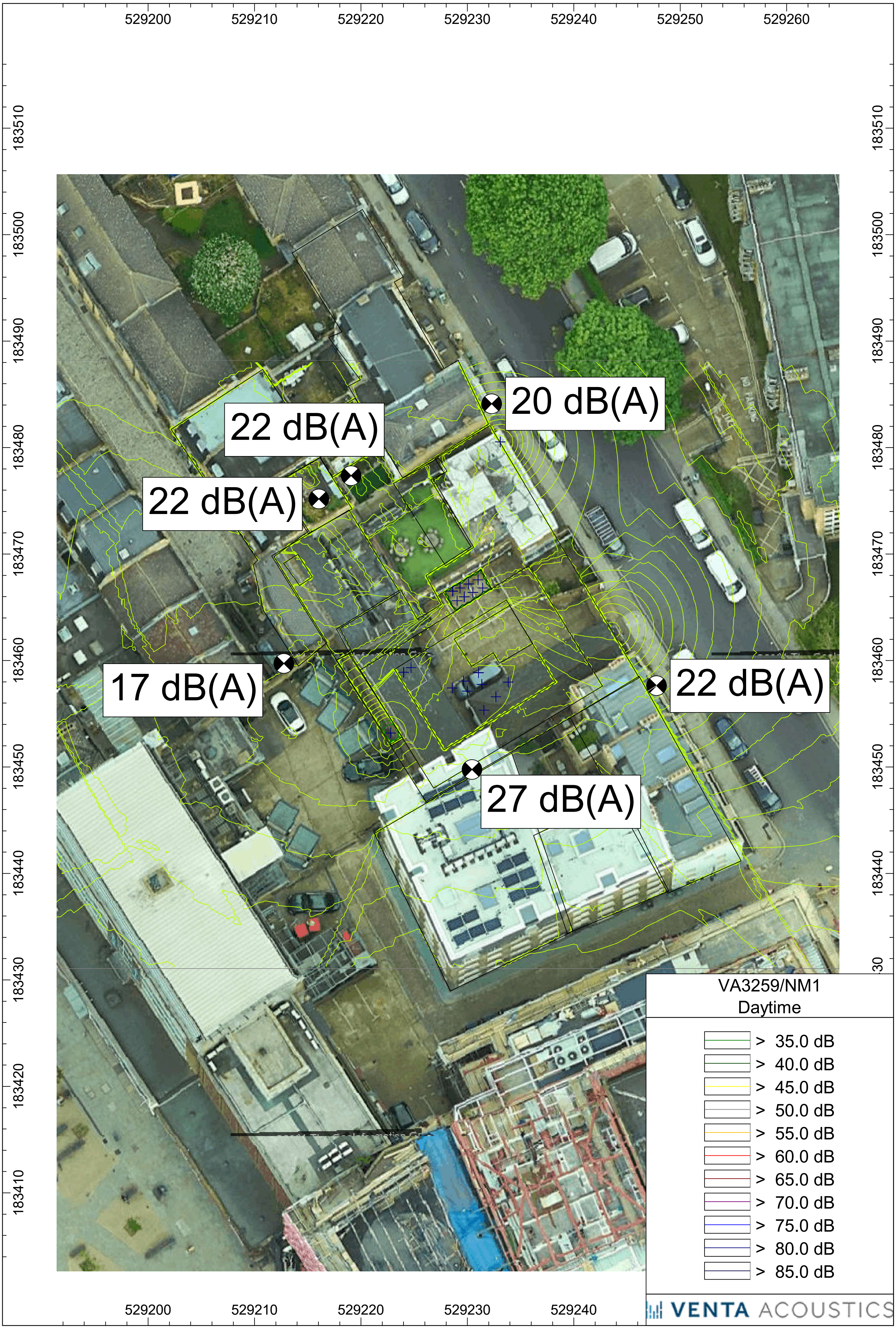
7abc Bayham Street, Camden, London

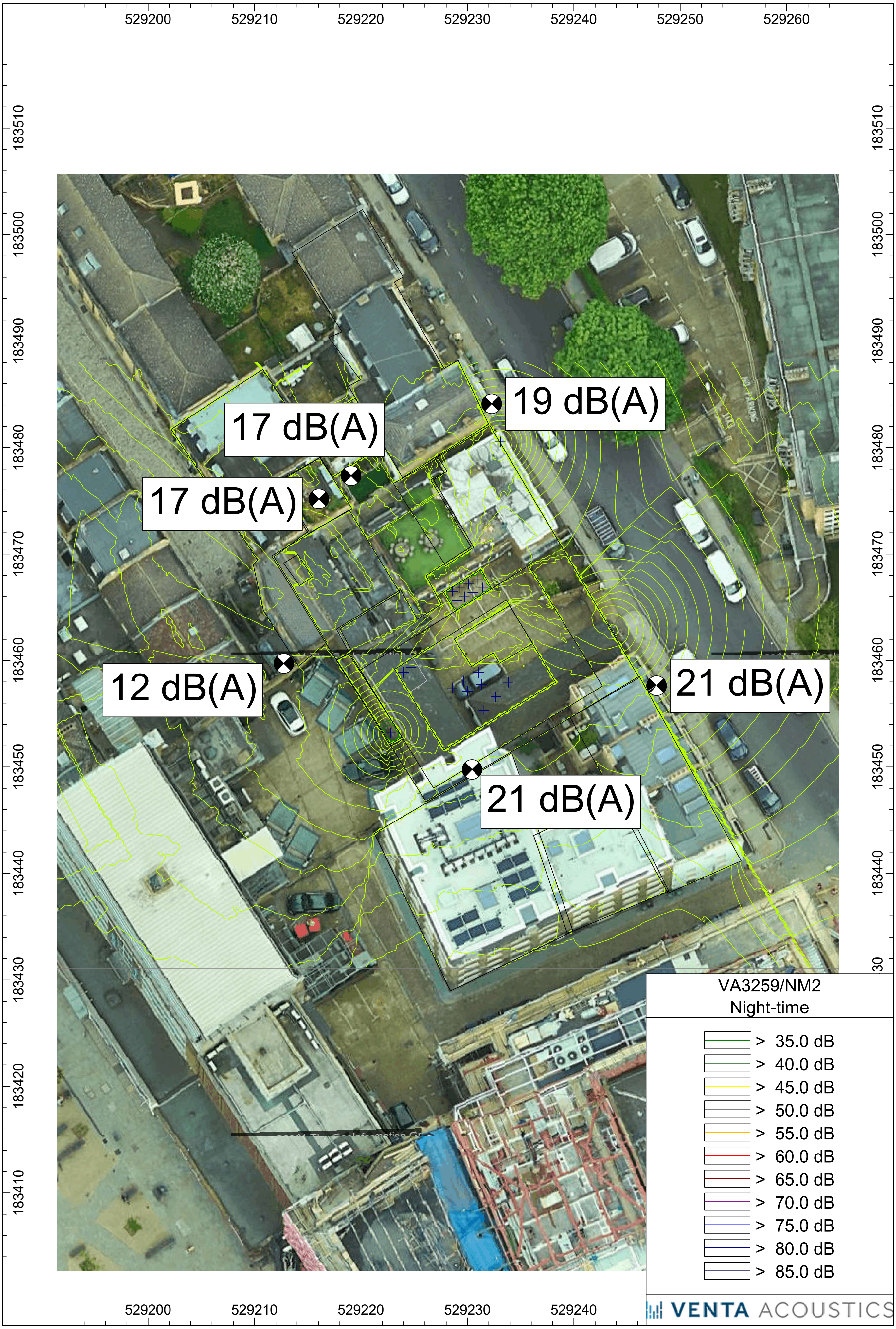
Environmental Noise Time History: 12

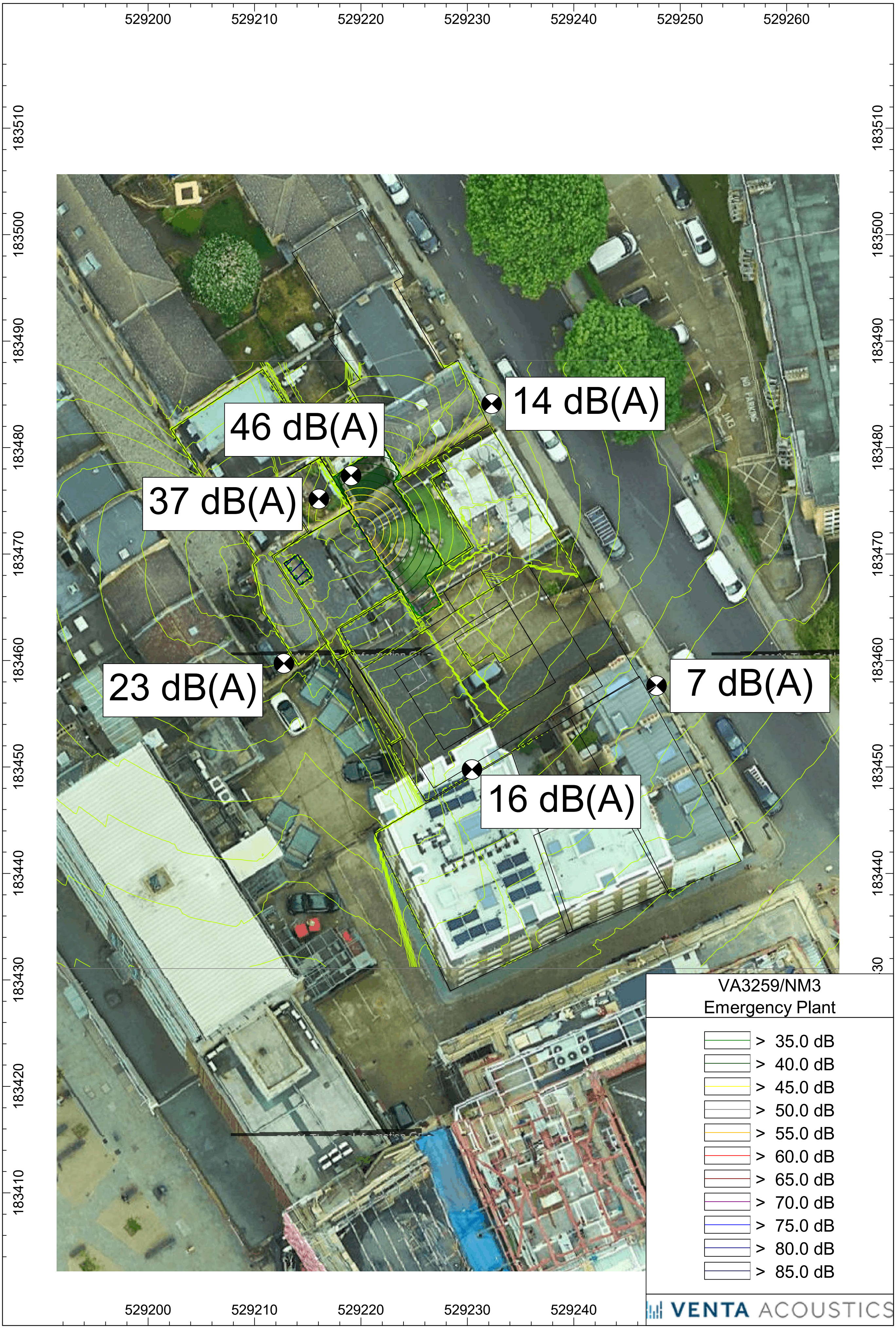
Position 2

Figure VA3259/TH12




529200
529210
529220
529230
529240
529250
529260
183510
183500
183490
183480
183470
183460
183450
183440
183430
183420
183410
20 dB(A)
22 dB(A)
22 dB(A)
17 dB(A)
22 dB(A)
27 dB(A)
VA3259/NM1
Daytime
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
VENTA ACOUSTICS


529200
529210
529220
529230
529240
529250
529260
183510
183500
183490
183480
183470
183460
183450
183440
183430
183420
183410
19 dB(A)
17 dB(A)
17 dB(A)
12 dB(A)
21 dB(A)
21 dB(A)
VA3259/NM2
Night-time
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
VENTA ACOUSTICS


529200
529210
529220
529230
529240
529250
529260
183510
183500
183490
183480
183470
183460
183450
183440
183430
183420
183410
46 dB(A)
37 dB(A)
14 dB(A)
23 dB(A)
7 dB(A)
16 dB(A)
VA3259/NM3
Emergency Plant
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
VENTA ACOUSTICS

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