Report VA3548.210330.NIA1.1

Athene House, 86 The Broadway, London

Noise Impact Assessment

30 March 2021

Caulston Limited

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Contents

Attachments

1. Introduction

An application is to be made for the change of use of the building at Athene House, 86 The Broadway, London from office to residential use under Class O of the General Permitted Development Order.

Venta Acoustics has been commissioned by Caulston Limited to undertake an assessment of the current environmental noise impact on the site and provide recommendations of acoustic mitigation where required in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the noise levels incident on the site. These levels are then used to undertake an assessment of the likely impact in accordance with Class O of the GPDO.

Outline mitigation measures are considered and an appraisal of the requirements of external building fabric elements are provided where appropriate.

2. Guidance and Legislation

2.1 Permitted Development – Class O

Class O of the General Permitted Development Order provides the following requirements.

Conditions

O.2. *(1) Development under Class O is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to—*

> *(a) transport and highways impacts of the development,*
>
> *(b) contamination risks on the site,*
>
> *(c) flooding risks on the site, and*
>
> *(d) impacts of noise from commercial premises on the intended occupiers of the development, and the provisions of paragraph W (prior approval) apply in relation to that application.*

(2) Development under Class O is permitted subject to the condition that it must be completed within a period of 3 years starting with the prior approval date.

Interpretation of Class O

O.3. *For the purposes of Class O, "commercial premises" means any premises normally used for the purpose of any commercial or industrial undertaking which existed on the date of application under* *paragraph O.2(1), and includes any premises licensed under the Licensing Act 2003(1) or any other place of public entertainment.*

Part 3, paragraph W(10)(b) of the GPDO states that the local planning authority must, when determining an application, have regard to the National Planning Policy Framework so far as relevant to the subject matter of the prior approval as if the application were a planning application.

2.2 BS4142:2014

British Standard BS4142:2014 *Methods for rating and assessing industrial and commercial sound* describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and;
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

The Standard is therefore suited to this assessment.

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the source under investigation in terms of a L_{Aeq} value over a one-hour period during daytime operation (07:00-23:00 hours) and a fifteen-minute period during night-time operation (23:00-07:00 hours).

A correction factor is added to this level to account for the acoustic character of the sound. This is determined as follows when using the subjective assessment methodology:

Tonality - For sound ranging from not tonal to prominently tonal, the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be allocated as a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity - A correction of up to +9dB can be applied for sound that is highly impulsive considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be allocated as a penalty of 3 dB for impulsivity which is just perceptible at the receiver, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other sound characteristics - Where the specific sound contains characteristics that are neither tonal nor impulsive, but are otherwise startling, disturbing or incongruous with the residual acoustic environment, a penalty of +3 dB can be applied.

Intermittency - When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.

An initial estimate of the impact of the source is then obtained by subtracting the typical background noise level, in terms of a LA90 value over the relevant period of operation, from the corrected Specific Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

2.3 The National Planning Policy Framework (2019)

The revised *National Planning Policy Framework* (NPPF), adopted in 2019, sets out the Government's planning polices for England, superseding all previous planning policy statements and guidance.

In respect of noise, the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

Hence, Paragraph 180 states that *planning policies and decisions should also ensure new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

In regards to the term adverse impact, reference is made to the Noise Policy for England:

2.4 Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) sets out the long term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

This vision is supported by the following aims:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

The terms "significant adverse" and "adverse" are related to the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect on health and quality of life can be detected.
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The guidance acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations, but will be different for different noise sources, receptors and times.

In order to enable assessment of impacts in line with these requirements, reference should be made to other currently available guidance.

2.5 WHO Guidelines for Community Noise (1999)

The guidance in this document details suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this document are shown in Table 2.1.

Criterion	Environment	Design range $L_{Aeq,T}$ dB
Maintain speech intelligibility and avoid moderate annoyance, daytime and evening	Living Room	35 dB
Prevent sleep disturbance, night time	Bedrooms	30 dB

Table 2.1 – Excerpt from WHO **[dB ref. 20µPa]**

2.6 BS8233:2014

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

The relevant section of the standard is shown below in Table 2.2.

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 2.2 – Excerpt from BS8233:2014 - Indoor ambient noise levels for dwellings [dB ref. 20µPa]

3. Site Description

As illustrated on attached site plan VA3548/SP1, the site is located on the corner of The Broadway and Hartley Avenue in an area of mixed use. The Broadway is a typical high street with surrounding premises generally having commercial use at ground floor level and residential dwellings above. To the south, across Hartley Avenue, is an apartment block with a gym at ground floor level. To the rear of the site is a pharmacy and clinic.

Immediately to the north of the site is a café with plant to the rear. This is expected to be the primary commercial noise source affecting the site. Other sources include delivery scooters associated with the pizza take away restaurant on the opposite side of The Broadway.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing noise levels at the site, a noise survey was carried out between Tuesday 9th and Thursday 11th March 2021 at the locations shown in site plan VA3548/SP1. These locations were chosen to be representative of the noise levels incident on the building as well as background noise levels in the locality.

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 on Tuesday into Wednesday with strong winds and rain on Wednesday evening and Thursday.

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-11586-E0	UCRT20/1565	29/6/20
NTi Class 1 Integrating SLM	XL2	A2A-12202-E0	UCRT21/1102	21/1/21
Larson Davis calibrator	CAL200	13069	UCRT20/1562	26/6/20

Table 4.1 – Equipment used for the survey

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 VA3548/TH1-2 for position 1 and VA3548/TH3-4 for position 2.

The site is primarily affected by traffic on The Broadway. To the north, building services plant associated with the café were noted to operate intermittently during the day.

The average noise levels for the Daytime and Night-time periods, as measured at the automated monitoring positions were:

Monitoring Period	$L_{Aeq,T}$	
	Front	North
07:00 – 23:00 hours	65 dB	55 dB
23:00 – 07:00 hours	59 dB	51 dB

Table 4.2 – Average ambient noise levels at measurement locations **[dB ref. 20µPa]**

Additional measurements were undertaken on Hartley Avenue towards the rear of the building which indicated that noise levels are some 5dB lower than measured at the front of the building.

The typical night time L_{Amax} events, generated by vehicle passbys on The Broadway, were recorded to be in the order of 76dB $L_{Amax,fast}$.

Typical background noise levels were measured as follows:

Monitoring Period	Typical[1] $L_{A90,T}$	
	Front	North
07:00 – 23:00 hours	58 dB	47dB
23:00 – 07:00 hours	45 dB	40 dB

Table 4.3 – Typical background and ambient noise levels

[1] The typical L_{A90} value is taken as the 10^{th} percentile of all L_{A90} values measured during the relevant period

4.3 Traffic Flows & COVID

Due to the current COVID travel restrictions, traffic noise captured during the noise survey may be lower than 'typical' levels, especially at the front of the site which has full view of The Broadway.

The noise assessment submitted with the planning application (ref: H/02274/12) for the apartment building on the opposite side of Hartley Avenue was reviewed to compare the historical noise levels prior to the Covid Pandemic. Noise surveys were undertaken at the neighbouring site in 2012 and the following levels were reported:

Monitoring Period	$L_{Aeq,T}$	
	Hartley Avenue (North)	Flower Lane (West)
07:00 – 23:00 hours	66 dB	68 dB
23:00 – 07:00 hours	59 dB	61 dB

Table 4.4 – Previous noise surveys in the area **[dB ref. 20µPa]**

The noise levels at the front of the building were measured to be 2-3dB higher than the current survey results.

Considering the above, the data collected during the noise survey at the front will be adjusted upwards by 3dB. At the rear, road noise is well screened, and noise from the adjacent premises building services plant are expected to control the requirements from the building envelope, which will be discussed in more detail in section 6..

5. BS4142 Commercial Noise Assessment

Noise associated with the plant at the rear of the adjacent café is relevant on the north side of the site. However, this façade has limited windows due to overlooking concerns and is likely to have primarily skylight windows.

No significant noise is associated with the pharmacy to the east other than normal vehicle movements in the small car park during the day. This noise source is congruent with the traffic noise and is not expected to be perceived as a 'commercial' impact.

To the east, the gym at ground floor level of the apartment building across Hartley Avenue was not operational during the survey. However, the noise emissions from the gym are controlled by planning conditions to protect the amenity of the apartments above. The impact on the proposed new dwellings, at a greater distance from the gym, is expected to be low.

To the west, on the opposite side of The Broadway is a pizza takeaway restaurant with delivery scooters. Review of the survey data shows no clear indication of noise from the scooters prominent against the general traffic noise. However, to provide a complete assessment, the impact of the use of scooters will be assessed.

5.1 Acoustic Character Correction

The subjective method of allocating corrections to the sound source has been used following the methodology provided in BS4142:2014 and summarised in section 2.2.

Noise Source	Subjective Description	Allocated Corrections
Building Services Plant	Operates intermittently. Survey data indicated a potential 315Hz tone	Tonality: +2 dB Impulsivity: 0 dB Intermittency: +3 dB
Scooters	Intermittent operation although congruent with general traffic noise	Tonality: 0 dB Impulsivity: 0 dB Intermittency: +3 dB

Table 5.1 – Acoustic character corrections

5.2 Rating Noise Level and Assessment

The rating noise levels at the assessment locations are compared against the relevant background noise levels to assess the notional significance of the noise impact on the proposed new dwelling at the front of the building.

Results		Relevant Clause	Commentary
Building Services Plant	L_{Aeq} 52dB	7.3.4	As measured at the window (8m)
Distance Loss (4m)	+6 dB	7.3.5	Nearest window
Specific Sound Level	L_{Aeq} 58 dB		
Continuous Operation	0 dB	7.2	
Acoustic feature correction	+5 dB	9.2	+3dB for intermittency, +2 dB for tonality
Rating level	L_{Ar} 63 dB	9.2	
Background sound level	L_{A90} 40 dB	8	Assume plant may operate at night
Excess of rating over background sound level	+23 dB	11	
Assessment indicates a significant impact		11	Depending on context
Uncertainty and Context	The survey indicated that the plant operates occasionally at night. The plant ran a few times on the second night with no activity on the first night. Although the plant did not run for more than 10 minutes at a time at night, the assessment has allowed for continuous operation to provide a robust assessment. It is likely that there will be no windows on this façade or the windows will be frosted and sealed due to over looking. Roof light windows would be screened from the plant and a lower impact would be expected.		

Table 5.2 – BS4142 Assessment – Neighbouring Plant

Results		Relevant Clause	Commentary
Delivery Scooter	SEL 57 dB(A) @10m	7.3.4	Based on Deliveroo scooter drive-bys
Distance Loss (20m)	-6 dB	7.3.5	
Assume 30 movements per hour	15 dB	7.2	
Specific Sound Level	L_{Aeq} 66 dB		
Acoustic feature correction	+3 dB	9.2	+3dB for intermittency
Rating level	L_{Ar} 69 dB	9.2	
Background sound level	L_{A90} 45 dB	8	Operational hours
Excess of rating over background sound level	+24 dB	11	
Assessment indicates a significant impact		11	Depending on context
Uncertainty and Context	The number of scooter movements has been assumed based on one movement every 2 minutes. The assessment has also assumed that deliveries occur at this frequency at night. In reality, the deliveries would primarily take place in the early evening when background noise levels are higher, leading to a lower impact. The noise of scooters is congruent with the traffic noise dominating at the front of the building and is not out of character with the locality.		

Table 5.3 – BS4142 Assessment – Delivery Scooters

These impacts are valid on the north and west façades only. The remaining façades are expected to experience a low impact due to commercial noise.

5.3 Context and Mitigation

The site is located is a mixed residential and commercial area and is intended to be developed as flats, with two balconies on the south façade at first floor level.

The impact from plant is valid on the north façade where only where small windows are envisaged, which are likely to be sealed closed.

Noise from delivery scooters is valid on the west façade only and is not expected to be prominent against the general traffic noise in the locality.

Within this context, the estimated impact of the sound sources is expected to remain valid or be slightly reduced.

The BS4142 standard aims to cover a wide variety of situations under the same base assessment methodology and so has some inherent shortcomings. To allow for this, the guidance encourages consideration of the site context as a means of adapting the base assessment to specific scenarios.

The base assessment methodology is considered to be weighted towards the more sensitive case of assessing industrial noise upon an existing residential receiver. The introduction of a new residential use to an area with existing sources of commercial noise provides an opportunity to provide appropriate mitigation against the noise sources.

The redevelopment of the site provides an opportunity to provide mitigation in the form of appropriately specified external building fabric elements. This would allow appropriate internal noise levels to be achieved such that the commercial noise source is not considered to be disruptive.

This allows the impact to be significantly reduced for occupants within the dwellings and is considered in section 6.Although two of the new dwellings have a terrace at first floor level, this is on the southern side of the building, well screened from the commercial noise sources, and so is not expected to be impacted. For the areas affected by commercial noise internal noise levels are how future residents would experience the noise.

5.4 Uncertainty

This section considers the variables in the assessment that may cause variations within the final results and describes how these have been addressed.

- Use of Class 1 sound level meters is considered to reduce instrument error to insignificant levels as compared with environmental variations. The calibration of the instrumentation was confirmed before and after the noise surveys.

- The background measurements were undertaken under suitable weather conditions over a period designed to include reasonable temporal variations in background noise levels. Two monitoring locations were selected to minimise local acoustic phenomenon that may affect a single measurement location. These measurement locations were selected to be representative of the background noise levels expected to be experienced by the proposed dwellings without being unduly influenced by extraneous noise sources.
- Although a national lockdown was implemented during the survey, sufficient data is considered to have been obtained to show typical noise levels. The lower background noise due to reduced traffic during the Covid crisis would lead to a more robust assessment.

Overall, the uncertainty is considered to have been be minimised to a suitable range so as not to risk significant variations in the impact assessment of typical operations.

6. Internal Noise Assessment

To control sound from the commercial uses, the sound insulation performance of the building glazing will be specified to control the Rating noise level (including BS4142 penalties) to below the recommended values in BS8233. This hybrid approach of assessing commercial noise with a BS4142 penalty against the BS8233 criteria (over a shortened assessment period) is endorsed in the ProPG guidance.

Although Class O of the GPDO does not require assessment of traffic noise, the following includes the glazing requirement to control external noise levels, including traffic, to BS8233 levels internally as an informative.

Noise levels have been assessed against the spectral noise data collected whilst on site, with the noise levels at the front adjusted to correlate with the higher day and night-time noise levels collected in the 2012 noise survey.

6.1 Sound Reduction Performances of Building Elements

It has been assumed that all the non-glazed elements, i.e. walls and roof systems, will be capable of providing the following minimum sound insulation performance, when tested in accordance with BS EN ISO 10140-2:2010 *Acoustics - Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation*.

Building Element	Single figure weighted sound reduction index, dB
Masonry	R_w 51

Table 6.1 – Assumed sound reductions performances of non-glazed elements

6.2 Sound Reduction Performance of Windowsets and Vents

The following glazing specification is recommended:

Glazing Location	Required Glazing SRI, dB	Ventilator Performance, dB
North Façade	R_w 27 dB	$D_{n,e,w}$ 35 dB
East & South – Bedroom	R_w 27 dB	$D_{n,e,w}$ 35 dB
East & South – Living Room	R_w 27 dB	$D_{n,e,w}$ 35 dB
West - Bedroom	R_w 40 dB	$D_{n,e,w}$ 40 dB
West – Living Room	R_w 37 dB	$D_{n,e,w}$ 40 dB

Table 6.2 – Required minimum sound reduction indices for glazing and ventilators

It is important that the performance shown in Table 6.2 are achieved by the entire windowset including frames, ventilators, seals, etc. Glass performance alone would not be likely to show compliance with the specification as the other elements typically provide the weakest noise transmission path.

With the above recommendations implemented, the noise levels within the proposed dwellings would be expected to be in line with recommendations given in the WHO 1999 and BS8233:2014 guidance. Internal noise levels can therefore be considered to be between the NOEL the LOAEL levels.

6.3 Ventilation

With windows partially open, internal noise levels would exceed the recommended levels.

In order that windows may remain closed to maintain the internal noise levels, it is expected that attenuated means of background ventilation will be required. If trickle vents are used the performance shown in Table 6.2 will be required. The figures stated are for a single vent per room. If multiple vents are required, then the performance requirement shown in Table 6.2 will increase by a value equal to +10log(*N*), with N being the total number of vents serving the room.

The ventilator performances provided would need to be achieved with the vents open. Should this performance not be achievable, a mechanical ventilation solution may be required.

The ventilation scheme for the dwellings should ensure that the appropriate air changes can be achieved, in line with Part F of the building regulations and with consideration of summer overheating, without reliance on windows being open.

It should be noted that there is no reason why windows could not be opened as a matter of personal preference or for purge ventilation.

6.4 Appraisal of Existing Glazing

During site visits, an appraisal of the current glazing performance of the windows was undertaken. Simultaneous measurements were undertaken 1m outside a window and 1m from the window inside the building. The results of the measurement exercise are summarised below.

Window Location	In-Situ Sound Reduction Performance
Front Facade	27 dB(A)

Table 6.3 – Measured sound reduction of window (L_{Aeq} outside to inside)

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	D_w
Existing Window	24	25	20	26	28	28	33	25	27

Table 6.4 – Spectral Sound Reduction Index

The existing glazing at the front of the building (curtain walling) does not meet the requirements to control traffic or commercial noise. It is recommended that this is uprated to the values provided in Table 6.2.

Although the glazing on the remaining facades was not tested, the required sound insulation value of R_w 27dB is typically provided by standard thermal double glazing.

7. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the prevailing noise climate in the locality of Athene House, 86 The Broadway, London in support of an application for change of use from office to residential.

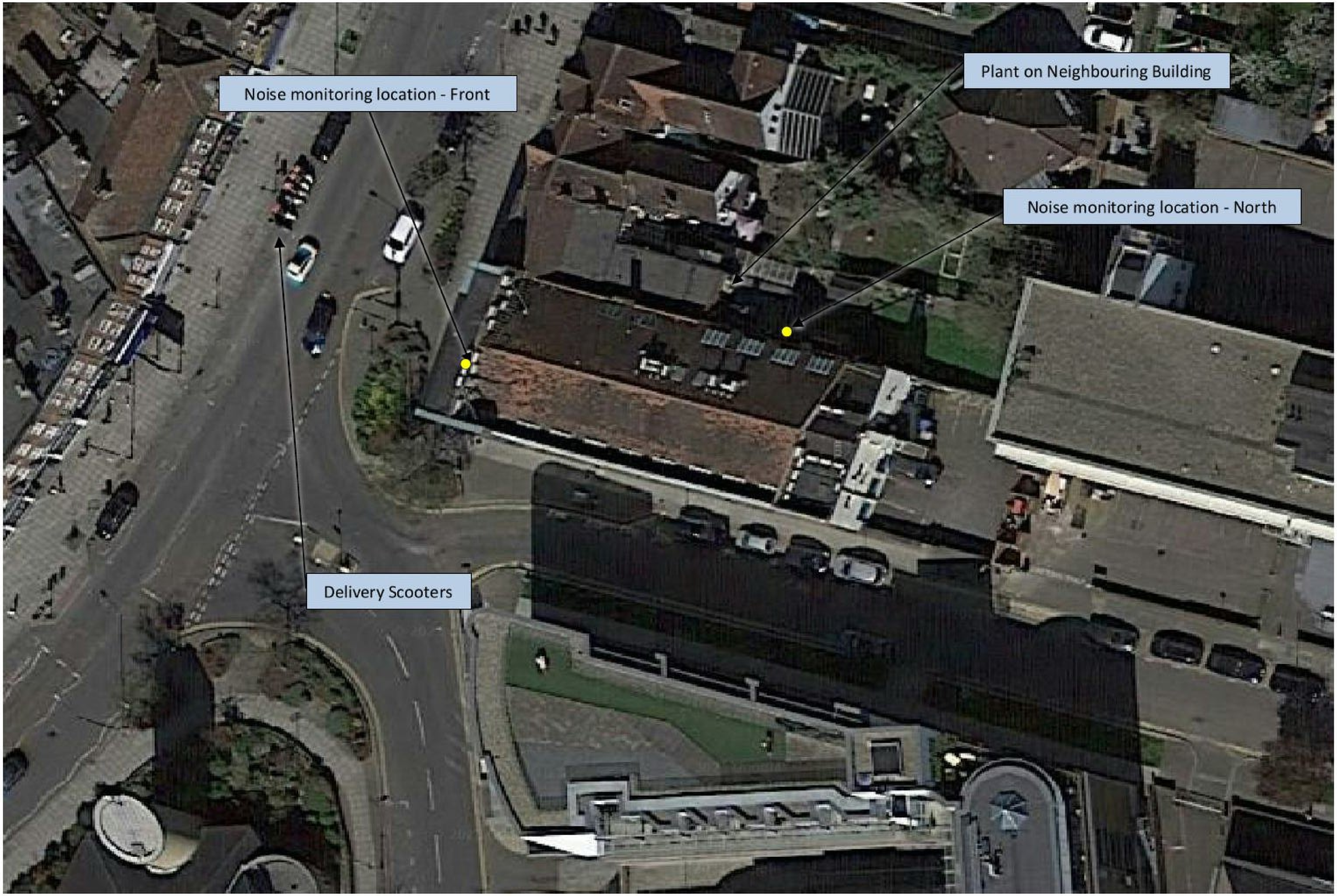
The commercial noise impact on the site has been assessed as required under Class O of the GPDO.

Noise from building services plant to the north and delivery scooters to the west are shown to have an adverse impact when assessed outside the building. However, there are no external amenity areas on these façades, and it has been demonstrated how these levels can be controlled to represent a low impact through appropriate specification of the external building fabric.

Although not required under Class O, indicative glazing performances have been provided to control traffic noise to meet the guidelines provided in BS8233.

The proposed scheme is not expected to experience a significant adverse noise impact and the site is considered acceptable for the proposed residential use.

Steven Liddell MIOA


Noise monitoring location - Front
Plant on Neighbouring Building
Noise monitoring location - North
Delivery Scooters

Athene House, 86 The Broadway, London

Environmental Noise Time History: 1

Front

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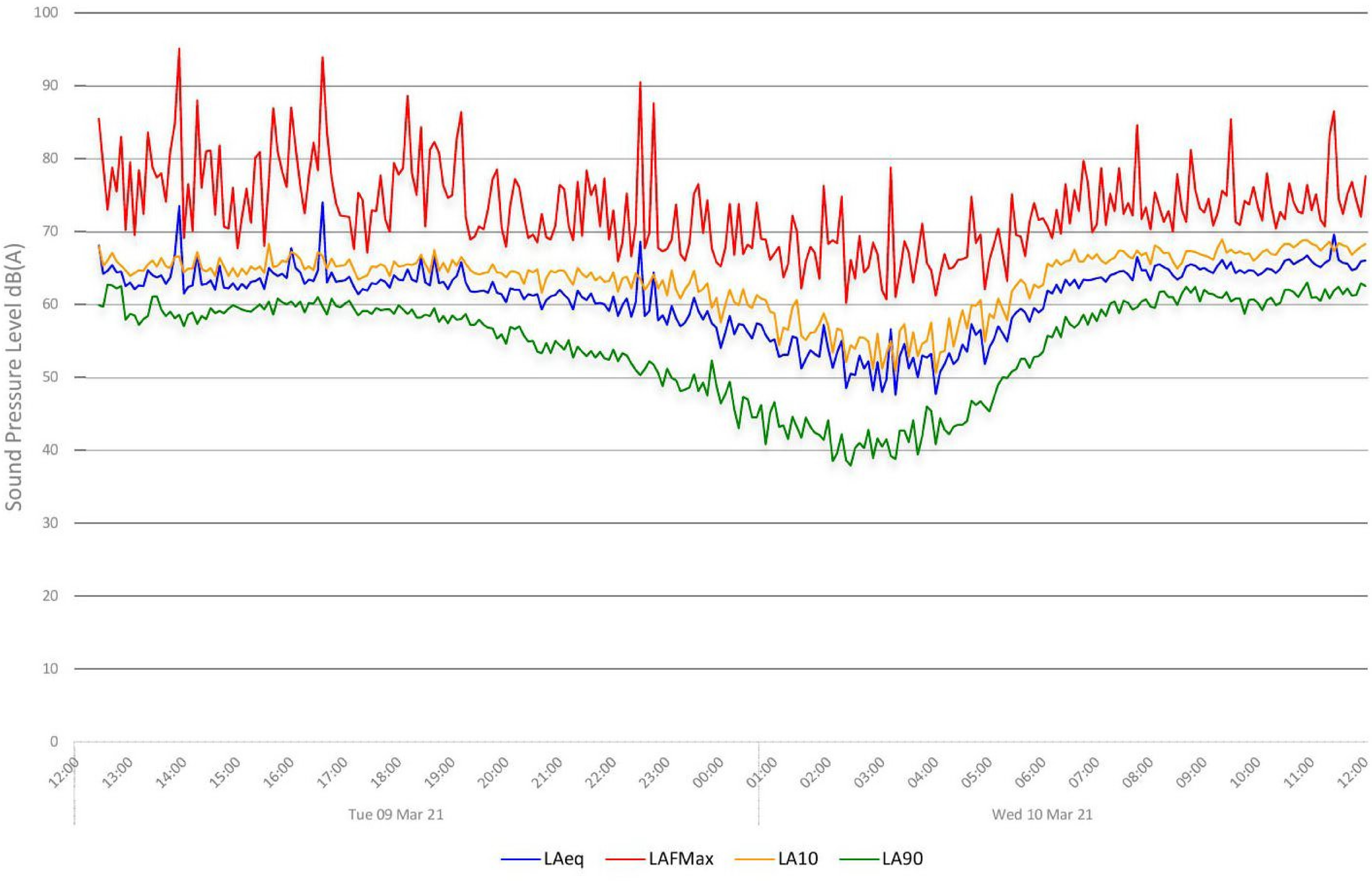
Figure VA3548/TH1

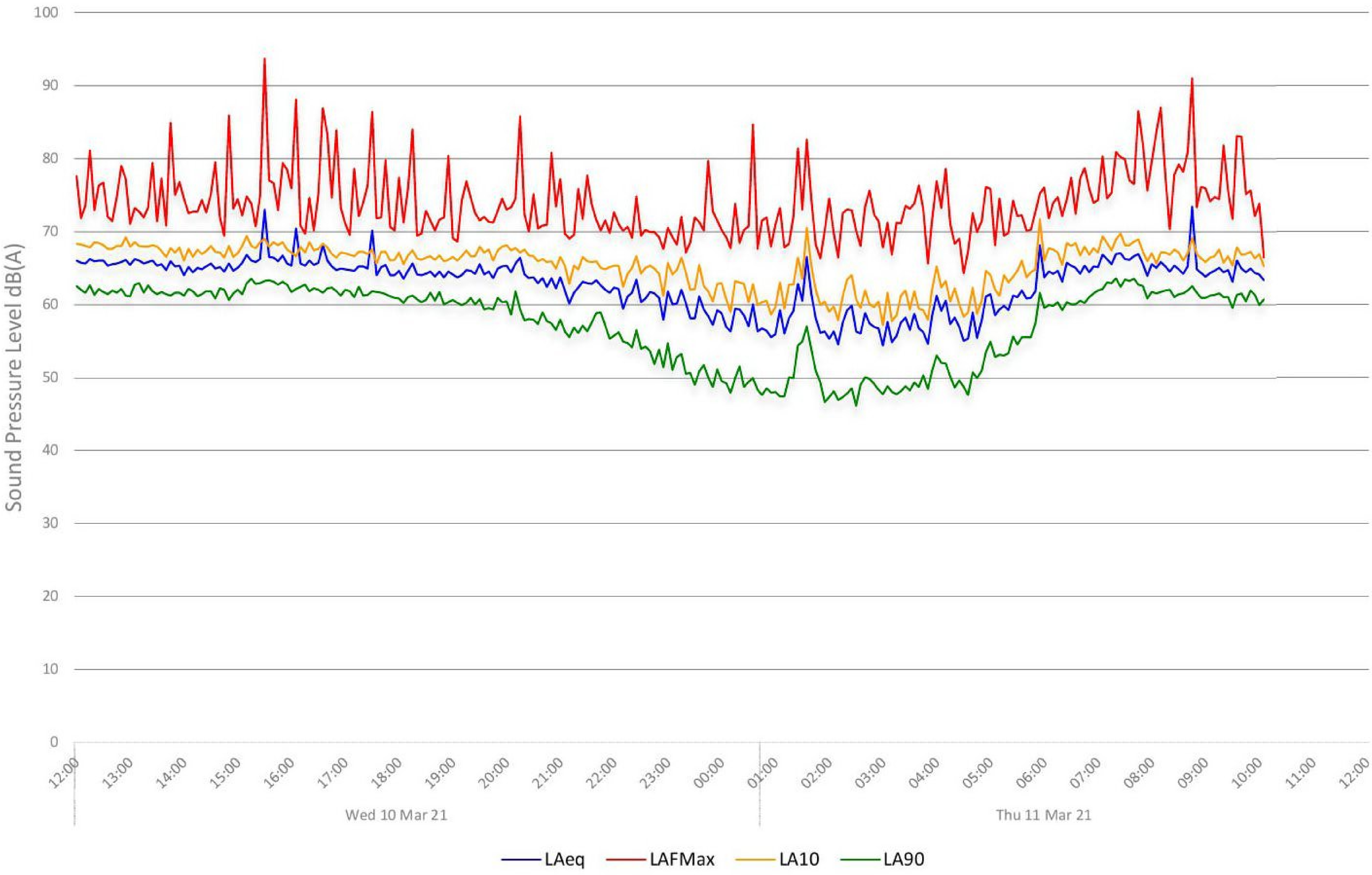


Athene House, 86 The Broadway, London

Environmental Noise Time History: 2

Front

Figure VA3548/TH2



Athene House, 86 The Broadway, London

Environmental Noise Time History: 3

North Facade

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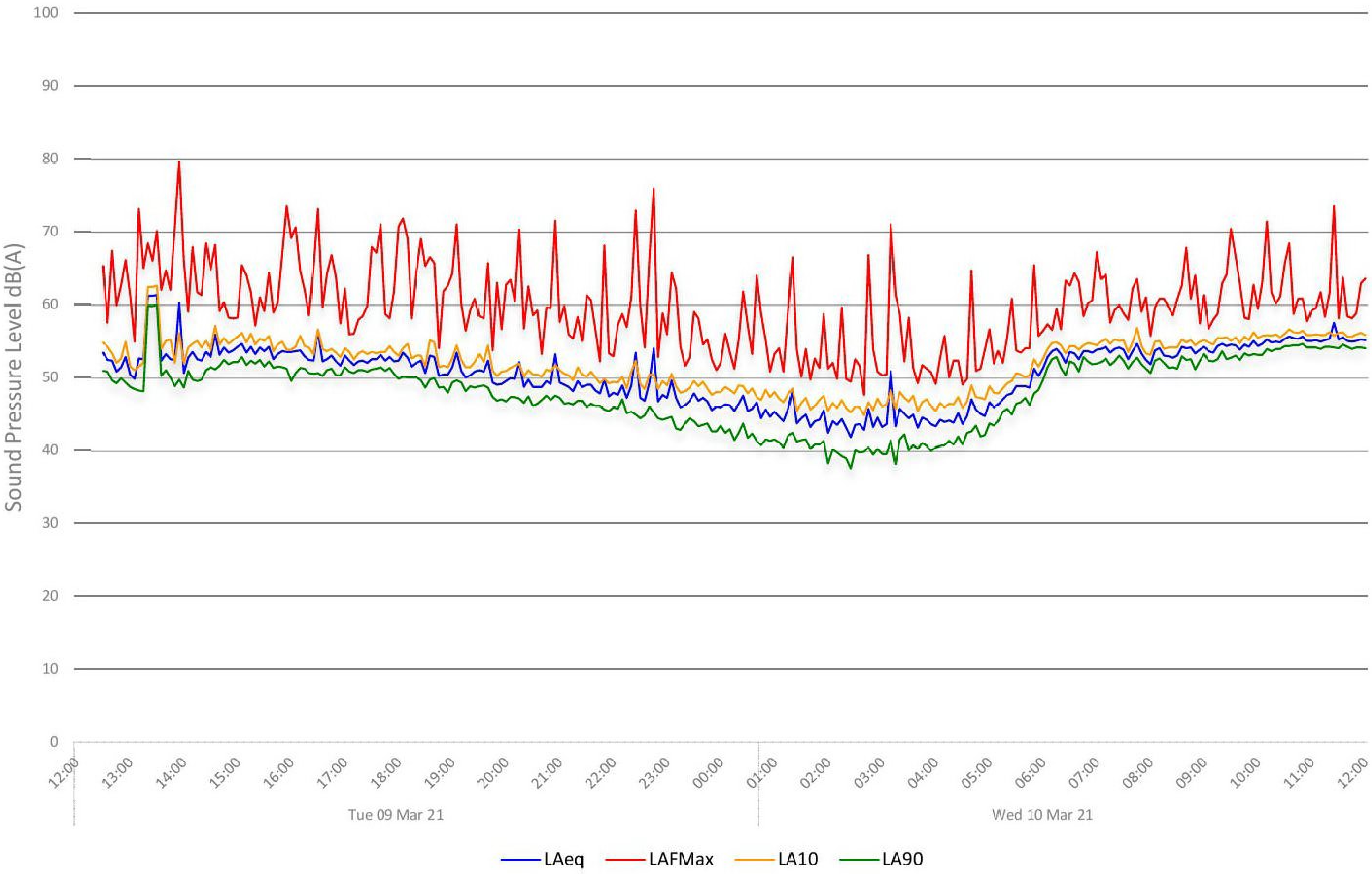
Figure VA3548/TH3



Athene House, 86 The Broadway, London

Environmental Noise Time History: 4

North Facade

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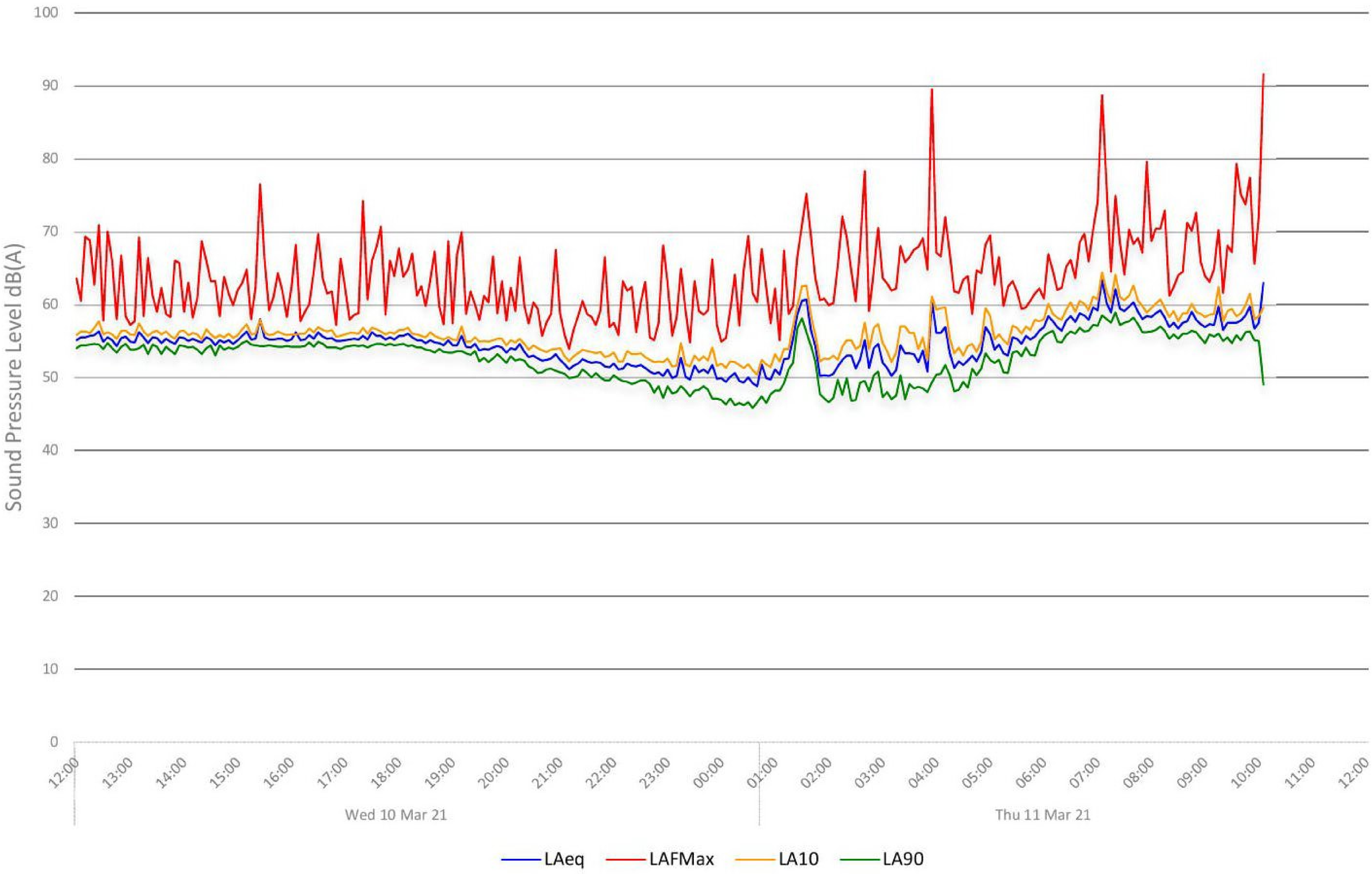
Figure VA3548/TH4



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

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

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

External Building Fabric Calculations

BS8233 Calculation of Noise Break-in

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: North Façade Bedroom

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	1.2
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	7.1
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished bedroom: VA
K	Façade correction	-3.0

	Term	Term Description	Description	Octave Band Centre Frequency						dB(A)
				125	250	500	1000	2000	4000	
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	65	65	58	57	53	45	62
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw27 BS8233 Example - 6-12-6 insulated glass unit	26	29	33	28	24	100	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00036	0.00018	0.00007	0.00023	0.00058	0.00000	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00007	0.00004	0.00001	0.00001	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-31	-32	-32	-33	-30	-31	
	A	Equivalent Absorption Area		17	16	14	15	16	16	
G		10log(S/A)		-3	-3	-2	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{eq}	**Internal Noise Level**	(F + G + H)	31	30	23	22	20	10	**28 dB(A)**

BS8233 Calculation of Noise Break-in

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: South Façade Bedroom

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	1.8
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	6.5
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished bedroom: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency						
				125	250	500	1000	2000	4000	dB(A)
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	61	56	54	55	52	46	59
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw27 BS8233 Example - 6-12-6 insulated glass unit	26	29	33	28	24	100	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00055	0.00027	0.00011	0.00034	0.00087	0.00000	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00006	0.00004	0.00001	0.00001	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-30	-32	-32	-32	-29	-31	
	A	Equivalent Absorption Area		17	16	14	15	16	16	
G		10log(S/A)		-3	-3	-2	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{eq}	**Internal Noise Level**	(F + G + H)	31	24	23	24	23	14	**28 dB(A)**

BS8233 Calculation of Noise Break-in - Maximum Events

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: South Façade Bedroom

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	1.8
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	6.5
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished bedroom: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency						
				125	250	500	1000	2000	4000	dB(A)
A	$L_{max,ff}$	Free-field L_{max} outside room	Enter the Octave Band L_{max} Data	82	74	72	70	68	63	76
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw27 BS8233 Example - 6-12-6 insulated glass unit	26	29	33	28	24	100	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00055	0.00027	0.00011	0.00034	0.00087	0.00000	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00006	0.00004	0.00001	0.00001	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-30	-32	-32	-32	-29	-31	
	A	Equivalent Absorption Area		17	16	14	15	16	16	
G		10log(S/A)		-3	-3	-2	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{max}	**Internal Maximum Noise Level**	(F + G + H)	52	43	40	39	39	31	**45 dB(A)**

BS8233 Calculation of Noise Break-in

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: South Façade Living Room

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	1.8
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	6.5
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished Living Room: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency						
				125	250	500	1000	2000	4000	dB(A)
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	67	61	60	62	59	54	66
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw27 BS8233 Example - 6-12-6 insulated glass unit	26	29	33	28	24	100	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00055	0.00027	0.00011	0.00034	0.00087	0.00000	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00006	0.00004	0.00001	0.00001	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-30	-32	-32	-32	-29	-31	
	A	Equivalent Absorption Area		20	16	15	16	16	16	
G		10log(S/A)		-4	-3	-3	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{eq}	**Internal Noise Level**	(F + G + H)	36	30	28	30	31	23	**35 dB(A)**

BS8233 Calculation of Noise Break-in

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: West Façade Bedroom

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	8.3
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	0.0
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished bedroom: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency						dB(A)
				125	250	500	1000	2000	4000	
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	63	58	56	57	54	48	61
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw40 VA 6-12-8.8	26	29	39	42	42	46	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00251	0.00126	0.00013	0.00006	0.00006	0.00003	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-25	-28	-32	-34	-33	-31	
	A	Equivalent Absorption Area		17	16	14	15	16	16	
G		10log(S/A)		-3	-3	-2	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{eq}	**Internal Noise Level**	(F + G + H)	38	30	25	23	21	17	**29 dB(A)**

BS8233 Calculation of Noise Break-in - Maximum Events

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: West Façade Bedroom

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	8.3
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	0.0
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished bedroom: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency 125	250	500	1000	2000	4000	dB(A)
A	$L_{max,ff}$	Free-field L_{max} outside room	Enter the Octave Band L_{max} Data	82	74	72	70	68	63	76
	$D_{n,e}$	Insulation of the trickle vent	35dB Trickle vent with direct air path (from Draft Part E)	35	35	34	36	34	32	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00038	0.00038	0.00048	0.00030	0.00048	0.00076	
	R_{wi}	SRI of the window	Rw40 VA 6-12-8.8	26	29	39	42	42	46	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00251	0.00126	0.00013	0.00006	0.00006	0.00003	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-25	-28	-32	-34	-33	-31	
	A	Equivalent Absorption Area		17	16	14	15	16	16	
G		10log(S/A)		-3	-3	-2	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{max}	**Internal Maximum Noise Level**	(F + G + H)	56	46	40	36	35	32	**45 dB(A)**

BS8233 Calculation of Noise Break-in

V2.4

Project Number: 3548

Project Name: Athene House, 86 The Broadway, London

Description: West Façade Living Room

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	8.3
S_{wi}	Area of the windows (m^2)	8.3
S_{rr}	Area of the ceiling (m^2)	0.0
S_{ew}	Area of the external wall (m^2)	0.0
S	Area of facade and roof	8.3
x	Room Dimension x	3.6
y	Room Dimension y	4.1
z	Room Dimension z	2.3
RT	Receiving Room RT	Typical furnished Living Room: VA
K	Façade correction	0.0

	Term	Term Description	Description	Octave Band Centre Frequency 125	250	500	1000	2000	4000	dB(A)
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	69	63	62	64	61	56	68
	$D_{n,e}$	Insulation of the trickle vent	40dB Renson Invisivent 102cm²	36	30	34	42	49	51	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00030	0.00121	0.00048	0.00008	0.00002	0.00001	
	R_{wi}	SRI of the window	Rw37 VA 10-40-6 sealed	28	29	35	38	39	44	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00158	0.00126	0.00032	0.00016	0.00013	0.00004	
	R_{ew}	SRI of the external wall	Rw51 Typical Cavity Wall	41	43	48	50	55	55	
D		$\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling								
E		$\frac{S_{rr}}{S}10^{\frac{-Rrr}{10}}$		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-27	-26	-31	-36	-39	-43	
	A	Equivalent Absorption Area		20	16	15	16	16	16	
G		10log(S/A)		-4	-3	-3	-3	-3	-3	
H	3	Correction Factor		3	3	3	3	3	3	
	L_{eq}	**Internal Noise Level**	(F + G + H)	41	37	31	28	23	13	**34 dB(A)**

CERTIFICATE OF CALIBRATION

MEASUREMENT SYSTEMS

0653

Date of Issue: 29 June 2020

Certificate Number: UCRT20/1565

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

[redacted]

B. Bogdan

Customer: Venta Acoustics
73 Westman Road
Winchester
SO22 6DX

Order No.: Jamie Duncan

Description: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification:

Manufacturer	Instrument	Type	Serial No. / Version
NTi	Sound Level Meter	XL2-TA	A2A-11586-E0
NTi	Firmware		4.21
NTi	Pre Amplifier	MA220	6035
NTi	Microphone	MC230A	A16376
Larson Davis	Calibrator	CAL200	13069
	Calibrator adaptor type if applicable		N/A

Performance Class: 1

Test Procedure: TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013: Yes
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received: 26 June 2020 ANV Job No. UKAS20/06328

Date Calibrated: 29 June 2020

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	Dated	Certificate No.	Laboratory
	07 June 2018	UCRT18/1582	0653

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number
UCRT20/1565

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	XL2-TA Handheld Audio and Acoustic Analyser		
SLM instruction manual ref / issue	4.21.02/23 July 2019	Source	NTi
Date provided or internet download date	05 December 2019		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013 | YES

Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	N/A		
Calibrator cal. date	26 June 2020		
Calibrator cert. number	UCRT20/1562		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	114.15	dB	Calibration reference sound pressure level
Calibrator frequency	1000.00	Hz	Calibration check frequency
Reference level range	Mid 20 - 120	dB	

Accessories used or corrected for during calibration - None

Environmental conditions during tests	Start	End			
Temperature	22.69	22.95	±	0.30	°C
Humidity	52.6	53.5	±	3.00	%RH
Ambient Pressure	99.78	99.79	±	0.03	kPa

Indication at the Calibration Check Frequency

Initial indicated level	114.1	dB	Adjusted indicated level	114.0	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10	dB

Self Generated Noise

Microphone installed - Less Than 19.6 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	10.2	dB	UR	13.9	dB	UR	21.5	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

.... END ....

Calibrated by: B. Giles R 2

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
Electrical tests were completed with a nominal microphone sensitivity of 42 mV/Pa as specified in the users manual.

CERTIFICATE OF CALIBRATION

ANV MEASUREMENT SYSTEMS

0653

Date of Issue: 21 January 2021

Certificate Number: UCRT21/1102

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory [redacted]

B. Giles

Customer: Venta Acoustics Ltd
73 Westman Road
Winchester
Hampshire
SO22 6DX

Order No.: Venta Acoustics

Description: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification:

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
NTi	Sound Level Meter	XL2-TA	A2A-12202-E0
NTi	Firmware		3.11
NTi	Pre Amplifier	MA220	6248
NTi	Microphone	MC230	9273
Brüel & Kjær	Calibrator	4231	C001
	Calibrator adaptor type if applicable		UC 0210

Performance Class: 1

Test Procedure: TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013: Yes
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received: 20 January 2021 ANV Job No. UKAS21/01047

Date Calibrated: 21 January 2021

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	04 January 2019	UCRT19/1017	0653

CERTIFICATE OF CALIBRATION

Certificate Number **UCRT21/1102**

UKAS Accredited Calibration Laboratory No. 0653

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	XL2-TA Handheld Audio and Acoustic Analyser		
SLM instruction manual ref / issue	4.21.02/23 July 2019	Source	NTi
Date provided or internet download date	05 December 2019		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013 YES

Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Lab Calibrator		
Calibrator adaptor type if applicable	UC 0210		
Calibrator cal. date	07 January 2021		
Calibrator cert. number	UCRT21/1030		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	114.11	dB	Calibration reference sound pressure level
Calibrator frequency	999.84	Hz	Calibration check frequency
Reference level range	Mid 20 - 120	dB	

Accessories used or corrected for during calibration - None

Environmental conditions during tests	Start	End		
Temperature	23.99	24.06	±	0.30 °C
Humidity	34.7	33.1	±	3.00 %RH
Ambient Pressure	97.46	97.42	±	0.03 kPa

Indication at the Calibration Check Frequency

Initial indicated level	113.8	dB	Adjusted indicated level	113.9	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10	dB

Self Generated Noise

Microphone installed - Less Than 18.9 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	8.2	dB	UR	12.1	dB	UR	19.5	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

.... END ....

Calibrated by: B. Bogdan R 2

Additional Comments The results on this certificate only relate to the items calibrated as identified above. Electrical tests were completed with a nominal microphone sensitivity of 42 mV/Pa as specified in the users manual. The meter was supplied with a Larson Davis CAL200 sound calibrator, serial number 13049. For information only, once the meter was adjusted to read correctly in response to the laboratory calibrator the CAL200 was applied and produced a reading of 113.9 dB in calibration mode.