

Report VA3706.220629.AA

Joynes House, New Road, Gravesend

Noise Impact Assessment
Class AA - Vertical Extension

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VA3706/SP1	Indicative Site Plan
VA3706/TH1-TH8	Environmental Noise Time Histories
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1. Introduction

An application is being made for a Class AA Upwards Extension of Joynes House, New Road, Gravesend to provide a two new storeys of residential dwellings at fifth and sixth floor level.

Venta Acoustics has been commissioned by Joynes House Development 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 the application.

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 AA of the GPDO.

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

All staff at Venta Acoustics are fully qualified and members of the Institute of Acoustics, the recognised UK professional body for acoustics, noise and vibration professionals and are fully competent to undertake BS4142 assessments.

2. Guidance and Legislation

2.1 Permitted Development – Class AA

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

Conditions

AA.2.—(1) Where any development under Class AA is proposed, development is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for prior approval of the authority as to—

- (a) transport and highways impacts of the development;*
- (b) air traffic and defence asset impacts of the development;*
- (c) contamination risks in relation to the building;*
- (d) flooding risks in relation to the building;*
- (e) the external appearance of the building, including—*
 - (i) the design and architectural features of —*
 - (aa) the principal elevation; and*

(bb) any side elevation that fronts a highway; and

(ii) the impact of any works under sub-paragraph (1)(c) or (d) of Class AA;

(f) the provision of adequate natural light in all habitable rooms of the new dwellinghouses;

(g) impact on the amenity of the existing building and neighbouring premises including overlooking, privacy and the loss of light;

(h) impacts of noise from any commercial premises on the intended occupiers of the new dwellinghouses;

(i) impacts of the introduction of, or an increase in, a residential use of premises in the area on the carrying on of any trade, business or other use of land in the area;

(j) whether, because of the siting of the building, the development will impact on a protected view identified in the Directions Relating to Protected Vistas dated 15th March 2012(12) issued by the Secretary of State,

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+A1:2019

British Standard BS4142:2014+A1:2019 *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 fixed installations comprising mechanical and/or electrical plant and equipment;

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the source under investigation. A correction factor is added to this level to account for the acoustic character of the sound as follows:

Tonality – A correction of up to 6dB depending on the prominence of tones;

Impulsivity - A correction of up to 9dB depending on the prominence of impulsivity;

Other sound characteristics - A 3dB correction may be applied where a distinctive acoustic character is present that is neither tonal nor impulsive;

Intermittency - A 3dB correction may be applied where the specific sound has identifiable on/off conditions.

An estimate of the impact of the source is obtained by subtracting the typical background noise level 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.

2.3 The National Planning Policy Framework (2021)

The revised *National Planning Policy Framework* (NPPF), published in July 2021, sets out the Government's planning policies 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 185 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]

This guidance also states:

For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times a night (Vallet & Vernet 1991).

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 LAeq, 16 hour	-
Dining	Dining Room	40 dB LAeq, 16 hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 hour	30 dB LAeq, 8 hour

Table 2.2 – Excerpt from BS8233:2014 - Indoor ambient noise levels for dwellings

[dB ref. 20µPa]

3. Site Description

The building is located on the corner of New Road and Darnley Road. The site is bordered by residential dwellings to the west, Gravesend Adult Education Centre to the south, and shops to the north on New Road and shops and two public houses to the east on Darnley Road. Further to the south is the railway station.

The local area is mixed commercial and retail in nature, with an Iceland supermarket opposite, with the delivery bay to the rear of the premises. The two public houses do not have beer gardens facing Joynes House. There is a loading area marked on New Road opposite Joynes House.

Considering the lack of nearby commercial noise sources, road noise is expected to dominate in the area, with the occasional delivery in the loading bay on New Road being the only expected source of commercial noise affecting the building.

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 Thursday 17th and Monday 21st June 2021 at the locations shown in site plan VA3706/SP1. These locations were chosen to be representative of the ambient and background noise level at the most affected noise sensitive receivers.

Continuous 5-minute samples of the LAeq, LAmax, LA10 and LA90 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-11586-E0	UCRT20/1565	29/6/20
NTi Class 1 Integrating SLM	XL2	A2A-15993-E0	UCRT21/1390	22/3/21
Larson Davis calibrator	CAL200	13049	UCRT21/1385	22/3/21

Table 4.1 – Equipment used for the survey

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

5. Results

The measured sound levels are shown as time-history plots on the attached charts VA3706/TH1-4 for position 1 and VA3706/TH5-8 for position 2.

The ambient and background noise level are determined by road traffic on the surrounding roads.

The average ambient and typical background noise levels measured are summarised in Table 5.1.

Monitoring Period	Position 1 (New Road)		Position 2 (Rear)	
	L _{Aeq,T}	Typical ¹ L _{A90,5min}	L _{Aeq,T}	Typical ¹ L _{A90,5min}
07:00 – 23:00 hours	66 dB	53 dB	63 dB	48 dB
23:00 – 07:00 hours	60 dB	42 dB	56 dB	39 dB

Table 5.1 – Average ambient and typical background noise levels

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

6. BS4142 Noise Impact Assessment

An assessment of a lorry unloading outside the shops on New Road has been undertaken to the nearest point at fifth floor level on the front façade of the building. This would be the location with the highest potential for impact, with all other apartments exposed to lower levels, and hence having a lower risk of impact from commercial noise.

6.1 Source Noise Levels

The following source noise levels have been used for the assessment.

Noise Source	Measurement Location	Measured L _{Aeq}	Notes
Lorry loading/ unloading	5m	61dB	During shop daytime hours

Table 6.1 – Noise sources used for assessment

6.2 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
Lorry unloading/loading	Impulsive noise from occasional bangs, clatters, from loading. Intermittent nature of deliveries.	Tonality: 0dB Impulsivity: +3dB Intermittency: +3dB

Table 6.2 – Acoustic character corrections

These penalties are applied to the specific noise level in section 6.3 to obtain the rating noise level.

6.3 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 as follows. Operations are adjusted to the appropriate on times.

Results		Relevant Clause	Commentary
Lorry unloading/loading	L _{Aeq} 61dB	7.3.4	
Distance Loss (27m)	-15 dB	7.3.5	
Specific Sound Level	L _{Aeq} 46 dB		
15 minutes per hour	-6 dB	7.2	
Acoustic feature correction	+6 dB	9.2	+3dB for impulsivity, +3dB for intermittency
Rating level	L _{Ar} 46 dB	9.2	
Background sound level	L _{A90} 53 dB	8	Shop hours
Excess of rating over background sound level	-7 dB	11	
Assessment indicates a low impact		11	Depending on context

Table 6.3 – BS4142 Assessment – Lorry loading/unloading

6.4 Context

The site is located in a mixed retail and commercial area.

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

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, although considering the level of impact indicated in this situation, this would be considered unnecessary.

6.5 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, including a weekend period. 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.
- Where library data has been used, propagation calculations have been used to correct noise levels to the relevant distance at the receiver.

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

7. Internal Noise Assessment

Class AA applications only take into consideration commercial and industrial noise sources affecting potential new receivers, and does not include for traffic noise.

However, as an informative to the client and provide good acoustic design (as recommended by the ProPG guidance) an assessment of the external building fabric performance has been undertaken with regards to road noise against BS8233 and the WHO Guidelines, which can be utilised in the scheme should the developer wish to do so. It should be highlighted, that this is advisory and not part of the part AA application.

7.1 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
Lightweight Façade System	R _w 47

Table 7.1 – Assumed sound reductions performances of non-glazed elements

7.2 Sound Reduction Performance of Windowsets and Vents

The monitoring data has been used to calculate the required sound insulation performance for the windowsets (glazing and frame combination) and open ventilators for the building. These are summarised in Table 7.2 below.

Glazing Location	Required Glazing SRI, dB	Ventilator Performance, dB
New Road & Darnley Road, Living Rooms & Bedrooms	R_w 36	$D_{n,e,w}$ 38
New Road & Darnley Road, Bedrooms	R_w 39	$D_{n,e,w}$ 42
South & West Living Rooms	R_w 33	$D_{n,e,w}$ 33
South & West Bedrooms	R_w 34	$D_{n,e,w}$ 35

Table 7.2 – Required minimum sound reduction indices for glazing and ventilators

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 at the front of the building. If trickle vents are used the performance shown in Table 7.2 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 7.2 will increase by a value equal to $+10\log(N)$, with N being the total number of vents serving the room. 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.

7.3 Windowset Performances

It is important that the performance shown in Table 7.2 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.

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.

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.

8. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of Joynes House, New Road, Gravesend.

The measured levels have been assessed against BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, the National Planning Policy Framework and currently available standards and guidance documents including World Health Organisation *Guidelines for Community Noise* (1999) and BS8233:2014 *Guidance on sound Insulation and noise*.

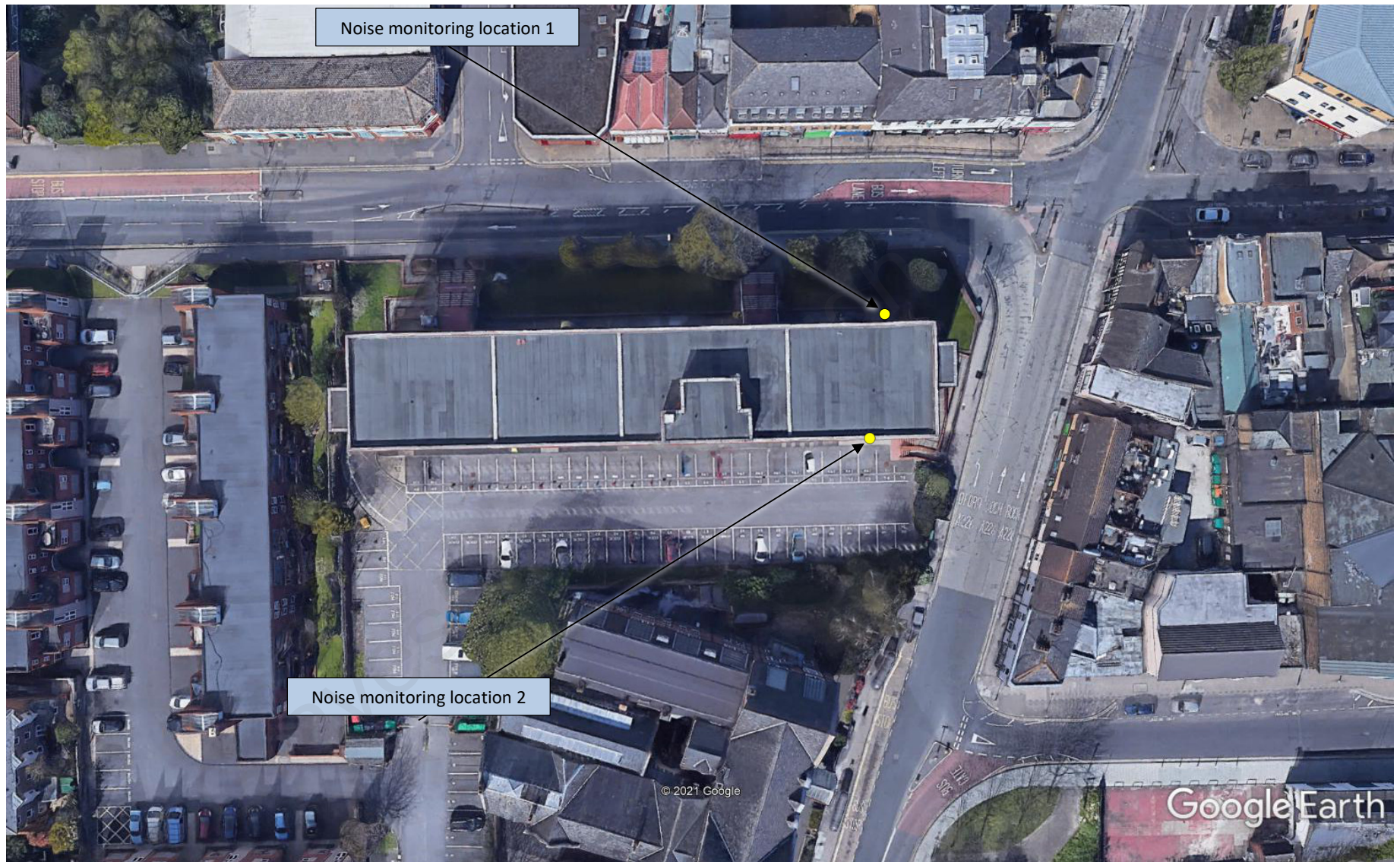
When assessed using BS4142, noise from nearby deliveries have been shown to have a low impact.

An advisory discussion of potential mitigation in the form of building envelope performance has been included and through the use of this, external traffic noise levels can be mitigated to

acceptable noise levels in the new dwellings, although this is not required under the class AA application.

With the recommended measures in place, the proposed scheme is not expected to experience a significant adverse noise impact and the site is considered acceptable for the proposed residential use under the requirements of class AA of the GPDO.

Jamie Duncan MIOA



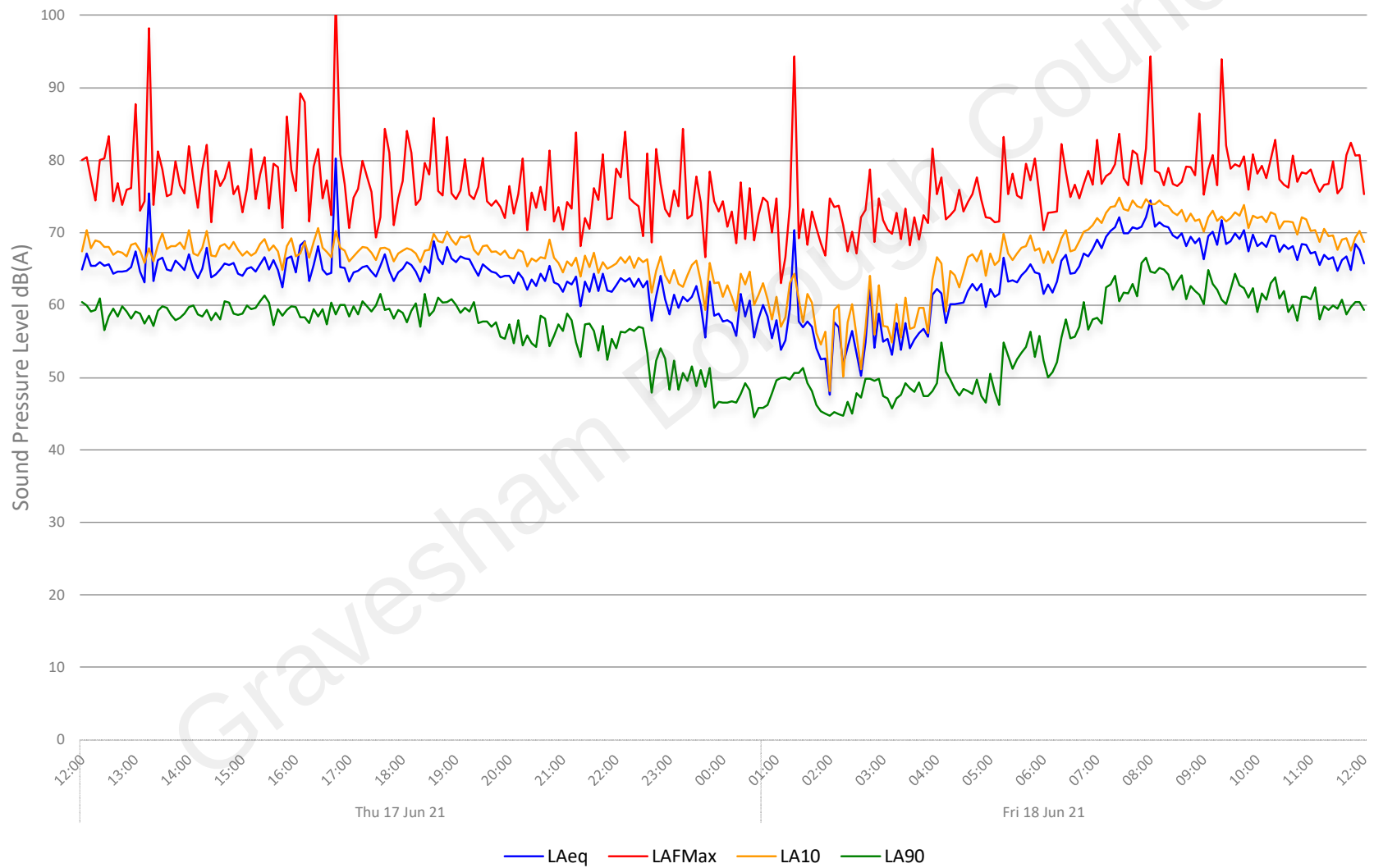
Joynes House, New Road, Gravesend

Environmental Noise Time History: 1

Position 1

 **VENTA** ACOUSTICS

Figure VA3706/TH1



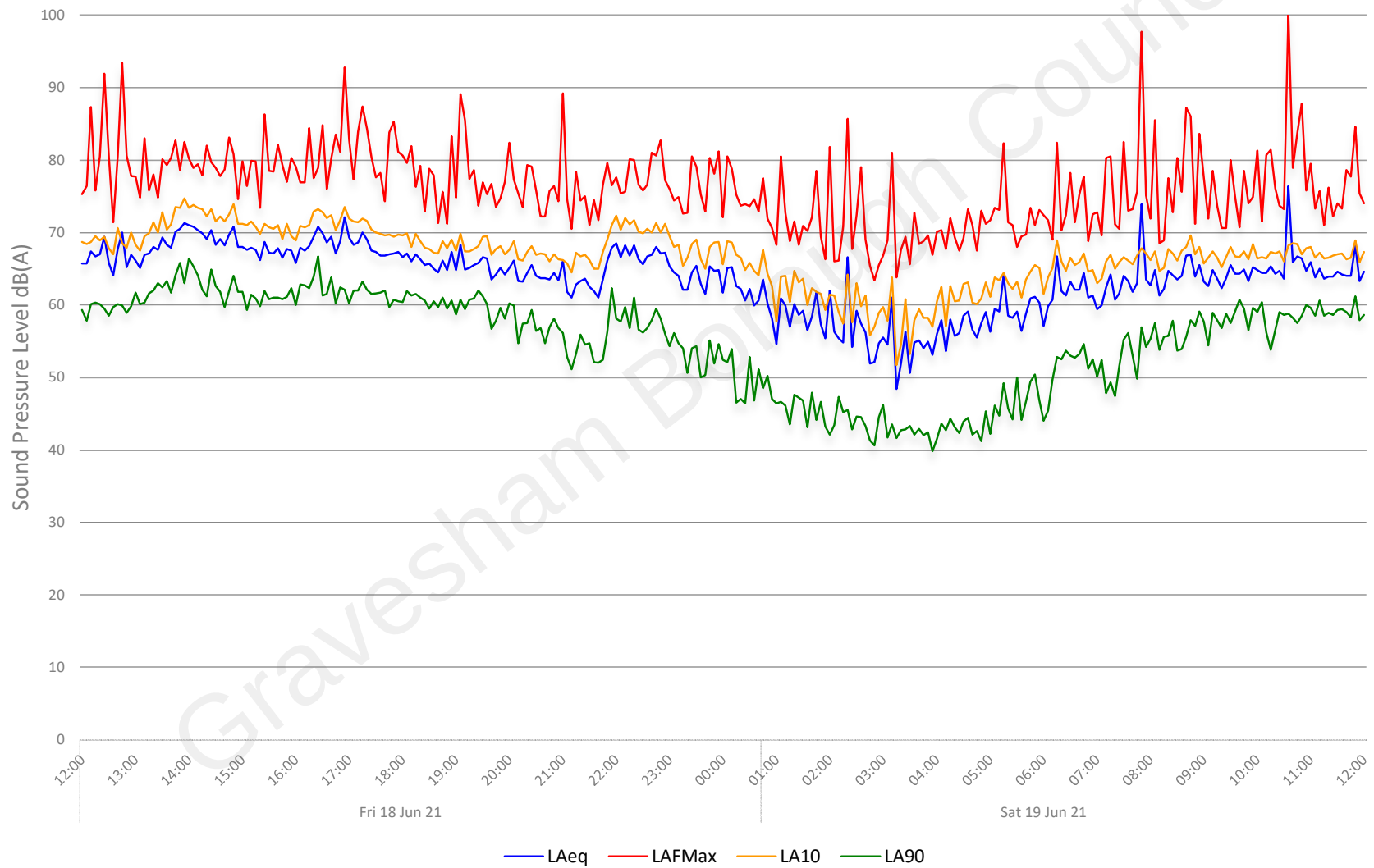
Joynes House, New Road, Gravesend

Environmental Noise Time History: 2

Position 1

 **VENTA** ACOUSTICS

Figure VA3706/TH2



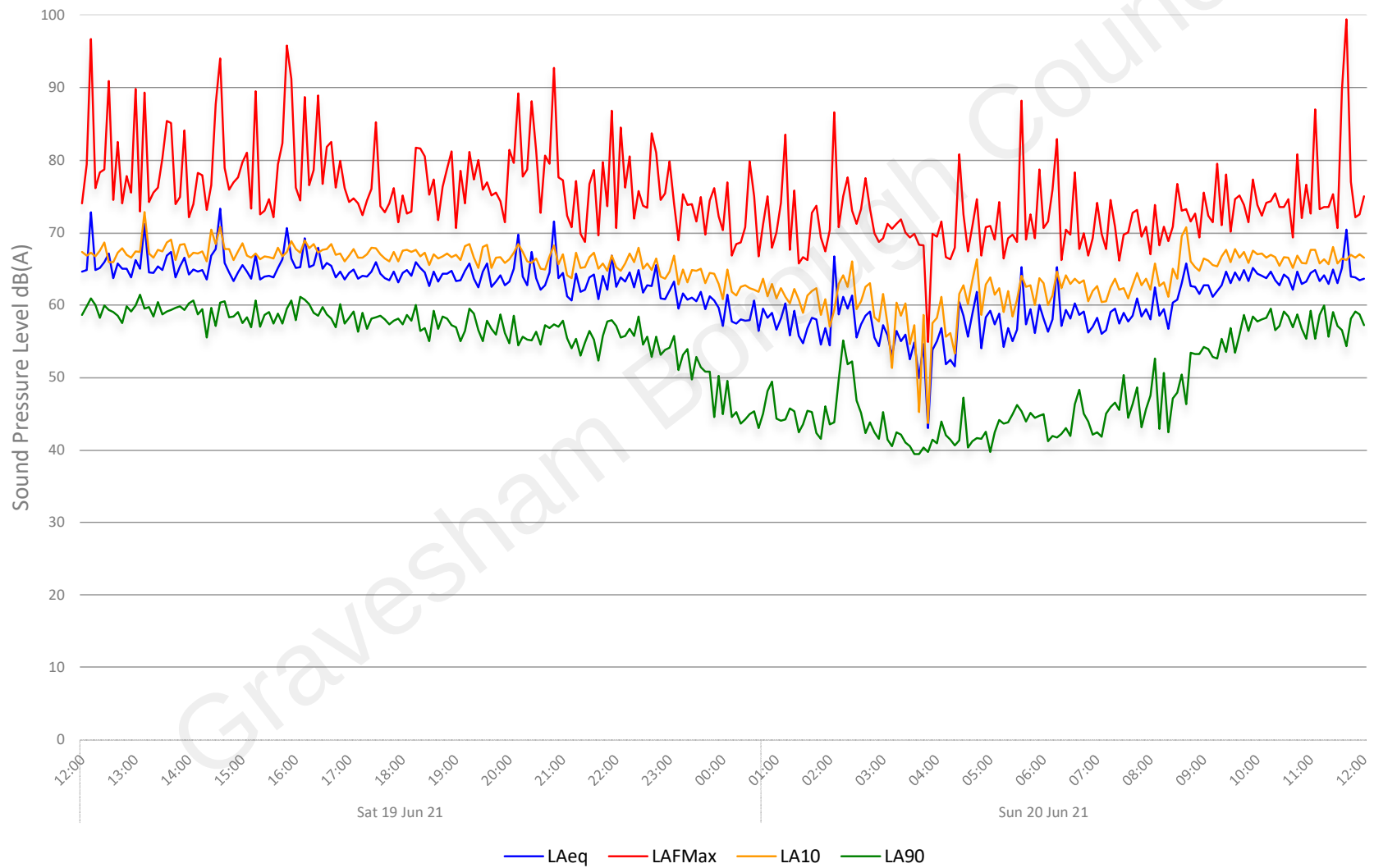
Joynes House, New Road, Gravesend

Environmental Noise Time History: 3

Position 1

 **VENTA** ACOUSTICS

Figure VA3706/TH3



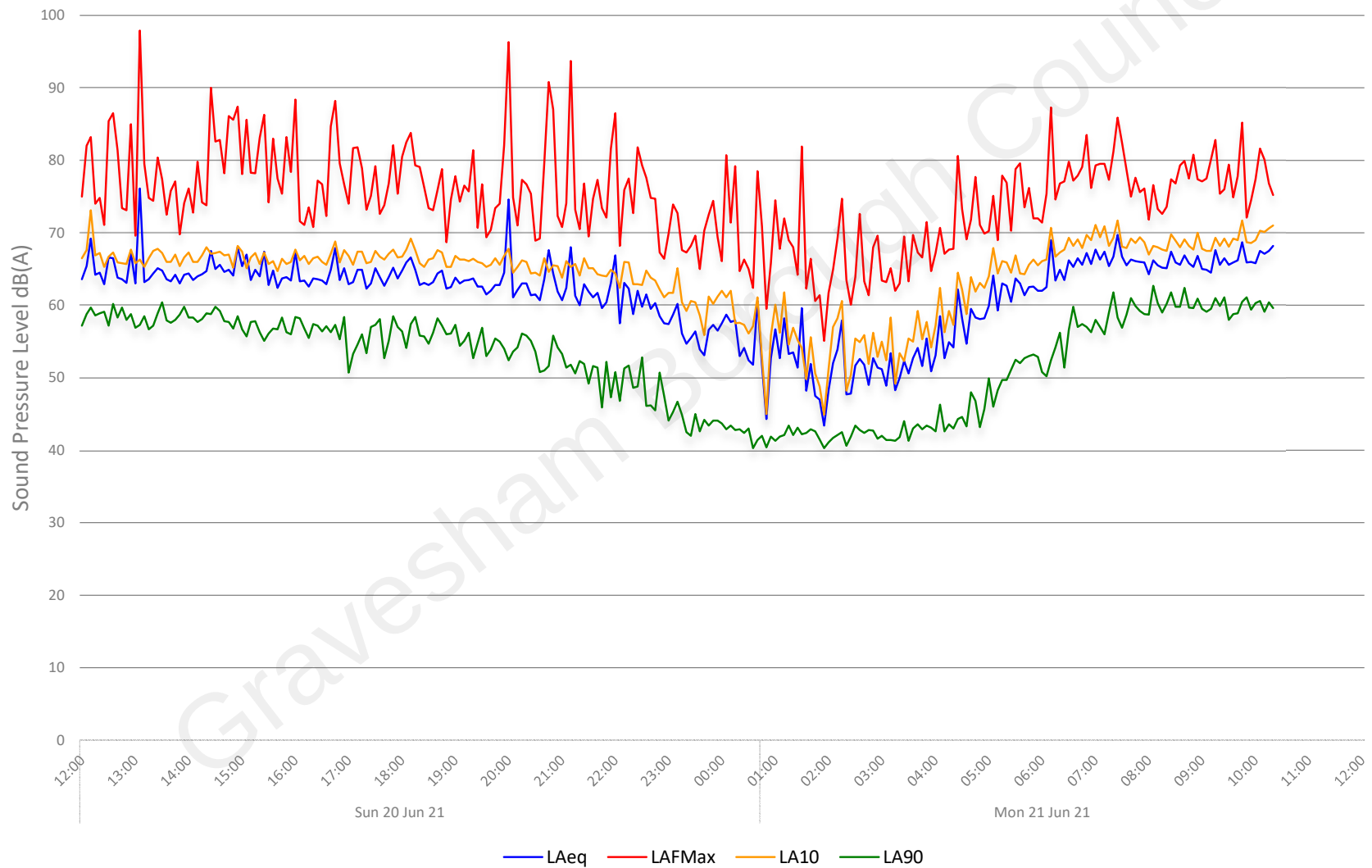
Joynes House, New Road, Gravesend

Environmental Noise Time History: 4

Position 1

 **VENTA** ACOUSTICS

Figure VA3706/TH4



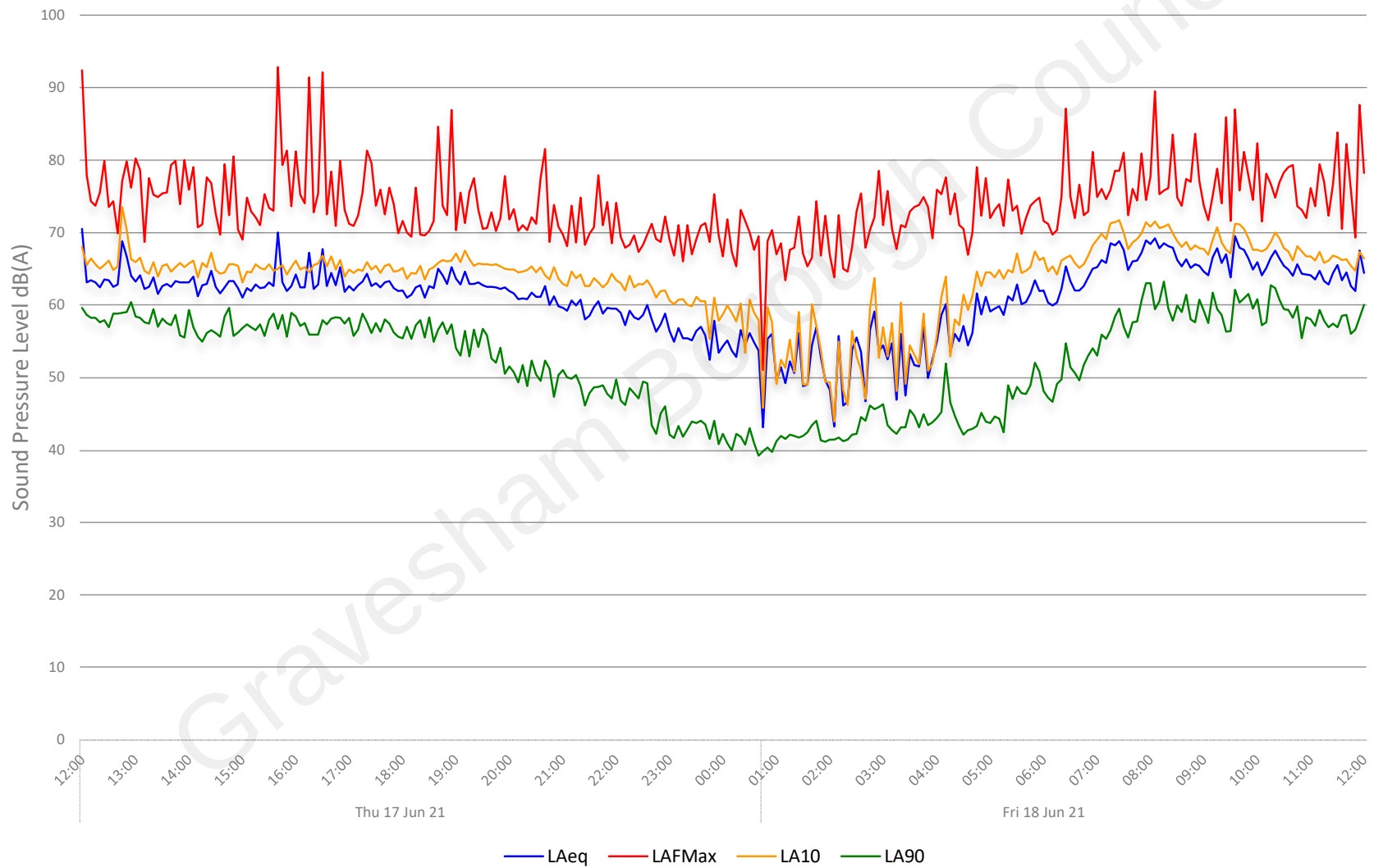
Joynes House, New Road, Gravesend

Environmental Noise Time History: 5

Position 2

 **VENTA** ACOUSTICS

Figure VA3706/TH5



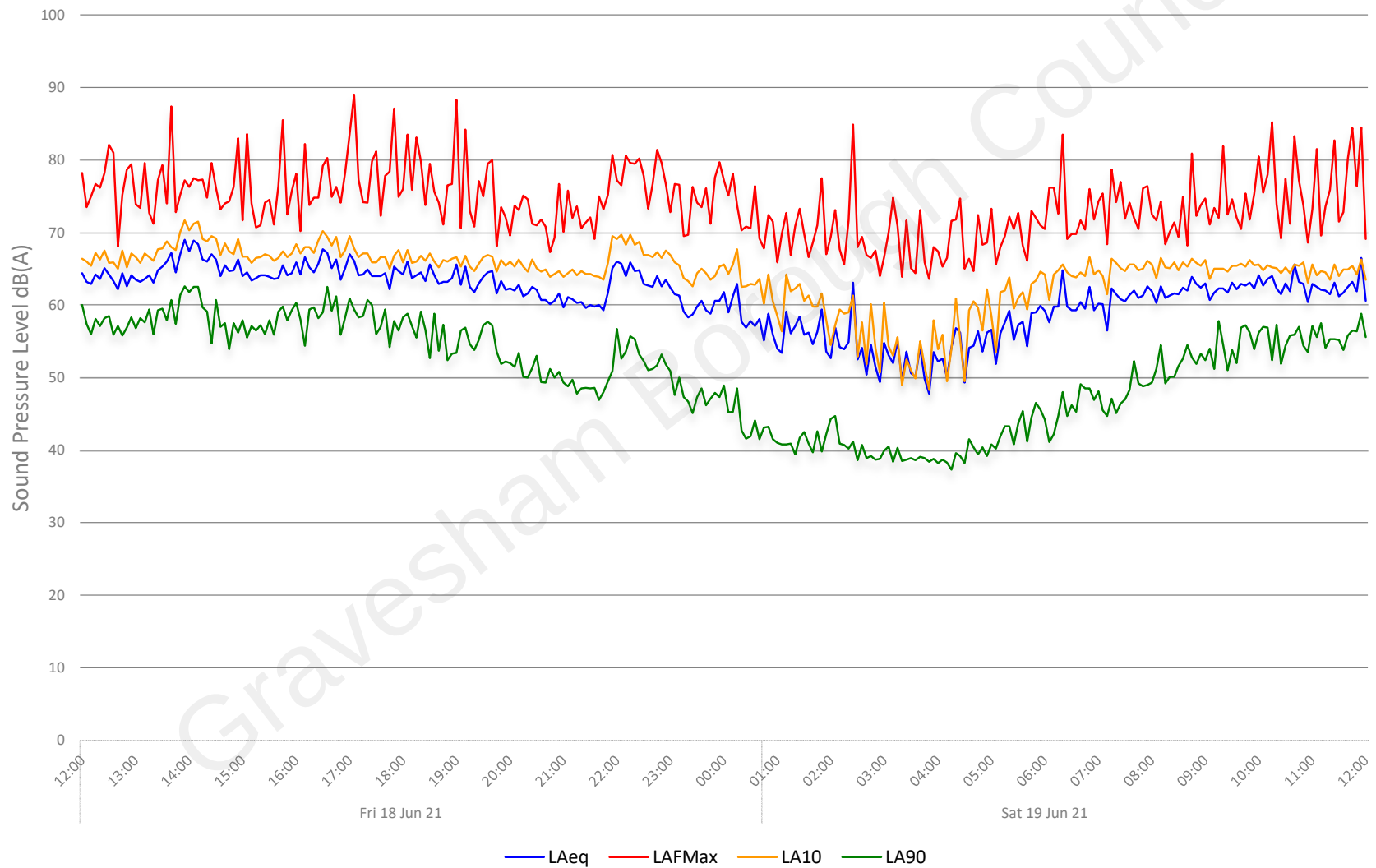
Joynes House, New Road, Gravesend

Environmental Noise Time History: 6

Position 2

 **VENTA** ACOUSTICS

Figure VA3706/TH6



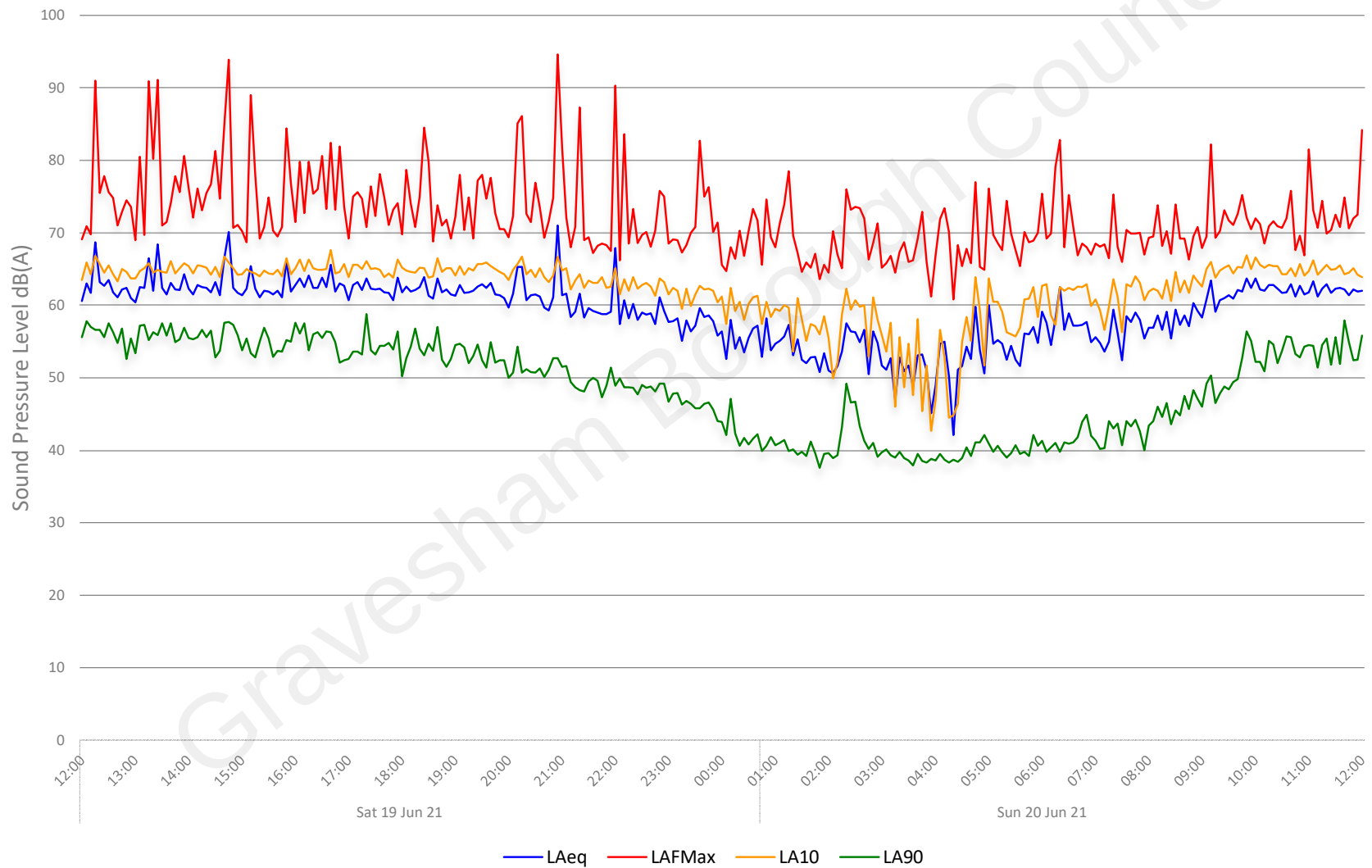
Joynes House, New Road, Gravesend

Environmental Noise Time History: 7

Position 2

 **VENTA** ACOUSTICS

Figure VA3706/TH7



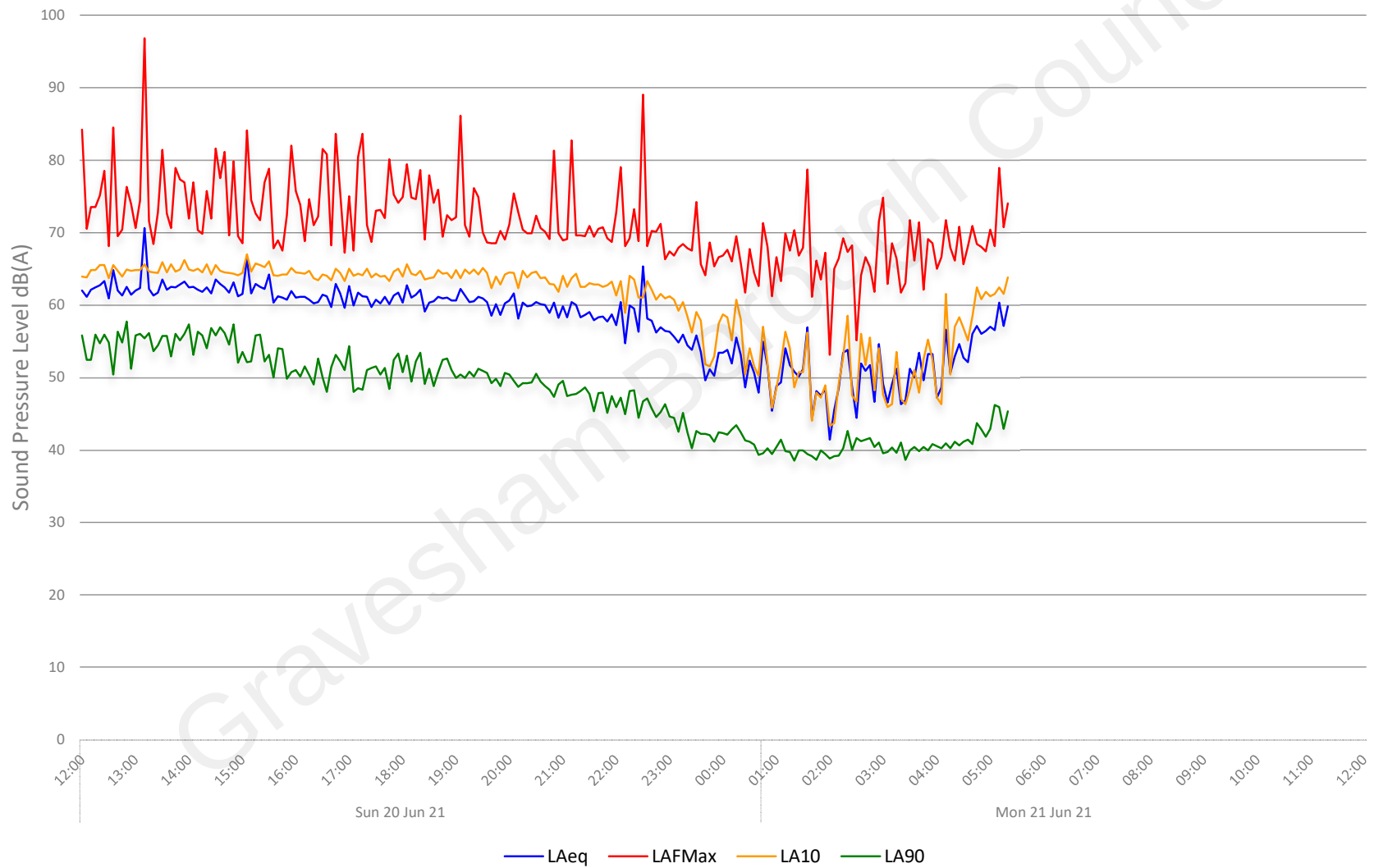
Joynes House, New Road, Gravesend

Environmental Noise Time History: 8

Position 2

 **VENTA** ACOUSTICS

Figure VA3706/TH8



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 . 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).
L_{eq} :	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
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APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

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