



PREPARED: 02 October 2026

29A Castle Street, Salisbury

Noise Impact Assessment

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Project Ref:	AS14666	Project Name:	29A Castle Street, Salisbury
Report Ref:	AS14666.260625.R1.3	Report Title:	Noise Impact Assessment
Client Name:	Fanfic Ltd		
Project Manager:	Michael Symmonds		
Report Author:	Michael Symmonds		
Clarke Saunders Acoustics Winchester SO22 5BE		This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.	

1.0 EXECUTIVE SUMMARY

- 1.1 It is proposed to convert the existing Class E premise at 29A Castle Street, Salisbury, SP1 1TT to a residential dwelling. Clarke Saunders Acoustics has assessed the noise environment in the vicinity of the site, to assess the site's suitability for residential use.
- 1.2 A BS4142 assessment of sound levels generated by nearby existing plant has been undertaken in response to the Council's comments dated 23rd September.
- 1.3 BS4142 is used to determine sound levels at outdoor locations, where the context forms a key part of any BS4142 assessment. In this case, the development does not include external amenity spaces, so internal sound levels are of most significance.
- 1.4 It is proposed that secondary glazing would be installed, the specification of which is provided in paragraph 7.2.4. Once fitted, internal sound levels would reduce towards a level around 10dB below the desirable internal ambient noise levels presented in BS8233.
- 1.5 Consideration has been given to background ventilation requirements, where acoustic performances for trickle vents are specified on the basis that they can be installed as part of the proposed window frame replacements.
- 1.6 As detailed in Section 7.3, the proposed secondary glazing system would form a plenum-style opening, which can be designed to provide a suitable inside to outside noise level difference such that internal noise levels below the BS8233 values can be maintained.
- 1.7 With respect to noise intrusion, the building can be made suitable for residential use, where the sound sources in the area should not result in adverse impact on the future occupiers of the development.
- 1.8 Planning condition wording has been suggested, requiring the secondary glazing and plenum windows arrangement to be implemented.

2.0 INTRODUCTION

- 2.1 Fanfic Ltd proposes to convert 29A Castle Street, Salisbury, SP1 1TT, to a Class C3 dwellinghouse (application ref. PL/2026/02496). The site currently falls under Use Class E and is a Grade II Listed Building.
- 2.2 Clarke Saunders Acoustics (CSA) has been commissioned to undertake a noise impact assessment to determine whether the site can be made suitable for residential use, focussing on the internal ambient noise levels within proposed habitable rooms.
- 2.3 A summary of the acoustic terminology used throughout the report is provided in Appendix A.

3.0 COMPETENCE

- 3.1 This project has been managed by Michael Symmonds, a Senior Consultant at Clarke Saunders Acoustics (CSA), who is also the author of this report.
- 3.2 Michael Symmonds holds a Master's degree in Acoustical Engineering, obtained from the Institute of Sound and Vibration Research at the University of Southampton. He has over

nine years of experience in the consultancy field and is a Corporate Member of the Institute of Acoustics.

- 3.3 The environmental noise survey was undertaken by Joel Bird, an Assistant Consultant at CSA under the supervision of Michael Symmonds.
- 3.4 Joel Bird holds a Master's degree in Acoustical Engineering, obtained from the Institute of Sound and Vibration Research at the University of Southampton. He is an Associate Member of the Institute of Acoustics.
- 3.5 The report adheres with the principles required by the Institute of Acoustics in their Code of Conduct, and the work is within the author's own area of knowledge and expertise. Where opinions have been expressed these represent true and complete professional opinions on the matters to which they refer.
- 3.6 CSA is a full member of the Association of Noise Consultants (ANC). The author of this report is a Corporate Member of the Institute of Acoustics.

4.0 SITE DESCRIPTION & PROPOSALS

- 4.1 29A Castle Street is a Grade II Listed Building located in the centre of Salisbury, surrounded by a mixture of commercial and residential buildings. The site is set back from Castle Street by around 30m and is accessed through a pedestrian archway.
- 4.2 Avon House, a large building comprising a shop and offices, surrounds the site to the west and south, with several items of mechanical plant located on its roof. It is noted that the western windows of the site's second floor have line of sight to some of these plant items. Line of sight to other nearby plant units is generally obscured by various elements of building massing.
- 4.3 The proposals involve the site's change of use from a Use Class E sunbed studio to a Use Class C3 four-bedroom dwelling. Whilst this would typically fall under a Class MA permitted development, the building's listed status means that a full planning application is required.
- 4.4 The internal layout of the site will be altered to provide a kitchen and living room at ground floor level, and two bedrooms at both first and second floor levels. The existing windows will either be retained or replaced with acoustically equivalent or improved systems. New secondary glazing systems will also be installed, to increase the overall sound reduction performance.
- 4.5 The city centre development does not include private external amenity spaces. Public amenity and green spaces would be easily accessible for future occupiers.
- 4.6 The site can be seen in context with its surroundings in the attached site plan, Figure AS14666/SP1. The proposed internal layout of the site can be seen in Figure AS14666/SP2.

5.0 LOCAL AUTHORITY REQUIREMENTS & RELEVANT GUIDANCE

5.1 WILTSHIRE COUNCIL

- 5.1.1 In June 2026, Trish Morse, a Senior Public Protection Officer for Wiltshire Council, made the following comments regarding the application:

“Whilst the site itself is located along an alleyway set back from the busy Castle Street, aerial imagery indicates the presence of a number of commercial plant installations in close proximity. These have the potential to adversely impact the amenity of future occupants of the proposed dwelling...

...No noise assessment has been submitted in support of the application to demonstrate that noise from nearby commercial plant will not give rise to adverse effects on future occupants, or that appropriate internal ambient noise levels can be achieved in accordance with relevant guidance, including WHO Guidelines and BS8233.

In the absence of a suitable noise impact assessment, it is not possible to determine whether acceptable living conditions can be provided. As such, a recommendation for refusal is made at this time.”

- 5.1.2 Reference has also been made to the Wiltshire Council Planning Consultation Guidance Note – Noise and Vibration (dated 31/10/2023).

5.2 BS8233 & WHO

- 5.2.1 BS8233:2014 *Guidance on sound insulation and noise reduction for buildings* provides guidance on suitable IANLs for various types of buildings.
- 5.2.2 Table 4 (reproduced below) of the standard provides recommended levels for steady external noise sources in dwellings.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 5.1: Indoor ambient noise levels for dwellings

- 5.2.3 The Standard notes that where noise sources have a specific character, lower noise limits might be appropriate.
- 5.2.4 The World Health Organisation *Guidelines for Community Noise (2000)* (WHO) suggests that noise maxima in bedrooms at night should not exceed 45dB L_{Amax} more than 10-15 times per night.

5.3 BS4142

5.3.1 BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS4142) 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.

5.3.2 The purpose of this standard is to determine the magnitude of potential impact on nearby sensitive receptors from industrial or commercial sound, with respect to the existing background sound levels and relevant character penalties owing to distinguishable sound features.

5.3.3 The numerical impact assessment may then be modified by taking consideration of the context in which the sound occurs.

5.3.4 It is noted that the methods described in BS4142 apply to the determination and assessment of outdoor sound levels.

5.3.5 A detailed overview of the BS4142 methodology is provided in Appendix B.

6.0 ENVIRONMENTAL NOISE SURVEY

6.1 PROCEDURE & EQUIPMENT

6.1.1 A survey of the existing ambient noise levels was undertaken at external and internal positions at first and second floor level. The monitoring positions are shown in the appended site plans, Figures AS14666/SP1 and AS14666/SP2.

6.1.2 The external position was selected to capture the noise generated by the plant items on the roof of Avon House, at a position representative of the most affected proposed residential windows. The internal position was selected to measure the existing indoor ambient noise levels within a proposed bedroom at second floor level. All windows remained closed for the duration of the survey.

6.1.3 The monitors were set to record measurements of consecutive 5-minute L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels between the hours of 12:00 on Thursday 2nd July and 10:30 on Monday 6th July 2026.

6.1.4 The following equipment was used during the survey:

- 1 no. Rion Class 1 sound level meter type NA28;
- 1 no. Rion Class 1 sound level meter type NL32;
- 1 no. Rion sound level calibrator type NC74.

6.1.5 Additional attended measurements of internal and external noise levels around the site were conducted between 11:30 and 13:30 on 2nd July 2026. These measurements were synchronised with the automated noise measurements and were undertaken at the positions indicated in Figures AS14666/SP1 and AS14666/SP2. Internal measurements were undertaken with windows open and closed.

6.1.6 The following equipment was used during the attended measurements:

- 1 no. Norsonic Class 1 sound level meter type 118;
- 1 no. Norsonic sound level calibrator type 1251.

6.1.7 The calibration of the sound level meters was verified before and after use, with no significant calibration drift detected. All equipment has current certified traceable laboratory calibration which is available for inspection on request.

6.1.8 Measurements were made following procedures in BS7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use* and, where relevant, BS4142.

6.1.9 The weather during the survey period was typically calm with light winds, and as such is considered suitable for the purposes of measuring environmental noise.

6.2 RESULTS

6.2.1 Figures AS14666/TH1-TH8 show the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels as time histories at each of the measurement positions.

6.2.2 The average noise levels for the daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods are shown in Table 6.1. The external noise levels are free-field values.

Position	Monitoring Period	Average Ambient $L_{Aeq,5mins}$	Typical Highest* L_{AFmax}
Position 1 (external)	Daytime	51 dB	-
	Night-time	49 dB	60 dB
Position 2 (internal)	Daytime	31 dB	-
	Night-time	28 dB	43 dB

Table 6.1: Environmental noise survey results

[dB ref. 20 μ Pa]

*derived as the L_{AFmax} value exceeded no more than 10 times per night

6.2.3 The noise levels measured during the attended measurements, recorded are summarised in Table 6.2.

Position	Window Open or Closed?	Measured Short-term Daytime Ambient $L_{Aeq,T}$
Attended Position 1	N/A (external measurement)	53 dB (T=20mins)
Attended Position 2	Closed	32 dB (T=10mins)
	Open	46 dB (T=10mins)
Attended Position 3	Closed	33 dB (T=10mins)
	Open	44 dB (T=10mins)
Attended Position 4	Closed	29 dB (T=10mins)

Table 6.2: Attended noise measurement results

[dB ref. 20 μ Pa]

6.2.4 The noise climate within the proposed bedrooms is primarily determined by plant noise emissions from Avon House, with some contributions from individual vehicle pass-bys on Castle Street.

7.0 ASSESSMENT

7.1 BS4142 ASSESSMENT

Initial Numerical Impact Estimate

- 7.1.1 It should be noted that there is no external amenity space included as part of this proposal. BS4142 is used to determine sound levels at outdoor locations and specifically states that it *"is not intended to be applied to the assessment of indoor sound levels"*. Internal sound levels can, however, be taken into account by considering whether good internal acoustic conditions can be provided.
- 7.1.2 From inspection of the relevant time histories, the external ambient sound levels are controlled by the nearby plant between the hours of circa 01:30 and 17:30 Monday to Saturday, and 05:30 to 17:30 on Sundays. During these periods, the external ambient sound level has been identified as $L_{Aeq,T}$ 51dB.
- 7.1.3 The residual sound level has been identified as $L_{Aeq,T}$ 43dB through interrogation of the measured external levels outside of the period in which the plant operated. As such, the specific plant sound level has been derived as $L_{Aeq,T}$ 51dB, following procedures described in BS4142.
- 7.1.4 The external sound spectra has been reviewed, with no notable tonal components. From review of the appended time history, AS14666/TH1-TH4, no intermittent nor impulsive characteristics are evident. The plant is, however, expected to be readily distinctive against the residual sound climate, so a character correction of +3dB has been included.
- 7.1.5 The representative background has been determined as L_{A90} 40dB between the hours of 00:00 and 01:00, during the night-time period but in the absence of plant sound.
- 7.1.6 A summary of the initial BS4142 assessment is presented in Table 7.2. Note that all numbers have been presented rounded to the nearest integer, whereas the assessment level has been derived using full precision.

Parameter	Receptor
	Western Facing Bedroom Windows
Assessment Period	Night-time (23:00 – 07:00) T = 15mins
Specific Sound Level $L_{Aeq,15min}$	51 dB
Acoustic Character Corrections	+3 dB
Rating Level $L_{A,r,Tr}$	54 dB
Typical Background Sound Level L_{A90}	40 dB
Assessment Level	+13 dB

Figure 7.1: Summary of initial BS4142 assessment

- 7.1.7 Where the rating level exceeds the representative background level by 10dB or more, BS4142 states that this “*is likely to be an indication of a significant adverse impact, depending on the context*”.

Context

- 7.1.8 The context forms a key part of any BS4142 assessment. No external amenity spaces are proposed at the site. As such, the internal sound levels are of most significance. These are discussed in detail at Section 7.2 and 7.3.
- 7.1.9 It should also be acknowledged that the site is located in a busy, urban location in the centre of Salisbury, where plant sound is not uncharacteristic. Future occupiers would be cognisant of this and would make an informed choice as to whether to reside in this city centre location.
- 7.1.10 In determining a comparable residential development for 4 x flats at 27 Castle Street (now 1-4 Castle Mews), as identified on AS14666/SP1, the Council's Officers concluded the following:

The change of use of the existing office/storage accommodation to residential accommodation is not considered to create any additional impacts on adjoining uses or conflict with the retained commercial use at ground floor. Each unit would provide for self-contained accommodation with provision for bin and cycle storage. There would be no external amenity space which is usual in town centre locations where flats and apartments are provided above shops and commercial premises and it is accepted that the location is accessible to public amenity and green spaces in relatively close proximity. It is considered that the proposal would not materially affect the amenities of existing occupiers and no representations have been received to the contrary.

- 7.1.11 A review of aerial imagery confirms that Avon House has been served by commercial plant for more than a decade. The Council's Public Protection Officers raised no objection to the change of use in 2019 (19/09941/FUL).

Uncertainty

- 7.1.12 As per the requirements of BS4142, the uncertainty in the assessment is considered and reported. This is not an indication of error, but an acknowledgement of possible variability of the factors contributing to the assessment.
- 7.1.13 Use of a calibrated class 1 sound level meter reduces measurement instrumentation error to insignificant levels as compared to environmental variations.
- 7.1.14 Measuring environmental sound levels across a four-day period reduces the uncertainty in the measured sound levels used in the BS4142 assessment, compared with shorter term measurements.
- 7.1.15 As the plant is currently operational, the specific sound level has been measured in-situ rather than relying on manufacturer data.

7.2 INTERNAL AMBIENT NOISE LEVELS

- 7.2.1 Internal ambient noise levels have been considered on the basis of the existing sound levels.
- 7.2.2 The layout has been designed taking into consideration the various constraints, including the inherent limitation of utilising existing windows and partitions. As a result, practicable acoustic improvements in terms of design and internal layout are limited.
- 7.2.3 The mechanical plant affecting the site is not within the control of the applicant, so the application cannot rely on the plant being relocated, or mitigation being imposed at source.
- 7.2.4 In the building's current condition, the internal noise levels comply with the desirable internal ambient noise levels set out in BS8233, reproduced in Table 5.1. Secondary glazing, consisting of minimum 4mm toughened glass, is also proposed and shall be installed at least 100mm from the primary pane. Due to the larger air gap, secondary glazing systems can typically achieve higher performances, with simplistic systems achieving laboratory sound reductions in the low 40s (dB R_w), and higher performing systems achieving upwards of R_w 50dB.
- 7.2.5 With the introduction of secondary glazing, resultant noise intrusion would tend towards a level 10 dB below the desirable internal ambient noise levels set out in BS8233, significantly reducing the potential distinctiveness of the plant sound.
- 7.2.6 Separate consideration has been given to the background ventilation case, where it is assumed that trickle ventilators can be installed as part of the proposed window frame replacements. Table 7.1 presents the required sound reduction performance of passive ventilators to maintain an internal sound level well below the values given in Table 5.1.

Façade	Ventilator Sound Reduction Performance
Rear	$D_{n,ew}$ 30 dB
Front	$D_{n,ew}$ 30 dB

Table 7.1: Trickle ventilator acoustic performance requirements

- 7.2.7 These specifications are achievable with standard proprietary acoustically rated trickle ventilators.
- 7.2.8 These specifications are provided on the basis of a single ventilator per room. Where more than one ventilator will be installed, the performance requirement will increase by a factor of $+10\log(N)$, where N is the number of ventilators in the room.

7.3 CONSIDERATION OF THE OPEN WINDOW SCENARIO

- 7.3.1 Wiltshire guidance recommends that, for noise with a distinguishable character, such as mechanical plant noise, the desirable levels in Table 5.1 should be achieved with windows open.
- 7.3.2 Although the proposed bedrooms are well shaded, limiting solar gain, future residents may open the windows for rapid ventilation or to release excess heat. Two of the four bedrooms are dual-aspect, allowing some cross-ventilation.
- 7.3.3 The proposed secondary glazing system benefits from the ability to form a plenum-type opening which can provide substantially greater outside-to-inside sound attenuation than a single open window. An example plenum window design is shown below.

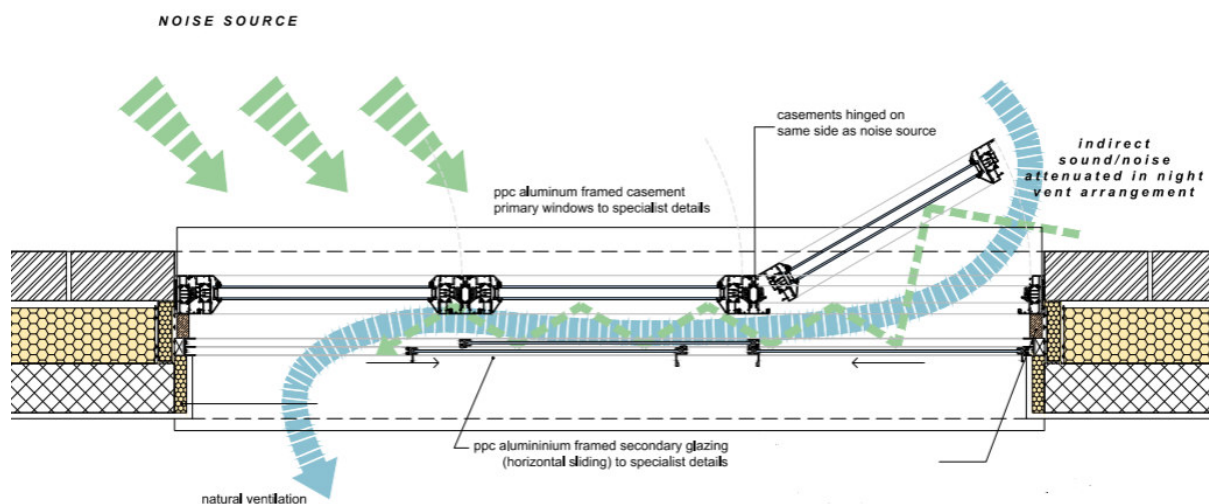


Figure 7.2: Example plenum window detail, showing tortuous path for noise intrusion

- 7.3.4 An outside-to-inside level difference of 21dB is required to control the specific sound level from the existing plant ($L_{Aeq,T}$ 51dB) to those below the BS8233 desirable internal ambient noise levels. This level of attenuation would also be sufficient for controlling noise maxima during the night-time period.
- 7.3.5 Test data provided by a supplier of plenum windows¹ has been referenced, which gives a range of outside-to-inside level differences for different opening settings. On the basis of this data, reproduced in Table 7.2, internal noise levels should readily comply with the target BS8233 levels.

¹ <https://www.acousticfacades.co.uk/products>

Opening Setting	Sound Reduction Performance, R_w
38mm	33dB
76mm	29dB

Table 7.2: Sound reduction through open plenum window

7.3.6 The provision of plenum windows would, therefore, allow windows to be open during both daytime and night-time periods whilst maintaining internal acoustic conditions below the values given in Table 5.1. Adverse impact should, therefore, not be experienced by future residents.

7.4 SUGGESTED PLANNING CONDITION

7.4.1 The Local Authority can impose a planning condition to require the scheme of acoustic mitigation to be implemented. Suggested wording is as follows:

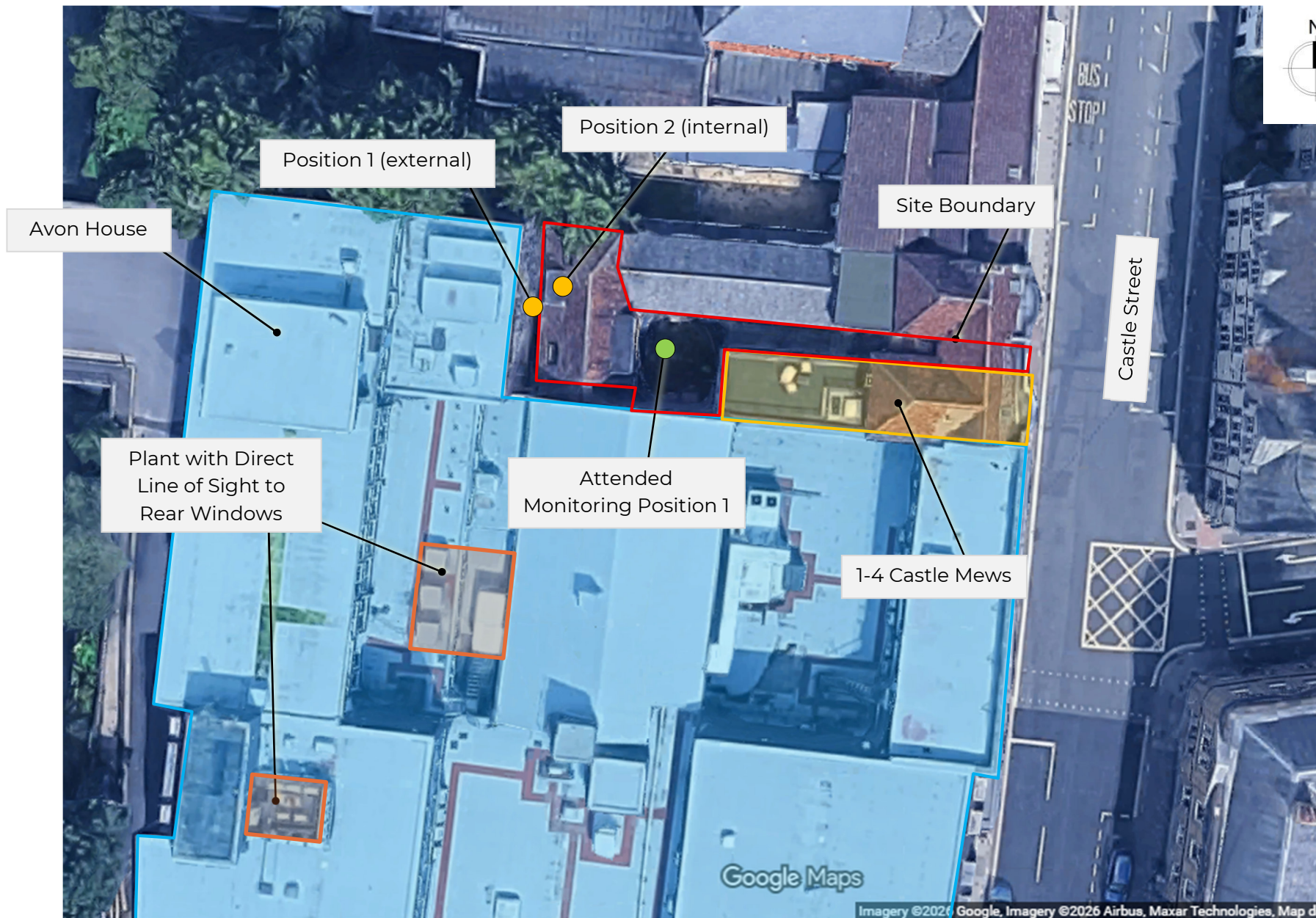
All noise attenuation measures as summarised the Clarke Saunders Acoustic Report dated October 2026, including secondary glazing (section 7.2) and plenum windows (section 7.3) shall be implemented in full, and maintained at all times thereafter.

8.0 CONCLUSIONS

- 8.1 Clarke Saunders Acoustics has conducted an assessment of the noise environment in the vicinity of 29A Castle Street, Salisbury, SP1 1TT. This assessment has been conducted to determine the site's suitability for residential use, referencing the requirements of the local authority, as advised in the Public Protection Department Consultation comment.
- 8.2 A BS4142 assessment of the external sound levels generated by existing plant has been undertaken to determine subsequent impact on the proposed residential dwelling.
- 8.3 The survey results have indicated that the existing glazing is capable of controlling external plant noise intrusion to below the desirable internal ambient noise levels in BS8233, across both the day and night-time periods, with windows closed. It is proposed that secondary glazing is installed, the specification of which is provided in paragraph 7.2.4. Once fitted, internal ambient noise levels would reduce further, tending towards a level 10dB lower than the BS8233 values.
- 8.4 Consideration has been given to background ventilation requirements, where acoustic performances for trickle vents have been specified on the basis that they can be installed as part of the proposed window frame replacements.
- 8.5 The secondary glazing will also allow for a plenum-type window opening. As shown in Section 7.3, such a system can be designed to provide a suitable outside-to-inside noise level difference such that internal noise levels below the BS8233 values can be maintained.
- 8.6 The building can be made acoustically suitable for residential use, where the sound sources in the area should not result in adverse impact on the future occupiers of the development.
- 8.7 Planning condition wording has been suggested, requiring the secondary glazing and plenum windows arrangement implemented.

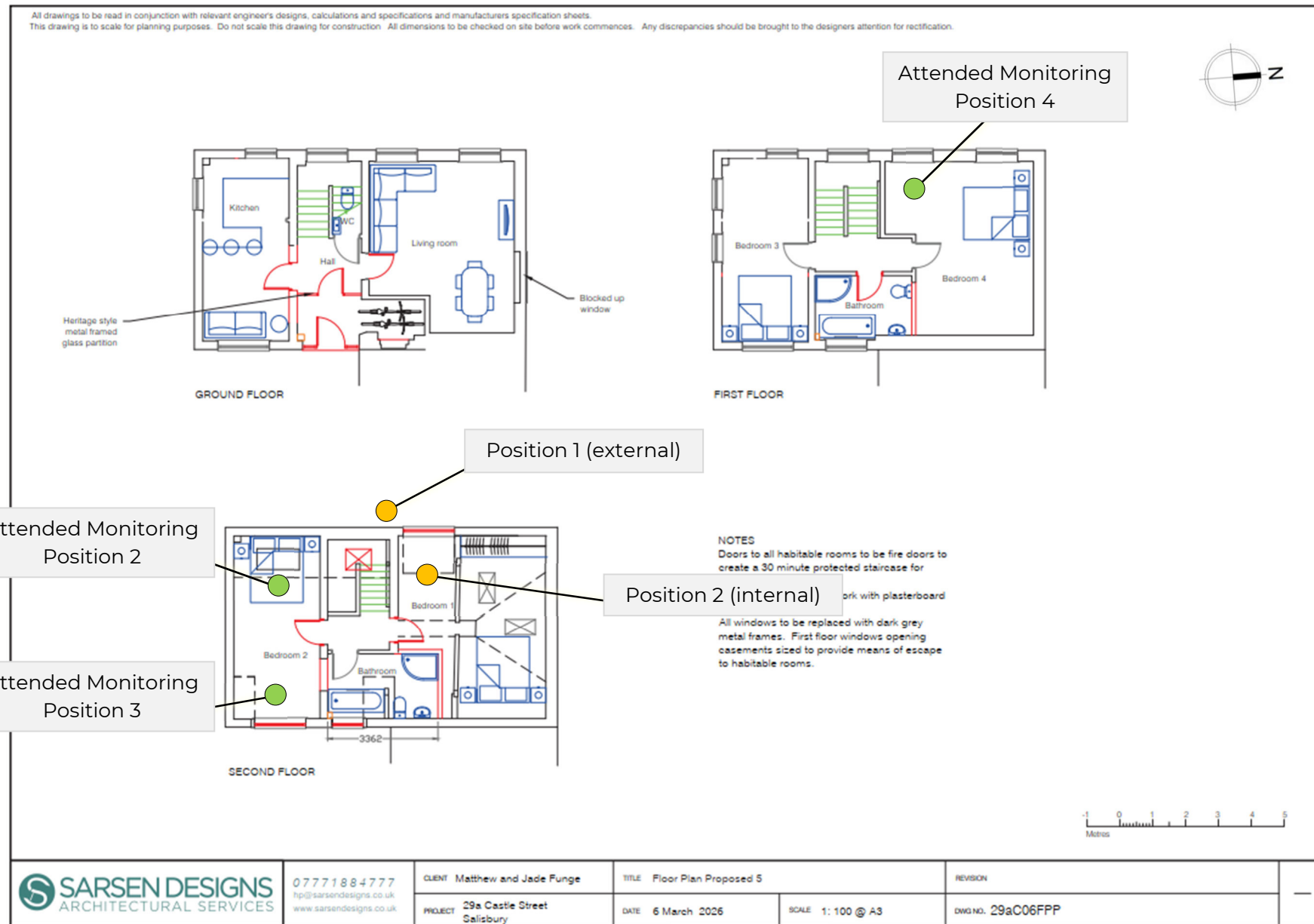
M Symmonds

Michael Symmonds MIOA
CLARKE SAUNDERS ACOUSTICS



Indicative Site Plan

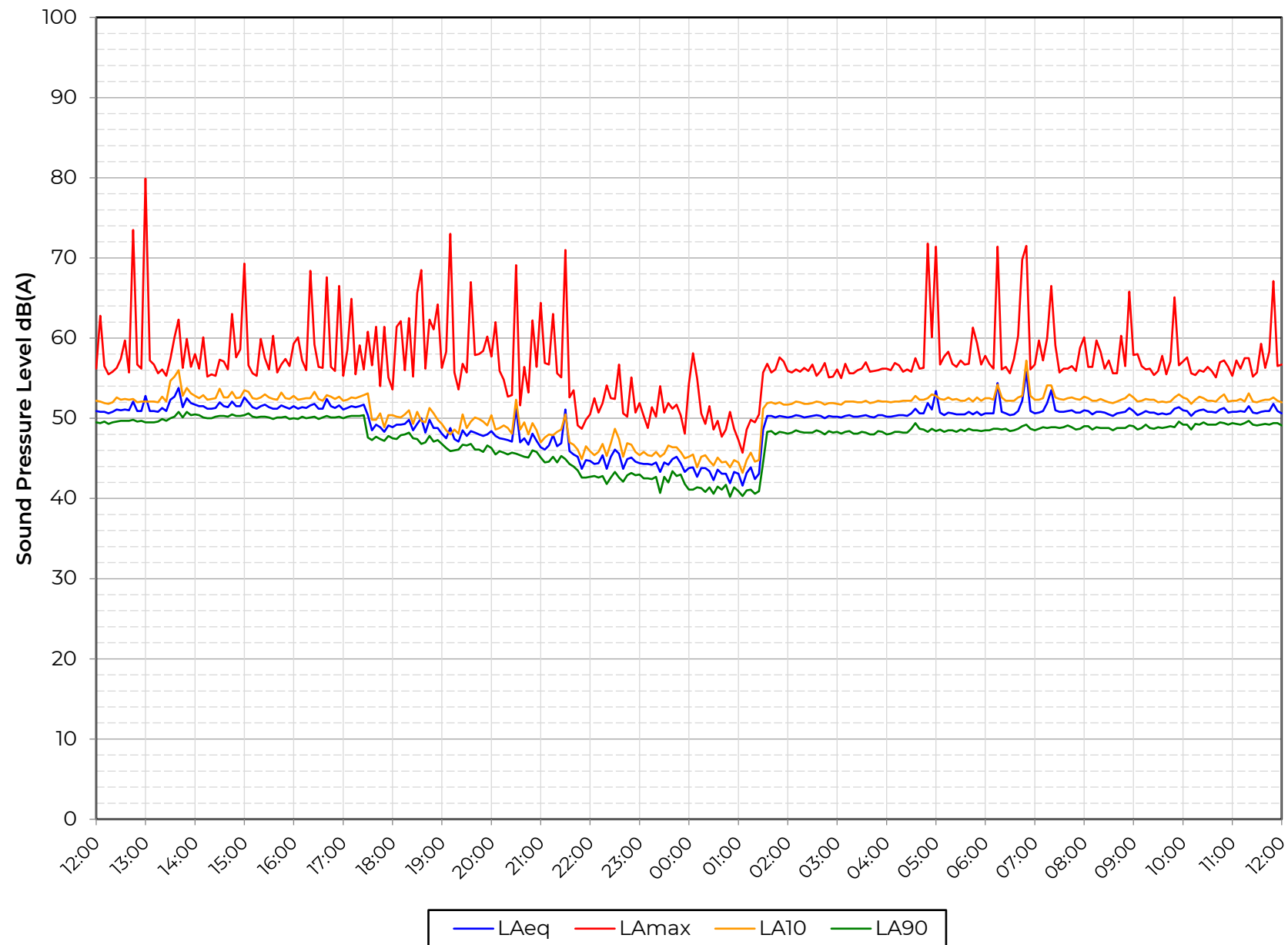
Figure AS14666/SP1.1



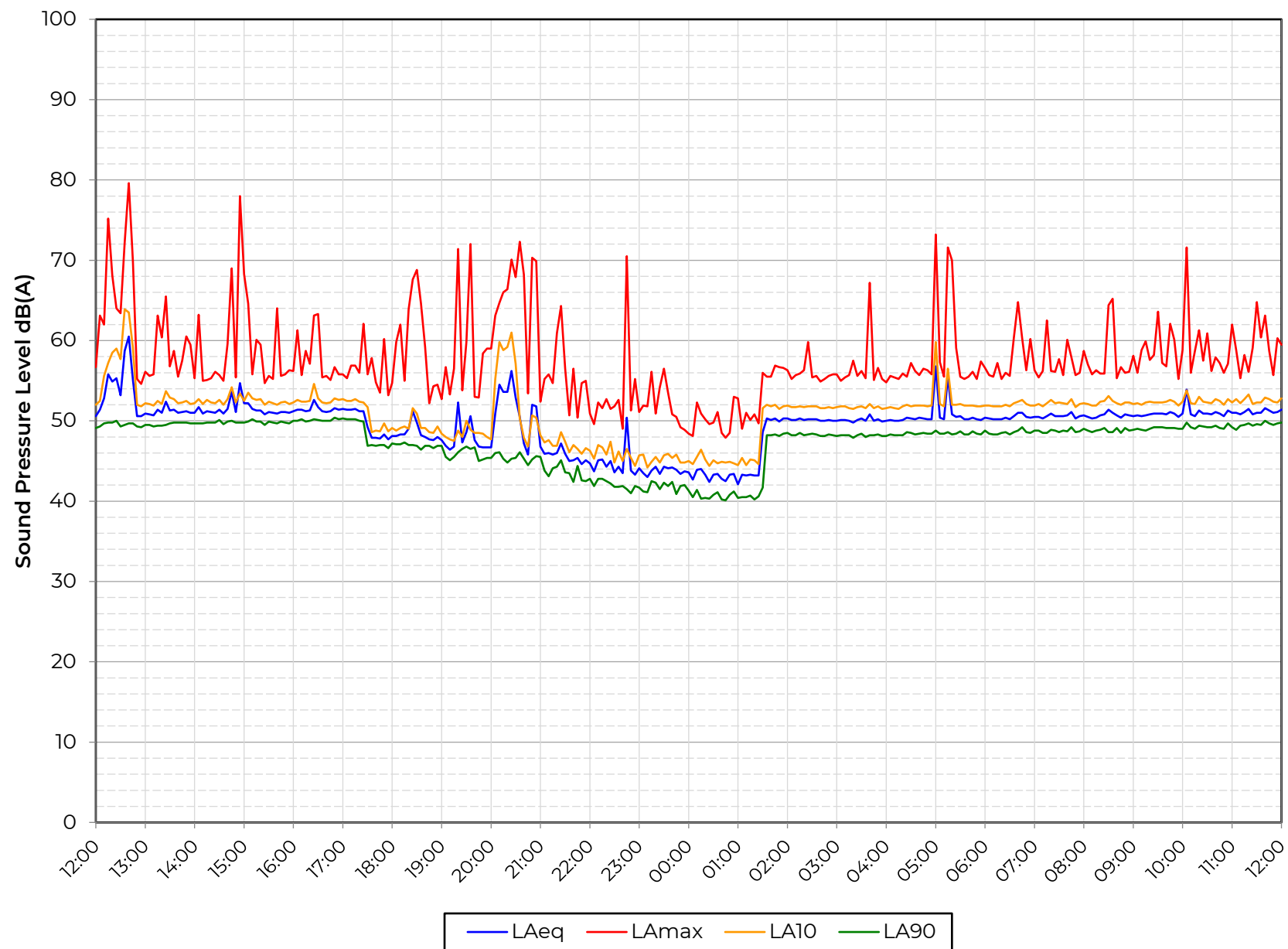
Indicative Layout Plan

Figure AS14666/SP2

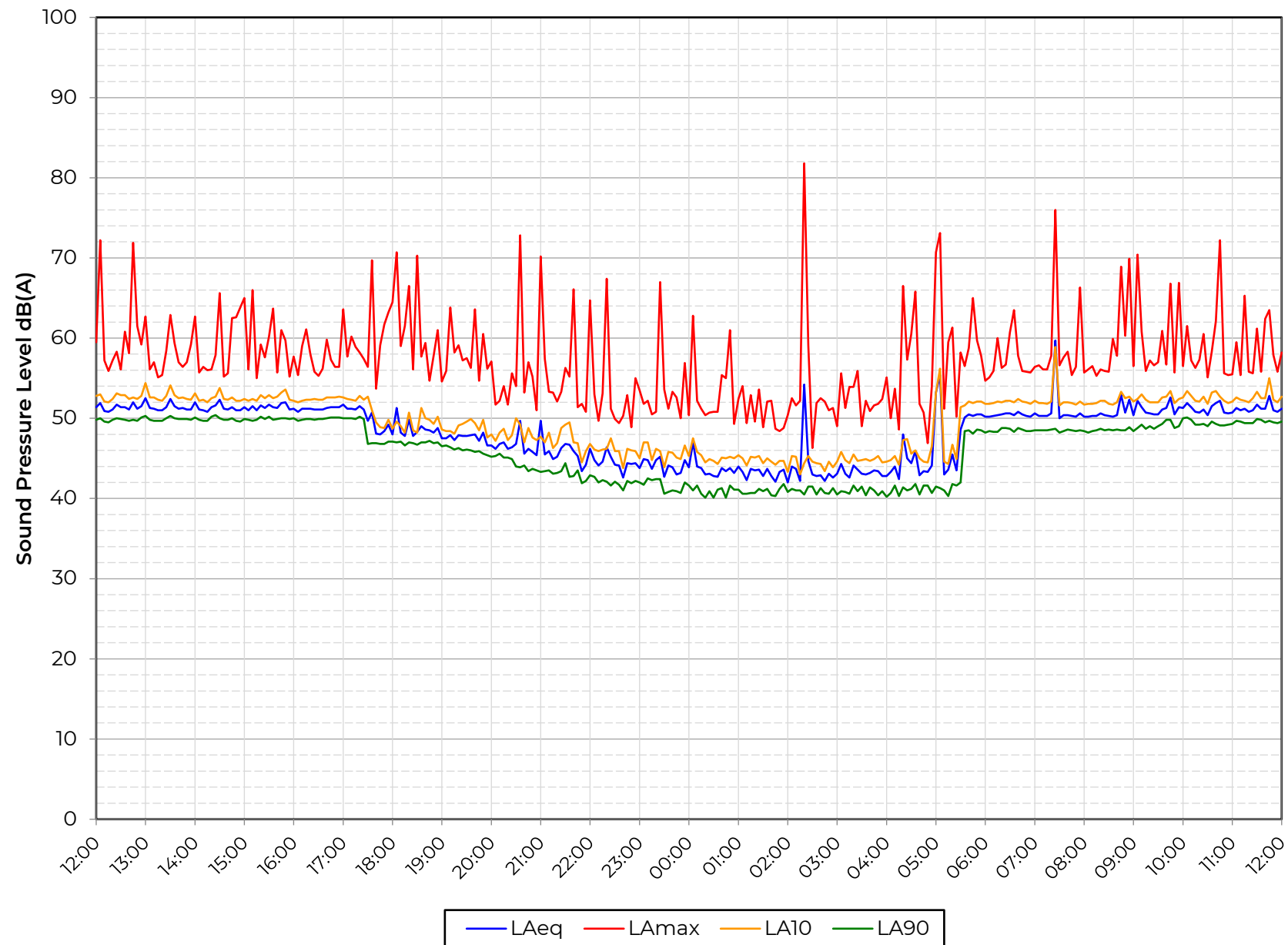
Position 1 (External)



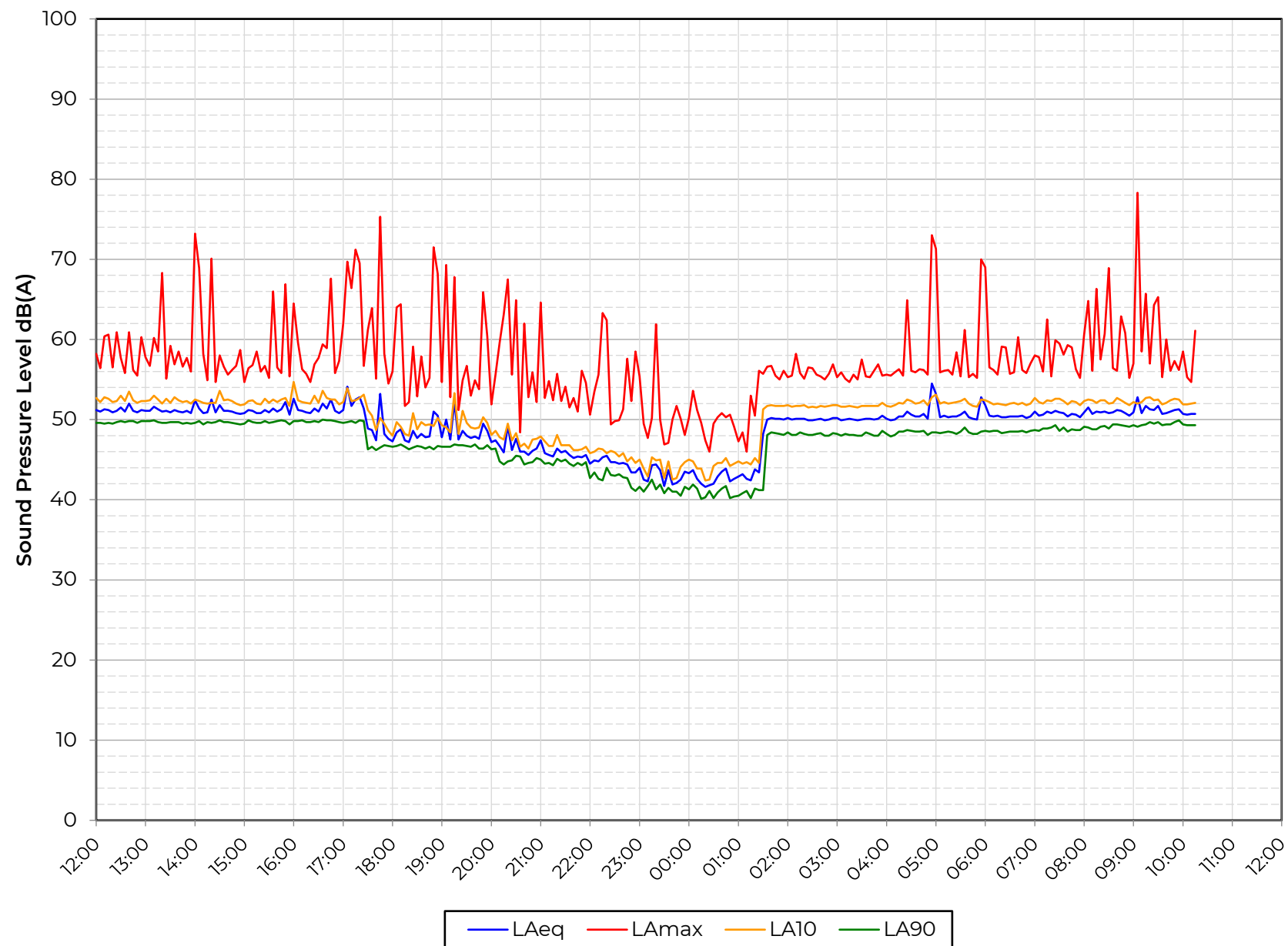
Position 1 (External)



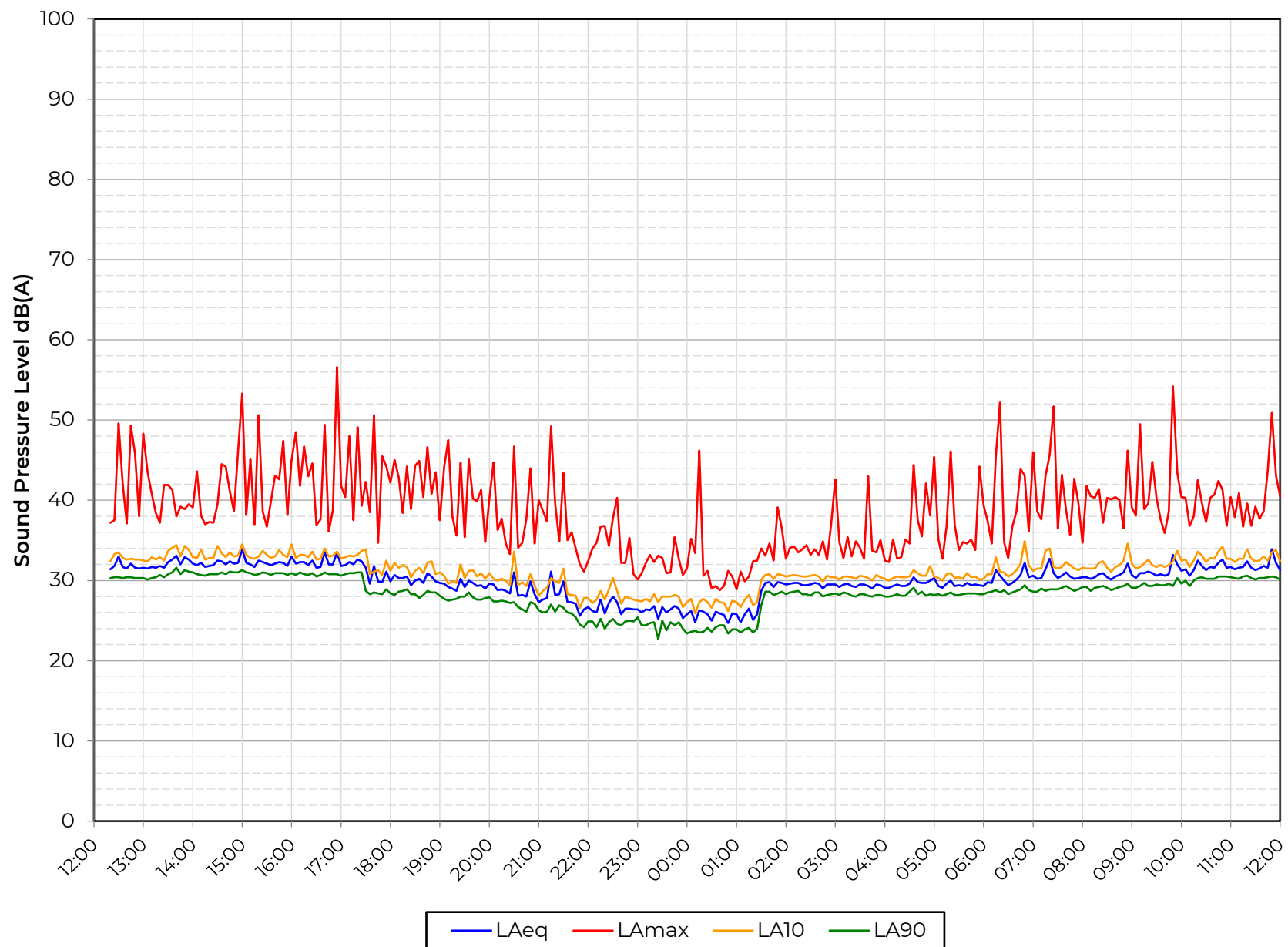
Position 1 (External)



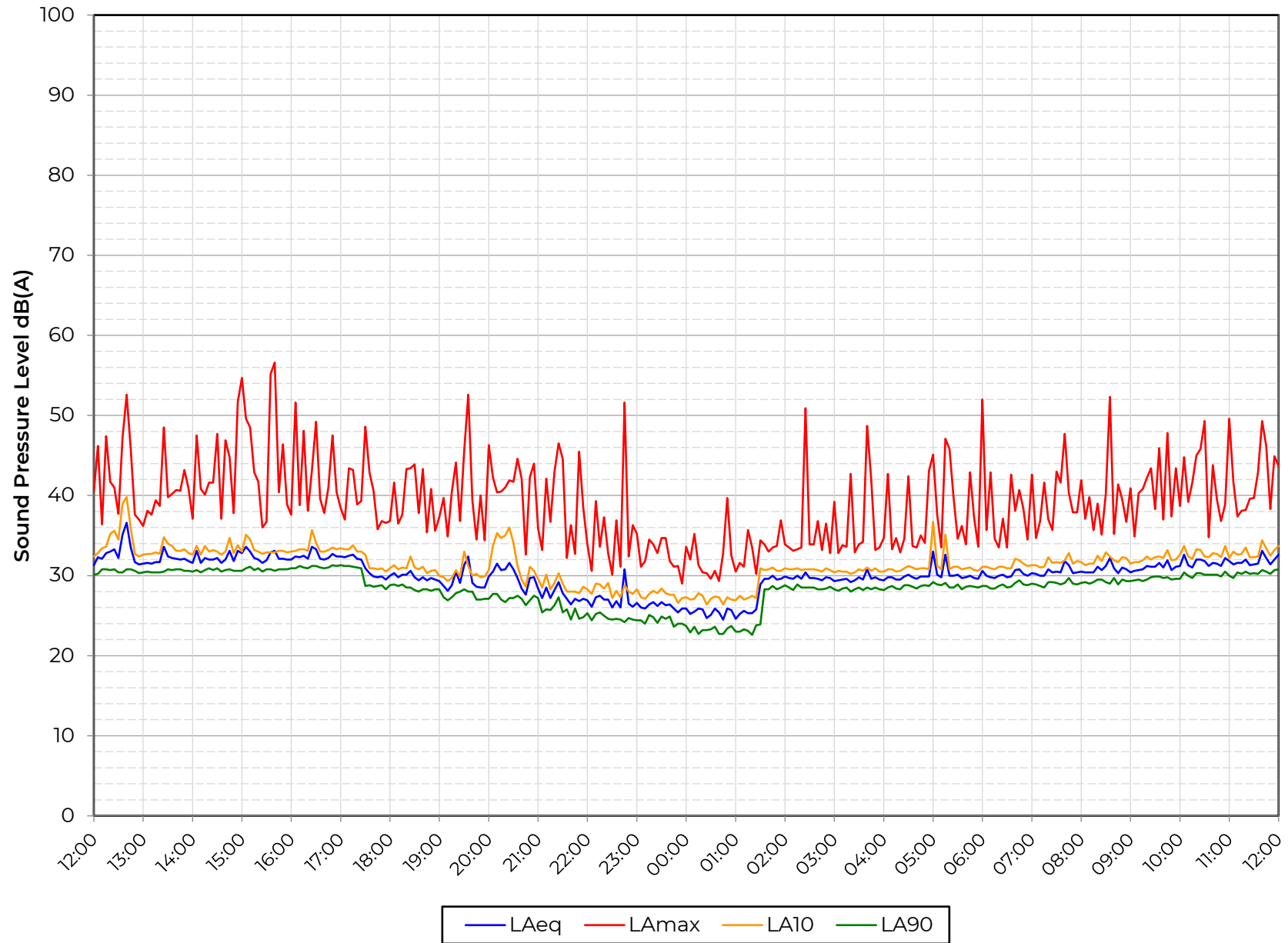
Position 1 (External)



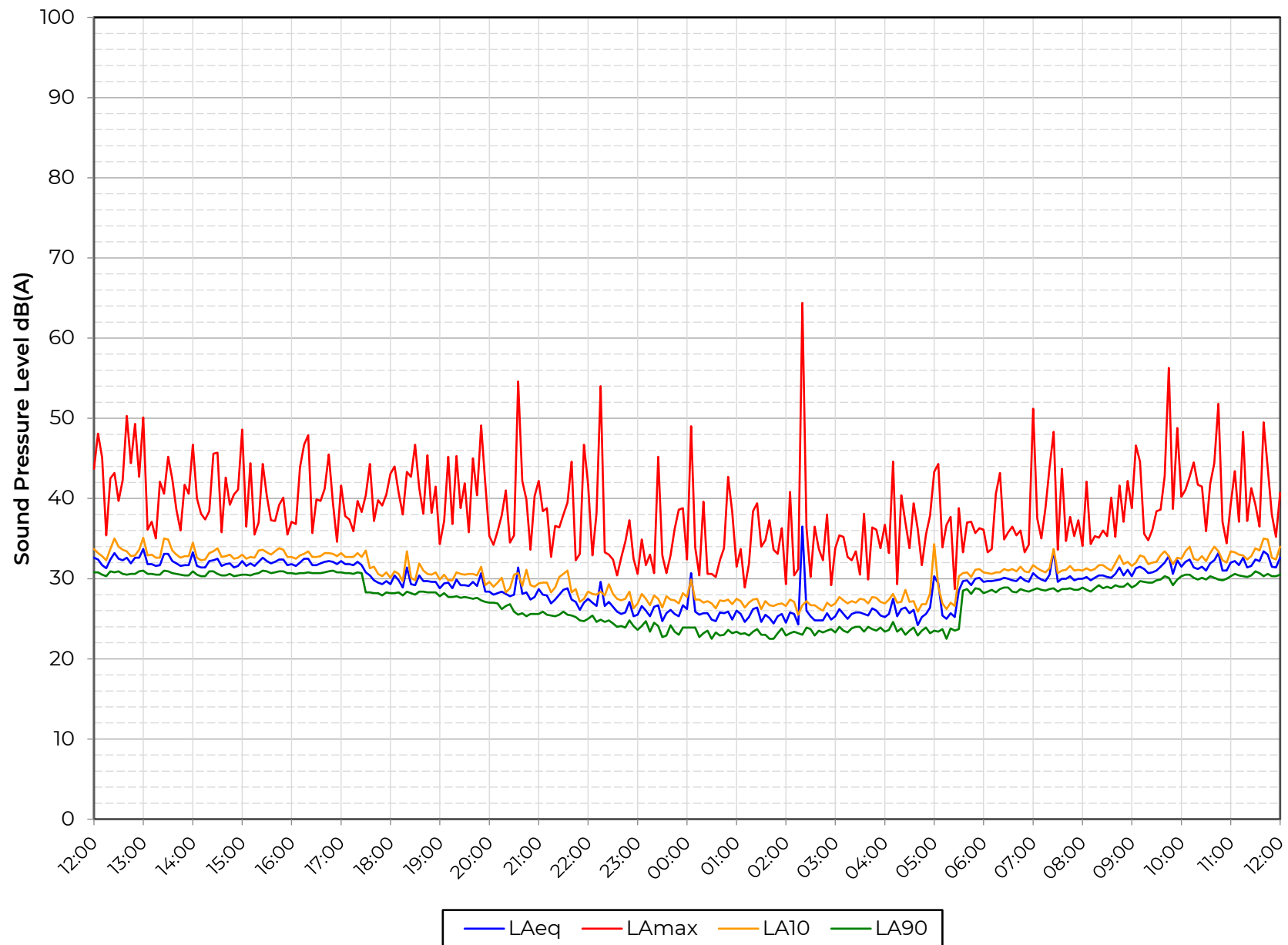
Position 2 (Internal)



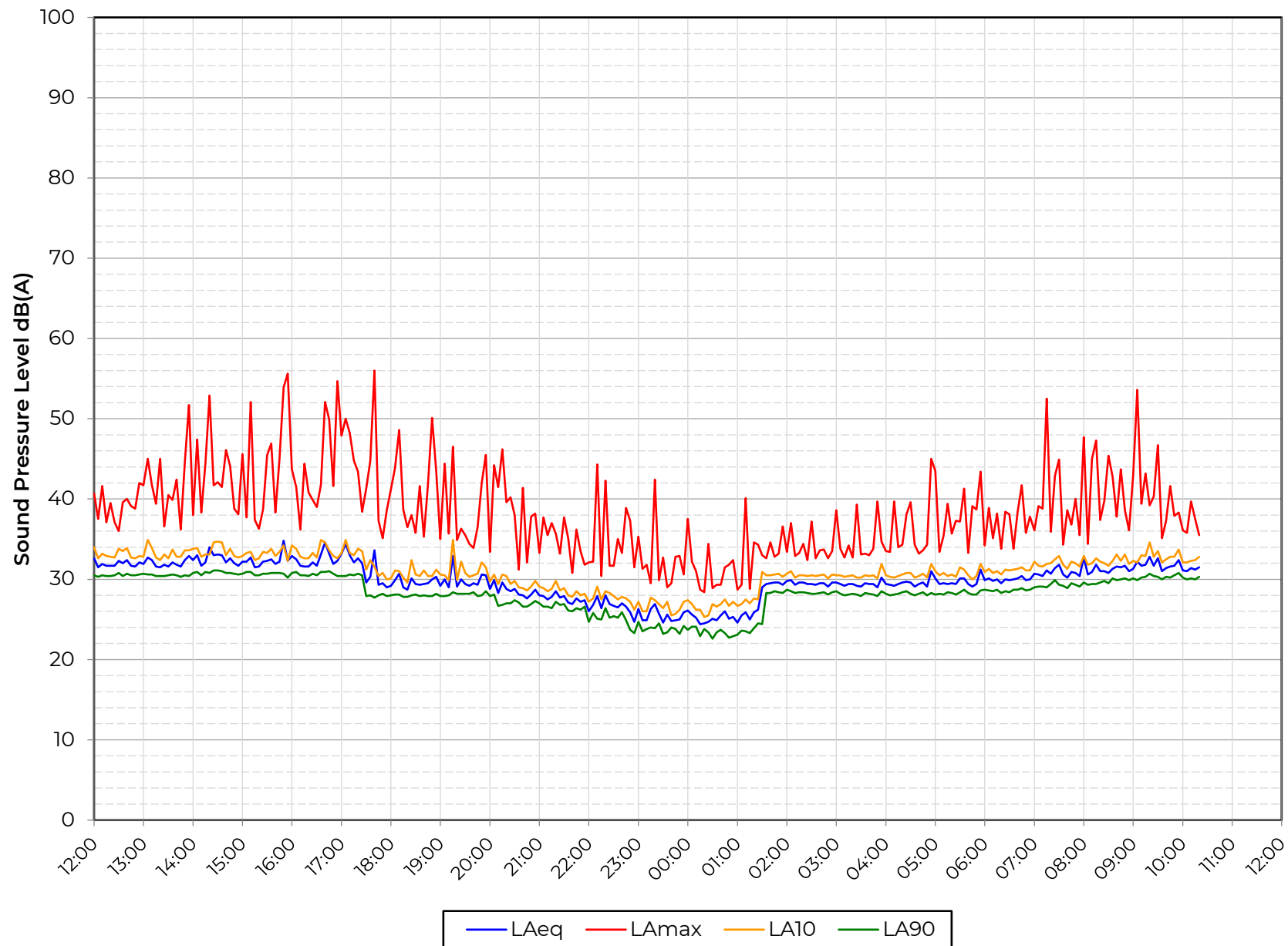
Position 2 (Internal)



Position 2 (Internal)



Position 2 (Internal)



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.
NR	<i>Noise Rating</i> . A single figure noise level rating that takes into account the frequency content of an acoustic environment.
R	<i>Sound Reduction Index</i> . 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.
D	The sound insulation performance of a construction is described in terms of the difference in sound level on either side of the construction in the presence of a

sound source on one side and the reverberant characteristics of the adjoining 'receive' space. D is the arithmetic Level Difference in decibels between the source and receive sound levels when filtered into frequency bands.

D_{nT}	<i>Weighted Standardised Level Difference.</i> As defined in BS EN ISO 717-1, representing the Weighted Level Difference, when standardised for reference receiving room reverberant characteristics.
$D_{n,e}$	Normalised sound insulation of small building elements of fixed dimensions, such as vents, measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010.
$D_{n,f}$	Flanking sound insulation of lightweight elements, such as curtain wall mullions, measured in an accredited laboratory test suite in accordance with the procedures laid down in ISO 10848-2:2006
R_w D_w $D_{nT,w}$ $D_{n,e,w}$ $D_{n,f,w}$	Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure value.
C , C_{tr}	Spectral adaptation terms to be added to a single number quantity such as $D_{nT,w}$, to take account of the sound insulation within frequency ranges of particular interest.
$L'_{nT,w}$	<i>Weighted Standardised Impact Sound Pressure Level</i> as defined in BS EN ISO 717-2, representing the level of sound pressure when measured within a space where the floor above is under excitation from a calibrated tapping machine, standardised for the receiving room reverberant characteristics.
ΔL_w	Change in impact sound pressure level when a floor is fitted with a 'soft' or resilient covering, as measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-3:2010.

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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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.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

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 they climb up a ladder (and are closer to the top of the barrier) than if they were standing at ground level. Equally if they sat on the ground the sound would seem quieter than if 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

BS4142 METHODOLOGY

BS4142 is designed to allow contextual assessment of impact from commercial, or industrial sound on sensitive receptors. Examples covered by the Standard include:

- 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.

In brief, the assessment procedure involves establishing sound levels from the items or processes of interest, (the specific sound source(s)), corrected for any acoustic features to derive the Rating Level, (L_{Ar,T_r}), at the relevant assessment position(s). The Rating Level is compared against the existing Background Sound Level, ($L_{A90,T}$), to provide an initial estimate of impact. The Standard offers the following guidance with regard to the significance of estimated impact:

- a) Typically, the greater this difference, the greater the magnitude of the impact;*
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- c) A difference of around +5dB could be an indication of an adverse impact, depending on the context;*
- d) 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 lower the rating level is relative to the background sound level, the less likely it is that the specific sound source will have an adverse impact.*

Where relevant, the initial estimate should then be modified by accounting for contextual aspects of the operation of the specific sound source and / or the context of the character of the area.

Other Assessment Parameters and Guidance on Character Corrections

The Specific Sound Level (L_s) is expressed in terms of an L_{Aeq} for a reference time interval, (T_r) of one-hour during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours). The Rating Level is also expressed in terms of the reference time interval, T_r .

The Specific Sound Level can be determined by various means, which can include prediction based on manufacturer's data and accompanying propagation calculations to the assessment position(s). This method could be used, for instance, where the specific sound source is not yet in-situ, or is in-situ but not yet operational.

Where the specific sound source is already operational and in-situ, measurements of the sound climate resulting from both the specific sound source and all other contributing

sources, (known as the Ambient Sound Level, $L_a = L_{Aeq,T}$) should be measured over a representative time period, ideally at the assessment position(s).

Depending on the relative contribution of other sources not related to the specific sound, (known as the residual sound), the Specific Sound Level can be derived by logarithmically subtracting the Residual Sound Level, $L_r = L_{Aeq,T_r}$, from the Ambient Sound Level.

With justification, representative proxy locations can be used for the measurement of the ambient and/or residual sound climate. Where these measurement locations are not fully representative of the assessment position(s), measurement can be supplemented with calculation.

The Background Sound Level should ideally also be measured at the assessment position(s) but can be measured at representative proxy locations where suitable reasons can be provided. The Background Sound Level should be measured over a period which is suitable to characterise the background sound climate during the period of interest and should normally be at least 15 minutes.

When deriving the Rating Level from the Specific Sound Level, consideration is given to the character of the sound. The Standard provides several methods for deriving appropriate character corrections, offering the following advice for subjective assessment:

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 sound 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 3dB for impulsivity which is just perceptible at the receiver, 6dB where it is clearly perceptible and 9dB 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 +3dB 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 +3dB can be applied.