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DWP Worthing

Noise Impact Assessment

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Project Ref:	AS13843	**Project Name:**	DWP Worthing
Report Ref:	AS13843.250626.NIA	**Report Title:**	Noise Impact Assessment
Client Name:	R&B MEP Limited		
Project Manager:	Andrew Nesbitt		
Report Author:	Andrew Nesbitt		

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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 Clarke Saunders Acoustics (CSA) has been commissioned by R&B MEP Limited to undertake a noise impact assessment of proposed Air Source Heat Pumps (ASHPs) at DWP Worthing, Crown Buildings, High Street, Worthing, BN11 1NG.

1.2 An environmental sound survey was undertaken, the results of which were used in conjunction with manufacturer's sound data for the proposed ASHPs to assess its impact on the nearest noise-sensitive receptors. This assessment was carried out following procedures in BS4142.

1.3 The assessment found that there is a low likelihood of an adverse impact on nearby sensitive receptors.

2.0 INTRODUCTION

2.1 Clarke Saunders Acoustics has been commissioned by R&B MEP Limited to undertake a noise impact assessment of new ASHPs serving DWP Worthing, Crown Buildings, High Street, Worthing, BN11 1NG. It is understood that the new units are part of decarbonisation measures.

2.2 This report describes the environmental sound survey and assessment undertaken, including relevant acoustic calculations and discussions with the environmental health department of the Local Authority.

2.3 A summary of the acoustic terminology used throughout the report is provided in Appendix A.

3.0 COMPETENCE

3.1 The project was managed by Andew Nesbitt, a Consultant at CSA who has conducted the assessment and is the author of this report. Andrew holds a Master's degree in Acoustical Engineering from the Institute of Sound and Vibration Research at the University of Southampton and is a Corporate Member of the Institute of Acoustics (MIOA).

3.2 The survey works were undertaken by Joel Bird, an Assistant Consultant at CSA, under the supervision of Andrew Nesbitt. Joel holds a Master's degree in Acoustical Engineering from the Institute of Sound and Vibration Research at the University of Southampton and is an Associate Member of the Institute of Acoustics (AMIOA).

3.3 This report adheres with principles required by the IOA 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 matter.

3.4 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 The Crown Buildings are located in central Worthing, and is bound by High Street (A259) to the west, Charlecote Road to the north, Warwick Gardens to the east and Elm Road to the south.

4.2 DWP Worthing operates within these premises between the hours of 09:00 – 17:00 Monday to Saturday.

4.3 The surrounding area is urban in nature, with a mixture of commercial and residential buildings nearby.

4.4 The existing sound climate is largely determined by road traffic on High Street, with contributions from the existing plant.

4.5 It is proposed that the existing plant compound will be extended to make space for the new ASHPs. It is understood that the existing mechanical plant operates between the hours of 07:00 – 19:00, as will the new ASHPs.

4.6 The nearest residential receptor to the proposed ASHPs is 17 Elm Road, the garden of which lies circa 30m to the south of the proposed plant compound, whilst the dwelling itself is set back a further 5m. Its first-floor windows have direct line of sight to both the existing and proposed plant compounds.

4.7 The site and its surroundings are shown in the attached site plan, AS13843/SP1.

5.0 LOCAL AUTHORITY REQUIREMENTS & RELEVANT GUIDANCE

5.1 LOCAL AUTHORITY REQUIREMENTS

5.1.1 The Planning Noise Advice Document (PNAD) – Sussex (November 2023) has been jointly developed by several local authorities in Sussex, including Worthing Borough Council (WBC). Section 3.4 of the PNAD provides guidance on the installation of ASHPs, and includes the following statement:

"If installation of a ASHP requires planning permission, then a full BS4142 assessment may be considered necessary (Section 3.1 and 3.2 above)."

5.1.2 Sections 3.1 and 3.2 provide general guidance on industrial and commercial sound sources, where it is recommended to contact the Local Planning Authority so that a target rating level can be discussed and agreed upon.

5.1.3 CSA contacted Mr Michael Lavender, a Senior Environmental Health Officer at WBC, on 1st July 2025 to discuss the assessment. He requested that the BS4142 assessment target a Rating Level equal to the existing typical Background Sound Level, but a slightly higher level may be acceptable where the context supports it.

5.2 BS4142

5.2.1 BS4142:2014+A.1:2019 *Methods for rating and assessing industrial and commercial sound* (BS4142) provides a methodology to assess the likelihood of adverse impact arising from sound generated by industrial and commercial sound sources.

5.2.2 Sound emissions which result in distinguishable features are subject to additional penalties. The context of the sound emissions and existing soundscape form an important part of the assessment.

5.2.3 A detailed summary of the BS4142 assessment methodology is provided at Appendix C.

6.0 ENVIRONMENTAL SOUND SURVEY

6.1 SURVEY PROCEDURE & EQUIPMENT

6.1.1 A survey of existing residual and background sound levels was undertaken at locations representative of the nearby noise-sensitive receptors. Additionally, a reference monitor was installed near the existing condensers to monitor their operating period.

6.1.2 The monitoring positions, locations of the proposed ASHPs and nearest affected receptor are identified in the attached site plan, AS13843/SP1.

6.1.3 Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken in free-field conditions at position 1, circa 2m above ground level. Measurements were taken between 10:00 hours on Friday 27th June and 09:45 hours on Tuesday 1st July 2025.

6.1.4 The following equipment was used during the survey:

- 1 no. Rion sound level meter type NL32;
- 1 no. Convergence Instruments reference monitor type RT-P;
- 1 no. Rion sound level calibrator type NC74.

6.1.5 Measurements were made following procedures in accordance with BS 7445-2:1991 (ISO1996-2:1987) *Description and measurement of environmental noise – Part 2: Acquisition of data pertinent to land use* and BS4142.

6.1.6 Class 1 measurement instrumentation was used to minimise uncertainty where the calibration of the instrumentation was verified before and after use. No significant calibration drift was detected.

6.1.7 Historic weather data has been reviewed, and the weather during the survey was found to be dry with light winds. These conditions are therefore suitable for the purposes of environmental sound monitoring.

6.2 SURVEY RESULTS

6.2.1 Figures AS13843/TH1-TH5 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement position. Figures AS13843/TH6-TH10 show the L_{Aeq} and L_{Amax} sound pressure levels as measured by the reference monitor.

6.2.2 Comparison of the time histories at the two measurement positions support the site engineer's subjective impressions such that, the soundscape at nearby dwellings is influenced by the existing condensers but they do not occupy a dominant position.

6.2.3 The average ambient $L_{Aeq,T}$ and typical background L_{A90} sound levels measured during the survey are shown in Table 6.1. These levels are shown both for the proposed operational hours and the full daytime period (for reference).

Monitoring Location	Monitoring Period	Average Ambient $L_{Aeq,T}$	Typical Background* L_{A90}
Position 1	Daytime (07:00 – 23:00)	54dB	41dB
	Operational Hours (07:00 – 19:00)	54dB	43dB
Reference Monitor	Daytime (07:00 – 23:00)	51dB	N/A
	Operational Hours (07:00 – 19:00)	52dB	N/A

Table 6.1: Summary of environmental noise survey results [dB ref. 20µPa]
*Typical background determined as the 10th percentile of the L_{A90} dataset

6.2.4 Inspection of the time histories for the reference monitor (Figures AS13843/TH6-TH10) confirm that the existing plant operates between the hours of 07:00 – 19:00 Monday to Saturday.

7.0 PLANT NOISE ASSESSMENT

7.1 PROPOSED PLANT

7.1.1 The proposed ASHPs are as follows:

- 1 no. Mitsubishi PURY-M250YNW-A1;
- 2 no. Mitsubishi PURY-M400YNW-A1;
- 1 no. Mitsubishi PURY-M450YNW-A1.

7.1.2 The manufacturer's sound pressure level data for the selected ASHPs is shown in Table 7.1.

ASHP	Unit	63	125	250	500	1k	2k	4k	8k	dB(A)
PURY-M250YNW-A1 (heating mode)	L_p @ 1m	69	63	62	60	54	50	51	44	61
PURY-M400YNW-A1 (heating mode)	L_p @ 1m	81	70	70	68	62	59	54	49	69
PURY-M450YNW-A1 (heating mode)	L_p @ 1m	84	71	71	69	63	61	56	51	70

Table 7.1: Manufacturer's sound data [dB ref. 20 µPa]

7.2 ASSESSMENT & DISCUSSION

7.2.1 The assessment has been made to the first-floor level windows of receptors at Elm Road, during the operational hours (07:00 – 19:00). The assessment is based on the source data given in Table 7.1 and the results of the environmental sound survey shown in Table 6.1.

7.2.2 Based upon the manufacturer's spectral sound data, the ASHPs are not expected to have tonal characteristics that are discernible at the nearest noise-sensitive receptors. Where heating is likely to be required for continuous periods, no intermittent characteristics are anticipated. Similarly, the operation of the plant will not result in impulsive characteristics.

7.2.3 A summary of the BS4142 assessment for the proposed operational hours is given in Table 7.2 with the derivation of the specific sound level shown in Appendix B.

Parameter	17 Elm Road (First Floor Window)
Assessment Period	07:00 – 19:00
Specific Sound Level ($L_{Aeq,1hr}$)	44dB
Acoustic Character Corrections	N/A
Rating Level ($L_{Ar,Tr}$)	44dB
Typical Background Sound Level (L_{A90})	43dB
BS4142 Assessment Level	+1dB

Table 7.2: Summary of BS4142 assessment [dB ref. 20 µPa]

7.2.4 The numerical assessment has determined that the cumulative impact from the proposed plant operating at 100% duty would result in a BS4142 initial impact assessment level of +1dB. Where the plant does not always operate concurrently or at full duty, the rating level is not expected to exceed the background sound level. In this regard, guidance from BS4142 indicates that this would result in a "*low impact, depending on the context*".

8.0 CONTEXT & UNCERTAINTY

8.1 CONTEXT

8.1.1 The existing mechanical plant has been operating for a number of years with no known noise complaints.

8.1.2 The on-site engineer noted that the existing soundscape was determined by road traffic on High Street, with contributions from the existing plant. This is corroborated through comparison of the time histories of Position 1 and the reference monitor, where it is noted that the background sound levels at Position 1 vary independently of the activity measured by the reference monitor. Sound emissions from the new ASHPs will therefore be commensurate with this existing sound climate.

8.1.3 The assessment has assumed that all four of the new ASHPs will be operating concurrently at 100% duty throughout the operational period. In practice it is unlikely

that this would be the case, and so the sound levels at the receptors will likely be lower than assessed here.

8.1.4 Sound data for both cooling and heating modes are provided by the manufacturer. The more onerous of the two (heating) has been used in the calculations to provide a robust assessment. The impact would therefore be lower when the units are running in cooling mode in warmer weather when residents may be more likely to have their windows open.

8.1.5 The operational hours of 07:00 – 19:00 fall within the bounds of the daytime period.

8.1.6 The context supports the findings of the initial numerical assessment and the resultant sound impact at nearby sensitive receptors should be low.

8.2 UNCERTAINTY

8.2.1 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.

8.2.2 Use of a calibrated type 1 sound level meters reduces measurement instrumentation error to insignificant levels as compared to environmental variations.

8.2.3 Manufacturer provided spectral sound data has been used, where possible.

8.2.4 The survey period covered several days (including a weekend) such that the typical diurnal variations in the soundscape could be observed and accounted for.

9.0 CONCLUSIONS

9.1 Clarke Sanders Acoustics has undertaken a sound impact assessment of proposed air source heat pumps at DWP Worthing, Crown Buildings, High Street, Worthing, BN11 1NG.

9.2 An environmental noise survey has been undertaken to determine the existing sound levels at a location representative of the nearest noise sensitive receptor.

9.3 An assessment of the potential noise impact has been undertaken, and the resultant sound impact has been determined to be low.



Andrew Nesbitt MIOA
CLARKE SAUNDERS ACOUSTICS



Indicative Site Plan

Figure AS13843/SP1

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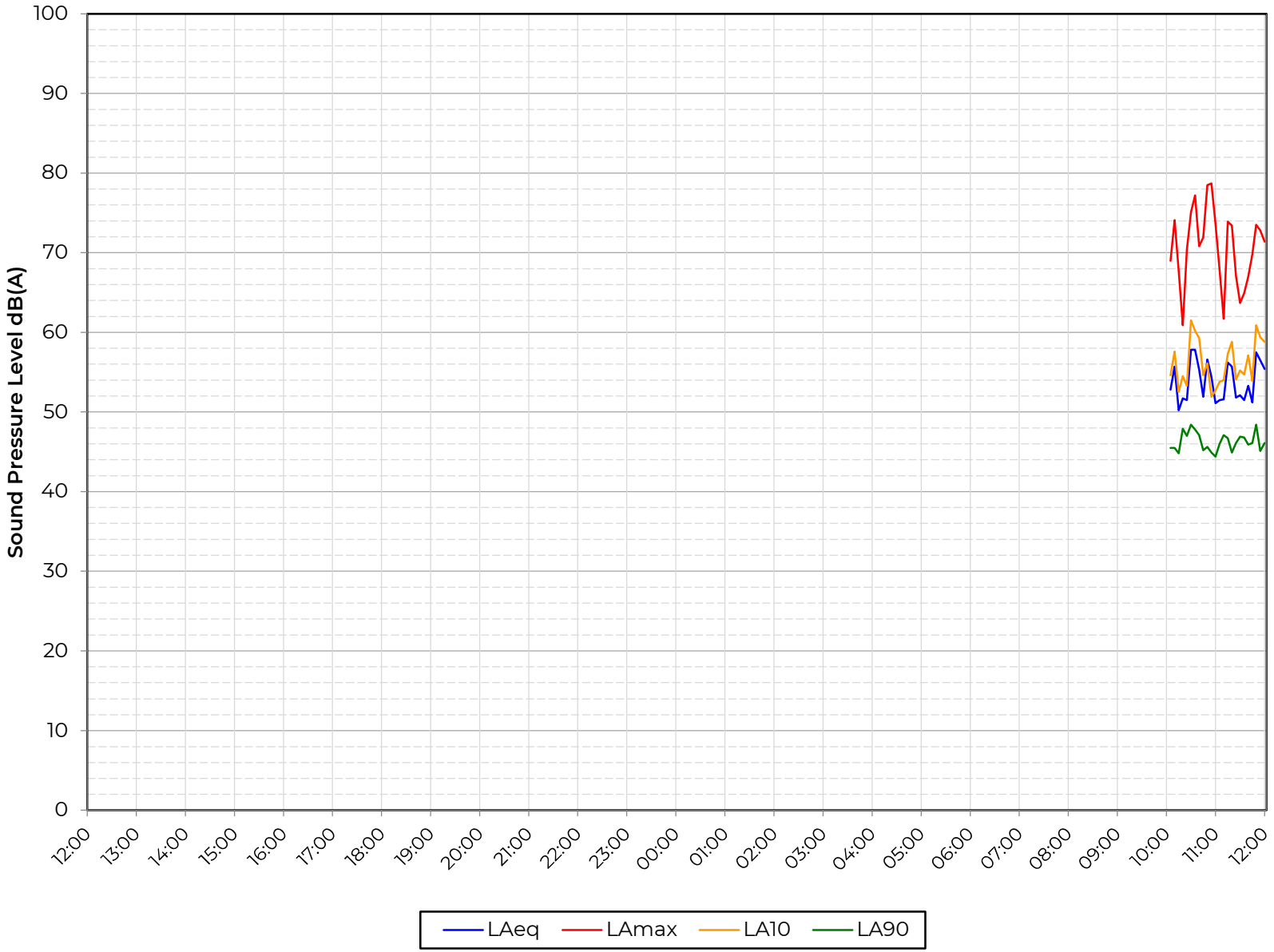
DWP Worthing

Position 1



Thu 26 Jun to Fri 27 Jun

Figure AS13843/TH1

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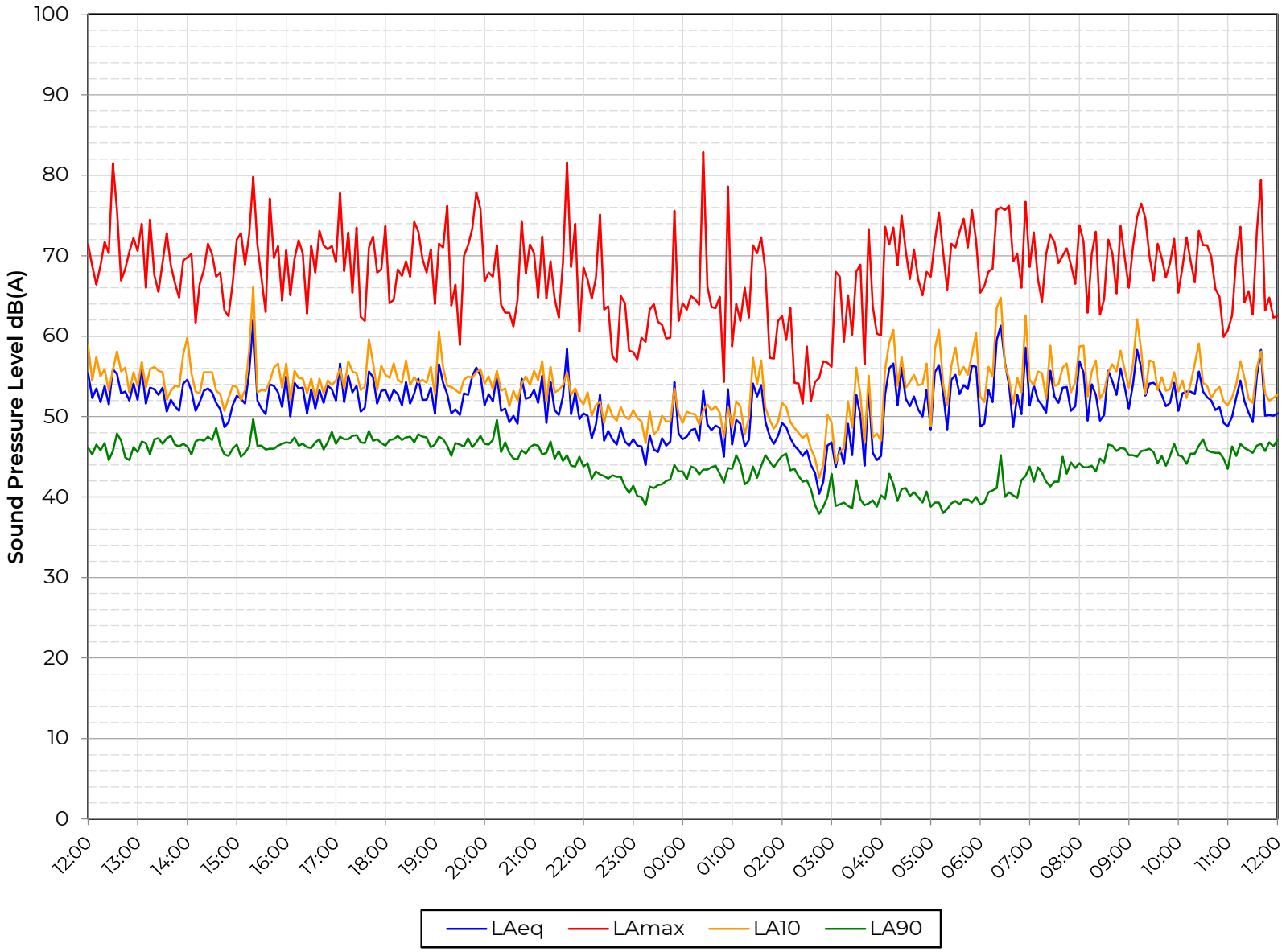
DWP Worthing

Position 1



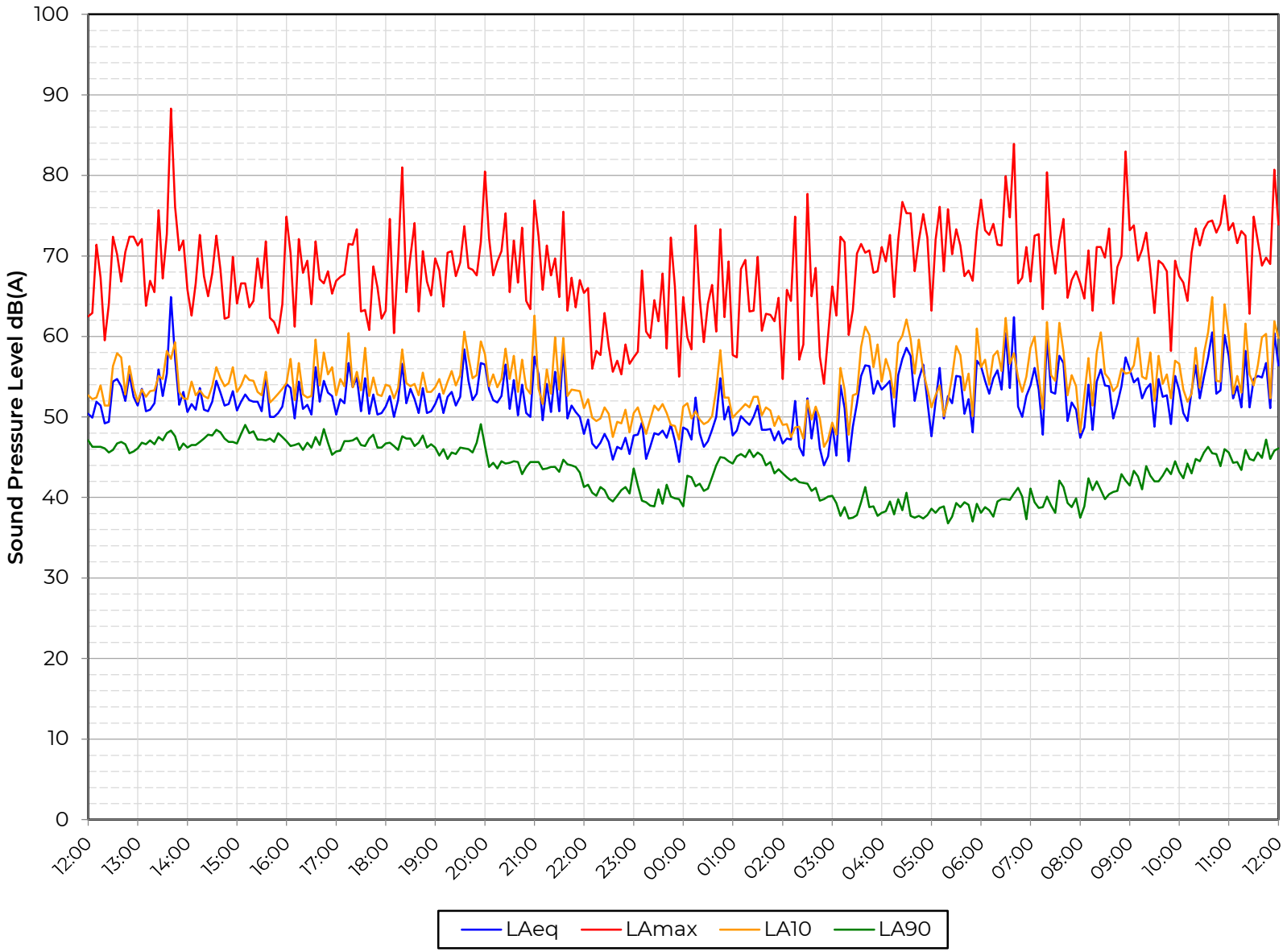
Fri 27 Jun to Sat 28 Jun

Figure AS13843/TH2

clarke saunders acoustics

DWP Worthing

Position 1



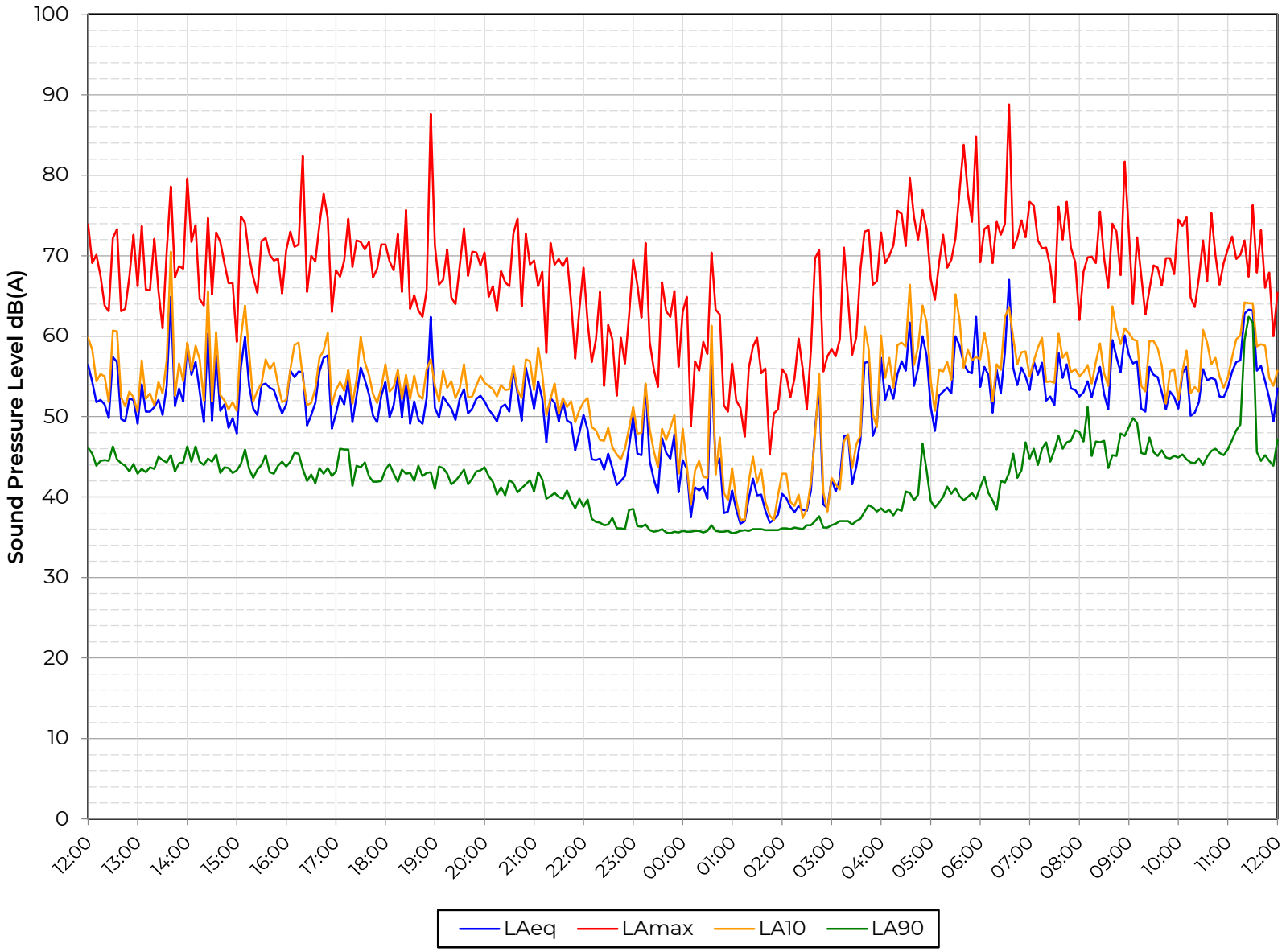
Sat 28 Jun to Sun 29 Jun

Figure AS13843/TH3

clarke saunders acoustics

DWP Worthing

Position 1



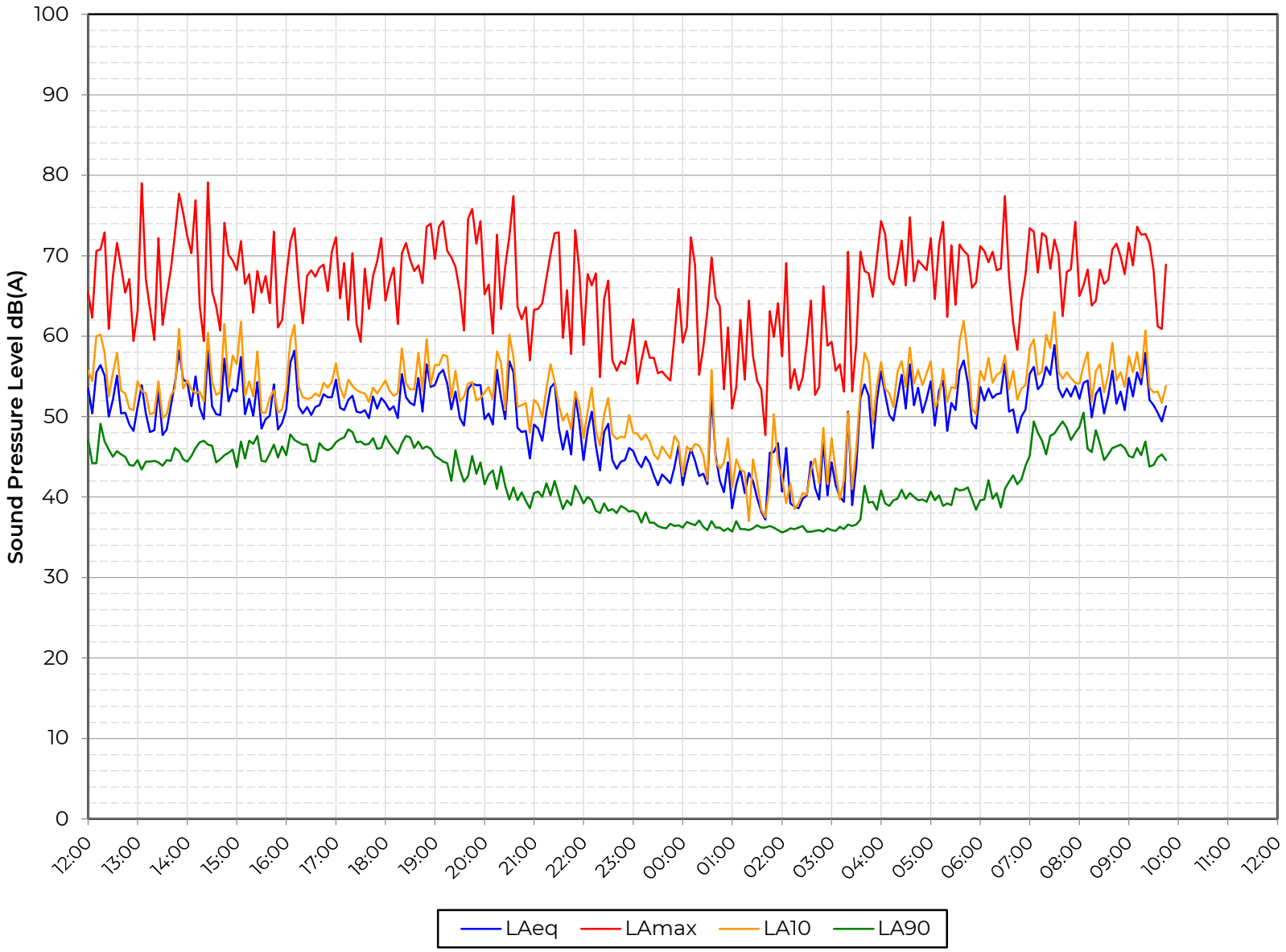
Sun 29 Jun to Mon 30 Jun

Figure AS13843/TH4

clarke saunders acoustics

DWP Worthing

Position 1



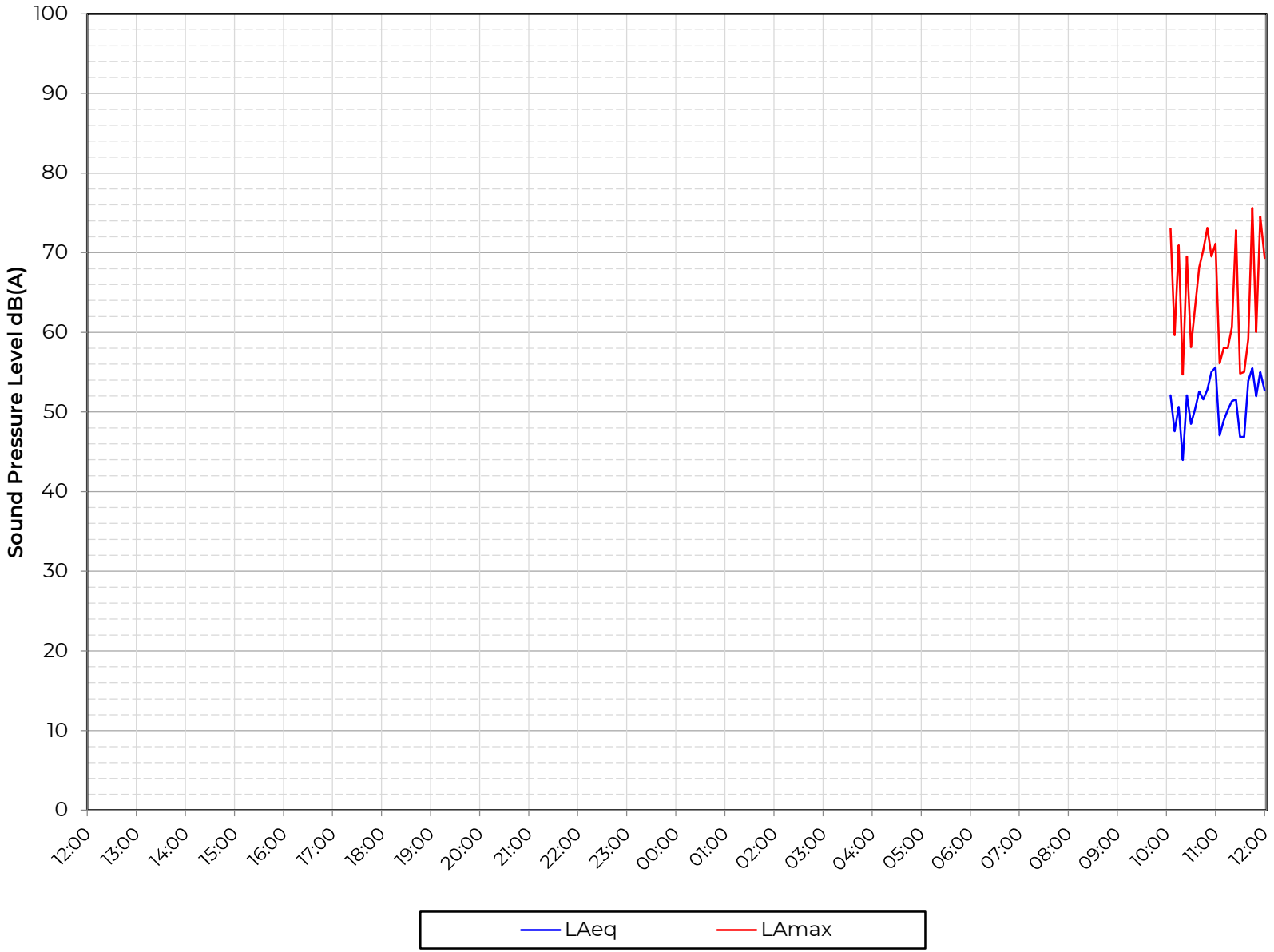
Mon 30 Jun to Tue 01 Jul

Figure AS13843/TH5

clarke saunders acoustics

DWP Worthing

Reference Monitor



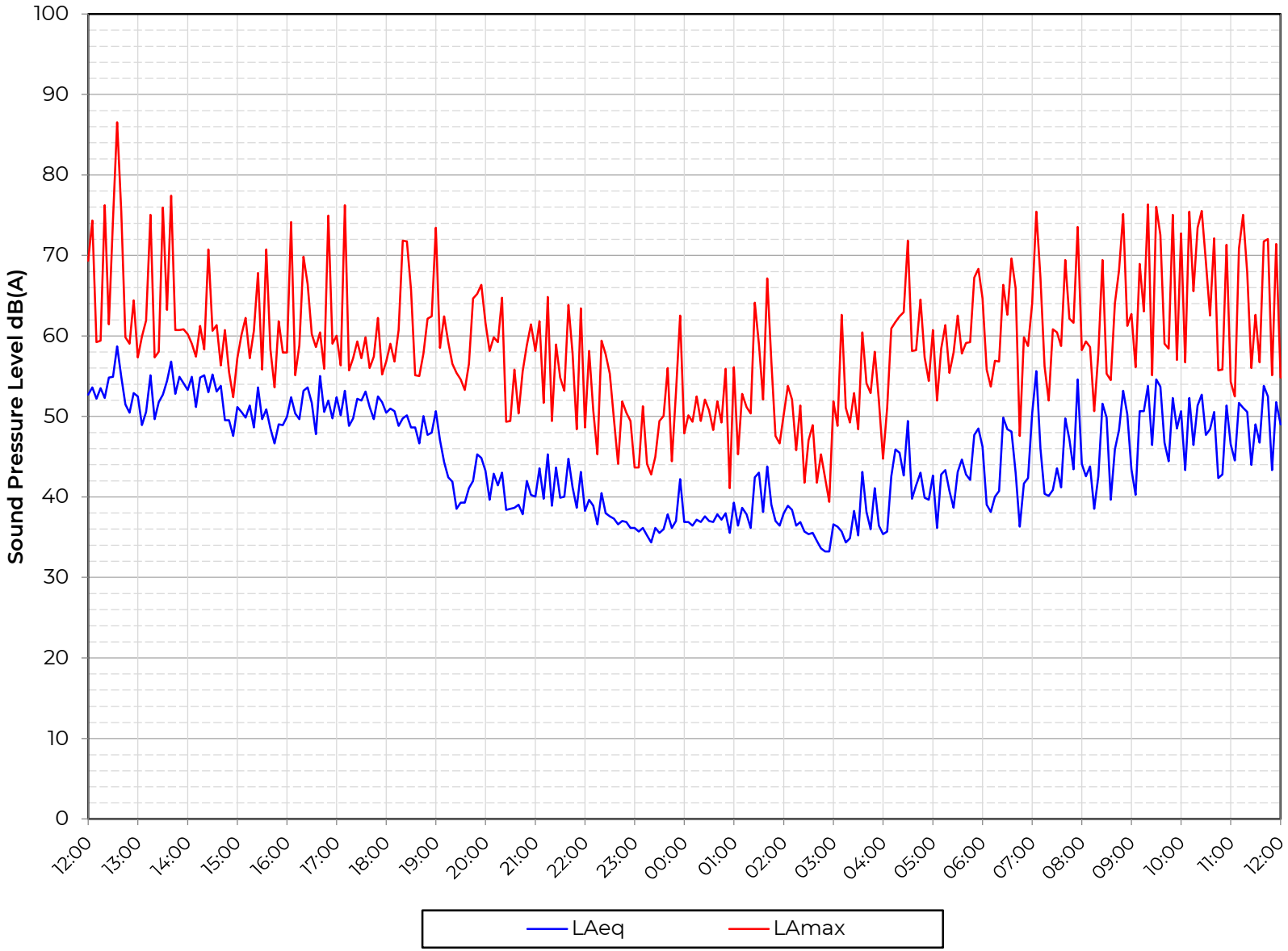
Thu 26 Jun to Fri 27 Jun

Figure AS13843/TH6

clarke saunders acoustics

DWP Worthing

Reference Monitor



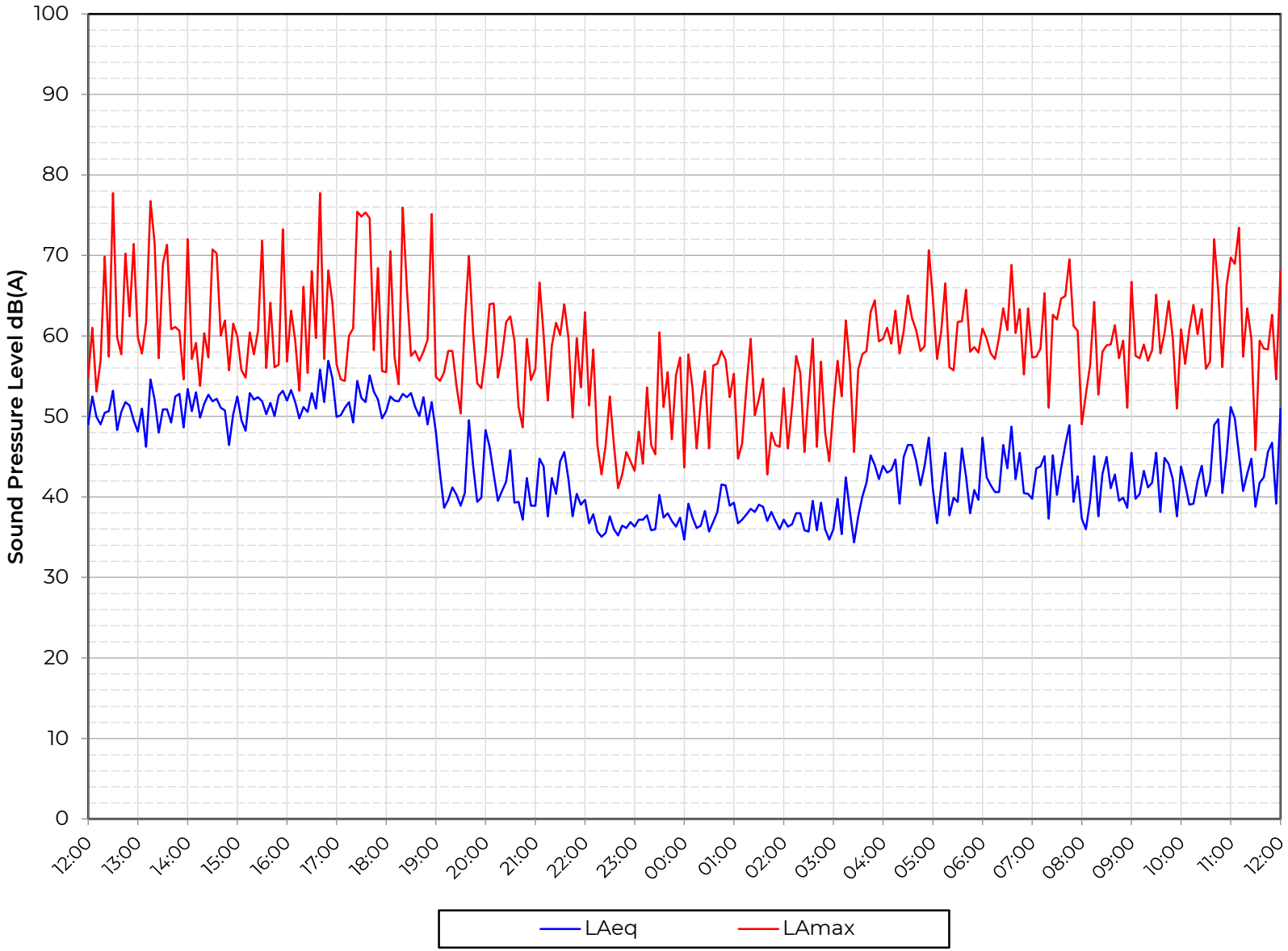
Fri 27 Jun to Sat 28 Jun

Figure AS13843/TH7

clarke saunders acoustics

DWP Worthing

Reference Monitor



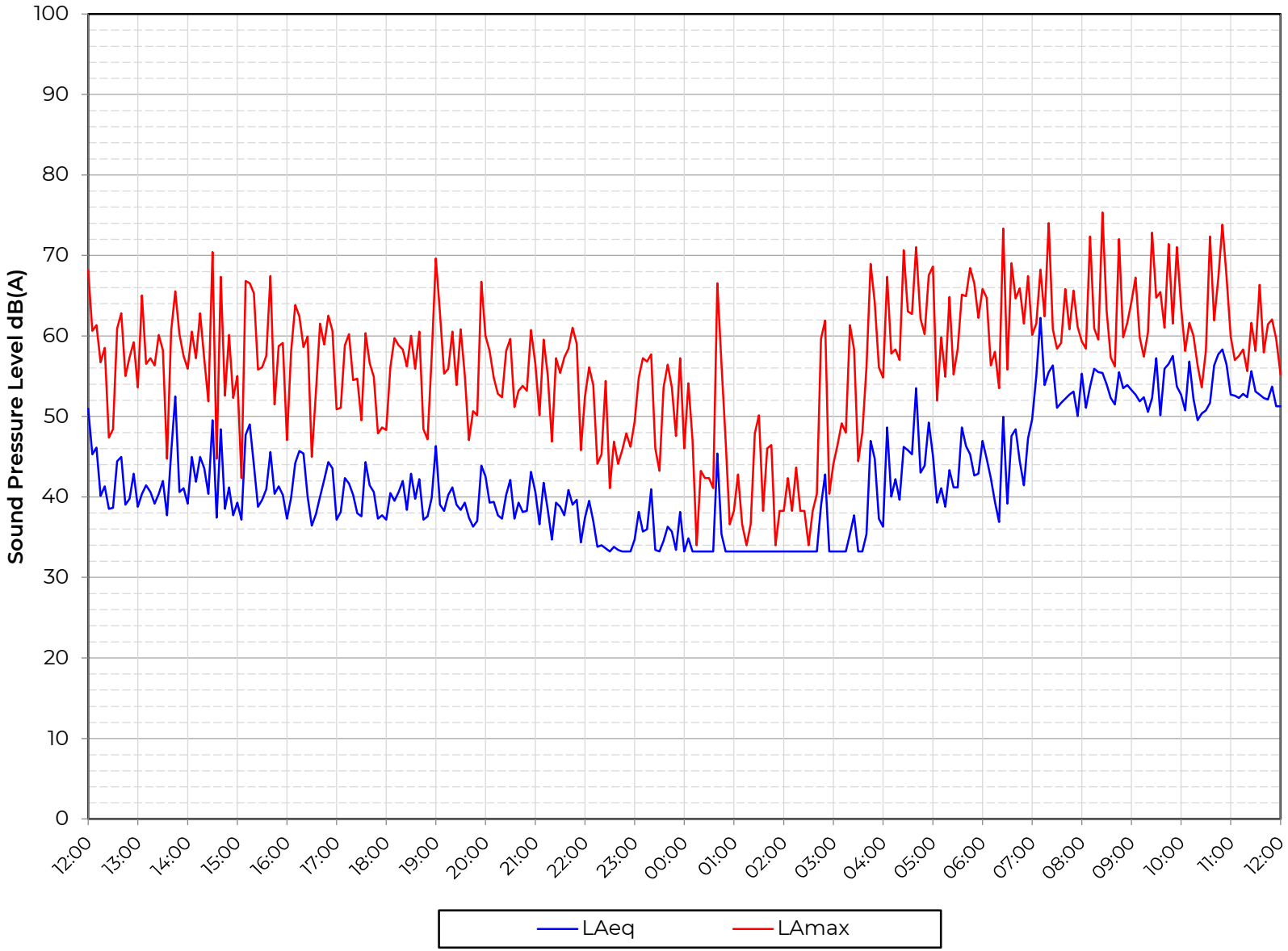
Sat 28 Jun to Sun 29 Jun

Figure AS13843/TH8

clarke saunders acoustics

DWP Worthing

Reference Monitor



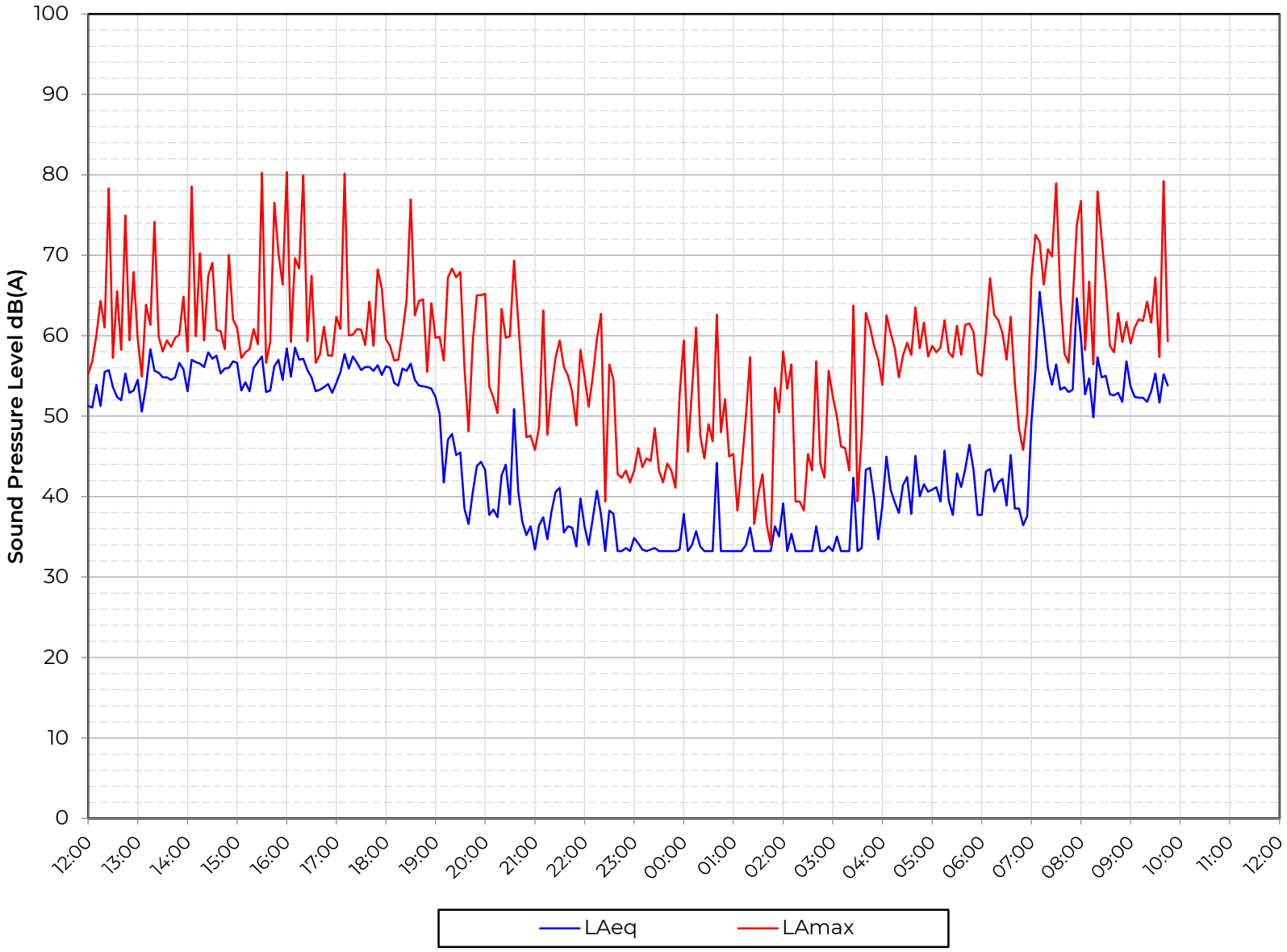
Sun 29 Jun to Mon 30 Jun

Figure AS13843/TH9

clarke saunders acoustics

DWP Worthing

Reference Monitor



Mon 30 Jun to Tue 01 Jul

Figure AS13843/TH10

APPENDIX A

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 *Noise Rating*. A single figure noise level rating that takes into account the frequency content of an acoustic environment.

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

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}	*Weighted Standardised Level Difference*. 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 DnT,w, to take account of the sound insulation within frequency ranges of particular interest.
$L'_{nT,w}$	*Weighted Standardised Impact Sound Pressure Level* 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

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 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

ASHP to Elm Road (1F window)		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Source X										
PURY-M250YNW-A1 (heating mode)	Lp @ 1m	69	63	62	60	54	50	51	44	61
Lw to Lp @ 1m	-	0	0	0	0	0	0	0	0	
Number of	1no	0	0	0	0	0	0	0	0	
Distance Loss	31m	-30	-30	-30	-30	-30	-30	-30	-30	
	Subtotal	**39**	**33**	**32**	**30**	**24**	**20**	**21**	**14**	**31**
Specific sound level at receptor	**$L_{eq\ 1hr}$**	**39**	**33**	**32**	**30**	**24**	**20**	**21**	**14**	**31**

ASHP to Elm Road (1F window)		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Source X										
PURY-M400YNW-A1 (heating mode)	Lp @ 1m	81	70	70	68	62	59	54	49	69
Lw to Lp @ 1m	-	0	0	0	0	0	0	0	0	
Number of	2no	3	3	3	3	3	3	3	3	
Distance Loss	31m	-30	-30	-30	-30	-30	-30	-30	-30	
	Subtotal	**54**	**43**	**43**	**41**	**35**	**32**	**27**	**22**	**42**
Specific sound level at receptor	**$L_{eq\ 1hr}$**	**54**	**43**	**43**	**41**	**35**	**32**	**27**	**22**	**42**

ASHP to Elm Road (1F window)		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Source X										
PURY-M450YNW-A1 (heating mode)	Lp @ 1m	84	71	71	69	63	61	56	51	70
Lw to Lp @ 1m	-	0	0	0	0	0	0	0	0	
Number of	1no	0	0	0	0	0	0	0	0	
Distance Loss	31m	-30	-30	-30	-30	-30	-30	-30	-30	
	Subtotal	**54**	**41**	**41**	**39**	**33**	**31**	**26**	**21**	**40**
Specific sound level at receptor	**$L_{eq\ 1hr}$**	**54**	**41**	**41**	**39**	**33**	**31**	**26**	**21**	**40**

Cumulative sound level at receptor	**$L_{eq\ 1hr}$**	**57**	**45**	**45**	**43**	**37**	**35**	**30**	**25**	**44**

APPENDIX C

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, ($L_{Ar,Tr}$), 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, (knows 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, $L_r = L_{Aeq,T}$, 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.