



114 – 116 THE STREET,
LITTLEHAMPTON
BN16 3DA

Plant Noise Assessment

Reference: 11416.RP01.PNA.0
Prepared: 3 November 2021
Revision Number: 0

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	3 November 2021	Toby Walton	James Stokes

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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1.0 INTRODUCTION

A new kitchen extract fan is proposed at the rear of 114–116 The Street, Littlehampton, BN16. As part of the planning application, Arun District Council requires consideration to be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive receptors.

RBA Acoustics has been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the impact of atmospheric noise in accordance with Arun District Council's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2.0 SITE DESCRIPTION

The site is located on The Street, in an area containing predominantly commercial properties. The site is located amongst various cafes, shops and restaurants. The new kitchen extract system is located on the rooftop at the rear of the property.

The nearest noise sensitive property to the proposed plant installations is understood to be Broadmark House, approximately 45 m away from the proposed plant installation.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 General

In accordance with the requirements of the Local Authority, monitoring of the prevailing background noise was undertaken over the following period:

Wednesday 27 October to Friday 29 October 2021

During the survey periods the weather conditions were generally appropriate for the noise measurement exercise, it being dry with light winds.

Measurements were made of the L_{A90} , L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

3.2 Measurement Locations

Position 1

Measurements were undertaken at Position 1 with the microphone positioned on a tripod adjacent to the proposed kitchen extract fan location at the roof to the rear of the property.

The measurement positions are also illustrated on the site plan in Figure 1 in Appendix D.

3.3 Instrumentation

Details of the instrumentation used to undertake the survey are provided in Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

4.0 RESULTS

The noise levels at the measurement positions are shown as time-histories on the attached Graphs 1 to 2.

In order to ensure a worst-case assessment, the lowest background L_{A90} noise levels measured have been used in our analyses. The hours within which the kitchen extract fan was in operation during the survey have been excluded from our analyses. The lowest daytime $L_{A90,15\text{minute}}$ was experienced within the hours prior to the kitchen extract fan operation (07:00 – 11:00 hours).

The noise levels measured are shown as time-histories on the attached Graphs 1-2.

The typical L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1.

Table 1 – Measured Levels

Measurement Period	Position 1 – Rear of Property	
	Lowest $L_{A90,15\text{min}}$ (dB)	L_{Aeq} (dB)
Daytime (07:00 – 23:00)	38	53
Night-time (23:00 – 07:00)	35	47
Plant Operating Hours (11:30 – 22:00)	41	52

5.0 GUIDANCE DOCUMENTS

5.1 Summary of BS 4142

Guidance for noise emissions from proposed new items of building services plant is given in BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background noise levels at the nearest noise sensitive adjacencies.

BS 4142 suggests that if the noise level of the proposed plant is 10 dB or more higher than the existing background noise level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background noise level, it is likely to be an indication of an adverse impact. If the level does not exceed the background noise level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs, etc., a penalty, based on the type and impact of those features, is applied.

5.2 Local Authority Requirements

We understand that Arun District Council requires an assessment in line with BS4142:2014 to be undertaken to assess the noise impact of the proposed plant but does not specify a numerical target based on the existing background noise level at the site.

5.3 Summary

We propose that the kitchen extract fan should be designed as such that noise emissions at the identified receptors does not exceed the existing typical background noise level (L_{A90}), therefore indicating a low impact in line with BS 4142:2014.

In line with the above requirements we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

- Daytime (07:00 to 23:00) 38 dBA
- Night-time (23:00 to 07:00) 35 dBA
- Plant Operating Hours (11:30 to 22:00) 41 dBA

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

It should be noted that the above requirements are applied at the nearest residential adjacencies and alternative criteria should be incorporated if there are also commercial properties affected by the proposed plant installations.

6.0 ASSESSMENT

Our assessment has been based upon the following information:

6.1 Proposed Kitchen Extract Fan

The following kitchen extract fan is proposed to run between 11:30 hours to 22:00 hours.

Table 3 – Plant Information

Ref.	Manufacturer/Model/Duty	Plant Type
KEF	SEL355/2-1AC	Kitchen Extract Fan

6.2 Position of Unit

The kitchen extract fan terminates at roof level, approximately 7 m from the nearest identified noise sensitive receptor. The equipment positions are indicated on the site plan in Figure 1 in Appendix D.

6.3 Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 4 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
KEF	In-duct Outlet L_w	80	70	79	79	80	76	71	65

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

6.4 Location of Nearest Residential Windows

Receptor 1

The closest residential windows to the plant are understood to be the windows of the residential properties located to the north at Broadmark House, at a distance of 45m.

6.5 Mitigation

We understand that the following mitigation measures are to be included within the design.

In-duct Attenuators

In-duct attenuation is to be installed to the atmospheric side of the kitchen extract fan, as detailed in the following table. This should be installed as close to the fan as possible.

Table 5 – in-Duct Attenuation Specification (Atmospheric)

Description	Length (mm)	Free Area [%]	Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
			63	125	250	500	1k	2k	4k	8k
KEF Exhaust	600	50	4	7	3	19	28	25	16	13

6.6 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the proposed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SWL
- Mitigation (as per Section 6.5)
- 20LogR Distance Attenuation
- Directivity
- Reflections

Calculation sheets are attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 5 – Predicted Noise Levels

Operating Period	Receptor 1	
	Prediction (dB)	Criterion (dB)
KEF Operating Hours (11:30 – 22:00)	25	41

Noise from the unit is below the target criteria and should therefore be considered acceptable.

7.0 VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that air handling units be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not “short-circuited” by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

8.0 CONCLUSION

Measurements of the existing background noise levels at 144–146 The Street, Littlehampton BN16 have been undertaken. The results of the measurements have been used to determine the required criteria for atmospheric noise emissions from the proposed kitchen extract fan installation.

The results of the assessment indicate atmospheric noise emissions from the plant are within the criteria required by Arun District Council. As such, the proposed plant installation should be considered acceptable.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as 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 (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g. L_{A10} , L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and 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 the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B - Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1406970	U32886	05 October 2023
Norsonic Pre Amplifier	1209	21205		
Norsonic ½" Microphone	1225	271055	32885	05 October 2023
Norsonic Sound Calibrator	1251	35020	U32884	05 October 2023

Appendix C – Plant calculations

An example calculation is provided below.

Unit	<i>L_w</i> In-duct (dB)	Attenuator (dB)	Grille End Reflection (dB)	Divergence (dB)	Received Level (dBA)
KEF Outlet	83	-20	-1	-41	25

Appendix D – Graphs and Site Plans

114 - 116 The Street, Littlehampton BN16 3DA

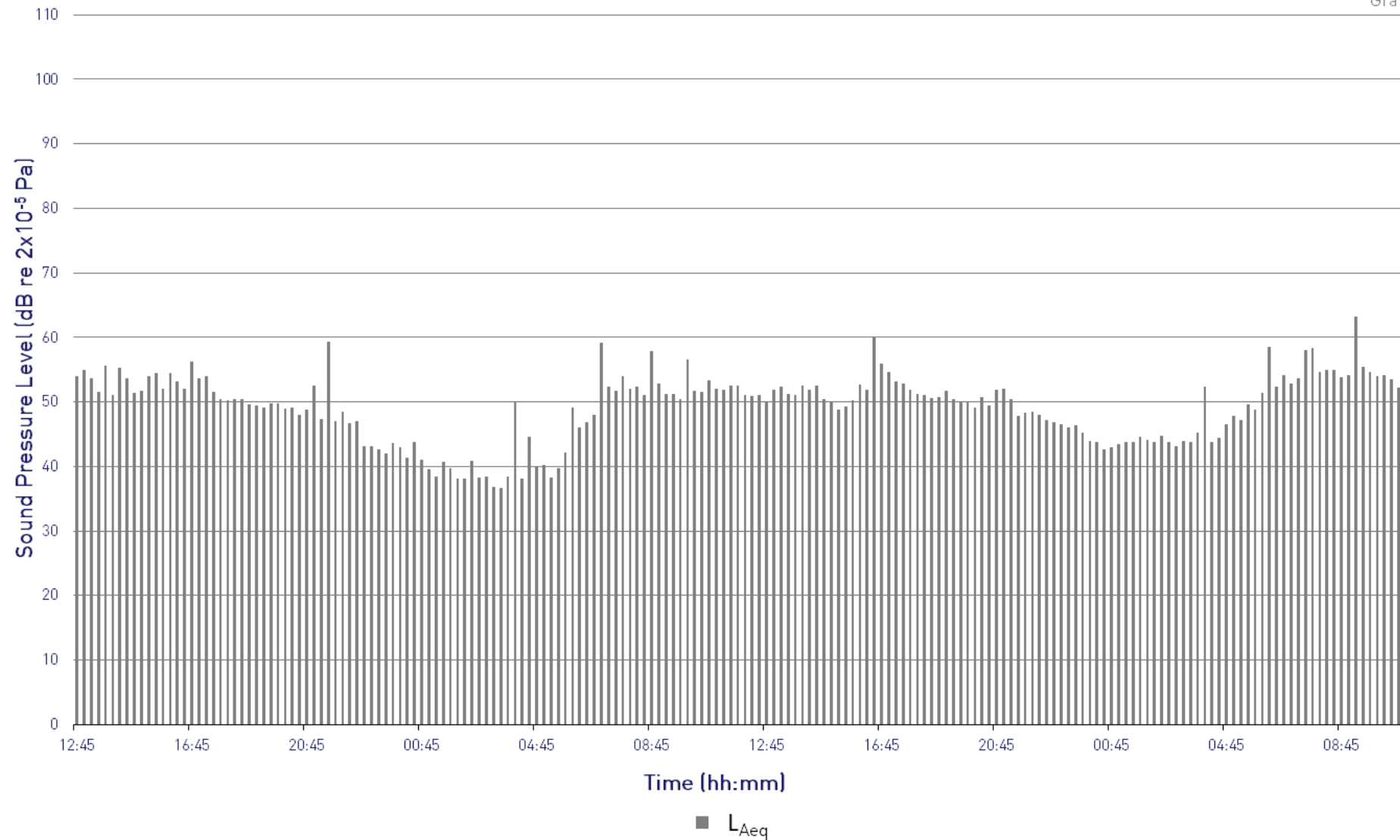
L_{Aeq} Time History

Measurement Position 1 - Rear of Building



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Graph 1



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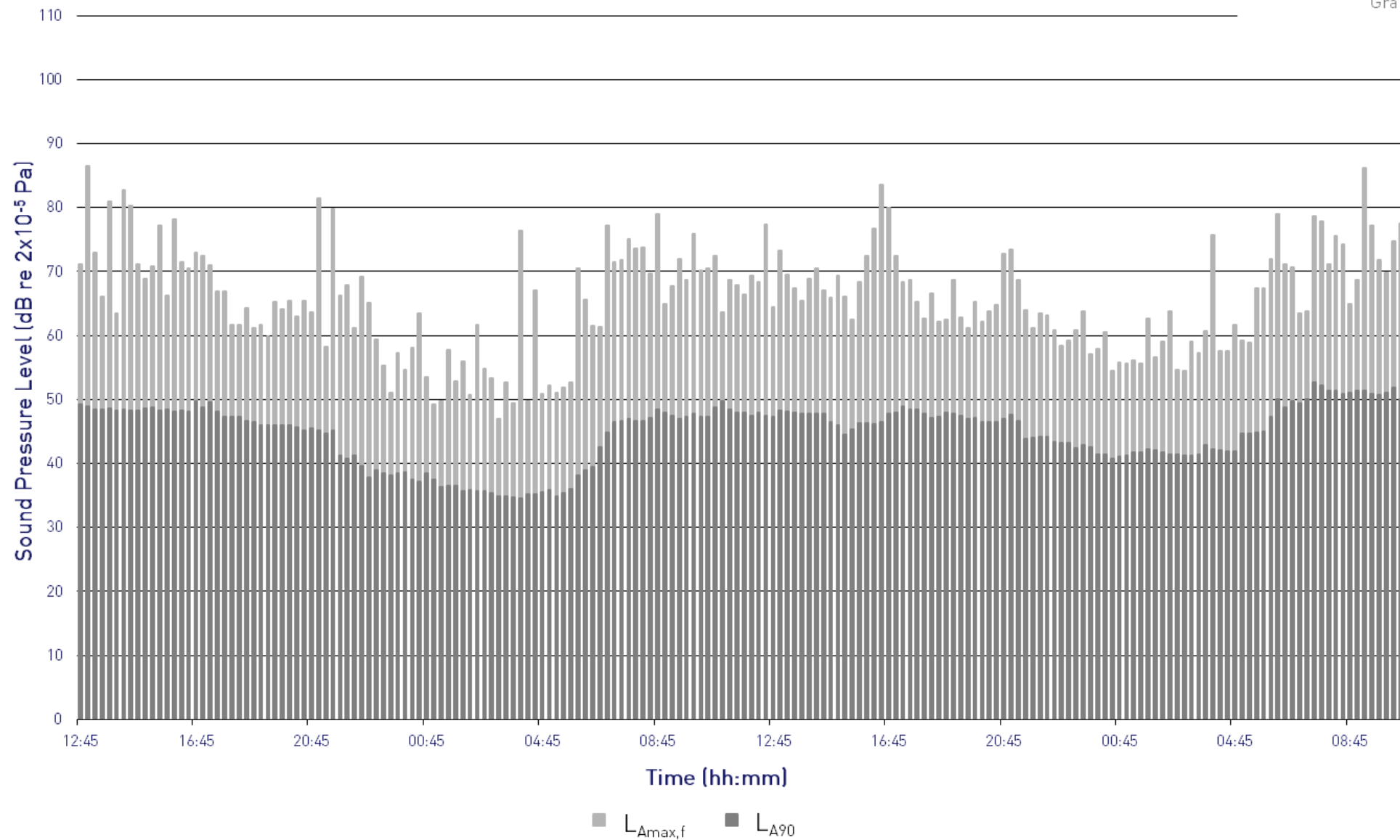
$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1 - Rear of Building



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Graph 2



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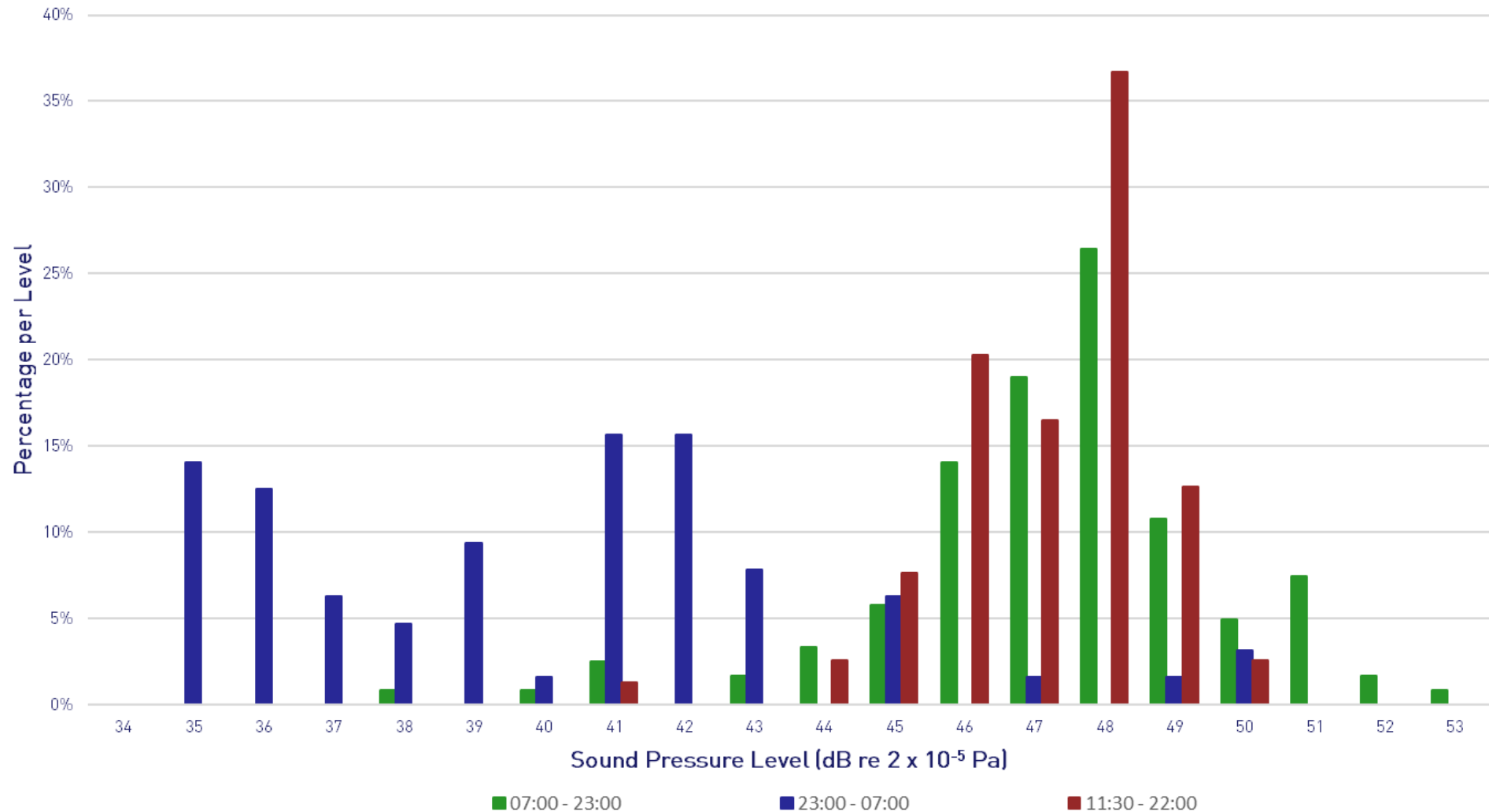
L_{A90,15 minutes} Histogram

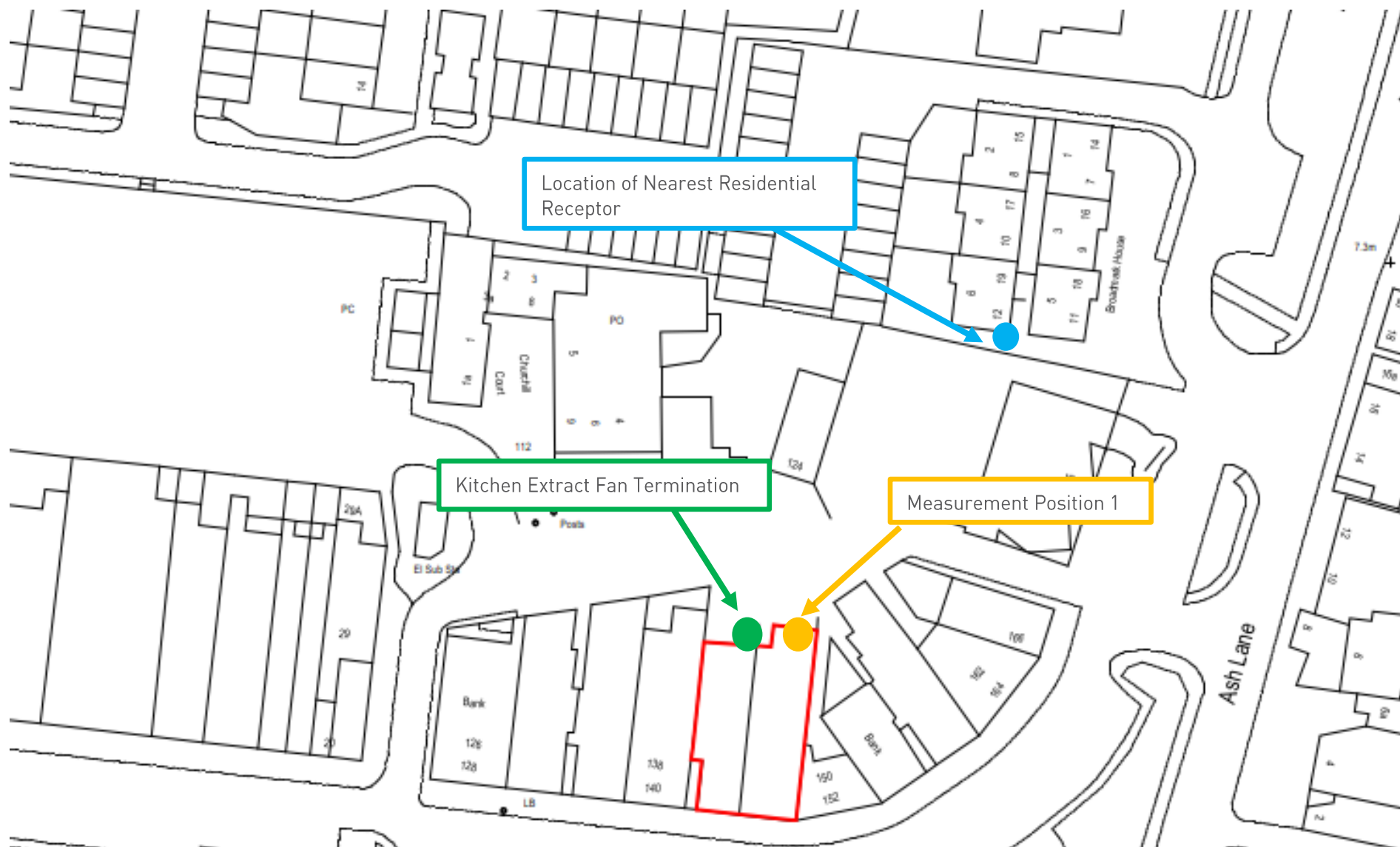
Measurement Position 1 - Rear of Building



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Graph 3





114 – 116 The Street, Littlehampton BN16 3DA
 Site Map Highlighting Plant and Measurement Location
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Figure 1
 3 November 2021
 Not to Scale



114 – 116 The Street, Littlehampton BN16 3DA
Photograph Showing Measurement Position
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Figure 2
3 November 2021
Not to Scale

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