Fulwood Place Limited

Elizabeth House, Fulwood Place, London

Plant Noise Assessment

MLM. Group

© MLM Consulting Engineers Limited

Notice

This document and its contents have been prepared and intended solely for Fulwood Place Limited information and use in relation to Elizabeth House, Fulwood Place, London.

MLM Consulting Engineers Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Certifying Body

MLM are full members of the ANC:

Document History

Client: Fulwood Place Limited
Project: Elizabeth House, Fulwood Place, London
Document Title: Plant Noise Assessment
Document Reference: 102034-MLM-ZZ-XX-RP-U-0002
MLM Reference: 102034/002R/SL

Revision	Status	Description	Author	Checked/Approved	Date
00	I	For Information	Sam Laws	Mark Scaife	08/10/2018

© MLM Consulting Engineers Limited

Contents

© MLM Consulting Engineers Limited

1 Introduction

MLM Consulting Engineers Ltd has been commissioned by Fulwood Place Limited to assess the impact of noise at the proposed development of Elizabeth House, 4-7 Fulwood Place, London, in respect of the site's suitability for office use.

The assessment considers noise from static plant and equipment associated with the proposed development, with respect to the existing noise levels in the area, which has been assessed in accordance with the assessment methodology contained in British Standard 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound.

Accordingly, the assessment is based upon environmental noise measurements undertaken at a location representative of the closest noise sensitive receptors in the vicinity of the site, and the design specification for fixed plant items.

This report is necessarily technical in nature and contains terminology relating to acoustics and noise. Therefore, a glossary together with a brief introduction to the subject of noise has been provided in Appendix A.

2 Site Description

The location and extent of the proposed development site is identified in Figure 1.

The development site is located west of the pedestrian-only Fulwood Place, just north of the busy High Holborn in London borough of Camden. The immediate surrounding area of the site is mostly commercial, not untypical for the area. The existing building has been used as an office and has been recently decommissioned prior to the redevelopment.

Figure 1: Site Location

2.1 Location of Noise Sensitive Receptors

The nearest and worst-affected noise-sensitive receptors to the proposed plant location have been identified as the commercial office building opposite the development site, at 15 Fulwood Place (some 11m from the proposed plant compound), and the residential properties located at 31-33 High Holborn (some 25 meters away).

© MLM Consulting Engineers Limited

3 Assessment Criteria

3.1 Local Authority Requirements

Following consultation with Environmental Health Officer Peter Rodham of the London Borough of Camden, the requirements of the Local Planning Authority are confirmed as follows:

External noise from machinery, extract/ventilation ducting, mechanical gates, etc.

Condition: Prior to [commencement] [use] of the development, details shall be submitted to and approved in writing by the Council, of the external noise level emitted from plant/ machinery/ equipment and mitigation measures as appropriate. The measures shall ensure that the external noise level emitted from plant, machinery/equipment will be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity. A post installation noise assessment shall be carried out where required to confirm compliance with the noise criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.

Reason: To ensure that the amenity of occupiers of the development site/ surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment.

3.2 British Standard 4142

BS 4142 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS 4142 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to 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 the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

For the daytime, the assessment is carried out over a reference time period of one hour, but at night-time it is carried out over a 15 minute period. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

© MLM Consulting Engineers Limited

4 Noise Measurements

The prevailing noise conditions at the location of the proposed development have been determined by an environmental noise survey. The survey was undertaken over a typical weekday and weekend, between Wednesday 22 to Monday 27 November 2017.

4.1 Noise Monitoring Methodology

Continuous long-term measurements were undertaken at two secure measurement positions, as described in greater detail below. Continuous daytime and night-time noise monitoring was undertaken for the duration of the surveys.

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445.

All acoustic measurement equipment used during the noise survey conformed to Type 1 Specification of British Standard 6167[2]. A full inventory of this equipment is shown in Table 1 below:

Table 1: Inventory of Acoustic Measurement Equipment

Item	Make & Model	Serial Number
Sound Level Meter	01dB Duo	10965
Preamplifier	01dB PRE-23	10449
Microphone	GRAS 40CD	161799
Sound Level Meter	Rion NA-28	00860027
Preamplifier	Rion NH-23	60027
Microphone	Rion UC-59	10030
Calibrator	Rion NC-74	34315165

The noise measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrators used had been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on any sound level meter.

The microphones were fitted with protective windshields for the measurements. The sample period was selected following close monitoring of local weather conditions. During the survey, it was noted that the weather conditions were generally suitable for the sound measurement exercise, it being dry with very light winds.

Measurements were carried at the following locations, as described below and shown in Figure 2 below:

Microphone Position 1 – An unattended daytime and night-time measurement of sound along the eastern façade of the existing development. The microphone was attached onto a pole and extended at 1 metre from the rooftop above the existing third floor level facing Fulwood Place at 14m above the street level. This measurement position was deemed representative of the noise climate affecting the eastern façade of the development as well as the existing background noise levels in the area. Whilst the survey was largely unattended, during our time on site the sound environment was noted to have been affected by screened road traffic noise using High Holborn, pedestrian activity along Fulwood Place, noise emissions from numerous nearby plant items associated with the surrounding developments and occasional commercial aircraft. It should be noted that during the daytime period of Friday 24th, the measurement equipment at this position was moved by a third party. This meant that no reliable data was logged for the remainder of the survey at this position.

Microphone Position 2 – An unattended daytime and night-time measurement of sound along the western façade of the existing development. The microphone was attached onto a pole and extended at 1 meter from the rooftop above the existing third floor level facing the courtyard area of surrounding commercial buildings. Due to the presence of a roofed ground floor with plant items on top, the microphone was located only approximately 10 meters above the plant items, which would in this case be considered the local ground level. This measurement deemed representative of the noise climate affecting the western façade of the development as well as the existing background noise levels in the area. Whilst the survey was largely unattended, during our time on site the sound environment was noted to have been affected by noise emissions from a vast number of plant items associated with the surrounding commercial developments and some screened noise from the surrounding streets and occasional aircrafts.

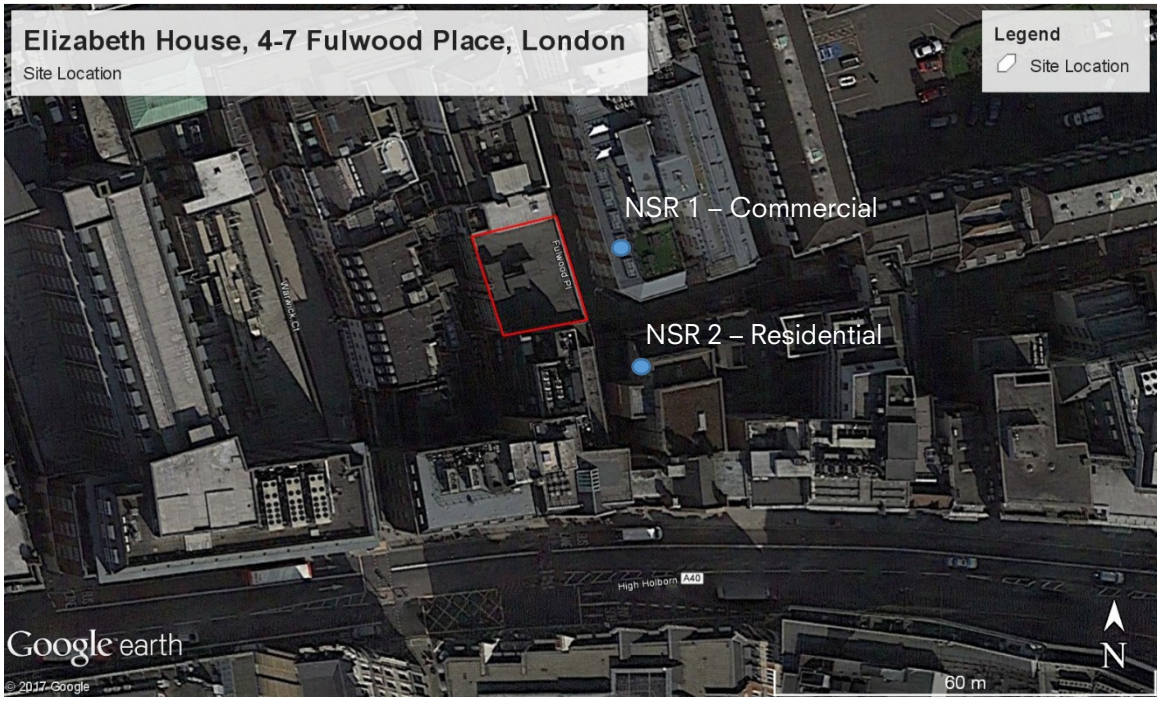


Figure 3: Measurement & NSR Locations

© MLM Consulting Engineers Limited

4.2 Measurement Results

The measured typical daytime and night-time background noise levels (L_{A90}) at each measurement position are detailed in Tables 2 and 3 below:

Table 2: Summary of Noise Measurement Results – Measurement Position 1			
Period	Typical Daytime L_{A90} (dB) Noise Level (07:00 – 23:00)	Typical Office Hours L_{A90} (dB Noise Level (09:00 – 17:00)	Typical Night-time L_{A90} (dB) Noise Level (23:00 – 07:00)
Wednesday (22/11/17)	-	-	49
Thursday (23/11/17)	52	52	48

Table 3: Summary of Noise Measurement Results – Measurement Position 2			
Period	Typical Daytime L_{A90} (dB) Noise Level (07:00 – 23:00)	Typical Office Hours L_{A90} (dB Noise Level (09:00 – 17:00)	Typical Night-time L_{A90} (dB) Noise Level (23:00 – 07:00)
Wednesday (22/11/17)	-	-	49
Thursday (23/11/17)	55	55	47
Friday (24/11/17)	55	55	46
Saturday (25/11/17)	51	-	46
Sunday (26/11/17)	50	-	47
Monday (27/11/17)	56	56	47

Please note that in accordance with the requirements of BS4142:2014, the typical L_{A90} noise levels detailed above have been derived following a detailed statistical analysis of the measured noise levels over the relevant daytime and night-time periods. By definition, the lowest L_{A90} is not typical and, therefore, should not be the basis of an assessment in accordance with BS4142:2014. The results of the statistical analysis are detailed in Appendix B.

The measured L_{Aeq}, L_{AFmax}, L_{A10} and L_{A90} noise levels are presented as time histories in Appendix B.

© MLM Consulting Engineers Limited

5 Assessment

A BS4142 Assessment has been carried out for fixed items of plant to determine the potential noise impact on the nearest noise-sensitive receptors. Our assessment has been based upon the following information:

5.1 Operating Hours

We understand the proposed plant may be required to operate between 09:00 and 17:00 daily (during weekdays only). As such, our assessment considers the lowest typical background noise levels during the relevant daytime period.

5.2 Criteria

Based upon the measured typical background noise levels and the proposed operating profile, we propose the worst-case noise emissions criteria detailed in Table 4 below.

Table 4: Proposed Noise Emissions Criteria		
Period	Lowest Typical Measured $L_{A90,T}$ (dB)	Maximum Rating Noise Level $L_{Ar,Tr}$ (dB)
Fulwood Place (MP1)	52	42
Rear Courtyard (MP2)	55	45

Please note that in order to ensure a robust assessment, the lowest typical noise levels have been used to formulate the above criteria. Where the source is tonal, a further 5dB penalty should be applied to the above levels.

5.3 Proposed Static Plant and Location

We understand that the proposed scheme is to include the following equipment:

Table 5: Proposed Plant Equipment
Make and Model
7No. Mitsubishi PURY-M200YNW-A outdoor unit

The proposed layout of the equipment can be seen in Figure 3. As shown, all equipment is to be located at roof level, with an imperforate, solid barrier of 1.1m height above roof level surrounding the plant compound.

© MLM Consulting Engineers Limited

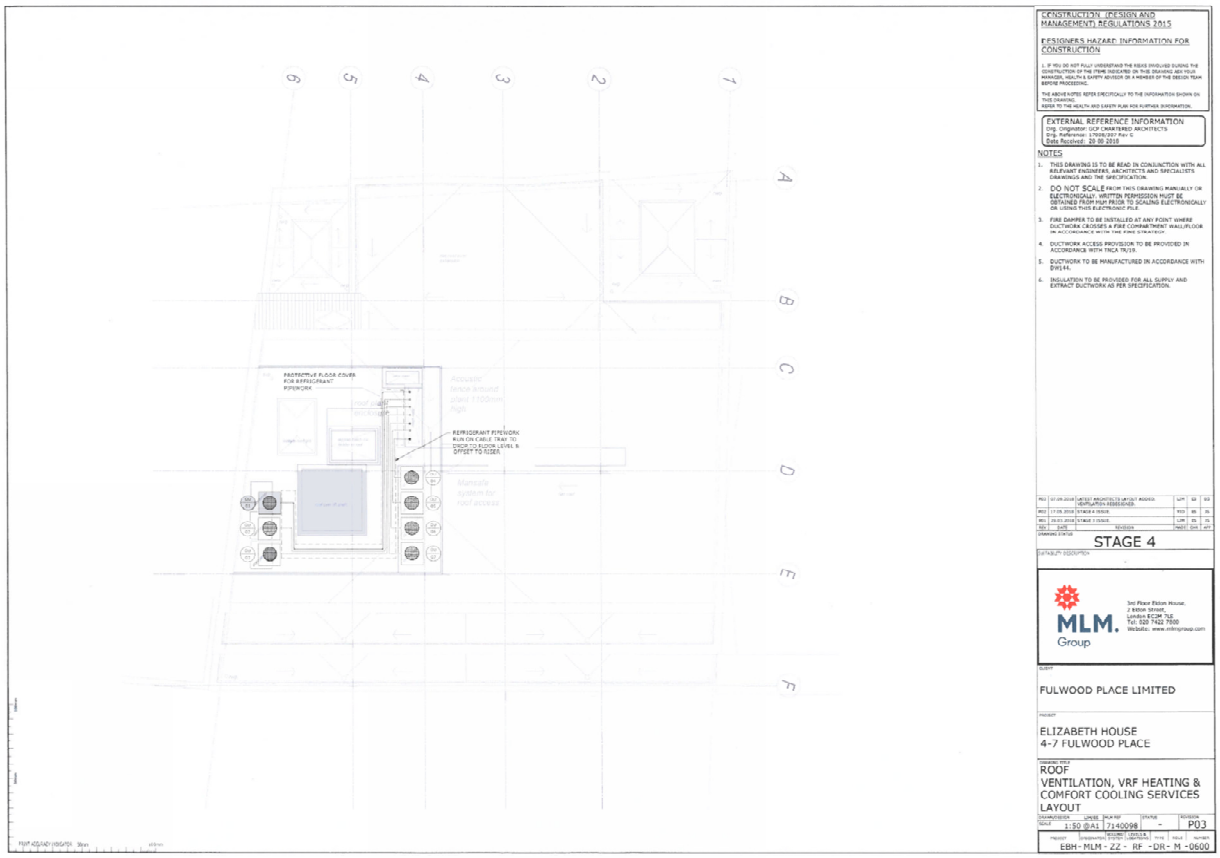


Figure 3: Proposed Plant Locations

5.4 Noise Levels

Information regarding the broadband noise levels of the proposed plant has been provided by the manufacturers, as detailed in Table 6, below.

Table 6: Manufacturers Noise Emission Data

Unit	Operation Mode	Data Type	Octave Band Data (dB)								dBA
			63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
PURY-M200YNW-A	Heating	SPL at 1m	77.0	61.0	60.5	57.5	51.0	46.5	44.0	41.5	59.0

5.5 Location of Nearest/Worst-Affected Noise-Sensitive Locations

Please refer to Section 2 of this report.

© MLM Consulting Engineers Limited

5.6 Calculation of Noise Levels at Nearest Noise-Sensitive Location

The calculated specific sound level at the location of the nearest/worst-affected noise sensitive dwelling resulting from the operation of proposed plant items has been assessed in accordance with the requirements of BS4142:2014.

Our calculation method for predicting noise levels from the proposed air conditioning units at the nearest residential window, based on the information stated above, is summarised below.

- Source Term (Plant SPL at 1m)
- Derivation of Source Term Sound Power Level (SPL to SWL)
- Derivation of Total Sound Power Level
- 20xLog(R) Distance Attenuation
- Applicable Screening Losses

BS4142:2014 advises that when the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the perceptibility of the aforementioned characteristics of the sound at the receptor location is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary. It also advises that the assessment of the significance of sound needs to take into account the context in which the sound will occur.

Based on the operating profile of the proposed plant and data provided by the manufacturers, no penalties are considered necessary for tonality or impulsivity of the sound arising from the development in this instance. However, to take account of the potential for intermittency of operation, a correction of +3dB has been applied to the calculated specific noise levels.

It should be borne in mind that noise measurements were undertaken at a location representative of the prevailing noise climate at the location of the nearest residential receptors and spanned a midweek and weekend period. As such, uncertainty is considered low in this instance.

Taking into account the context; the sound from the proposed plant is not expected to materially alter the character of the prevailing acoustic environment at the location of the nearest noise sensitive receptor, which is currently dominated by sound from the nearby road network, pedestrian activities and existing commercial activities in the area.

The results of the assessment can be seen in Table 7 below, which shows the predicted specific sound levels at a distance of 1m from the façade of the worst-affected receptor location and provides a comparison against the typical prevailing $L_{A90,15min}$ background sound levels.

Table 7: Predicted Sound Levels at Receptor Locations & Assessment

Assessment Location	Predicted Specific Sound Level (dB)	Feature Correction (dB)	Predicted Rating Level $L_{Ar,Tr}$ (dB)	Typical $L_{A90,T}$ (dB) Over Assessment Period	Excess of $_{LAr,T}$ above $L_{A90,T}$ (dB)	Significance of Sound
NSR1	38	+3	41	52	-11	Low Impact
NSR2	36	+3	39	52=	-13	Low Impact

As may be seen with reference to Table 7 above, the proposed scheme is predicted to result in no more than a low impact at the location of the nearest noise-sensitive receptors. As such, no further mitigation is deemed necessary in order to satisfy the requirements of the Local Authority in this instance.

© MLM Consulting Engineers Limited

6 Conclusion

MLM Consulting Engineers Ltd has been commissioned by Fulwood Place Limited to undertake an assessment of atmospheric plant noise impacts associated with the proposed redevelopment of Elizabeth House, 4-7 Fulwood Place, London.

This report presents the results of detailed noise measurements undertaken at the site and, in accordance with Government Guidance, presents the associated design criteria, along with the required assessment.

The assessment has shown that the predicted specific and rating level $L_{Ar,Tr}$ from the proposed development is expected to fall significantly below the design criteria and result in no more than a low impact when assessed in accordance with BS4142:2014.

© MLM Consulting Engineers Limited

Appendix A - Glossary of Acoustic Terminology

© MLM Consulting Engineers Limited

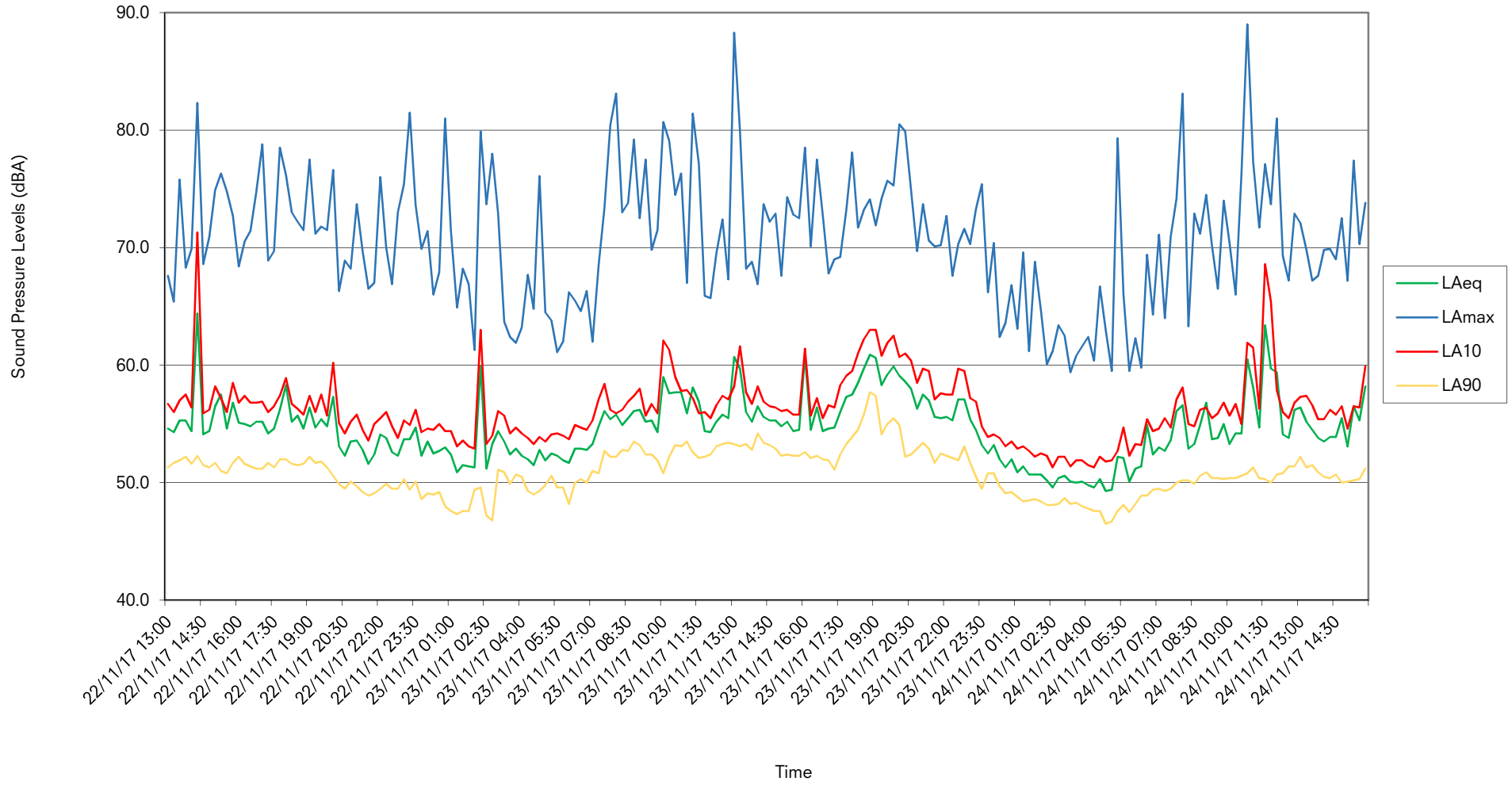
Wording	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

© MLM Consulting Engineers Limited

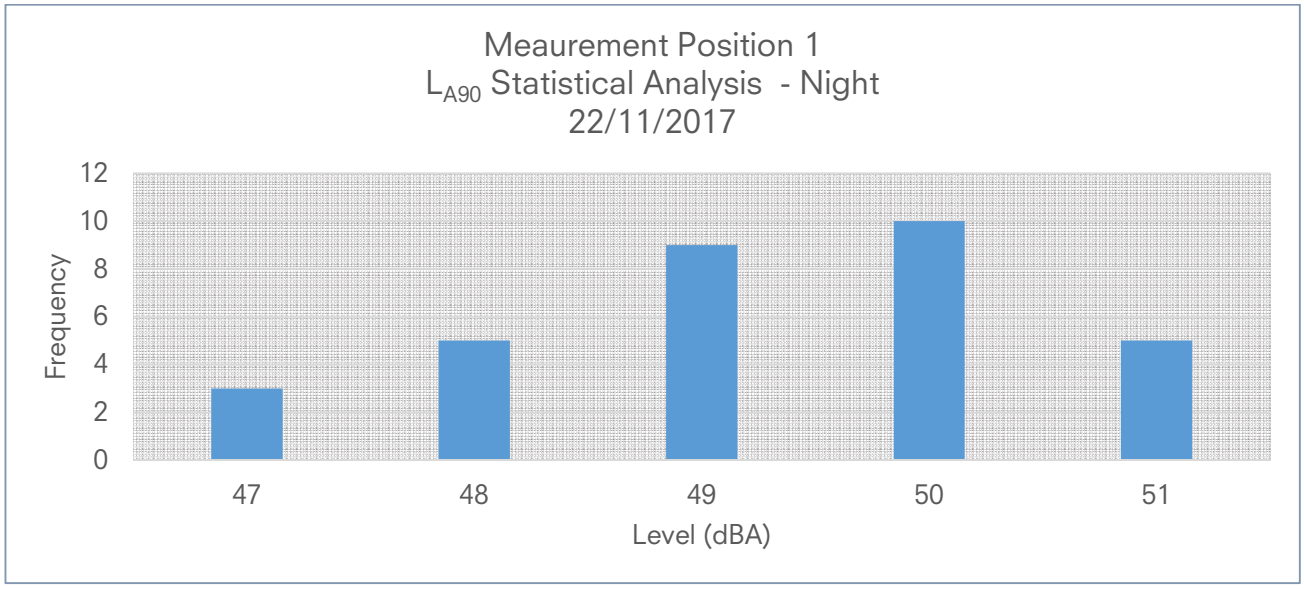
Appendix B - Noise Measurements

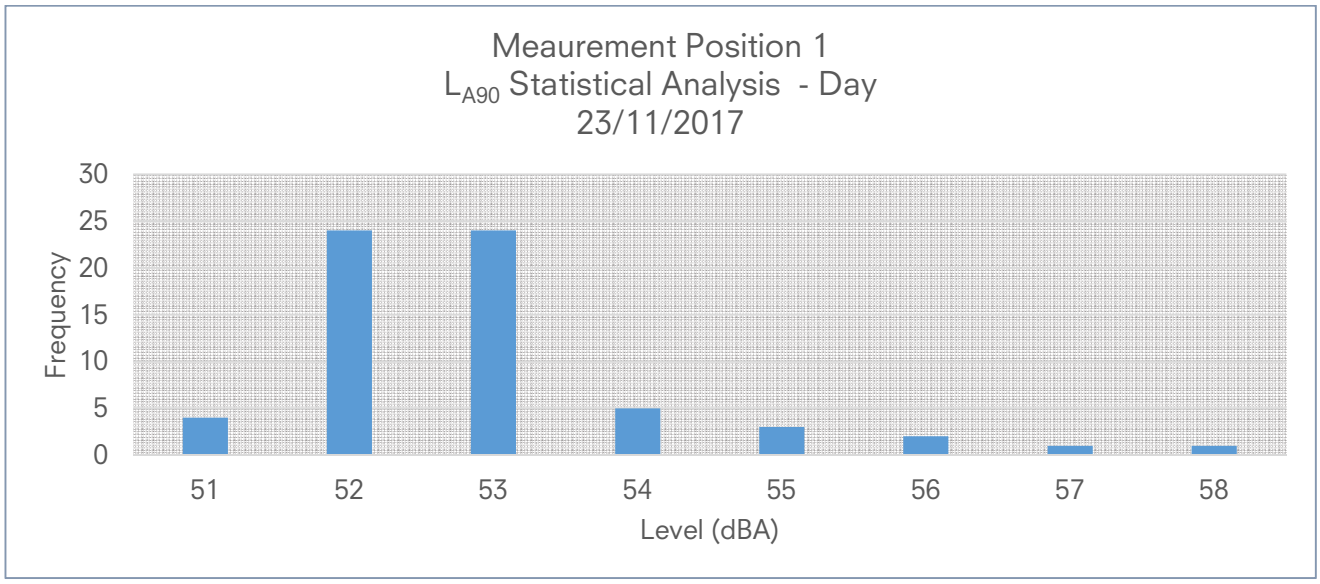
© MLM Consulting Engineers Limited

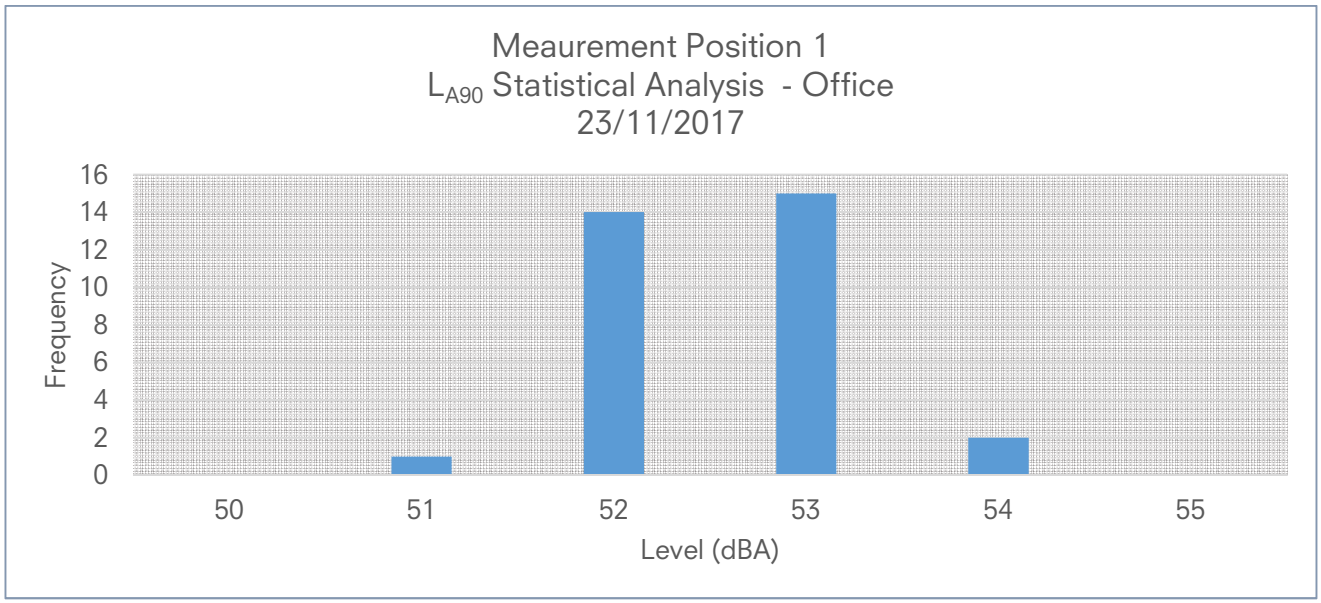
Elizabeth House, Fulwood Place, London
Microphone Position 1
Measured LAeq, LAMax, LA10 & LA90 Time Histories
22/11/17 - 24/11/17



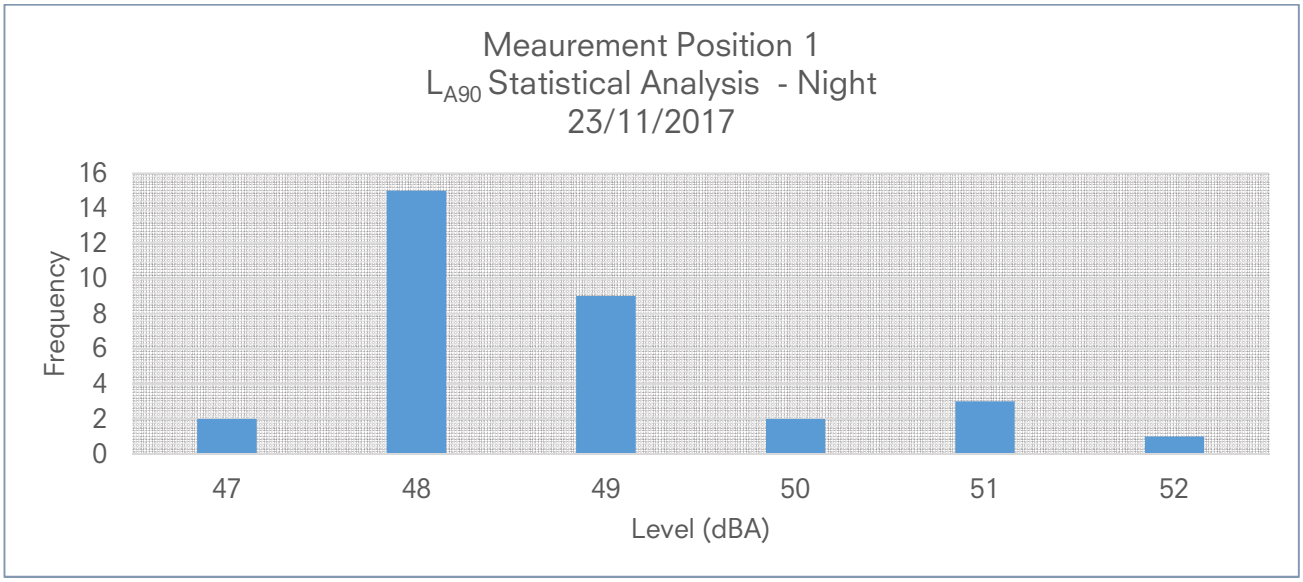
© MLM Consulting Engineers Limited





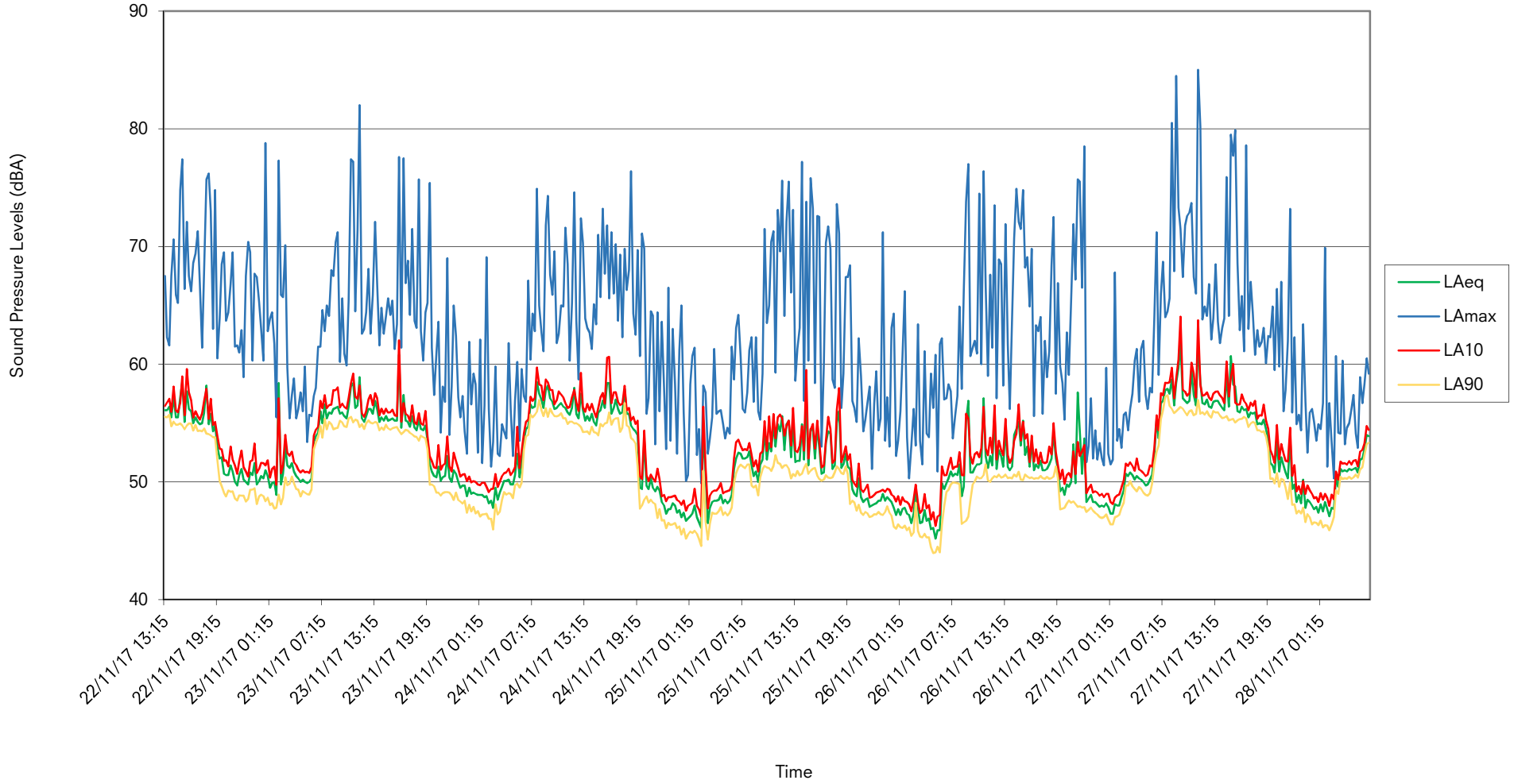


© MLM Consulting Engineers Limited

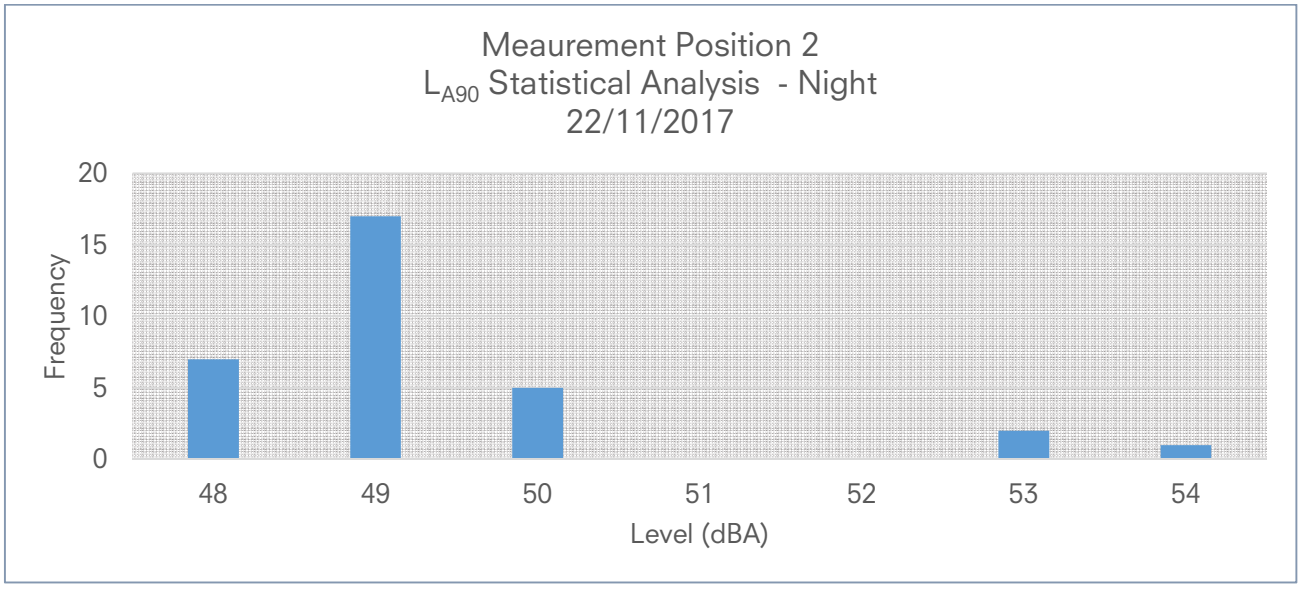


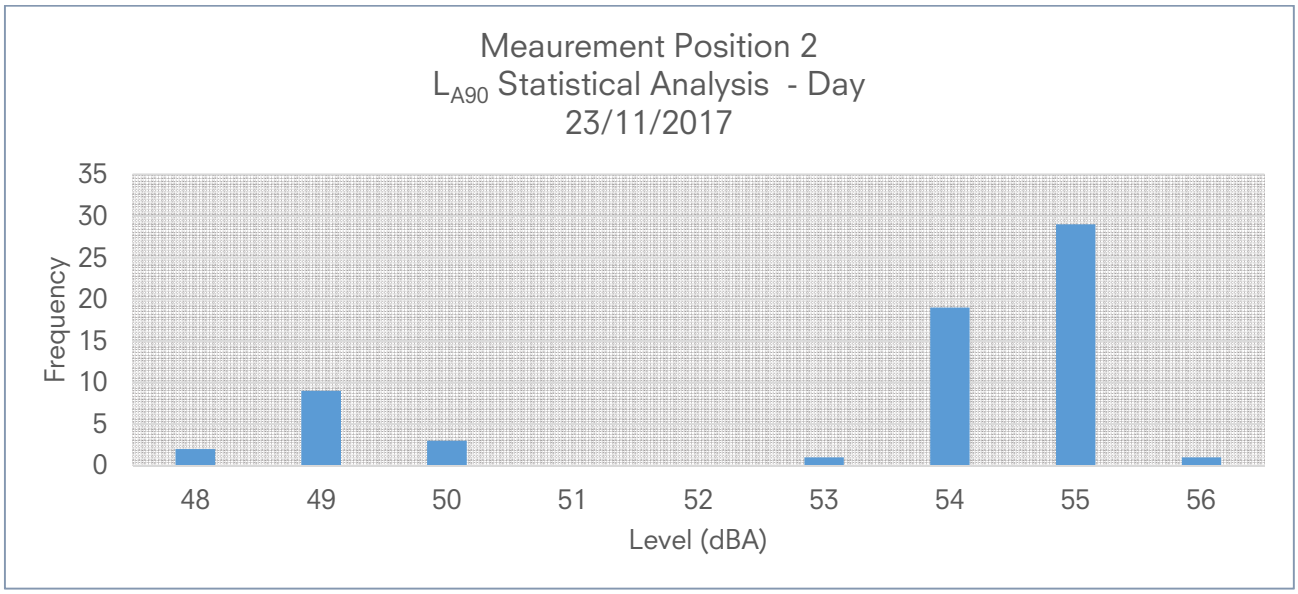
© MLM Consulting Engineers Limited

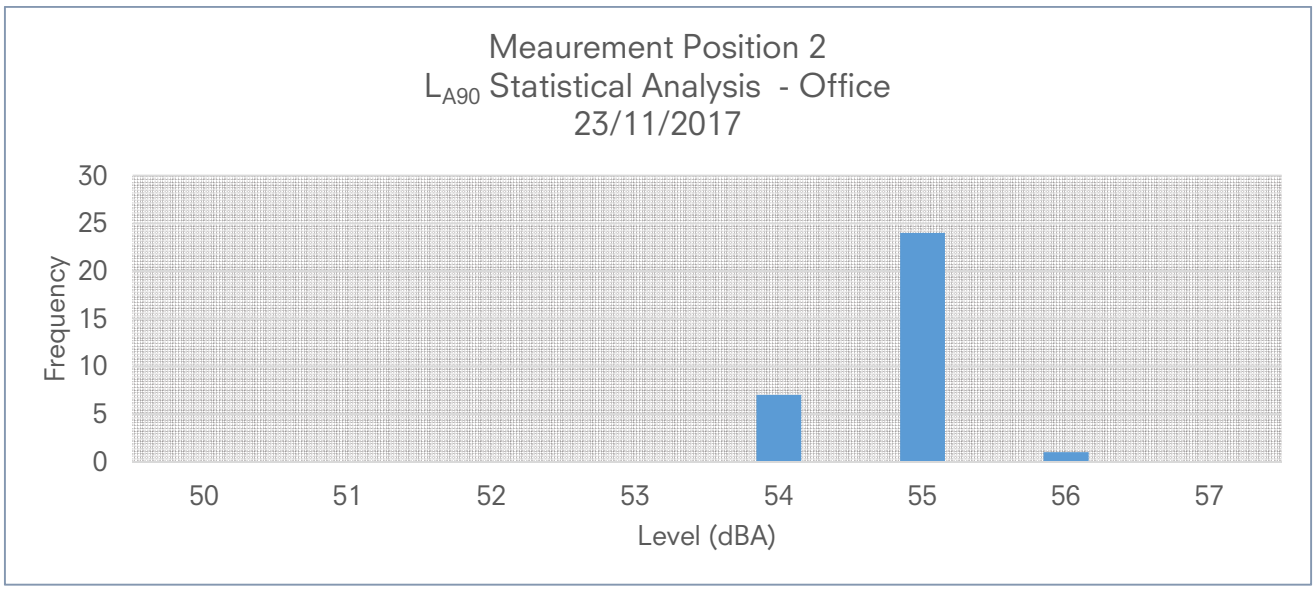
Elizabeth House, Fulwood Place, London
Microphone Position 2
Measured LAeq, LAMax, LA10 & LA90 Time Histories
22/11/17 - 28/11/17



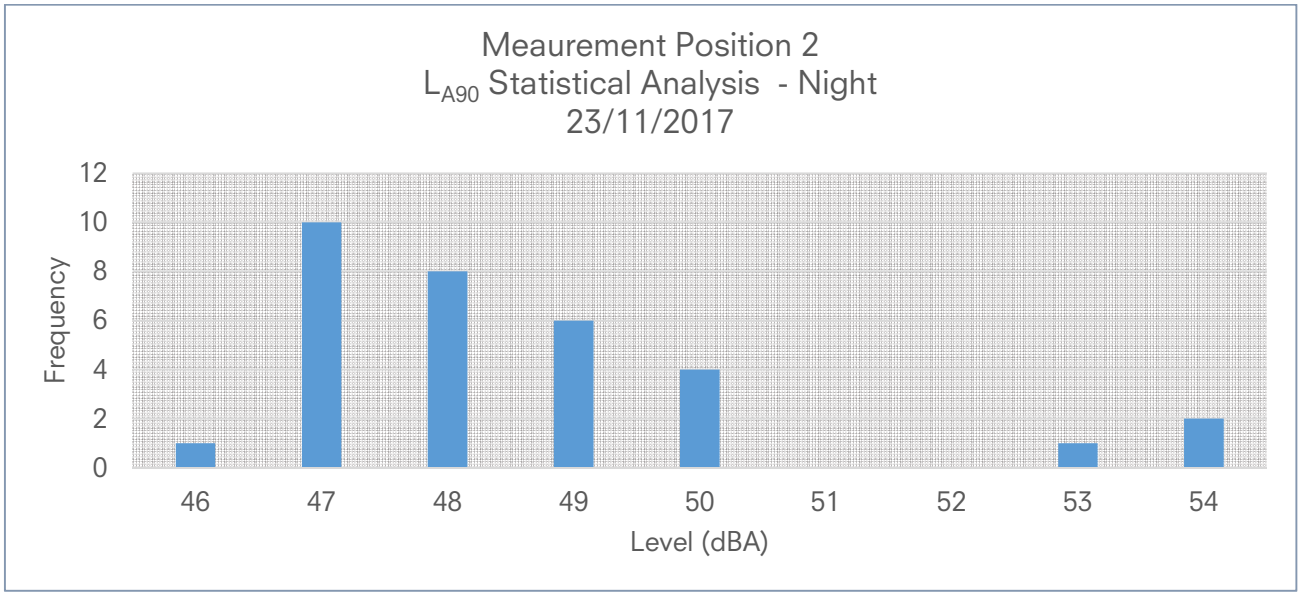
© MLM Consulting Engineers Limited

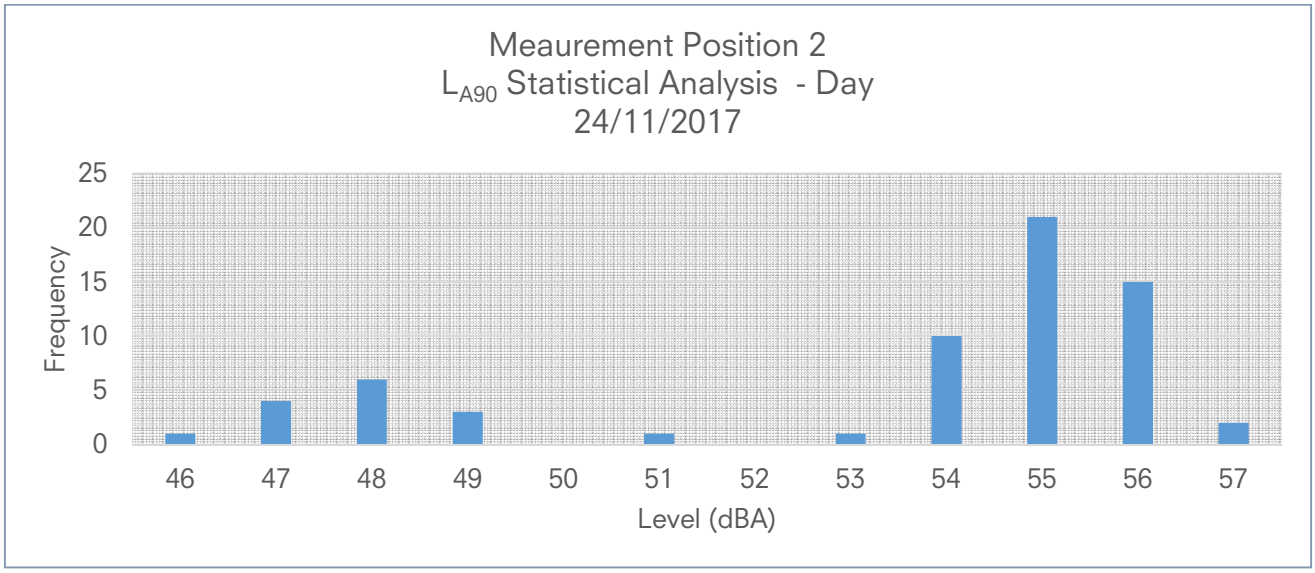


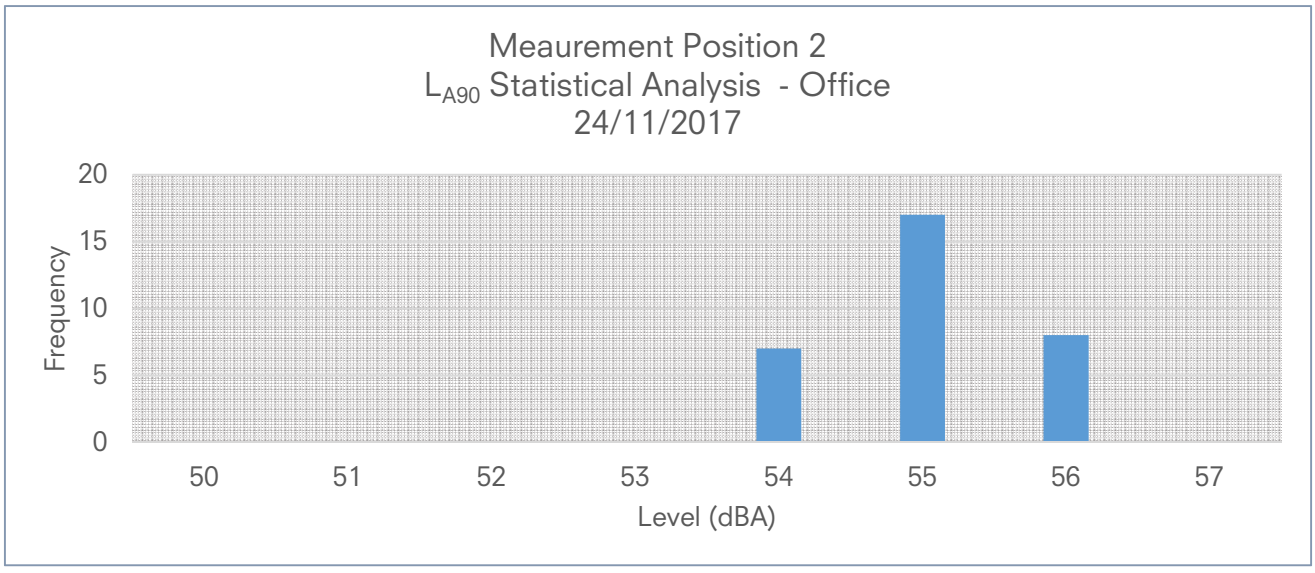




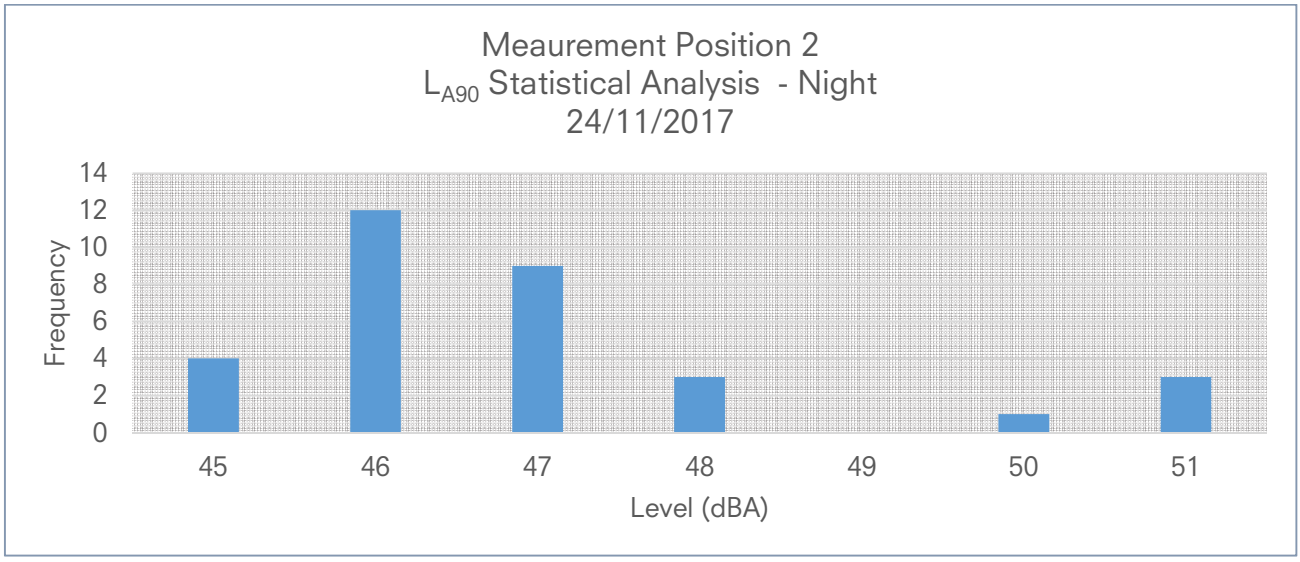
© MLM Consulting Engineers Limited

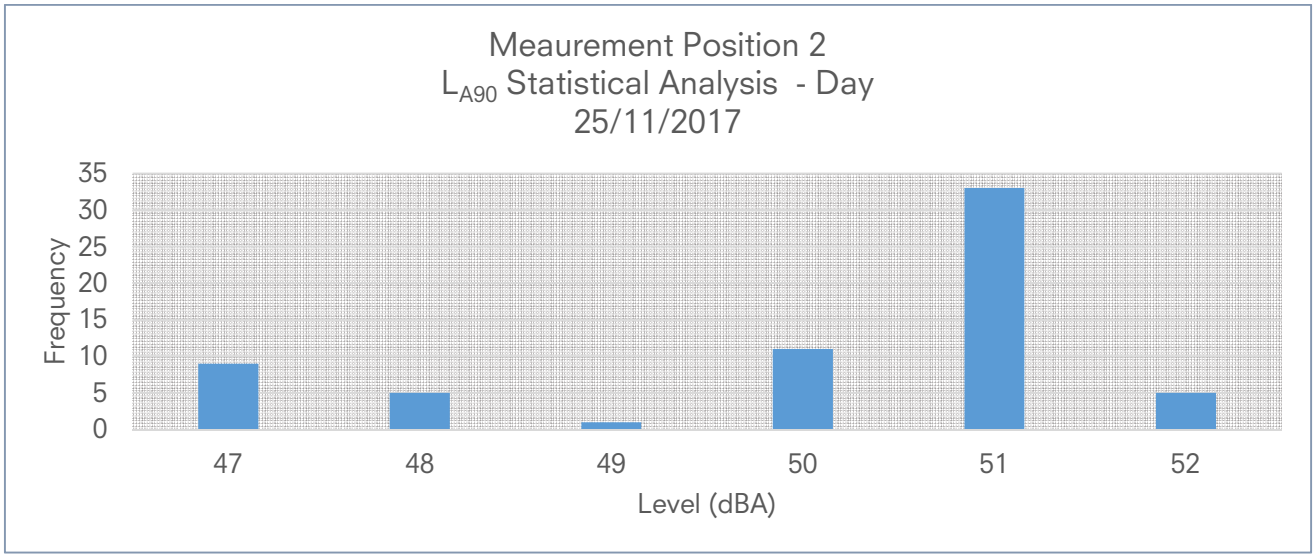


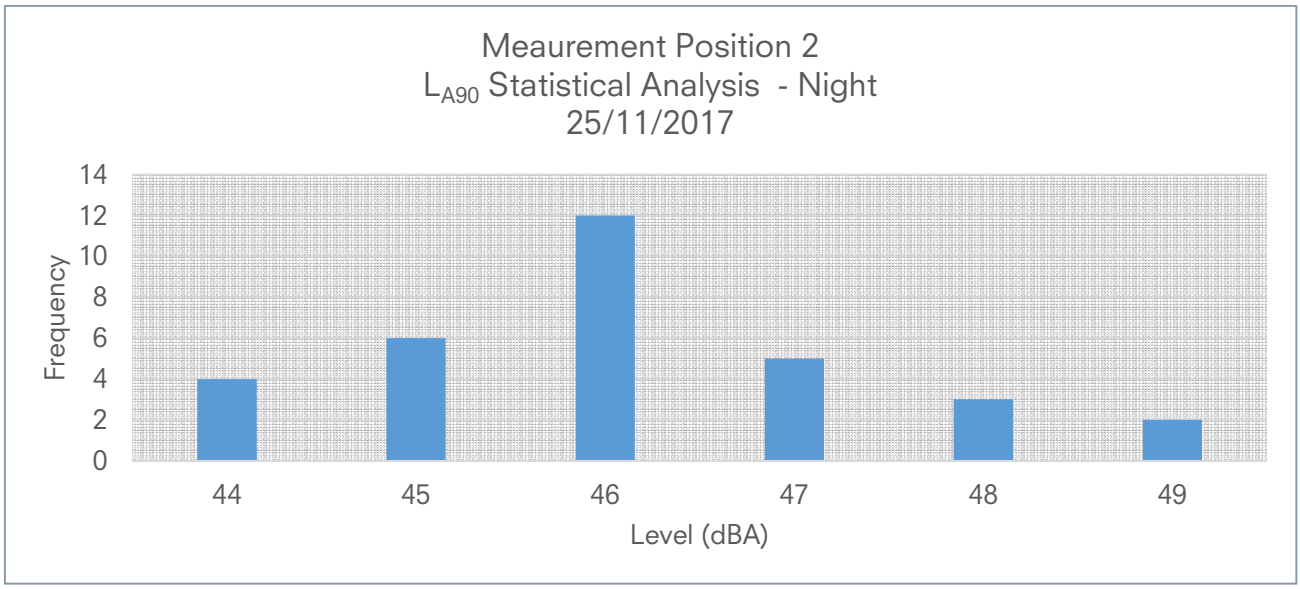




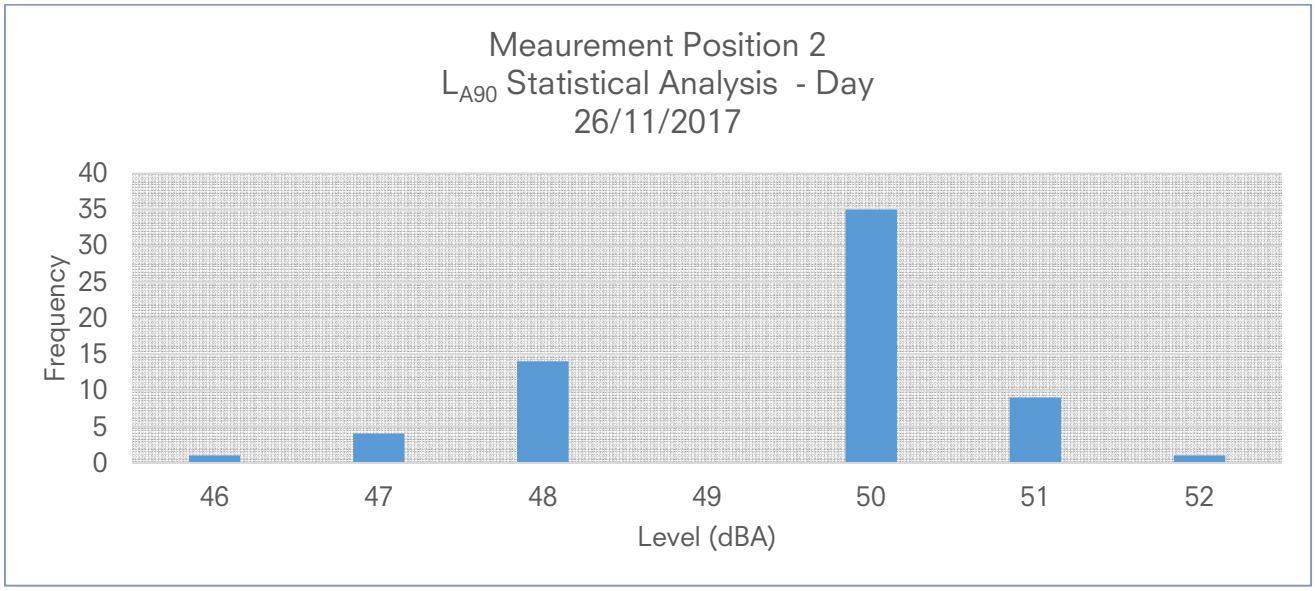
© MLM Consulting Engineers Limited

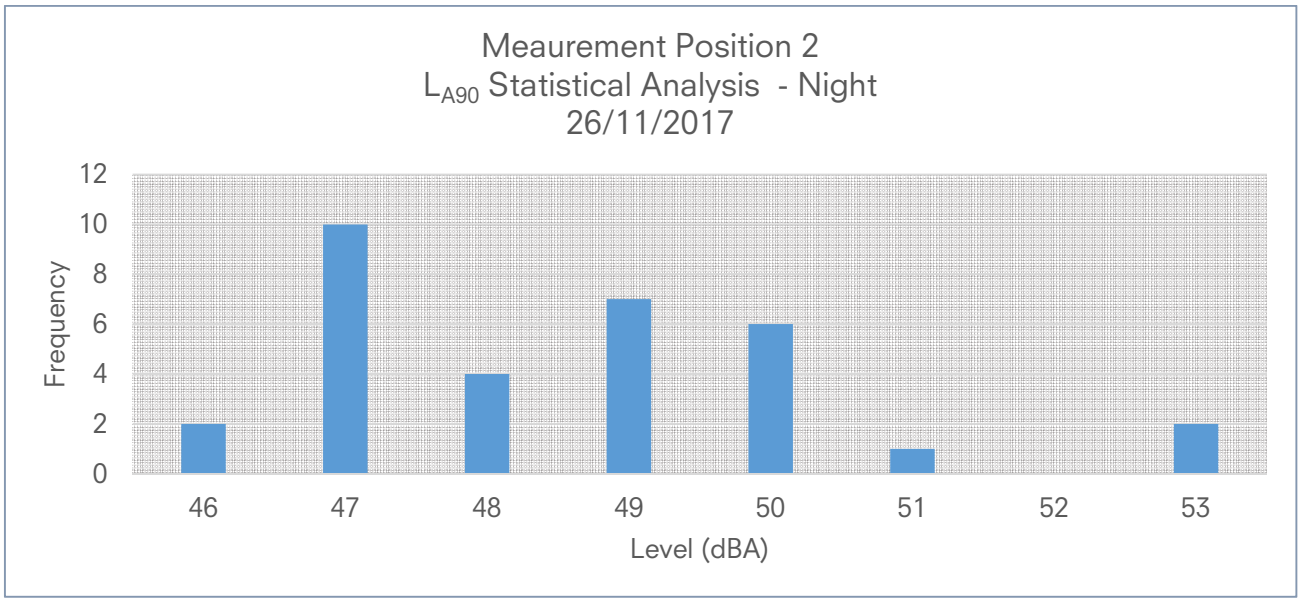


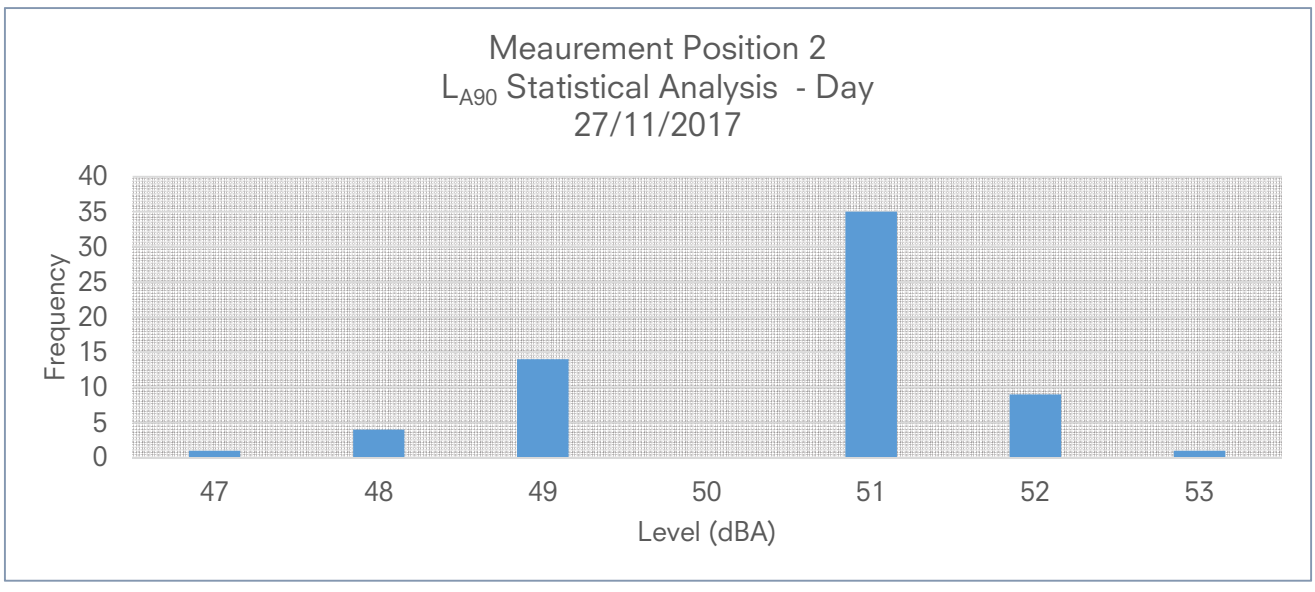




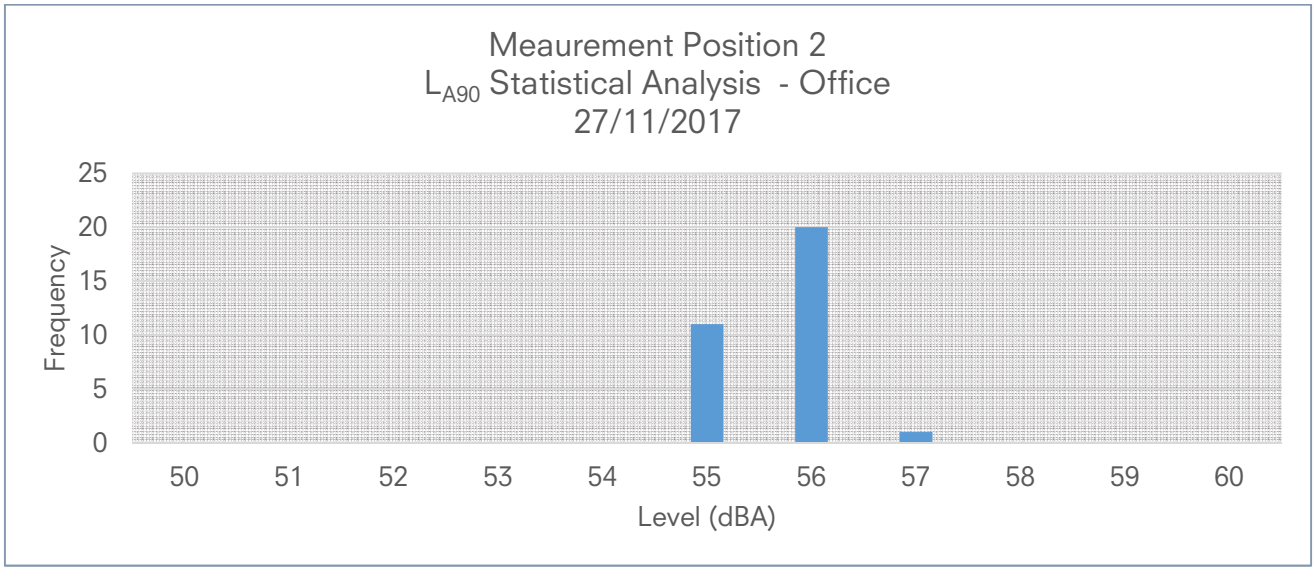
© MLM Consulting Engineers Limited

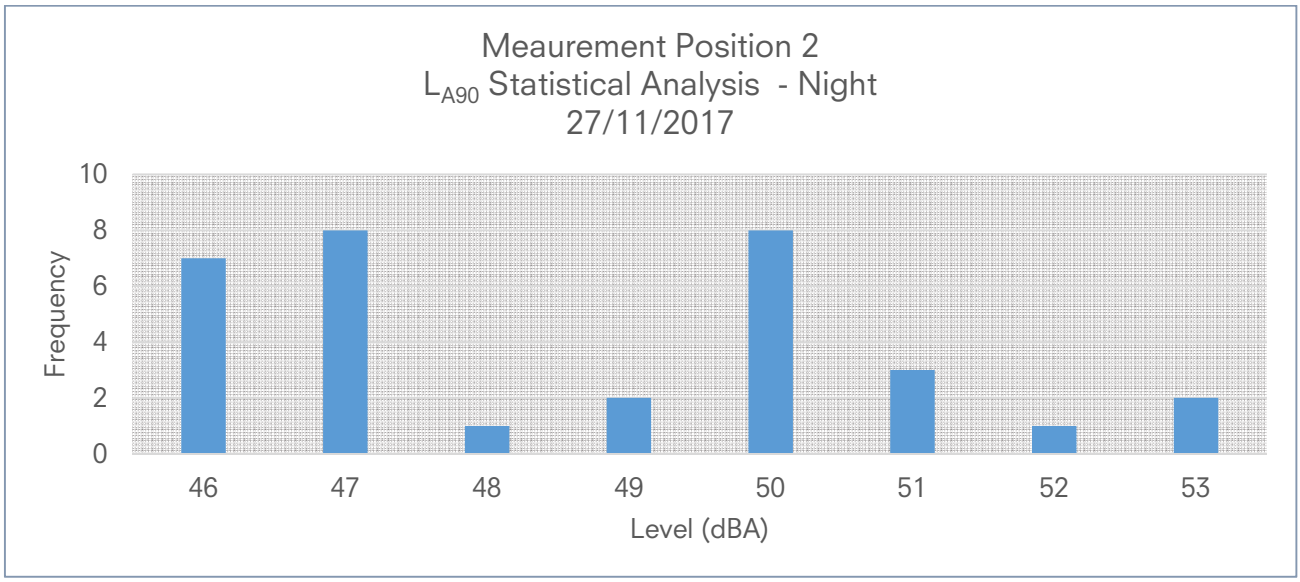






© MLM Consulting Engineers Limited





T +44 1245 359911
A Saxon House
23 Springfield Lyons Approach
Chelmsford
Essex
CM2 5LB

www.mlmgroup.com