Suite 8 Crown House
94 Armley Road
Leeds
LS12 2EJ
T: 0113 322 7977
E: info@novaacoustics.co.uk
W: www.novaacoustics.co.uk

NOISE IMPACT ASSESSMENT

Client: Mr Mark Harper

Address: 16 Doughty Mews

London

WC1N 2PF

Date: 06/12/2016

Prepared By:	J Barratt Gibson, BSc
Authorised By:	A T Martin MSc, AMIOA, MIET
Authorised By:	J I A Medina, MSc, MIOA
Date:	06/12/2016
Document Reference:	1099MH

CONTENTS

Executive summary

An environmental noise survey and noise impact assessment has been undertaken to assess the potential noise impact from the A/C unit at 16 Doughty Mews, London WC1N 2PF, upon the closest noise sensitive receptors. The measured background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

The BS4142 assessment shows that there is potential for the unit to cause adverse impact on the noise sensitive receiver as the rating level is 4.0 dBA above the prevailing background level. Mitigation measures have been provided in section 6.0 of the report which will reduce the specific noise level of the A/C unit to below the prevailing background level, and therefore significantly reduce the impact at the noise sensitive receptors and ensure the amenity of the future occupants is protected.

1.0 Introduction

NOVA Acoustics Ltd has been commissioned by Mr Mark Harper to undertake a noise impact assessment at 16 Doughty Mews, London WC1N 2PF, hereafter named "Site"**.** This assessment has been carried out with specific reference to the retrospective planning application for the installation of an A/C plant unit placed on the roof of the site. The results of this assessment will outline the expected noise impact and will provide any mitigation measures if necessary.

The purposes of this report are:

. To evaluate prevailing noise at the nearest sensitive receptor (NSR).

. To evaluate the noise emissions from the specific sources.

. To provide design/mitigation measures in order to reduce the noise levels at the NSRs.

2.0 Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance:

- The National Planning and Policy Framework (2012)
- The Noise policy Statement for England (2010)
- BS 4142:2014, Methods for rating and assessing industrial and commercial sound'
- Draft Guidelines from the IOA and IEMA on Noise Impact Assessments

2.1 English Planning Policy on Noise Impact – NPPF and NPSE

The NPPF is the over-arching planning and policy document that applies to all new developments in England. The guidance and assessment criteria given (or referred to) in this document can therefore be applied to all standards in terms of assessing the suitability of granting planning permission with respect to noise impact.

The NPPF states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impact on health and quality of life as a result of a new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from new developments, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions placed upon them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity, which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

With specific reference to noise impact, the NPPF document refers to the noise policy statement for England (NPSE). The NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

In order to provide a consistent frame of reference (and to allow a view to be taken on the suitability of the application with reference to the relevant planning guidance), the levels criteria given in other relevant documents used in assessment will be re-framed in terms of the following:

NOEL: The level of noise impact below which no effect can be detected, and there would be no discernible negative effect on health or quality of life.

LOEL: The lowest level of noise impact which adverse effect on health or quality of life can be detected. Designing noise impacts to be less than or equal to LOAEL should see that any adverse effects on health or quality of life are negligible.

SOAEL: The level above which significant adverse effect to health and quality of life occur. Designs should always seek to avoid a noise impact, which would be categorised as SOAEL.

2.2 BS 4142:2014

BS 4142:2014 provides a method of rating and assessing industrial and commercial sound. It is a widely used standard by local authorities and consultants to rate noise from fixed installations. The standard advocates the use of $L_{Aeq,T}$.

When used to assess industrial noise, the rating level is determined by correcting, when appropriate, the specific noise level measured and the LA90 background level is subtracted from it. Then, depending on this difference the impact is characterised:

- The greater this difference, the greater the magnitude of the impact
- A difference of about 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 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.

When using the one-third octave method given in BS 4142 within 9.3 Objective methods, a correction of 6dB is to be applied to the specific noise level if a tone is present. In order to decide whether a tone is present or not, an analysis of the third-octave bands is made and the differences that identify a tone between adjacent bands are as follows:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz)
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)

2.3 Draft Guidelines for Noise Impact (2002)

A joint working party of the Institute of Acoustics and Institute of Environment Management and Assessment has produced a draft guidance document on noise impact assessment called Guidelines for Noise Impact Assessment. Although these guidelines are at a draft stage at present they are of use for this assessment. The Working Party has set out an example of how changes in noise level may be assessed, as shown in Table 1.

Sound Level Change dB(A)	Subjective Response	Impact Description
0.0	No change	None
0.1 – 2.9	Imperceptible change in loudness	Slight
3.0 – 4.9	Perceptible change in loudness	Moderate

5.0 – 9.9	Up to a doubling or halving of loudness	Substantial
10.0 or more	More than doubling or halving in loudness	Severe

Table 1.0

The draft guidelines state that the assessor should set out assessment criteria specific to each assessment. However, the above criteria reflect key benchmarks of human response to changes in noise level. For example, a 3dB (A) change is generally taken to be the smallest change perceptible to the human ear and a 10dB (A) change is heard as a doubling or halving of the loudness of a source. The 5dB (A) category has been included as it provides a greater definition of the assessment of changes in noise level.

3.0 Site Description & Background

The site is a terraced house within a primarily residential area. The site has 1 external heat pump A/C unit located on the roof of the dwelling. The NSR used in the subsequent assessment is the neighbouring residential property 18 Doughty Mews, specifically the first floor bedroom windows. It is assumed that if the impact of the A/C plant can be minimised at this NSR then it should be significantly lower at all other surrounding NSRs. The distance of the NSR is approximately 4m from the unit. The chiller units operate during the day and the night time, dependent on the temperature within the dwelling. Therefore, the time periods when the units are active fluctuates. Full site plans can be found in appendix C and D.

4.0 Environmental Noise Survey

In order to characterise the sound profile of the area a long term environmental noise survey was carried out on the 22nd of November to the 23rd November 2016. The A/C unit was inactive throughout the measurement period.

4.1 Measurement Locations

In order to measure the prevailing background sound of the surrounding area the microphone was positioned in near free field conditions on the rooftop of 16 Doughty Mews, at a height of approximately 1.5m above the surface of the roof and 3.5m from any other reflective surfaces.

All measurement locations were chosen in order to collect representative sound levels of the site and surrounding area, all measurement positions can be found in Appendix C and D.

4.2 Measurement Equipment

Piece of Equipment	**Serial No**
SVAN 977 Class 1 Sound Level Meter	34826
SVAN Class 1 Calibrator SV31	029791 – 1

Table 2.0

Full calibration certificates can be found in appendix B.

4.3 Weather Summary

The monitoring was undertaken over an unmanned 24 hour period therefore no records of weather conditions are kept. However, during the set up and collection of the equipment weather conditions were generally dry with light winds of less than 5m/s and therefore suitable for the measurement of environmental noise. All measurements have been compared with local met office data and all periods of precipitation and elevated wind speeds have been removed from the average. The measurement procedure generally complied with BS7445:1991 "Description and measurement of environmental noise, Part 2 – Acquisition of data pertinent to land use".

4.4 Results

Background Sound Measurements

Table 3.0 shows the L_{Aeq}, L_{Amax}, L_{A10} and the L_{A90} for the day and night time periods.

Background Environmental Noise Survey				
MP1	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A10,t}$**	**$L_{A90,t}$**
Day 1 (12:45 – 23:00)	55.3 dB	85.7 dB	57.4 dB	50.9 dB
Night 1 (23:00 – 07:00)	46.9 dB	73.2 dB	51.4 dB	40.5 dB
Day 2 (7:00 – 11:10)	54.8 dB	78.9 dB	56.5 dB	53.4 dB

Table 3.0

As shown in table 3.0 the background noise level at night is significantly lower than in the daytime, therefore it is assumed the night will be the most likely period of potential impact due to the noise generated by the heat pump A/C unit. It is for this reason that the background levels measured at the night time will be used in the subsequent assessment.

The following table shows the measured background L_{A90} as well as the overall range, this is also compared with the statistically most repeated background $L_{A90.}$ A full histogram can be found in appendix E.

Parameter	**Noise Levels**
Measured L_{A90}	40.5 dB
Minimum L_{A90}	38.1 dB
Maximum L_{A90}	50.9 dB
Statistically most repeated L_{A90}	40.0 dB

Table 4.0

As can be seen from table 4.0 the range of measured background L_{A90}'s is large due to the dynamic sonic environment of the area. The measured L_{A90} level and the statistical L_{A90} value are consistent with each other, therefore the background level, L_{A90}, of 40.0 dB which occurred 21.87% of the time will be used in the subsequent assessment.

Specific Source Measurements

Table 6.0 shows the specific sound level provided by the manufacturer for the Mitsubishi MXZ – 4D72VA air conditioning plant unit installed on site; the specific sound level is assumed to have been measured at 1m from the source which is stated as 53.0 dBA. The table below also calculates the specific source level at the noise sensitive receptor approximately 4m away. To provide a conservative and robust assessment no on-time correction has been applied.

L_S	**Distance from Source**	**Distance from Source to Receiver**	**Specific Source at Receiver**
53.0 dBA	1m	4m	41.0 dBA

Table 6.0

4.5 Subjective Impressions & Context

Whilst on site it was found that there were no dominant noise sources in the area. The surrounding background noise was comprised of mixed sources of a moderate level as can be seen by the measured results and the time history in appendix E.

4.6 Uncertainty

Efforts have been taken to address the uncertainty in the measurement and calculation of the level of impact. The following points have been addressed:

1) The most exposed measurement position has been chosen to ensure a robust survey.

2) The ambient sound environment during the measurement period did not vary significantly.
3) The background measurement location was within close proximity to the proposed dwelling.
4) Meteorological conditions were appropriate for the measurement of environmental noise.
5) Short measurement time intervals were used to show short term increases in ambient sound levels.
6) All figures are rounded to the nearest 0.1dB.
7) The instrumentation used is class 1 and within calibration.
8) A in depth analysis of ambient sound levels has been undertaken to ensure the figure used is consistent across the monitoring period.
9) Approved standards have been used to complete any calculations.

5.0 Assessment Methodology

5.1 BS4142

The BS4142 analysis compares the specific sound emissions of the sound source against the existing background sound level.

Results	**Garage door**	**Relevant clause**	**Commentary**
Background sound level	40.0 dBA	8.3	Most representative value used for background sound level.
Specific sound level at NSR	41.0 dBA	7.3.4	Predicted sound level from the sources of sound. Accounting only for spherical propagation.
Acoustic feature correction	+5 dB	9.2	Acoustics correction +3 for intermittency +2 for tonality.
Rating level	46.0 dBA	9.2	Level to be used to assess the impact.
Background sound level	40.0 dBA	8	Actual background sound level, without the sources of sound
Excess of rating over the background sound level	(46.0 – 40.0) dB = 6 dB	11	The specific sound level is 6.0 dB above background level.

Table 8.0

As seen in table 8.0 the specific sound source is rated 6.0 dBA above the background level. This implies that there is likelihood of adverse Impact on the nearby receptors. Providing mitigation measures are implemented the amenity of the NSR should be fully protected and the impact from the heat pump A/C Plant reduced.

5.2 Increase in ambient sound levels

The increase in ambient sound levels that is predicted as a result of the introduction of the new sound sources on the site is assessed by means of adding the sound level of the specific sound source predicted at the NSR to the ambient sound level measured at the same position. The ambient noise level measured for the night time period is used to ensure that the assessment is robust.

Ambient sound level	46.9 dBA
Specific sound level	41.0 dBA
Addition (Ambient + Specific)	47.9 dBA
Increase	1.0 dBA
Expected Impact	Slight

Table 9.0

6.0 Recommendations

The results of the preceding BS4142:2014 analysis show that the rating level of the source is 6.0 dB above the prevailing background L_{A90}. Therefore, it is assumed that there is likelihood of adverse impact on the NSR due to the heat pump A/C unit.

It should be stated however that sound emitted by the cooling/heating unit should ideally fall 5.0 - 10.0 dB below the prevailing background sound levels for there to be a low likelihood of adverse impact. Therefore, the noise generated by the A/C plant should be reduced by 15.0 dB. The following enclosures in table 10.0 will reduce the sound produced by the Heat Pump A/C unit to acceptable levels, any other enclosure providing a minimum attenuation of 15.0 dB could be installed.

Make/model	Expected Attenuation
Environ Domestic Heat Pump Enclosure	25 dBA
ICE Air Conditioning Acoustic Enclosure	27 dBA

Table 10.0

7. Conclusion

An environmental noise survey and noise impact assessment has been undertaken to assess the potential noise impact at the nearby noise sensitive receptors caused by the A/C plant situated on the roof of 16 Doughty Mews, London, WC1N 2PF. The measured background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

The BS4142 assessment shows that there is potential for the A/C plant unit to cause adverse impact on the noise sensitive receiver as the rating level is 6.0 dBA above the background level. Providing the mitigation measures in section 6.0 are followed the noise emissions from the units should be reduced to 10.0 dB below the prevailing background LA90.

APPENDIX A – Terms Glossary

Acoustic environment: sound from all sound sources as modified by the environment

Ambient sound: totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far

Ambient sound level *L*a = *L*Aeq,*T*: equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval

Background sound level, *L*A90,*T* : A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

Equivalent continuous A-weighted sound pressure level, LAeq,*:* value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

Measurement time interval, Tm: total time over which measurements are taken

Rating level, LAr,Tr: specific sound level plus any adjustment for the characteristic features of the sound

Reference time interval, Tr: specified interval over which the specific sound level is determined

Residual sound: ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

Residual sound level, Lr = LAeq,T*:* equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

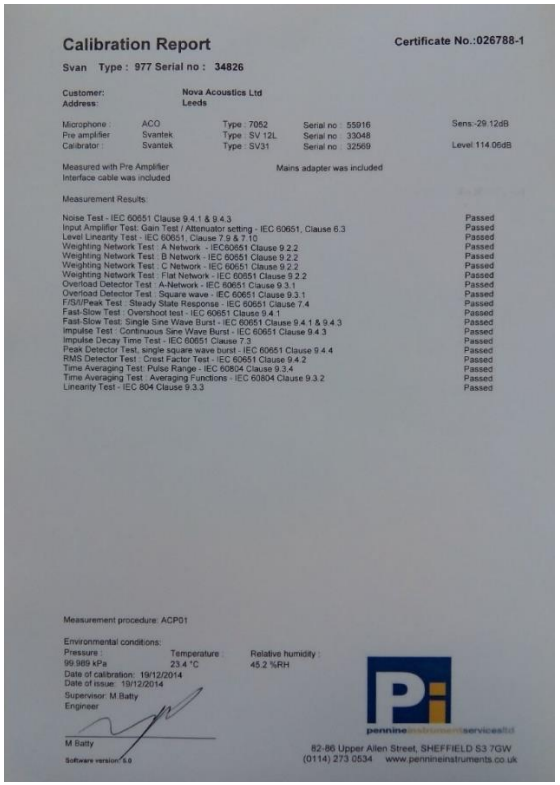
Specific sound level, Ls = LAeq,Tr: equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr

Specific sound source: sound source being assessed

APPENDIX B – Calibration Certificates

Piece of Equipment	Serial No	Pre calibration	Post calibration
Svantek Class 1 Sound Level Meter Svan 977	34826	-0.56	-0.47
Svantek Class 1 Sound Level Meter	029791 – 1		

Calibration certificate of the sound level meter



Calibration Report

Certificate No.:026788-1

Svan Type : 977 Serial no : 34826

Customer: Nova Acoustics Ltd
Address: Leeds

Microphone :	ACO	Type : 7052	Serial no : 55916	Sens:-29.12dB
Pre amplifier	Svantek	Type : SV 12L	Serial no : 33048	
Calibrator :	Svantek	Type : SV31	Serial no : 32569	Level: 114.06dB

Measured with Pre Amplifier Interface cable was included — Mains adapter was included

Measurement Results:

Noise Test - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Input Amplifier Test: Gain Test / Attenuator setting - IEC 60651, Clause 6.3	Passed
Level Linearity Test - IEC 60651, Clause 7.9 & 7.10	Passed
Weighting Network Test : A Network - IEC60651 Clause 9.2.2	Passed
Weighting Network Test : B Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test : C Network - IEC 60651 Clause 9.2.2	Passed
Weighting Network Test : Flat Network - IEC 60651 Clause 9.2.2	Passed
Overload Detector Test : A-Network - IEC 60651 Clause 9.3.1	Passed
Overload Detector Test : Square wave - IEC 60651 Clause 9.3.1	Passed
F/S/I/Peak Test : Steady State Response - IEC 60651 Clause 7.4	Passed
Fast-Slow Test : Overshoot test - IEC 60651 Clause 9.4.1	Passed
Fast-Slow Test: Single Sine Wave Burst - IEC 60651 Clause 9.4.1 & 9.4.3	Passed
Impulse Test : Continuous Sine Wave Burst - IEC 60651 Clause 9.4.3	Passed
Impulse Decay Time Test - IEC 60651 Clause 7.3	Passed
Peak Detector Test, single square wave burst - IEC 60651 Clause 9.4.4	Passed
RMS Detector Test : Crest Factor Test - IEC 60651 Clause 9.4.2	Passed
Time Averaging Test: Pulse Range - IEC 60804 Clause 9.3.4	Passed
Time Averaging Test : Averaging Functions - IEC 60804 Clause 9.3.2	Passed
Linearity Test - IEC 804 Clause 9.3.3	Passed

Measurement procedure: ACP01

Environmental conditions:

Pressure :	Temperature :	Relative humidity :
99.989 kPa	23.4 °C	45.2 %RH

Date of calibration: 19/12/2014
Date of issue: 19/12/2014
Supervisor: M Batty
Engineer

M Batty

Software version 5.0

pennineinstrumentsservicesltd
82-86 Upper Allen Street, SHEFFIELD S3 7GW
(0114) 273 0534 www.penninеinstruments.co.uk

Calibration certificate of the calibrator

Sound Calibrator Certificate

Calibrator : Svantek SV31

Serial no : 32569

Level : 114.07 dB
Frequency : 1000.00 Hz

The stated level is valid at measurement conditions.
Calibrator signal distortion: 0.48 %
Short term level stability : 0.02 dB
Frequency stability : 0.00 %

Measured according to IEC 60942.
The stated level is relative to 20uPa.
The level is traceable to NPL, England.
with a calculated uncertainty less than 0.13 dB (2×sd).

Reference conditions:
Pressure : 101.325 kPa
Temperature : 23.0 °C
Relative humidity : 50 %RH

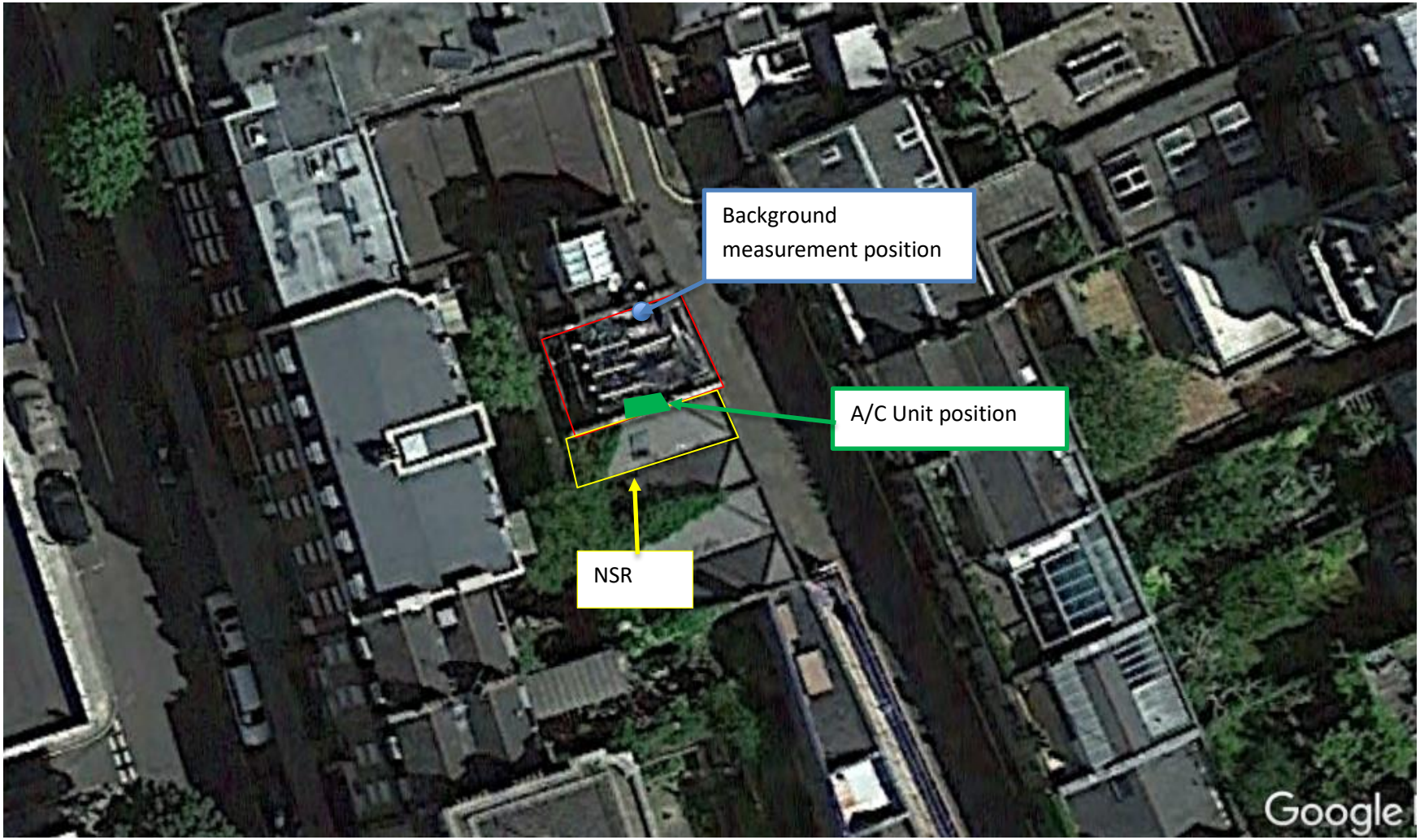
Measurement conditions :
Pressure : 97.732 ± 0.015 kPa
Temperature : 21.4 ± 1.0 °C
Relative humidity : 53.9 ± 3.0 %RH

Pennine Instrument Services Ltd.
82-86 Upper Allen Street, SHEFFIELD S3 7GW
(0114) 273 0534 www.penninеinstruments.co.uk

Date : 07/01/2016
Signature :

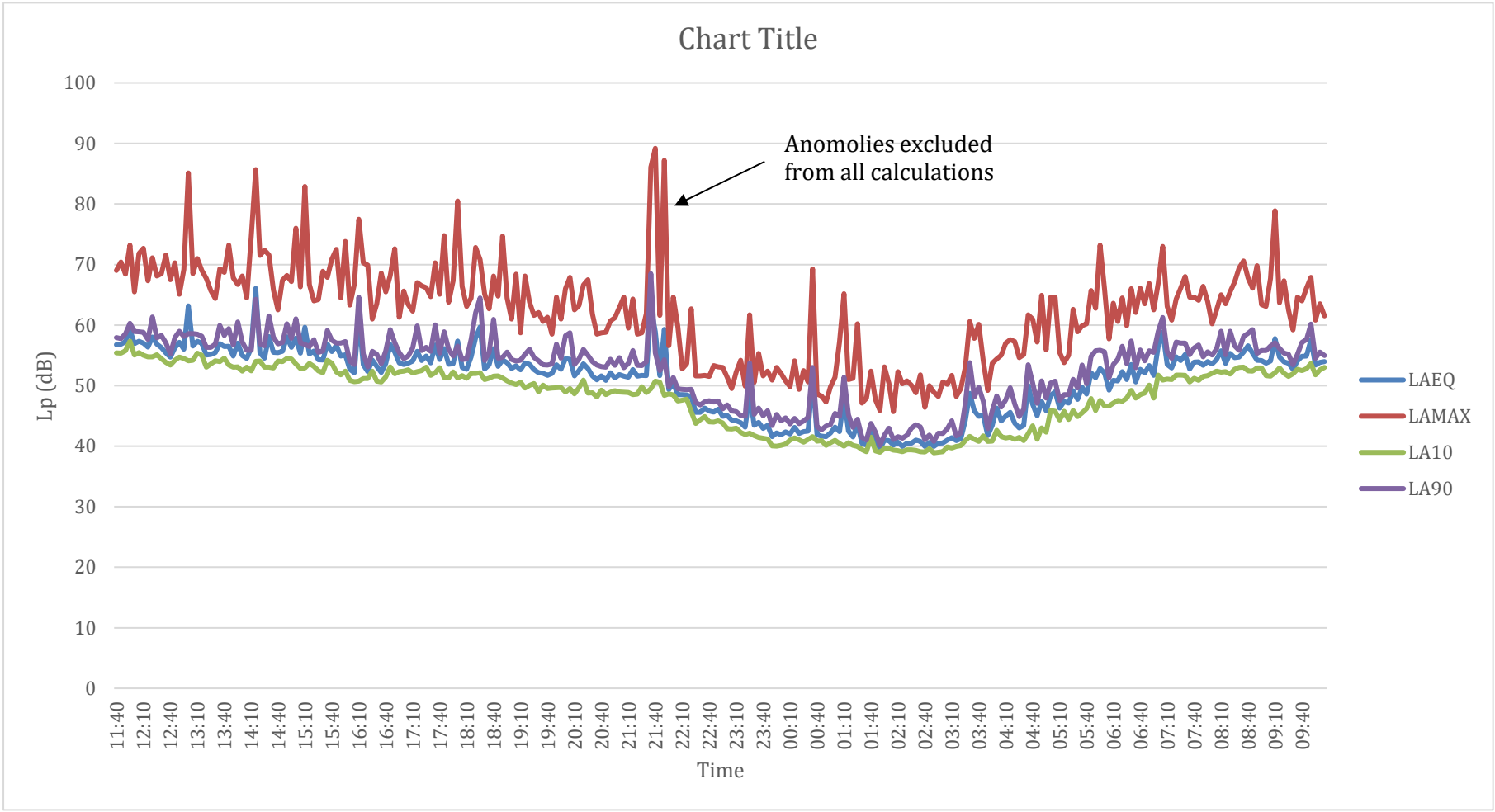
APPENDIX C – Location Plan

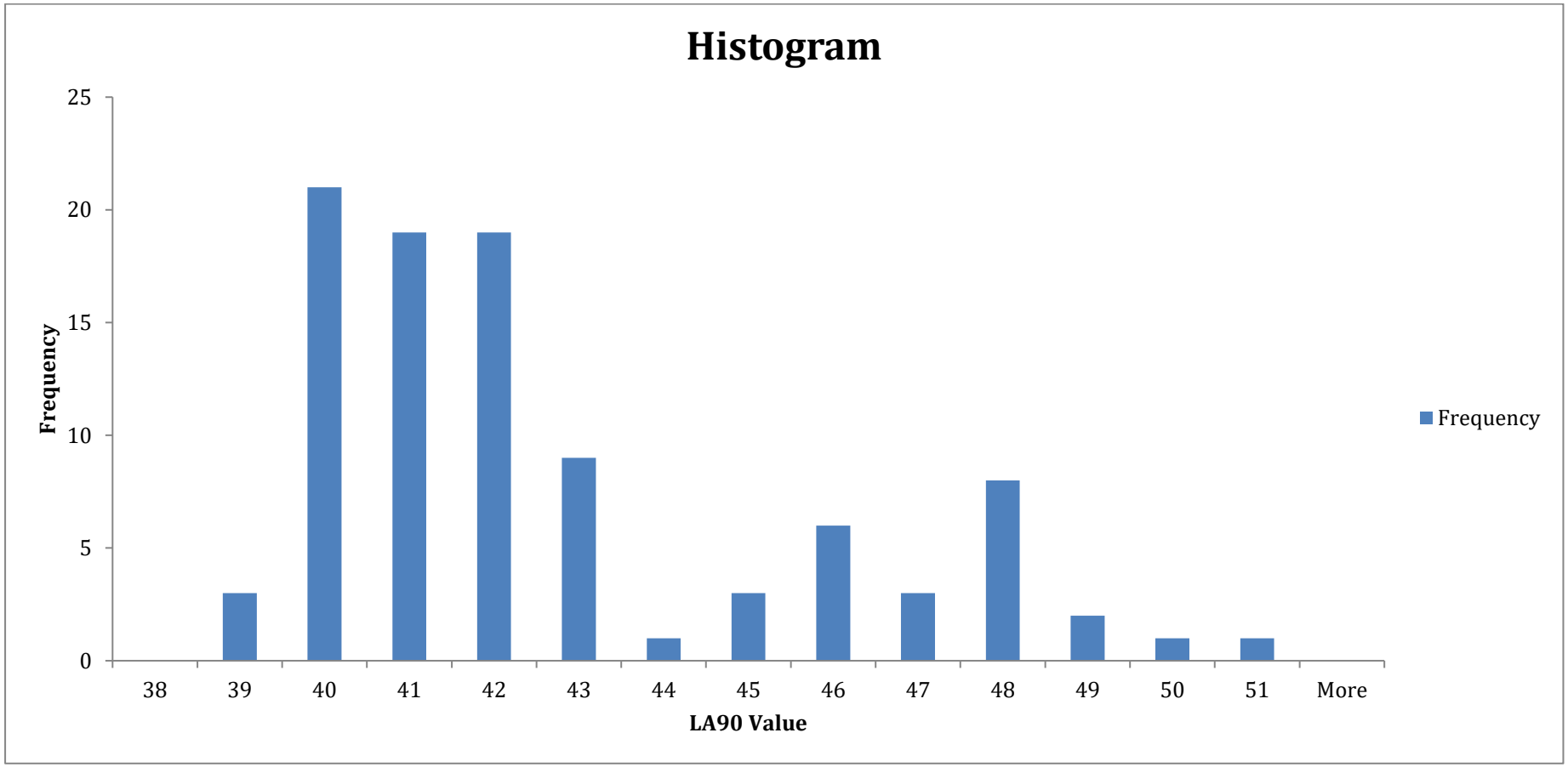
APPENDIX D – Site Plan




Exit Street View
NSR
16 Doughty Mews
© 2016 Google
Google Earth

Appendix E – Time History & Histograms




Histogram
25
20
15
10
5
0
Frequency
38
39
40
41
42
43
44
45
46
47
48
49
50
51
More
LA90 Value
Frequency

Disclaimer

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees.

Except for the provision of professional services on a fee basis, NOVA Acoustics Ltd does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report.

NOVA Acoustics Ltd cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a "best endeavours" basis and no responsibility or liability is warranted or accepted by NOVA Acoustics Ltd.