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Mount Anvil Limited

Kidderpore Avenue, London

Shell & Core M&E Environmental Noise Assessment

24 April 2017

PROJECT:	Kidderpore Avenue, London Environmental and Intrusive Noise Study
CLIENT:	Mount Anvil Limited 140 Aldersgate Street London
DOCUMENT REFERENCE:	P1652-REP03-SJF
SIGNED:	_____ SIMON FERENCZI
CHECKED:	_____ DARREN CLUCAS
DATE:	24 April 2017

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SUMMARY

Sol Acoustics Ltd (Sol) has been commissioned by Mount Anvil Limited (MA) to conduct an environmental acoustic assessment of the proposed Shell & Core M&E plant scheme relating to the Kidderpore development site, located in Hampstead, London.

The principal purpose of this assessment is to address the environmental noise impact assessment requirements of Planning Condition 30 and 34, all as based upon proposed plant as advised to Sol by the M&E Engineer.

Specific attenuation and vibration isolation requirements are provided herein, in addition to acoustic performance specifications encompassing all plant items, in environmental noise terms.

The predicted, resultant environmental noise level arising from each item of plant is also provided herein.

In addition to environmental M&E plant noise mitigation requirements, this report also outlines the corresponding system side (i.e. room side) requirements also.

Where details of specific M&E plant (e.g. Fit Out scope plant, leisure and pool plant, finalised car park ventilation plant etc.) are not available at the time of reporting (April 2017), overriding acoustic performance noise criteria are provided for all such future installations to be compliant with.

Please refer to the main report for further details.

1.0 INTRODUCTION

Sol Acoustics Ltd (Sol) has been commissioned by Mount Anvil Limited (MA) to conduct an environmental acoustic assessment of the proposed Shell & Core M&E plant scheme relating to the Kidderpore development site, located in Hampstead, London.

Planning Condition 30 and Condition 34 state the following:

'… Condition 30

Before the use commences, the [extract ventilating system] [air-conditioning plant] shall be provided with [acoustic isolation], [sound attenuation] [and anti-vibration measures] in accordance with the scheme approved in writing by the local planning authority. All such measures shall thereafter be retained and maintained in accordance with the manufacturers' recommendations. …'

'… Condition 34

Before the occupation of each building, details of noise and vibration mitigation to protect the residential properties in that building against noise and vibration (including building services plant) shall be submitted and approved in writing by the Local Planning Authority. The approved scheme shall be implemented prior to occupation and remain in place for the lifetime of the development. …'

Accordingly, therefore, the principal purpose of this assessment is to address the interpreted, Conditioned environmental noise impact assessment requirements, all as based upon proposed plant as advised to Sol by the M&E Engineer.

Specific attenuation and vibration isolation requirements are provided herein, in addition to acoustic performance specifications encompassing all plant items, in environmental noise terms.

The predicted, resultant environmental noise level arising from each item of plant is also provided. In addition to environmental M&E plant noise mitigation requirements, this report also outlines the corresponding system side (i.e. room side) requirements also.

2.0 DESCRIPTION OF SITE

2.1 Description of Development

The Kidderpore Avenue residential development on Kidderpore Avenue, Hampstead will provide residential dwellings by way of the conversion and refurbishment of four statutorily listed buildings, Kidderpore Hall, Maynard Hall, Skeel Library and The Chapel; the conversion and extension of three other buildings, Bay House, Dudin Brown Hall and Lady Chapman Hall; the demolition of three non-listed buildings, and their replacement with three new buildings (Lord Cameron Hall, Rosalind Franklin Hall and Queen Mother's Hall).

The relocation and restoration of one statutorily listed building within the site, The Summerhouse, will also be undertaken, along with associated residents' facilities, various hard and soft landscaping works including the removal of trees, and the construction of a double storey basement including car and cycle parking and plant.

The site is located on the northern side of Kidderpore Avenue, London, NW3; the extent of the application site is as shown on Figure 1. The site extends to approximately 1.22 hectares and there are eleven buildings or structures on the site, of which five are on the national list of buildings of special architectural or historic interest.

Pre-existing residential buildings are sited on the opposite side of Kidderpore Avenue, including the "Westfield" residential development and the adjacent site which is currently being developed by Barratt Homes for residential accommodation and community use.

Figure 1: Pre-development site location plan

3.0 BACKGROUND NOISE ASSESSMENT

In order to determine the prevailing environmental noise levels around the Development site, surveys of the pre-existing noise climate have been carried out over typical weekdays, during daytime, evening and night time periods.

Specifically, noise surveys were undertaken at the Kidderpore Avenue residential development site during the following periods, with no site construction activities being undertaken:

- Wednesday 14th October 2015 (16:20 hours to 23:59 hours)
- Thursday 15th October 2015 (00:00 hours to 20:00 hours)

External noise measurements were made at a height of approximately 3 metres from corresponding ground level per measurement position. All the measuring locations were in so-called “free field” conditions, in acoustic terms (i.e. free from nearby reflective surfaces except the ground), and thus no correction has been applied to the noise survey data directly obtained, in any instance.

All noise measurements were undertaken using continuous logged measurement durations of 5 minutes during daytime periods and 1 minute during night time periods, with L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} parameters being recorded, together with unweighted octave band L_{eq}, L_{max}, L_{10} and L_{90}.

The prevailing weather conditions were suitable for the purposes of environmental noise measurements throughout the various noise surveys. No rain occurred at any time and mean wind velocities were below 5m/s, albeit microphone windshields were in use at all times.

Figure 2 shows the approximate location of all external noise monitoring points; the various site monitoring locations were selected to coincide with existing and future building façades.

Type 1 Precision Grade sound measuring instrumentation was exclusively used for all surveys. Full details of all the instrumentation used, and corresponding traceable calibration records, are retained on file by Sol and available for inspection if required.

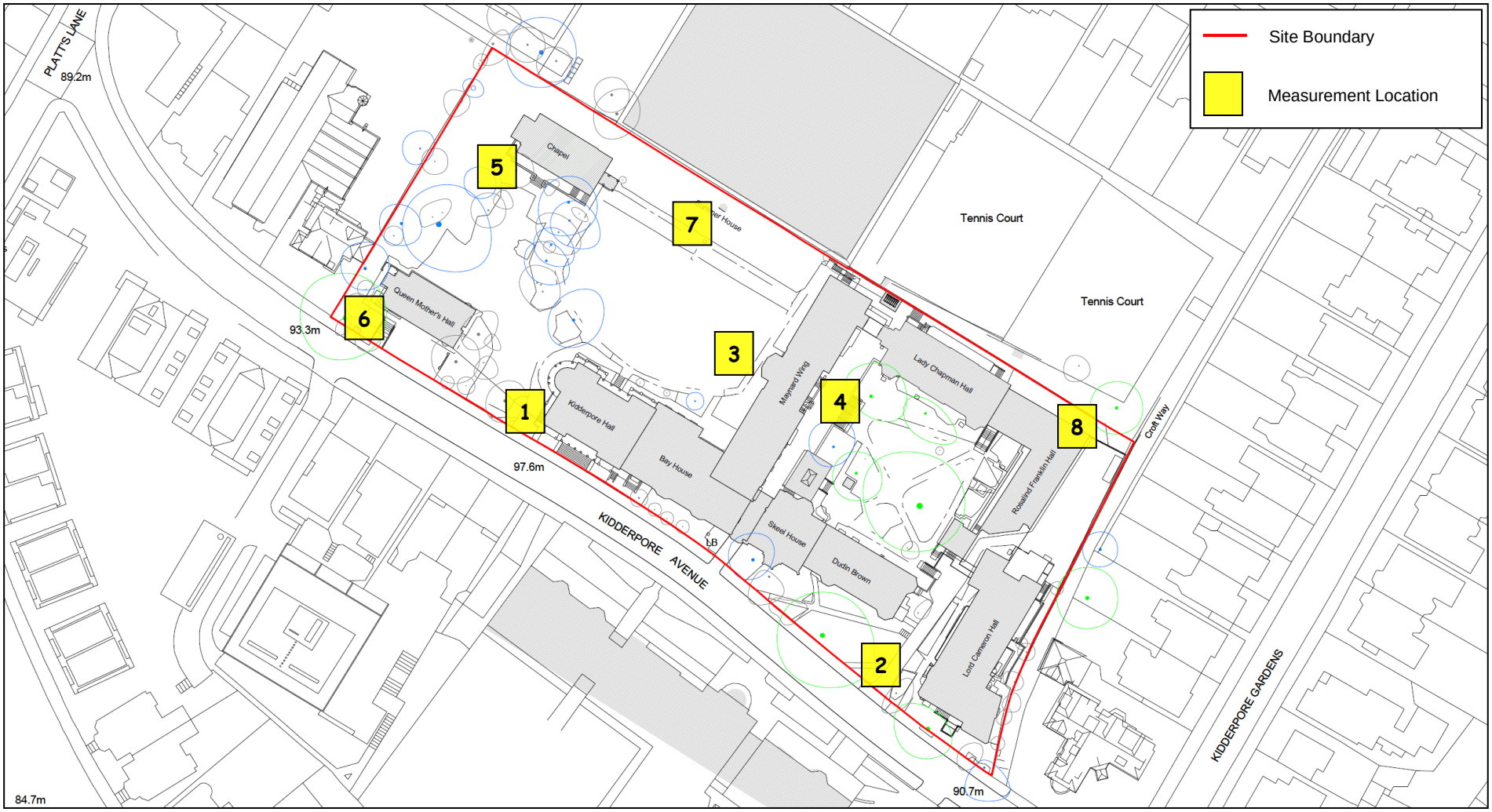


Figure 2: External noise survey measurement positions

4.0 BACKGROUND NOISE CLIMATE

Table 1 provides a basic summary of the typical overall, A-weighted noise levels measured at the various external locations around the Kidderpore Avenue site, in L_{Aeq}, L_{A90} and L_{Amax} terms:

	Measured Noise Level (Average L_{Aeq}, Range L_{A90} & L_{Amax})					
	Daytime			**Night Time**		
Position	**dB, L_{Aeq}**	**dB, L_{Amax}**	**dB L_{A90}**	**dB, L_{Aeq}**	**dB, L_{Amax}**	**dB L_{A90}**
1	55	56 to 75	**42 to 54**	49	43 to 75	**36 to 53**
2	54	51 to 75	**42 to 49**	47	42 to 71	**40 to 47**
3*	52	52 to 72	**44 to 50**	n/a	n/a	**n/a**
4*	52	56 to 74	**37 to 41**	n/a	n/a	**n/a**
5*	47	51 to 66	**41 to 43**	n/a	n/a	**n/a**
6	57	64 to 77	**49 to 53**	49	47 to 73	**36 to 46**
7*	n/a	n/a	**n/a**	39	39 to 51	**36 to 40**
8	51	50 to 81	**40 to 49**	n/a	n/a	**n/a**
**short term measurements for comparative purposes only*						

Table 1: Summary of typical, measured environmental noise levels, in broadband terms

The lowest typical daytime and night time background noise levels recorded were 40dB L_{A90} and 38dB L_{A90} respectively (Position 4 daytime, Position 1, 2, 6 and 7 night time).

Appendix A provides full details.

5.0 BASIS OF ACOUSTIC DESIGN

5.1 Applicable Environmental Noise Performance Specification and Criteria

In order to sufficiently control the environmental noise impact of all M&E plant associated with the Development, all such mechanical services plant should be selected and suitably attenuated so as to limit the environmental noise at any residential property facades to the following daytime and night time limits:

Location	**Maximum Building Services Plant Noise Level dB L_{Aeq}**	
Any residential façade within (or adjacent to) the proposed development	**Daytime (07:00hrs to 23:00hrs)**	**Night time (23:00hrs to 07:00hrs)**
	35	33

Table 2: Environmental noise limits for M&E plant

The above maximum allowable daytime and night time M&E plant environmental noise level equate to the typical, pre-existing, measured background noise level at the site, for daytime and night time periods, less a further 5dB in accordance with Local Authority guidance, BS4142: 2014 *et al*, and must be complied with, in all instances and all duty plant operating conditions (e.g. maximum CO gas extraction airflow, non smoke condition car park vent extract mode).

The above stated daytime and night time M&E environmental noise limits form the basis of all environmental noise control measures (e.g. duct attenuators) prescribed herein and within noise and vibration control schedules issued as part of this report submission also.

It must be noted that these M&E plant environmental noise limits identified above are applicable to *all* such plant and louvres etc. (including all Fit Out scope and any Tenant plant, car park plant and future pool plant, as well as Shell & Core scope plant, as serving *all* areas of the development), when operating *simultaneously.*

5.2 Applicable Roomside Noise Criteria

The internal area, roomside acoustic requirements for all ventilation and all other plant, as regards internal noise criteria for mechanical and electrical services, are provided by Table 3, in NR terms:

Area / Room Type	Adopted Internal Ambient Noise Criterion for all M&E Plant
Bedrooms	NR25
Living Rooms	NR30
Other Habitable Rooms within Flats (except Bedrooms)	
Common Areas	NR35-NR40
Swimming Pool, Leisure Areas	
Electrical Substations (Transformer Fully Energised)	45-50dB L_{Aeq}
Bin Stores	NR40-NR45
CHP and Boiler Plantroom (All Plant Running and On Full Load)	65dB L_{Aeq}
Chiller Plantroom (All Plant Running and On Full Load)	70dB L_{Aeq}

Table 3: Maximum allowable building services plant room noise levels (roomside)

The above stated maximum allowable internal room spatial averaged noise levels M&E form the basis of all system side (roomside) noise control measures (e.g. duct attenuators) prescribed herein and within noise and vibration control schedules issued as part of this report submission also.

5.3 Shell & Core Plant Scope and Baseline Noise Data

The following scope of Shell & Core ventilation plant has been considered as part of this acoustic compliance assessment (plant references as per M&E Engineer's project drawings, specifications and equipment schedules supplied to Sol):

5.3.1 Electrical Substation (Lord Cameron Building)

Transformer unit within ground floor, naturally ventilated substation; maximum transformer sound power level is 52dB L_{wA}, as advised to Sol by the specialist Designer.

No fan(s) to be used to ventilate the space; this is afforded via proposed louvres/louvred doors which are c.4 metres distance to the nearest flat window façade (also 90-degrees off axis to the louvres/louvred door).

5.3.2 Ground Floor Chiller Plantroom (Rosalind Franklin)

Low noise, packaged, attenuated "Galletti" chiller unit complete with duct mounted attenuators to (hard ducted) air discharge external louvres, and attenuated inlet louvres.

In the case of the inlet air louvre panel (Architect's reference L04), the minor single leaf louvred door must be non air passing/blanked off, fitted with perimeter and threshold acoustic seals, and capable of providing at least 40dB R'w sound insulation as fitted.

5.3.3 Ground Floor CHP and Boiler Plantroom

The ground floor plantroom will encompass the following plant:

(a) 2 no. Wessex Modumax WM254/762V modular boilers; manufacturer published source noise level per unit is 47-65dB(A) @ 1 metre from burner
(b) 2 no. Micro T30 packaged and acoustically enclosed CHP units; manufacturer published source noise level per unit is 60dB(A) @ 1 metre from any enclosure surface (within plantroom) and 57dB(A) @ 1 metre from the engine exhaust flue on roof
(c) Various minor plant, to include 3 no. run/standby LTHW pump pairs and mains booster set

The M&E Engineer has advised Sol that the principal external wall mounted (natural ventilation) louvre, Reference L01, may be fitted with a c.45% free area attenuator.

The minor single leaf louvred door must be non air passing/blanked off, fitted with perimeter and threshold acoustic seals, and capable of providing at least 30dB R'w sound insulation as fitted.

5.3.4 Ground Floor Binstores (Lord Cameron, Queen Mothers)

The ground floor binstores are each served by a single, minor extract fan, each of which is to be installed with duct mounted roomside and atmospheric side attenuators.

General Note

It is essential that none of the above (and attenuator scheduled) plant noise source noise levels are exceeded, in any instance. In the event of different, higher noise plant being selected, the acoustic mitigation requirements (both roomside and environmental) must be reassessed by Sol. As a minimum, any increase in plant noise must be mitigated by a commensurate increase in attenuator insertion loss acoustic performance.

6.0 ATTENUATOR SCHEDULE

Please refer to the Sol attenuator schedule, reference P1652-S01, Revision B, as provided under separate cover.

This provides details of attenuator performance specifications for the compliance with environmental and roomside acoustic criteria stated herein (as based on the stated plant source noise levels in each case also, which must not be exceeded), together with other basic specific requirement as appropriate, such as approximate attenuator pressure losses (to be validated and approved by M&E Engineer prior to any finalisation), preliminary attenuator dimensions (actual, firm attenuator dimensions must be checked and determined by others and will be subject to physical space constraints) and manufacturer-specific product codes in each case.

7.0 VIBRATION ISOLATION SCHEDULE

Please refer to the Sol vibration isolator schedule, reference P1652-S02, Revision -, as provided under separate cover. The schedule indicates the minimum required, as installed static deflection of all vibration isolator systems, together with their basic types and example manufacturer product codes. Others must determine specific vibration isolator load ratings etc.

In addition, generic acoustic detailing of all major pipework and CHP/boiler flue penetrations into plantroom envelope/building fabric (floors, walls) has also been provided under separate cover (all subject to Fire Engineer and M&E Engineer approval). As stated on the vibration isolator schedule, all plantroom wall and floor penetrations must be resilient.

8.0 PREDICTED M&E PLANT ENVIRONMENTAL NOISE LEVEL SUMMARY

Table 4 provides a basic summary of calculated vs. required duty Shell & Core scope M&E plant, as based on the baseline plant noise levels and satisfactory implementation of the various noise control measures as stated herein:

Plant Reference	Predicted Flat Façade Environmental Noise, dB L_{Aeq}	Required Flat Façade Environmental Noise, dB L_{Aeq}	PASS/FAIL
Substation	<27dB	33dB	PASS
Chiller plantroom louvres	<20dB	33dB	PASS
Boiler/CHP plantroom	<20dB	33dB	PASS
Lord Cameron bin store exhaust	<29dB	33dB	PASS
Queen Mothers bin store exhaust	<29dB	33dB	PASS
Car park extract (TBC awaiting Contractor design)	**TBC**	**33dB**	**TBC**
Pool plant, leisure plant (including any pumps, condensers, external AC units, fans)	**TBC**	**33dB**	**TBC**

Table 4: Summary of calculated plant environmental noise levels

Minor binstore fans are encapsulated within these areas and exhaust to car park, not external façades, as previously stated.

9.0 ADDITIONAL PLANT SPECIFIC ACOUSTIC GUIDANCE

9.1 Continuous Mechanical Extract (MEV)

The M&E Engineer has informed Sol that where continuous mechanical extract is to be used, the specific manufacturer and unit type/size shall be Nuaire Type “MEVDC”, not to run any greater than “Curve 2” fan speed in any instance. (At this fan speed to unit noise level is acceptable and within required roomside noise criteria stated herein).

9.2 Temporary Plantroom

The M&E Engineer has informed Sol that the proposed short term, temporary plantroom shall not emit noise levels in excess of the manufacturer published 45dB(A) @ 10 metres distance (when unscreened and at full load) and that furthermore, the unit location shall be not be less than 30 metres distance from any occupied residential (e.g. flat) façade. (In the event of this not being the case, further attenuation to the temporary plantroom will be needed).

APPENDIX A
NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Kidderpore Avenue, Hampstead, London

DATES AND TIMES

Wednesday 14th October 2015 – 20:00 hours to 23:59 hours

Thursday 15th October 2015 – 00:00 hours to 20:00 hours

PERSONNEL PRESENT DURING MEASUREMENTS

Darren Clucas – Sol

INSTRUMENTATION

Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 28260)
Norsonic Type 1251 IEC 60942-1997 Class 1 Sound Calibrator (serial no. 29917)

Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 28957)
Norsonic Type 1251 IEC 60942-1997 Class 1 Sound Calibrator (serial no. 31041)

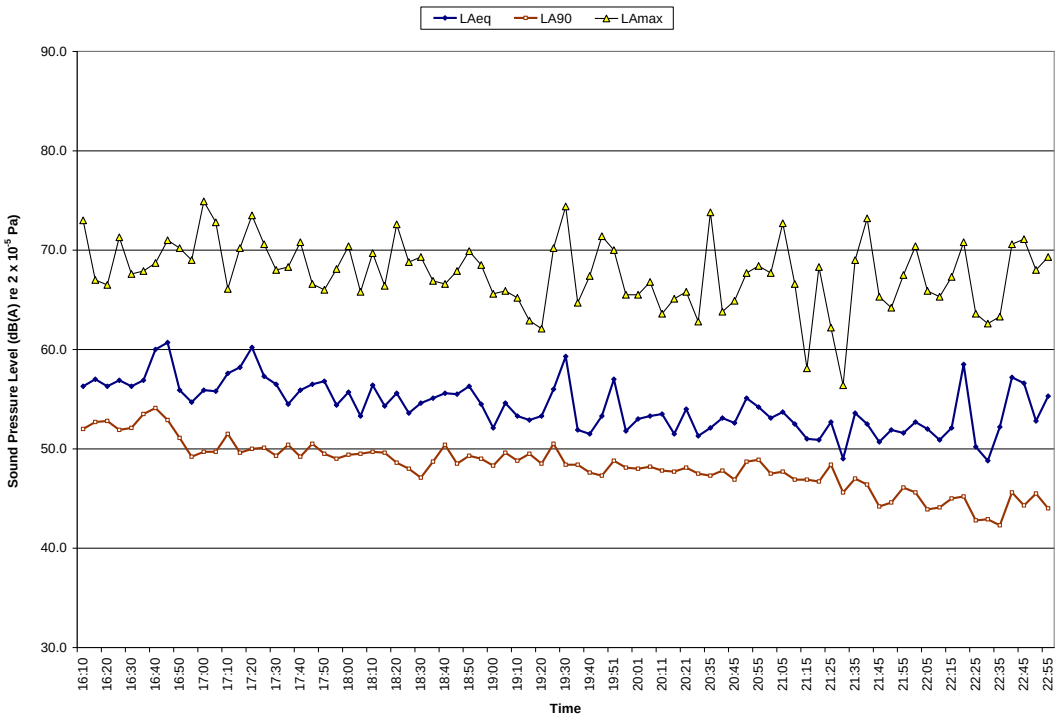
Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 31498)
Norsonic Type 1251 IEC 60942-1997 Class 1 Sound Calibrator (serial no. 31971)

METHODOLOGY

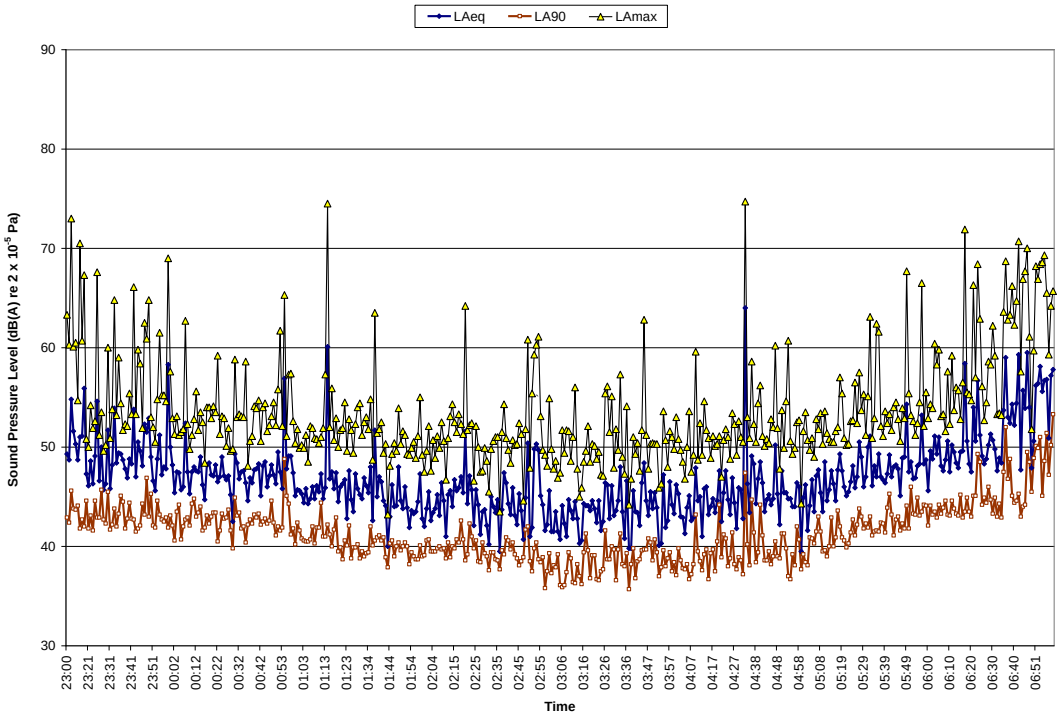
Before and after the measurements the Norsonic Type 118 was check calibrated to an accuracy of ±0.3dB using the Norsonic Type 1251 Calibrator. The calibrator produces a sound pressure level of 114 dB re $2x10^{-5}$ Pa @ 1kHz.

MEASUREMENT RESULTS

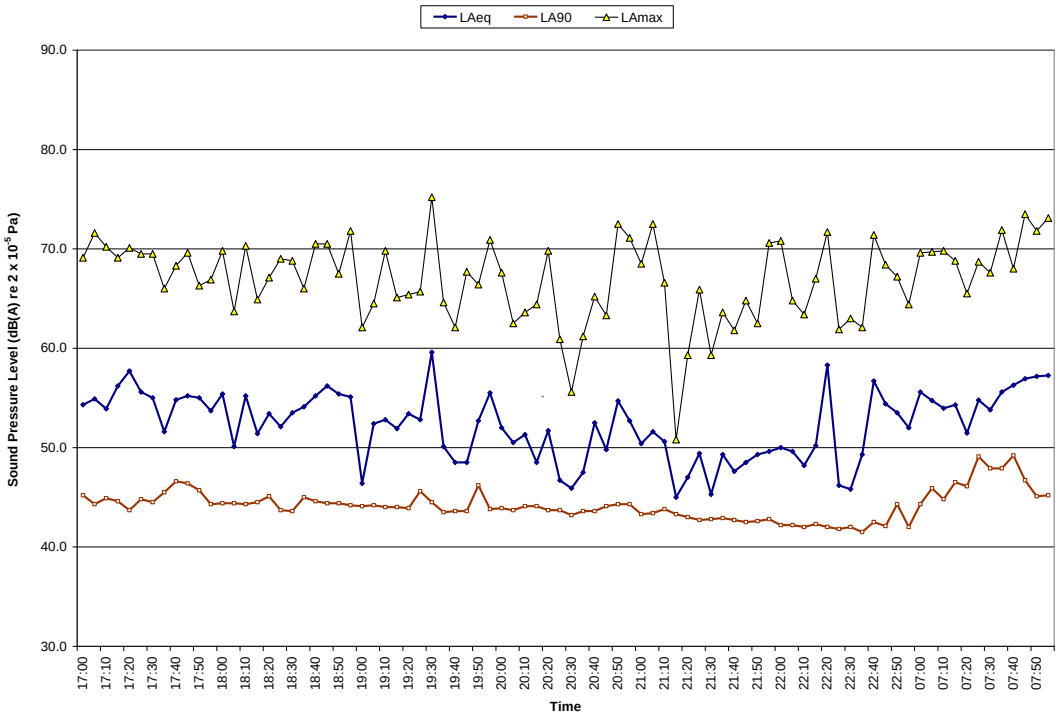
Graphs A1 to A12 summarise the results obtained from the external noise surveys.
Graphs A13 to A17 summarise the results obtained from the internal noise intrusion surveys.



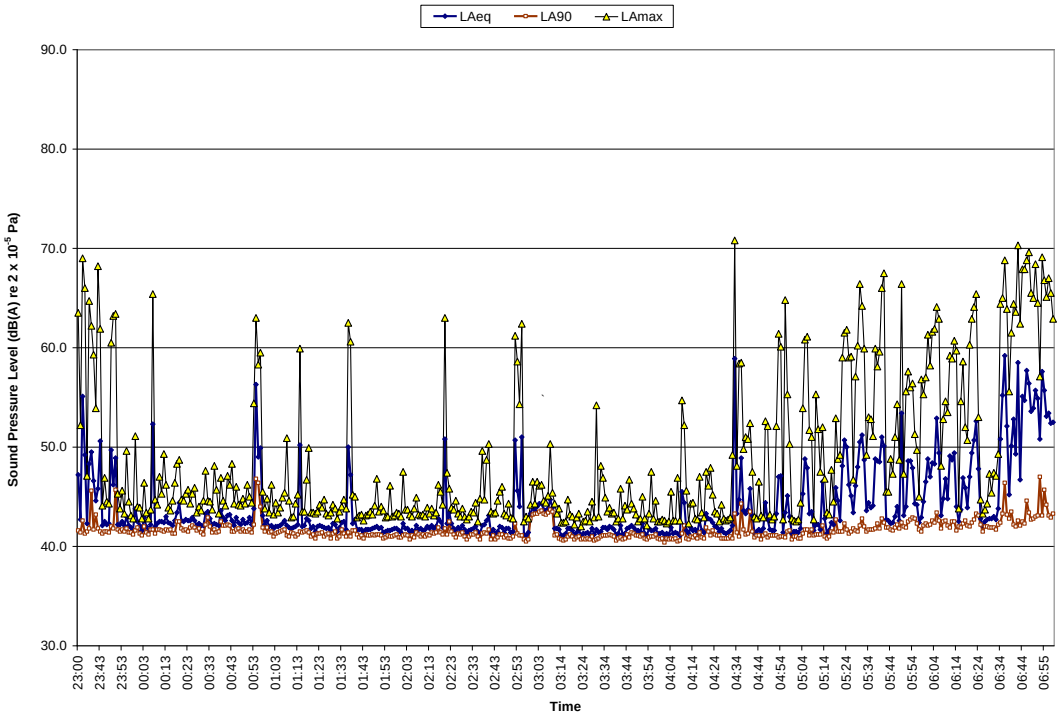
Graph A1: Summary Statistical Noise Levels – Position 1 - Daytime, 14th October 2015



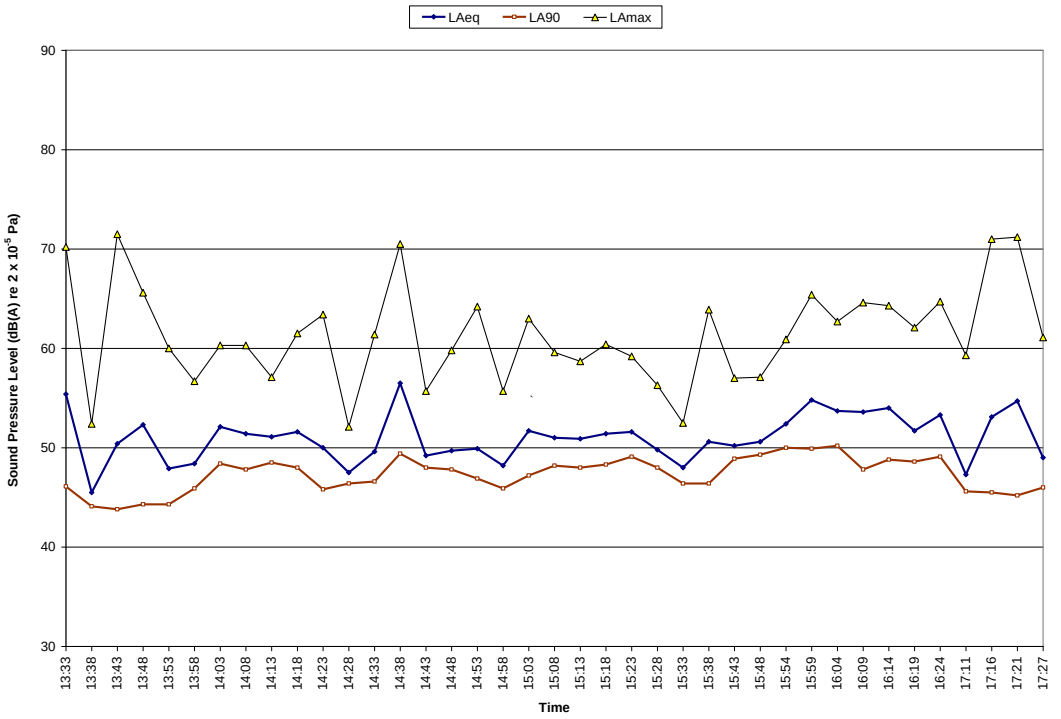
Graph A2: Summary Statistical Noise Levels – Position 1 – Night Time, 14th to 15th October 2015



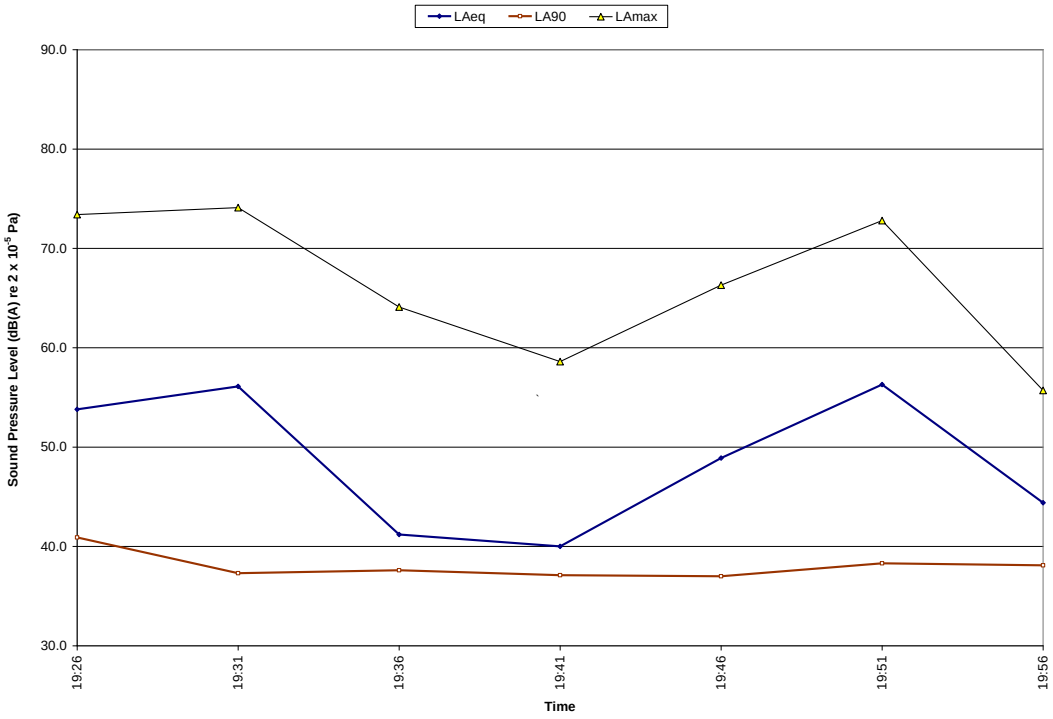
Graph A3: Summary Statistical Noise Levels – Position 2 - Daytime, 14th October 2015



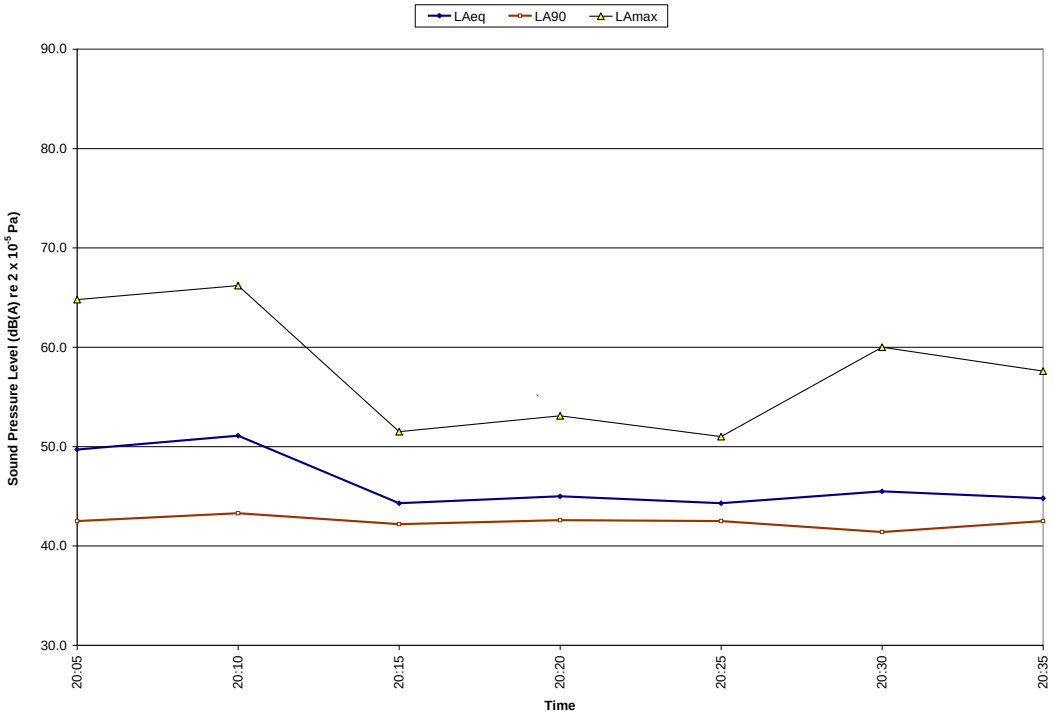
Graph A4: Summary Statistical Noise Levels – Position 2 – Night Time, 14th to 15th October 2015



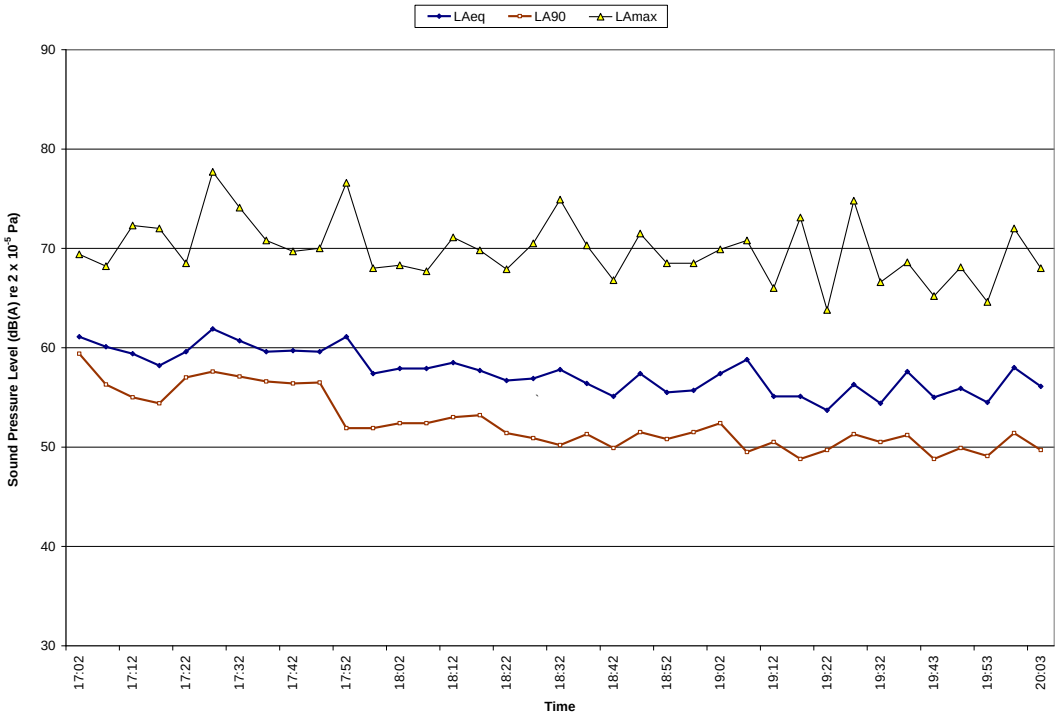
Graph A5: Summary Statistical Noise Levels – Position 3 - Daytime, 14th October 2015



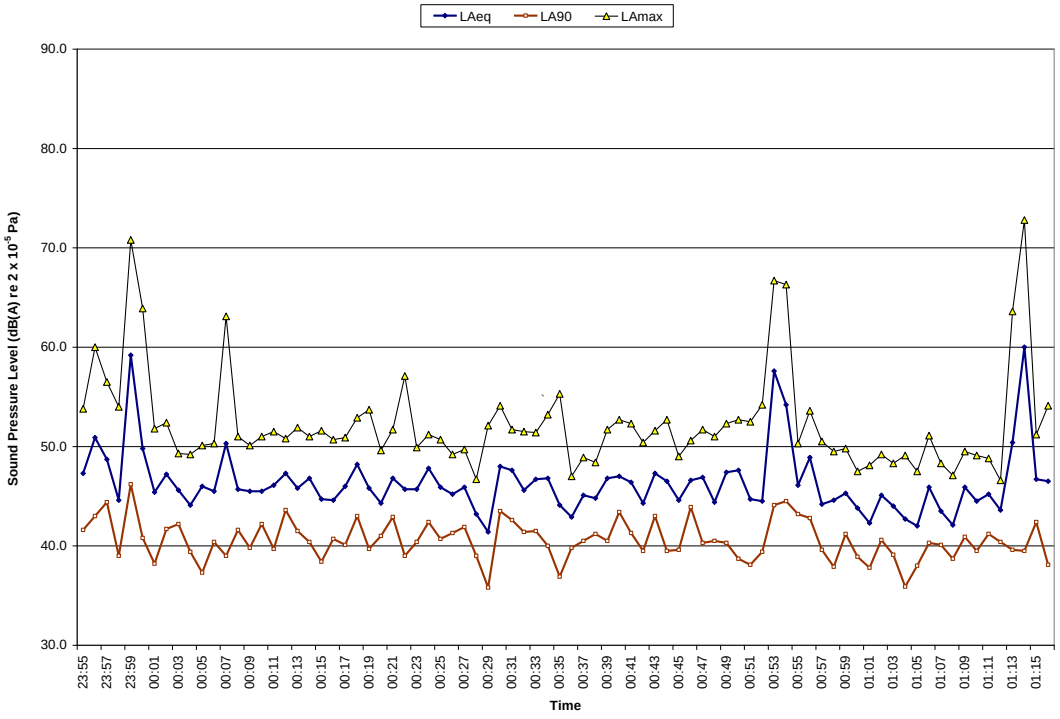
Graph A6: Summary Statistical Noise Levels – Position 4 - Daytime, 14th October 2015



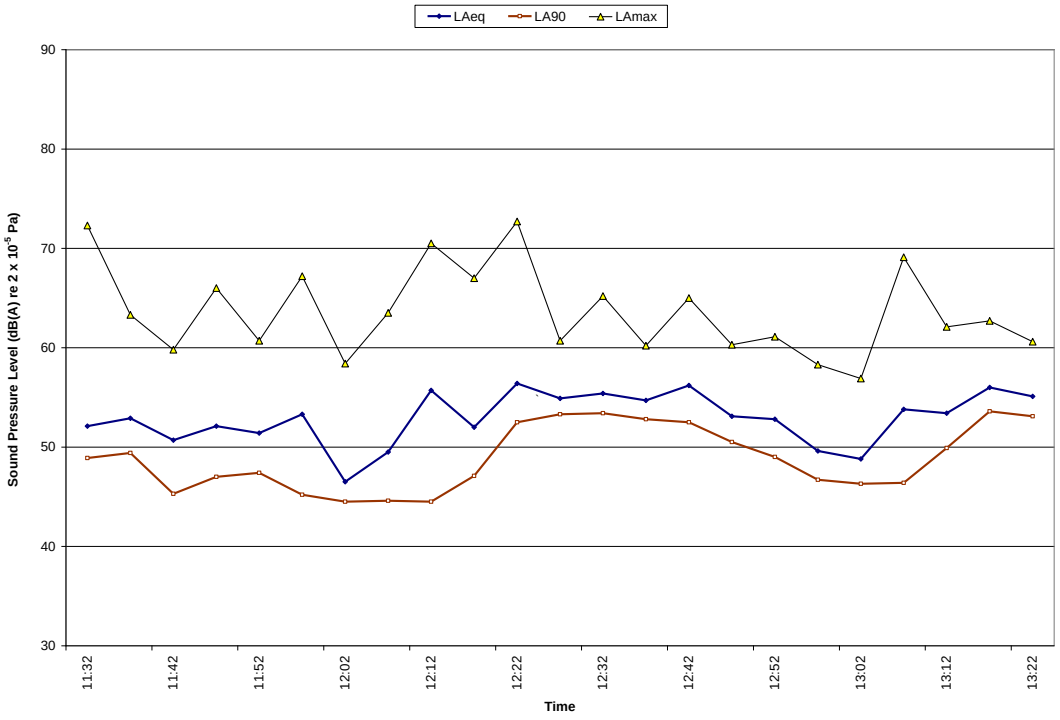
Graph A7: Summary Statistical Noise Levels – Position 5 - Daytime, 14th October 2015



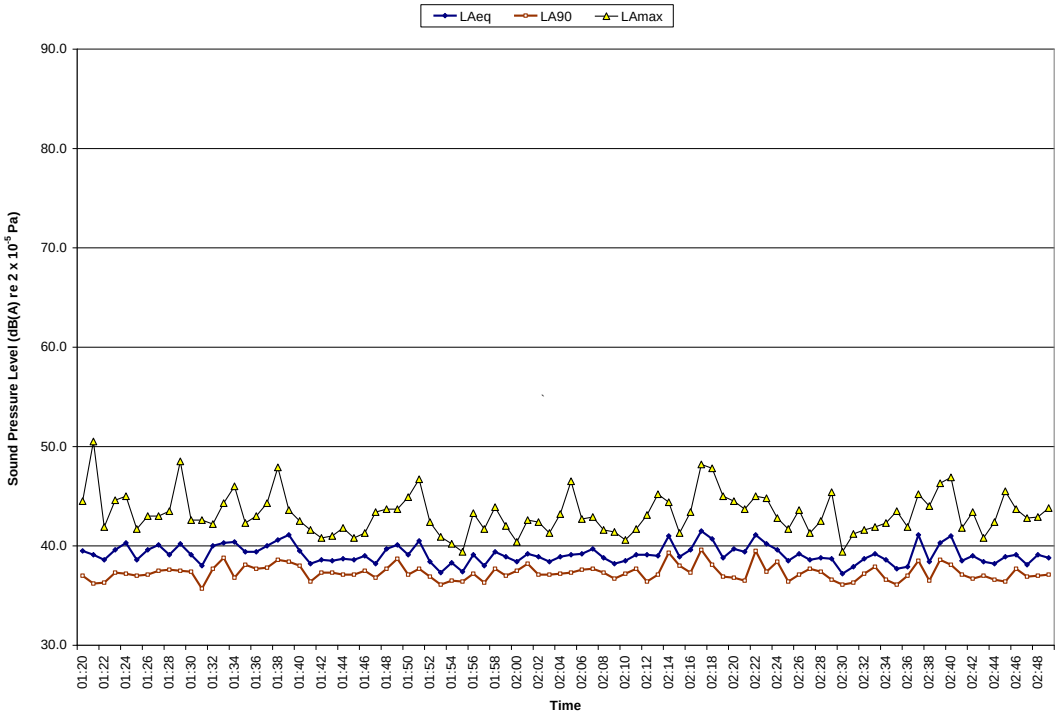
Graph A8: Summary Statistical Noise Levels – Position 6 - Daytime, 14th October 2015



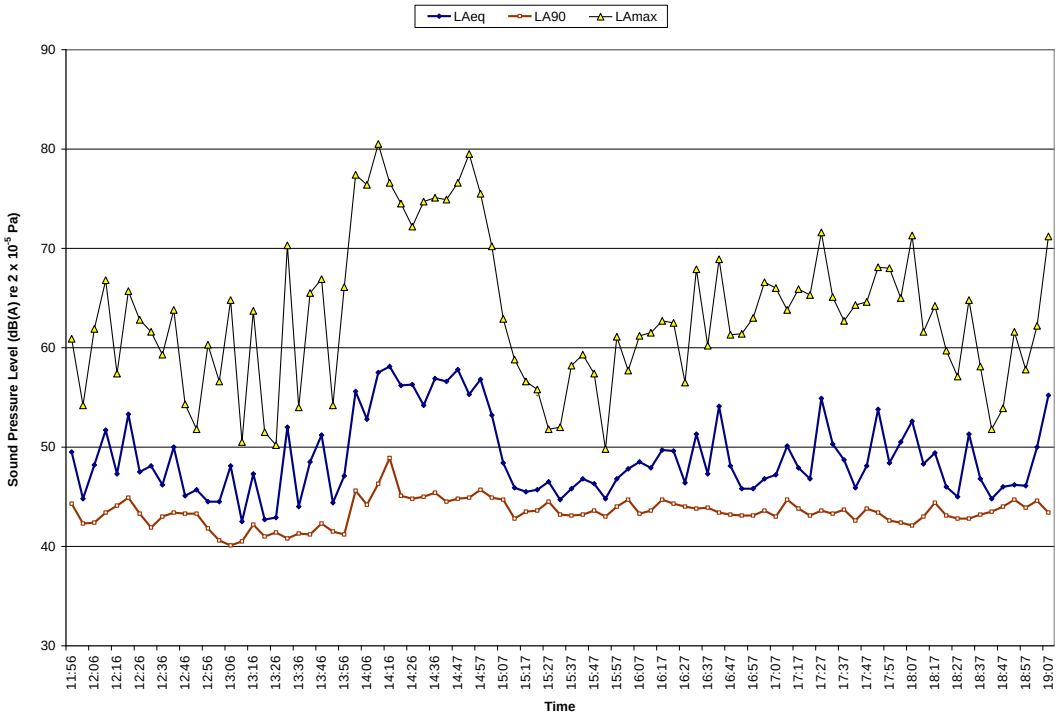
Graph A9: Summary Statistical Noise Levels – Position 6 – Night Time, 14th to 15th October 2015



Graph A10: Summary Statistical Noise Levels – Position 7 - Daytime, 14th October 2015



Graph A11: Summary Statistical Noise Levels – Position 7 – Night Time, 14th to 15th October 2015



Graph A12: Summary Statistical Noise Levels – Position 8 - Daytime, 14th October 2015