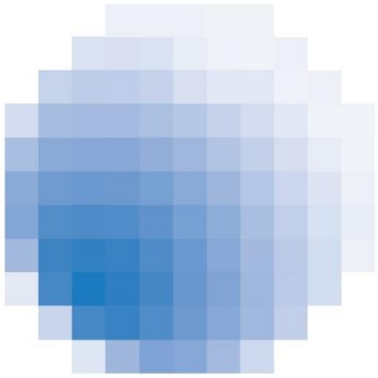

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Lovell

Regents Park Estate

Newlands Substation

Environmental Noise and Vibration Assessment

18 November 2016

PROJECT:	Regent's Park Estate, Camden, London Newlands Substation Environmental Noise and Vibration Assessment
CLIENT:	Lovell Tasman House The Waterfront Elstree Road, Elstree, WD6 3BS
DOCUMENT REFERENCE:	P1703-REP02-Rev A-SJF
SIGNED:	_____ SIMON FERENCZI
CHECKED:	_____ DARREN CLUCAS
DATE:	18 November 2016

CONTENTS

SUMMARY

Sol Acoustics Ltd (Sol) has been commissioned by Lovell to conduct an environmental noise and vibration acoustic assessment of the proposed Regent's Park Estate Newlands Block electrical substation installation, for Planning consent purposes.

London Borough of Camden Council (LBoC) requires that the daytime and night time environmental noise as arising from any normal operation of the electrical substation (as expressed in dB L_{Aeq} terms) shall not exceed the lowest daytime and night time, pre-existing background noise level at any residential façade (as expressed in dB L_{A90} terms), less a further 10dB.

In addition, *vibration* arising from the normal operation of the substation is required to be undiscernible at any residential location.

Accordingly, therefore, this report provides outline details of the proposed substation and its proximity to noise and vibration sensitive housing, together with an acoustic assessment of the worst case environmental noise impact and details of vibration mitigation measures required.

The report provides full details, but in short:

- **Environmental noise;** no specific acoustic mitigation measures are required, given the minimum 8 metres distance (and orientation) of substation louvres and nearest housing façades, and relatively very low, fully energised advised substation transformer total sound power level of 55dB L_{wA}.

- **Environmental vibration arising from transformer operation;** it is essential to ensure that the 500kVA Schneider Electric substation transformer unit is wholly and entirely vibration isolated from all building structures (e.g. floor), via the provision of suitable, proprietary vibration isolators (e.g. neoprene "Tico" pad), each vibration isolation pad providing a static deflection of at least 2mm as installed and correctly loaded.

1.0 INTRODUCTION

Sol Acoustics Ltd (Sol) has been commissioned by Lovell to conduct an environmental noise and vibration acoustic assessment of the proposed Regent's Park Estate Newlands Block electrical substation installation, for Planning consent purposes.

London Borough of Camden Council (LBoC) requires that the daytime and night time environmental noise as arising from any normal operation of the electrical substation (as expressed in dB L_{Aeq} terms) shall not exceed the lowest daytime and night time, pre-existing background noise level at any residential façade (as expressed in dB L_{A90} terms), less a further 10dB.

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Accordingly, therefore, this report provides outline details of the proposed substation and its proximity to noise and vibration sensitive housing, together with an acoustic assessment of the worst case environmental noise impact and details of vibration mitigation measures required.

2.0 DESCRIPTION OF SITE

The proposed substation is to comprise of a single, standalone, part-louvred (naturally ventilated) plantroom building which is to house a single 500kVA substation transformer having an advised, total unit sound power level of 52dB $L_{wA.}$

Figure 1 shows the intended location and orientation (handing) of the substation relative to the nearest, pre-existing noise sensitive housing,1-15 Newlands block of flats.

The *minimum* distance between the closest substation façade and the 1-15 Newlands flat façade facing the substation is c.8 metres, albeit the minimum distance between any substation louvred door is c.10 metres.

As indicated by Figure 2, the substation building is to comprise of a 215mm thick solid brickwork building envelope. Ventilation is to be achieved via the provision of two louvred doors and a weather louvre panel also, albeit none will be facing the noise sensitive Newlands flats façade.

The substation is to operate on a 24-hour basis.

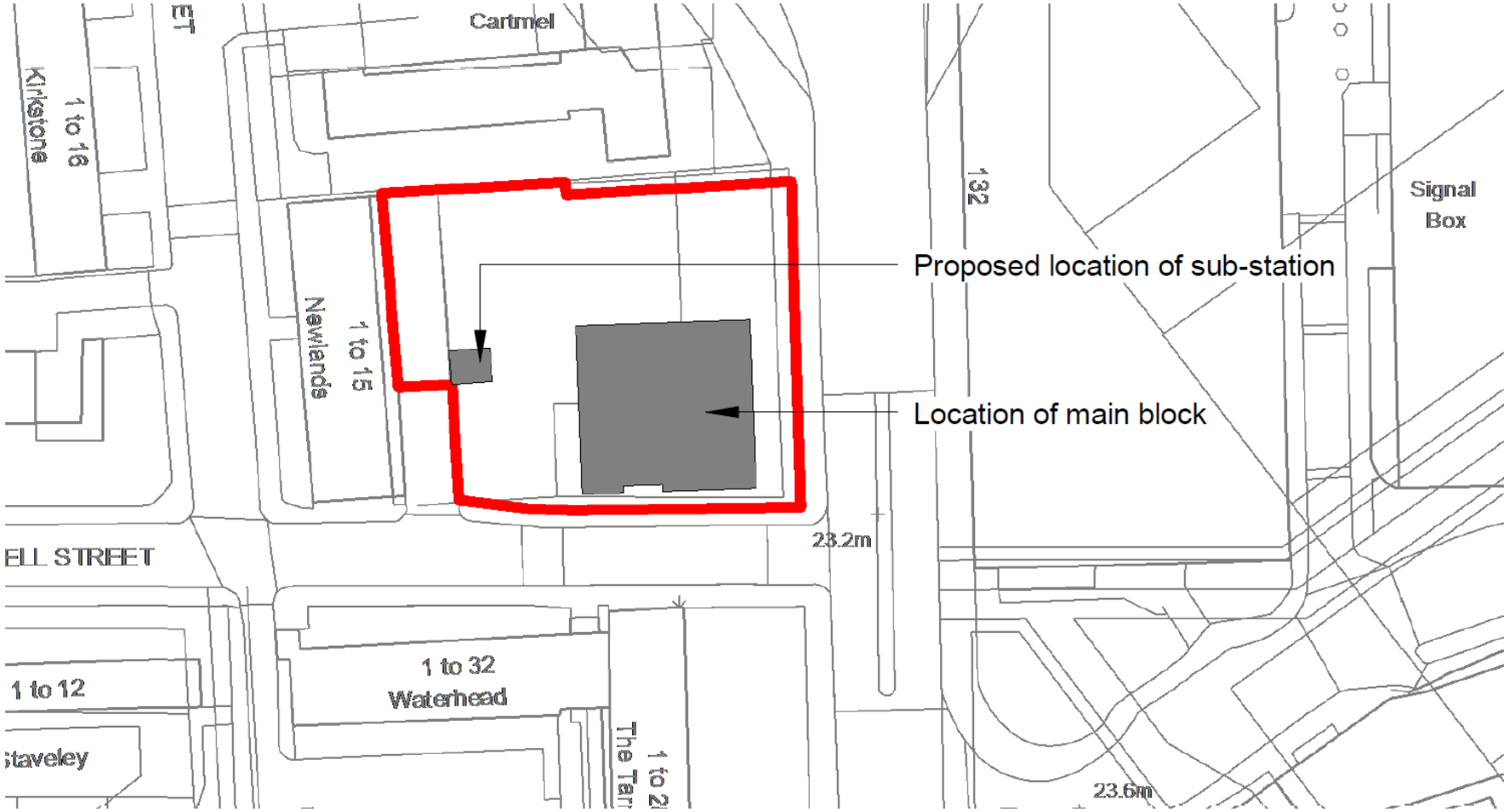


Figure 1: Site plan showing proposed substation building relative to pre-existing 1-15 Newlands accommodation

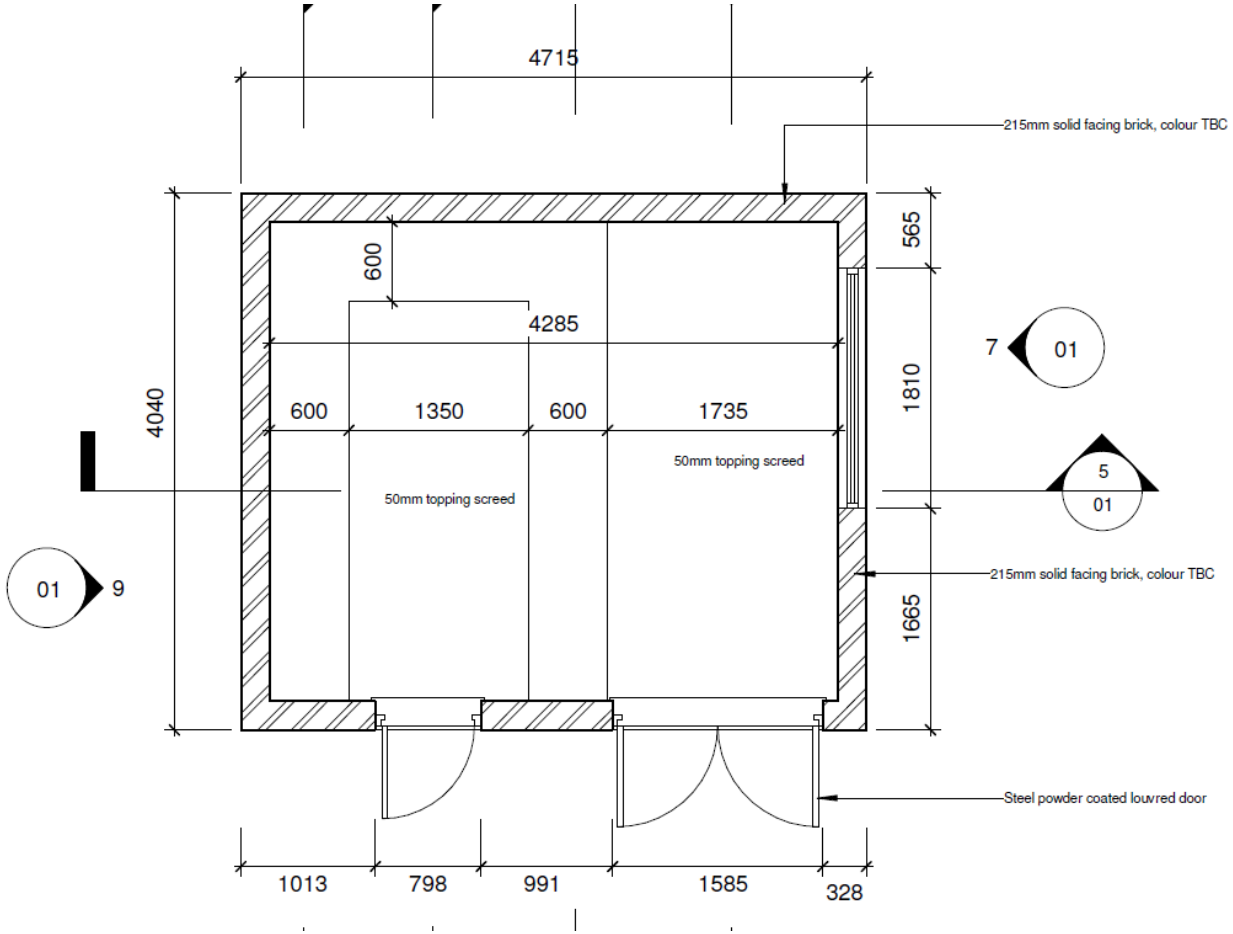


Figure 2: Site plan showing proposed substation building relative to pre-existing 1-15 Newlands accommodation

3.0 DETAILS OF INVESTIGATION

3.1 Environmental and Intrusive Noise Study of Commercial Unit

In order to determine the prevailing, pre-existing daytime and night time environmental background noise levels around the proposed substation site and Newlands flats façade, noise surveys have been carried out as over a typical weekday, with no construction activities being undertaken (either by Lovell, or any third-party site).

Specifically, noise surveys were undertaken between 16:00 hours and 08:00 hours on 9-10 November 2016.

The prevailing weather conditions were suitable for the purposes of environmental noise measurements throughout the 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 3 shows the approximate location of the two noise monitoring points, Position 1 and Position 2. In particular, Position 1 was selected to provide a directly comparable (albeit free field, not façade-corrected) 1-15 Newlands residential façade location; the noise measurements were conducted at 5 metre mast height, completely unscreened by site perimeter fencing or similar, in all cases.

As stated, all noise monitoring locations were in so-called "free field" conditions, in acoustic terms, and thus no correction has been applied to the noise survey data directly obtained.

All noise measurements were undertaken using continuous, consecutively logged measurement durations of 15 minutes, with L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} being recorded, together with corresponding unweighted octave band L_{eq}, L_{max}, L_{10} and L_{90}, per time period.

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.

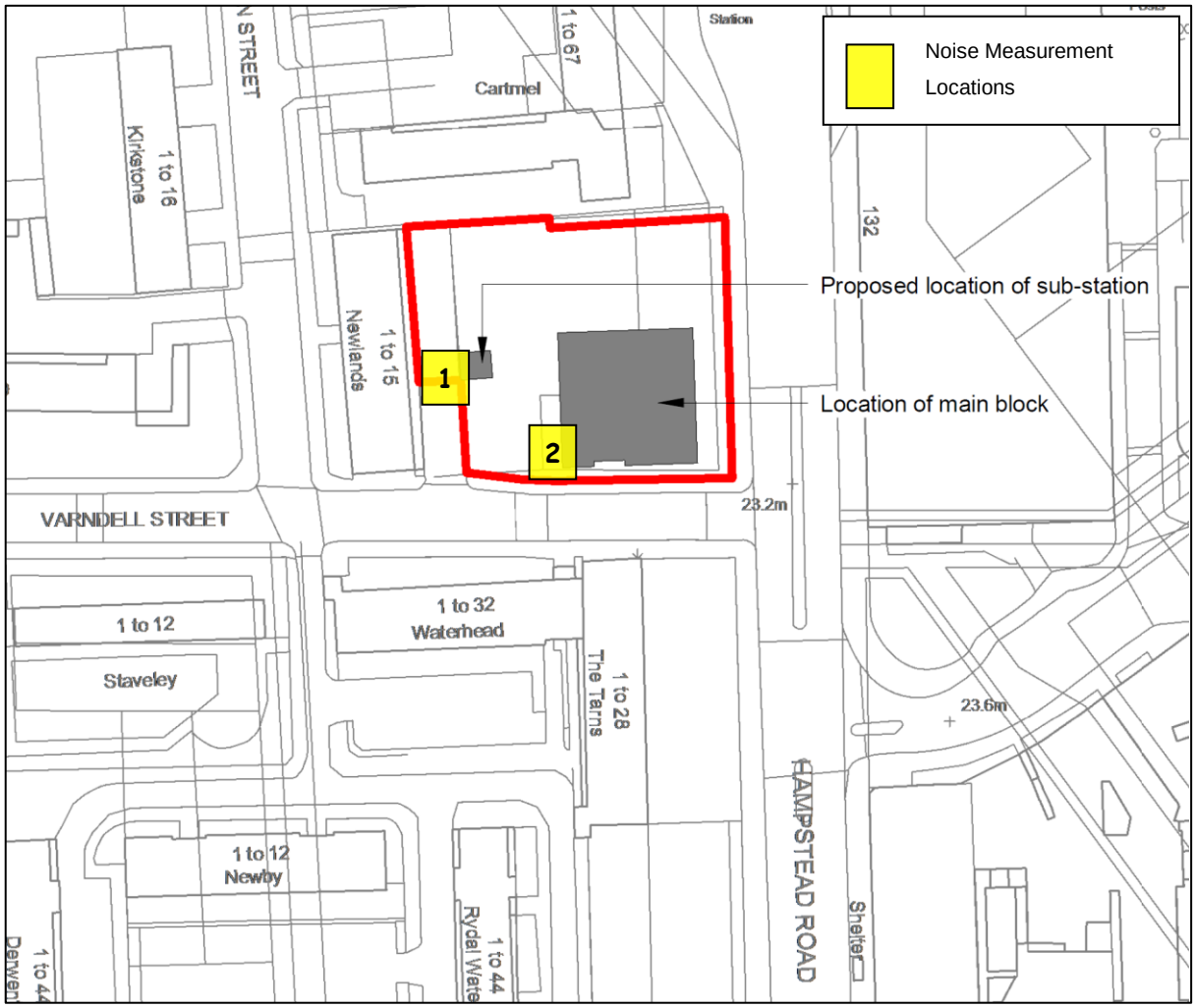


Figure 3: Noise survey monitoring locations

4.0 SUMMARY OF MEASURED NOISE DATA

4.1 Environmental and Intrusive Noise Study

Table 1 provides a basic summary of the lowest recorded, free field background noise levels measured at the two locations around the site:

	Measured Noise Level (Lowest L_{A90} shown)			
	Daytime		**Night time**	
Position	**Typical dB, L_{Aeq}**	**Lowest dB L_{A90}**	**Typical dB, L_{Aeq}**	**Lowest dB L_{A90}**
1	63dB	54dB	60dB	**44dB**
2	60dB	50dB	57dB	42dB

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

It should thus be noted that the lowest measured (night time) free field background noise level for the 1-15 Newlands flats façade was 44dB L_{A90}. Thus, the maximum allowable environmental noise level due to cumulative, worst case, fully energised transformer operation (even though this is most unlikely to actually occur in practice during night time periods), in order to comply with LBoC requirements is 34dB $L_{Aeq,T}$.

Refer to Appendix A for further information.

5.0 CALCULATED ENVIRONMENTAL NOISE ARISING FROM SUBSTATION

The following calculation is provided in terms of the predicted worst case, free field 1-15 Newlands substation environmental noise arising due to full energisation substation transformer operation:

- Total transformer sound power level, fully energised = **52dB L_{wA}.** This is the total acoustic energy of the substation.
- Reverberant sound pressure level within 46m^3 volume substation, having a reverberation time of c.1 seconds, is given by:

  $L_{Arev} = L_{wA}$ - (10 * log (46)) + 14dB + (10 * log (1)) = **49dB**

- Combined, total sound power level of c.5m^2 total area louvred doors given by:

  $L_{wA(doors, total)} = L_{Arev}$ + (10 * log (5)) - 6dB (field change) = **50dB**

- Attenuation due to 10 metres distance, hemispherical propagation and 90**°** directivity is given by:

  $L_{A(Newlands)} = L_{wA(doors, total)}$ – (20 * log (10)) – 11dB + 3dB – 5dB = **17dB L_{Aeq}**

Thus, the predicted worst case transformer (substation) noise arising at the nearest and worst potentially affected residential façade, for worst case conditions (both transformers fully energised) is calculated as **17dB L_{Aeq}**, and therefore wholly compliant with the maximum permitted 34dB $L_{Aeq,T}$ environmental noise limit, as discussed in Section 4.1 (as based on lowest night time background noise level, less a further 10dB).

Therefore, no specific environmental noise attenuation measures are required in this instance.

6.0 VIBRATION ISOLATION OF SUBSTATION TRANSFORMERS

Ground borne vibration transmission to noise sensitive flats, as arising from transformer operation, must be avoided.

It is essential to ensure that the 500kVA Schneider Electric substation transformer unit is wholly and entirely vibration isolated from all building structures (e.g. floor), via the provision of suitable, proprietary vibration isolators (e.g. neoprene "Tico" pad), each vibration isolation pad providing a static deflection of at least 2mm as installed and correctly loaded.

APPENDIX A

NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Newlands, Regents Park Estate, London NW1

DATES AND TIMES

Wednesday 9th November 2016 15:00 hrs to 23:59 hrs

PERSONNEL PRESENT DURING MEASUREMENTS

Simon Ferenczi – Sol

Darren Clucas – Sol

INSTRUMENTATION

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)

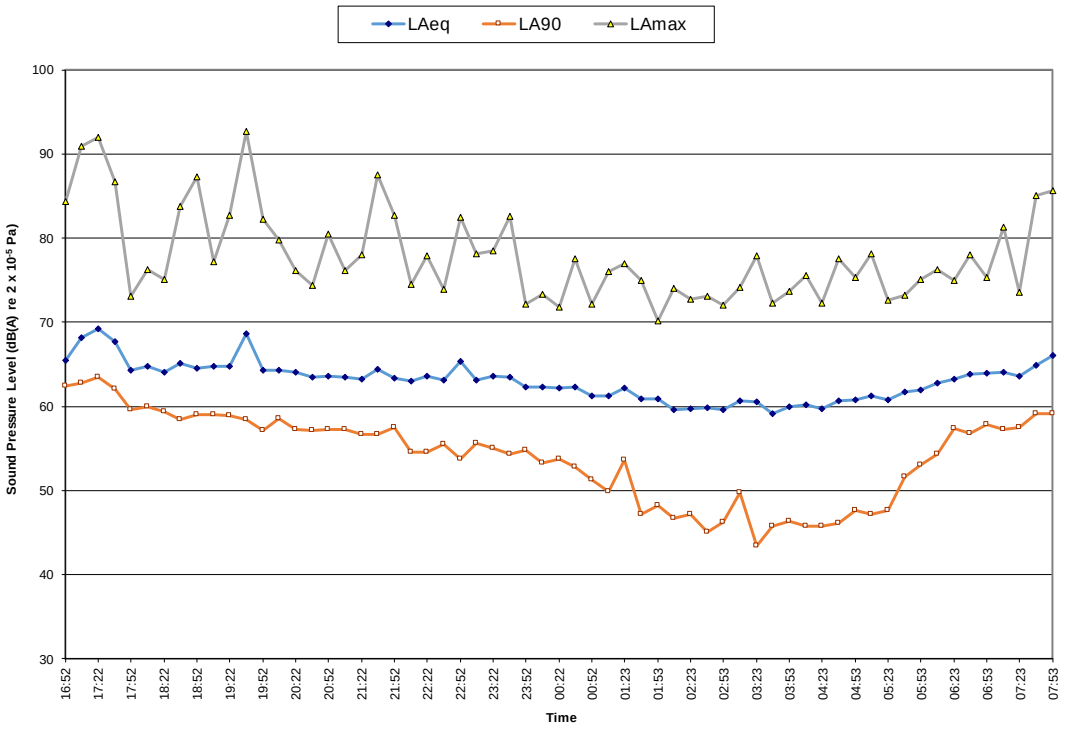
METHODOLOGY

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.

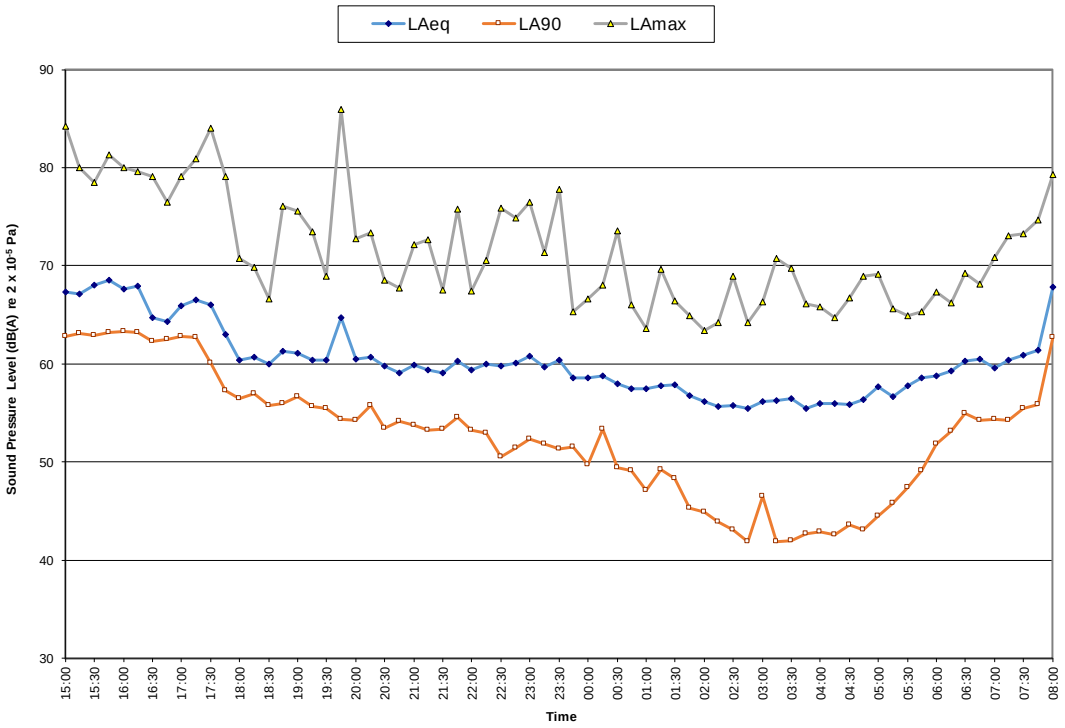
MEASUREMENT RESULTS

Graphs A1 to A2 summarise the results obtained from the noise surveys.

Measurement locations are shown on Figure 3.



Graph A1: Noise summary – 9th to 10th November 2016 - Position 1



Graph A2: Noise summary – 9th to 10th November 2016 - Position 2