Anderson Acoustics

PLANT NOISE ASSESSMENT

WELLESLEY ROAD CARE HOME, LONDON NW5

KIER CONSTRUCTION

JULY 2014

Condition 15.

PLANT NOISE ASSESSMENT
WELLESLEY ROAD CARE HOME, LONDON NW5

Our Ref: 1458_001r

Anderson Acoustics

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Date:	23 July 2014
Project No:	1458
Status:	ISSUED

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REVISION HISTORY

Version	Comments	Changes made by	Approved by
V1.0	First Issued Version	RNM	JB

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CONTENTS

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Kier Construction to undertake a noise impact assessment for the external roof plant areas at the residential care home development, Wellesley Road, London N5.

Planning permission has been granted by the London Borough of Camden, LBC (application reference 2010/4890/P) with a number of conditions. This assessment has been conducted to support the discharge of planning condition 14 at this development in respect of LBC planning policy requirements for noise from external fixed plant.

2 NOISE UNITS, POLICY AND CRITERIA

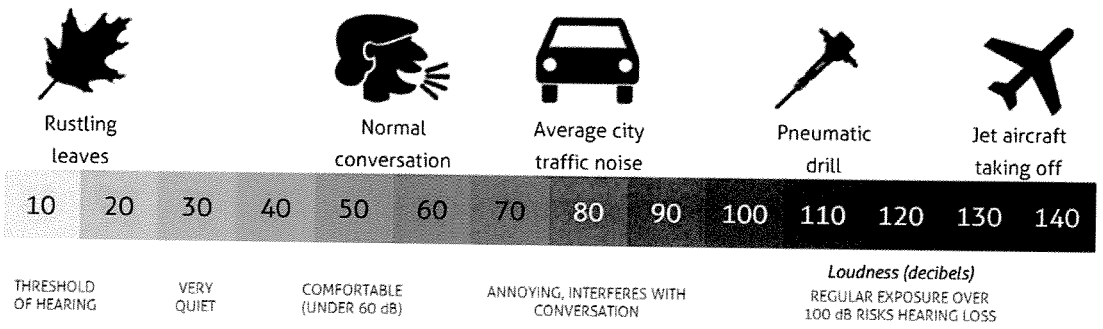
2.1 Noise Units

There is a million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

$L_{A90,T}$	This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.
$L_{Aeq,T}$	This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.
$L_{Amax,F}$	This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken, or calculated to, a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

2.2 Noise Policy and Criteria

2.2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) [1] was published on 15 March 2010. It sets out the long term vision of the Government's noise policy, which is to promote good health and a good quality of life through the management of noise within the context of sustainable development.

The NPSE sets out the following aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

2.2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) [2] was published on 27 March 2012. Along with the introduction of this document, a number of detailed planning policy guidance notes were withdrawn, including PPG24, on planning and noise.

The NPPF sets out how the Government's planning policies should be applied. In terms of the detail of policies on environmental issues such as noise, the intention is for Local Planning Authorities to set their own guidance. This will form part of or be referred to in the relevant Local Plan.

2.3 Local Authority Requirements

The table below is an extract from Camden Council's 'Unitary Development Plan 2006 – Appendix 1 (Table E)':

Table 2.1: Local Authority Requirements

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) $<L_{A90}$
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) $<L_{A90}$
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) $<L_{A90}$
Noise at 1 metre external to sensitive façade where $L_{A90}>60$dB	Day, evening and night	0000-2400	55dB L_{Aeq}

3 NOISE MONITORING SURVEY

3.1 Continuous Noise Monitoring

Continuous, unattended measurements of ambient and background noise levels were undertaken at 1st floor level at two locations, one at the northern boundary and one at the southern boundary of the site under 'free-field' conditions. The location of the measurement positions is shown in Figure A1 of Appendix A. These locations are considered to be representative of noise levels at the nearest residential properties.

Noise levels were measured using a Rion NL-31 and Rion NL-52 precision integrating sound level meters fitted with weatherproof windshields. The sound level meters were powered by dry cell batteries and stored inside a weatherproof security box.

Measurements were obtained using the 'Fast' response and A-weighting frequency network. The equipment was calibrated before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed.

Fifteen minute consecutive measurements of $L_{Amax,F}$, $L_{Aeq,T}$, $L_{A10,T}$ and $L_{A90,T}$ noise levels were obtained between 15:45 hrs on Friday 25th and 12:15 hrs on Monday 28th October 2013.

The prevailing noise environment at the monitoring position was noted to consist of typical suburban noise sources including traffic and distant aircraft noise.

3.2 Weather Conditions

Weather conditions during the survey period have been obtained from the internet source www.wunderground.com (Hampstead weather station) which indicates a mix of conditions with negligible rainfall and light to moderate wind speeds. At the time of set-up of the noise monitor the weather conditions were dry with light winds.

3.3 Noise Survey Results

The results of the continuous noise monitoring surveys are presented in graphical form in Figures A3 and A4 of Appendix A for Location 1 (northern boundary) and Location 2 (southern boundary) respectively.

At the time of the survey the development was already under construction, therefore measured daytime ambient and background noise levels are likely to have been significantly affected whilst the site was operational (understood to be Monday to Friday 08:00 to 18:00 hrs). Therefore noise levels measured during the site working hours have not been used to derive background noise levels for the assessment.

The daily ambient $L_{Aeq,16\,hr}$ and night-time ambient $L_{Aeq,8\,hr}$ noise levels are summarised in Table 3.1 and 3.2 below, along with the lowest measured background $L_{A90,15min}$ noise levels.

Table 3.1: Measured Levels – Location 1 (Northern Boundary - Wellesley Road Façade)

Date	Measurement Period	Minimum L_{90} (dBA)	Average L_{eq} (dBA)
Friday 25/10/13	Daytime (07:00-23:00)	47	58
	Night-time (23:00-07:00)	45	54
Saturday 26/10/13	Daytime (07:00-23:00)	47	58
	Night-time (23:00-07:00)	41	52
Sunday 27/10/13	Daytime (07:00-23:00)	47	58
	Night-time (23:00-07:00)	41	53
Monday 28/10/13	Daytime (07:00-23:00)	51	65
	Night-time (23:00-07:00)	47	59

Table 3.2: Measured Levels – Location 2 (Southern Boundary - Wellesley Place Façade)

Date	Measurement Period	Minimum L_{90} (dBA)	Average L_{eq} (dBA)
Friday 25/10/13	Daytime (07:00-23:00)	46	59
	Night-time (23:00-07:00)	45	54
Saturday 26/10/13	Daytime (07:00-23:00)	46	61
	Night-time (23:00-07:00)	39	53
Sunday 27/10/13	Daytime (07:00-23:00)	45	61
	Night-time (23:00-07:00)	40	55
Monday 28/10/13	Daytime (07:00-23:00)	52	63
	Night-time (23:00-07:00)	45	57

These results indicate representative background noise levels as follows:

- For properties on the northern boundary, daytime and night-time background noise levels of 47 dB $L_{A90,T}$ and 41 dB $L_{A90,T}$ respectively; and
- For properties on the southern boundary, daytime and night-time background noise levels of 45 dB $L_{A90,T}$ and 39 dB $L_{A90,T}$ respectively.

In-line with the Local Authority's requirements (Section 2.3) the proposed plant should be designed so that noise emissions do not exceed the following levels when assessed at the nearest noise sensitive location.

- Daytime Criteria (0700 to 2300) – 40dB(A)
- Night-time Criteria (2300 to 0700) – 34dB(A)
- Design Criteria (24 hour operation) – 34dB(A)

4 NOISE IMPACT ASSESSMENT

4.1 Noise Model

A computer noise model of the plant noise sources proposed for the Wellesley Road Care Home and neighbouring buildings has been generated using Cadna-A. Screenshots of the noise model are presented in Figure A2 of Appendix A. This commercial software package implements the noise propagation calculation specified in ISO 9613-2 [3] using the following acoustic algorithm:

$$L_{ft}(DW) = L_w + D_c - A$$

where:

$L_{ft}(DW)$	=	equivalent continuous downwind octave-band sound pressure level at a receiver location
L_w	=	sound power level of the noise source
D_c	=	directivity correction
A	=	attenuation that occurs during propagation from the point sound source to the receiver. $A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$
A_{div}	=	attenuation due to geometrical divergence
A_{atm}	=	attenuation due to atmospheric absorption
A_{gr}	=	attenuation due to the ground effect
A_{bar}	=	attenuation due to a barrier
A_{misc}	=	attenuation due to miscellaneous other effects

Calculations are based on the following assumptions:

- plant will operate 24 hours a day, 7 days a week and therefore a limit is presented for both daytime and night-time periods;
- plant is non-tonal, impulsive or irregular in nature;
- the plant areas (at their closest) are 19 m from the nearest noise sensitive residential window to the north (153 to 175 Wellesley Road); and 26 metres to the south (162 Malden Road).

4.2 Noise Sources

It is understood that 22 Air Conditioning units, 13 Heat Recovery Units, 1 Air Handling Unit, 3 Extract Fans and 1 Kitchen Extract Fan are proposed for the 2nd and 3rd floor roof areas. The specific location of these is shown in Figure A2of Appendix A.

Table 4.1 below presents the manufacturer's and calculated octave sound power data.

Table 4.1: Octave Band Sound Power Data of Proposed Plant

Ref	Unit	Sound Power Level, dB, at Octave Band Centre Frequency, Hz						
		125	250	500	1k	2k	4k	8k
All External Air conditioning units	Mitsubishi PUHZ-ZRP140VKA	54	52	50	46	52	35	39
HRU02 & HRU04	FlaktWoods HR XH-HW 2 SS BP Evo PH	65	57	60	52	58	52	44
HRU03	FlaktWoods HR XH-HW 2 SS BP Evo PH	56	47	39	51	42	40	39
HRU05	FlaktWoods HR XH-HW 2 SS BP Evo PH	54	44	35	46	39	30	25
HRU06	FlaktWoods HR XH-HW 2 SS BP Evo PH	71	71	72	75	73	70	64
HRU07	FlaktWoods HR XH-HW 2 SS BP Evo PH	56	50	50	48	41	31	28
HRU08	FlaktWoods HR XH-HW 2 SS BP Evo PH	68	67	67	66	65	62	50
HRU09	FlaktWoods HR XH-HW 2 SS BP Evo PH	69	59	63	64	61	57	48
HRU10	FlaktWoods HR XH-HW 2 SS BP Evo PH	52	42	34	47	35	33	30
HRU11	FlaktWoods HR XH-HW 2 SS BP Evo PH	69	59	63	64	61	57	48
HRU12	FlaktWoods HR XH-HW 2 SS BP Evo PH	56	47	9	51	42	40	39
HRU13	FlaktWoods HR XH-HW 2 SS BP Evo PH	56	50	50	48	41	31	28
AHU01	Aungus Air AHU	84	89	89	85	81	77	73
EF01*	S&P Silent 100 Series Extract Fan	32	34	34	33	29	25	19
EF02*	S&P Silent 100 Series Extract Fan	37	39	39	38	34	30	24
EF03*	S&P Silent 100 Series Extract Fan	29	31	31	30	26	22	16
KEF01	S&P Silent 100 Series Extract Fan	86	91	82	77	69	60	57

Note*: Calculated In-duct sound power level

4.3 Sound Reduction of Attenuators

Model calculations have assumed that attenuators of 900mm in length and a 50% free area with the following insertion loss values are present on all intake and extracts of the HRUs, AHU and kitchen extract fan.

Table 4.2: Attenuator Insertion Losses

Location	Dimensions, mm			Performance, dB							
	L	W	H	63	125	250	500	1k	2k	4k	8k
All HRU intake/extract AHU intake & Kitchen extract fan	900	500	500	-2	-4	-9	-15	-17	-14	-10	-8

4.4 Receptor Locations

Receptors have been created to represent all floors for the following nearest residential locations:

- 1 to 48 Wellesley Road – Block Flats to west (Front Facade)
- 2 to 104 Wellesley Road – Block Flats to east (Front Facade)
- 153 to 175 Wellesley Road – Block Flats to north (Front Facade)
- 162 Malden Road – Single property to the south (Rear Façade)

These locations are shown in Figure A2 of Appendix A.

4.5 Noise Model Results

The results of the computer noise modelling at the nearest residential properties are summarised below in Table 4.3.

Table 4.3: Results of Computer Noise Model

Receptor Location	Predicted Facade Noise Level $L_{Aeq,T}$ dB
1 to 48 Wellesley Road	27
2 to 104 Wellesley Road	20
153 to 175 Wellesley Road	31
162 Malden Road	29

These results indicate that the facade noise levels arising from the simultaneous operation of the units, are likely to be highest at the façade of 153 to 175 Wellesley Road.

4.6 LBC Criterion

An assessment of noise from the proposed plant has been undertaken with respect to the LBC criterion, presented in Tables 4.4 and 4.5 below.

Based on the manufacturer's sound power data provided it is considered that the proposed units are non-tonal in acoustic character and so a correction factor has therefore not been applied.

Table 4.4: LBC Noise Level Results - Day-time

Receptor	Calculated Specific Noise Level $L_{Aeq,1hour}$ dB	Lowest Measured Daytime Background $L_{A90,T}$	LBC Criteria Level $L_{A90,T}$	LBC Assessment Level dB
1 to 48 Wellesley Road	27	45	40	-13
2 to 104 Wellesley Road	20			-20
153 to 175 Wellesley Road	31			-9
162 Malden Road	29			-11

Table 4.5: LBC Noise Level Results - Night-time

Receptor	Calculated Specific Noise Level $L_{Aeq,1hour}$ dB	Lowest Measured Night-time Background $L_{A90,T}$	LBC Criteria Level $L_{A90,T}$	LBC Assessment Level dB
1 to 48 Wellesley Road	27	39	34	-7
2 to 104 Wellesley Road	20			-14
153 to 175 Wellesley Road	31			-3
162 Malden Road	29			-5

Tables 4.4 and 4.5 above show that provided atmosphere side attenuators are installed to all HRU and AHU units, noise emissions from proposed items of plant serving Wellesley Road care home comply with the London Borough of Camden's' noise limits.

5 SUMMARY

Anderson Acoustics has undertaken an environmental noise assessment to assist in the planning application for the proposed installation of mechanical services plant serving a care home development at Wellesley Road, London NW5.

Manufacturer's plant noise data provided by to us by Kier Construction has been used along with measured background noise levels obtained from an unattended background noise survey. Calculations have been made to predict the impact of plant noise emissions at the windows of the nearest dwellings.

The results of the assessment indicate that provided attenuators of recommended insertion loss are installed to all HRU and AHU units, atmospheric noise emissions from the plant should comply with the criteria required by Camden Council.

6 REFERENCES

1 Noise Policy Statement for England (NPSE). 15 March 2010

2 National Planning Policy Framework (NPPF). 27 March 2012

3 British Standard BS 4142: 1997. Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas.

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APPENDIX A

FIGURE

Figure A1: Site plan detailing measurement position and location of proposed plant

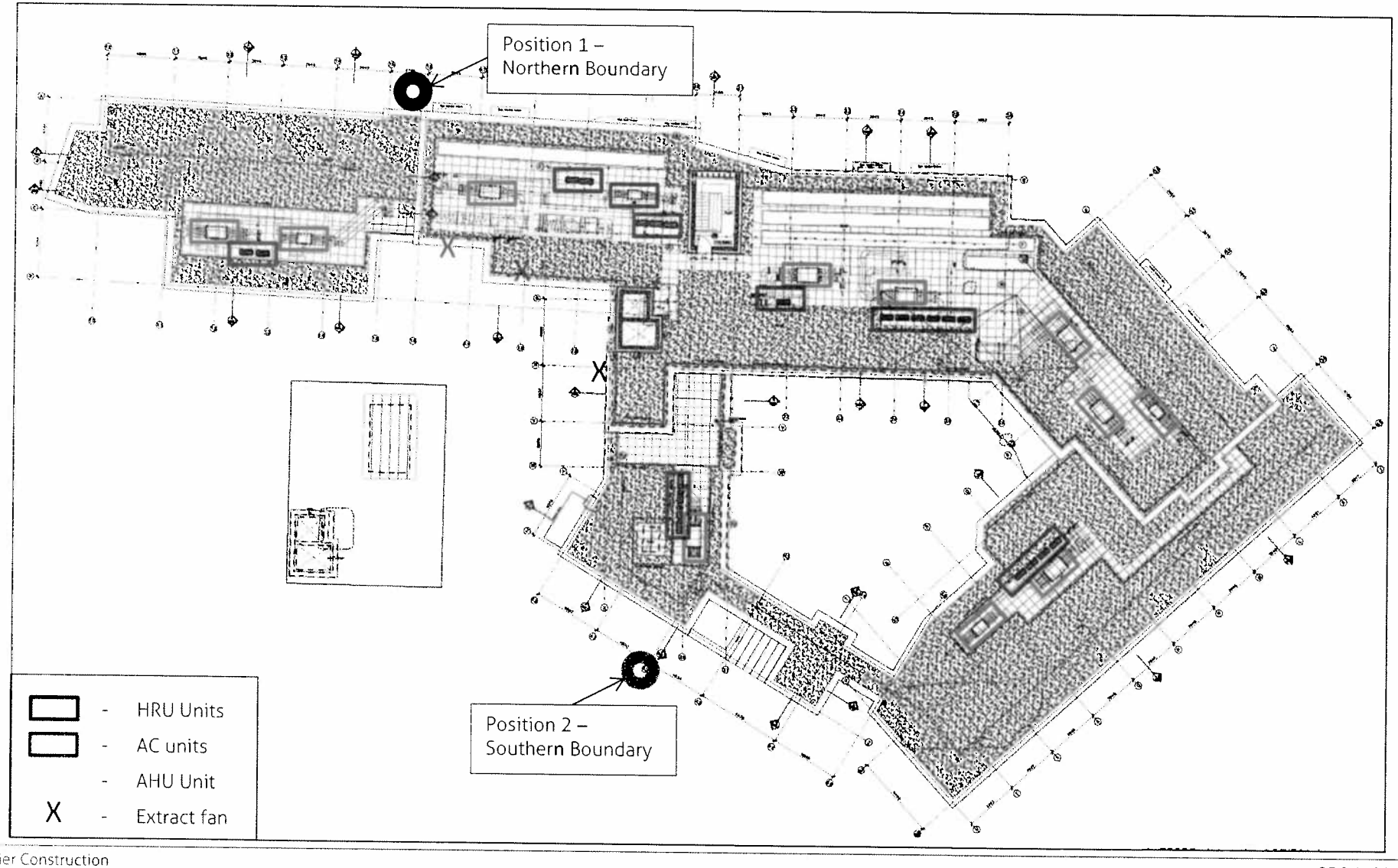

Figure A2: 3D Noise Model

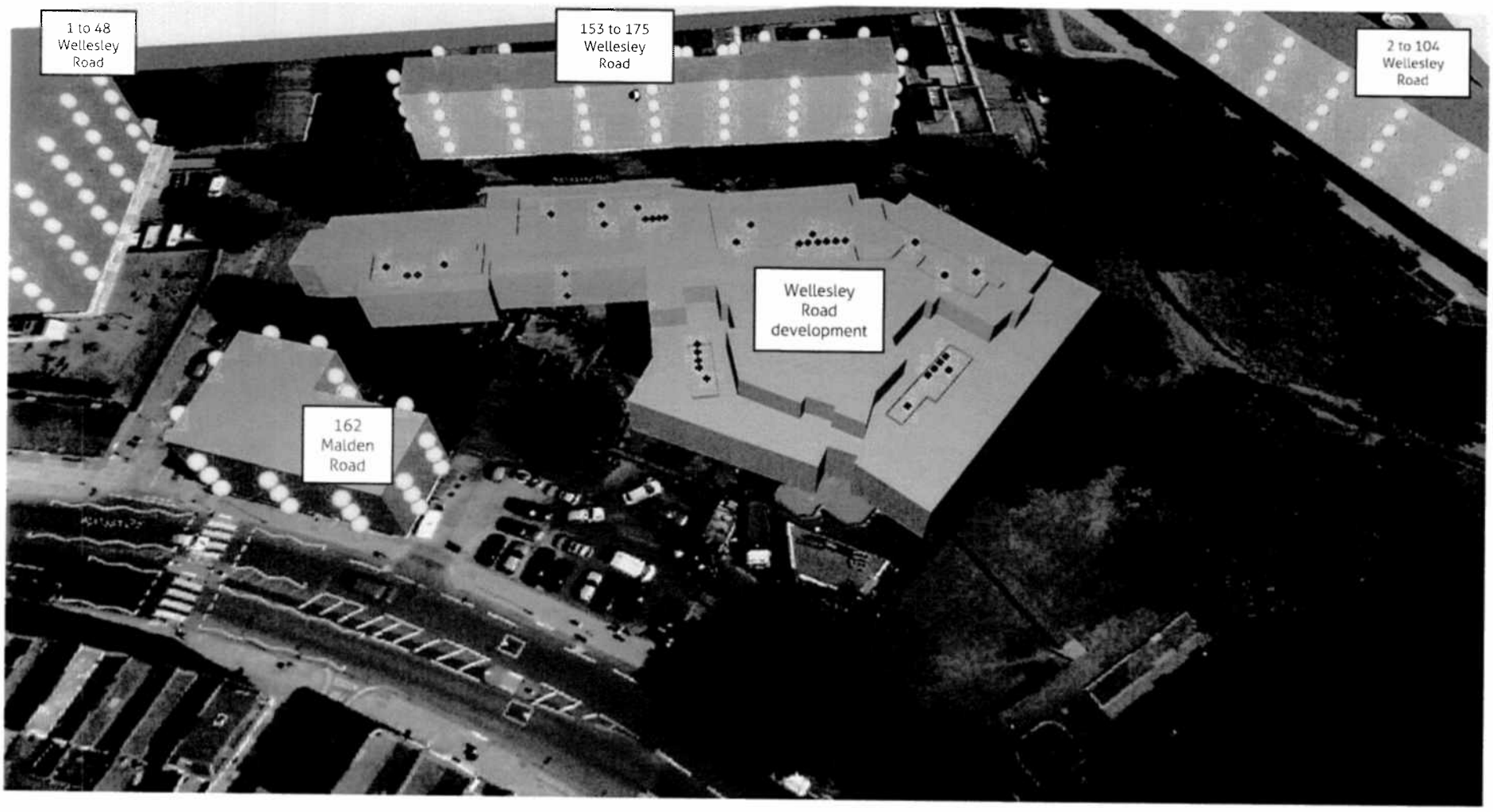

Figure A3 – L_{Aeq} and L_{A90} Time History (Location 1)

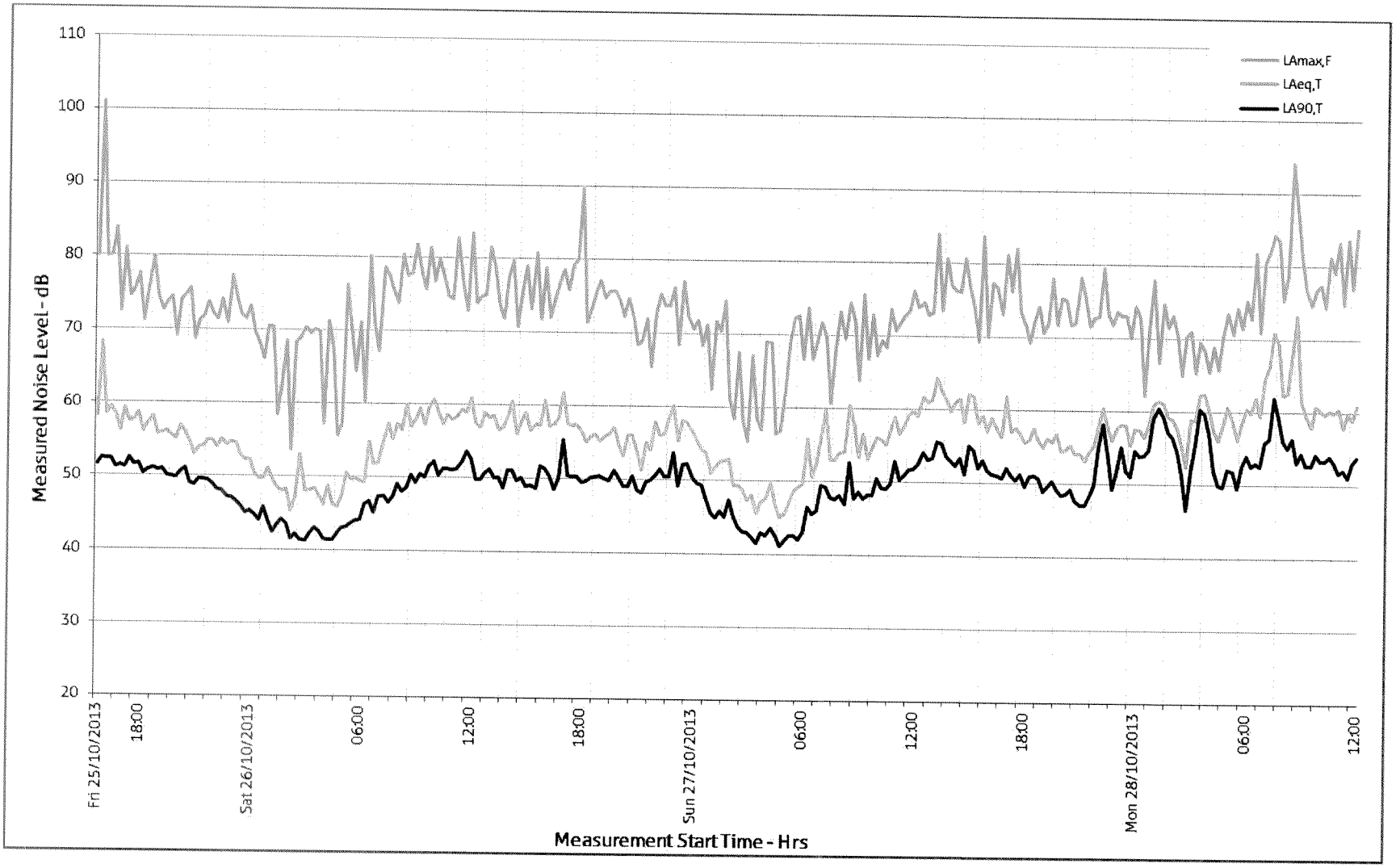

Figure A4 – L_{Aeq} and L_{A90} Time History (Location 2)