WEST HAMPSTEAD POLICE STATION

Plant Noise Assessment

Reference: 9277.RP01.PNA.1
Prepared: 18 March 2019
Revision Number: 1

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	8 March 2019	Daniel Flood	Robert Barlow
1	Reassessment for new plant	18 March 2019	Daniel Flood	Robert Barlow

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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1.0 INTRODUCTION

As part of general refurbishment works at West Hampstead Police Station, it is understood that new items of plant are proposed to be installed. A number of heat recovery and supply extract fans are being installed internally, which are ducted to the atmosphere.

As part of the planning application, the London Borough of Camden requires consideration to be given to atmospheric noise emissions from the proposed equipment at the nearest sensitive property.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with the London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 General

Monitoring of the prevailing background noise was undertaken over the following period:

11:45 hours Tuesday 5 March to 11:45 hours Wednesday 6 March 2019.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However, based on observations during the site visits, and weather reports for the area, it was considered suitable for obtaining representative noise measurements, it being mostly dry with little wind.

2.2 Measurement Location

Measurements were undertaken on the roof of the police station, on the rear elevation. The microphone was attached to existing railings, at a height of approximately 1.5m. The prevailing noise climate was noted to be determined by road traffic noise from the surrounding road network.

The measurement positions are also illustrated on the site plan in Figure 1 in Appendix D.

2.3 Instrumentation

Details of the instrumentation used to undertake the survey are provided in Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.0 RESULTS

The noise levels at the measurement position are shown as time-histories on the attached Graphs 1 to 2.

In order to ensure a worst case assessment the lowest background L_{A90} noise levels measured have been used in our analyses. The lowest L_{A90} and the period averaged L_{Aeq} dB noise levels measured are summarised below.

Table 1 – Measured Levels

Measurement Period	Sound Pressure Levels	
	L_{90} (dBA)	L_{eq} (dBA)
Daytime (07:00 – 19:00)	50	63
Evening (19:00 – 23:00)	48	54
Night-time (23:00 – 07:00)	44	53

4.0 CRITERIA

The requirements of Camden Council's Development Policies 2010-2025, Local Development Framework regarding noise levels from new plant and machinery are confirmed as follows.

Table 2 – Camden Council Noise Thresholds

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 façade	Day, evening and night	0000-2400	10dB(A) <L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90} >60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

In line with BS 4142: 2014 and as illustrated within Table 2, should the proposed plant be identified as having intermittent or tonal characteristics, an additional 5dB should be subtracted from any of the above proposed noise emission limits.

In addition to the above, Camden require consideration to be taken with regards to the Observable Adverse Effect Level of noise sources within the borough. After communicating with an Environmental Health Officer for Camden council, the criteria states the following:

> *"BS 4142 states that if the rating level does not exceed the background noise level, then this is an indication of the specific sound source having a low impact, and a difference of +10 dB is likely to be an indication of a significant adverse impact. The advice regarding these impacts is dependent on the context and to account for this when determining the example values for LOAEL and SOAEL it will be assumed that the character of the residual background noise is different to the character of the specific noise from the proposed development, as such 10dB or below background should be achieved, (with 15 dB being achieved if the noise has a tonal element).*

These levels have been determined appropriate in the Camden context, to guard against future complaints once the development is in used, and, to protect against 'background noise creep', as required by Camden's Noise Strategy. If it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required."

Analysis of the proposed supply/extract fans indicates that no tonal elements are present. We therefore propose that a criteria of 5 dB below the minimum background L_{A90} should be applied, as measured at 1m from the nearest noise sensitive receptor. Target criteria are given below:

- Daytime 45 dB
- Evening 43 dB
- Night-time 39 dB

5.0 ASSESSMENT

Our assessment has been based upon the following information:

5.1 Proposed Plant Items

Table 3 – Plant Information

Ref.	Manufacturer/Model/Duty	Plant Type
HRU01	Vent Axia HR500	Heat recovery ventilation unit
HRU02	Vent Axia HR500	Heat recovery ventilation unit
HRU03	Vent Axia HR500	Heat recovery ventilation unit
SF1	Nuaire DS2HA-NES	Toilet supply fan
TF1	Nuaire AVT3	Toilet extract fan
TF2	Nuaire AVT1	Toilet extract fan

5.2 Position of Units

It is understood that the proposed plant is due to be located at various points along the outer façade at second floor level. The equipment positions are indicated on the site plan in Figure 1 in Appendix D.

5.3 Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the units. The associated plant noise levels are detailed as follows:

Table 4 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
HRU01, 02 & 03	Lp at 3m	-	-	-	-	-	-	-	-	53
SF1	Lw	76	73	64	71	59	60	58	59	-
TF1	Lw	81	77	78	74	69	68	58	58	-
TF2	Lw	75	71	63	63	63	59	53	51	-

5.4 Location of Nearest Residential Windows

The closest residential windows to the plant were observed as being to the front and rear of site, belonging to the properties of 46-48 Fortune Green road, 60 Fortune Green Road and 28-31 Hillfield Road.

5.5 Mitigation

We recommend that TF1, one of the toilet extracts, allows for in-duct silencers. The silencers should be capable of achieving the performance levels detailed in the specification below.

Unit	Indicative length (mm) and free area (%)	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
TF1 Extract	600mm, 40%	3	5	9	13	15	16	11	9

5.6 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the proposed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SPL / SWL
- Duct Loss
- End reflection
- In-duct Silencers / Attenuators
- 20LogR Distance Attenuation
- Directivity

An example calculation sheet is attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 5 – Predicted Noise Levels

Operating Period	46-48 Fortune Road		60 Fortune Road		28 – 31 Hillfield Road	
	Prediction (dBA)	Criterion (dBA)	Prediction (dBA)	Criterion (dBA)	Prediction (dBA)	Criterion (dBA)
Daytime (07:00 – 19:00)	39	45	36	45	34	45
Evening (19:00 - 23:00)	39	43	36	43	34	43
Night-time (23:00 – 07:00)	39	39	36	39	34	39

6.0 VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that HRU units and supply/extract fans be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7.0 CONCLUSION

Measurements of the existing background noise levels at West Hampstead Police Station have been undertaken. The results of the measurements have been used in order to determine the required criteria for atmospheric noise emissions from the future plant installations.

The results of the assessment indicate atmospheric noise emissions from the plant are within the criteria required by the London Borough of Camden, providing that the recommended mitigation options are employed. As such, the proposed plant installation should be considered acceptable.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B - Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1403127	30803	30 January 2021
Norsonic Pre Amplifier	1209A	12071	30816	31 January 2021
Norsonic ½“ Microphone	1225	41473		
Norsonic Sound Calibrator	1251	31986	30801	30 January 2021

Appendix C – Plant calculations

An example calculation of the assessment to 46-48 Fortune Green Road is presented below.

Detail	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
SF1 – Toilet Supply. Lw	76	73	64	71	59	60	58	59	
Duct Loss	-2	-2	-2	-1	-1	-1	-1	-1	
End Reflection	-10	-6	-2	-1	0	0	0	0	
Directivity	-1	0	0	-1	-5	-8	-7	-7	
Hemispherical Radiation	-8	-8	-8	-8	-8	-8	-8	-8	
Distance loss (28m)	-29	-29	-29	-29	-29	-29	-29	-29	
Result	27	27	23	31	17	15	13	14	29
HRU01 – Lp at 3m									53
Lp at 1m									62
Distance loss (24m)									-28
Result									35
HRU01 – Lp at 3m									53
Lp at 1m									62
Distance loss (24m)									-28
Result									35
Total at Receiver									39

Appendix D – Graphs and Site Plans

West Hampstead Police Station

L_{Aeq} Time History 05 - 06 March 2019

Roof

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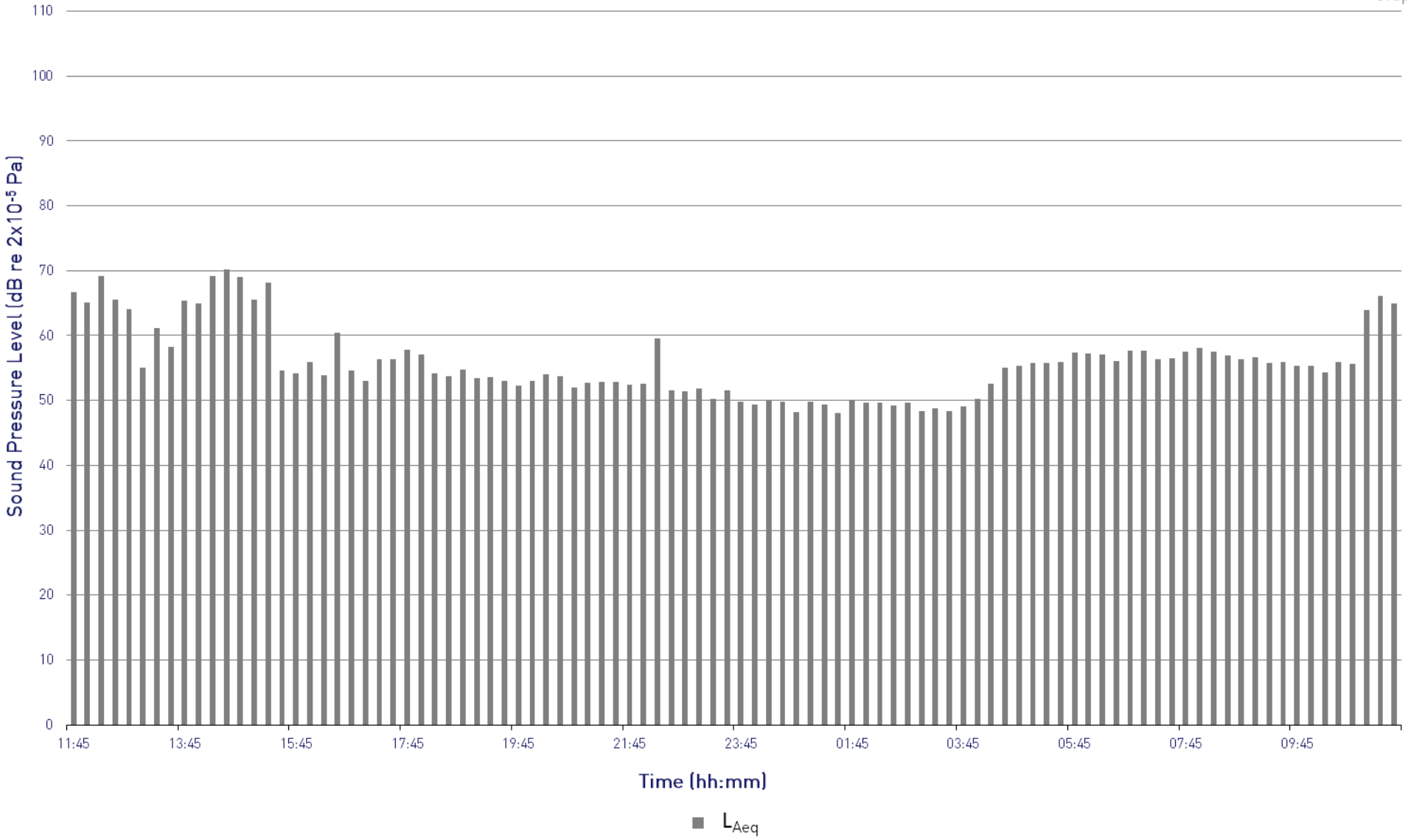
Graph 1



West Hampstead Police Station

$L_{Amax,f}$ and L_{A90} Time History 05 - 06 March 2019

Roof

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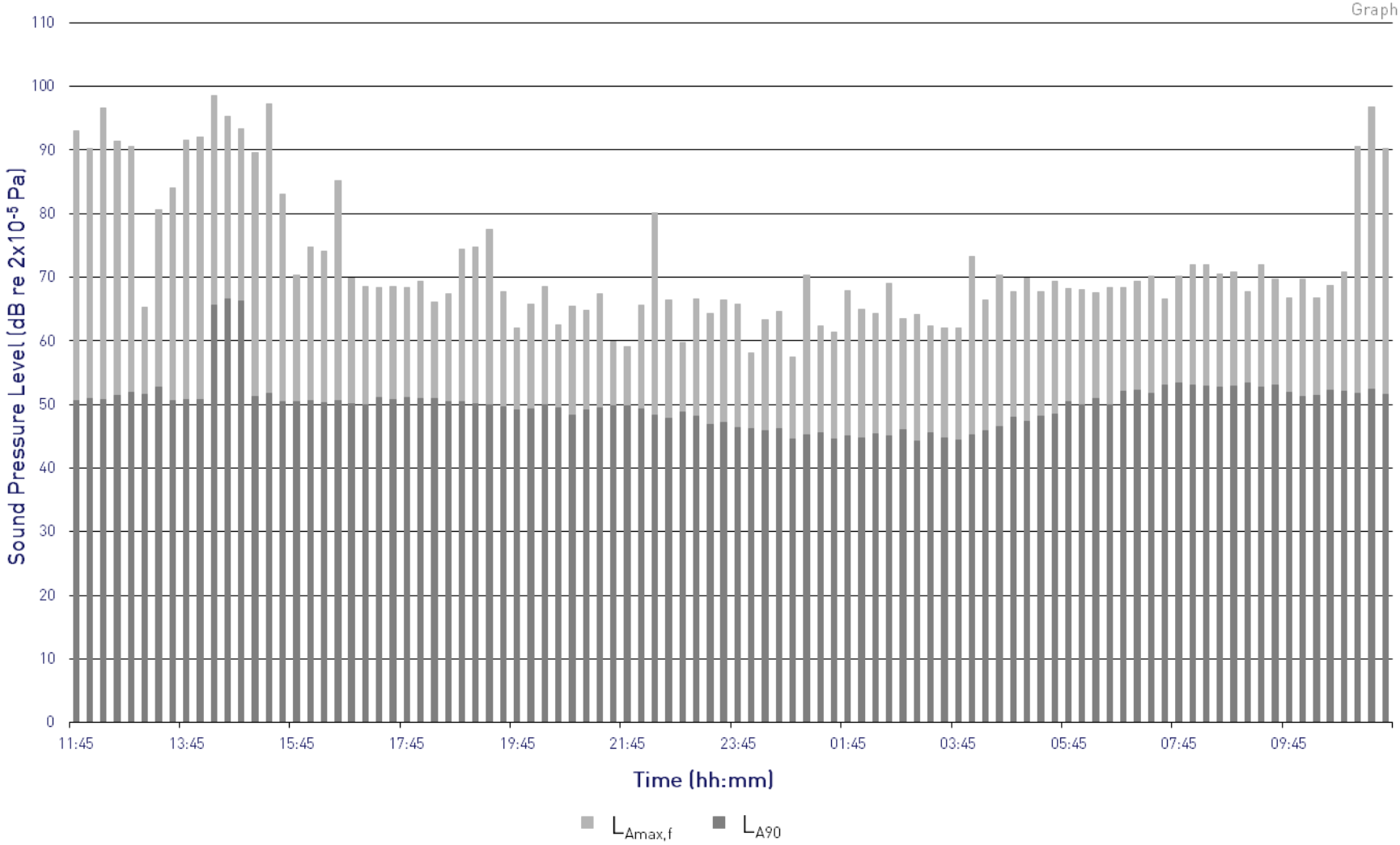
Graph 2



West Hampstead Police Station
Site Location Plan
Project 9277

Figure 1
18 March 2019
Not to Scale

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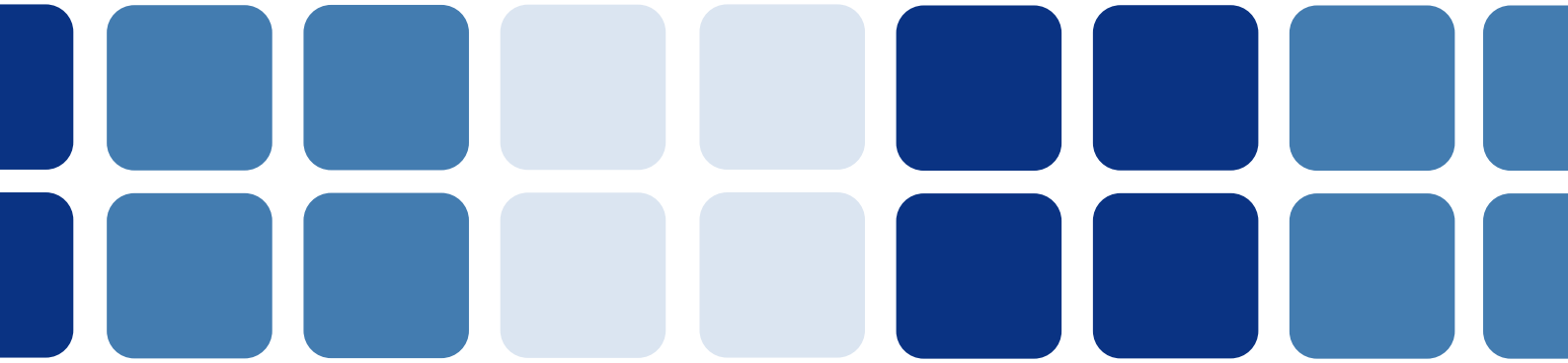

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