Shropshire House

Environmental Noise Survey and Plant Noise Assessment Report

24376/PNA1 Rev2

21 September 2017

For:
HCA International
c/o Rolfe Judd
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Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	09/06/2017	-	Fauwaz Baig Consultant BEng(Hons)	Gareth Evans Associate BSc(Hons), MIOA
1	20/06/2017	Revision under Section 3.2	Fauwaz Baig Consultant BEng(Hons)	Gareth Evans Associate BSc(Hons), MIOA
2	21/09/2017	Revised to include assessment of specific plant items	[redacted]	
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Appendix A – Acoustic Terminology

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1.0 Introduction

External alterations to the rear elevations and roof of Shropshire House, 2-10 Capper Street are proposed. The proposal comprises new services and minor reconfiguration of an access door within glazed frame.

The works are to serve an existing pathology laboratory which is currently operational at the Ground and Lower Ground floor of the building.

The changes to external services and access door are resultant of a proposed reconfiguration of the existing laboratory space, and expansion of laboratory footprint into a former administration area at Ground Floor level. These internal reconfigurations have led to the need for alteration to some of the existing ventilation services, as well as provision of additional rooftop plant such as an Air Handling Unit to serve the proposed additional laboratory space at Ground Floor.

2.0 Objectives

To establish the existing noise levels by means of fully automated noise monitoring over a period of approximately 24 hours.

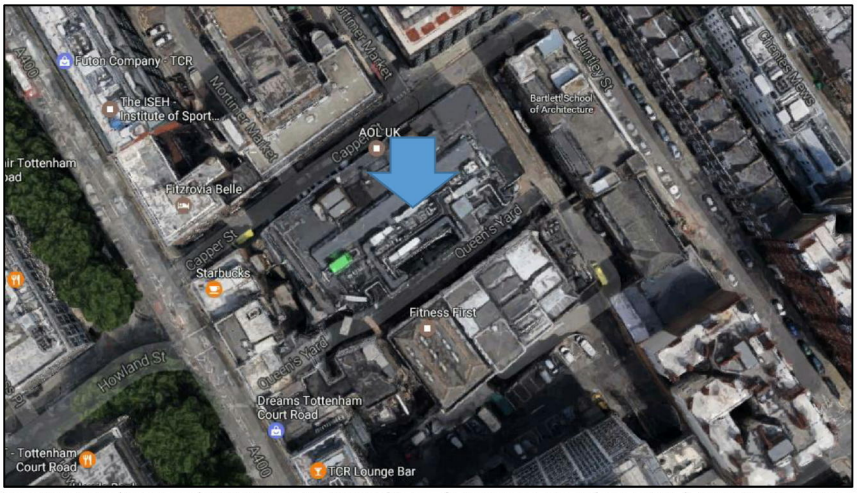
To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To advise on noise control measures if required with reference to the requirements of the Local Authority.

3.0 Site Description

3.1 Location

The site is located at 2-10 Capper Street, London WC1E 6JA.The location is shown in the Location Map below.



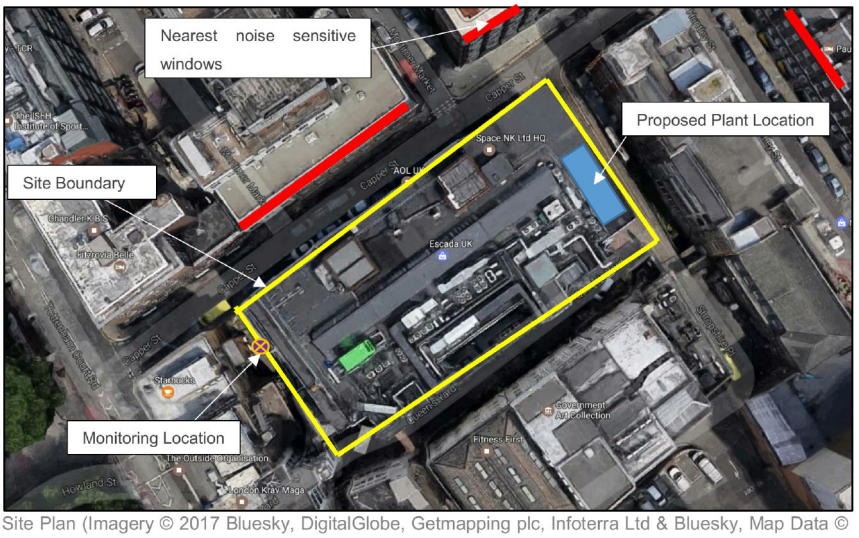
Location Map (Imagery © 2017 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map Data © 2017 Google.)

3.2 Description

The site is bounded by Capper Street to the north, Queen's Yard to the south, Shropshire Place to the east and a mixture of commercial and residential properties to the west.

The existing building is seven storeys from lower ground floor to roof, with additional stairwell projections and plant at roof level. The building is multi-tenanted and served by two communal entrances at Capper Street.

We understand the nearest noise sensitive windows are those of the UCH MacMillan Cancer Centre to the north, approximately 25m from the proposed plant location. See Site Plan below.



Site Plan (Imagery © 2017 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map Data © 2017 Google.)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Survey Methodology

The survey was undertaken by Ryan Fernandez, Technical Assistant, AMIOA.

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 14:30 hours on 31 May 2017 to 14:30 hours on 1 June 2017.

During the periods we were on site the wind conditions were calm and the sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.2 Measurement Position

The microphone was attached to a pole approximately 5 metres above ground level at the first floor mezzanine roof at the rear of Shropshire House. The microphone was at least 2m away from any reflecting surfaces.

5.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3829	13/7/2016
Preamp		PRM902	4812	
Microphone		377B02	135744	
Type 1 Calibrator	Larson Davis	CAL200	3082	9/6/2016

The sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred.

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

The microphone was fitted with a windshield.

6.0 Results

The results have been plotted on Time History Graph 24376/TH1 enclosed, presenting the 15 minute A-weighted (dBA) L_{90} and L_{eq} noise levels at each measurement position throughout the duration of the survey.

The lowest $L_{A90\ (15\ min)}$ measurements recorded during the survey are presented in the table below:

Position	Lowest Measured $L_{A90(15min)}$ Background Noise Level (dB re 2 x 10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	55 dBA	54 dBA	54 dBA

7.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise source was noted to be from road traffic on surrounding roads and building services.

8.0 Plant Noise Emission Criteria

The site falls within the London Borough of Camden. We understand the London Borough of Camden's advice relating to noise emissions from air conditioning plant is as follows:

"Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment are in operation. Where it is anticipated that any plant/equipment will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps) special attention should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dB(A) below the L_{A90}, expressed in dB(A)".

In order to meet the above advice, noise emissions from the proposed plant should not exceed a level of 5dB below the lowest measured $L_{A90(15min)}$. Therefore, based on the results of the noise survey and the advice above, we recommend the following plant noise emission levels to be achieved with all plant running simultaneously at 1m external to the nearest noise sensitive façade.

On the basis of the above and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window.

Plant Noise Emission Criteria (dB re 2x10-5 Pa)	
Daytime (07:00 – 23:00 hours)	**Night-time (23:00 – 07:00 hours)**
50 dBA	49 dBA

The above criteria are to be achieved with all plant operating simultaneously.

If plant contains tonal or impulsive characteristics the external design criteria should be reduced by 5dBA.

It should be noted that the above are subject to the final approval of the Local Authority.

9.0 Plant Noise Impact Assessment

We understand the proposed plant comprises the following:

Plant Description	Location	Qty	Plant Make	Model Number
External Condenser Units	South east corner of roof	2	Daikin	ERQ250AW1
AHU serving ground floor	South east corner of roof	1	Daikin	ADN08FED2
AHU serving CAT 3 Lab	South east corner of roof	1	Daikin	ADN02ECD2

9.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

Plant Description	L_w/ L_p	Sound Pressure Level L_p (dB re $2x10^{-5}$ Pa) at 1 metre or Sound Power Level L_w (dB re $2x10^{-12}$ W) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
External Condenser	L_p at 1m	61	63	62	56	52	46	38	31	58
Ground Floor AHU Inlet	L_w	78	84	83	84	87	85	82	80	91
Ground Floor AHU Discharge	L_w	75	74	83	87	88	85	80	77	92
CAT3 Lab AHU Inlet	L_w	75	73	75	76	77	78	75	69	83
CAT3 Lab AHU Discharge	L_w	73	72	71	74	75	76	72	67	81

9.2 Location of Plant

Based on Sonnemanntoon architects drawing 1370 (22) 007 rev A2 we understand all proposed plant items are to be located towards the south east corner of the roof. We understand the nearest noise sensitive windows to this location are those of the UCH MacMillan Cancer Centre approximately 25m to the north, which have line of sight view to the plant. We understand that the grilles of the ground floor AHU are pointed away from these windows but that those of the Cat 3 Lab AHU are pointed directly towards them.

9.3 Mitigation Measures

In order to control plant noise emissions in line with the proposed criterion, we recommend that acoustic attenuators complying with the following insertion losses are installed on both the inlet and discharge sides of both AHUs i.e. between the fans and the atmospheric grilles. We recommend the pressure drop of each attenuator is limited to 50Pa.

Insertion Losses (dB) at Octave Band Centre Frequency (Hz)							
63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
2	4	9	15	17	14	10	8

9.4 Plant Noise Impact Assessment

We understand that the proposed units could be operational at any time.

The following tables summarise our predictions of atmospheric noise emissions from the proposed units to the nearest noise sensitive window. The first table details noise emissions from the external condensers and the following tables detail the noise emissions from various grilles.

Description	**Sound Pressure Level L_p (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)**								**dBA**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
ERQ250AW1 Condenser	61	63	62	56	52	46	38	31	58
2No. Correction	3	3	3	3	3	3	3	3	
Radiating correction	3	3	3	3	3	3	3	3	
Conformal area distance loss (25m)	-26	-26	-26	-26	-26	-26	-26	-26	
Façade reflection	3	3	3	3	3	3	3	3	
Calculated noise level at window	44	46	45	39	35	29	21	14	41

Description	Sound Power Level L_w (dB re $2x10^{-12}$ W) or Sound Pressure Level L_p (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Ground Floor AHU Inlet Lw	78	84	83	84	87	85	82	80	91
Attenuator	-2	-4	-9	-15	-17	-14	-10	-8	
End reflection loss	-3	0	0	0	0	0	0	0	
Directivity	0	0	-4	-7	-7	-7	-7	-7	
Radiating correction	3	3	3	3	3	3	3	3	
Lw to Lp at 25m	-39	-39	-39	-39	-39	-39	-39	-39	
Façade reflection	3	3	3	3	3	3	3	3	
Calculated noise level at window	37	44	34	26	27	28	29	29	36

Description	Sound Power Level L_w (dB re $2x10^{-12}$ W) or Sound Pressure Level L_p (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Ground Floor AHU Discharge Lw	75	74	83	87	88	85	80	77	92
Attenuator	-2	-4	-9	-15	-17	-14	-10	-8	
End reflection loss	-3	0	0	0	0	0	0	0	
Directivity	0	0	-4	-7	-7	-7	-7	-7	
Radiating correction	3	3	3	3	3	3	3	3	
Lw to Lp at 25m	-39	-39	-39	-39	-39	-39	-39	-39	
Façade reflection	3	3	3	3	3	3	3	3	
Calculated noise level at window	34	34	34	29	28	28	27	26	35

Description	Sound Power Level L_w (dB re $2x10^{-12}$ W) or Sound Pressure Level L_p (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
CAT3 Lab AHU Inlet Lw	75	73	75	76	77	78	75	69	83
Attenuator	-2	-4	-9	-15	-17	-14	-10	-8	
End reflection loss	-6	-3	0	0	0	0	0	0	
Directivity	1	2	3	4	5	6	6	6	
Radiating correction	3	3	3	3	3	3	3	3	
Lw to Lp at 25m	-39	-39	-39	-39	-39	-39	-39	-39	
Façade reflection	3	3	3	3	3	3	3	3	
Calculated noise level at window	32	32	33	29	29	34	35	31	40

Description	Sound Power Level L_w (dB re $2x10^{-12}$ W) or Sound Pressure Level L_p (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
CAT3 Lab AHU Discharge Lw	73	72	71	74	75	76	72	67	81
Attenuator	-2	-4	-9	-15	-17	-14	-10	-8	
End reflection loss	-6	-3	0	0	0	0	0	0	
Directivity	1	2	3	4	5	6	6	6	
Radiating correction	3	3	3	3	3	3	3	3	
Lw to Lp at 25m	-39	-39	-39	-39	-39	-39	-39	-39	
Façade reflection	3	3	3	3	3	3	3	3	
Calculated noise level at window	30	31	29	27	27	32	32	29	38

The following table shows the cumulative effects of atmospheric noise emissions calculated above from the site to the nearest noise sensitive window.

Description	Cumulative Sound Pressure Level Lp at 1m from nearest noise sensitive window (dB re $2*10^{-5}$PA) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Condensers	44	46	45	39	35	29	21	14	41
Ground Floor AHU Inlet Lw	37	44	34	26	27	28	29	29	36
Ground Floor AHU Discharge Lw	34	34	34	29	28	28	27	26	35
CAT3 Lab AHU Inlet Lw	32	32	33	29	29	34	35	31	40
CAT3 Lab AHU Discharge Lw	30	31	29	27	27	32	32	29	38
Calculated cumulative noise level at window	30	48	46	40	37	38	38	35	**46**

Our calculations indicate that including the proposed mitigation measures presented in Section 9.3 the proposed plant should be capable of achieving the requirements of the Local Authority outlined in Section 8.0.

In addition, an assessment was also carried out to the top floor windows of Shropshire House, directly below the plant. Including the proposed mitigation measures our calculations indicate that the proposed plant should also be capable of achieving the criteria at these windows.

10.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate.

Environmental plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the requirements of the Local Authority and BS 4142 so as to avoid causing statutory noise nuisance.

Our calculations indicate that including the proposed mitigation measures presented in Section 9.3 the proposed plant should be capable of achieving the requirements of the Local Authority outlined in Section 8.0.

In addition, an assessment was also carried out to the top floor windows of Shropshire House, directly below the plant. Including the proposed mitigation measures our calculations indicate that the proposed plant should also be capable of achieving the criteria at these windows.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

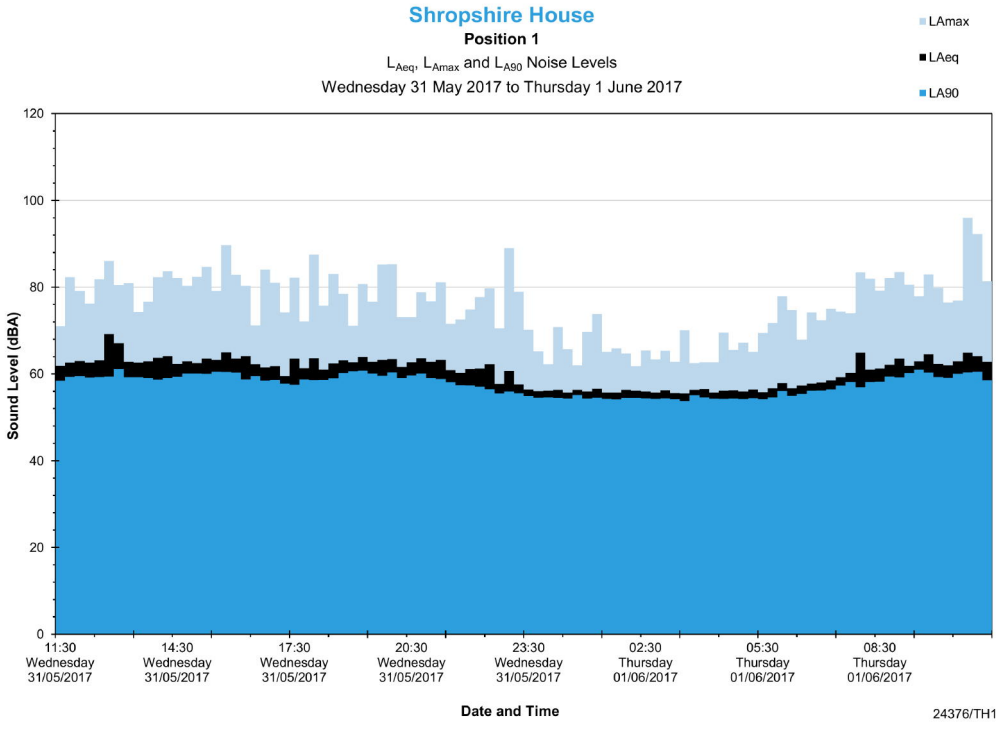
$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).


Shropshire House
Position 1
L_{Aeq}, L_{Amax} and L_{A90} Noise Levels
Wednesday 31 May 2017 to Thursday 1 June 2017
LAmax
LAeq
LA90
120
100
80
60
40
20
0
Sound Level (dBA)
11:30 Wednesday 31/05/2017
14:30 Wednesday 31/05/2017
17:30 Wednesday 31/05/2017
20:30 Wednesday 31/05/2017
23:30 Wednesday 31/05/2017
02:30 Thursday 01/06/2017
05:30 Thursday 01/06/2017
08:30 Thursday 01/06/2017
Date and Time
24376/TH1