

Great Ormond Street Hospital, iMRI Plant Noise

Plant Noise Assessment Report

Report 17/0132/R1-1

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Great Ormond Street Hospital

Great Ormond Street
London
WC1N 3JH

Revision	Description	Date	Prepared	Approved
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Plant Noise Assessment Report

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Attachments

Glossary of Acoustic Terms

17/0132/F1

Site plan illustrating the measurement and assessment positions on site

17/0132/TH1-TH2

Time history at position MP1 and MP2 over the measurement period

17/0132/PNS1

Plant noise schedule

17/0132/RS1-RS4

Results sheets

 End of Section



Plant Noise Assessment Report

1 Introduction

- 1.1 This Noise Assessment Report accompanies a full planning application dated June 2017. The Planning Application is submitted on behalf of Great Ormond Street Hospital for Children – NHS Foundation Trust, known as GOSH and is referred to as the Trust, hereafter. Redevelopment is part of the Trust's on-going commitment to updating the Hospital's existing facilities and deliver an improved model of care into the 21st Century.
- 1.2 Cole Jarman have been instructed to undertake a noise survey at the site to quantify the existing background noise levels representative of those at the nearest noise sensitive receivers and an assessment of the noise levels at these receivers due to the proposed plant items.
- 1.3 This report details the methodology and results of the survey and the subsequent evaluations of noise emissions from the proposed plant package to the nearest noise sensitive areas.
- 1.4 This Assessment should be read in conjunction with all other documents submitted in support of the planning application, which include the Design and Access Statement, Planning Statement, Drawing Package, Draft Construction Management Plan, Sunlight and Daylight Assessment, Sustainability Statement, Ground Conditions Report and Desk Based Archaeological Assessment.

2 Site Description

- 2.1 Great Ormond Street Hospital, Great Ormond Street, WC1N 3JH is a children's hospital located in the Bloomsbury area of London. The site is made up by a campus of hospital buildings which will surround the position of the proposed Southwood Courtyard Building.
- 2.2 The proposed plant position is surrounded by hospital buildings. To the north, east and west is the Southwood Building. To the south is the Chapel and the Variety Club Building.
- 2.3 Further north is Guilford Street (B502) and Coram's Field. Further east of the site is Lamb's Conduit Street and to the south Great Ormond Street. To the west are further medical buildings and Queen Square and to the south is Great Ormond Street and the nearest residential units.

3 Background Noise Survey

3.1 Methodology

- 3.1.1 An unattended noise survey was undertaken at the site commencing at 13h00 on Friday 10th March and continuing until 13h00 on Tuesday 14th March 2017.



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- 3.1.2 Measurements of background noise levels were taken at the Southwood Building, 1m from the balcony. Measurements at the frontage were taken at 1m from the façade overlooking Great Ormond Street. This has been illustrated in attached site plan 17/0132/F1.
- 3.1.3 This position was selected to quantify background noise levels representative of those at the nearest hospital and residential noise sensitive receptors to the proposed mechanical services plant.
- 3.1.4 Measurements of the L_{Aeq} , L_{Amax} and L_{A90} indices were recorded over consecutive 15 minute periods for the duration of the survey using the equipment listed within table T1 below (see attached Glossary of Acoustic Terms for an explanation of the noise units used).

Item	Manufacturer	Type
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74
Weatherproof windshield	Rion	WS-15
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74
Weatherproof windshield	Rion	WS-15

T1 Equipment used during unattended noise survey.

- 3.1.5 The microphones were fitted with a weatherproof windshield, and the sound level meter was calibrated before and after the survey in order to confirm an acceptable level of accuracy. No significant drift was noted to have occurred.
- 3.1.6 The weather conditions when setting up and collecting the noise monitoring equipment were bright, cool, calm and dry. It is understood that there was a patch of rain on the 12th March. This is not thought to have affected the results of the noise survey.

3.2 Results

- 3.2.1 The results of the noise measurements are presented in attached time history figure 17/0132/TH1-TH2.
- 3.2.2 The noise climate in the courtyard was dominated by existing plant noise. To the Frontage Building the noise climate was dominated by existing plant and road traffic noise from Great Ormond Street.
- 3.2.3 The representative background noise levels recorded during the proposed operating and closed hours of the unit are set out in table T2 below:



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Location	Representative Background Noise Level, dB(A)	
	Operating Hours (1000-2200 only)	Night time (24-hour)
Courtyard Adjacencies	56	56
Nearest Residences	54	47

T2 Representative background noise levels, L_{A90} .

4 Plant Noise Limits

4.1 BS4142:2014

4.1.1 Section 1.1 of BS4142:2014 this standard states the following:

This British Standard described methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- a) sound from industrial and manufacturing processes;*
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment*
- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and*
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.*

4.1.2 The methodology in the standard compares the measured or calculated rating level of the noise from the source and compares it to the representative existing measured L_{A90} background noise level for the period concerned.

4.1.3 The higher the excess of rating level over background noise level, the greater the likelihood of complaint. BS4142:2014 gives the following guidance:

4.1.4 Typically, the greater this difference, the greater the magnitude of the impact.

4.1.5 A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.



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- 4.1.6 A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4.2 Camden Requirements

- 4.2.1 Typically, Camden Council advise that plant should be designed to restrict noise emissions at the nearest residential receptors to a level no greater than 10 dB below the representative background noise level recorded during the day, evening and night time periods.
- 4.2.2 The plant noise limits that shall apply at this site are therefore as follows:

Location	Noise Emission Limit, dB(A)	
	Operating Hours (1000-2200 only)	Night time (24-hour)
Courtyard Adjacencies	46	46
Nearest Residences	44	37

T3 Plant noise emission limits at the nearest noise sensitive receivers.

5 Plant Noise Assessment

5.1 Proposed Installation

- 5.1.1 It is proposed that there be two Air Handling Units and two Chillers installed at this building. Manufacturers data for the AHU's and Chiller can be found in the attached Plant Noise Schedule 17/0132/PNS1.
- 5.1.2 The noise data suggests that tonality is not present in the plant items noise profile and therefore no tonality correction need be applied.

5.2 Methodology

- 5.2.1 The assessment has considered the closest and most exposed noise sensitive receptor associated with the hospital and the nearest noise sensitive residential unit to the proposed plant, labelled on attached site plan 17/0132/F1 and described as follows:



Plant Noise Assessment Report

- AP1 – Nearest ward at the Southwood Building
- AP2 – Residences on Great Ormond Street

5.2.2 The specific noise levels generated by the equipment at the assessment position has been calculated by correcting the plant noise levels for distance and radiation losses and façade reflections where appropriate.

5.3 Mitigation Measures

- 5.3.1 The results of our assessment indicate that mitigation of noise emissions from each plant item will be required in order to meet the discussed noise limits.
- 5.3.2 The Chillers must be installed within full high performance acoustic enclosures meeting the insertion loss shown in table T4 below. One company which produces an enclosure which will achieve the insertion losses in Environ Technologies Ltd¹.
- 5.3.3 It will be necessary to reduce noise emissions from the supply intake and kitchen extract fans. The minimum insertion loss requirement for these silencers can be found in table T4 below.

Mitigation Element	Insertion Loss (dB)							
	Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Chiller Losses	12	13	20	29	36	37	39	39
Extract Silencer	4	7	13	19	23	23	16	13
Supply Silencer	4	8	14	21	27	27	21	16

T4 Required insertion loss from mitigation elements

- 5.3.4 The drawings provided by *The Richard Stevens Partnership Limited* Indicate that the extract and supply fans will be positioned internally, with the supply ducted out of the western façade at high level and the extract ducted out vertically at roof level.
- 5.3.5 The silencer losses required for the extract fans are expected to be achieved with a silencer of 900mm length and 40% free area. For the supply fans this is expected to be achieved by a silencer of 1200mm length and 35% free area. These are indicative examples only, the design requirement for the silencers is the insertion losses set out in Table T4 above.

¹ www.Environ.co.uk



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5.4 Results

- 5.4.1 The rating noise levels calculated taking account of the mitigation measures specified are shown in table T5. The noise rating level calculated at AP2 is based on the minimum loss provided as by an element providing line-of-sight screening only. In actuality the buildings surrounding the plant will provide substantially greater acoustic screening than this, and so the rating noise level stated for AP2 is considered pessimistic. It can be seen that the plant noise limits are assessed to be met at all locations 24 hours a day.

Location	Rating Noise Level, dB(A) <i>(Limit)</i>
	Operating Hours (24-hour)
AP1 – Residence above the unit	46 (46)
AP2 – Flats to the rear	19 (36)

T5 Plant noise emission levels at the nearest noise sensitive properties.

6 Conclusion

- 6.1 It is proposed that there be new mechanical plant services installed at Great Ormond Street Hospital to service the proposed new Southwood Courtyard Building.
- 6.2 Cole Jarman have undertaken a noise survey to quantify existing background noise levels at nearby noise sensitive premises and set limits for plant noise emissions according to the requirements of the local planning authority.
- 6.3 Noise mitigation measures have been recommended on the basis of a subsequent assessment of the proposed units and it has been shown that with the proposed mitigation measures in place the noise levels set out above will be met.

■ End of Section



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Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} & L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly, L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

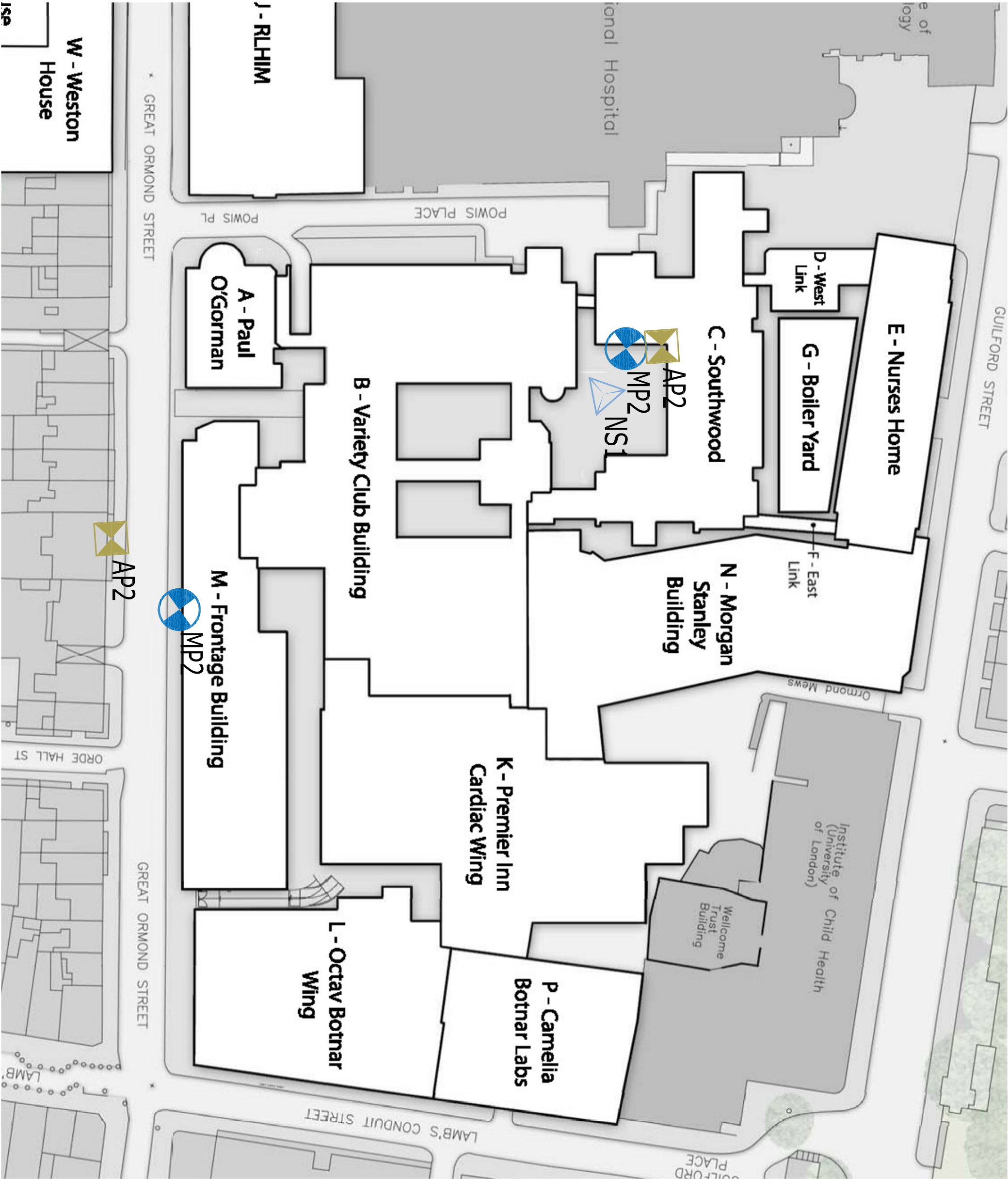
L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

■ End of Section

Figure 17/0132/F1



Title:

Site plan detailing the monitoring positions, assessment positions and the proposed noise source position



Measurement Position



Assessment Position



Noise Source



Project:

GOSH, iMRI Plant Noise

Date:

April 2017

Revision:

-

Scale:

Not to scale



Figure 17/0132/TH01

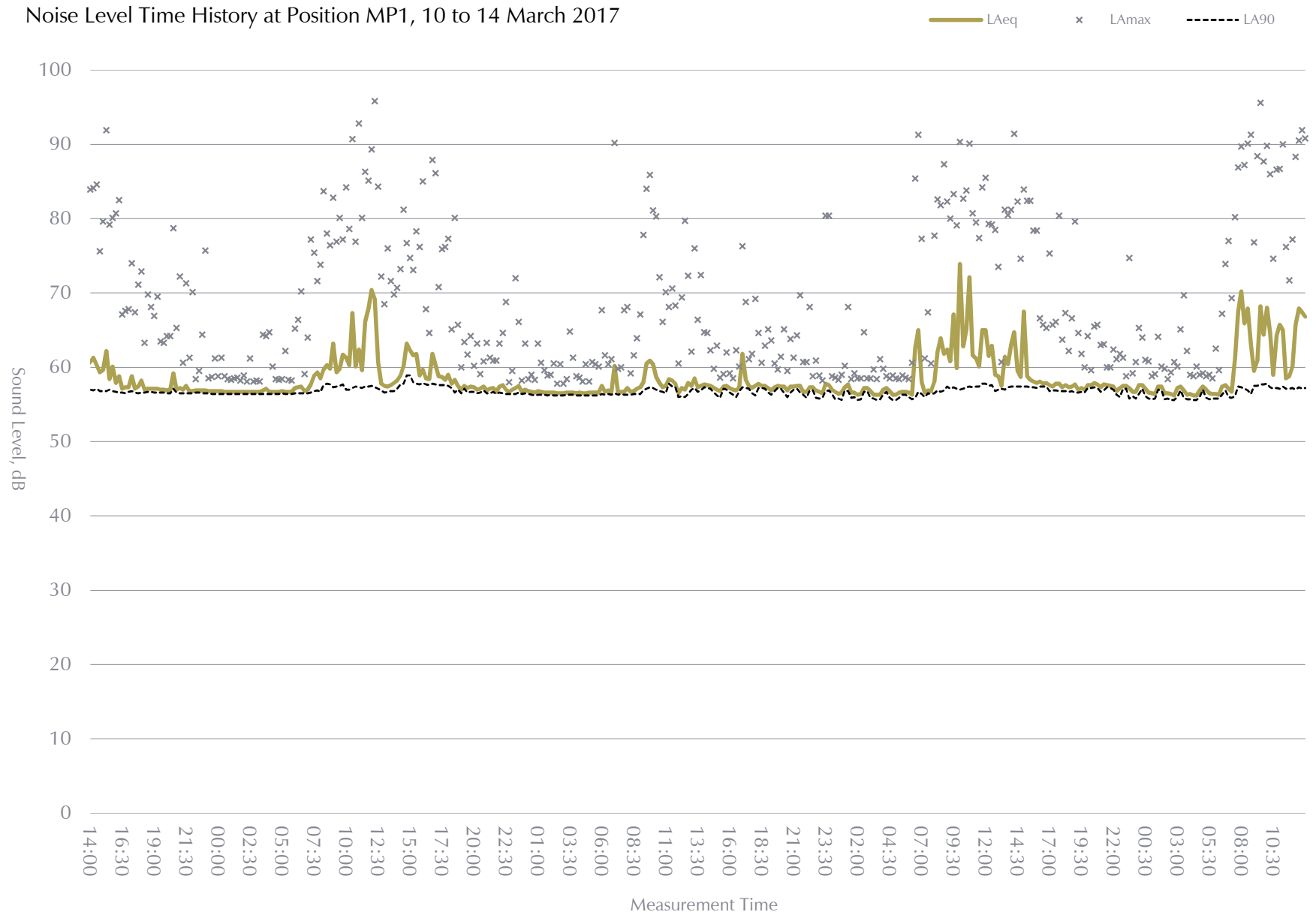
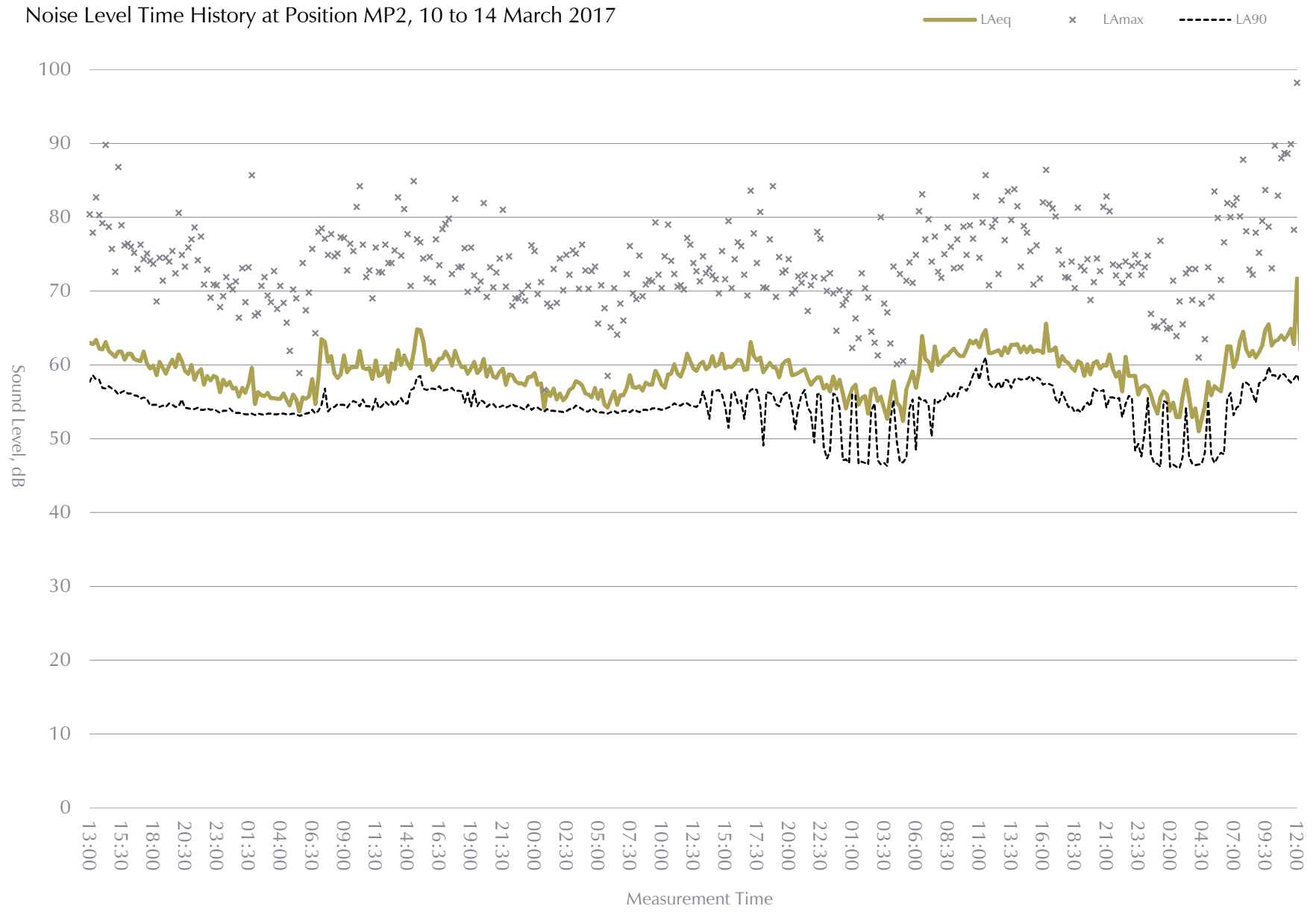




Figure 17/0132/TH02



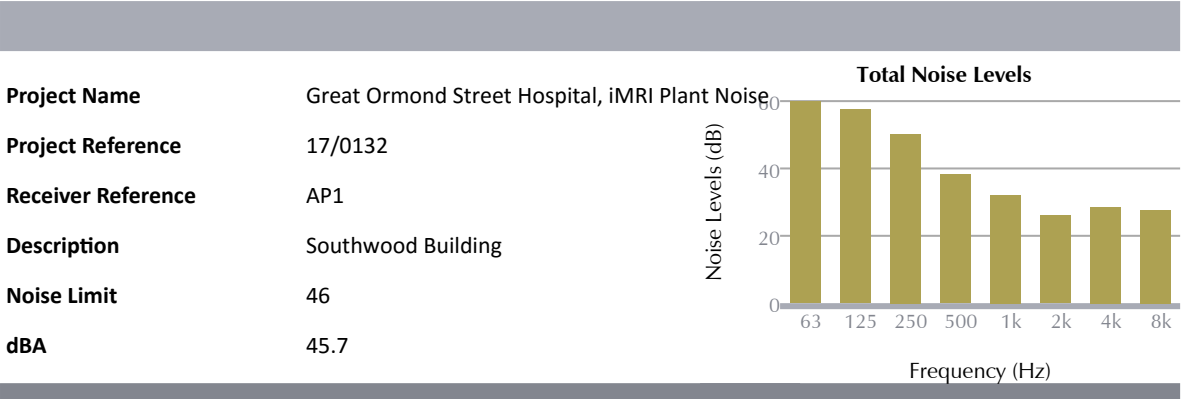


Schedule of Plant and Air Handling Equipment Sound Levels, dB

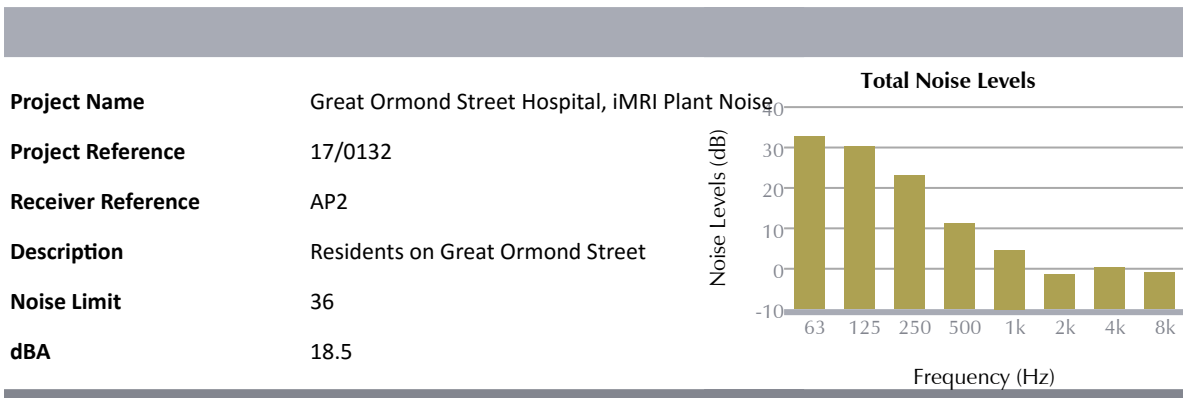
Reference	Description	Volume (m3/s)	Data ¹ Source	Noise Level Type	Noise Levels (dB)							
					63	125	250	500	1k	2k	4k	8k
AHU01 Supply	Supply Inlet AHS16589-01-0	1.7	Man	Sound Power, Lw	72	70	74	71	71	67	64	58
AHU01 Extract	Extract Outlet AHS16589-01-0	1.45	Man	Sound Power, Lw	70	65	75	71	71	66	63	59
AHU02 Extract	Extract Outlet AHS16589-05-0	1.33	Man	Sound Power, Lw	66	61	71	67	67	62	59	55
AHU02 Supply	Supply Inlet AHS16589-05-0	1.7	Man	Sound Power, Lw	79	74	78	72	68	65	59	57
Chiller 1	DCC016DR-04AJJ0		Man	Sound Power, Lw	83.6	82.8	81.3	77.7	77.4	70.1	66.4	55.8
Chiller 2	DCC016DR-04AJJ0		Man	Sound Power, Lw	83.6	82.8	81.3	77.7	77.4	70.1	66.4	55.8

Notes

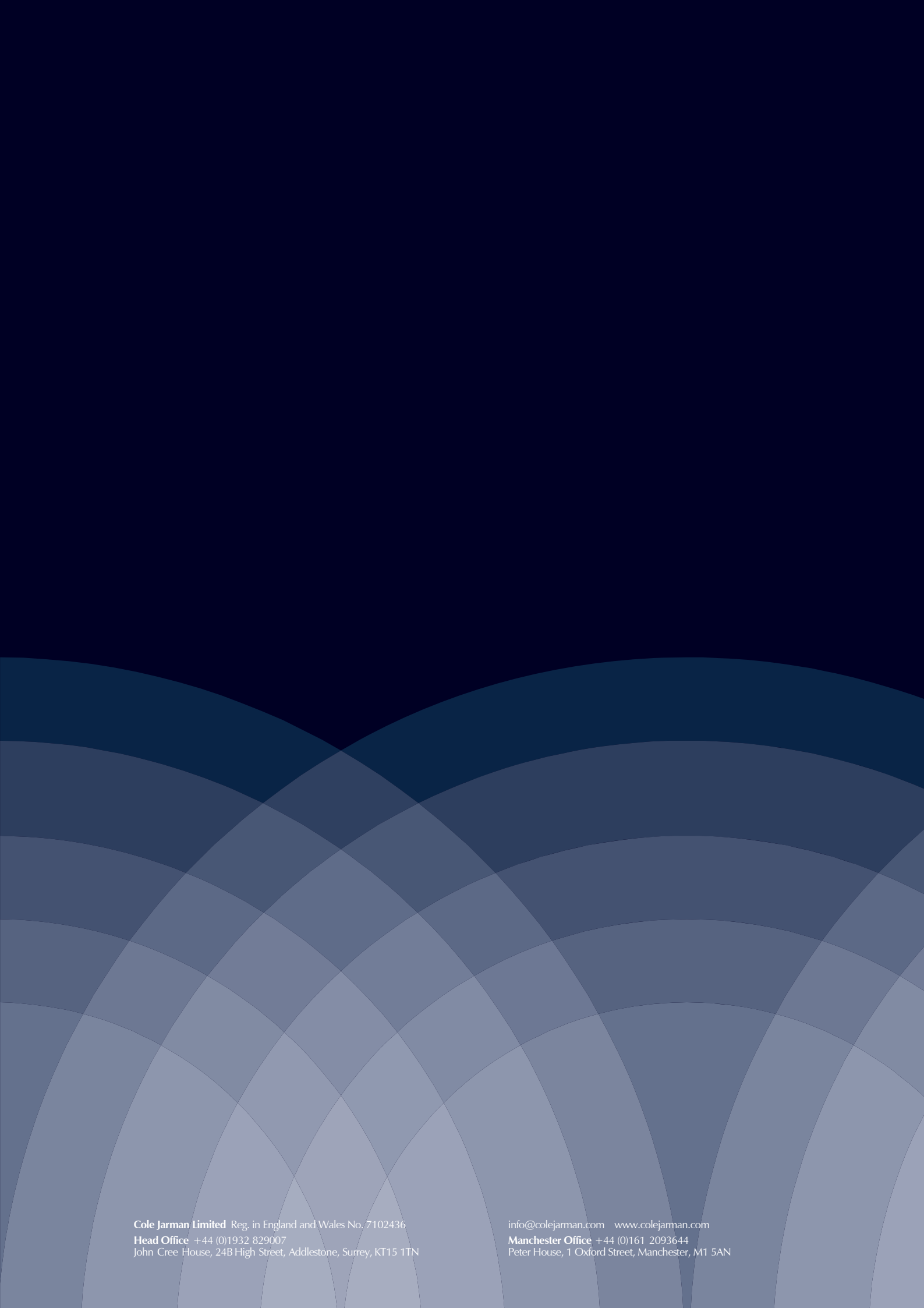
1 - Man refers to data supplied by the equipment manufacturer or supplier, Emp refers to data calculated using empirical formulae, and Meas refers to data measured by Cole Jarman



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
AHU01 Supply	43.8	38.4	35.5	25.7	19.8	15.8	18.8	17.8
AHU02 Extract	39.3	32.9	37	27.2	23.3	18.3	22.3	21.3
AHU02 Supply	50.8	42.4	39.5	26.7	16.8	13.8	13.8	16.8
AHU01 Extract	43.3	36.9	41	31.2	27.3	22.3	26.3	25.3
Chiller 1	57.1	55.3	46.8	34.2	26.9	18.6	12.9	2.3
Chiller 2	54.6	52.8	44.3	31.7	24.4	16.1	10.4	-0.2



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
AHU01 Supply	16.9	12.5	10.7	0.8	-5.2	-9.4	-6.7	-8.2
AHU02 Extract	10.9	4.5	8.7	-1.2	-5.2	-10.4	-6.7	-8.2
AHU02 Supply	23.9	16.5	14.7	1.8	-8.2	-11.4	-11.7	-9.2
AHU01 Extract	14.9	8.5	12.7	2.8	-1.2	-6.4	-2.7	-4.2
Chiller 1	28.8	27	18.4	5.8	-1.6	-10	-16	-27.2
Chiller 2	28.8	27	18.4	5.8	-1.6	-10	-16	-27.2



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