THE ATRIUM

ACOUSTIC STRATEGY

OCM LUXEMBOURG APARTHOTEL SARL

SEPTEMBER 2017

REVISION 03

CONTENTS

1 Introduction 3
2 External noise survey 4
2.1 Site description 4
2.2 Measurement methodology 4
2.3 Weather 5
2.4 Measurement results 6
2.5 Commentary 7
3 Noise intrusion assessment 8
3.1 Criteria 8
3.2 Reference noise levels 8
3.3 Recommended façade constructions 9
4 Noise emission assessment 10
4.1 Criteria 10
4.2 Assessment methodology 10
4.3 Plant proposals 11
4.4 Nearest noise-sensitive receivers 12
4.5 Background sound levels 12
4.6 Noise emission limits 12
4.7 Assessment of predicted noise levels 13
Appendix A Noise level data 14
Appendix B - Terminology 18

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R03	Minor edits	13/09/2017	Kial Jackson BSc MIET AMIOA	Jason Clouston BEng MSc MIOA

1 INTRODUCTION

1.1 Proposals are for the refurbishment of the existing hotel to create a 160 bed aparthotel. The existing a3 units are to also be refurbished. The nightclub is to be converted into new guest bedrooms. An ancillary bar and workspace are also to be provided as part of the refurbishment works.

1.2 In support of the planning application, an external noise survey has been conducted on site to establish the prevailing acoustic environment. The data has then been used to assess both the level of external noise intrusion into the newly formed guest rooms and noise emitted from new building services plant. Chapter 2 describes the noise survey while assessments of noise intrusion and emission are presented in Chapters 3 and 4 respectively.

1.3 Measurement data from the noise survey, over a typical 24-hours, are presented in Appendix A and a glossary of the terminology used within this report is included in Appendix B. The brand standards for acoustics are available separately upon request.

2 EXTERNAL NOISE SURVEY

2.1 SITE DESCRIPTION

2.1.1 The site is located within Manchester City Centre, and is bounded by Princess Street to the east, Whitworth Street to the south, Beaver Street to the west and the Rochdale Canal to the north. Manchester City Council has been identified as the Local Authority for the site.

2.1.2 The development comprises of three masonry buildings of varying heights known as Dominion House (6-storeys), Central House (6-storeys) and Johnson House (7-storeys). Believed to have originally operated as separate warehouses, the buildings have since been conjoined into a single complex providing serviced apartments.

2.1.3 Neighbouring buildings to the north and west of the site have been identified as being for commercial use consisting of a private multi-storey carpark, offices and entertainment venues on Canal Street.

2.1.4 To the south of the site is Lancaster House which comprises of residential properties located above ground floor commercial units. Additionally, to the east is a multi-storey residential / commercial scheme which is currently under development by Urban and Civic (Planning ref: 110346/FO/2015/C2).

2.2 MEASUREMENT METHODOLOGY

2.2.1 Continuous unattended noise level measurements were conducted at one location to the south-eastern corner of the site. The microphone was extended 1 metre from a window on the second floor overlooking the junction between Princess Street and Whitworth Street. The measurement location is shown superimposed on a satellite image of the area in Figure 2.1.

2.2.2 Statistical and spectral data were recorded in 10-minute samples between 14:20 on Friday 5th May and 07:20 on Monday 8th May 2017. The measurements are considered representative of those expected at the facades of both the site and the surrounding buildings.

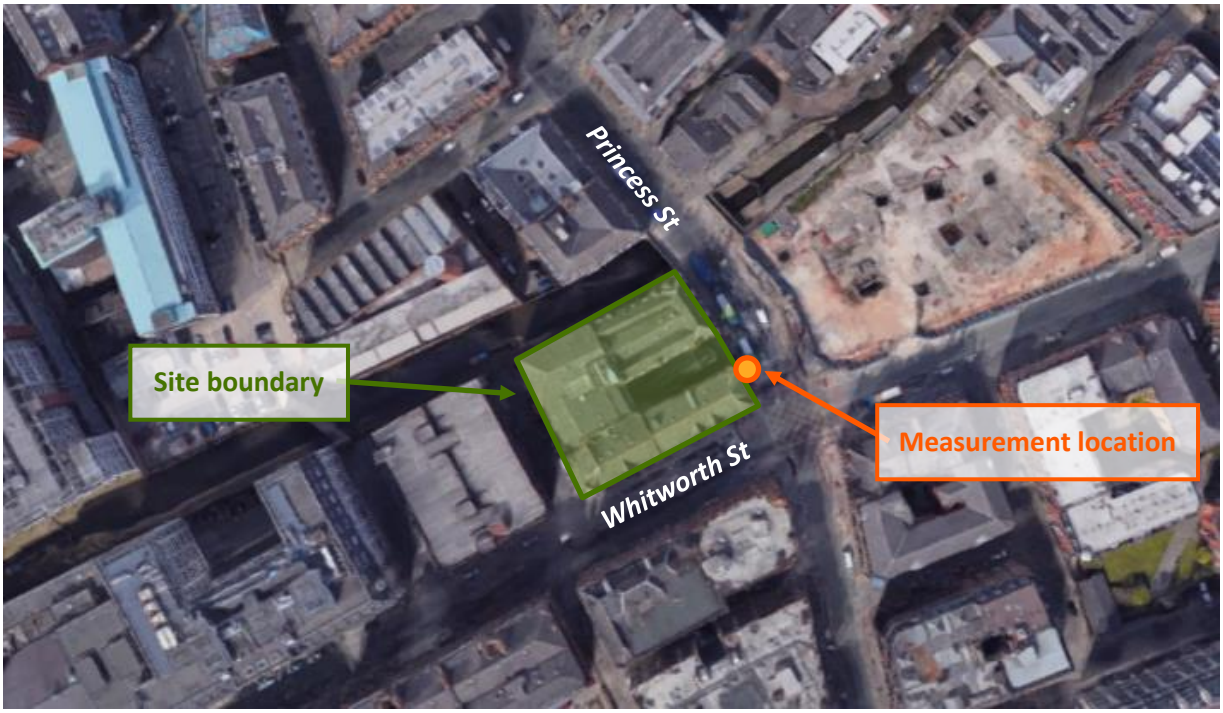
2.2.3 The survey was carried out over a weekend as Friday and Saturday are typically the busiest nights for entertainment venues, while Sunday is usually the quietest. As such, it is believed that the measurements are representative of both the highest and lowest noise levels expected in the area.

2.2.4 The following equipment was used for the noise survey:

Equipment	Type	Serial No.
Norsonic 131	Precision sound analyser	1312766
Norsonic 1218	Microphone protection kit	12182517
Brüel & Kjær 4231	Calibrator	2291098

Table 2.1 Noise measurement equipment

2.2.5 The calibration of the sound level meter and associated microphone were checked prior to and completion of both measurement periods in accordance with recommended practice. No significant drift in calibration occurred during the measurement period. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.



Satellite image provided by Google

Figure 2.1 Noise measurement locations superimposed on satellite image

2.3 WEATHER

2.3.1 Weather conditions throughout the survey are considered to have been favourable with mild temperatures, low of 5°C and high of 19°C; clear skies with the occasional cloud cover; and light winds below 5 m/s. As such, the data is not believed to have been adversely affected by the weather.

2.4 MEASUREMENT RESULTS

2.4.1 Provided below in Figure 2.2 is a graph detailing the noise level history at the measurement location throughout the survey. A selection of the measured data, for a typical 24-hour period, are provided in Appendix A.

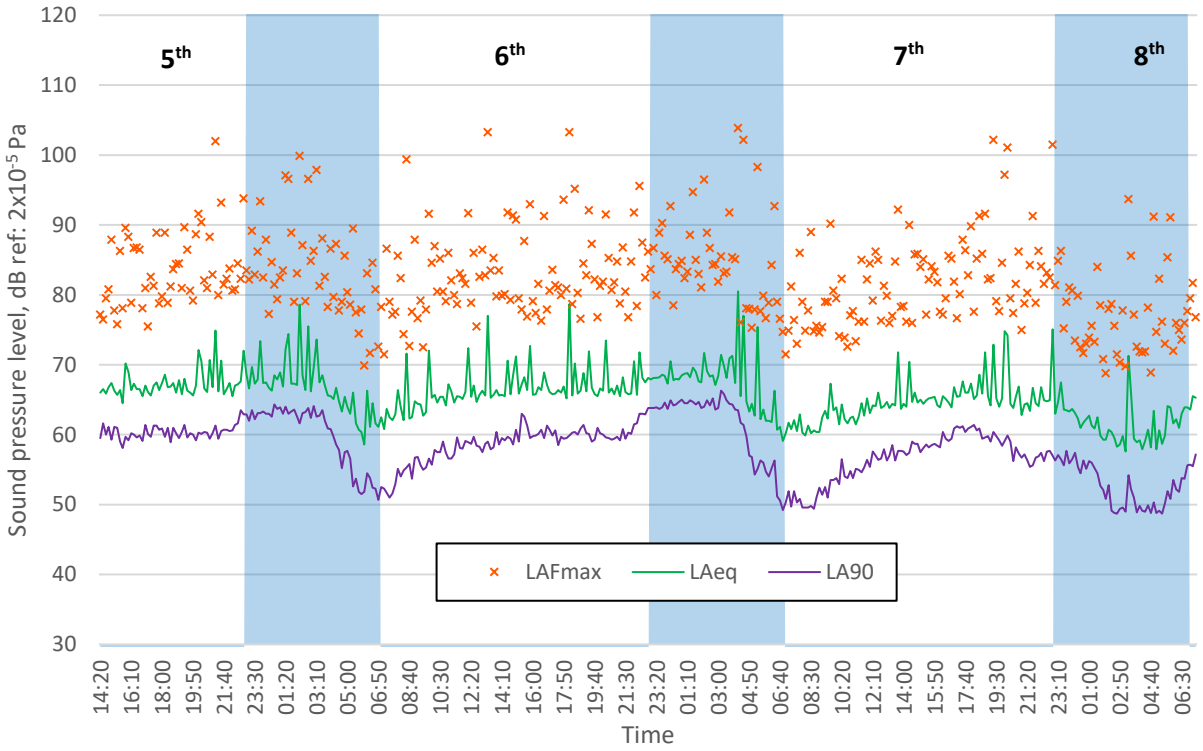


Figure 2.2 Noise level history, 05/05/2017 – 08/05/2017

2.4.2 The lowest background noise levels measured during the survey are set down in Table 2.2. These levels are assumed to be representative of those likely to be experienced at the facades of the surrounding properties.

Time Period	Lowest background noise level
Day (07:00-23:00)	49 dB $L_{A90,10min}$
Night (23:00-07:00)	49 dB $L_{A90,10min}$

All values are sound pressure levels (dB ref: $2x10^{-5}$ Pa)

Table 2.2 Summary of lowest measured background noise levels

2.5 COMMENTARY

2.5.1 It was observed that the acoustic environment around the site was dominated by road traffic travelling along Princess Street and Whitworth Street. Traffic was generally free-flowing up to 30mph and comprised of cars, buses, motorcycles, emergency vehicles and the occasional light or heavy goods vehicle. This is reflected by the consistent level of noise throughout the day and night, only reducing in the early hours of the morning when traffic levels are generally lower.

2.5.2 Maximum noise events typically consisted of engine noise as vehicles accelerated from a standstill at the main junction of Princess Street and Whitworth Street. Most notable were the large diesel engines of the buses travelling along Princess Street, generating a great deal of low frequency noise.

2.5.3 Analysis of the measurements during Friday and Saturday night revealed that the sporadic uplifts in the L_{Aeq} maxima were associated with patrons travelling to and from Canal Street, oftentimes congregating in proximity to The Atrium.

3 NOISE INTRUSION ASSESSMENT

3.1 CRITERIA

3.1.1 The control of external noise intrusion within a commercial hotel building is typically a matter of concern for the hotel operator rather than the Local Authority. The SACO brand standards for external noise intrusion are presented below in Table 3.1 and have been based on available guidance from British Standard 8233 and the World Health Organisation.

Time	Limit
Apartments during daytime (07:00 – 23:00)	35 dB $L_{Aeq,1hour}$
Apartments during night-time (23:00 – 07:00)[1]	30 dB $L_{Aeq,1hour}$
	45 dB L_{AFmax}

[1] *The maximum criterion applies to all vehicle and railway train passbys and all aircraft flyovers. It also applies to the noise from all street activities including those associated with patrons attending and leaving adjacent, neighbouring or connected entertainment venues; noise associated with commercial and industrial neighbouring premises including delivery activities and process equipment. Genuinely infrequent and unpredictable sources of noise (such as car alarms) occurring no more than twice a night are excluded.*

Table 3.1 Internal noise limits within apartments owing to external noise intrusion

3.1.2 It is understood that these limits are in line with the internal noise limits for residential properties adopted by Manchester City Council.

3.2 REFERENCE NOISE LEVELS

3.2.1 To calculate the required sound insulation performance of the façades to the apartments, the reference noise levels presented in Table 3.2, have been determined from the noise level data obtained during external noise survey.

	Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Daytime $L_{eq,1hr}$	74	65	64	62	68	68	58	50
Night-time $L_{eq,1hr}$	74	63	64	64	72	69	59	50
Night-time L_{Fmax}	92	86	87	85	89	85	82	75

All values are sound pressure levels in dB re: $2x10^{-5}$Pa

Table 3.2 Reference external noise levels used for the façade sound insulation assessment

3.2.2 The level of external noise intrusion within a space is determined by the sound insulation performance provided by the building envelope, the volume and reverberation time of the internal space, and the influence of any openings (e.g. for ventilation).

3.3 RECOMMENDED FAÇADE CONSTRUCTIONS

3.3.1 Based on the latest architectural drawings, the sound insulation performance of the façade elements have been calculated so as to achieve the noise limits set down in Table 3.1. The recommended minimum sound reduction indices are provided in Table 3.3.

	Frequency (Hz)					
	125	250	500	1k	2k	4k
Solid façade elements	36	46	51	53	50	60
Apartment windows	26	34	44	56	53	52

All values are sound reduction indices measured in accordance with BS EN ISO 10140-2 or equivalent

Table 3.3 Recommended façade sound reduction indices

3.3.2 The existing masonry is expected to readily achieve the performance required of the solid façade elements. Confirmation of this sound insulation performance will not be required.

3.3.3 Existing windows to the apartment locations are believed to comprise of single glazed units with an assumed thickness of 6mm. It is proposed that the acoustic performance be enhanced with the installation of a secondary glazing system. The required performance in Table 3.3 could be achieved with a 6mm pane of glass set back at least 100mm from the original glazing. Alternative glazing configurations may also be suitable.

3.3.4 It is understood that cost constraints may limit the installation of secondary glazing to only those rooms where lower internal noise levels are considered necessary. Achieving lower internal noise levels within living / dining rooms would not be considered necessary. However, external noise break in to bedrooms is currently in excess of what would normally be considered acceptable, therefore it is recommended that installation of secondary glazing to bedrooms be considered necessary.

4 NOISE EMISSION ASSESSMENT

4.1 CRITERIA

4.1.1 In July 2012, Manchester City Council adopted their *Core Strategy* which outlines the Authority's vision for the city, presenting a series of policies considered during the planning process. Policy DM1, presented below, addresses the issue of noise:

> *"Policy DM1 - Development Management*
>
> *All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:*
>
> - *Effects on amenity, including privacy, light,* ***noise****, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise."*

4.1.2 Additional guidance regarding acoustic design criteria is provided by the Local Authority within their *Planning and Noise* document. Based on national guidance provided by the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE), the Authority have established a noise limit for externally mounted plant items of 5dB below the typical background (L_{A90}). It should be noted that this limit applies to the plant's rating level which is to be assessed in accordance with BS 4142: 2014.

4.2 ASSESSMENT METHODOLOGY

4.2.1 BS 4142: 2014 *Method for rating and assessing industrial and commercial sound* provides guidance on the assessment of the impact of a noise source. The standard presents a methodology for comparing the noise level of the new source (the *specific sound level*) with that of the existing background noise level in the area in the absence of the new source (the *background sound level*).

4.2.2 The methodology requires consideration to be given to all aspects of the assessment process and also accounts for unusual acoustic features such as tonal, impulsive, or intermittency characteristics of the noise by the addition of various decibel corrections to the *specific sound level*. The corrected *specific sound level* is known as the *rating level*.

4.2.3 The *rating level* is then arithmetically subtracted from the *background sound level*. The greater the positive difference between the *rating level* and the *background sound level*, the greater the magnitude of the impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.
- A difference of around +5 dB or more is likely to be an indication of an adverse impact, depending upon the context.
- Where the *rating level* does not exceed the *background sound level*, this is an indication of a low impact, depending upon the context.

4.3 PLANT PROPOSALS

4.3.1 It is understood that existing external plant, located at rooftop level on a raised metal platform, is to be replaced. While plant selections are still to be finalised, for the purpose of this assessment, indicative sound levels of the proposed equipment are presented below in Table 4.1.

4.3.2 Kitchen extract fans are to be housed internally and as such, case break out noise from these units has not been considered within this assessment.

Plant	No.	Sound level per unit
Air source heat pump	4	63 dB $L_{pA\ at\ 1\ metre}$
Air handling unit	1	Inlet: 81 dB L_{wA} Outlet: 81 dB L_{wA} Case breakout: 72 dB L_{wA}
Toilet extract	2	Outlet: 61 dB L_{wA} Case breakout: 54 dB L_{wA}
Kitchen extract	2	Outlet: 74 dB L_{wA}

Table 4.1 Sound level data for proposed plant

4.3.3 Attenuators are to be affixed to both the inlet and outlet of the AHU and the outlets of the kitchen extract fans. Presented below are the recommended static insertion losses across the frequency spectrum and while final selections may vary slightly from these values, the overall level of attenuation should be equivalent.

Plant	Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Air handling unit	1	6	12	16	16	12	11	10
Kitchen extract	4	7	14	24	30	30	17	10

All values are static insertion losses in dB

Table 4.2 Recommended attenuator specification

4.3.4 This is expected to reduce noise levels from these units to the following values at 1 metre from their termination.

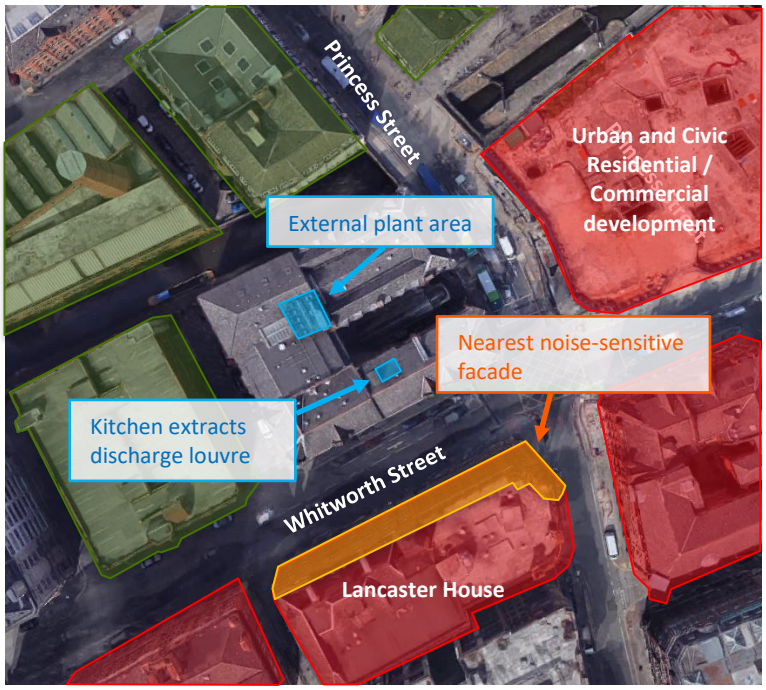
Plant	No.	Sound level per unit
Air handling unit	1	Inlet: 57 dB L_{pA} Outlet: 57 dB L_{pA}
Kitchen extract	2	Outlet: 46 dB L_{pa}

Table 4.3 Attenuated noise levels

4.3.5 It should also be noted that all newly installed plant items shall be mounted on suitable proprietary anti-vibration mounts so as to minimise vibration transmission into the building.

4.4 NEAREST NOISE-SENSITIVE RECEIVERS

4.4.1 Figure 4.1 provides an aerial view of the area surrounding the development site highlighting the location of the rooftop plant (blue), commercial buildings not considered noise-sensitive (green), and buildings believed to contain noise-sensitive residential properties (red). The closest noise-sensitive façade has been identified as the northern face of Lancaster House which has been highlighted in orange.



Satellite image courtesy of Google

Figure 4.1 Approximate plant location and nearest noise sensitive receiver

4.5 BACKGROUND SOUND LEVELS

4.5.1 Guidance from the Local Authority states that the level of plant noise should be assessed against the typical background level. For the purpose of this assessment, a conservative approach has been taken by assuming that the lowest measured background noise levels presented in Table 2.2 are typical.

4.6 NOISE EMISSION LIMITS

4.6.1 In line with the Authority's requirements, the limits set down in Table 4.4 are proposed at the nearest noise-sensitive neighbour.

Time Period	Noise emission limit
Day (07:00-23:00)	44 dB $L_{Ar,Tr}$
Night (23:00-07:00)	44 dB $L_{Ar,Tr}$

Table 4.4 Noise emission limits for all building services plant operating simultaneously

4.6.2 It is important to note that these limits apply to the equipment's *rating level* and should take into account any unusual acoustic features in accordance with the methodology of BS 4142. For information, the methodology applies the following corrections depending on the character of the noise:

- **Tonality:** up to +6 dB depending on how perceptible any tonal qualities are
- **Impulsivity:** up to +9 dB subject to how rapidly the overall sound level changes.
- **Intermittency:** +3 dB if the sound has clear and identifiable on/off conditions
- **Other sound characteristics:** +3 dB for any other features which are neither tonal nor impulsive but are readily distinctive against the prevailing acoustic environment.

4.7 ASSESSMENT OF PREDICTED NOISE LEVELS

4.7.1 With a distance of 40 metres between the nearest noise sensitive façade and the plant area, geometric divergence is expected to provide 32 dB of attenuation. This will increase for the noise-sensitive receivers situated further from the development site. The additional effects of atmospheric absorption and reflections are expected to be negligible owing to the relatively short distance and the plant's raised location.

4.7.2 Newly installed equipment is expected to operate continuously with a "soft start-up" mode and as such, corrections for impulsivity or intermittency are not believed to be necessary. Owing to previous experience with the proposed plant items an allowance for a +2 dB correction should be made to account for tones which may just be perceptible against the prevailing acoustic environment.

4.7.3 Based on the plant sound data presented in Table 4.1, attenuation owing to geometric spreading, and the corrections to the plant's *specific sound level*, the *rating level* of all the plant operating simultaneously is predicted to be 40 dB $L_{ArTr.}$ This is some 9 dB below the worst-case lowest measured *background sound level* and demonstrates compliance with the requirements of the Local Authority, as set out within the *Planning and Noise* document.

4.7.4 Acoustic guidance will be ongoing as the design progresses to ensure continued compliance with the noise limits proposed in Table 4.2.

APPENDIX A NOISE LEVEL DATA

A selection of the measured noise level data over a 24-hour period is presented in the tables in this appendix. The full set of data are available in electronic form on request.

All values are sound pressure levels in dB re: $2x10^{-5}$ Pa.

Table A1 Statistical measurement data, Saturday 6th May

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
06/05/2017 00:00	67.4	82.5	59.9	69.2	63.3
06/05/2017 00:10	67.5	87.9	59.8	69.1	63.0
06/05/2017 00:20	66.7	77.3	59.8	68.9	63.0
06/05/2017 00:30	66.3	84.7	59.2	68.5	62.6
06/05/2017 00:40	68.5	81.5	61.9	71.0	64.3
06/05/2017 00:50	67.9	79.4	60.3	70.3	63.7
06/05/2017 01:00	68.9	82.5	60.9	71.4	63.9
06/05/2017 01:10	66.9	83.5	59.9	69.3	63.0
06/05/2017 01:20	72.2	97.1	60.5	70.9	64.0
06/05/2017 01:30	74.4	96.6	59.0	70.6	63.0
06/05/2017 01:40	67.3	88.9	60.8	68.6	63.3
06/05/2017 01:50	67.3	79.0	60.3	69.4	63.6
06/05/2017 02:00	67.1	83.1	59.0	69.3	62.6
06/05/2017 02:10	78.6	99.9	58.7	70.0	61.6
06/05/2017 02:20	68.5	87.1	59.9	69.8	63.1
06/05/2017 02:30	66.4	79.1	60.2	68.4	63.2
06/05/2017 02:40	75.5	96.6	59.7	70.9	63.8
06/05/2017 02:50	66.2	84.9	58.8	68.3	62.4
06/05/2017 03:00	69.6	86.3	61.7	71.7	64.1
06/05/2017 03:10	73.6	97.9	58.8	70.1	62.6
06/05/2017 03:20	67.5	81.3	58.8	69.7	62.7
06/05/2017 03:30	68.5	88.1	60.6	70.6	63.5
06/05/2017 03:40	67.0	82.6	59.1	69.0	62.0
06/05/2017 03:50	65.6	78.3	56.6	68.4	60.9
06/05/2017 04:00	65.5	86.6	57.0	67.8	60.8
06/05/2017 04:10	65.1	79.7	56.4	67.9	59.7
06/05/2017 04:20	66.7	87.3	53.2	68.6	58.6
06/05/2017 04:30	64.8	77.8	52.5	67.9	57.8
06/05/2017 04:40	63.3	79.0	51.5	66.5	55.2
06/05/2017 04:50	65.4	85.6	52.5	68.2	57.5
06/05/2017 05:00	64.0	80.4	51.9	66.9	57.7
06/05/2017 05:10	63.0	78.6	52.5	66.3	56.6
06/05/2017 05:20	66.0	89.5	49.3	65.3	52.6
06/05/2017 05:30	61.6	77.5	50.3	64.9	53.7
06/05/2017 05:40	60.7	74.5	49.4	64.0	51.8
06/05/2017 05:50	60.4	77.9	48.3	64.0	51.5
06/05/2017 06:00	58.6	69.9	49.1	62.1	51.8
06/05/2017 06:10	66.3	83.1	49.8	70.5	54.5
06/05/2017 06:20	61.1	71.7	49.2	64.5	53.8
06/05/2017 06:30	64.5	84.6	49.2	65.8	52.4
06/05/2017 06:40	61.6	80.8	50.5	65.0	52.3
06/05/2017 06:50	61.1	72.6	48.5	64.8	50.7
06/05/2017 07:00	62.5	78.3	48.9	66.6	52.5
06/05/2017 07:10	60.8	71.5	49.3	64.8	52.3
06/05/2017 07:20	63.7	86.6	49.2	66.1	51.7
06/05/2017 07:30	62.5	79.0	48.8	65.6	51.0
06/05/2017 07:40	62.1	77.2	48.6	66.1	51.6
06/05/2017 07:50	62.9	77.6	49.7	66.0	52.9
06/05/2017 08:00	66.4	85.6	50.7	68.7	55.1
06/05/2017 08:10	63.9	82.4	51.1	66.9	54.0
06/05/2017 08:20	62.1	74.4	51.7	65.7	54.9
06/05/2017 08:30	71.6	99.4	50.8	67.2	55.3
06/05/2017 08:40	62.3	72.7	52.9	65.7	55.8
06/05/2017 08:50	62.5	77.6	51.1	66.0	53.7
06/05/2017 09:00	64.8	87.9	51.3	67.1	56.7
06/05/2017 09:10	64.4	76.7	53.5	67.9	56.8
06/05/2017 09:20	64.3	79.2	51.2	67.1	55.6
06/05/2017 09:30	62.7	72.5	52.1	66.1	55.0
06/05/2017 09:40	63.2	77.9	51.1	66.6	55.3
06/05/2017 09:50	72.0	91.6	50.6	68.2	56.6
06/05/2017 10:00	65.3	84.6	51.4	67.5	55.7
06/05/2017 10:10	65.7	87.0	54.5	68.2	57.8
06/05/2017 10:20	64.6	80.5	52.9	66.8	57.5
06/05/2017 10:30	65.4	85.2	53.4	67.9	57.5
06/05/2017 10:40	65.4	80.5	54.7	68.3	59.0
06/05/2017 10:50	64.2	79.1	52.5	66.6	57.4
06/05/2017 11:00	67.2	86.0	51.2	69.6	56.6
06/05/2017 11:10	66.2	82.1	51.5	68.5	56.6
06/05/2017 11:20	64.6	80.0	53.2	67.2	57.2
06/05/2017 11:30	65.5	78.7	54.5	68.5	59.6
06/05/2017 11:40	65.4	83.1	53.9	67.3	58.1
06/05/2017 11:50	65.1	82.4	54.5	68.1	58.0

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
06/05/2017 12:00	66.1	81.6	54.8	68.6	59.1
06/05/2017 12:10	72.4	91.7	54.1	71.5	58.9
06/05/2017 12:20	65.4	78.9	53.8	68.6	58.7
06/05/2017 12:30	67.0	86.0	56.3	69.1	59.7
06/05/2017 12:40	64.7	75.5	55.3	67.9	58.4
06/05/2017 12:50	65.7	82.6	54.8	68.1	58.3
06/05/2017 13:00	66.3	86.5	52.7	68.8	57.5
06/05/2017 13:10	65.6	82.8	53.7	67.9	58.7
06/05/2017 13:20	77.0	103.3	53.4	69.3	59.0
06/05/2017 13:30	65.3	83.5	53.7	68.3	57.9
06/05/2017 13:40	65.7	85.3	53.9	67.3	58.2
06/05/2017 13:50	66.4	79.8	55.8	69.4	60.4
06/05/2017 14:00	65.6	83.5	55.2	68.6	58.6
06/05/2017 14:10	65.7	79.9	54.3	68.6	59.5
06/05/2017 14:20	65.5	80.1	55.4	68.3	59.2
06/05/2017 14:30	70.6	91.8	55.4	69.8	59.7
06/05/2017 14:40	65.8	79.3	53.6	69.0	59.4
06/05/2017 14:50	68.5	91.4	54.3	67.9	58.6
06/05/2017 15:00	71.2	90.8	56.8	70.2	60.7
06/05/2017 15:10	65.9	79.5	54.3	68.3	59.0
06/05/2017 15:20	67.2	77.9	60.6	69.5	63.0
06/05/2017 15:30	68.2	87.7	56.7	69.8	62.6
06/05/2017 15:40	66.4	76.9	57.0	69.2	61.3
06/05/2017 15:50	72.7	93.0	55.0	69.4	59.5
06/05/2017 16:00	65.7	79.1	56.4	68.7	59.8
06/05/2017 16:10	65.8	77.4	55.6	68.6	59.9
06/05/2017 16:20	66.8	81.6	54.2	70.2	60.1
06/05/2017 16:30	66.4	76.3	55.5	69.4	60.7
06/05/2017 16:40	68.9	91.3	53.4	71.8	59.5
06/05/2017 16:50	67.1	77.9	56.1	70.4	61.3
06/05/2017 17:00	66.1	80.6	55.2	68.9	60.7
06/05/2017 17:10	65.8	83.6	54.4	68.0	59.9
06/05/2017 17:20	65.9	81.4	54.3	68.7	60.6
06/05/2017 17:30	66.4	81.1	53.6	68.8	58.5
06/05/2017 17:40	66.0	80.0	54.5	68.9	59.7
06/05/2017 17:50	66.9	93.6	54.8	68.4	59.4
06/05/2017 18:00	65.2	80.9	56.6	68.3	59.5
06/05/2017 18:10	78.7	103.3	55.0	70.0	59.9
06/05/2017 18:20	65.6	78.7	56.3	68.2	60.3
06/05/2017 18:30	70.2	95.2	55.4	69.4	60.4
06/05/2017 18:40	65.9	80.3	54.2	68.9	60.0
06/05/2017 18:50	66.3	76.6	57.4	69.3	60.9
06/05/2017 19:00	68.8	84.5	57.4	71.3	61.4
06/05/2017 19:10	66.2	82.8	56.0	68.6	60.2
06/05/2017 19:20	71.9	92.1	56.0	70.2	60.1
06/05/2017 19:30	66.7	87.3	55.5	68.7	59.0
06/05/2017 19:40	65.8	82.2	54.8	68.6	59.3
06/05/2017 19:50	65.5	76.8	56.1	68.2	61.0
06/05/2017 20:00	66.6	81.3	56.9	69.8	60.2
06/05/2017 20:10	66.3	81.9	55.5	69.1	60.0
06/05/2017 20:20	73.5	91.5	55.4	71.6	59.6
06/05/2017 20:30	66.0	85.3	55.3	68.7	59.5
06/05/2017 20:40	66.6	80.7	55.9	68.9	59.3
06/05/2017 20:50	65.8	81.8	55.3	68.9	59.4
06/05/2017 21:00	67.0	84.8	56.3	69.6	59.7
06/05/2017 21:10	65.5	78.8	55.9	68.6	59.2
06/05/2017 21:20	68.2	86.8	57.5	70.3	60.8
06/05/2017 21:30	66.1	80.5	54.7	69.0	59.4
06/05/2017 21:40	65.8	76.8	56.2	68.4	60.3
06/05/2017 21:50	65.9	84.8	56.6	68.7	60.1
06/05/2017 22:00	70.5	91.8	58.8	69.4	61.5
06/05/2017 22:10	65.7	78.4	58.7	68.2	61.6
06/05/2017 22:20	71.8	95.6	59.2	70.2	63.0
06/05/2017 22:30	68.1	87.5	60.1	70.6	63.0
06/05/2017 22:40	67.5	82.5	59.4	70.1	62.9
06/05/2017 22:50	68.1	86.2	61.5	70.3	63.8
06/05/2017 23:00	67.9	83.7	61.2	70.0	63.8
06/05/2017 23:10	68.1	86.7	60.4	69.8	63.8
06/05/2017 23:20	68.1	80.0	59.8	70.5	63.9
06/05/2017 23:30	68.2	88.9	61.0	69.9	63.7
06/05/2017 23:40	68.6	90.3	61.4	70.3	63.9
06/05/2017 23:50	68.4	85.6	61.4	69.9	64.6

Table A2 Frequency measurement data, Saturday 6th May

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
06/05/2017 00:00	74.5	64.7	63.1	63.3	63.1	59.6	57.2	51.8	87.0	76.9	76.0	83.8	78.8	78.6	80.3	77.0
06/05/2017 00:10	73.9	65.2	63.0	63.6	63.1	59.9	57.4	44.9	88.2	79.1	77.0	79.6	74.0	80.6	85.0	66.2
06/05/2017 00:20	75.0	65.7	64.1	63.5	62.7	58.6	52.1	48.5	94.4	81.1	84.3	76.6	74.4	68.6	70.9	75.4
06/05/2017 00:30	72.0	63.7	62.7	62.8	62.2	58.6	55.0	42.9	85.6	74.5	72.8	76.5	77.4	76.9	82.2	60.5
06/05/2017 00:40	74.7	64.6	64.3	64.4	65.3	60.9	53.7	43.9	92.1	78.1	82.8	79.1	81.6	74.7	66.9	57.7
06/05/2017 00:50	73.3	63.2	62.9	63.9	64.7	60.3	52.9	46.2	90.9	74.2	76.3	77.4	79.1	72.5	69.3	71.4
06/05/2017 01:00	72.7	64.3	66.9	65.2	64.2	61.0	57.8	54.6	84.9	76.8	81.2	80.8	81.4	78.6	72.8	68.1
06/05/2017 01:10	72.8	63.3	63.2	63.3	63.0	59.6	53.6	45.1	86.2	77.5	75.9	75.1	81.2	77.1	77.4	69.2
06/05/2017 01:20	75.4	67.1	67.9	64.6	67.1	66.5	62.8	49.2	92.1	89.8	90.5	78.6	93.1	92.5	91.3	76.1
06/05/2017 01:30	74.7	67.6	65.9	67.6	70.0	69.6	60.6	50.1	92.2	93.9	92.1	93.5	91.1	91.5	83.9	73.1
06/05/2017 01:40	73.1	64.3	64.9	64.1	63.2	59.4	52.9	45.3	89.7	80.1	87.8	89.1	83.1	77.5	71.5	67.4
06/05/2017 01:50	75.3	63.9	63.0	63.7	63.5	59.7	53.0	47.0	91.9	75.2	76.6	78.3	77.2	73.4	65.6	69.7
06/05/2017 02:00	74.3	63.1	62.8	64.0	63.4	59.3	52.7	43.5	91.0	74.3	80.8	82.2	82.0	77.0	79.4	64.7
06/05/2017 02:10	73.9	63.8	62.5	63.1	75.0	73.5	68.5	55.1	92.2	80.9	82.0	83.8	97.8	96.7	89.5	78.2
06/05/2017 02:20	73.6	63.1	62.9	64.2	65.2	61.5	53.4	45.5	87.5	74.6	74.3	83.6	85.9	82.3	71.6	71.9
06/05/2017 02:30	74.2	62.7	61.9	62.8	62.7	58.8	52.3	45.1	89.8	74.2	75.3	76.7	74.3	75.0	72.3	71.0
06/05/2017 02:40	74.0	64.4	62.6	64.7	72.6	69.5	63.8	51.2	92.1	85.9	78.6	85.3	95.5	90.8	86.1	70.7
06/05/2017 02:50	73.4	63.2	61.6	62.5	62.3	58.7	52.5	50.1	89.2	77.2	71.1	74.9	84.2	75.2	73.8	77.4
06/05/2017 03:00	74.5	64.6	67.4	66.0	65.1	61.5	58.0	54.4	89.5	76.5	87.1	81.7	86.6	77.7	83.8	75.2
06/05/2017 03:10	73.6	62.7	62.1	63.6	70.2	68.3	60.4	46.2	90.9	77.9	79.0	80.7	96.7	94.5	87.6	67.1
06/05/2017 03:20	74.2	63.1	62.2	63.7	64.0	60.3	53.2	45.4	91.8	74.1	76.1	78.4	80.1	77.1	70.1	68.6
06/05/2017 03:30	73.9	63.8	66.3	64.4	63.9	60.7	57.8	54.8	92.6	74.9	78.6	75.3	87.6	75.8	70.1	68.0
06/05/2017 03:40	73.1	63.3	62.4	62.5	63.5	60.0	53.0	46.1	86.1	78.1	72.4	76.8	80.9	76.5	77.1	69.0
06/05/2017 03:50	73.4	62.5	61.5	61.9	61.9	58.1	51.8	46.4	89.6	75.8	72.1	75.4	77.4	72.0	72.9	68.9
06/05/2017 04:00	73.1	63.7	62.6	61.7	61.4	58.6	52.2	43.8	89.1	78.5	74.8	75.2	71.7	83.9	78.7	63.3
06/05/2017 04:10	72.6	61.3	61.7	61.2	61.4	57.5	51.0	45.7	88.2	74.1	74.2	74.4	79.2	71.9	67.8	67.2
06/05/2017 04:20	73.1	67.1	67.7	62.7	62.5	58.5	51.8	44.0	88.4	90.1	92.8	85.4	82.8	79.8	71.8	65.9
06/05/2017 04:30	70.6	62.8	61.7	60.9	61.0	57.3	51.3	43.3	82.4	80.1	78.3	77.4	73.6	72.4	74.3	64.2
06/05/2017 04:40	71.3	63.5	60.8	59.2	59.2	55.8	51.0	42.7	88.5	86.5	78.3	72.6	69.7	68.8	77.9	67.4
06/05/2017 04:50	72.1	66.3	62.5	61.8	61.4	58.0	51.7	44.2	88.1	88.7	80.1	80.0	82.9	80.4	71.9	63.8
06/05/2017 05:00	72.0	61.0	60.7	59.8	60.5	56.5	50.0	43.2	87.1	78.6	71.4	77.5	77.8	73.8	70.8	66.0
06/05/2017 05:10	69.6	59.2	59.6	58.8	59.7	55.3	48.2	40.9	83.8	71.6	73.0	73.0	76.0	73.0	63.8	62.6
06/05/2017 05:20	67.7	58.7	60.4	57.5	63.0	60.0	52.5	39.3	84.6	73.7	80.5	78.2	87.4	84.2	78.9	56.6
06/05/2017 05:30	68.0	58.3	58.1	57.1	58.2	53.7	49.2	38.8	83.6	69.5	68.9	71.9	73.7	64.4	76.5	56.2
06/05/2017 05:40	68.5	57.8	57.4	56.8	57.1	53.3	46.2	38.4	83.7	73.1	71.8	73.4	70.0	68.3	60.8	58.2
06/05/2017 05:50	66.3	57.2	57.4	56.0	57.2	52.8	45.1	36.6	83.7	73.8	75.7	69.4	76.0	71.7	60.9	54.8
06/05/2017 06:00	65.3	56.1	55.4	54.4	54.9	51.4	44.7	39.2	83.1	70.3	66.6	67.9	66.2	64.6	60.0	60.4
06/05/2017 06:10	73.4	63.3	63.3	62.0	62.3	59.2	54.1	45.2	88.4	80.6	80.0	80.2	77.1	76.1	80.4	67.0
06/05/2017 06:20	68.6	60.1	59.5	56.9	57.3	53.6	46.9	41.5	86.4	75.5	75.2	67.9	68.9	69.2	60.0	65.0
06/05/2017 06:30	67.8	61.7	61.5	59.3	59.7	58.3	53.5	48.7	85.6	79.2	82.0	77.8	77.4	80.9	76.7	73.7
06/05/2017 06:40	67.3	59.6	58.5	56.9	57.7	54.9	49.1	41.9	88.0	74.7	73.2	77.9	77.1	75.7	70.8	64.8
06/05/2017 06:50	68.8	59.4	60.2	57.3	57.3	53.0	46.5	38.9	90.2	78.0	76.4	69.7	69.2	67.7	62.1	59.7
06/05/2017 07:00	69.7	60.6	60.6	58.0	58.4	55.1	50.3	41.7	91.2	78.8	77.3	72.6	71.3	71.1	74.5	59.5
06/05/2017 07:10	68.2	60.8	58.8	56.4	57.0	53.0	46.5	41.8	85.9	80.0	76.3	66.6	67.0	65.1	63.6	67.4
06/05/2017 07:20	69.4	59.8	59.9	57.4	58.1	55.3	57.1	52.0	89.3	76.5	77.8	74.5	76.5	72.6	85.1	78.1
06/05/2017 07:30	69.0	60.4	62.2	58.7	58.1	54.7	49.4	45.0	89.6	77.1	81.7	78.4	75.1	68.5	68.7	70.8
06/05/2017 07:40	71.1	60.8	60.7	58.2	57.6	54.4	50.1	42.7	91.2	77.7	76.3	73.5	71.7	72.1	70.7	63.5
06/05/2017 07:50	68.9	60.6	60.2	58.7	58.9	55.5	50.4	45.2	87.7	75.9	74.5	72.4	73.1	71.4	75.9	73.1
06/05/2017 08:00	70.1	62.8	61.8	60.8	62.5	59.9	55.0	50.2	89.5	81.2	74.6	76.6	82.6	80.1	76.3	70.1
06/05/2017 08:10	68.2	62.3	61.9	59.4	59.6	56.5	53.3	46.1	84.3	77.5	78.6	75.3	76.6	73.6	80.8	73.9
06/05/2017 08:20	67.6	60.2	59.1	58.0	58.3	54.5	49.1	45.4	87.3	73.8	73.0	73.0	70.2	67.6	67.6	68.7
06/05/2017 08:30	74.5	66.3	69.4	70.2	67.8	61.6	53.4	48.6	97.2	89.5	96.2	98.4	95.7	90.3	81.4	73.1
06/05/2017 08:40	68.5	61.4	59.8	58.0	58.6	54.9	48.5	40.5	88.6	77.3	75.7	68.7	69.0	67.0	61.6	57.8
06/05/2017 08:50	70.9	61.1	60.4	58.3	58.2	54.3	51.8	45.4	90.9	75.4	75.3	70.7	68.3	66.5	76.0	69.9
06/05/2017 09:00	73.8	63.6	62.9	60.0	59.3	57.2	55.8	52.0	91.7	80.7	80.6	74.3	73.8	81.1	83.7	81.3
06/05/2017 09:10	73.0	64.6	64.8	60.1	59.6	56.7	51.3	49.7	92.0	77.4	81.4	73.2	71.4	71.9	69.5	77.0
06/05/2017 09:20	72.1	61.9	64.0	59.8	59.8	56.8	51.5	45.8	91.2	81.1	85.3	73.4	73.6	73.3	70.7	68.9
06/05/2017 09:30	72.3	61.7	60.8	58.5	58.6	55.2	49.7	42.5	89.0	76.9	74.2	69.9	66.8	66.7	65.9	61.0
06/05/2017 09:40	70.6	60.7	60.6	58.8	59.0	55.2	51.1	51.5	88.1	78.8	73.6	70.6	71.1	71.0	76.3	77.9
06/05/2017 09:50	70.5	62.2	61.3	59.2	68.9	67.0	55.7	48.0	89.5	77.3	72.5	70.9	90.2	87.5	75.8	68.1
06/05/2017 10:00	73.1	62.9	65.6	61.6	60.6	57.2	51.7	45.8	90.9	78.3	89.8	81.0	77.3	74.0	68.4	65.7
06/05/2017 10:10	71.3	63.6	63.1	61.2	61.5	58.6	54.4	47.0	89.7	79.2	80.6	79.8	81.8	81.8	79.7	67.4
06/05/2017 10:20	71.4	62.8	64.3	59.9	60.2	57.2	52.2	46.4	88.8	77.7	87.6	72.6	73.9	73.8	73.7	68.1
06/05/2017 10:30	70.3	63.6	62.8	61.0	60.4	57.6	56.3	51.9	85.8	81.0	79.2	82.6	80.3	79.2	80.0	73.3
06/05/2017 10:40	70.5	65.0	65.5	61.9	60.6	57.3	52.9	49.6	83.0	83.6	80.7	78.7	74.7	75.9	73.2	69.1
06/05/2017 10:50	70.0	63.3	63.2	60.8	60.0	56.5	50.4	42.2	85.5	81.7	81.7	80.8	71.1	70.2	67.7	59.8
06/05/2017 11:00	72.7	66.1	66.3	62.9	61.9	61.5	53.0	48.7	89.2	86.8	90.9	85.2	78.2	82.3	73.7	70.8
06/05/2017 11:10	74.7	64.3	63.0	61.9	61.5	58.5	56.6	51.1	96.8	80.9	76.6	77.4	76.3	77.8	78.8	75.5
06/05/2017 11:20	71.5	63.1	63.6	60.2	60.5	56.7	52.0	45.8	88.2	76.6	84.9	72.6	73.7	71.4	74.1	67.7
06/05/2017 11:30	74.2	63.9	63.0	61.3	61.4	57.8	53.3	49.0	93.6	79.5	78.9	76.7	74.4	72.3	74.7	73.7
06/05/2017 11:40	73.6	70.0	65.1	61.8	60.7	56.9	52.0	45.0	90.7	95.7	86.4	80.1	76.5	71.7	72.0	63.2
06/05/2017 11:50	74.6	63.6	62.9	60.7	60.8	57.3	53.8	49.9	94.1	76.7	78.2	76.4	71.6	69.5	80.7	74.7
06/05/2017 12:00	75.7	65.2	64.8	62.2	61.4	58.6	54.2	48.9	92.1	81.0	84.3	77.8	73.9	78.6	79.7	73.2
06/05/2017 12:10	75.0	65.0	65.0	62.8	69.4	66.3	59.3	54.0	92.5	78.1	82.8	78.6	90.0	86.9	80.1	81.5
06/05/2017 12:20	73.4	63.7	64.8	61.3	61.1	57.6	52.0	48.9	92.3	77.4	83.9	72.4	74.2	73.7	70.0	71.4

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
06/05/2017 12:30	75.5	65.8	64.9	61.7	63.1	59.2	54.4	48.9	94.7	83.3	82.2	73.6	84.7	75.7	71.3	70.6
06/05/2017 12:40	74.5	63.1	62.4	60.4	60.4	57.3	52.0	48.9	91.8	79.5	76.3	71.4	74.0	69.7	67.7	68.0
06/05/2017 12:50	73.9	67.2	66.6	62.2	60.7	57.1	52.5	49.6	91.7	87.3	86.2	82.3	74.6	71.8	77.2	73.8
06/05/2017 13:00	73.9	64.4	64.8	62.6	60.9	57.7	58.3	51.6	92.1	80.6	85.8	80.6	73.4	69.3	84.9	78.2
06/05/2017 13:10	74.3	67.2	67.0	62.9	60.5	56.6	50.7	48.5	91.5	86.8	88.4	82.5	72.3	69.8	66.6	77.2
06/05/2017 13:20	74.2	66.3	74.0	73.1	73.8	69.1	61.0	53.1	91.7	90.2	98.8	98.8	100.1	96.7	87.8	80.4
06/05/2017 13:30	73.8	65.0	64.1	62.0	61.3	56.8	51.2	46.8	91.7	82.0	82.1	83.5	81.3	71.4	66.3	68.9
06/05/2017 13:40	73.1	64.4	63.9	61.8	61.5	58.0	52.6	45.6	92.4	84.9	86.9	82.5	80.5	76.9	75.1	69.5
06/05/2017 13:50	75.0	68.8	66.0	62.2	61.5	58.5	54.9	48.4	91.1	89.1	86.9	77.6	75.8	69.7	78.0	70.6
06/05/2017 14:00	75.0	64.5	63.7	61.0	60.8	57.2	56.3	51.8	93.3	77.8	81.2	73.5	78.1	75.0	81.8	75.4
06/05/2017 14:10	74.4	66.4	65.3	62.7	60.8	57.5	52.9	46.2	92.1	85.0	80.9	76.3	71.5	71.6	77.4	67.5
06/05/2017 14:20	75.2	63.6	63.4	61.6	60.9	58.2	53.6	50.0	93.0	75.0	77.9	79.2	74.9	75.3	75.4	75.6
06/05/2017 14:30	73.7	64.2	65.1	62.7	67.1	65.0	56.5	49.9	91.1	77.7	83.4	80.0	89.3	85.2	76.3	72.3
06/05/2017 14:40	75.0	65.4	63.7	61.5	61.4	58.2	54.9	48.9	90.1	79.0	77.6	72.9	77.5	70.1	76.6	68.2
06/05/2017 14:50	72.9	66.2	64.5	61.7	64.9	61.7	57.0	51.7	91.7	87.0	85.7	81.5	87.4	86.3	82.5	82.2
06/05/2017 15:00	74.0	67.4	64.0	62.4	68.1	65.5	56.4	47.2	91.1	92.0	78.2	75.5	89.3	86.2	74.4	66.6
06/05/2017 15:10	74.6	64.7	64.0	61.6	61.4	58.4	54.2	50.3	93.9	83.4	82.9	76.7	71.0	69.5	75.8	81.0
06/05/2017 15:20	76.0	68.6	66.9	62.6	62.6	59.6	55.5	49.4	92.4	87.2	83.6	76.5	72.0	70.3	73.2	70.4
06/05/2017 15:30	75.2	65.5	65.2	62.3	62.2	59.9	61.9	55.2	89.6	77.9	82.2	76.2	81.9	80.6	86.1	79.2
06/05/2017 15:40	75.6	65.9	65.2	62.6	61.9	58.8	54.0	48.1	94.2	83.9	79.2	76.9	71.5	70.8	70.0	71.0
06/05/2017 15:50	73.7	63.4	63.8	62.2	68.7	68.0	59.6	50.1	90.3	83.0	81.4	78.6	90.8	90.7	83.5	72.2
06/05/2017 16:00	73.9	64.2	64.7	62.4	61.3	58.0	52.8	45.6	90.8	76.0	84.3	80.9	71.5	69.3	69.3	68.5
06/05/2017 16:10	74.1	64.1	63.2	61.7	61.9	58.1	52.7	47.4	90.5	83.3	78.0	73.8	75.2	71.6	68.5	70.9
06/05/2017 16:20	73.8	66.3	65.4	62.9	62.3	59.2	54.1	50.7	90.7	85.0	83.4	82.6	75.6	72.5	68.8	79.1
06/05/2017 16:30	75.8	65.4	64.5	62.4	62.1	59.0	53.7	51.2	92.4	82.4	78.9	73.7	73.1	69.3	68.6	72.1
06/05/2017 16:40	73.6	66.4	67.2	65.0	64.1	61.3	59.2	50.2	89.9	87.0	85.4	82.6	82.5	81.9	88.8	78.2
06/05/2017 16:50	74.9	65.3	64.4	64.4	62.7	59.1	53.8	48.6	92.7	80.2	78.6	78.8	77.4	74.1	72.7	74.0
06/05/2017 17:00	75.0	65.7	64.0	62.2	61.5	58.8	54.2	48.7	92.0	87.4	78.0	72.4	76.7	76.1	73.0	74.0
06/05/2017 17:10	73.3	62.7	63.0	62.3	61.7	57.7	54.6	44.9	91.8	75.6	82.5	81.9	82.0	76.1	81.0	67.2
06/05/2017 17:20	75.6	65.6	64.2	61.5	61.2	58.5	54.6	50.2	93.7	83.9	78.0	70.7	71.4	75.2	76.9	75.3
06/05/2017 17:30	74.1	65.7	65.3	62.5	61.6	58.4	55.6	48.8	91.0	83.4	82.7	76.5	78.0	74.8	80.0	76.1
06/05/2017 17:40	74.9	64.7	66.4	62.7	61.1	57.7	54.1	47.3	92.2	78.8	84.9	76.3	69.1	67.9	78.4	71.1
06/05/2017 17:50	72.6	63.2	65.2	62.5	62.7	59.9	54.6	50.1	88.6	77.8	86.0	87.6	89.7	88.3	82.2	78.7
06/05/2017 18:00	73.6	62.8	62.9	61.0	60.7	57.3	55.4	48.9	91.0	75.1	78.4	75.0	74.1	73.3	79.3	72.5
06/05/2017 18:10	73.7	64.3	63.6	62.9	74.6	74.7	62.4	52.5	90.6	79.8	78.3	82.2	99.7	101.7	84.3	74.5
06/05/2017 18:20	73.9	66.5	63.3	61.5	61.4	57.9	53.6	46.3	89.7	87.7	81.4	77.2	71.1	71.1	76.9	64.7
06/05/2017 18:30	74.2	64.1	64.0	62.5	65.2	65.5	58.9	49.0	91.4	79.6	80.4	76.8	90.2	92.3	85.6	71.0
06/05/2017 18:40	73.7	64.3	63.2	61.6	61.1	57.8	56.9	51.0	90.4	77.1	79.1	72.3	69.9	69.0	78.3	72.0
06/05/2017 18:50	74.1	66.0	64.6	62.1	61.9	58.8	54.8	50.1	89.7	82.4	79.4	73.1	71.5	70.6	71.2	71.6
06/05/2017 19:00	76.3	67.8	66.1	65.5	63.6	62.3	55.9	48.8	90.4	87.3	84.3	85.6	79.5	82.6	77.7	76.1
06/05/2017 19:10	74.3	64.8	63.3	61.7	61.7	58.1	56.3	52.5	93.4	82.2	79.3	75.6	73.0	71.6	81.1	78.1
06/05/2017 19:20	74.8	66.0	68.8	62.9	68.6	65.6	58.2	48.8	91.0	82.5	90.8	80.7	90.9	88.1	79.1	70.2
06/05/2017 19:30	73.9	66.5	66.7	63.6	61.7	58.2	52.3	47.5	91.9	92.0	91.5	87.3	79.4	73.2	70.4	75.8
06/05/2017 19:40	73.0	63.2	63.2	61.8	61.3	58.2	55.2	47.6	91.0	76.7	76.2	77.8	80.7	74.7	80.6	70.7
06/05/2017 19:50	74.4	63.3	62.5	61.4	61.3	58.3	52.6	47.9	91.0	77.3	77.6	69.8	74.2	73.0	70.1	71.4
06/05/2017 20:00	74.2	66.0	63.9	62.5	62.4	59.4	54.4	47.5	93.9	84.6	80.1	74.7	75.2	72.6	77.4	64.8
06/05/2017 20:10	74.6	63.3	62.6	61.7	62.2	59.3	54.7	49.2	92.2	77.2	76.1	73.7	78.2	76.7	72.3	71.3
06/05/2017 20:20	73.6	65.7	63.1	64.6	70.7	67.6	56.3	46.3	91.2	86.1	82.8	84.2	90.5	87.6	74.2	67.2
06/05/2017 20:30	75.1	64.2	63.4	61.6	61.1	57.8	57.1	51.9	92.3	78.5	79.4	72.6	72.4	70.4	83.9	75.9
06/05/2017 20:40	73.6	64.0	63.2	61.8	62.4	59.9	55.3	47.8	91.1	84.4	79.1	78.2	78.3	75.8	72.9	67.6
06/05/2017 20:50	73.9	64.2	63.3	61.7	61.6	57.8	54.8	48.0	90.8	85.1	77.9	74.3	74.4	68.9	80.3	73.1
06/05/2017 21:00	74.4	64.8	65.7	63.8	62.3	58.9	53.0	50.8	90.1	81.0	85.7	83.1	80.0	76.6	70.8	75.1
06/05/2017 21:10	76.1	64.6	63.4	61.8	61.0	57.6	52.8	50.6	94.3	80.6	76.6	75.5	72.7	69.7	74.1	79.5
06/05/2017 21:20	74.7	68.0	67.0	65.2	63.5	59.6	56.9	50.4	92.0	87.4	86.8	83.7	85.7	74.5	83.5	76.3
06/05/2017 21:30	75.1	66.5	63.6	62.6	61.9	58.7	52.8	45.1	91.9	87.2	79.3	78.6	77.7	72.0	69.4	63.4
06/05/2017 21:40	74.3	66.2	65.2	62.8	61.4	57.5	51.4	44.4	91.6	83.6	83.6	77.1	74.5	67.0	65.5	65.7
06/05/2017 21:50	73.9	63.4	62.7	62.0	61.6	58.4	54.2	48.6	90.8	78.2	74.6	71.8	72.0	72.6	83.3	73.4
06/05/2017 22:00	74.7	64.5	63.5	62.6	67.1	64.5	57.7	49.5	90.4	77.8	79.9	79.2	89.2	86.9	81.4	74.5
06/05/2017 22:10	74.7	63.6	62.3	62.2	61.7	57.9	53.1	44.3	91.9	74.6	74.6	74.6	74.5	71.3	75.6	68.0
06/05/2017 22:20	75.7	69.7	72.0	69.5	66.0	64.5	58.5	52.5	91.0	91.4	93.9	92.5	90.2	90.6	84.4	75.0
06/05/2017 22:30	76.9	68.0	66.6	65.0	63.9	59.8	53.9	52.0	91.9	87.0	83.5	82.4	86.8	72.0	68.8	79.3
06/05/2017 22:40	74.9	66.7	64.6	63.3	62.4	60.4	57.5	50.2	91.7	85.5	78.2	78.7	77.5	78.1	80.9	73.9
06/05/2017 22:50	76.6	66.1	64.7	63.5	63.2	61.9	56.0	51.1	93.8	78.5	78.4	80.7	82.7	81.7	73.0	78.3
06/05/2017 23:00	74.7	67.2	65.3	64.3	63.4	60.2	56.8	49.9	86.8	81.5	88.4	83.1	79.0	81.1	82.0	74.9
06/05/2017 23:10	74.6	65.6	63.9	64.5	64.3	60.6	55.0	47.7	90.2	80.8	80.2	77.8	83.6	82.5	77.8	72.2
06/05/2017 23:20	75.7	65.9	64.7	64.8	63.8	60.6	55.9	49.2	89.6	77.1	80.7	79.9	78.5	74.2	77.5	70.6
06/05/2017 23:30	76.6	67.2	65.1	64.4	64.0	60.9	55.3	48.0	94.1	82.7	80.4	79.6	87.2	81.3	77.2	70.7
06/05/2017 23:40	75.7	68.3	65.1	65.0	63.7	60.7	59.5	49.6	91.9	90.5	80.2	82.3	76.4	83.2	87.8	73.7
06/05/2017 23:50	75.9	70.2	65.4	65.2	63.9	60.4	56.8	47.1	93.1	93.4	84.6	83.2	79.6	77.7	83.1	69.2

APPENDIX B - TERMINOLOGY

This appendix provides an explanation of some of the acoustics terms used in this report.

	The human ear does not sense all frequencies of sound equally. Our sensitivity is at a maximum at around 2 kHz and steadily decreases above and below. Below 20 Hz and above about 20 kHz we can't hear at all.
A-weighting L_A or L_{pA}, L_{WA},	Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA}.
L_p	*The instantaneous sound pressure level* (L_p)
L_{pA} (or L_A)	*The A-weighted instantaneous sound pressure level* (L_{pA} or L_A)
	This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125 s (FAST time constant) or the previous 1 s (SLOW time constant).
L_{AF}, L_{AS}	The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max}	*The maximum instantaneous sound pressure level* (L_{max}),
L_{Amax}	*The A-weighted maximum instantaneous sound pressure level* (L_{Amax})
L_{AFmax}	*The A-weighted maximum instantaneous sound pressure level with a FAST time constant* (L_{AFmax}).
L_{min} , L_{Fmin}	The opposite of the L_{max} is the *minimum instantaneous sound pressure level* or L_{min} etc. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{N,T}$	*The percentage exceedance sound pressure level* ($L_{N,T}$),
$L_{AN,T}$ $L_{AFN,T}$ N = %age value, 0-100 T = measurement time e.g. L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$	*The A-weighted percentage exceedance sound pressure level* ($L_{AN,T}$), *the A-weighted percentage exceedance sound pressure level with a FAST time constant* ($L_{AFN,T}$).
	This is the sound pressure level exceeded for *N*% of time period *T*. e.g. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB.
	L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}.
	It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{eq,T}$	The *equivalent continuous sound pressure level over period T* ($L_{eq,T}$),
$L_{Aeq,T}$ T = measurement time e.g. $L_{Aeq,5min}$	*The A-weighted equivalent continuous sound pressure level over period T* ($L_{Aeq,T}$).
	This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value.
	The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation

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