

Acoustic Assessment at



533-535 Oxford Road Reading

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Executive Summary

Ned Johnson Acoustic Consultants Limited has been appointed to undertake an acoustic assessment for the proposed development at 533-535 Oxford Road, Reading.

This report provides the results of the acoustic survey, which covers the various noise sources affecting the proposed apartments at 533-535 Oxford Road.

As a result of the survey this report makes recommendations for noise performance of glazing for the new property that will adequately protect future occupants from noise. This will ensure that the internal noise guidelines set out in BS8233: 2014 and the World Health Organisation Guidelines for Community Noise are met.



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1. Introduction

- 1.1 Ned Johnson Acoustic Consultants Limited has been appointed to undertake an acoustic assessment for the proposed development at 533-535 Oxford Road, Reading.
- 1.2 The application for planning permission is for the change of use of the 1st floor from a social club to 2 residential apartments.
- 1.3 Recommendations for glazing performance and sound insulation have been made based upon the measurements taken during the survey and a suitable specification is proposed to meet the likely requirements of Reading Borough Council. The proposed apartments will have a suitable insulation scheme and will ensure all future occupants are suitably protected from external noise sources.
- 1.4 The assessment takes account of the existing noise environment, which has been quantified using direct measurement. The noise levels inside the building have been compared to the internal noise recommendation contained in British Standard 8233: 2014 *Sound insulation and noise reduction for buildings – Code of practice*. The detailed method in BS8233:2014 was used to calculate the necessary level of glazing for bedrooms and living rooms.

2. Site Description

- 2.1 533-535 Oxford Road has an existing restaurant at ground floor level with a former social club use at first floor level. The main sources of noise are road traffic travelling along Oxford Road and the various items of plant at the rear serving nearby restaurants and take aways.
- 2.2 Figure 1 below shows the location of the development and the monitoring point.

Figure 1.





3. Reference Documents

National Planning Policy Framework

- 3.1 The Department of Housing, Communities and Local Government published the National Planning Policy Framework (NPPF) in February 2019.
- 3.2 Paragraphs 170 (e) 180(a), (b) and 182 refer to noise in terms of policy approach:
170. Planning policies and decisions should contribute to and enhance the natural and local environment by:
- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

Noise Policy Statement for England

- 3.3 The Department for Environment, Food and Rural Affairs published the *Noise Policy Statement for England* (NPSE) in March 2010. The explanatory note of NPSE defines the terms used in the NPPF:
- "2.20 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*
- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.*
- 2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.”

- 3.4 The NPSE does not define the SOAEL numerically, stating at paragraph 2.22:

“2.22 It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.”

- 3.5 There is no local or national guidance on how the three terms should be defined numerically.
- 3.6 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.
- 3.7 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.
- 3.8 This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking

into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

British Standard 8233:2014

- 3.9 The scope of British Standard 8233: 2014 *Sound insulation and noise reduction for buildings – Code of practice* is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use.
- 3.10 The standard suggests suitable internal noise levels for residential dwellings, as shown in Table 1. Below.

Table 1.

Activity	Location	07:00 - 23:00	23:00 - 07:00
		$L_{Aeq, 16 \text{ hour}}$	$L_{Aeq, 8 \text{ hour}}$
Resting	Living Rooms	35	-
Dining	Dining Area	40	-
Sleeping	Bedrooms	35	30

- 3.11 In terms of this development the internal noise levels have been compared to the internal noise levels in Table 1. It is suggested in this report that by meeting these noise levels the development would be classed as NOAEL.



3.12 With respect to the night-time maximum noise levels, the World Health Organisation guidelines state:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAF max more than 10-15 times per night.”

3.13 As part of the planning process Reading Borough Council has requested a noise impact assessment.



4. Survey Methodology

- 4.1 The survey was conducted over a 47-hour period from February 4th to February 6th 2020.
- 4.2 The instruments used for the survey were a Bruel & Kjaer 2260 and a Bruel & Kjaer 2250 sound level meters.
- 4.3 The sound level meters were calibrated immediately before and after use with a Bruel & Kjaer 4231 Acoustic Calibrator producing 94dB at 1KHz and no drift was noted in calibration readings. Both calibration results were 93.8dB for the 2260 and 93.7dB for the 2250.
- 4.4 The measurements at MP1 were taken with the sound level meter mounted on a tripod inside a room facing on to Oxford Road. At first floor level This was done as the applicant has relatively new windows in the rooms that will form bedrooms facing Oxford Road, should the application be granted permission.
- 4.5 The measurements at MP2 were taken with the microphone extended out of a first floor window facing on to the rear of 533-535 Oxford Road. The microphone was housed in a Bruel & Kjaer UA1404 weather-proof microphone cover using a 3-metre microphone extension cable.
- 4.6 The sound level meter was set to log every 15 minutes. The metrics measured were L_{Aeq} and $L_{AF Max}$. No unusual events appear to have occurred during the survey.



- 4.7 The weather during the survey was dry with showery periods. The temperature ranged from 3°C – 9°C with wind speed less than 5m/s.



5. Noise Survey Results

5.1 The tables below show the results of measurements taken during the survey.

Table 2. Summary of measured noise levels at MP1.

Date	Duration	$L_{Aeq,T}$	10 th Highest $L_{AF\ Max}$
04/02/20	21:30 – 23:00	37	N/A
04/02/20	23:00 – 07:00	34	52
05/02/20	07:00 – 23:00	41	N/A
05/02/20	23:00 – 07:00	36	53
06/02/20	07:00 – 20:30	41	N/A

Table 3. Summary of measured noise levels at MP2.

Date	Duration	$L_{Aeq,T}$	10 th Highest $L_{AF\ Max}$
04/02/20	21:30 – 23:00	50	N/A
04/02/20	23:00 – 07:00	46	62
05/02/20	07:00 – 23:00	54	N/A
05/02/20	23:00 – 07:00	46	60
06/02/20	07:00 – 20:30	54	N/A

5.2 The next sections discuss the sound insulation required based on the external noise data. The calculations were made using the detailed method in BS8233:2014. The full data can be found in Appendix 3.



6 Evaluation of results

- 6.1 The suitability of the site for residential development has been determined by comparing the measured noise levels with the criteria set out in Section 3 of this report.
- 6.2 The development, with suitable glazing and sound insulation, will be able to meet the guidelines of BS8233:2014 for internal noise. The sound pressure levels, incident upon the facades of the proposed dwelling are not unusual for such an environment and appropriate glazing and sound insulation is proposed in the next section.
- 6.3 The recommendation for glazing will take account of the effect of road traffic noise which generally has a lower frequency content. To ensure this is suitably controlled all ratings for glazing will be the sound reduction index (R_w) with C_{tr} , which is the traffic A-weighted spectrum that can be added to the to take account of low frequency traffic noise.
- 6.4 With suitable glazing and sound insulation installed the internal noise levels at the property are considered acceptable for residential development, as they will be within the range of values deemed to be NOEL. This is consistent with the Noise Policy Statement England. Considering the noise levels as NOEL is justified here as the internal noise levels will meet those put forward in BS8233:2014 which is judged to be the point where there will be no adverse effect on human health.



7. Mitigation

- 7.1 The weakness in any structure are the windows, which vary in performance, depending upon the thickness of the glass and the space between the panes. The walls will be solid brick, which, generally provides a sound reduction index of 50dB (BS8233:2014). A flat roof provides approximately 45dB sound reduction index (BS8233:2014). This demonstrates that in terms of the structure, noise from any external source in this location will be sufficiently attenuated to meet the internal noise standards in BS8233:2014. The glazing will be the weakest part of the structure.
- 7.2 Glazing performance for the rear facades should be double glazing with a minimum acoustic performance of $28R_w$ ($26R_w + C_{tr}$) as this is the level of sound reduction needed to meet the sound pressure guidelines as set-out in BS8233:2014 for L_{Aeq-T} and the $L_{AF Max}$ in the WHO guidance for bedrooms and living rooms. This can be achieved with standard double-glazing using an arrangement of (for example) 4/16/4, which will be sufficient for the purposes of this building in this location.
- 7.3 The glazing for the front of the building facing Oxford Road will require secondary glazing in order to meet the internal noise guidelines in BS8233:2014 and the WHO Guidelines for Community Noise. The secondary glazing should have a minimum gap of 100mm air gap to the secondary pane of glass, which should have a minimum thickness of 4mm.
- 7.4 Any glazing manufacturer should provide certificates that their windows will meet the required sound insulation standard; the performance must be for the whole window and not just the glass.



- 7.5 The full sound insulation value of any window cannot be realized if there are air gaps. These commonly occur around frames due to insecure fixing, shrinkage of wood and poor maintenance. A double-glazed unit must be used in a frame with good seals to realize its full insulating potential. Any gaps or poor fitting could reduce the glazing performance by 2-3dB.
- 7.6 The above glazing recommendation would ensure that during the daytime and night time noise levels in the property would be 35dB_A and 30dB_A respectively due to external sources. Should trickle ventilators be fitted to the windows they should be acoustically lined with a performance of 30 D_{ne,w}+C_{tr}.
- 7.7 BS8233:2014 also states that if internal noise standards are achieved only with windows closed an alternative means of ventilation should be provided. The aforementioned British Standard states that an open window will provide 15db of sound attenuation, this means that if façade levels are more than 50dB_A during the day or 45dB_A during the night then the internal noise targets will be exceeded with windows open and alternative ventilation is required.
- 7.8 In regard to the development, the monitoring data shows that both during the day and night the flat will have façade noise levels, which exceed 45dB_A and 50dB_A. For this reason an alternative means of ventilation should be incorporated into the design to allow residents to ventilate the rooms without having to open the windows, this could be trickle vents on the windows or acoustically lined air bricks. In the case of acoustically lined air bricks the level of attenuation required is the same as for trickle vents. Windows should be openable to allow for rapid ventilation, if required.



- 7.9 During the survey it was noticed that the noise from the extraction plant was audible in the function room section at the rear. This may be due to the existing fire escape door being poorly fitted, which is to be removed. Once development is underway should the plant noise still be audible it is recommended to ensure that the extraction ducting, which is attached to the external rear wall, is fitted with appropriate anti-vibration mounts to prevent noise transference through the structure.
- 7.10 Should the ducting already be attached with anti-vibration mounts and the plant noise is still audible insulation of the wall should be undertaken. The rear wall should have a Gypframe GL1 lining channel framework attached to give a 35mm cavity. The cavity should be filled with 25mm Isover APR 1200 and then two layers of 12.5mm SoundBloc plasterboard attached.



Appendix 1: Glossary of Terms

Daytime Defined in BS8233 and BS4142 as the period 07:00-23:00 hours.

Night-time Defined in BS8233 and BS4142 as the period 23:00-07:00 hours.

Decibel (dB): A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure levels the reference quantity is 20 μPa . The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB_A : Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB_A broadly agree with people's assessment of loudness. A change of 3 dB is the minimum perceptible under normal conditions, and a change of 10 dB corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB_A ; normal conversation about 60 dB_A at 1 metre; heavy road traffic about 80 dB_A at 10 metres; the level near a pneumatic drill about 100 dB_A .

$L_{A10,T}$: The A weighted noise level exceeded for 10% of the measurement period, T. It gives an indication of the upper limit of fluctuating noise such as that from road traffic.

$L_{A90,T}$: The A weighted noise level exceeded for 90% of the measurement period, T. This is defined in BS 4142 as the background noise level.

L_{AE} : The sound exposure level – the level of a sound with a period of 1 second that has the same sound energy as the event considered.



$L_{Aeq,T}$: The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T).

$L_{A\ Max}$: The highest A weighted noise level recorded during a noise event. The time weighting (slow or fast) should be stated.



Appendix 2: Calibration Certificates

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, CM6 1HD
www.campbell-associates.co.uk
Phone 01371 871030 Facsimile 01371879106



Certificate of Calibration

Certificate number: 28772 **CALIBRATION**

Test object: Sound Level Meter
Manufacturer: Brüel and Kjær
Type: 2260_G1
Serial no: 2034414

Customer: Ned Johnson Acoustic Consultants Ltd
Address: 378 Church Street,
London, N9 9HS,
Contact Person: Ned Johnson.

Method :
Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. The following items have been calibrated as set out in BS 7580 Part 1:1997

	Producer:	Type:	Serial No:	Certificate number
Microphone	Brüel & Kjær	4189	2169417	28771
Calibrator*	Brüel and Kjær	4231	2039392	28770
Preamplifier	Brüel & Kjær	ZC0026	Not marked	Included

Additional items that also have been submitted for verification

Wind shield	None
Attenuator	None
Extension cable	None

These items have been taken into account wherever appropriate.

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.16 kPa	23.5 °C	45.6 %RH

Date received : 06/06/2018
Date of calibration: 13/06/2018
Date of issue: 13/06/2018

Engineer

Michael Tickner

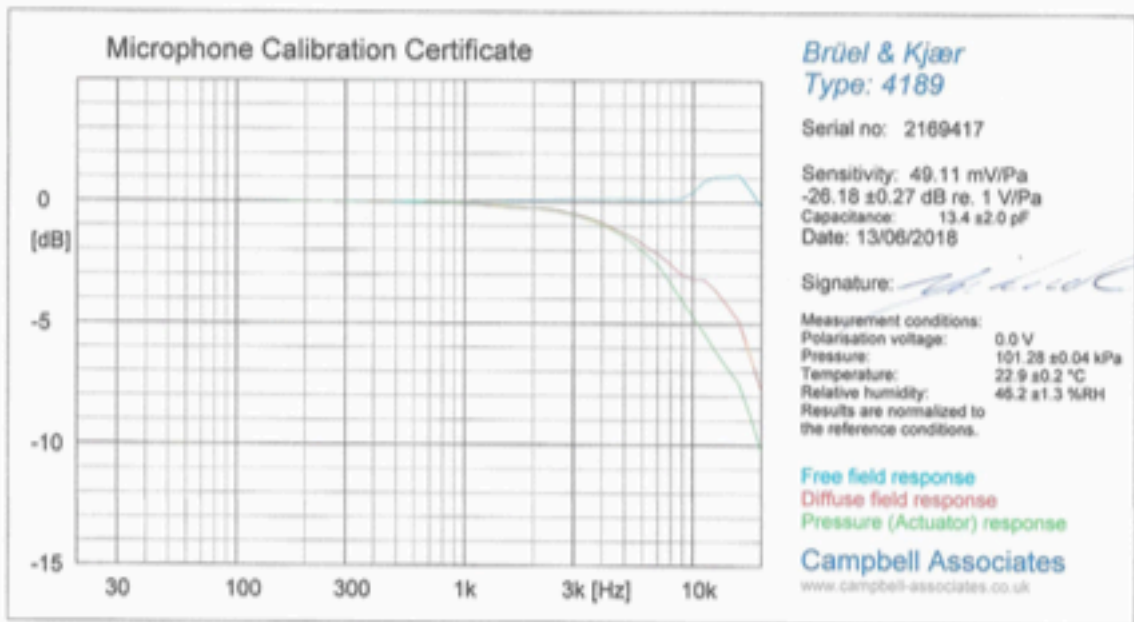
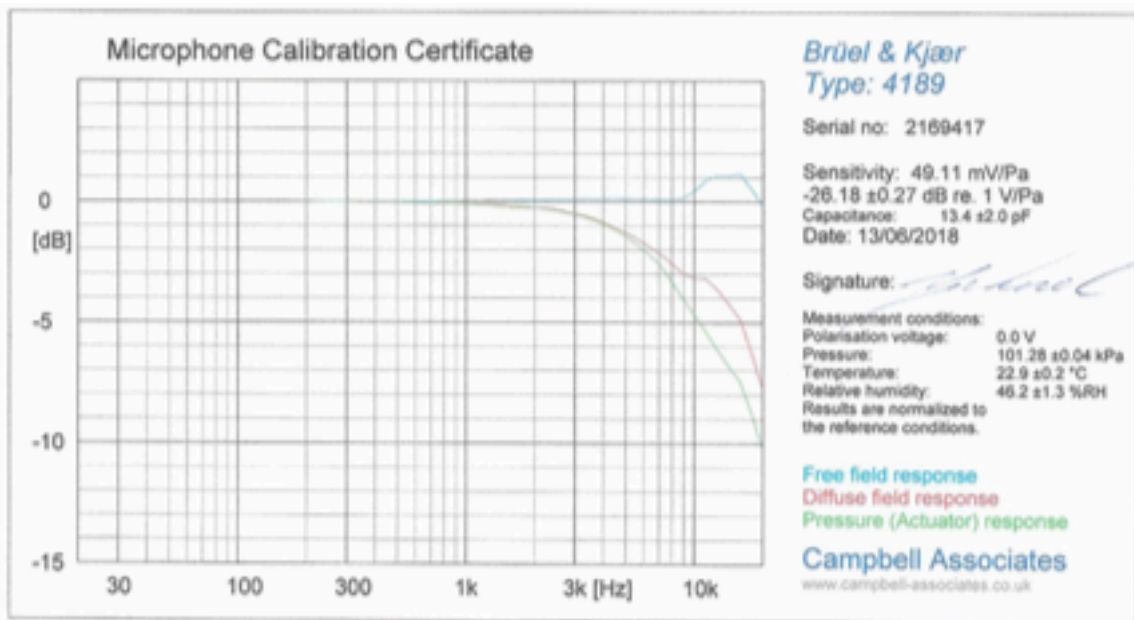
Supervisor

Darren Batten Tech/OA

This certificate provides traceability of measurement to recognized national standards, and to the units of measurement realized at the National Physical Laboratory or other recognized national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

* The calibrator was complete with any required coupler for the microphone specified

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Comment:

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, CM6 1HD, England
www.campbell-associates.co.uk
info@campbell-associates.co.uk
Phone 01371 871030 Facsimile 01371879106


CALIBRATION

Certificate number: 28770
Certificate of Calibration and Conformance

Test object: Sound Calibrator
Manufacturer: Brüel and Kjær
Type: 4231
Serial no: 2039392

Customer: Ned Johnson Acoustic Consultants Ltd
Address: 378 Church Street,
London, N9 9HS.
Contact Person: Ned Johnson.

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	94.04 dB	0.01 dB	999.85 Hz	0.00 %	0.32 %
2:	94.04 dB	0.01 dB	999.86 Hz	0.00 %	0.32 %
3:	94.04 dB	0.01 dB	999.86 Hz	0.00 %	0.32 %
Result (Average):	94.04 dB	0.01 dB	999.86 Hz	0.00 %	0.32 %
Expanded Uncertainty:	0.10 dB	0.02 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	>100	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.
The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0008 dB/kPa Temperature: 0.0015 dB/°C Relative humidity: 0.001 dB/%RH Load volume: 0.0003 dB/mm³
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.
Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal2018\BNK4231_2039392_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	101.306 ± 0.042 kPa	22.5 ± 0.1 °C	46.5 ± 1.1 %RH

Date received for calibration: 06/06/2018
Date of calibration: 13/06/2018
Date of issue: 13/06/2018
Engineer

Supervisor
Michael Tickner
Darren Batten TechIOA

This certificate is issued in accordance with the CA quality management system. It provides traceability of measurement to recognized national standards, and to the units of measurement realized at the National Physical Laboratory or other recognized national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

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Template Cert_Traceable_FC_v1.1

Appendix 3: Data

Noise Measurement Data:

MP1:

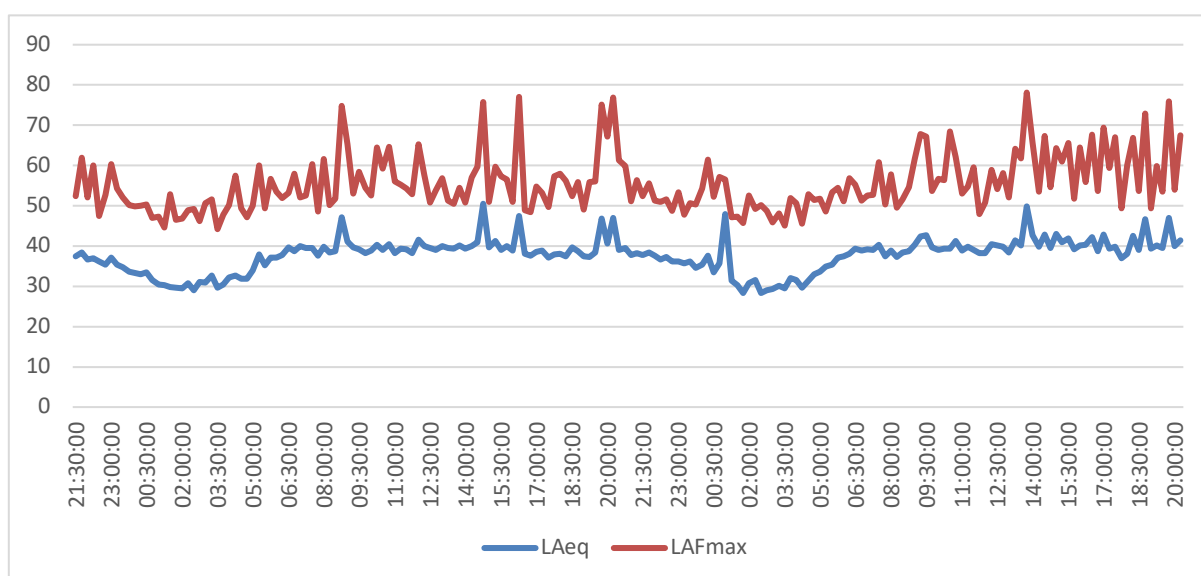


Table 4

Time	L _{Aeq} 15min	L _{AF} Max 15min
21:30:00	37.38	52.37
21:45:00	38.47	61.98
22:00:00	36.58	52.1
22:15:00	36.96	60.03
22:30:00	36.23	47.39
22:45:00	35.34	52.74
23:00:00	37.07	60.34
23:15:00	35.37	54.27
23:30:00	34.68	52.11
23:45:00	33.68	50.11
00:00:00	33.3	49.81
00:15:00	33.01	49.96
00:30:00	33.42	50.31
00:45:00	31.54	46.97
01:00:00	30.37	47.25
01:15:00	30.22	44.63



01:30:00	29.85	52.79
01:45:00	29.65	46.58
02:00:00	29.45	46.87
02:15:00	30.79	48.86
02:30:00	29.08	49.16
02:45:00	31.15	46.25
03:00:00	30.86	50.57
03:15:00	32.71	51.61
03:30:00	29.57	44.19
03:45:00	30.5	47.79
04:00:00	32.23	50.23
04:15:00	32.74	57.42
04:30:00	31.82	49.41
04:45:00	31.87	47.17
05:00:00	33.99	50.08
05:15:00	37.91	60
05:30:00	35.25	49.3
05:45:00	37.14	56.71
06:00:00	37.2	53.44
06:15:00	37.81	51.93
06:30:00	39.67	53.11
06:45:00	38.64	57.92
07:00:00	39.95	52.11
07:15:00	39.46	52.58
07:30:00	39.45	60.41
07:45:00	37.62	48.6
08:00:00	39.78	61.66
08:15:00	38.38	50.14
08:30:00	38.75	51.78
08:45:00	47.17	74.76
09:00:00	41.09	65.2
09:15:00	39.65	53
09:30:00	39.23	58.41
09:45:00	38.17	54.5
10:00:00	38.88	52.47
10:15:00	40.31	64.52
10:30:00	38.98	59.22
10:45:00	40.54	64.68
11:00:00	38.16	56.11
11:15:00	39.32	55.29
11:30:00	39.13	54.36
11:45:00	38.25	52.87
12:00:00	41.51	65.29
12:15:00	40.01	57.62
12:30:00	39.44	50.83



12:45:00	39.04	53.89
13:00:00	39.92	56.81
13:15:00	39.47	51.35
13:30:00	39.32	50.52
13:45:00	40.12	54.53
14:00:00	39.28	50.76
14:15:00	39.94	56.96
14:30:00	40.91	59.74
14:45:00	50.5	75.79
15:00:00	39.73	50.88
15:15:00	41.31	59.71
15:30:00	39.01	57.29
15:45:00	40.02	56.49
16:00:00	38.93	50.91
16:15:00	47.38	77.1
16:30:00	38.04	48.93
16:45:00	37.62	48.36
17:00:00	38.61	54.83
17:15:00	38.87	53.18
17:30:00	37.08	49.62
17:45:00	37.99	57.33
18:00:00	38.03	57.92
18:15:00	37.39	56.27
18:30:00	39.7	52.42
18:45:00	38.64	55.81
19:00:00	37.42	49.12
19:15:00	37.34	55.88
19:30:00	38.45	56.1
19:45:00	46.76	75.14
20:00:00	40.64	67.1
20:15:00	46.97	76.95
20:30:00	38.99	61.25
20:45:00	39.49	59.87
21:00:00	37.75	51.18
21:15:00	38.29	56.35
21:30:00	37.79	52.41
21:45:00	38.35	55.58
22:00:00	37.58	51.2
22:15:00	36.61	50.96
22:30:00	37.24	51.56
22:45:00	36.21	48.75
23:00:00	36.15	53.31
23:15:00	35.69	47.77
23:30:00	36.1	50.64
23:45:00	34.53	50.38



00:00:00	35.36	54.28
00:15:00	37.67	61.42
00:30:00	33.39	52.22
00:45:00	35.63	57.13
01:00:00	47.86	56.54
01:15:00	31.35	47.08
01:30:00	30.25	47.35
01:45:00	28.33	45.67
02:00:00	30.79	52.56
02:15:00	31.59	49.22
02:30:00	28.33	50.14
02:45:00	28.99	48.78
03:00:00	29.39	45.81
03:15:00	30.1	48.16
03:30:00	29.46	45
03:45:00	32.07	51.98
04:00:00	31.53	50.59
04:15:00	29.67	45.51
04:30:00	31.46	52.81
04:45:00	32.95	51.5
05:00:00	33.61	51.68
05:15:00	34.97	48.5
05:30:00	35.31	53.4
05:45:00	37.12	54.43
06:00:00	37.37	51.04
06:15:00	38.05	56.79
06:30:00	39.3	55.27
06:45:00	38.92	51.29
07:00:00	39.17	52.5
07:15:00	39.03	52.73
07:30:00	40.29	60.77
07:45:00	37.38	50.38
08:00:00	38.91	57.87
08:15:00	37.32	49.49
08:30:00	38.32	51.52
08:45:00	38.73	54.69
09:00:00	40.33	61.54
09:15:00	42.31	67.84
09:30:00	42.72	67.18
09:45:00	39.7	53.68
10:00:00	39.02	56.61
10:15:00	39.3	56.39
10:30:00	39.3	68.39
10:45:00	41.19	62.03
11:00:00	38.81	53.06



11:15:00	39.88	54.75
11:30:00	39.01	59.53
11:45:00	38.16	48.01
12:00:00	38.25	50.75
12:15:00	40.41	58.91
12:30:00	40.09	54.14
12:45:00	39.78	58.08
13:00:00	38.4	52.12
13:15:00	41.47	64.11
13:30:00	40.2	61.78
13:45:00	49.86	78.11
14:00:00	42.74	65.79
14:15:00	39.83	53.48
14:30:00	42.79	67.26
14:45:00	39.51	54.68
15:00:00	43.08	64.38
15:15:00	40.88	61.03
15:30:00	41.92	65.61
15:45:00	39.21	51.68
16:00:00	40.22	64.42
16:15:00	40.33	55.82
16:30:00	42.24	67.59
16:45:00	38.66	53.67
17:00:00	42.84	69.35
17:15:00	39.41	59.34
17:30:00	39.83	67.01
17:45:00	36.99	49.42
18:00:00	38.12	60.23
18:15:00	42.59	66.81
18:30:00	39.05	53.69
18:45:00	46.62	72.83
19:00:00	39.3	49.4
19:15:00	40.15	59.8
19:30:00	39.54	53.5
19:45:00	47.03	75.96
20:00:00	40.06	53.98
20:15:00	41.4	67.45

MP2

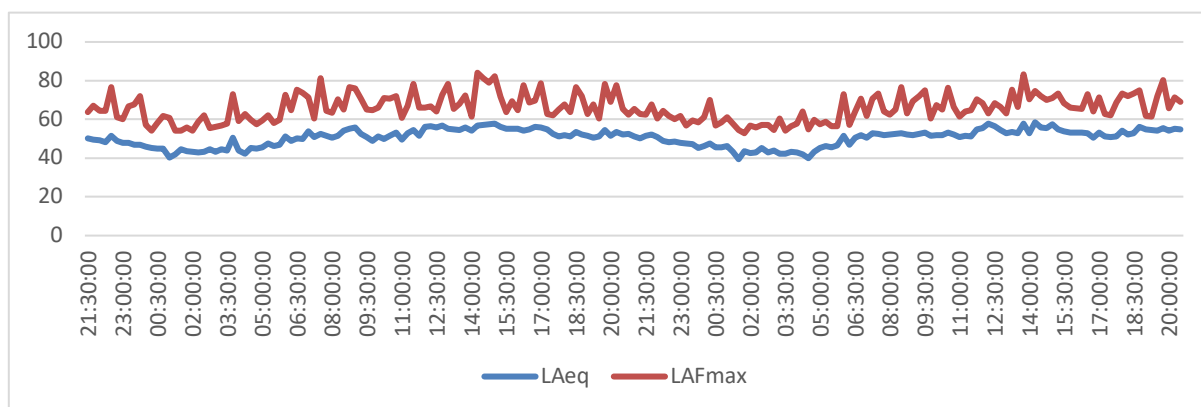


Table 5

Time	L _{Aeq} 15min	L _{AF} Max 15min
21:30:00	50.31	63.72
21:45:00	49.69	67
22:00:00	49.07	64.4
22:15:00	48.14	64.51
22:30:00	51.4	76.73
22:45:00	48.87	61.12
23:00:00	48	60.24
23:15:00	47.86	66.86
23:30:00	46.88	67.65
23:45:00	46.9	72.06
00:00:00	45.96	57.11
00:15:00	45.1	54.34
00:30:00	44.82	58.24
00:45:00	44.94	61.66
01:00:00	40.42	60.65
01:15:00	41.95	54.31
01:30:00	44.73	54.17
01:45:00	43.47	55.82
02:00:00	43.35	54.21
02:15:00	43.08	58.96
02:30:00	43.29	62.03
02:45:00	44.64	55.64
03:00:00	43.4	56.01
03:15:00	44.43	56.99
03:30:00	43.97	57.71



03:45:00	50.44	72.99
04:00:00	43.88	59
04:15:00	42.13	62.77
04:30:00	45.27	59.81
04:45:00	44.85	57.39
05:00:00	45.52	59.44
05:15:00	47.59	62.24
05:30:00	46.18	58.26
05:45:00	47.03	59.94
06:00:00	51.22	72.76
06:15:00	49.03	64.73
06:30:00	50.36	75.47
06:45:00	50.03	73.71
07:00:00	53.84	71.26
07:15:00	50.97	60.34
07:30:00	52.63	81.29
07:45:00	51.7	64.43
08:00:00	50.69	63.54
08:15:00	51.54	70.42
08:30:00	54.26	64.94
08:45:00	55.24	76.54
09:00:00	55.88	76.12
09:15:00	52.57	70.67
09:30:00	50.8	65.14
09:45:00	49.02	64.73
10:00:00	51.19	66.02
10:15:00	49.8	71.18
10:30:00	51.39	70.57
10:45:00	53.26	71.9
11:00:00	49.61	60.74
11:15:00	52.8	66.93
11:30:00	54.63	78.28
11:45:00	51.54	66.04
12:00:00	56.08	65.95
12:15:00	56.46	66.88
12:30:00	55.79	64.23
12:45:00	56.68	72.82
13:00:00	55.09	78.41
13:15:00	54.73	65.26
13:30:00	54.52	68
13:45:00	55.76	72.52
14:00:00	54.15	61.55
14:15:00	56.69	84.11
14:30:00	57.01	81.43
14:45:00	57.61	78.85



15:00:00	57.71	82.43
15:15:00	56.15	71.66
15:30:00	55.2	63.8
15:45:00	55.27	69.49
16:00:00	55.19	64.62
16:15:00	54.26	77.69
16:30:00	54.82	68.85
16:45:00	56.29	69.66
17:00:00	55.82	78.68
17:15:00	54.86	62.81
17:30:00	52.56	62.24
17:45:00	51.21	65.03
18:00:00	51.72	67.88
18:15:00	51.04	63.74
18:30:00	53.59	76.58
18:45:00	52.3	71.97
19:00:00	51.67	62.65
19:15:00	50.62	67.59
19:30:00	51.13	60.52
19:45:00	54.45	78.2
20:00:00	51.4	68.97
20:15:00	53.59	77.75
20:30:00	52.12	65.27
20:45:00	52.6	62.43
21:00:00	51.31	65.41
21:15:00	50.26	62.72
21:30:00	51.54	62.54
21:45:00	52.12	67.84
22:00:00	51.01	60.51
22:15:00	48.95	64.52
22:30:00	48.19	61.66
22:45:00	48.49	60.11
23:00:00	47.92	61.8
23:15:00	47.52	56.91
23:30:00	47.11	59.37
23:45:00	45.24	58.4
00:00:00	46.18	61.26
00:15:00	47.44	69.92
00:30:00	45.58	56.93
00:45:00	45.44	58.6
01:00:00	46.18	61.04
01:15:00	43.36	57.77
01:30:00	39.44	54.67
01:45:00	43.7	52.86
02:00:00	42.57	56.76



02:15:00	43.1	55.8
02:30:00	45.15	57.15
02:45:00	42.8	57.17
03:00:00	43.79	54.62
03:15:00	42.22	60.36
03:30:00	42.37	54.05
03:45:00	43.16	56.45
04:00:00	42.93	57.95
04:15:00	42.06	64.08
04:30:00	40.07	54.92
04:45:00	43.38	59.93
05:00:00	45.28	57.58
05:15:00	46.14	58.85
05:30:00	45.69	56.59
05:45:00	46.5	56.55
06:00:00	51.51	73
06:15:00	46.75	57.17
06:30:00	50.6	64.04
06:45:00	51.99	70.67
07:00:00	50.41	61.82
07:15:00	52.73	70.87
07:30:00	52.43	73.33
07:45:00	51.82	64.21
08:00:00	52.27	62.4
08:15:00	52.67	65.2
08:30:00	52.83	76.82
08:45:00	52.13	63.04
09:00:00	51.87	69.4
09:15:00	52.52	72.15
09:30:00	53.03	74.93
09:45:00	51.56	60.58
10:00:00	51.71	67.51
10:15:00	51.73	65.18
10:30:00	53.11	76.49
10:45:00	52.33	66.35
11:00:00	50.98	61.55
11:15:00	51.41	63.97
11:30:00	51.25	64.7
11:45:00	54.85	70.32
12:00:00	55.53	68.51
12:15:00	57.67	63.02
12:30:00	56.6	68.25
12:45:00	54.42	66.36
13:00:00	52.74	63.07
13:15:00	53.5	75.3



13:30:00	52.93	66.44
13:45:00	57.83	83.44
14:00:00	53.01	70.24
14:15:00	58.52	74.75
14:30:00	55.93	72.02
14:45:00	55.64	70.08
15:00:00	57.41	71.19
15:15:00	54.74	73.37
15:30:00	53.79	68.36
15:45:00	53.28	66.14
16:00:00	53.03	65.85
16:15:00	53.19	65.36
16:30:00	52.84	73.07
16:45:00	50.52	64.2
17:00:00	53.09	71.37
17:15:00	51.04	62.87
17:30:00	50.87	62.07
17:45:00	51.32	68.69
18:00:00	54.23	73.46
18:15:00	52.1	72.06
18:30:00	52.91	73.46
18:45:00	56.12	75.09
19:00:00	54.71	61.72
19:15:00	54.47	61.43
19:30:00	54.1	72.13
19:45:00	55.48	80.17
20:00:00	54.31	65.81
20:15:00	55.06	71.4
20:30:00	54.98	69.2