

St Margaret's The Ward Residents
Newtown Cottages – Aircraft Noise Survey

Aircraft Environmental Noise Survey Report



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1 Introduction

MLM Ireland has been commissioned by St Margaret's The Ward Residents to undertake a series of noise surveys at three selected properties located in the vicinity of Dublin Airport. Noise monitoring of up to 24hrs was undertaken at each property both internally and externally. It is understood that the sound insulation of the rooms assessed had been upgraded.

The purpose of the survey was to identify the noise levels within selected bedrooms of each property during aircraft movements. Of particular interest was the $L_{A_{fmax}}$ noise levels within each surveyed bedroom during night-time hours due aircraft movements. To enable identification of aircraft movements the internal noise level meter was set to trigger audio recordings for events over $L_{A_{fmax}}$ 45 dB and the external noise level meter was set to $L_{A_{fmax}}$ 70 dB in line with local planning guidelines for internal noise.

This report presents the results of the noise survey for each locations detailing the following levels:

- L_{Aeq}
- $L_{A_{fmax}}$
- L_{A1}
- L_{A10}
- L_{A90}

The measurements were carried out by a Consultant certified as competent in environmental noise measurement, using instrumentation conforming to Type 1 Specification, as set out in BS EN 61672: 2013: Electroacoustics. Sound Level Meters. Part 1 Specifications and in accordance with the principles of BS 7445: 2003: Description and Measurement of Environmental Noise.

Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a glossary of terms is included in Appendix A to assist the reader.

Appendix B details the (L_{Aeq} , L_{A1} , L_{A10} , L_{A90} and $L_{A_{fmax}}$) measured noise levels at the boundary of site as Time History Graphs.

2 Policy, Standards and Guidance Documents

A summary of the relevant policy, standards and guidance documents used to inform this survey and assessment is provided below.

- ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures.
- BS 7445: 2003: Description and Measurement of Environmental Noise.
- BS EN 61672: 2013: Electroacoustics. Sound Level Meters
- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings
- ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise
- WHO Guidelines for Community Noise

3 Bedroom Internal Noise Criteria

The internal noise levels have been compared against noise criteria typically applied to residential developments in Ireland at this time. Current planning applications for residential buildings apply guidance taken from ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise.

As advised on ProPG: Planning and Noise, the following noise level criteria would be expected to result in no adverse impact:

Table 1: Noise Level Criteria For This Assessment		
Location	07:00 to 23:00	23:00 to 07:00
Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq} and; ≤ 10 events > 45 dB $L_{A_{fmax}}$

The aforementioned criteria is derived from internal levels detailed in BS 8233:2014 Guidance on sound insulation and noise reduction for buildings and WHO Guidelines for Community Noise 2000.

4 Site Description

Three residential properties were selected for assessment their locations with respect to Dublin Airport are provided in Figure 1 below:

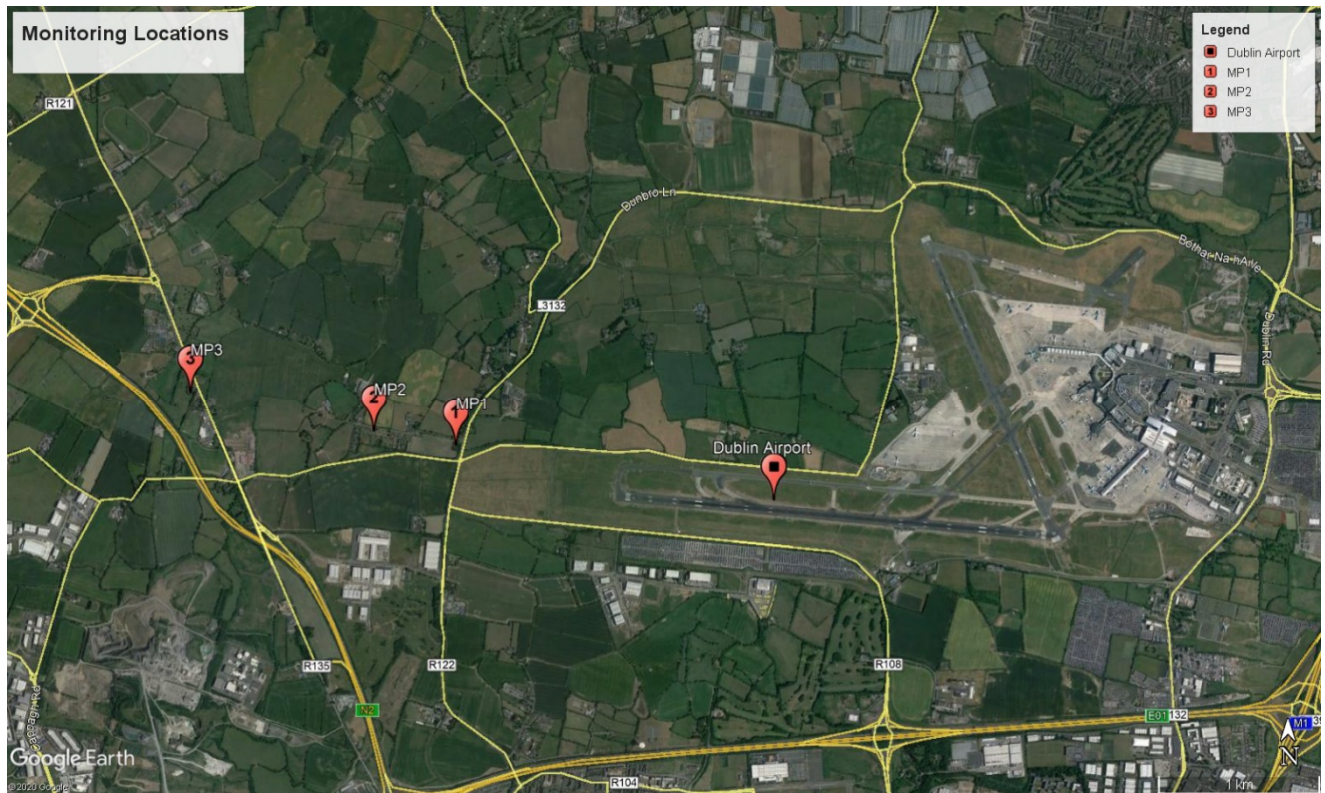


Figure 1: Site Location

Typically aircraft take off from the main runway 10/28 heading west directly over the surveyed properties. The measurements locations are described in detail in the following section.

5 Noise Survey Methodology

In order to quantify the noise levels at each location, unattended noise level measurements were undertaken within a selected bedroom of each property and also externally within the vicinity of the bedroom under assessment.

Measurements were undertaken at three properties for the following periods:

Location 1 – 15:30 Wednesday 9th September to 16:00 Thursday 10th September

Location 2 – 16:30 Thursday 10th September to 16:30 Friday 11th September

Location 3 – 17:00 Friday 11th September to 17:20 Saturday 12th September

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445¹. All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672².

Both internal and external meters were set to continuously log 1 second samples over the measurements periods. In order to identify aircraft movements the meters were set to trigger audio recordings when internal levels exceeded $L_{A_{fmax}}$ 45 dB internally and $L_{A_{fmax}}$ 70 dB externally.

5.1 Equipment

A full inventory of this equipment is shown below.

Table 2: Inventory of Sound Measurement Equipment			
Item	Make & Model	Serial Number	Date of Expiration of Calibration
Sound Level Meter (Internal)	Bruel & Kjaer 2270	3001952	27/01/22
Preamplifier	Bruel & Kjaer 4189	2819925	
Microphone	Bruel & Kjaer ZC-0032	8014	
Sound Level Meter (External)	Bruel & Kjaer 2250	2580156	24/02/22
Preamplifier	Bruel & Kjaer 4189	17445	
Microphone	Bruel & Kjaer ZC-0032	03875	
Calibrator	Bruel & Kjaer 4231	3005620	10/03/20

The sound measurement equipment used during the survey was check calibrated at the start and end of the measurement period. No significant drift in calibration was found to have occurred.

¹ British Standard 7445: 2003: Description and measurement of environmental noise. BSI.

² British Standard 61672: 2013: Electroacoustics, Sound level meters. Part 1 Specifications. BSI

The calibrator used has been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. Calibration certificates are available upon request.

5.2 Weather Conditions

During the survey periods the weather was typically dry with wind speeds in the order of 5 m/s and below. .

All microphones were fitted with a protective windshield.

5.3 Measurement Locations

Internal measurements the microphone was locate on a tripod at approximately 1.2 m from floor level and a minimum of 1.5 m from surrounding walls. During the survey all windows were closed, in wall vents open for background ventilation and rooms unoccupied.

External measurements the microphone was located on a tripod at approximately 2 m form ground level. The microphone was located more than 3.5 m from reflective surfaces.

5.3.1 Location 1

The internal and external monitoring locations are presented below:





Table 3: Location 1		
Location Address	Internal Measurement Location	External Measurement Location
Location 1 Newtown Cottages St Margaret's Co Dublin K67 YV02		



Figure 2: Location 1 Monitoring Locations

5.3.2 Location 2

The internal and external monitoring locations are presented below:

Table 4: Location 2		
Location Address	Internal Measurement Location	External Measurement Location
Location 2 12 Newtown Cottages St Margaret's Co Dublin		

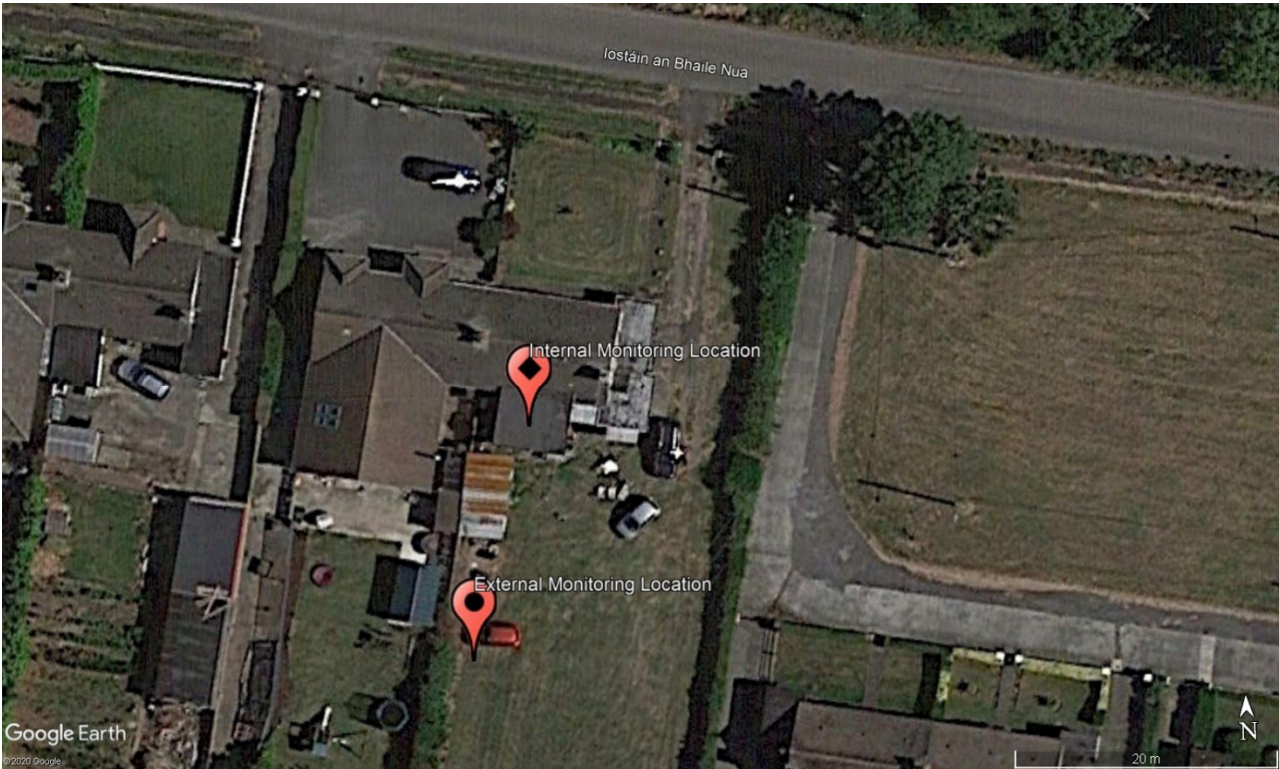


Figure 3: Location 2 Monitoring Locations

5.3.3 Location 3

The internal and external monitoring locations are presented below:

Table 5: Location 3		
Location Address	Internal Measurement Location	External Measurement Location
Location 3 Broughan The Ward Co Dublin D11 XY26		



Figure 4: Location 3 Monitoring Locations

6 Noise Survey Results

6.1 Night-time $L_{A_{\text{fmax}}}$ Events

The tables below presents the measured $L_{A_{\text{fmax}}}$ events over 45dB measured within each property. Only exceedances over 45dB are shown which are directly attributed to aircraft movements. In addition the external $L_{A_{\text{fmax}}}$ events have also been presented.

It should be noted that Dublin Airport is currently operating at reduced capacity due to COVID-19 as such the events are likely to increase once restrictions to travel have been reduced.

6.1.1 Location 1

Table 6: $L_{A_{\text{fmax}}}$ Exceedances over 45 dB – Location 1

Number of Events	Date and Time of Event	External Measured $L_{A_{\text{fmax}}}$ dB	Internal Measured $L_{A_{\text{fmax}}}$ dB
1	10/09/20 04:08:52	72	48
2	10/09/20 05:37:54	79	49
3	10/09/20 05:50:57	86	52
4	10/09/20 05:53:25	81	48
5	10/09/20 05:57:37	88	55
6	10/09/20 05:59:37	83	54
7	10/09/20 06:14:18	82	52
8	10/09/20 06:19:23	86	56
9	10/09/20 06:22:24	81	48
10	10/09/20 06:25:47	81	50
11	10/09/20 06:28:34	82	51
12	10/09/20 06:32:55	83	53
13	10/09/20 06:34:29	82	53
14	10/09/20 06:36:12	82	52
15	10/09/20 06:37:38	83	53
16	10/09/20 06:49:00	77	46
17	10/09/20 06:50:36	85	53
18	10/09/20 06:52:08	81	54
19	10/09/20 06:54:42	86	57
20	10/09/20 06:58:19	83	53
Total Number of Events			20

It can be seen from the table above that 20 events exceed the guidance of ≤ 10 events > 45 dB $L_{A_{\text{fmax}}}$. The exceedances above the 45 dB range from 1 to 11 dB.

Whilst on site it was noted that the subjectively dominant noise transmission path was via the roof.

6.1.2 Location 2

Table 7: $L_{A_{\text{fmax}}}$ Exceedances over 45 dB – Location 2		
Number of Events	Date and Time of Event	Internal Measured $L_{A_{\text{fmax}}}$ dB
1	11/09/20 01:22:41	51
2	11/09/20 05:52:35	48
3	11/09/20 06:09:43	46
4	11/09/20 06:17:09	48
5	11/09/20 06:21:03	50
6	11/09/20 06:27:56	46
7	11/09/20 06:29:19	48
8	11/09/20 06:32:22	47
9	11/09/20 06:34:00	47
10	11/09/20 06:36:29	47
11	11/09/20 06:38:00	49
12	11/09/20 06:39:34	48
13	11/09/20 06:42:32	48
14	11/09/20 06:44:01	47
15	11/09/20 06:45:26	50
16	11/09/20 06:52:02	48
17	11/09/20 06:55:17	50
Total Number of Events		17

It can be seen from the table above that the 17 events exceed the guidance of ≤ 10 events > 45 dB $L_{A_{\text{fmax}}}$. The exceedances above the 45 dB range from 1 to 6 dB.

Whilst on site it was noted that the subjectively dominant noise transmission path was via the roof. Please note due to an issue with the external meter at Location 2 measurements were only logged from 16:30 to 00:00.

6.1.3 Location 3

Table 8: L _{Afmax} Exceedances over 45 dB – Location 1			
Number of Events	Date and Time of Event	External Measured L _{Afmax} dB	Internal Measured L _{Afmax} dB
1	12/09/20 05:52:29	82	46
Total Number of Events			1

It can be seen from the table above that the 1 events exceed the guidance of ≤ 10 events > 45 dB L_{Afmax}. The event exceeded the 45dB by 1 dB. Another exceedance was noted at 06:03 hrs however the event was short in duration (1 sec) and did not trigger an audio recording, due to the short duration it is assumed this can be attributed to an isolated event as aircraft movements typically lasted over 20 seconds.

The table below presents the noted aircraft events measured and recorded on external noise meter with corresponding internal noise levels.

Table 9: L _{Afmax} Aircraft Movements at Location 3			
Number of Events	Date and Time of Event	External Measured L _{Afmax} dB	Internal Measured L _{Afmax} dB
1	11/09/20 23:52:46	75	42
2	12/09/20 00:10:18	74	40
3	12/09/20 05:52:29	82	46
4	12/09/20 06:03:46	71	40
5	12/09/20 06:11:20	74	39
6	12/09/20 06:20:20	76	44
7	12/09/20 06:22:35	78	42
8	12/09/20 06:24:06	72	42
9	12/09/20 06:32:25	77	42
10	12/09/20 06:34:02	76	44
11	12/09/20 06:36:50	77.	44.9
12	12/09/20 06:38:24	77	44
13	12/09/20 06:39:45	76	41
14	12/09/20 06:39:46	76	41
15	12/09/20 06:41:10	75	43
16	12/09/20 06:42:42	78	44
17	12/09/20 06:44:16	78	43

Table 9: $L_{A_{fmax}}$ Aircraft Movements at Location 3

Number of Events	Date and Time of Event	External Measured $L_{A_{fmax}}$ dB	Internal Measured $L_{A_{fmax}}$ dB
18	12/09/20 06:49:03	74	43
19	12/09/20 06:53:27	76	43
20	12/09/20 06:57:15	73	43
21	12/09/20 06:59:41	74	39
Total Number of Events			21

6.1.4 Summary of Exceedances

From the results of the survey it can be seen there are significant amount of ≤ 10 events over the guideline $L_{A_{fmax}}$ of 45dB at Locations 1 and 2, (20 and 17 respectively). For Location 3, one event was recorded. It should be noted that these events are likely to increase considerably once Dublin airport returns to normal operations and flight numbers increase.

6.2 Summary of Broadband Noise Levels

The tables below presents a summary of the noise levels at each location. Time history graphs at each location presenting the measured L_{Aeq} , $L_{A_{fmax}}$, L_{A10} and L_{A90} noise levels are presented at the rear of this report.

6.2.1 Internal Noise Levels

The table below presents the logarithmic average noise levels ($L_{Aeq,T}$, L_{A90} , L_{A10}) and maximum $L_{A_{fmax}}$ noise levels during both day-time and night-time periods.

It should be noted that these levels include all events from aircraft and domestic activities (dogs barking, door slams etc.).

Table 10: Measured Internal Broadband Sound Pressure Levels (dB)

Measurement Position	Period	$L_{Aeq,T}$ (dB)	$L_{A_{fmax}}$ (dB)	L_{A1T} (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Location 1	Daytime - (07:00 – 23:00)	34	65	37	36	31
	Night-time (23:00-07:00)	30	63	32	31	29
Location 2	Daytime - (07:00 – 23:00)	39	82	42	41	35
	Night-time (23:00-07:00)	26	66	30	29	24
Location 3	Daytime - (07:00 – 23:00)	46	88	51	50	37
	Night-time (23:00-07:00)	23	63	27	26.5	21

The noise levels are typically below the guideline values given Table 1

6.2.2 External Noise Levels

The table below presents the logarithmic average noise levels ($L_{Aeq,T}$, L_{A90} , L_{A10}) and maximum L_{Amax} noise levels during both day-time and night-time periods.

Table 11: Measured External Broadband Sound Pressure Levels (dB)						
Measurement Position	Period	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)	L_{A1T} (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Location 1	Daytime - (07:00 – 23:00)	65	99	66	66	64
	Night-time (23:00-07:00)	60	88	61	61	59
Location 2	Daytime - (16:30 – 23:00)	47	86	49	48	45
	Night-time (23:00-00:00)	48	62	49	49	47
Location 3	Daytime - (07:00 – 23:00)	63	88	65	65	62
	Night-time (23:00-07:00)	57	83	59	59	56

Please note due to an issue with meter at Locations 2 measurements were only logged from 16:30 to 00:00.

7 Conclusions

MLM Ireland has been commissioned by St Margaret's The Ward Residents to undertake a series of noise surveys at three residential locations following acoustic mitigation works to the facades of the buildings.

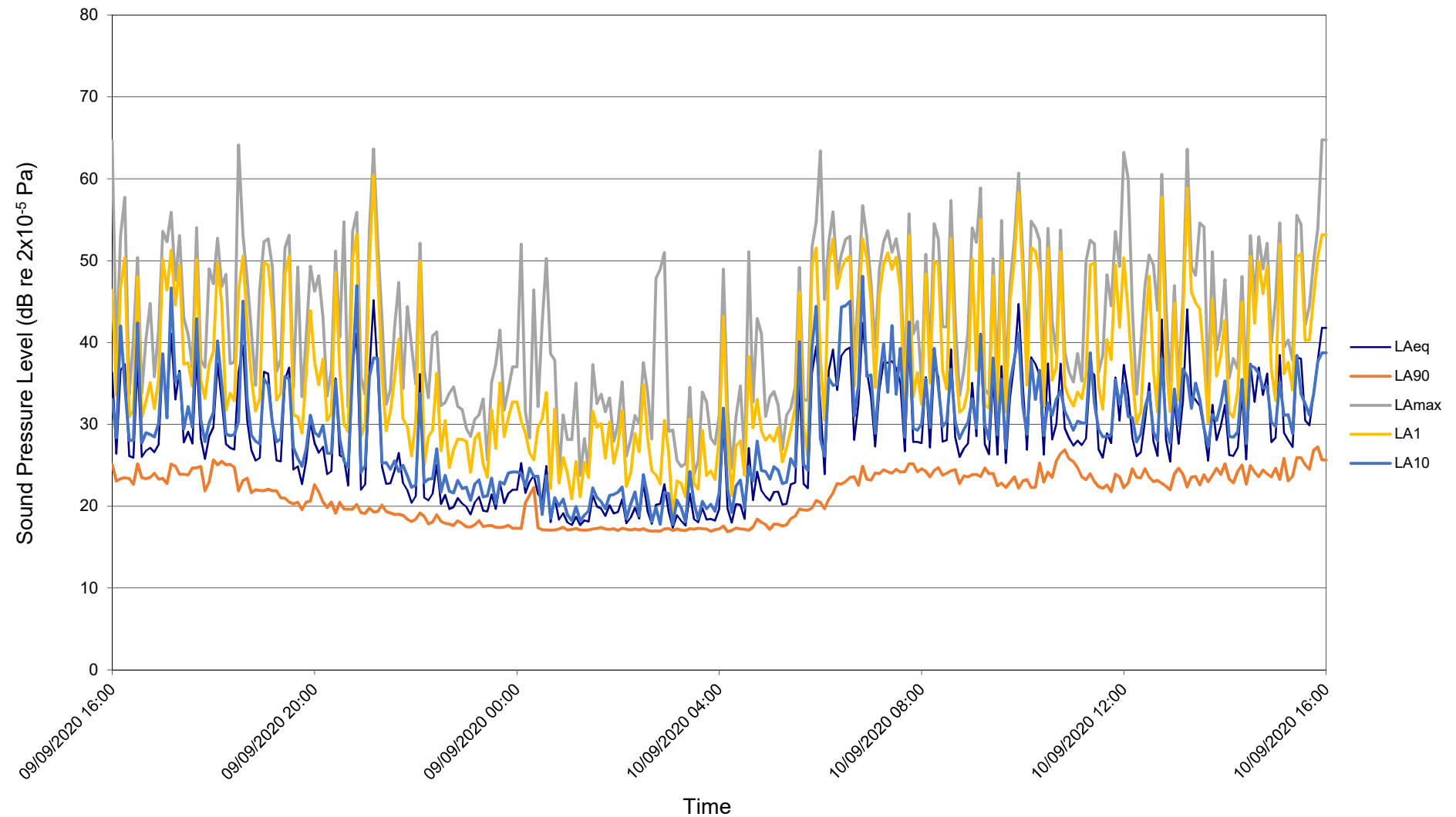
Noise levels measurements of up 24hrs were undertaken within a bedroom of each property and also externally. The results of noise surveys have been compared against typical internal noise criteria for residential buildings used in Ireland. It was found that two of the three locations have a number of exceedances over the guideline ≤ 10 events > 45 dB $L_{A_{fmax}}$. It should be noted that these events are likely to increase once restrictions ease following the COVID-19 pandemic and Dublin Airport returns to operating at normal capacity.

Appendix A - Glossary of Acoustic Terminology

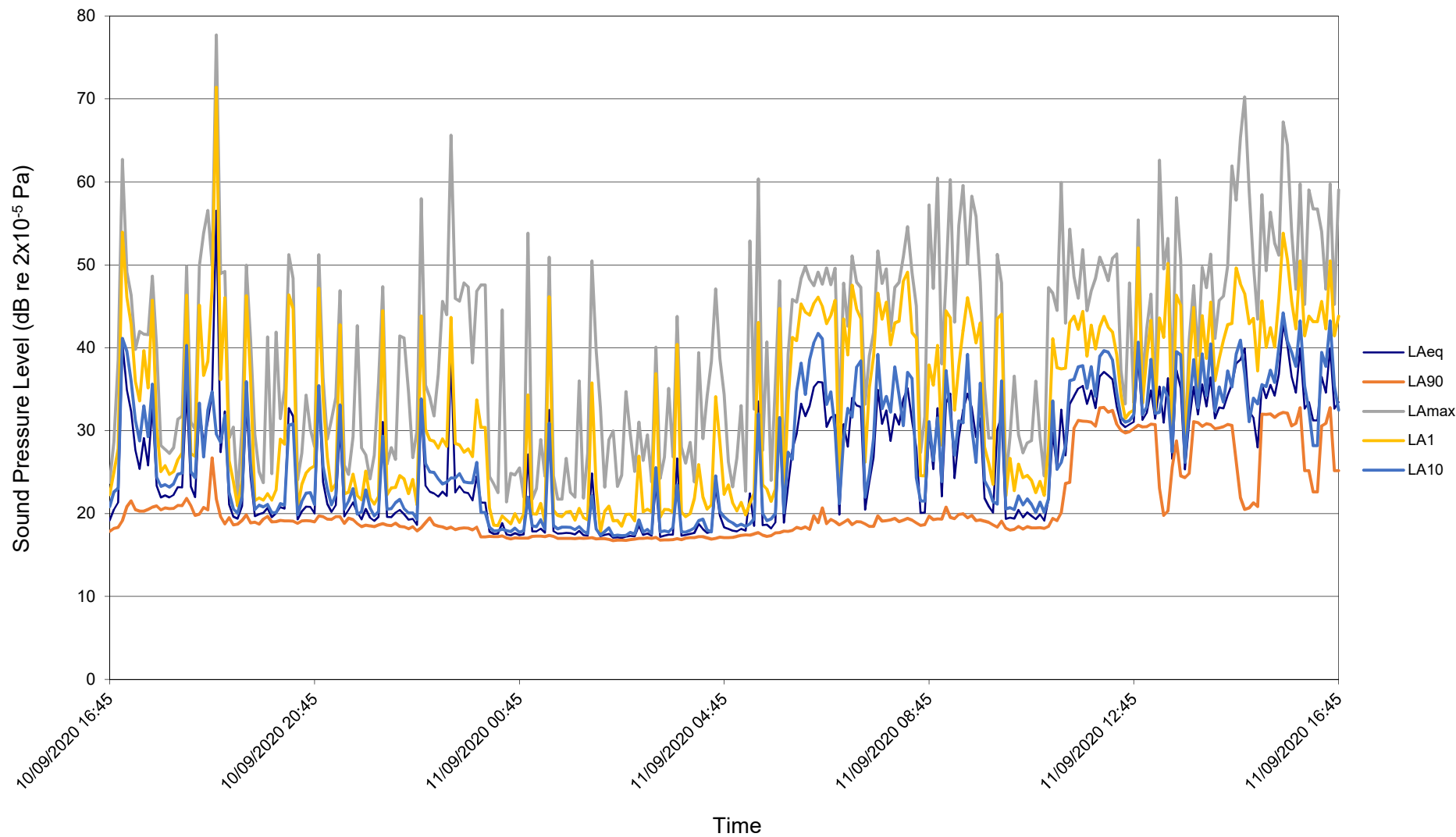
Wording	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log ₁₀ (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L _{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1 m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

Appendix B - Time History Graphs

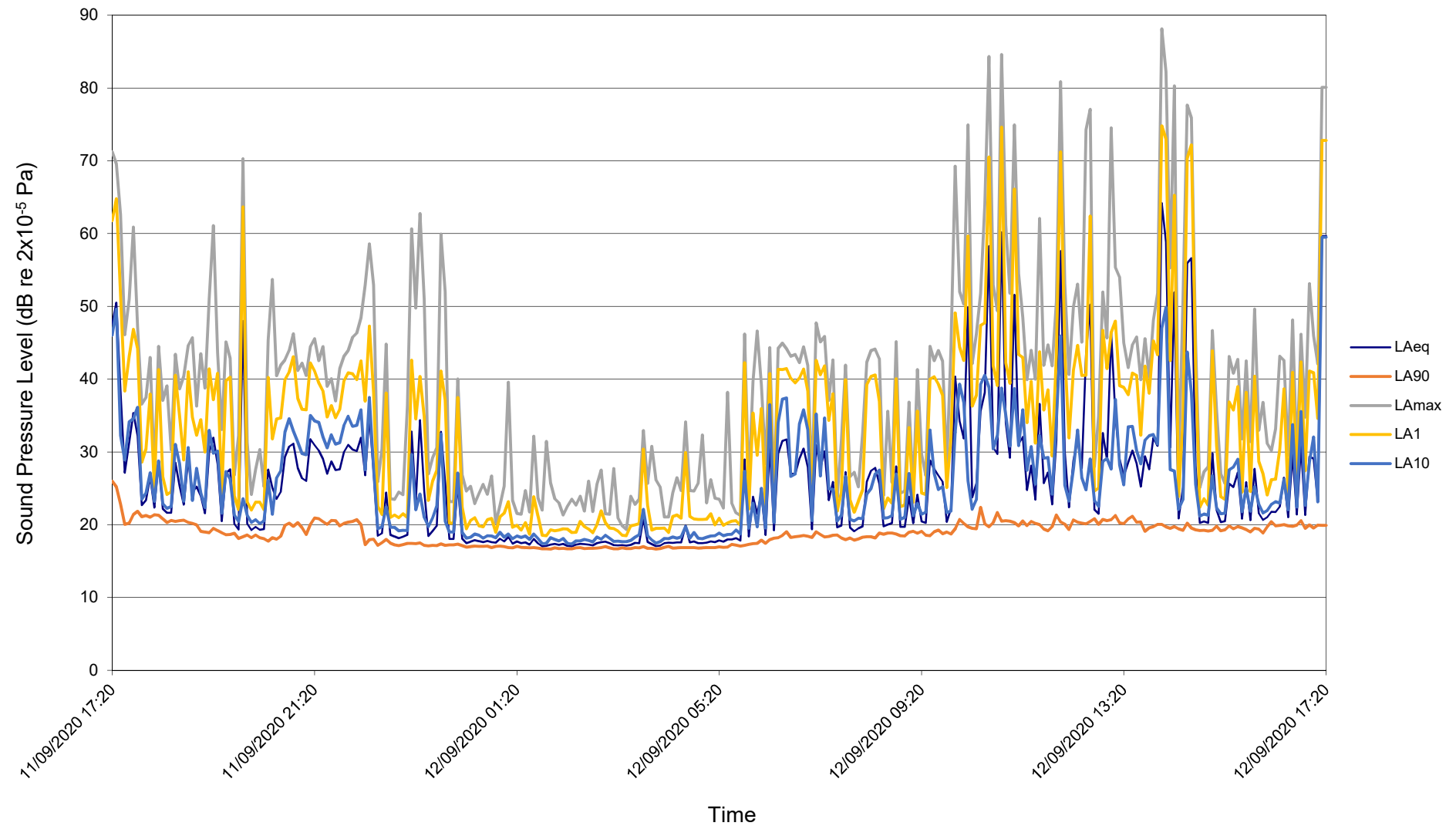
Monitoring Location 1 Internal
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History



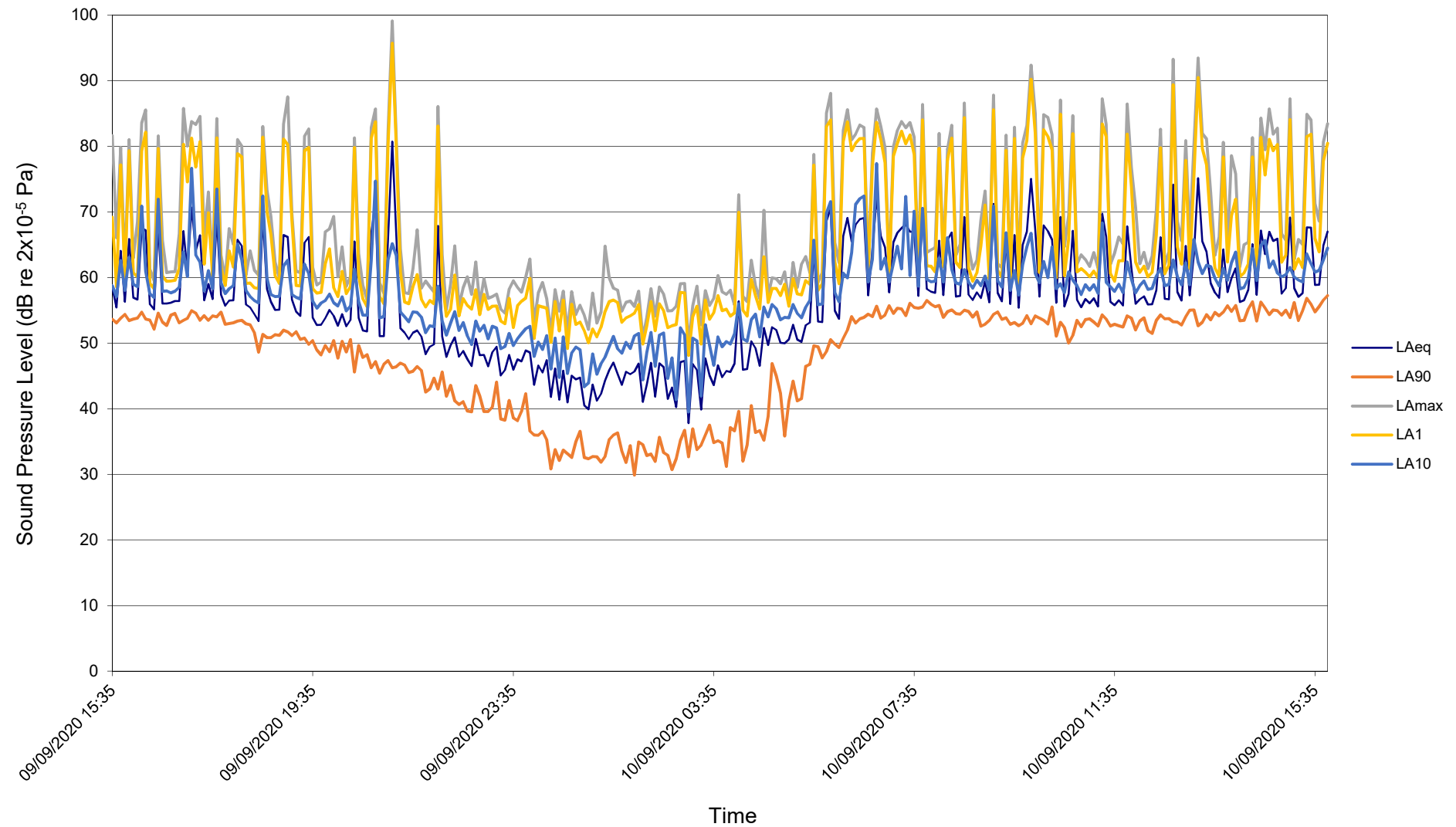
Monitoring Location 2 Internal
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History



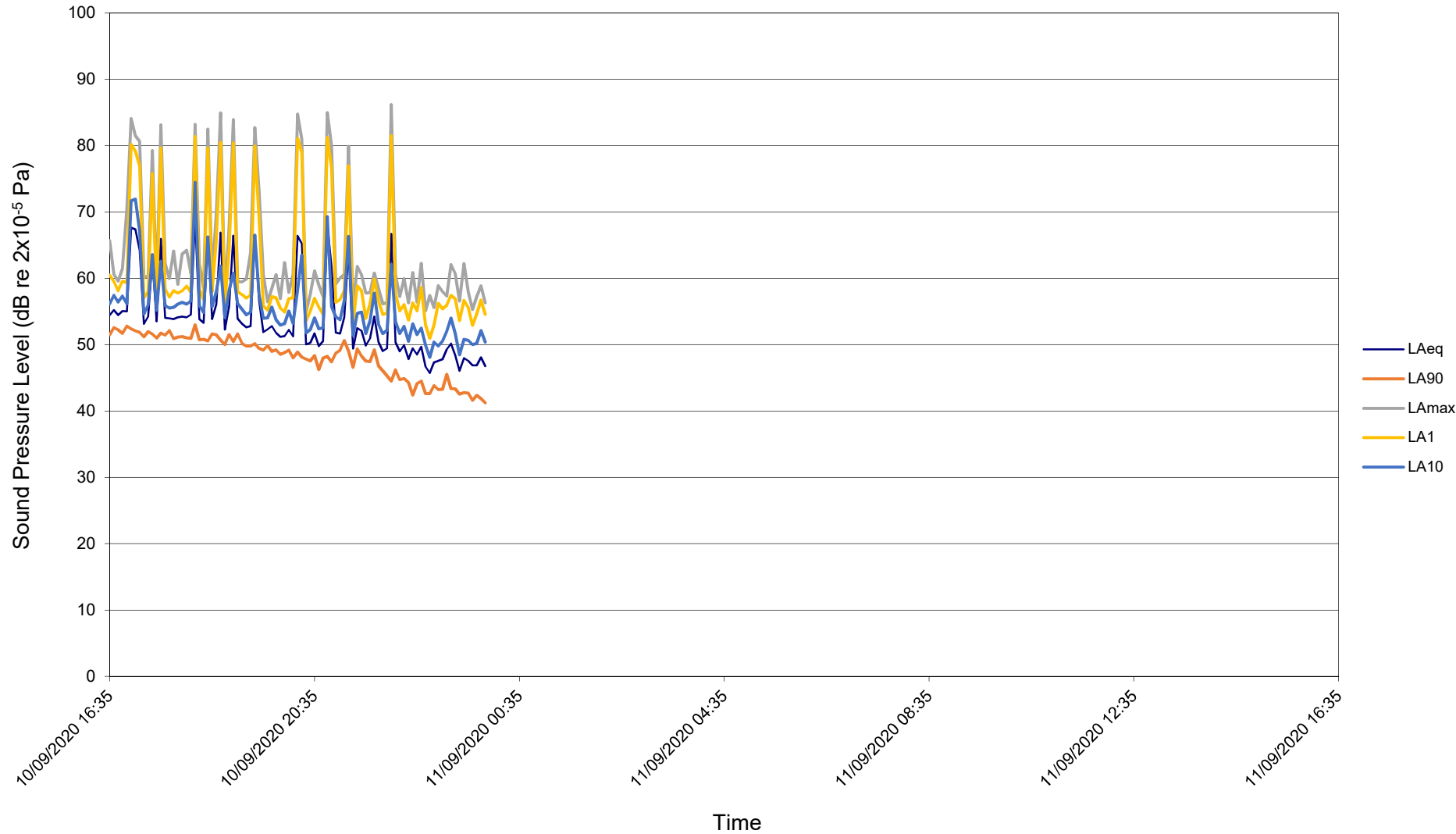
Monitoring Location 3 Internal
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History



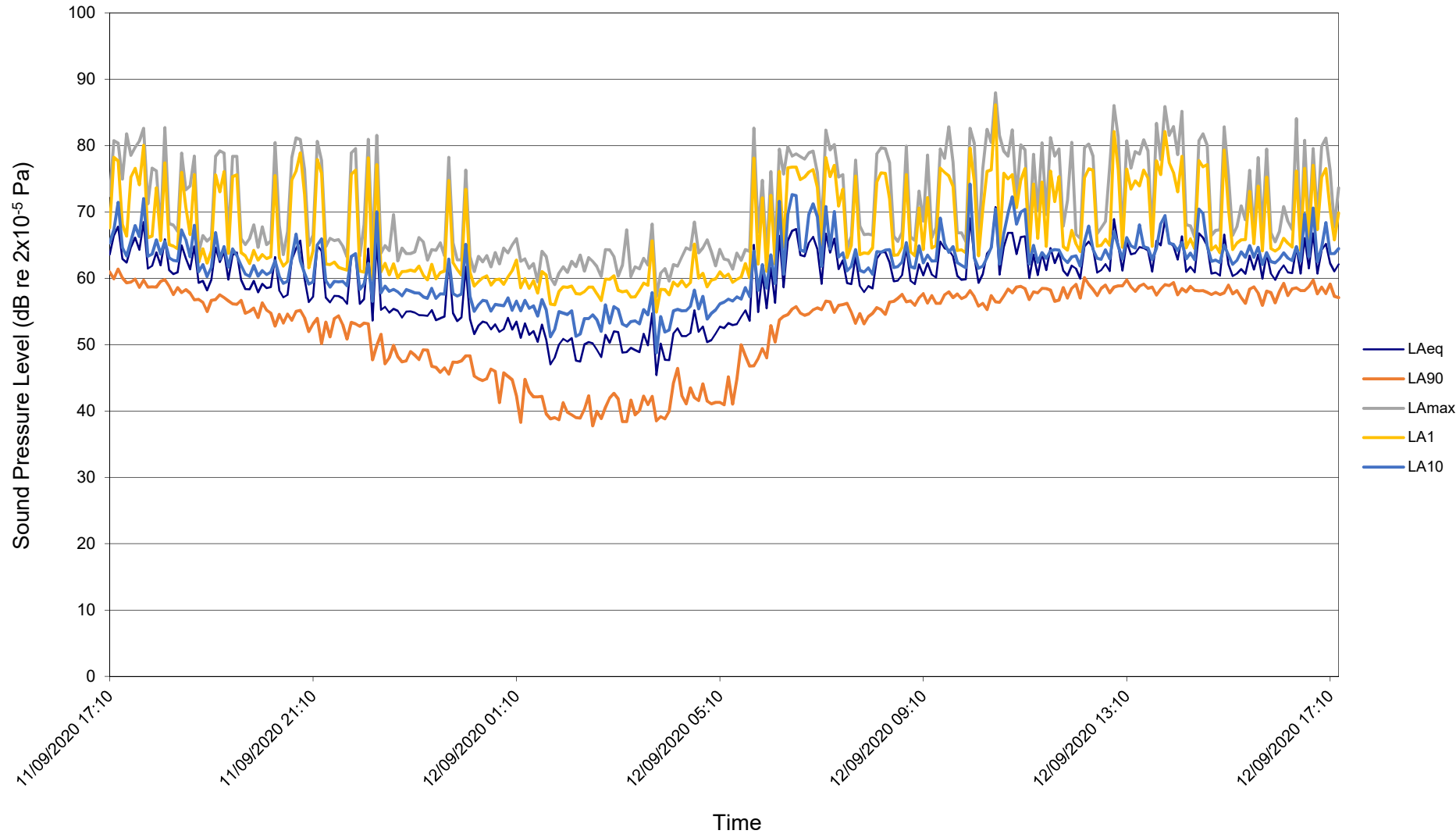
Monitoring Location 1 External
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History



Monitoring Location 2 External
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History



Monitoring Location 3 External
Measured L_{Aeq} , L_{A90} , L_{AFmax} , L_{A1} , L_{A10} Time History





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