ANNEX A1

RBA ACOUSTICS
PLANT NOISE ASSESSMENT

25 November 2021

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ANNEX A1

RBA ACOUSTICS
PLANT NOISE ASSESSMENT

25 November 2021

RBA ACOUSTICS

7 MINSTER ROAD, LONDON NW2

Plant Noise Assessment

Reference: 11320.RP01.PNA.0
Prepared: 25 November 2021
Revision Number: 0

The Mulberry House School
7 Minster Rd
London
NW2 3SD

Plant Noise Assessment

7 MINSTER ROAD, LONDON NW2

Reference: 11320.RP01.PNA.0
Prepared: 25 November 2021

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	25 November 2021	Robert Barlow	Andrew Heath

Terms of contract:

RBA Acoustics Ltd have prepared this report in accordance with our Scope of Work 11320.SW01.0 dated 13 September 2021. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.

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Contents

1. INTRODUCTION

Planning permission is sought for the installation of air conditioning (cooling) plant at the site of The Mulberry House School located at 7 Minster Road, London NW2. As part of the planning application, the London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment to the nearest noise-sensitive receptors.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emission limits in accordance with the London Borough of Camden's requirements.

This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2. SITE DESCRIPTION / EXISTING SITUATION

The site at 7 Minster Road comprises a converted semi-detached Victorian house, now used as an infant school. The classrooms and staff rooms are set out on the Ground, First and part-second (Attic) Floors. The rear garden is used by the young children. The property is not listed and is not situated in a conservation area.

An external air conditioning condenser unit has been installed within the side access of the building between 7-9 Minster Road. This air conditioning unit serves three internal classroom areas to the front of the building to provide cooling during periods of hot weather. Unfortunately, the school were not made aware of the requirement to apply for planning permission for the external unit prior to installation and are subsequently required to apply for retrospective permission.

Following an initial site inspection by ourselves it was advised that due to the close proximity of the unit to residential windows on the flank façade of 9 Minster Road it was probable that the current location was unlikely to achieve the requirements of the London Borough of Camden in terms of noise emissions and that opportunity to mitigate the unit in-situ were impractical due to the size of any resulting enclosure.

Furthermore, the school advised of a requirement to install further internal air conditioning units in the rear classrooms which would require an additional external air condenser to be installed.

Initial assessments have been undertaken in order to determine the best place to relocate the existing air condenser and also to install a second air condenser, such that the London borough of Camden's requirements in terms of noise impact are able to be achieved.

The result of these investigations have established that the preferred location for the existing and proposed external units, in terms of ensuring noise impact is controlled and no impact on school operation, is the flat roof area at the top of the building.

The site is shown in relation to its surroundings in the site plan in Figure 1 (Appendix E).

3. ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

Monitoring of the prevailing background noise was undertaken over the following 24-hour period:

- 11:00 Thursday 7 October to 11:00 Friday 8 October 2021

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period.

However, based on observations during the site visits and weather reports for the area, conditions were generally considered suitable for obtaining representative noise measurements, being predominantly dry with little wind.

Measurements were made of the L_{A90}, L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes. A summary of acoustic terminology is included in Appendix A.

3.2 Measurement Locations

To determine the existing noise climate around the site measurements were undertaken at the following locations:

Measurement Position 1 (Front of Building)

The microphone was positioned outside a 1st floor window on the front façade of the building overlooking Minster Road. The noise climate consisted of local traffic movements along Minster Road as well as the general comings and goings of the school. The position is considered representative of adjacent residential receptors to the front of the building.

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The microphone was positioned to the steel frame of the installed condenser unit within the side access alleyway (the condenser unit was not in operation at the time of survey). The noise climate also consisted of local traffic movements along Minster Road as well as occasional school activities. The position is considered representative of residential windows of 9 Minster Road overlooking the side access.

Measurement Position 3 (Rear of Building)

The microphone was positioned outside a 1st floor window on the rear façade of the building overlooking the garden. The noise climate consisted of ambient traffic from the local area as well as occasional school activity within the garden. The position is considered representative of adjacent residential receptors to the rear of the building.

The measurement positions are also illustrated on the site plan attached in Figure 1.

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1-6 (Appendix E). The lowest L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1.

For ease of reference, noise levels over the period 08:00 – 18:00 hours are included to reflect the operating times of the school and therefore the equipment operating periods.

Table 1 – Measured Levels

Measurement Position	Operational House (08:00 – 18:00)	
	Lowest $L_{A90,15mins}$ (dB)	Average L_{Aeq} (dB)
1 – Front of Building	48	59
2 – Side Access	44	58
3 – Rear of Building	44	56

4. PLANT NOISE CRITERIA

The requirements of the London Borough of Camden's Environmental Health Department regarding new building services plant are understood to be as follows.

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion."

In line with the above requirements we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

Operational Hours (08:00 to 18:00)

- Position 1 (Front) 36 dB
- Position 2 (Side Access) 34 dB
- Position 3 (Rear) 34 dB

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

5. PLANT NOISE ASSESSMENT

This assessment has been based on the information provided to RBA and is described in the following sections.

5.1 Proposed Plant Items

The following plant is proposed for the scheme:

Table 2 – Plant Types

Ref.	Manufacturer/Model/Duty	Plant Type
CU1	Panasonic Multi Split System CU-5Z90TBE	Air Conditioning Condenser
CU2	Panasonic Multi Split System CU-5Z90TBE	Air Conditioning Condenser

5.2 Plant Locations

The plant is to be located on the flat roof above 2nd floor level of the 7 Minster Road property. The equipment positions are indicated on the site plan in Figure 1 and Figure 2 in Appendix E.

5.3 Plant Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 3 – Plant Noise Levels

Unit	Parameter	Sound Pressure Level (dB)
CU-5Z90TBE	Lp at 1m	53

Frequency specific octave band noise data is not available from the manufacturer.

5.4 Mitigation

The rooftop units are to be surrounded by acoustic louvres. The following insertion losses for the louvres are advised:

Table 4 – Acoustic Louvre Insertion Losses

Louvre Depth	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
150-300mm	3	4	6	10	12	13	13	14

The noise control engineering company, Noico Ltd, have been consulted with regards to the development of mitigation and have confirmed the above performance requirements are achievable.

5.5 Location of the Nearest Noise-Sensitive Receptors

Based on observations made on site and with consideration of aerial photography and online mapping, we understand the nearest noise-sensitive windows to the proposed plant to be the rooflights within 5 Minster Road.

The receptors are shown in the site plan in Figure 1 in Appendix E.

5.6 Calculation of Noise Levels at Nearest Noise-Sensitive Receptors

Our calculation method for predicting noise levels from the proposed plant at the nearest noise-sensitive receptors, based on the information above, is summarised below.

- Source Term SPL
- Cumulative Operation
- Distance Attenuation
- Acoustic Louvres

Calculation sheets are attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 5 – Predicted Noise Levels

Operating Period	Noise Level (dB) at Receptor	
	Prediction	Criterion (worst case)
Daytime (07:00 – 23:00)	34	34

Noise from the proposed plant with the mitigation measures incorporated is therefore within the Local Authority criteria.

6. VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that condensing units be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7. CONCLUSION

RBA Acoustics have undertaken noise monitoring at 7 Minster Road, London NW2. The measured noise levels are presented within this report. The resultant noise levels have been used to determine the required criteria for atmospheric noise emissions from the proposed plant installations.

The following mitigation measures are proposed within this report:

Condenser units should be enclosed in louvres capable of achieving the specification detailed in Table 4. This has been confirmed with a supplier of acoustic mitigation.

Provided the above mitigation measures are included in the design and installation, the results of the assessment indicate atmospheric noise emissions from the proposed plant are within the criteria required by the London Borough of Camden and, as such, can be considered acceptable in terms of noise.

Appendix A – Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10}, L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
$L_{Amax,T}$	The instantaneous maximum A-weighted sound pressure level which occurred during the measurement period, *T*. It is commonly used to measure the effect of very short duration bursts of noise, e.g. sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the ambient level.
NR	Noise Rating – A single figure term to describe a measured noise level which considers the frequency content of the noise, generally used for internal noise level measurements (particularly mechanical services plant).

Appendix B – Instrumentation

The following equipment was used for the measurements.

Table B1– Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1403226	U36698	5 January 2023
Norsonic Pre Amplifier	1209A	12066		
Norsonic ½" Microphone	1225	168180	36697	5 January 2023
Norsonic Sound Calibrator	1251	31988	U36696	4 January 2023
Norsonic Type 1 Sound Level Meter	Nor140	1406971	U38866	2 September 2023
Norsonic Pre Amplifier	1209	21571		
GRAS ½" Microphone	40AF	207393	38865	2 September 2023
Norsonic Sound Calibrator	1251	35016	U38864	1 September 2023
Norsonic Type 1 Sound Level Meter	Nor140	1403127	U37031	11 February 2023
Norsonic Pre Amplifier	1209A	12071		
Norsonic ½" Microphone	1225	41473	37030	11 February 2023
Norsonic Sound Calibrator	1251	31986	U37029	11 February 2023

Appendix C – Plant Calculations

Table C1 –Calculation

Parameter	Octave-band Noise Levels (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
External Condenser SPL *	57	54	53	51	48	44	37	31	53
2No.	3	3	3	3	3	3	3	3	
Distance Loss	-12	-12	-12	-12	-12	-12	-12	-12	
Louvre Losses	-3	-4	-6	-10	-12	-13	-13	-14	
Total	45	41	38	32	27	22	15	8	34

* Representative spectral data of similar units has been adopted in our calculation.

Appendix D – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
4 – Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table D1 – Risk Ratings

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Table D2 – Risk Assessment

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Vibration Isolators	Injury to hands	Contractors	3	3	9	Care needs to be taken during adjustment. Follow manufacturers guidance	1	3	3
Acoustic Louvres	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4

L: Likelihood S: Severity R: Rating

Appendix E – Graphs and Site Plans

7 Minster Road, London NW2 - The Mulberry House School

L_{Aeq} Time History

Position 1, Thursday 7th October to Friday 8th October 2021

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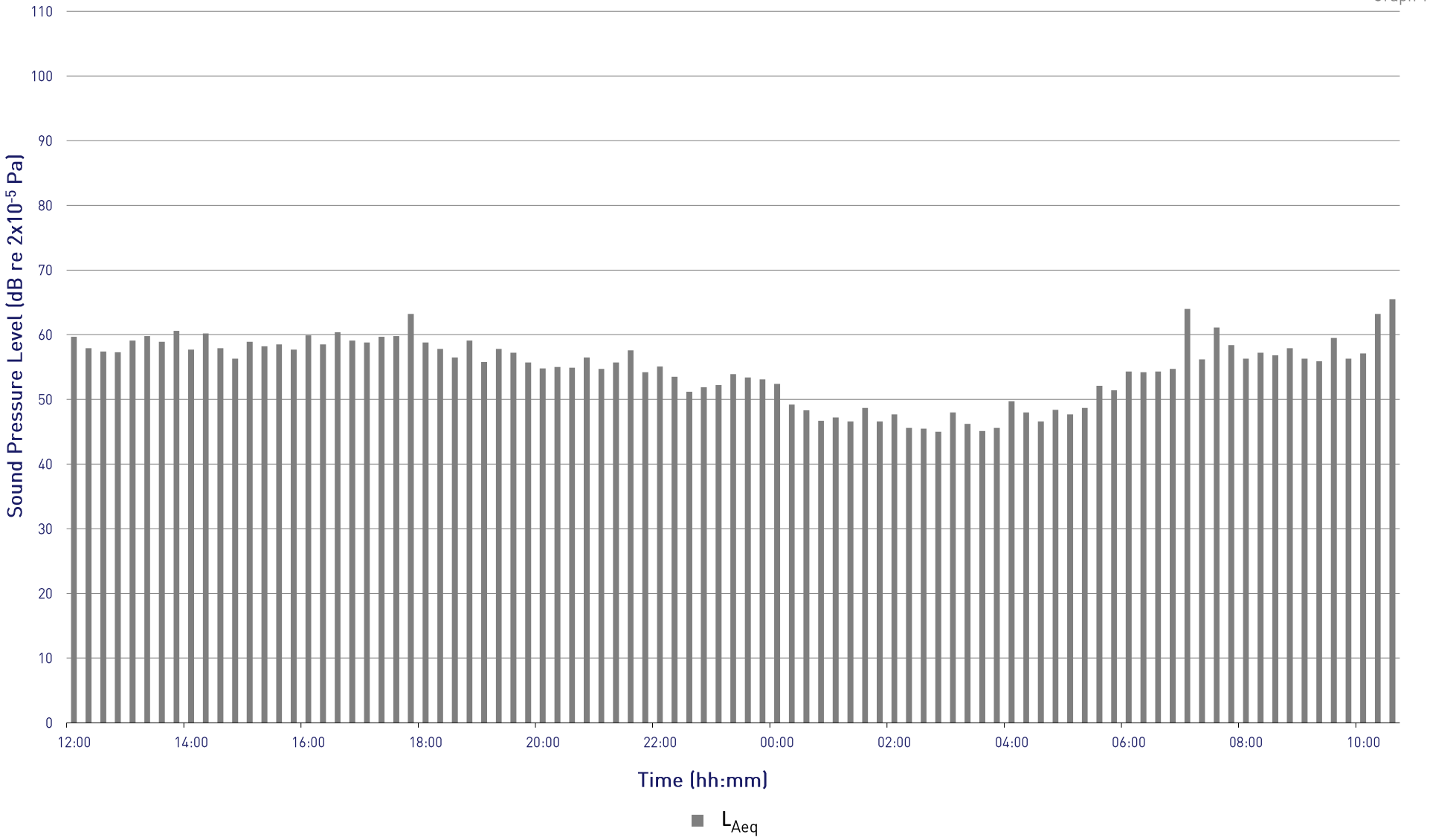
Project: 11320

Graph 1



7 Minster Road, London NW2 - The Mulberry House School

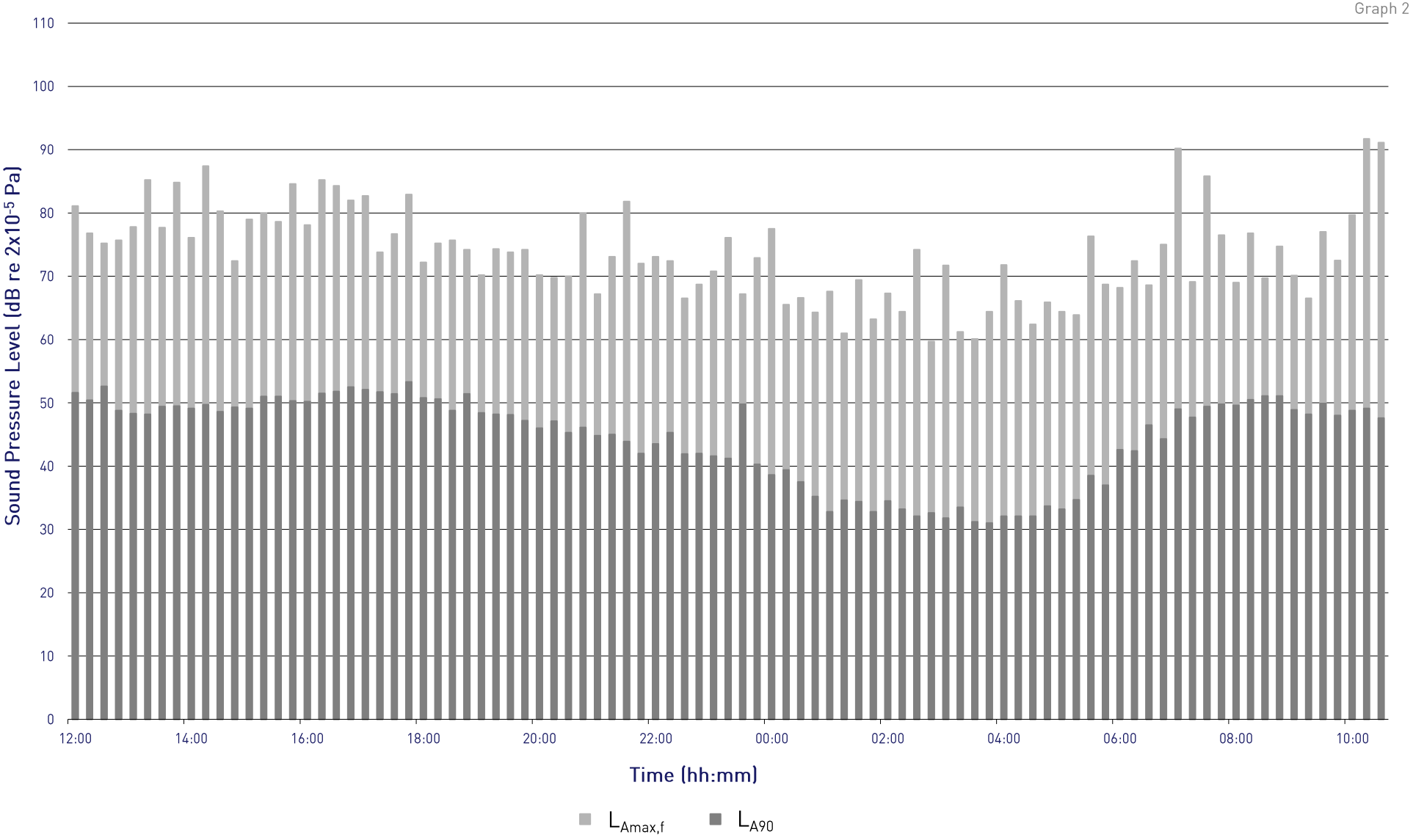
$L_{Amax,f}$ and L_{A90} Time History

Position 1, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 2



7 Minster Road, London NW2 - The Mulberry House School

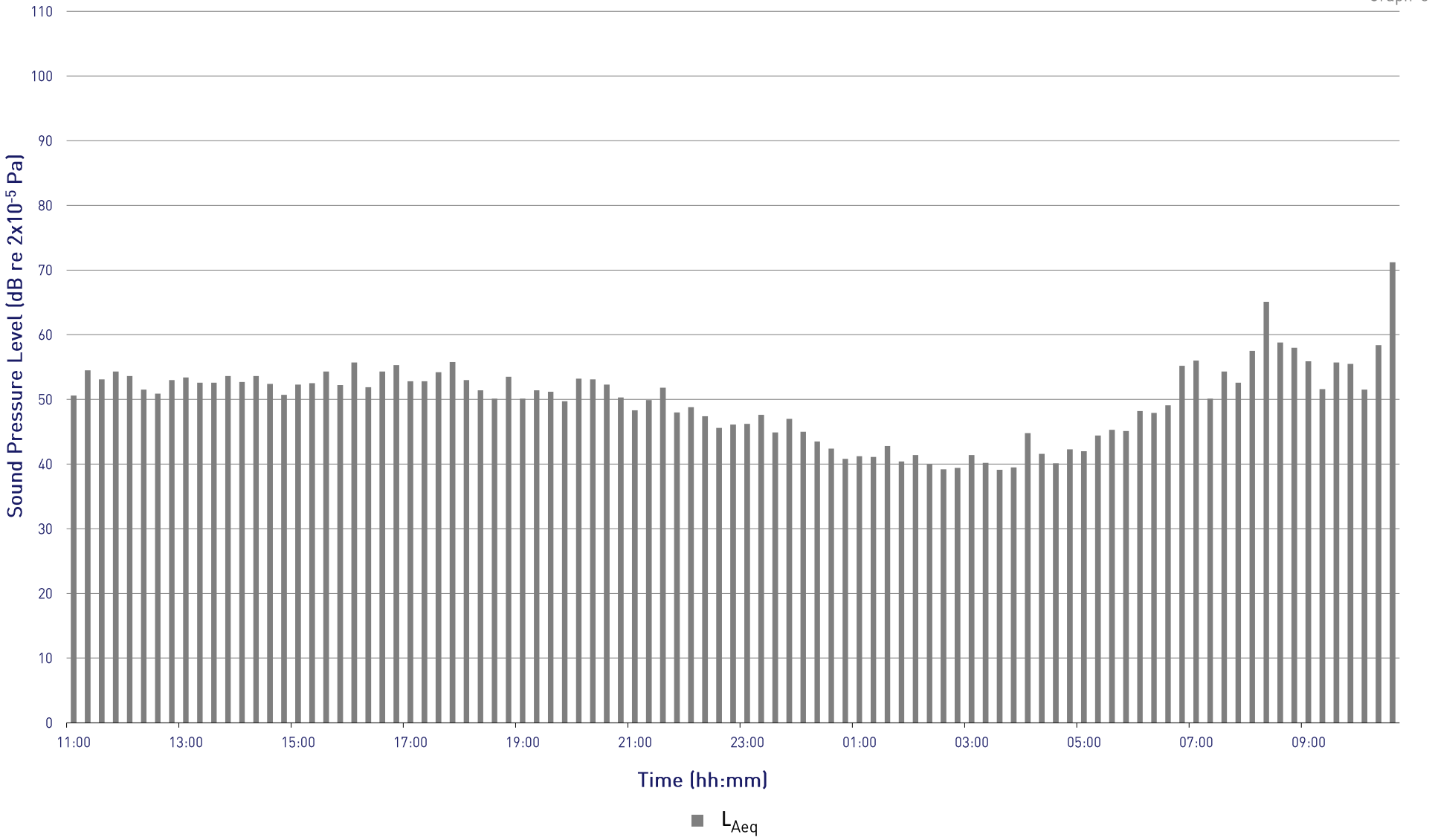
L_{Aeq} Time History

Position 2, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 3



7 Minster Road, London NW2 - The Mulberry House School

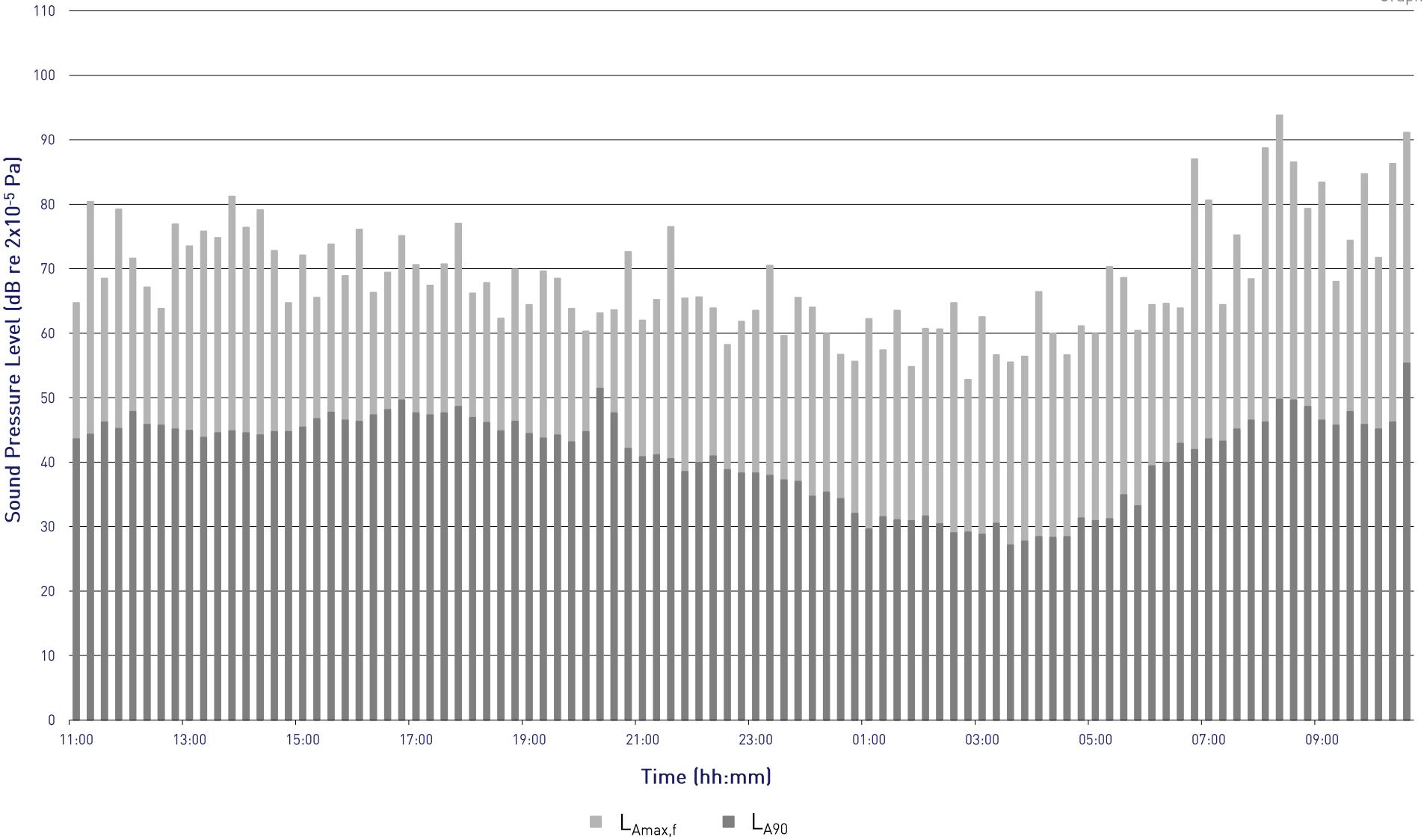
$L_{Amax,f}$ and L_{A90} Time History

Position 2, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 4



7 Minster Road, London NW2 - The Mulberry House School

L_{Aeq} Time History

Position 3, Thursday 7th October to Friday 8th October 2021

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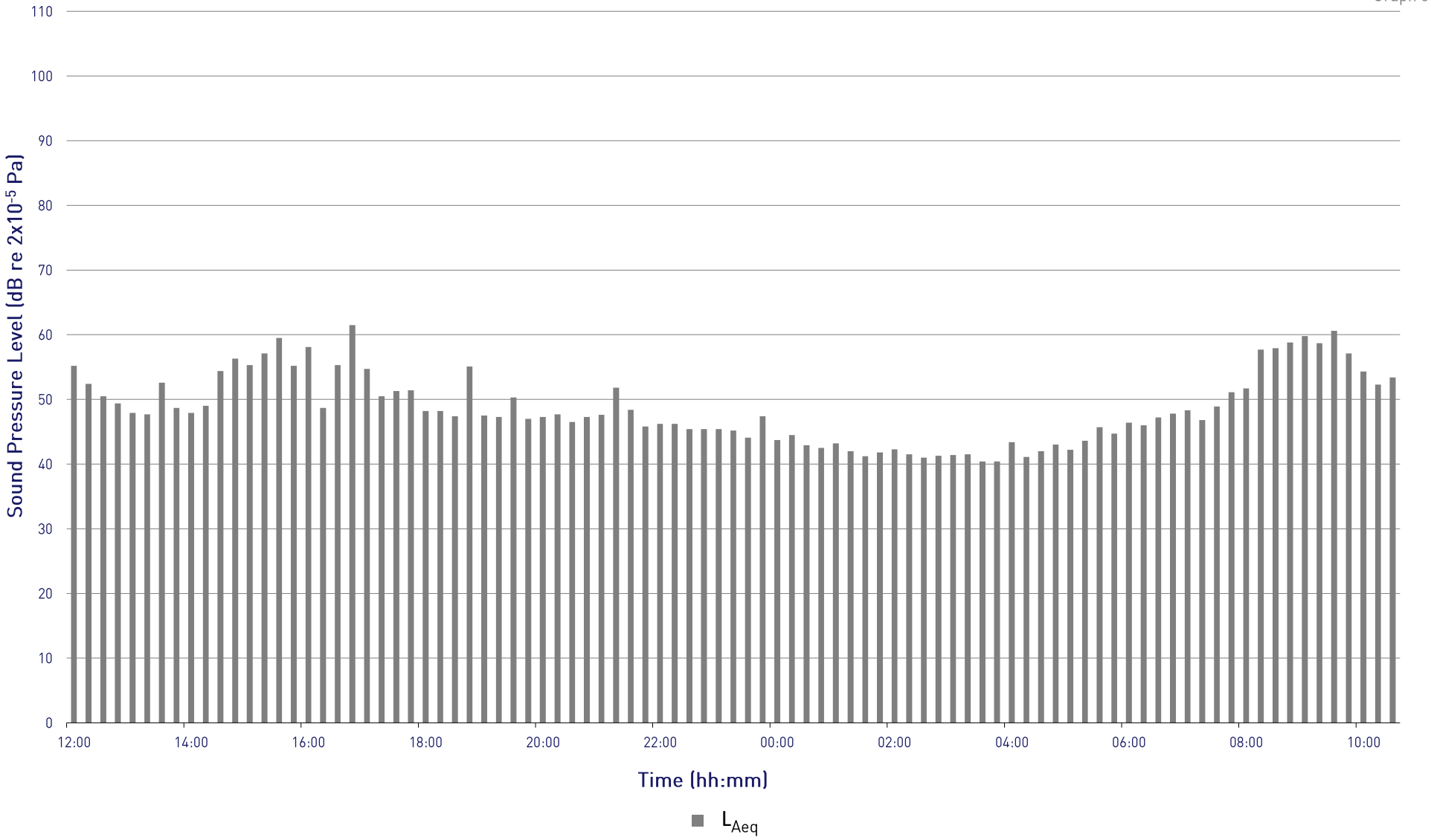
Project: 11320

Graph 5



7 Minster Road, London NW2 - The Mulberry House School

$L_{Amax,f}$ and L_{A90} Time History

Position 3, Thursday 7th October to Friday 8th October 2021

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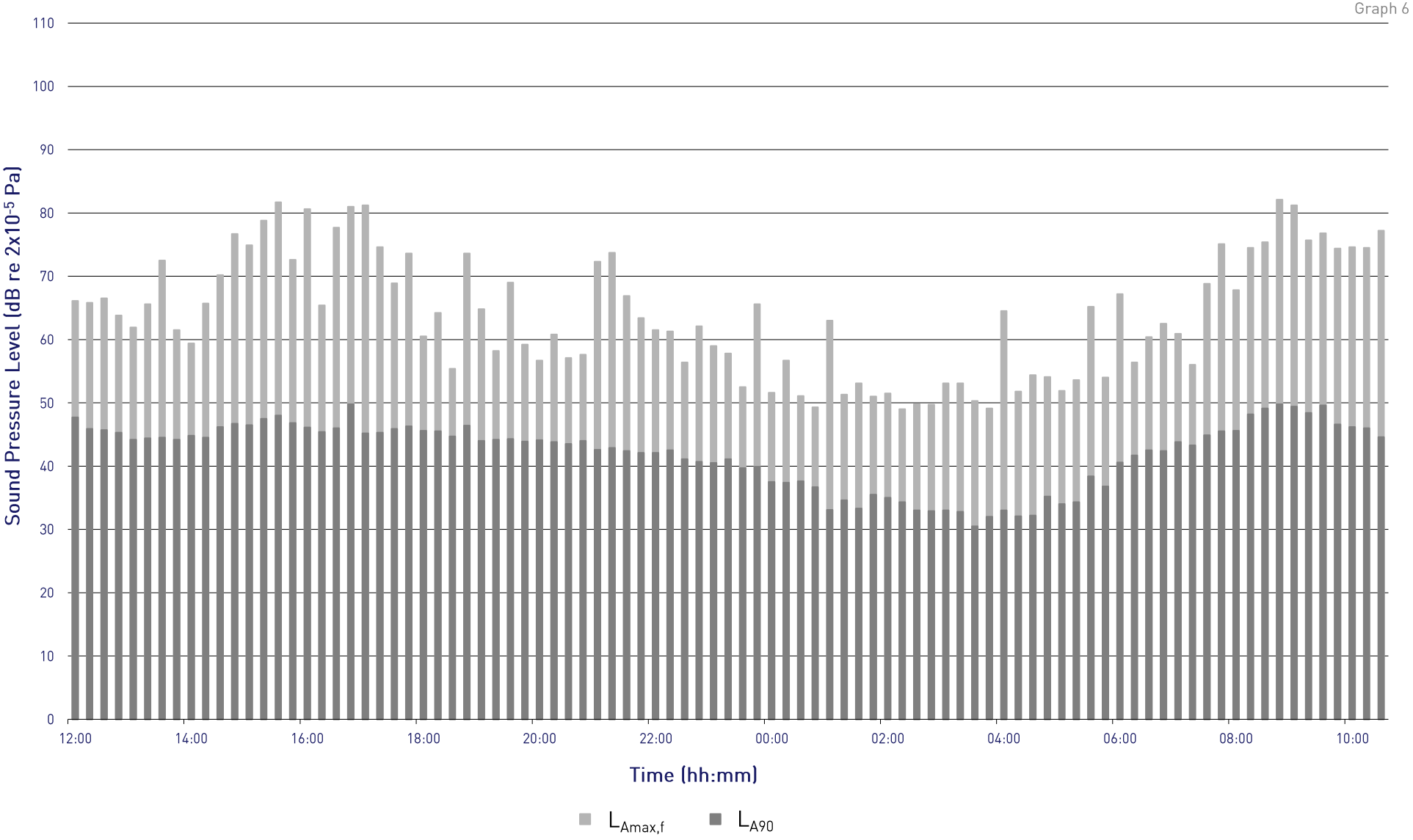
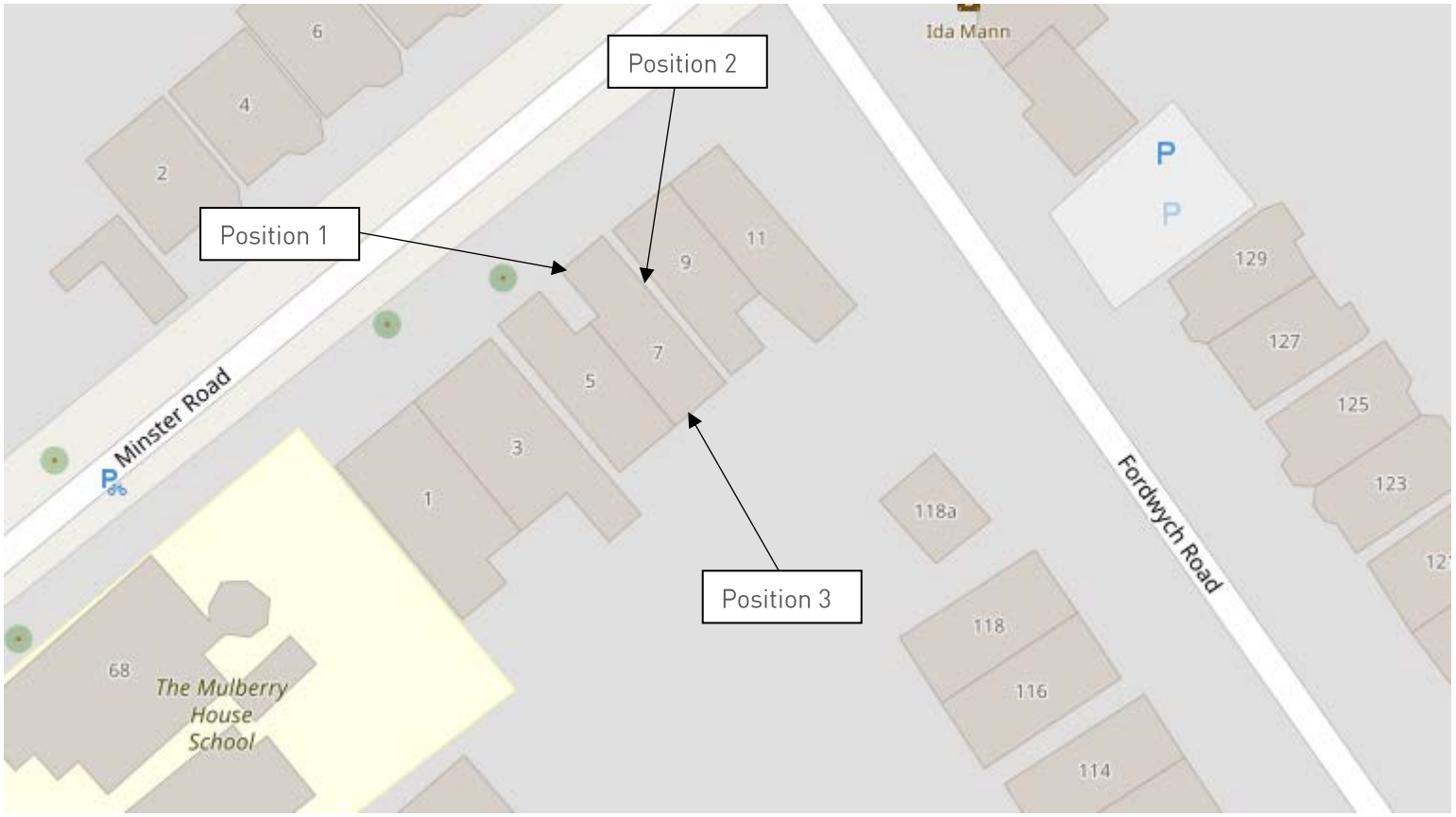
Project: 11320

Graph 6





7 MINSTER ROAD, London NW2

Site Plan Detailing Measurement Locations

Project 11320

Figure 1

25 November 2021

Not to Scale

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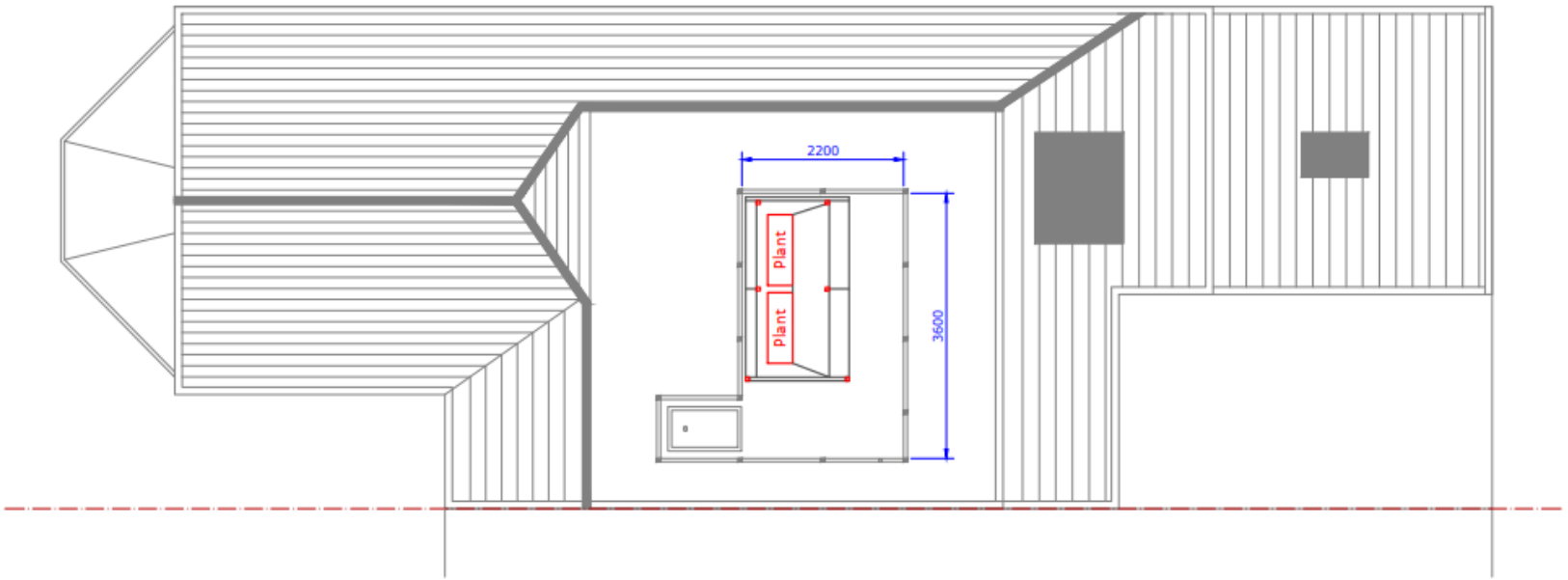

7 MINSTER ROAD, LONDON NW2

Roof Plant and Enclosure

Project 11320

Figure 2

25 November 2021

Not to Scale

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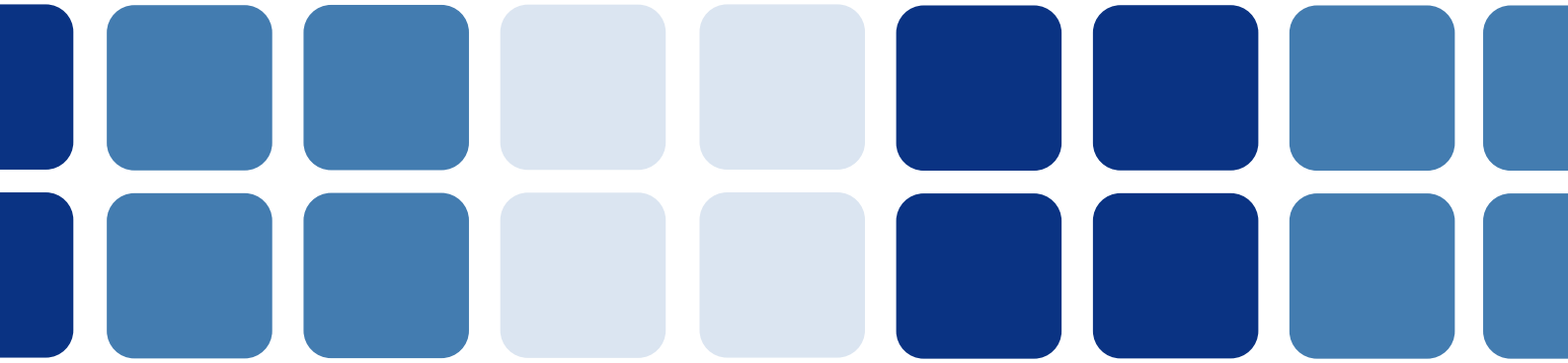

ANNEX A2

RBA ACOUSTICS
PLANT NOISE ASSESSMENT

16 June 2022

RBA ACOUSTICS

7 MINSTER ROAD, LONDON NW2

Plant Noise Assessment

Reference: 11320.RP01.PNA.2
Prepared: 16 June 2022
Revision Number: 2

The Mulberry House School
7 Minster Rd
London
NW2 3SD

Plant Noise Assessment

7 MINSTER ROAD, LONDON NW2

Reference: 11320.RP01.PNA.2
Prepared: 16 June 2022

Revision	Comment	Date	Prepared By	Approved By
2	Revised roof layout	16 June 2022	Robert Barlow	Andrew Heath

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Adrian Salt And Pang Limited, Development Planning Consultants are acting as Planning Agent for The Mulberry House School (Applicant). An initial noise assessment had been conducted by RBA for the pre-application enquiry to LB Camden in February 2022. On inspecting the site, RBA found that it would not be feasible to introduce a sound enclosure to the wall mounted air condenser because of the narrow width of the passageway that separates the flank wall of No. 7 from the boundary fencing with its neighbour at No.9 Minster Road. The introduction of a noise enclosure would over sail the ownership boundary. A new location for the plant was therefore discussed and options explored.

The proposed location of the relocated unit (and any new units) takes into account the health and safety concerns for the presence of very young children in the School grounds and the need to conform with London Borough of Camden's environmental noise criteria.

RBA Acoustics have undertaken measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emission limits in accordance with the London Borough of Camden's requirements.

This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2. SITE DESCRIPTION / EXISTING SITUATION

The site at 7 Minster Road comprises a converted semi-detached Victorian house, now used as an infant school. The classrooms and staff rooms are set out on the Ground, First and part-second (Attic) Floors. The rear garden is used by the young children. The property is not listed and is not situated in a conservation area.

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Following an initial site inspection by RBA it was advised that due to the close proximity of the unit to residential windows on the flank façade of 9 Minster Road it was probable that the current location was unlikely to achieve the requirements of the London Borough of Camden in terms of noise emissions and that opportunity to mitigate the unit in-situ were impractical due to the size of any resulting enclosure.

Furthermore, the school advised of a requirement to install further internal air conditioning units to serve a further seven rooms. (See Planning Design and Access Statement).

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The microphone was positioned outside a 1st floor window on the rear façade of the building overlooking the garden. The noise climate consisted of ambient traffic from the local area as well as occasional school activity within the garden. The position is considered representative of adjacent residential receptors to the rear of the building.

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4. PLANT NOISE CRITERIA

The requirements of the London Borough of Camden's Environmental Health Department regarding new building services plant are understood to be as follows.

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion."

In line with the above requirements we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

Operational Hours (08:00 to 18:00)

- Position 1 (Front) 36 dB
- Position 2 (Side Access) 34 dB
- Position 3 (Rear) 34 dB

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

5. PLANT NOISE ASSESSMENT

This assessment has been based on the information provided to RBA and is described in the following sections.

5.1 Proposed Plant Items

The following plant is proposed for the scheme:

Table 2 – Plant Types

Ref.	Manufacturer/Model/Duty	Plant Type
CU1 – Existing Unit	Panasonic (Multi Split System) CU-5Z90TBE	Air Conditioning Condenser
CU2 – Additional Unit	Samsung AM050KXMDEH/EU	Air Conditioning Condenser

5.2 Plant Locations

The plant is to be located on the flat roof above 2nd floor level of the 7 Minster Road property. The equipment positions are indicated on the site plan in Figure 1 and Figure 2 in Appendix E.

5.3 Plant Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 3 – Plant Noise Levels

Unit	Parameter	Sound Pressure Level (dB)
CU1	Lp at 1m	53*
CU2	Lp at 1m	55

Frequency specific octave band noise data is included in Appendix C.

5.4 Mitigation

The rooftop units are to be enclosed with a solid, imperforate material with a minimum surface density of >15kg/m^2. Such enclosure provides acoustic screening of the plant from the assessment location. The screen is to extend a height of 100mm above the top of the condensers.

5.5 Location of the Nearest Noise-Sensitive Receptors

Based on observations made on site and with consideration of aerial photography and online mapping, we understand the nearest noise-sensitive windows to the proposed plant to be the rooflights within 5 Minster Road.

The receptors are shown in the site plan in Figure 1 in Appendix E.

5.6 Calculation of Noise Levels at Nearest Noise-Sensitive Receptors

Our calculation method for predicting noise levels from the proposed plant at the nearest noise-sensitive receptors, based on the information above, is summarised below.

- Source Term SPL
- Cumulative Operation
- Distance Attenuation
- Screening

Calculation sheets are attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 5 – Predicted Noise Levels

Operating Period	Noise Level (dB) at Receptor	
	Prediction	Criterion (worst case)
Daytime (07:00 – 23:00)	32	34

Noise from the proposed plant with the mitigation measures incorporated is therefore within the Local Authority criteria.

6. VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would advise that condensing units be isolated from the supporting structure by means of steel spring isolators. For particularly sensitive locations, or when on lightweight structures the mounts should be caged and be of the restrained type. Manufacturers guidance should be followed during selection and installation to ensure correct operation.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7. CONCLUSION

RBA Acoustics have undertaken noise monitoring at 7 Minster Road, London NW2. The measured noise levels are presented within this report. The resultant noise levels have been used to determine the required criteria for atmospheric noise emissions from the proposed plant installations.

The following mitigation measures are proposed within this report:

- Condenser units are to be enclosed with solid, imperforate screening.

Provided the above mitigation measures are included in the design and installation, the results of the assessment indicate atmospheric noise emissions from the proposed plant are within the criteria required by the London Borough of Camden and, as such, can be considered acceptable in terms of noise.

Appendix A – Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10}, L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
$L_{Amax,T}$	The instantaneous maximum A-weighted sound pressure level which occurred during the measurement period, *T*. It is commonly used to measure the effect of very short duration bursts of noise, e.g. sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the ambient level.
NR	Noise Rating – A single figure term to describe a measured noise level which considers the frequency content of the noise, generally used for internal noise level measurements (particularly mechanical services plant).

Appendix B – Instrumentation

The following equipment was used for the measurements.

Table B1– Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1403226	U36698	5 January 2023
Norsonic Pre Amplifier	1209A	12066		
Norsonic ½“ Microphone	1225	168180	36697	5 January 2023
Norsonic Sound Calibrator	1251	31988	U36696	4 January 2023
Norsonic Type 1 Sound Level Meter	Nor140	1406971	U38866	2 September 2023
Norsonic Pre Amplifier	1209	21571		
GRAS ½“ Microphone	40AF	207393	38865	2 September 2023
Norsonic Sound Calibrator	1251	35016	U38864	1 September 2023
Norsonic Type 1 Sound Level Meter	Nor140	1403127	U37031	11 February 2023
Norsonic Pre Amplifier	1209A	12071		
Norsonic ½“ Microphone	1225	41473	37030	11 February 2023
Norsonic Sound Calibrator	1251	31986	U37029	11 February 2023

Appendix C – Plant Calculations

Table C1 –Calculation

Parameter	Octave-band Noise Levels (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
CU1 - Panasonic CU-5Z90TBE-1*	57	54	53	51	48	44	37	31	53
CU2 - Samsung AM050KXMDEH/EU	57	57	55	51	48	46	40	30	54
Sub-total	60	59	57	54	51	48	42	34	
Distance Loss	-12	-12	-12	-12	-12	-12	-12	-12	
Screening	-6	-8	-9	-12	-15	-17	-20	-20	
Total	42	39	36	30	24	19	10	1	32

* No octave band data is available. Representative spectral data of similar units has been adopted to allow frequency bands in our calculation.

Appendix D – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
4 – Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table D1 – Risk Ratings

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Table D2 – Risk Assessment

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Vibration Isolators	Injury to hands	Contractors	3	3	9	Care needs to be taken during adjustment. Follow manufacturers guidance	1	3	3
Screening	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4

L: Likelihood S: Severity R: Rating

Appendix E – Graphs and Site Plans

7 Minster Road, London NW2 - The Mulberry House School

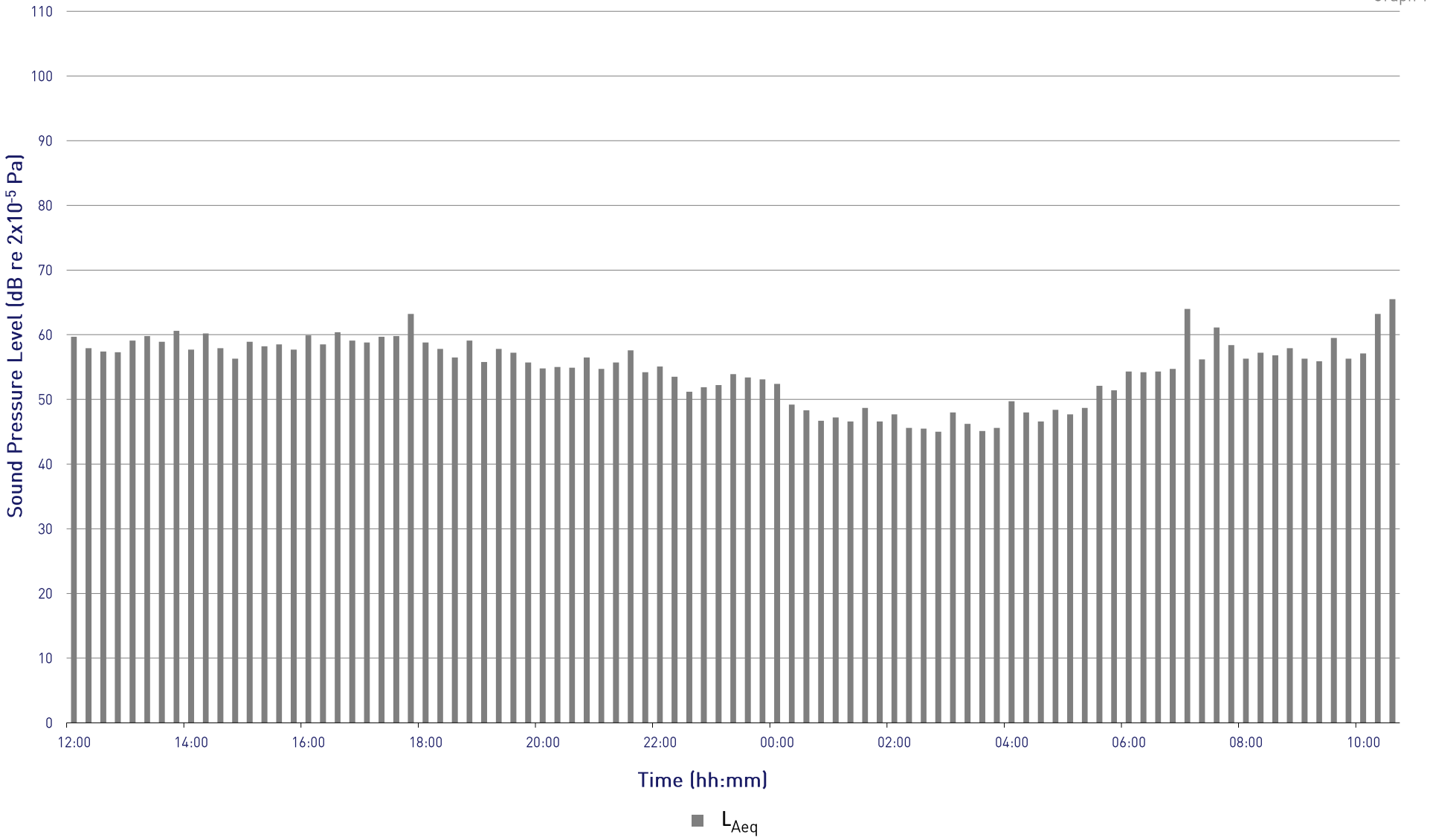
L_{Aeq} Time History

Position 1, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 1



7 Minster Road, London NW2 - The Mulberry House School

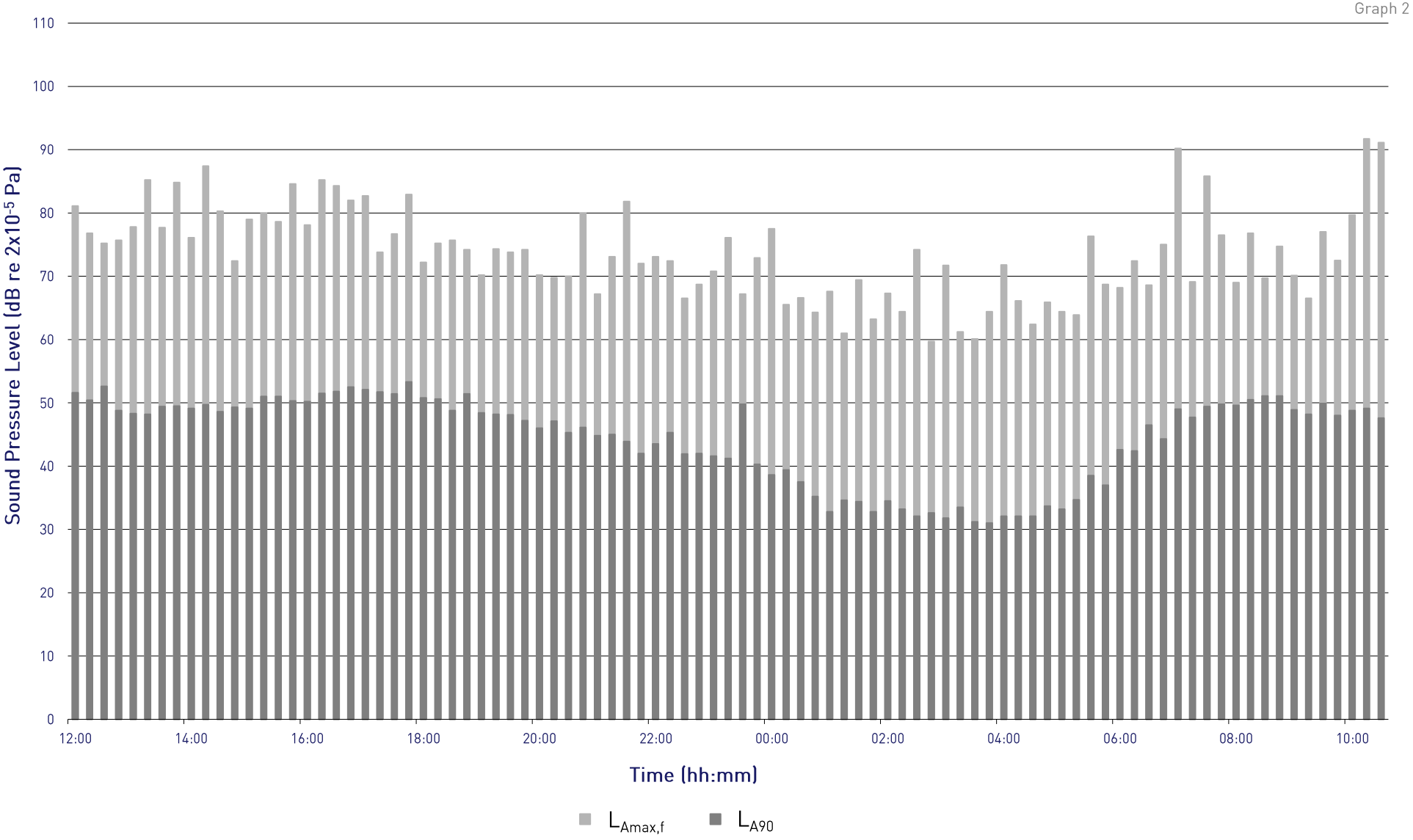
$L_{Amax,f}$ and L_{A90} Time History

Position 1, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 2



7 Minster Road, London NW2 - The Mulberry House School

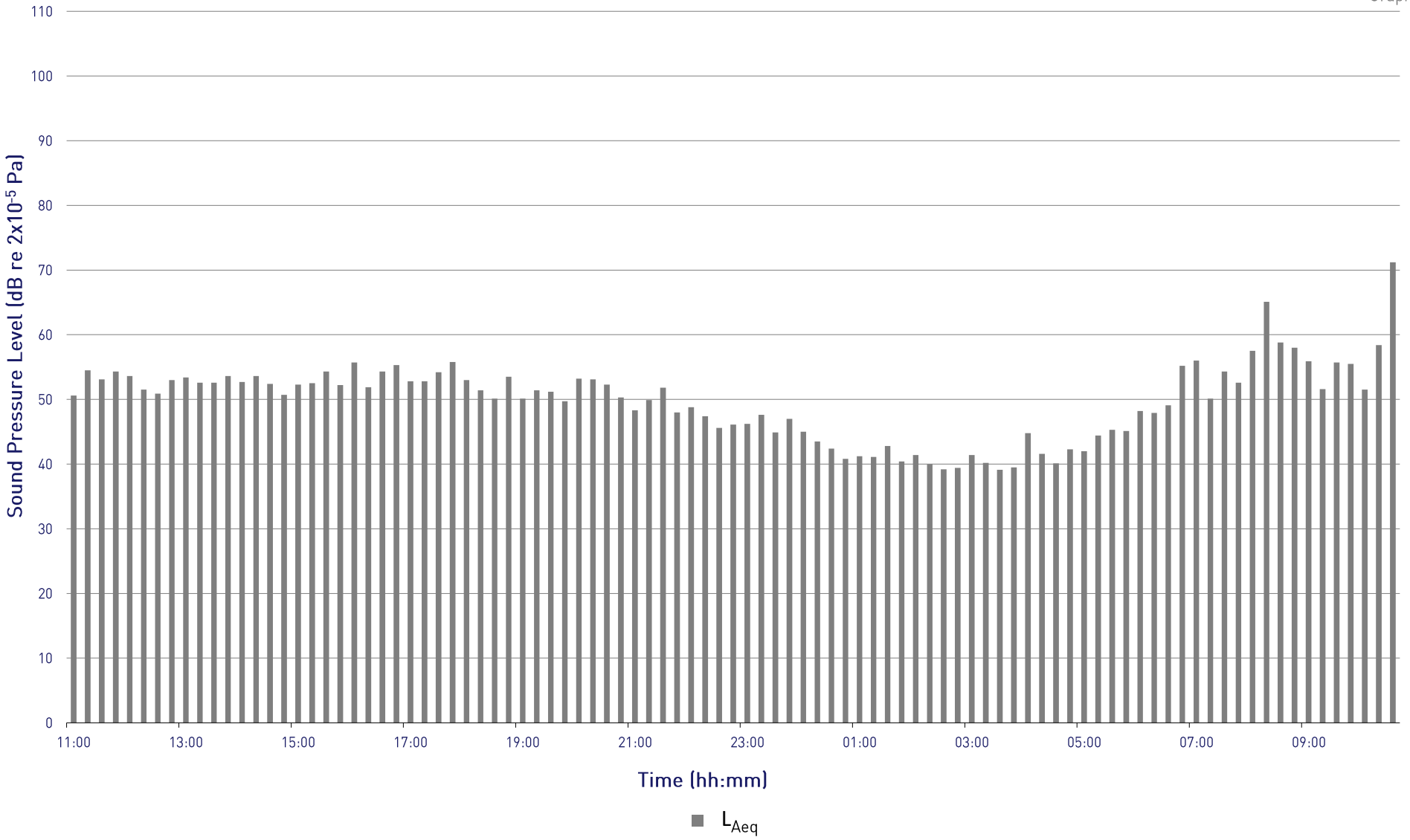
L_{Aeq} Time History

Position 2, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 3



7 Minster Road, London NW2 - The Mulberry House School

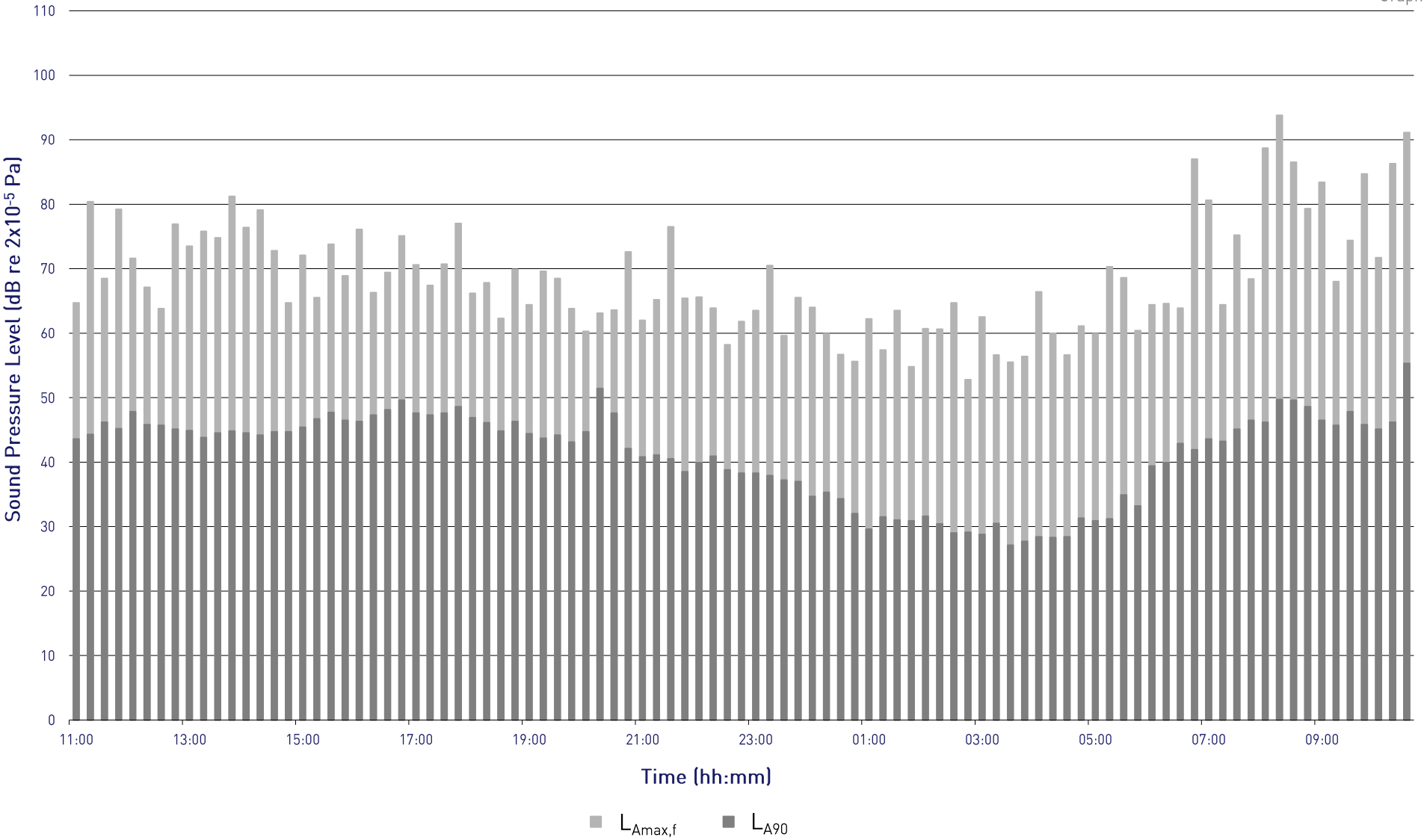
$L_{Amax,f}$ and L_{A90} Time History

Position 2, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 4



7 Minster Road, London NW2 - The Mulberry House School

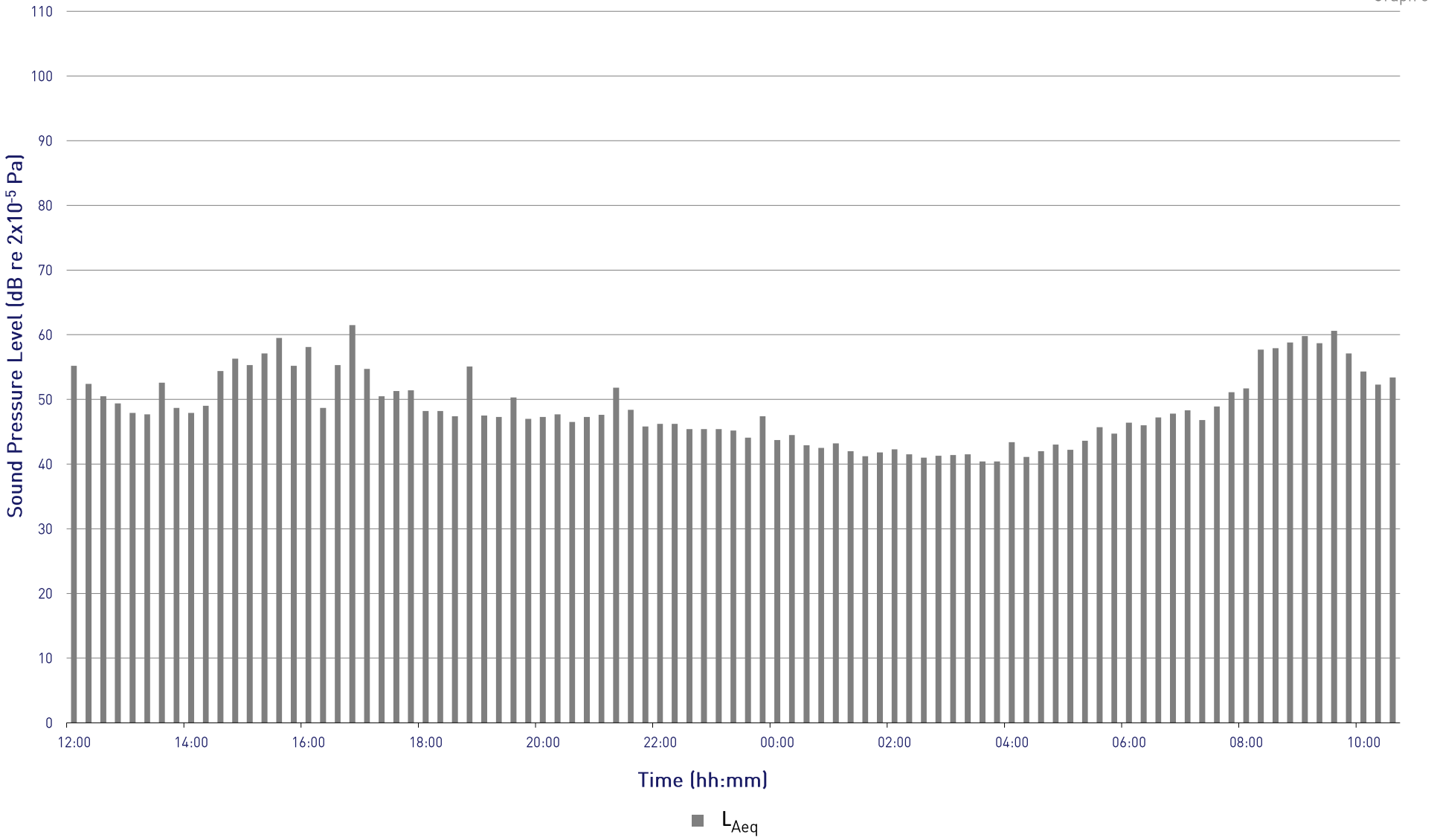
L_{Aeq} Time History

Position 3, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 5



7 Minster Road, London NW2 - The Mulberry House School

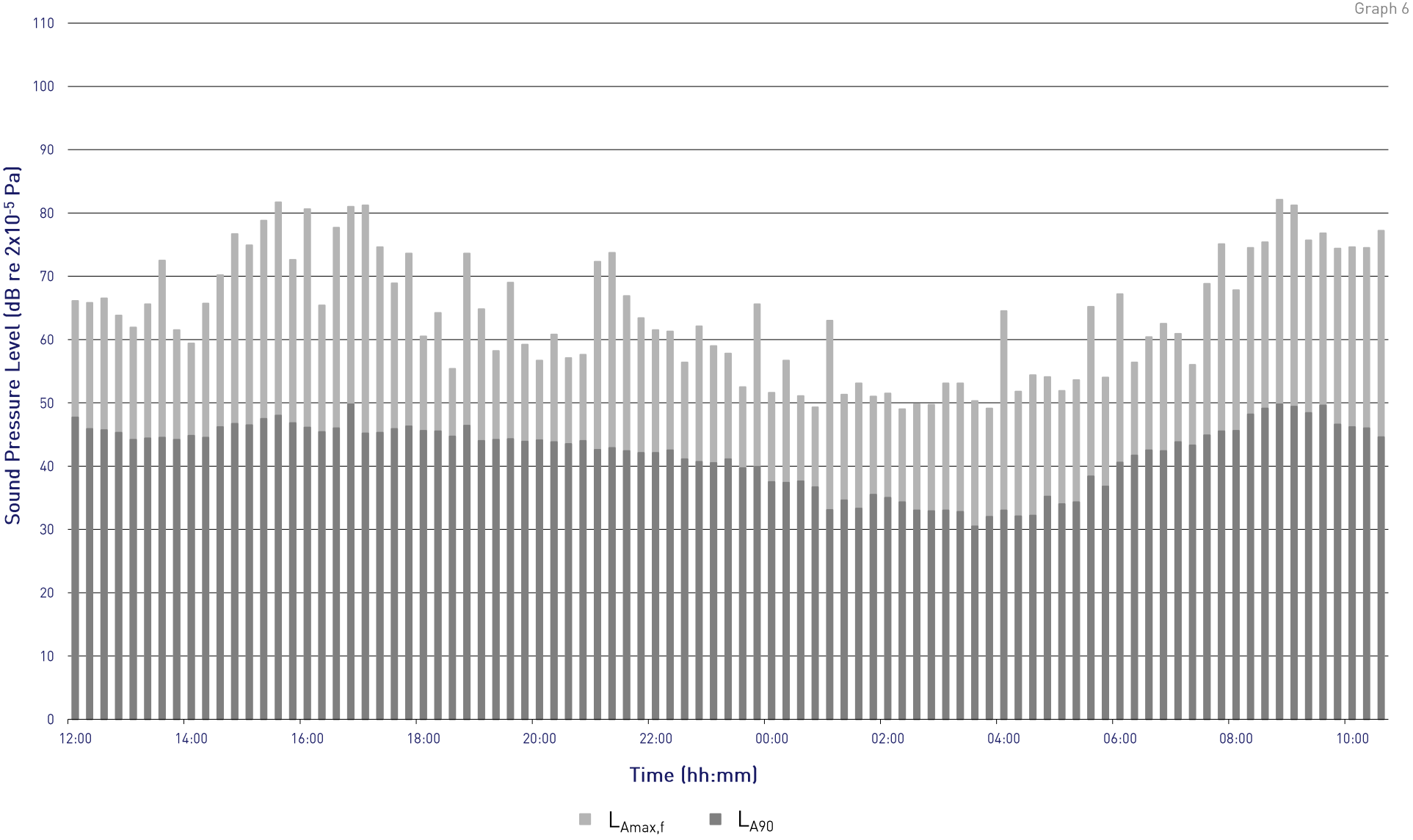
$L_{Amax,f}$ and L_{A90} Time History

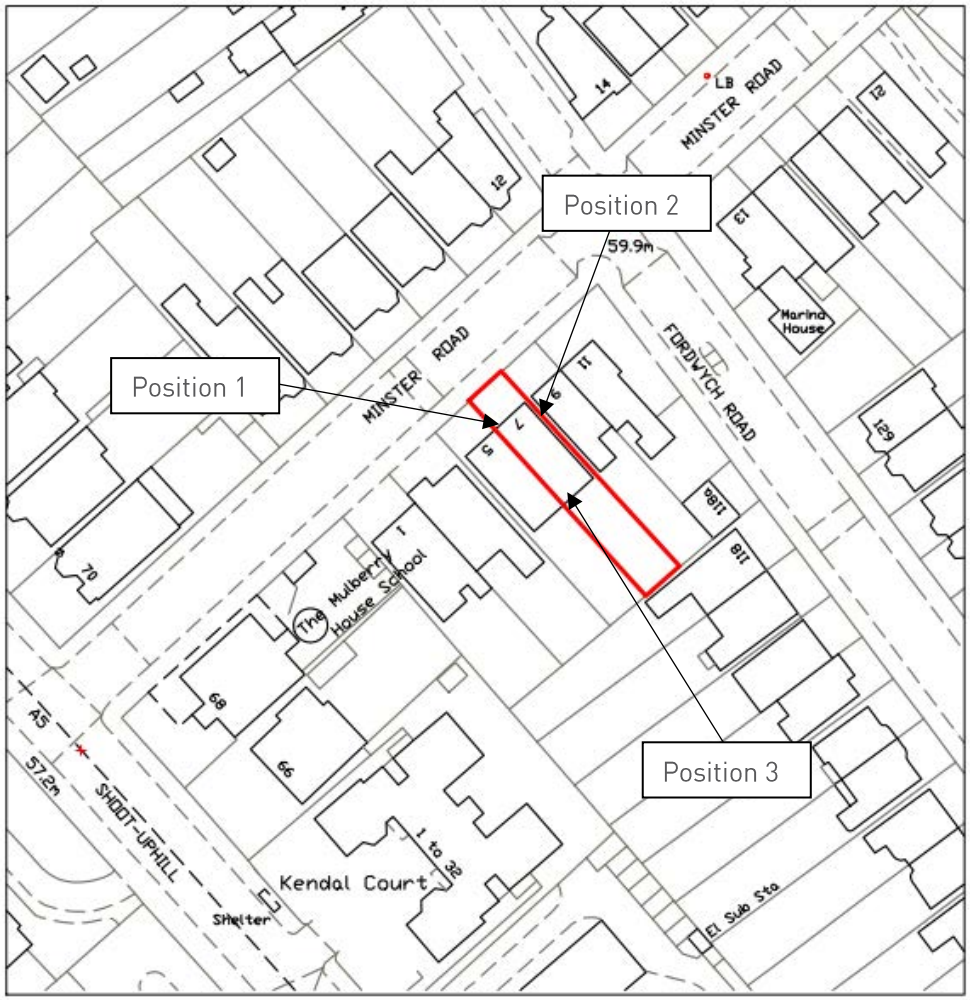
Position 3, Thursday 7th October to Friday 8th October 2021

RBA ACOUSTICS

Project: 11320

Graph 6





7 MINSTER ROAD, London NW2

Site Plan Detailing Measurement Locations

Project 11320

Figure 1

16 June 2022

Not to Scale

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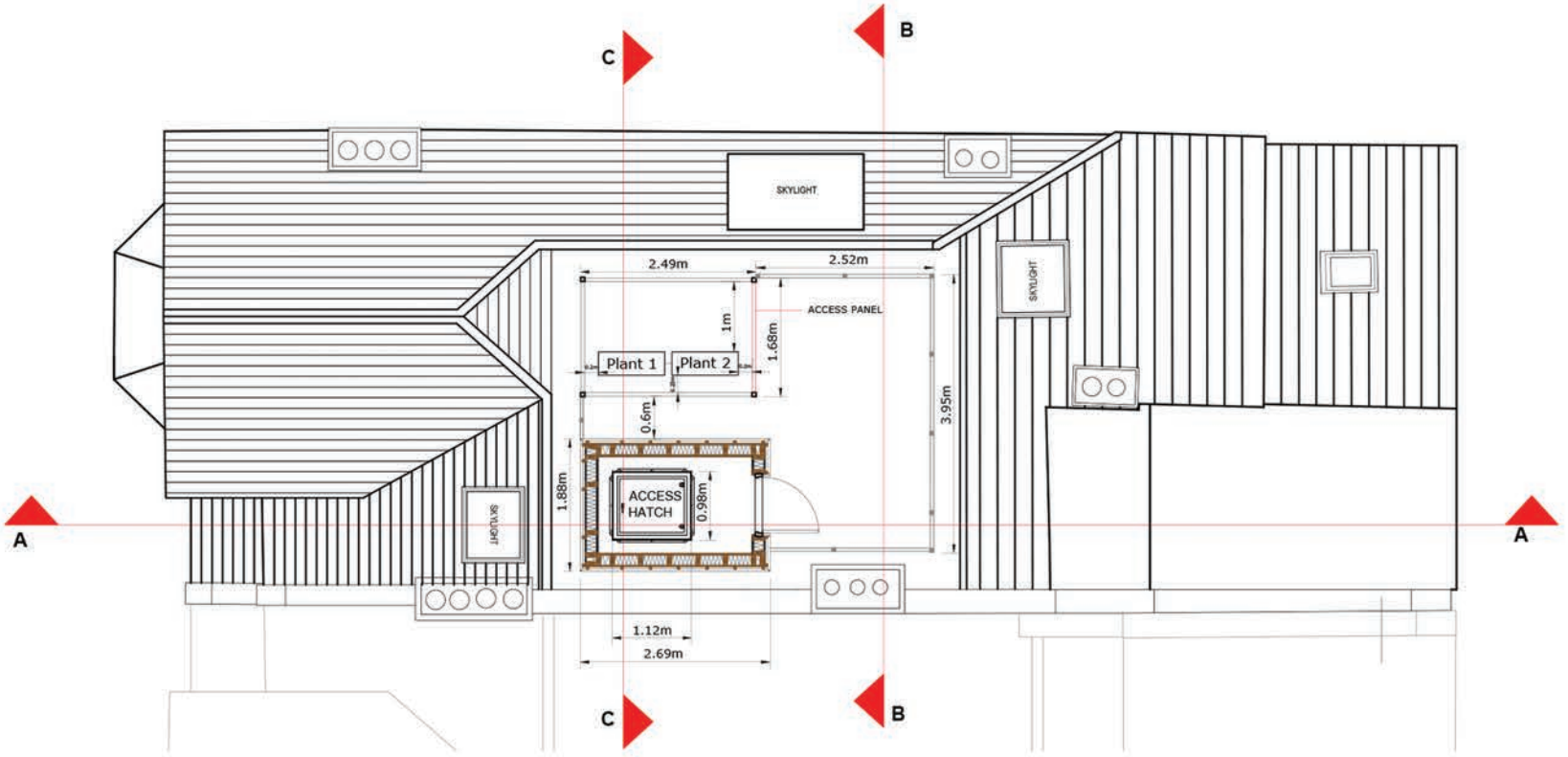

ROOF

7 MINSTER ROAD, LONDON NW2

Roof Plant and Enclosure

Project 11320

Figure 2

16 June 2022

Not to Scale

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