

Noise Feasibility Assessment



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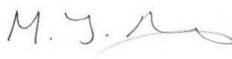
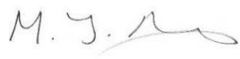
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HSP CONSULTING LIMITED

ACOUSTIC FEASIBILITY ASSESSMENT

**THE PRIORY SEND SCHOOL, NEVILLE AVENUE,
SPALDING, LINCOLSHIRE PE11 2EH**

REPORT VERSION CONTROL:

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1 INTRODUCTION

- 1.1.1 By instruction from HSP Consulting Limited ('the client'), NoiseAir was commissioned to conduct a preliminary noise impact assessment (NIA) as part of a feasibility study in support of the redevelopment of The Priory SEND School, Neville Avenue, Spalding, Lincolnshire PE11 2EH, herein referred to as the 'development site'.
- 1.1.2 This acoustic report has been prepared as part of a feasibility study for the development and assesses the results of a noise survey conducted in accordance with applicable guidance, including recommendations and mitigation, as appropriate.

1.2 Site Description

- 1.2.1 At the time of writing, The Priory School is a member of the Community Inclusive Multi Academy Trust (CIT). The school caters for students from the age of 11-16 years old. The school is operational; however, several blocks have been identified for potential redevelopment.
- 1.2.2 The existing school is a single storey building and the site includes an existing sports field, and separate playground.
- 1.2.3 The school is located approximately 25 km east of Peterborough City centre. It is flanked to the north, south and east by residential housing estates. To the western boundary of the site lies Spalding Academy Sixth Form College.
- 1.2.4 It has been advised in documentation provided to NoiseAir that The Priory School specifically accommodates special educational needs and disability (SEND) pupils.
- 1.2.5 The documentation provided at the time of writing details the school comprising of four standalone blocks. It is understood that the EFAB block is being replaced by the local authority and as such are providing a temporary block to the south of the EFAB block. During the NoiseAir site visit it was noted that the EFAB block was undergoing demolition works.
- 1.2.6 **Figure 1** shows an aerial image of the development site with respect to the local area and its context.



Figure 1: Site aerial Image

1.3 Site Development Proposal

1.3.1 **Figure 2** identifies the existing building structure blocks which form The Priory School.



Figure 2: Proposed Development per Block

1.3.2 It is understood that the colour coded buildings in **Figure 2** are identified as the following:

- Red – Target Block
- Yellow – Additional block
- Green – Untouched block
- Purple – Proposed temporary accommodation

1.3.3 **Table 1** provides a summary of the identified block types as provides by the Department for Education (DfE).

Table 1: Summary of identified block types (Department for Education)	
Identifier	Description
Target	This is a block that the selection process has identified as having both significant and urgent condition need and/or a limited design/structural life. Identification of this block indicates that SRP intends to undertake a condition need project on this school site. <i>Identified as red blocks on the site plan.</i>
Additional	This is a block that has not been identified by the selection process as being a target block. Nevertheless, it is a block that the condition survey confirms is in poor condition that will need major refurbishment or rebuilding works within the next 25 years or requires a significant level of works to retain the

Table 1: Summary of identified block types (Department for Education)	
Identifier	Description
	block's integrity. Consequently, the block will be pulled into scope and addressed. <i>Identified as yellow blocks on the site plan.</i>
Untouched	These are blocks that are unlikely to require any works. <i>Identified as green blocks on the site plan.</i>
Proposed Temporary Accommodation	<i>Identified as a purple area on the site plan.</i>

- 1.3.4 Documentation provided at the time of writing indicates proposed redevelopment of the single storey target block (EFAA). Proposals also indicate redevelopment of the two single storey additional blocks (EFAC and AFAD) which are currently in use as a temporary music classroom and a gym, respectively.
- 1.3.5 At the time of writing, no information has been provided to NoiseAir with respect to the proposed internal layout of the redevelopment options.

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Scope of Works

- 2.1.1 A feasibility assessment has been requested by the client in order to assess the acoustic environment at the site for the development.
- 2.1.2 This report will investigate the noise levels at and around the development site and assess against current appropriate guidance documentation, specifically:
- Building regulation in England for the resistance to the passage of sound and sound insulation, Approved Document E, 2010;
 - Acoustic design of schools: performance standards - Building bulletin 93 (BB93:2015);
 - Acoustics of schools: a design guide – ANC and IOA, 2015; and,
 - Guidelines on ventilation, thermal comfort, and indoor air quality in schools – Building Bulletin 101 (BB101:2018).
- 2.1.3 A summary of the relevant acoustic documentation which is listed above is subsequently provided.

Building regulation in England for the resistance to the passage of sound and sound insulation, Approved Document E, 2010

- 2.1.4 The building regulation in England for the resistance to the passage of sound and sound insulation, Approved Document E states in its 8th Section the following:

“In the Secretary of State’s view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and internal ambient noise which are given in Building Bulletin 93, Acoustic design of schools: performance standards.”

- 2.1.5 Therefore, it is required to follow the criteria set in BB93:2015 to satisfy the acoustic design requirements for these spaces.

Acoustic design of schools: performance standards - Building bulletin 93

- 2.1.6 The Building Bulletin 93, Acoustic design of schools: performance standards document sets out minimum performance standards for the acoustic of school buildings, new and refurbished, and describes the normal means of demonstrating compliance with the Building Regulations.

2.1.7 This document is to be read in conjunction with ‘Acoustics of school: a design guide’ published by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA), providing supporting information and additional design considerations.

2.1.8 The acoustic conditions in schools are controlled by Building Regulations Part E. Requirement E4 from Part E of Schedule 1 states the following:

“Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.”

2.1.9 BB93:2015 provides detail about the requirements for internal noise levels in teaching spaces, and states:

“The Building Regulations require that all spaces should meet the performance standards for indoor ambient noise level, airborne and impact sound insulation, and reverberation time as specified in tables 1 to 7. These values are for rooms that are finished, furnished for normal use, but unoccupied.”

2.1.10 The key elements conducted in this feasibility assessment are:

- Assessment of the external noise levels outside school buildings.
- Recommendations in the planning and layout.
- An estimation of the limits in indoor ambient noise levels.

2.1.11 Details on the noise activity and sensitivity and upper limits for indoor ambient noise levels are set out in **Table 1** of BB93:2015, which has been reproduced in **Table 2** below.

Table 2: BB93:2015 - Noise activity and sensitivity levels and upper limits for indoor ambient noise level.				
Type of room	Room classification for the purpose of airborne sound insulation in Tables 3a and 3b		Upper limit for the indoor ambient noise level L _{Aeq,30mins} dB(A)	
	Activity noise (Source room)	Noise tolerance (Receiving room)	New build	Refurbishment
Nursey school rooms Primary school: classroom, class base, general teaching area, small group room.	Average	Medium	35	40

Table 2: BB93:2015 - Noise activity and sensitivity levels and upper limits for indoor ambient noise level.

Type of room	Room classification for the purpose of airborne sound insulation in Tables 3a and 3b		Upper limit for the indoor ambient noise level L _{Aeq,30mins} dB(A)	
	Activity noise (Source room)	Noise tolerance (Receiving room)	New build	Refurbishment
Secondary school: classroom, general teaching area, seminar room, tutorial room, language laboratory				
Open plan: (See also section 1.8) Teaching area Resource / breakout area	Average	Medium	40	45
Primary music room	High	Medium	35	40
Secondary music classroom Small and large practice / group room Performance / recital room	Very high	Low	35	40
Ensemble room Recording studio	Very high	Low	30	35
Control room – for recording Control room – not for recording	High Average	Low Medium	35	40
Lecture room	Average	Medium	35	40
Teaching space intended specifically for students with special hearing and communication needs	Average	Low	30	35
SEN calming room	High	Low	35	35
Study room (individual study, withdrawal, remedial work, teacher preparation)	Low	Medium	40	45
Libraries: Quiet study area	Low	Medium	40	45
Resource area	Average	Medium	40	45
Science laboratory	Average	Medium	40	45
Design and technology: Resistant materials, CAD/CAM area	High	High	40	45
	Average	Medium	40	45

Table 2: BB93:2015 - Noise activity and sensitivity levels and upper limits for indoor ambient noise level.				
Type of room	Room classification for the purpose of airborne sound insulation in Tables 3a and 3b		Upper limit for the indoor ambient noise level L _{Aeq,30mins} dB(A)	
	Activity noise (Source room)	Noise tolerance (Receiving room)	New build	Refurbishment
Electronics / control, textiles, food, graphics, design / resource area, ICT room, art				
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio / visual presentations, assembly, occasional music)	High	Low	35	40
Atrium, circulation space not intended for teaching and learning	Average	Medium	45	50
Sports hall Dance studio Gymnasium / Activity studio	High	Medium	40	45
Swimming pool	High	High	50	55
Meeting room, interviewing / counselling room, video conference room.	Low	Medium	40	45
Dining room	High	High	45	50
Administration and ancillary spaces: Kitchen Office, medical room, staff room Corridor, stairwell, coats and locker area Changing area Toilet	High Low Average High Average	High Medium High High High	50 40 45 50 50	55 45 55 55 55

2.1.12 BB93:2015 also gives guidance in indoor ambient noise levels (IANL) when using different ventilation systems. **Table 3**, below, extracted from BB93:2015 and corresponding to Table 2 in the document, presents a summary of the ventilation conditions, system type and associated IANL tolerance.

Table 3: BB93:2015 - Summary of ventilation condition, system type and associated IANL tolerance

Condition	Ventilation system	Noise level limit
Normal – ventilation for normal teaching and learning activities	Mechanical	Table 2 value
	Natural	Table 2 value + 5 dB
	Hybrid	Mechanical system noise: Table 2 value
		Total noise level: Table 2 value + 5 dB
Summertime – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year	Mechanical	Table 2 value + 5 dB
	Natural or hybrid	≤ 55 dB
Intermittent boost – ventilation under local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology	Mechanical	Table 2 value + 5 dB
	Natural	≤ 55 dB
Process – extract can be automatic ventilation for safety and / or under local control of teacher	Mechanical and / or natural	See IoA / ANC guide for operational noise levels

Acoustics of schools: a design guide – ANC and IOA, 2015

- 2.1.13 The document ‘Acoustics of schools: a design guide’, presented in 2015 by the Association of Noise Consultants and the Institute of Acoustics is to be read in conjunction with BB93:2015, and provides supporting information and additional design considerations.
- 2.1.14 The main objective of these standards is to ensure the design and construction of new and refurbishment of school buildings provides the acoustic conditions that enable effective teaching and learning.
- 2.1.15 The guide provides the criteria to follow in noise control, internal sound insulation, design of rooms for speech, for music or for pupils with special needs, among others.
- 2.1.16 There are multiple notes outlined within BB93:2015 and the design guide by the ANC and IOA guide which should be considered in full. However, some of the main points for consideration are outlined below:

- The table provides recommended internal $L_{Aeq,30mins}$ limit levels for overall noise in the design of the different spaces of a new or refurbished school. These are the sum total of all the different noise sources.
- As stated in the design guide by the ANC and IOA, the total indoor ambient noise level is determined by combining the noise levels from all relevant sources. The indoor ambient noise level due to external sources such as traffic must be added to the noise from mechanical ventilation, heating systems, lighting and other classroom building services.
- Building Regulations states requirements both in terms of internal noise levels and ventilation requirements.
- Designing the site layout and the dwellings so that the internal limit levels can be achieved demonstrates good acoustic design. Where it is not possible to avoid exceeding internal limit levels with windows open, internal noise levels will be assessed with windows closed and ventilation noise must be considered.
- The method of ventilation used in the different spaces, including the type of system and the location and number of ventilation openings will affect the overall sound insulation of the building envelope.
- The insulation level provided by the external walls will typically be sufficiently high that the windows, ventilation and, in some scenarios, the roof, will dictate the overall sound insulation of the building envelope.

2.1.17 The guidance states that:

“For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation”. It also states, “Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$ ”.

2.1.18 This report addresses internal noise levels, with the requirements as specified by BB93:2015 and the Acoustics of School Design Guide, and a series of general recommendations on best practices to achieve the target requirements.

Guidelines on ventilation, thermal comfort, and indoor air quality in schools – Building Bulletin 101 (BB101:2018)

- 2.1.19 Ventilation is a key part of holistic design for Indoor Environmental Quality (IEQ), with the acoustic comfort being one of the four key design factors to achieve acceptable levels of indoor environmental comfort.
- 2.1.20 BB101:2018 covers the acoustic comfort in its section 4.18, where it expounds that the designs should meet the acoustic performance standards specified in documents BB93:2015 and the Acoustics of School Design Guide.
- 2.1.21 BB101:2018 states the following main considerations regarding to the ventilation in relation to the acoustic of the different spaces at schools:
- *Whether natural ventilation is a suitable strategy for the building taking into account the external acoustic environment - high external noise levels may preclude the use of systems based on free openings.*
 - *If exposed concrete soffits provide passive cooling, the design should consider the reduction in the effectiveness due to acoustic absorbers and suspended ceilings that obscure the thermal mass.*
 - *If ventilation paths are required through the building, the level of sound attenuation needs to be considered, e.g., between classrooms and atria.*
- 2.1.22 BB101:2018 states that: “Noise from building services including mechanical ventilation systems should meet the limits for indoor ambient noise levels (IANL) given in Table 1 of BB93:2015 together with the tolerances on the IANL limits given in Table 2 of BB93:2015 for different types of ventilation system under different operating conditions.”
- 2.1.23 It is therefore concluded that the acoustic considerations about the ventilation systems at school should follow the criteria previously presented in **Table 2** and **Table 3** of this report, corresponding to Table 1 and Table 2 of BB93:2015.

3 ACOUSTIC SURVEY

3.1 Acoustic Survey Details

- 3.1.1 NoiseAir conducted fixed position noise monitoring from the 29th of March 2022 to the 31st of March 2022 at the development site.
- 3.1.2 Noise monitoring was conducted at two monitoring locations, ML1 and ML2. The noise monitoring locations are shown in **Figure 3** and described in **Table 4**.

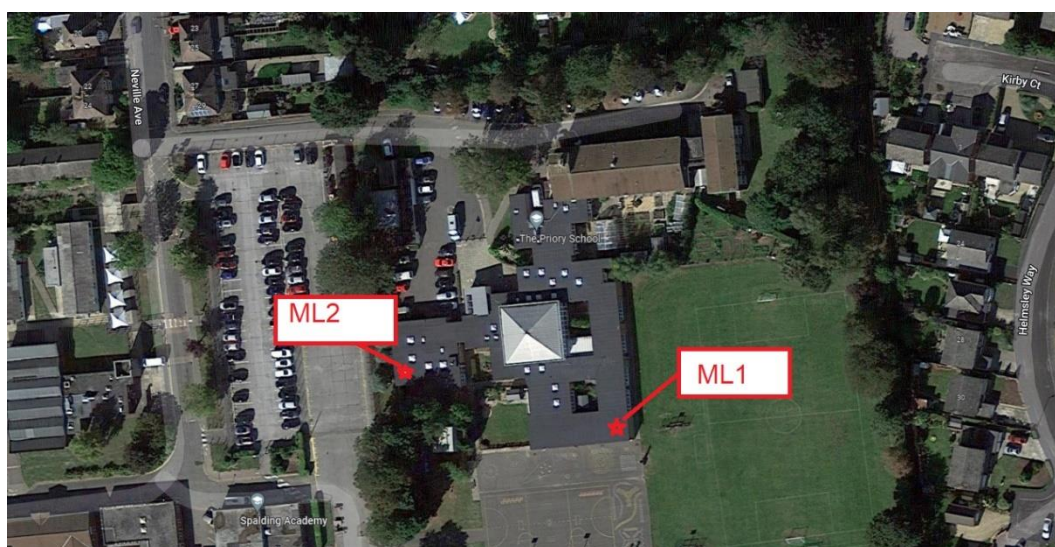


Figure 3: Noise monitoring locations.

Table 4: Summary of Noise Monitoring Locations				
Monitor Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End	
ML1	Mounted on a tripod on the flat roof to the southeast of the development site, microphone approximately 2 m above local roof level and approximately 2 m from the roof edge.	11:45 29/03/22	11:30 31/03/22	Unattended
ML2	Mounted on a tripod on the flat roof to the west of the development site, microphone approximately 2 m above local roof level and approximately 2 m from the roof edge.	12:00 29/03/22	11:30 31/03/22	Unattended

- 3.1.3 ML1 was positioned to be representative of noise levels on the eastern side of target block EFAA and ML2 positioned to be representative of noise levels on the western side of target block EFAA. It is considered that these monitoring locations are representative of general

ambient noise levels with respect to all blocks proposed for redevelopment at the development site.

- 3.1.4 Noise level data from these monitoring locations are also considered representative for calibration of a preliminary 3D sound model (presented in Section 4).
- 3.1.5 The noise measurements were made using Class 1, integrating sound level meters (SLMs).
- 3.1.6 The acoustic equipment was calibrated to comply with Section 4.2 of BS 7445-1:2003¹ before and after the noise monitoring periods.
- 3.1.7 Details of the SLMs and associated field calibration can be found in **Table 5** below:

Table 5: Summary of SLMs used for survey and associated field calibration					
SLM (Serial Number)	Preamp (Serial Number)	Microphone (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1405015)	NOR1209 (14517)	NOR1225 (42327)	-26.1	-26.0	-0.1
NOR140 (1405016)	NOR1209 (14242)	NOR1225 (118503)	-26.3	-26.1	-0.2

- 3.1.8 The weather conditions were noted to be as outlined in **Table 6** during the site visits at the start and end of the monitoring periods.

Table 6: Summary of weather conditions noted at the monitoring locations.		
Parameter	29th of March 2022	31st of March 2022
Roads (Wet / Dry)	Dry	Dry
Temperature (°C)	6	6
Wind speed (ms ⁻¹) / direction	4 (gusts) / ENE	Up to 4.3 (gusts) NNE
Cloud Cover (Approx. %)	100	40
Humidity (%)	93	55

- 3.1.9 A-weighted² L_{eq} ³ and L_{Amax} ⁴ noise levels were measured. The measured noise levels are set out in full in **Appendix C**.

¹ BS 7445-2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

² An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.

³ Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

⁴ The instantaneous maximum noise level recorded for a measurement period.

- 3.1.10 Attending the development site at the start and end of the survey monitoring period provided opportunity for observations and detailed notes to be made of the significant noise sources which contribute to each of the measured levels.

ML1 – East side of Target Block EFAA

Dominant noise was that from distant traffic. Secondary noise was that from nearfield road traffic. Secondary noise was human voice from pupils / staff and birdsong.

ML2 – West Side of Target Block EFAA

The NoiseAir on site consultant noted that the noise climate at ML2 was similar to that at ML1.

3.2 Measured Sound Levels

- 3.2.1 Data is shown in **Figure 4** and **Figure 5** detailing a level vs time graph of the recorded L_{Amax} , L_{Aeq} and L_{A90} sound level over 15-minute time periods for ML1 and ML2 respectively.

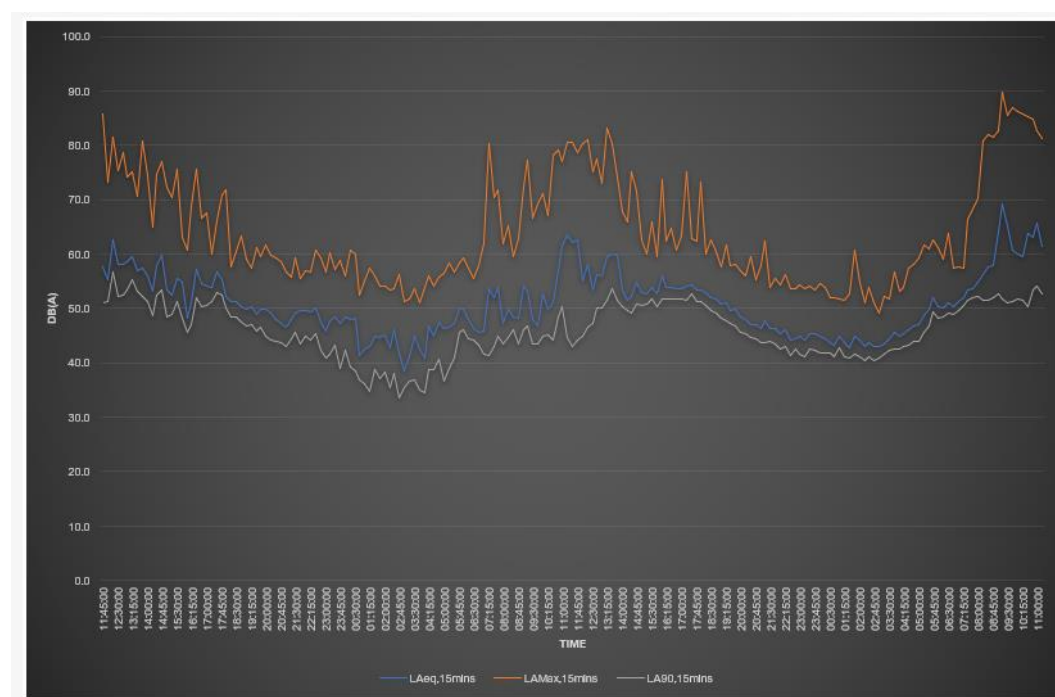


Figure 4: Level vs. time graph showing L_{Amax} , L_{Aeq} and L_{A90} sound levels – ML1

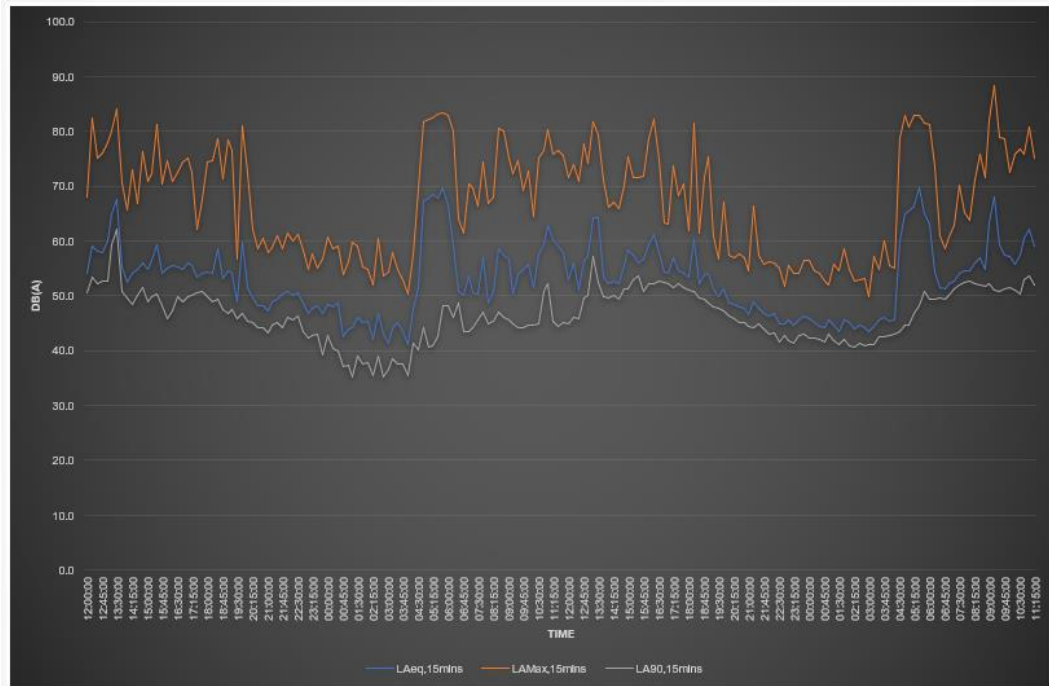


Figure 5: Level vs. time graph showing L_{Amax} , L_{Aeq} and L_{A90} sound levels – ML2

3.2.2 This assessment has been conducted in general accordance with 'BB93:2015, Acoustic design of schools' and the 'ANC / IOA design guide of acoustics of schools', therefore, the results for the monitoring locations are given in accordance with these standards. Results are presented in **Table 7**. The data provided has been restricted to typical school hours which might encompass 09:00 to 17:00 hours (allowing for extended teaching hours).

Table 7: Average Measured Daytime Noise Levels			
Monitoring Location	Time	Measured Noise Level	
	Start - Finish	dB $L_{Aeq,30min}$	dB $L_{A90,1hour}$
ML1	09:00 - 17:00	47.4 – 67.4	45.0 – 53.5
ML2	09:00 - 17:00	52.5 – 66.2	44.8 – 56.3

3.2.3 **Figure 6** details the results of the data analyses on the $L_{Aeq,30min}$ levels in terms of the frequency of occurrence of each value at ML1 during the measurement period 09:00 to 17:00.

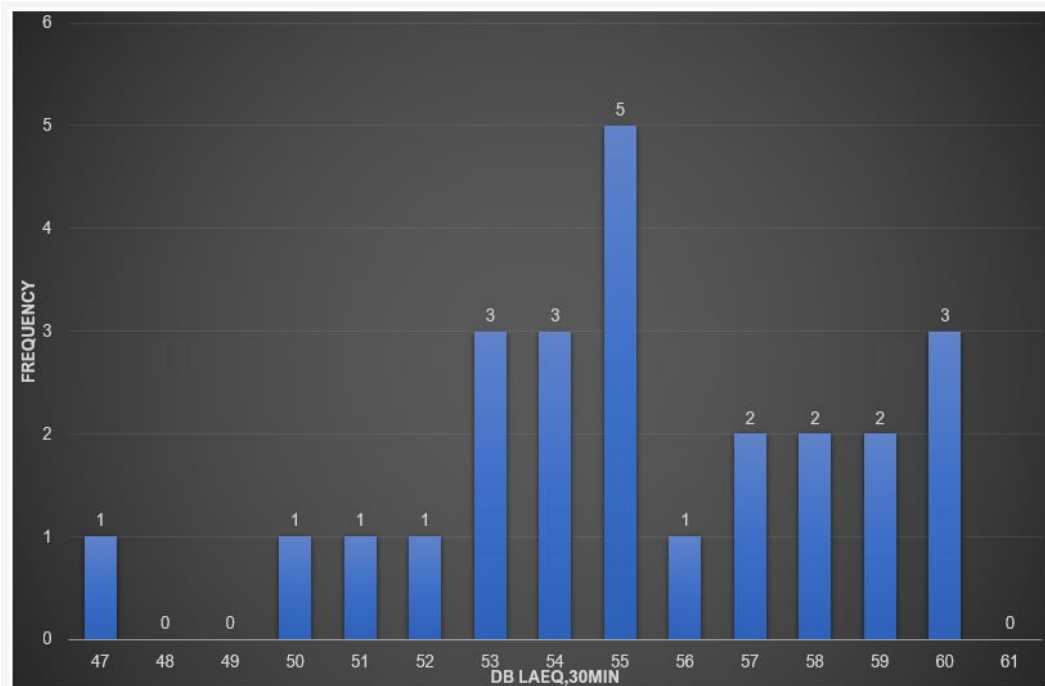


Figure 6: Data analysis of the daytime $L_{Aeq,30min}$ levels at ML1 during the measurement period 09:00 to 17:00.

- 3.2.4 **Figure 6** shows that the most common occurrence is 55 dB $L_{Aeq,30mins}$. On review of the dataset, taking a conservative approach, and given 88 % of the occurrences are 59 dB $L_{Aeq,30mins}$ or less, 59 dB $L_{Aeq,30mins}$ has been selected and will be adopted for calibration at ML1 in the 3D sound model.
- 3.2.5 **Figure 7** details the results of the data analyses on the background sound levels ($L_{A90,1hour}$) in terms of the frequency of occurrence of each value at measuring location ML1 during the measurement period 09:00 to 17:00.

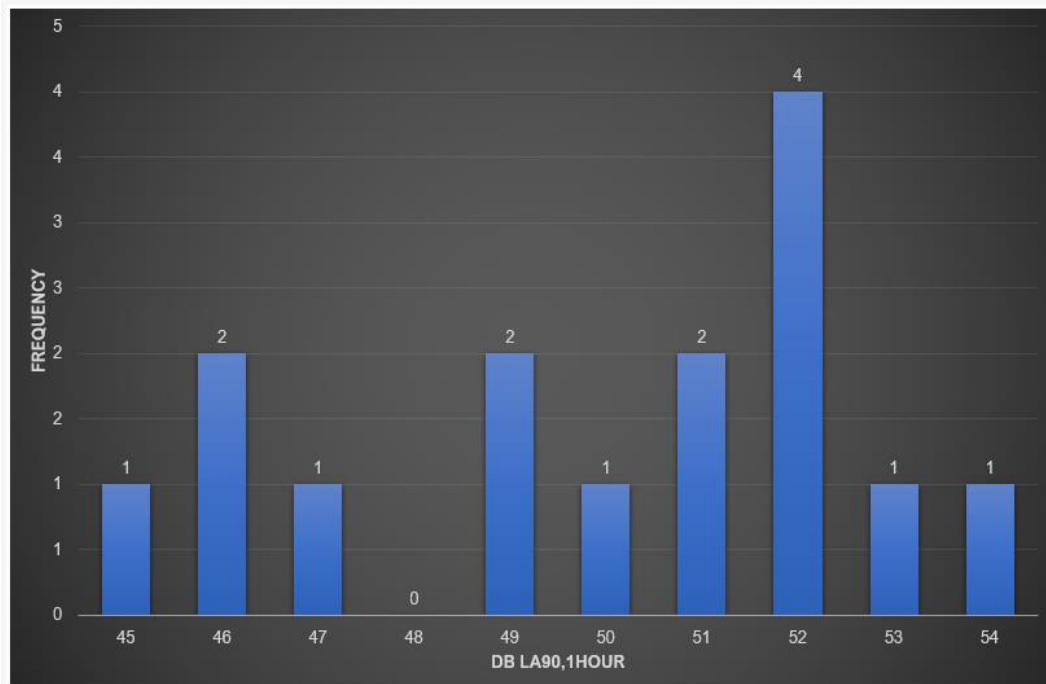


Figure 7: Data analysis of the daytime background ($L_{A90,1\text{hour}}$) sound level results – ML1 during measurement period 09:00 to 17:00.

3.2.6 Based on analysis of the data for ML1, 52 dB $L_{A90,1\text{hour}}$ is the most common occurrence. On review of the dataset, taking a conservative approach, and given 80% of the measurement period shows a background level of 47 dB $L_{A90,1\text{hour}}$ or greater, 47 dB $L_{A90,1\text{hour}}$ has been selected to represent background level at the closest NSR.

3.2.7 **Figure 8** details the results of the data analyses on the $L_{Aeq,30\text{min}}$ levels in terms of the frequency of occurrence of each value at ML2 during the measurement period 09:00 to 17:00.

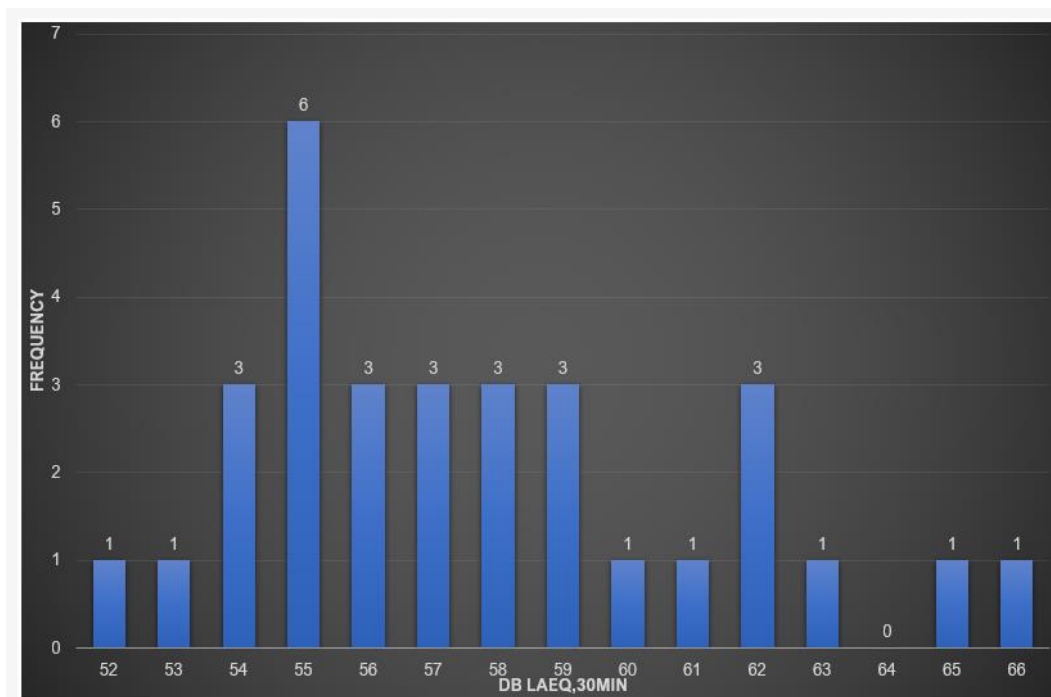


Figure 8: Data analysis of the daytime $L_{Aeq,30min}$ levels at ML2 during measurement period 09:00 to 17:00.

- 3.2.8 **Figure 8** shows that the most common occurrence is 55 dB $L_{Aeq,30mins}$. On review of the dataset, taking a conservative approach, and given 90 % of the occurrences are 62 dB $L_{Aeq,30mins}$ or less, 62 dB $L_{Aeq,30mins}$ has been selected and will be adopted for calibration at ML2 in the 3D sound model.
- 3.2.9 **Figure 9** details the results of the data analyses on the background sound levels ($L_{A90,1hour}$) in terms of the frequency of occurrence of each value at measuring location ML2 during the measurement period 09:00 to 17:00.

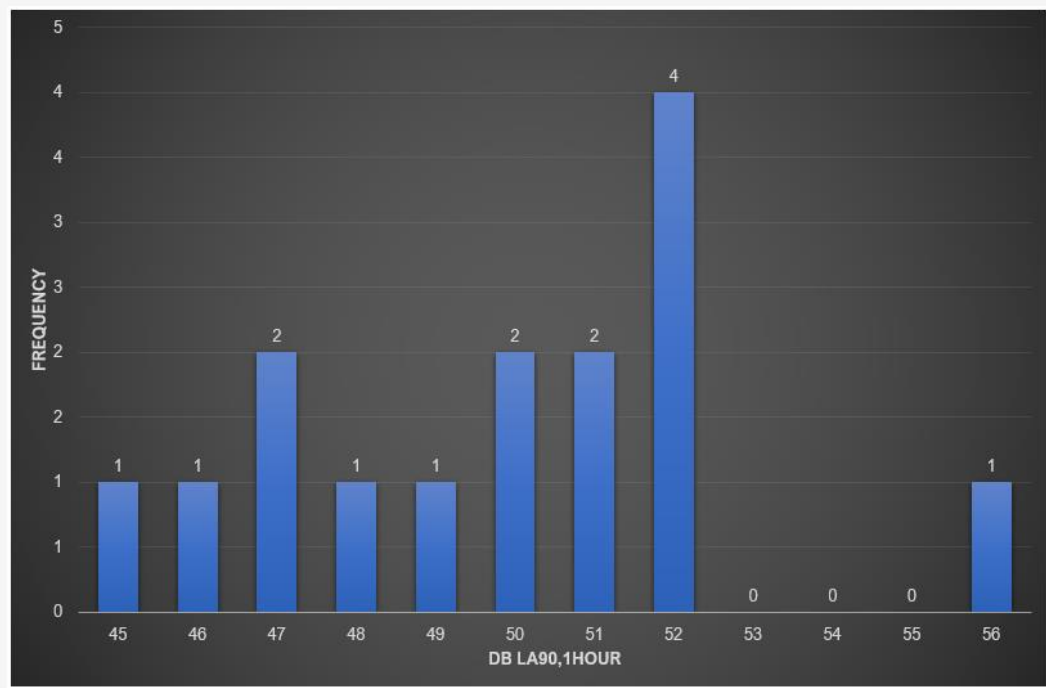


Figure 9: Data analysis of the daytime background ($L_{A90,1\text{hour}}$) sound level results – ML2 during measurement period 09:00 to 17:00.

- 3.2.10 Based on the analysis, for ML2 52 dB $L_{A90,1\text{hour}}$ is the most common occurrence, however taking a conservative approach and given 87% of the measurement period shows a background level of 47 dB $L_{A90,1\text{hour}}$ or greater, 47 dB $L_{A90,1\text{hour}}$ has been selected to represent background level at the closest NSR.

4 FEASIBILITY ASSESSMENT

- 4.1.1 A feasibility assessment regarding the criteria set out within the Building Regulation documentation, BB93:2015 and the Acoustics of School design guide has been conducted with reference to the sound levels measured at the development site.
- 4.1.2 To provide a preliminary indication of noise propagation at the development site a 3D sound model has been constructed.

4.2 3D Sound Model

- 4.2.1 A 3D sound model has been constructed in SoundPLAN™ to calculate the predicted sound pressure levels at different locations across the development site. The model uses the calculation method from ISO 9613-2:1996⁵ to account for the distance between the source and receiver and any screening or reflections provided by the surrounding buildings.
- 4.2.2 The model is based on and calibrated against data collected during the survey presented in Section 3 of this report as well as NoiseAir library data, SoundPLAN™ library data and traffic count data from the department of transport website, where appropriate.
- 4.2.3 It should be noted at this feasibility stage that the 3D sound model is considered preliminary in nature and based on assessment and measurement of the predominant noise sources as noted at the time of the acoustic survey conducted by NoiseAir. An exhaustive assessment of all noise sources at and around the school site has not been conducted and is not considered within the scope of a feasibility assessment. It should be noted therefore that detailed assessment of potential noise breakout from the development site and its surroundings is recommended at the appropriate stage and, subsequently, may require updating of the 3D sound model.
- 4.2.4 Based on observations during the NoiseAir site visit, the following noise sources have been identified as being predominant during the acoustic survey and, therefore, the following noise sources have been included within the 3D sound model.
- **A16** – modelled as a line source at a height of 0.5 m from road level. Calibrated to noise level measured at ML1.
 - **Low Road / Halmer Gate** – modelled as a line source at a height of 0.5 m from road level. Data obtained from the Department of Transport website traffic count point 37999 indicates vehicle passes of 10,359 during the daytime. Given an L_{AE} of 87.1

⁵ ISO9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"

- dB, the $L_{Aeq,16hours}$ (daytime) sound pressure is calculated at 79.6 dB at 1 m from the road edge. These levels have been adopted for the 3D sound model.
- **Birch Avenue and Helmsley Way** – modelled as line sources at a height of 0.5 m from local road level. Both these roads are cul-de-sacs and are assigned a typical sound power level of 75 dB $L_{Aeq,16hours}$.
- **Kirby Court, Rainton Court, Avebury Gardens and Neville Avenue** – modelled as line sources at a height of 0.5 m from local road level. These roads are all smaller cul-de-sacs relative to Birch Avenue and Helmsley Way and therefore given they are likely to accommodate less traffic than Birch Avenue and Helmsley Way are assigned a sound power of 70 dB $L_{Aeq,16hours}$.

4.2.5 A noise contour plot illustrating the propagation of the sound to receptor during the daytime $L_{Aeq,30min}$ is given in **Figure 10**.

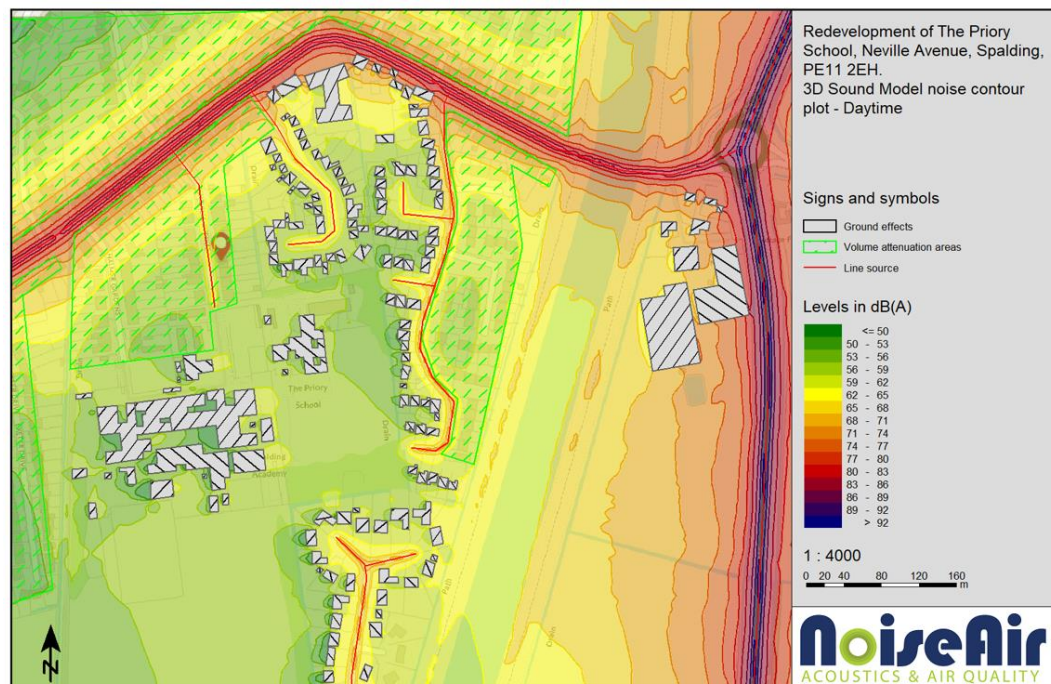


Figure 10: Noise contour plot illustration of the predicted propagation of sound to the site during the daytime – $L_{Aeq,30min}$.

4.2.6 Selected receptor locations at target blocks, additional blocks and potential outdoor learning locations across the development site are presented in **Figure 11**.

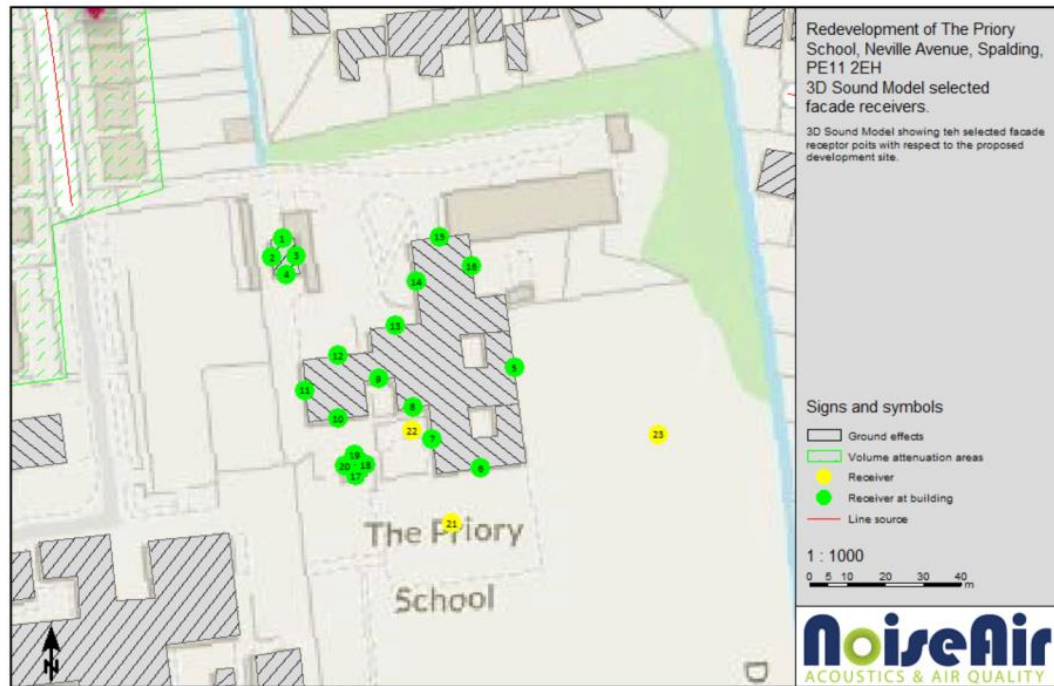


Figure 11: Plot illustration of the selected receptor locations across the development site.

4.2.7 Predicted façade readings have been calculated and are presented in **Table 8**.

No.	Identified Block	Floor Level	Façade Facing Direction	Predicted Levels $L_{Aeq,30min}$ (dB)
1	Additional	GF	North	55.1
2	Additional	GF	West	52.1
3	Additional	GF	East	55.9
4	Additional	GF	South	53.5
5	Target	GF	East	55.4
6	Target	GF	South	54.6
7	Target	GF	West	50.8
8	Target	GF	South	50.6
9	Target	GF	South	51.2
10	Target	GF	South	53.6
11	Target	GF	West	50.4
12	Target	GF	North	52.7
13	Target	GF	North	52.6
14	Target	GF	West	52.0
15	Target	GF	North	53.4

Table 8: Predicted Levels				
No.	Identified Block	Floor Level	Façade Facing Direction	Predicted Levels $L_{Aeq,30min}$ (dB)
16	Target	GF	East	55.0
17	Additional	GF	South	55.3
18	Additional	GF	East	55.5
19	Additional	GF	North	52.2
20	Additional	GF	West	51.5
21	N/A	N/A	N/A	56.6
22	N/A	N/A	N/A	53.0
23	N/A	N/A	N/A	54.9

4.3 BB93:2015 Assessment of Noise Levels in External Areas

- 4.3.1 It is noted that there are proposals for outdoor learning areas in the form of a sensory garden, horticulture, hard surfaced playing court and large grass playing field for sports. The proposals provided to NoiseAir do not specify the proposed locations for these outdoor learning areas and therefore suggested locations based on existing playground areas / sports fields and shielding from dominant noise sources have been selected in the model.
- 4.3.2 Receptors 21 – 23, modelled at 1.5 m from local ground level represent potential locations for outdoor learning and are calculated at 56.6 dB, 53.0 dB and 54.9 $L_{Aeq,30mins}$, respectively. In accordance with the guidance given in the Acoustics of schools: a design guide – ANC and IOA, 2015 and given The Priory School proposes to specifically accommodate SEND pupils, it is recommended that at least one outdoor learning area is provided such that the noise levels do not exceed 50 dB $L_{Aeq,30mins}$.
- 4.3.3 Given the calculated level at receptor 22 exceeds 50 dB $L_{Aeq,30mins}$, acoustic barriers were modelled at heights up to 2.5 m around the outdoor receptors, however it was noted that the level was still calculated to exceed 50 dB $L_{Aeq,30mins}$.
- 4.3.4 It is noted that ML1 was positioned overlooking the playground and therefore it is reasoned that the $L_{Aeq,30mins}$ at ML1 will include contribution with respect to the noise breakout from the playground. It is also reasoned that the noise breakout from the playground at lunch break and teaching time in classrooms do not occur simultaneously.
- 4.3.5 Given the model was calibrated to the potentially elevated sound pressure level at ML1 as discussed in 4.3.4, it is likely that the $L_{Aeq,30mins}$ at receptor 22 will reduce. However, to achieve an outdoor level of 50 dB $L_{Aeq,30mins}$, it is recommended that the design of a new

building should be such that a central courtyard area is adopted which is likely to provide natural shielding from local noise sources.

4.4 BB93:2015 Assessment of Internal Noise Levels – Building Envelope Requirements

- 4.4.1 At the time of writing, proposals are not developed such that the internal layout of the proposed blocks is available. It is noted however that the existing school has provision specifically for SEND pupils and therefore recommendations should be made as appropriate.
- 4.4.2 BB93:2015 outlines a wide range of target internal noise level criteria for an array of room uses that may be incorporated into a school design.
- 4.4.3 It is recommended that good acoustic design is adopted at an early stage. Therefore, it should be generally considered that rooms with more sensitive uses should be located where possible, to less noisy facades. The calculated noise levels and noise propagation model are presented in **Figure 10** and **Figure 11** for reference.
- 4.4.4 In order to provide initial recommendations on the appropriate building envelope requirements for typical classrooms given in the proposal options, a series of assumptions and requirements have been outlined in **Table 9**.

Table 9: Proposed room use assumptions and requirements					
Room Use	Teaching Requirement	Typical Size	BB93 Internal Ambient Noise Level Target – New Build ($L_{Aeq,30min}$)	BB93 Internal Ambient Noise Level Target – Refurb ($L_{Aeq,30min}$)	Typical Room Use Examples
Classroom	SEND	8 m x 7 m (56 m ²)	30 dB	35 dB	Teaching spaces for SEND pupils

- 4.4.5 **Table 10** outlines the likely building envelope requirements based on the 3D sound model results and the requirements as set out in **Table 9**.

Table 10: Building Envelope Requirements						
Block/ Façade	Classroom Type	Façade Noise Level (dB(A) (minimum to maximum)	BB93 Indoor Ambient Noise Level Target (dB(A))	Maximum Façade Attenuatio n Required (dB(A))	Estimated Building Façade Requirements ¹	
					With Passiv e Vents ³	Withou t Passive Vents
All blocks / All Façade s	New Build - SEND	50 - 56	30	26	Window – 31 dB R _w +C _{tr} ²	Window – 26 dB R _w +C _{tr} ²
All blocks / All Façade s	Refurb - SEND	50 - 56	35	21	Window – 26 dB R _w +C _{tr} ²	Window – 21 dB R _w +C _{tr} ²
¹ Wall construction assumed to be not less than 55 dB R _w +C _{tr} , roof construction assumed to be not less than 47 dB R _w +C _{tr} . Calculations have been conducted in accordance with BS EN ISO 12354-3:2000 methodology. Typical classroom is assumed as worst case corner room with three exposed façades (two sides and roof). ² Window area assumed to be not more than 16 m ² per classroom. ³ Up to 4 no. passive vents per classroom.						

- 4.4.6 It should be noted that the building façade requirements presented in **Table 10** are indicative only. Calculations have been based on a +5 dB(A) safety margin to account for ‘real world’ factors, however, calculations do not include provision for flanking transmissions and other such noise transmission elements. It is therefore recommended that the building façade requirements are confirmed at detailed design stage.

4.5 Acoustic Ventilation Requirements

- 4.5.1 Acoustic ventilation proposed at the development site, as a minimum, should comply with Building Regulations 2000 Approved Document F1 Means of Ventilation, British Standard BS 5925 1991: “Code of Practice for Ventilation Principles and Designing for Natural Ventilation” and Guidelines on ventilation, thermal comfort and indoor air quality in schools – Building Bulletin 101 (BB101:2018).
- 4.5.2 BB93 provides guidance on the likely ventilation solutions which can be adopted for a school development. The ventilation solution is predominantly determined by the level of acceptable noise break in from external noise sources. Subsequently BB93 outlines three typical ventilation solutions which are considered appropriate for schools being natural, mechanical and hybrid.

- 4.5.3 Where the calculated room conditions are likely to be acceptable with natural ventilation in the form of partially openable windows, mechanical and hybrid options are still acceptable solutions.
- 4.5.4 Calculations with respect to internal noise levels are based upon 15 dB(A) attenuation for a partially open window.
- 4.5.5 The predicted noise levels at the façades of the proposed building structures, as detailed in **Figure 11 and Table 8**, together with the likely BB93 ventilation solution required for refurbished classrooms, are presented in **Figure 12 and Table 11**.

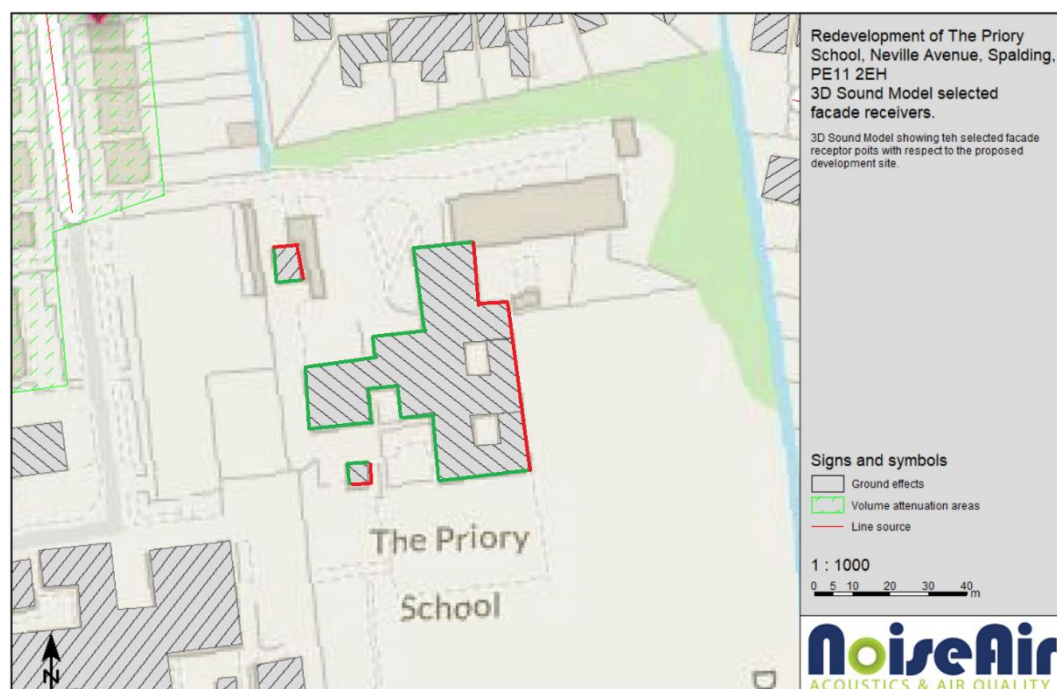


Figure 12: Colour coded illustration showing calculated likely ventilation solutions in accordance with BB93:2015 for refurbished classrooms.

- 4.5.6 **Table 11** outlines the likely BB93 ventilation requirements in accordance with the feasibility proposals.

Table 11: Summary of likely BB93 ventilation requirements							
Block/ Façade	Classroom Type	BB93 Indoor Ambient Noise Level Target – dB(A)	Calculate d Internal Maximum Noise Level ¹ – dB(A)	Excess above BB93 Level – dB(A)	Likely BB93 Ventilation Solution	BB93 Ventilation Design Criteria	
						Mech ²	Hybrid – dB(A) ³
All blocks / All Facades	New build – SEND	30	41	+11	Mechanical / Hybrid	NR25	35
Green	Refurb – SEND	35	40	+5	Natural	NR30	40
Red			41	+6	Mechanical / Hybrid		
¹ Allowing for 15 dB attenuation across a partially open window. ² Total mechanical ventilation noise breakout requirements for any given room. ³ Total ventilation system noise breakout requirements including any mechanical ventilation and passive ventilation noise sources. Mechanical ventilation noise must not exceed the given NR value when isolated.							

- 4.5.7 **Figure 12** and **Table 11** show that some of the facades (highlighted green), are calculated to achieve the required internal levels adopting natural ventilation with partially opened windows. The remainder of the facades (highlighted in red) are calculated to achieve the required levels with windows in the closed position.
- 4.5.8 Consideration to the acoustic ventilation design should be reassessed at a detailed design stage when considering the use of the classrooms in order to achieve the appropriate guidance levels in BB93:2015.
- 4.5.9 In the case of this assessment, natural ventilation has been assumed as ventilation by way of a partially open window or door in order to produce a robust – and worst-case scenario – assessment. However, it should be noted that this is not the only form of natural ventilation available. Natural ventilation is described in BB101:2018 as being ventilation that is driven by the wind and the stack effect.
- 4.5.10 These systems can involve:
- opening windows (can be manual, automated, or a combination of both);
 - opening dampers (can be manual, automated, or a combination of both); and,

- roof stacks (these can be manual or automated, but automated ones are more common).
- 4.5.11 The specific details and functions of a natural ventilation system, however, are beyond the scope of this report and should be considered as part of a detailed acoustic design statement.
- 4.5.12 Should a hybrid / mechanical system be incorporated into the design, ventilators should be acoustically treated for classrooms at all facades. Ventilation openings to these rooms should match or exceed the minimum values set out for the level of attenuation provided by the glazing. Hybrid / mechanical ventilation elements should also be included within the detailed sound insulation design where appropriate.
- 4.5.13 It should be noted that ventilation requirements for the students and teaching staff of the proposed development are outside the scope of this report.

4.6 Construction Noise

- 4.6.1 It is noted that the development proposals outline the location of a temporary block (LA). It is noted that construction noise breakout is likely to introduce significant temporary noise sources during this time which subsequently has the potential to cause disturbance to teaching activities at the school and also to local residents.
- 4.6.2 It is considered that construction noise will be appropriately managed by a reputable contractor. However, it is recommended that, in order to minimise disturbance to both school teaching activities and local residents, a construction noise impact assessment in general accordance with BS 5228-1:2009+A1:2014 (Code of practice for noise and vibration control on construction and open sites) should be undertaken prior to construction and appropriate mitigation be implemented.

4.7 Flanking noise

- 4.7.1 The noise transmission through the structural elements of the building, i.e., flanking noise, will reduce the expected overall sound insulation and therefore the indoor ambient noise levels would likely be increased.
- 4.7.2 It is essential flanking transmission is considered, assessed and allowances made as part of the new build in order to achieve the sound reduction level requirements at a given façade / internal partition.

4.8 Roof – Noise Ingress and Rainfall

- 4.8.1 Rain falling on the roof can create an impact noise that could considerably increase the indoor ambient noise levels within classrooms.
- 4.8.2 Rain noise has the potential to become an important noise source if not controlled properly, therefore it is important that a special consideration is put into the design of the roof, in order to dampen this noise and isolate the classrooms from it.
- 4.8.3 Attention should also be paid to any glazing located on the roof of the proposed building, if considered, such as roof lights.

5 PLANT NOISE LIMITS

- 5.1.1 It is considered likely that the proposed refurbishment and / or new build options will introduce new mechanical plant to the school site. Therefore, any new external plant installed as part of the proposals should be assessed in accordance with BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound.
- 5.1.2 It is recommended that a conservative approach is adopted to any mitigation that may be required for proposed mechanical plant at the development site. Consideration should also be given to the potential for noise disturbance to teaching activities at the school.
- 5.1.3 It is recommended that the rating level (measured / calculated in accordance with BS 4142:2014+A1:2019) from mechanical plant installed at the development site should not exceed 5 dB below the measured background sound level at the nearest noise sensitive receptor. This acoustic survey has measured a typical background sound level of 47 dB $L_{A90,1\text{hour}}$.
- 5.1.4 Good acoustic design is therefore recommended to ensure that mechanical plant which may form part of the proposals is located away from nearby local residents and away from noise sensitive areas of the proposed development such as teaching room windows. This is often achieved by installing mechanical plant within appropriately designed plant rooms or at roof level of a given building.
- 5.1.5 General recommendations for mechanical plant often require the use of appropriate anti-vibration mounts to ensure that vibration transfer into the building through structure borne vibration is minimised. Other typical solutions to minimise noise breakout typically include acoustic screens, acoustic enclosures, attenuators and acoustic louvres however the requirement of such measures is to be determined at detailed design stage.

6 CONCLUSIONS

- 6.1.1 NoiseAir has conducted a noise feasibility assessment with respect to the development of The Priory School, Neville Avenue, Spalding, Lincolnshire PE11 2EH.
- 6.1.2 Several of the existing building structures at the school site have been designated for redevelopment. This feasibility study investigates the acoustic requirements for the redevelopment of blocks EFAA, EFAC and EFAD.
- 6.1.3 To inform this feasibility acoustic assessment, an acoustic survey has been undertaken. Primary noise sources affecting the development site are considered to be local road traffic noise.
- 6.1.4 The results of the acoustic survey have been assessed in accordance with BB93:2015.
- 6.1.5 Preliminary building façade requirements are outlined within Section 4.4 of this report. In accordance with **Table 10**, facade requirements for new teaching spaces are likely to be at least 31 dB R_w+C_{tr} when utilising a passive ventilation system and at least 26 dB R_w+C_{tr} without passive ventilation.
- 6.1.6 Facade requirements for refurbished teaching spaces are likely to be at least 26 dB R_w+C_{tr} when utilising a passive ventilation system and at least 21 dB R_w+C_{tr} without passive ventilation.
- 6.1.7 Preliminary acoustic ventilation requirements are outlined within Section 4.5 of this report. To achieve the internal levels in accordance with BB93:2015, **Figure 12** and **Table 11** show that for a refurbished building, natural ventilation is calculated to suffice at some facades with the remainder calculated to require mechanical or hybrid ventilation / a closed window solution.
- 6.1.8 For new build, it is calculated that a mechanical or hybrid ventilation system would be required at all facades in order to achieve required internal levels, however it should be noted that natural ventilation options may still be appropriate where such systems do not rely on partially open windows.
- 6.1.9 It is noted, however, that building façade and ventilation requirements presented within this report are indicative and subject to detailed design.

APPENDIX A - REPORT LIMITATIONS

This Report is presented to HSP Consulting Limited and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this report.

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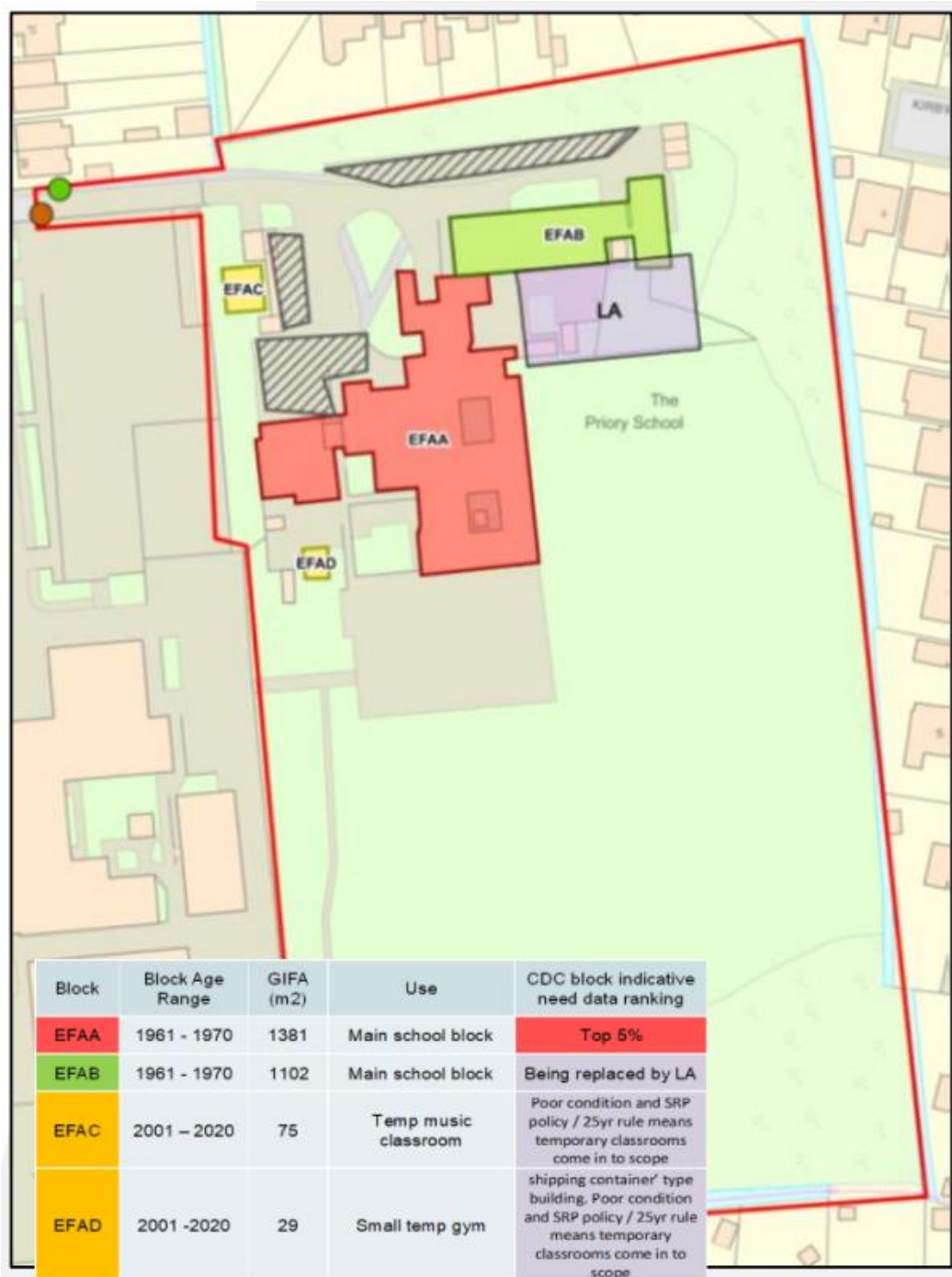
The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from who it has been requested and that such information is accurate. Information obtained by NoiseAir Limited has not been independently verified by NoiseAir Limited unless otherwise stated in the report and should be treated accordingly.

Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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APPENDIX B – PLAN OF EXISTING SCHOOL BUILDING



APPENDIX C – METER READINGS

ML1

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
29/03/2022	11:45:00	00:15:00	57.7	85.8	51.1
29/03/2022	12:00:00	00:15:00	55.3	73.3	51.2
29/03/2022	12:15:00	00:15:00	62.7	81.6	56.7
29/03/2022	12:30:00	00:15:00	58.2	75.4	52.1
29/03/2022	12:45:00	00:15:00	58.1	78.7	52.4
29/03/2022	13:00:00	00:15:00	58.7	74.1	53.4
29/03/2022	13:15:00	00:15:00	59.6	75.1	55.2
29/03/2022	13:30:00	00:15:00	56.9	70.6	53.2
29/03/2022	13:45:00	00:15:00	57.5	80.8	52.3
29/03/2022	14:00:00	00:15:00	56.1	74.3	51.3
29/03/2022	14:15:00	00:15:00	53.1	65.0	48.7
29/03/2022	14:30:00	00:15:00	57.9	74.6	52.4
29/03/2022	14:45:00	00:15:00	59.8	77.0	53.4
29/03/2022	15:00:00	00:15:00	53.3	72.2	48.4
29/03/2022	15:15:00	00:15:00	52.5	70.4	49.0
29/03/2022	15:30:00	00:15:00	55.5	75.6	51.3
29/03/2022	15:45:00	00:15:00	54.9	63.0	48.1
29/03/2022	16:00:00	00:15:00	48.1	60.8	45.5
29/03/2022	16:15:00	00:15:00	51.1	68.7	47.0
29/03/2022	16:30:00	00:15:00	57.1	75.6	52.0
29/03/2022	16:45:00	00:15:00	54.5	66.6	50.4
29/03/2022	17:00:00	00:15:00	54.0	67.5	50.6
29/03/2022	17:15:00	00:15:00	53.9	60.1	51.2
29/03/2022	17:30:00	00:15:00	56.7	66.2	53.0
29/03/2022	17:45:00	00:15:00	55.4	70.8	52.4
29/03/2022	18:00:00	00:15:00	52.3	71.9	50.1
29/03/2022	18:15:00	00:15:00	51.3	57.7	48.5
29/03/2022	18:30:00	00:15:00	51.3	60.5	48.5
29/03/2022	18:45:00	00:15:00	50.3	63.4	47.4
29/03/2022	19:00:00	00:15:00	49.8	59.1	46.8
29/03/2022	19:15:00	00:15:00	50.3	57.5	47.1
29/03/2022	19:30:00	00:15:00	49.0	61.3	45.8
29/03/2022	19:45:00	00:15:00	49.8	59.5	46.6
29/03/2022	20:00:00	00:15:00	49.9	61.6	44.9
29/03/2022	20:15:00	00:15:00	49.1	59.7	44.3
29/03/2022	20:30:00	00:15:00	47.9	59.3	43.9
29/03/2022	20:45:00	00:15:00	47.3	58.5	43.7
29/03/2022	21:00:00	00:15:00	46.5	56.7	42.9
29/03/2022	21:15:00	00:15:00	48.0	55.7	44.4
29/03/2022	21:30:00	00:15:00	49.1	59.2	45.6
29/03/2022	21:45:00	00:15:00	49.6	55.5	43.4
29/03/2022	22:00:00	00:15:00	49.7	56.9	44.9
29/03/2022	22:15:00	00:15:00	49.4	56.7	44.3
29/03/2022	22:30:00	00:15:00	50.0	60.7	45.3
29/03/2022	22:45:00	00:15:00	47.6	59.3	42.2
29/03/2022	23:00:00	00:15:00	45.8	56.7	41.0

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
29/03/2022	23:15:00	00:15:00	47.8	60.3	41.6
29/03/2022	23:30:00	00:15:00	48.4	57.1	43.3
29/03/2022	23:45:00	00:15:00	47.2	58.8	39.0
30/03/2022	00:00:00	00:15:00	48.4	55.9	42.3
30/03/2022	00:15:00	00:15:00	48.0	60.6	39.3
30/03/2022	00:30:00	00:15:00	48.1	60.1	38.6
30/03/2022	00:45:00	00:15:00	41.4	52.5	36.8
30/03/2022	01:00:00	00:15:00	42.5	55.1	36.1
30/03/2022	01:15:00	00:15:00	42.9	57.4	34.7
30/03/2022	01:30:00	00:15:00	45.0	56.1	38.8
30/03/2022	01:45:00	00:15:00	44.6	54.0	37.1
30/03/2022	02:00:00	00:15:00	45.1	54.1	38.2
30/03/2022	02:15:00	00:15:00	42.7	53.4	35.4
30/03/2022	02:30:00	00:15:00	46.0	53.6	38.1
30/03/2022	02:45:00	00:15:00	41.8	56.2	33.6
30/03/2022	03:00:00	00:15:00	38.5	51.2	35.4
30/03/2022	03:15:00	00:15:00	41.1	51.7	36.7
30/03/2022	03:30:00	00:15:00	44.9	53.6	36.8
30/03/2022	03:45:00	00:15:00	42.5	51.1	35.0
30/03/2022	04:00:00	00:15:00	40.9	53.9	34.5
30/03/2022	04:15:00	00:15:00	46.7	55.9	38.8
30/03/2022	04:30:00	00:15:00	45.0	54.1	38.7
30/03/2022	04:45:00	00:15:00	47.5	55.8	40.7
30/03/2022	05:00:00	00:15:00	46.4	56.4	36.6
30/03/2022	05:15:00	00:15:00	46.6	58.3	38.9
30/03/2022	05:30:00	00:15:00	47.2	56.8	41.0
30/03/2022	05:45:00	00:15:00	50.2	58.3	45.6
30/03/2022	06:00:00	00:15:00	49.8	59.2	46.0
30/03/2022	06:15:00	00:15:00	47.9	57.3	44.4
30/03/2022	06:30:00	00:15:00	46.4	55.5	44.3
30/03/2022	06:45:00	00:15:00	45.7	57.8	43.2
30/03/2022	07:00:00	00:15:00	45.8	61.9	41.5
30/03/2022	07:15:00	00:15:00	53.7	80.2	41.3
30/03/2022	07:30:00	00:15:00	52.0	70.3	43.1
30/03/2022	07:45:00	00:15:00	53.8	71.9	44.8
30/03/2022	08:00:00	00:15:00	47.3	61.8	43.5
30/03/2022	08:15:00	00:15:00	49.8	65.3	44.7
30/03/2022	08:30:00	00:15:00	48.5	59.5	46.1
30/03/2022	08:45:00	00:15:00	48.1	62.8	43.6
30/03/2022	09:00:00	00:15:00	54.0	72.4	46.0
30/03/2022	09:15:00	00:15:00	53.2	77.3	46.9
30/03/2022	09:30:00	00:15:00	47.9	66.6	43.6
30/03/2022	09:45:00	00:15:00	46.9	69.3	43.6
30/03/2022	10:00:00	00:15:00	52.6	71.2	44.9
30/03/2022	10:15:00	00:15:00	49.9	67.1	45.2
30/03/2022	10:30:00	00:15:00	51.1	78.3	44.1
30/03/2022	10:45:00	00:15:00	56.9	79.2	48.5
30/03/2022	11:00:00	00:15:00	61.4	77.1	50.3
30/03/2022	11:15:00	00:15:00	63.5	80.6	44.7

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
30/03/2022	11:30:00	00:15:00	62.1	80.5	43.1
30/03/2022	11:45:00	00:15:00	62.6	78.7	44.1
30/03/2022	12:00:00	00:15:00	55.0	80.4	44.8
30/03/2022	12:15:00	00:15:00	58.2	81.0	46.5
30/03/2022	12:30:00	00:15:00	53.5	75.2	47.3
30/03/2022	12:45:00	00:15:00	56.2	77.5	50.0
30/03/2022	13:00:00	00:15:00	56.0	73.0	50.2
30/03/2022	13:15:00	00:15:00	59.5	83.1	51.4
30/03/2022	13:30:00	00:15:00	60.1	80.2	53.7
30/03/2022	13:45:00	00:15:00	59.8	74.1	51.5
30/03/2022	14:00:00	00:15:00	53.3	67.8	50.4
30/03/2022	14:15:00	00:15:00	51.4	66.0	49.7
30/03/2022	14:30:00	00:15:00	52.1	75.1	49.2
30/03/2022	14:45:00	00:15:00	54.8	71.6	50.8
30/03/2022	15:00:00	00:15:00	52.9	62.5	50.5
30/03/2022	15:15:00	00:15:00	52.8	59.9	50.8
30/03/2022	15:30:00	00:15:00	53.8	66.0	51.7
30/03/2022	15:45:00	00:15:00	52.7	59.5	50.4
30/03/2022	16:00:00	00:15:00	55.9	73.7	51.8
30/03/2022	16:15:00	00:15:00	53.8	62.3	51.8
30/03/2022	16:30:00	00:15:00	53.8	64.8	51.8
30/03/2022	16:45:00	00:15:00	53.6	60.7	51.8
30/03/2022	17:00:00	00:15:00	53.6	63.3	51.7
30/03/2022	17:15:00	00:15:00	54.1	75.2	51.4
30/03/2022	17:30:00	00:15:00	54.4	62.8	52.6
30/03/2022	17:45:00	00:15:00	53.4	62.4	51.3
30/03/2022	18:00:00	00:15:00	53.3	73.2	51.2
30/03/2022	18:15:00	00:15:00	53.0	59.9	50.5
30/03/2022	18:30:00	00:15:00	51.9	62.7	49.6
30/03/2022	18:45:00	00:15:00	51.7	60.5	49.2
30/03/2022	19:00:00	00:15:00	50.8	57.6	48.3
30/03/2022	19:15:00	00:15:00	51.0	61.7	47.7
30/03/2022	19:30:00	00:15:00	49.7	57.8	47.3
30/03/2022	19:45:00	00:15:00	49.8	58.1	46.7
30/03/2022	20:00:00	00:15:00	48.5	57.0	45.7
30/03/2022	20:15:00	00:15:00	47.9	56.0	45.3
30/03/2022	20:30:00	00:15:00	47.1	59.6	44.6
30/03/2022	20:45:00	00:15:00	47.1	55.3	44.4
30/03/2022	21:00:00	00:15:00	46.2	57.9	43.7
30/03/2022	21:15:00	00:15:00	47.8	62.3	43.7
30/03/2022	21:30:00	00:15:00	46.4	53.9	43.9
30/03/2022	21:45:00	00:15:00	46.2	55.5	43.6
30/03/2022	22:00:00	00:15:00	45.4	54.3	42.5
30/03/2022	22:15:00	00:15:00	46.1	56.3	43.0
30/03/2022	22:30:00	00:15:00	44.2	53.6	41.3
30/03/2022	22:45:00	00:15:00	44.5	53.7	42.5
30/03/2022	23:00:00	00:15:00	45.0	54.3	41.7
30/03/2022	23:15:00	00:15:00	44.1	53.6	41.2
30/03/2022	23:30:00	00:15:00	45.3	54.1	42.5

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
30/03/2022	23:45:00	00:15:00	45.3	53.5	42.4
31/03/2022	00:00:00	00:15:00	44.9	54.6	41.9
31/03/2022	00:15:00	00:15:00	44.4	53.9	41.8
31/03/2022	00:30:00	00:15:00	43.7	51.9	41.8
31/03/2022	00:45:00	00:15:00	43.3	51.9	41.1
31/03/2022	01:00:00	00:15:00	44.8	51.8	42.8
31/03/2022	01:15:00	00:15:00	43.7	51.4	41.2
31/03/2022	01:30:00	00:15:00	42.8	52.6	40.8
31/03/2022	01:45:00	00:15:00	44.9	60.8	41.6
31/03/2022	02:00:00	00:15:00	44.2	54.8	41.2
31/03/2022	02:15:00	00:15:00	42.9	51.1	40.4
31/03/2022	02:30:00	00:15:00	43.8	53.8	41.2
31/03/2022	02:45:00	00:15:00	43.0	51.0	40.5
31/03/2022	03:00:00	00:15:00	43.0	49.2	40.9
31/03/2022	03:15:00	00:15:00	43.6	52.1	41.5
31/03/2022	03:30:00	00:15:00	44.5	51.7	42.3
31/03/2022	03:45:00	00:15:00	45.5	56.6	42.5
31/03/2022	04:00:00	00:15:00	44.8	53.1	42.6
31/03/2022	04:15:00	00:15:00	45.3	53.8	43.1
31/03/2022	04:30:00	00:15:00	46.1	57.5	43.2
31/03/2022	04:45:00	00:15:00	46.7	58.2	43.9
31/03/2022	05:00:00	00:15:00	47.0	59.4	44.0
31/03/2022	05:15:00	00:15:00	48.6	61.6	45.7
31/03/2022	05:30:00	00:15:00	49.9	61.0	46.9
31/03/2022	05:45:00	00:15:00	52.0	62.6	49.3
31/03/2022	06:00:00	00:15:00	50.4	61.2	48.3
31/03/2022	06:15:00	00:15:00	50.0	59.0	48.4
31/03/2022	06:30:00	00:15:00	51.0	63.9	49.2
31/03/2022	06:45:00	00:15:00	50.4	57.3	48.9
31/03/2022	07:00:00	00:15:00	51.2	57.7	49.7
31/03/2022	07:15:00	00:15:00	52.0	57.5	50.5
31/03/2022	07:30:00	00:15:00	53.3	66.5	51.4
31/03/2022	07:45:00	00:15:00	53.7	68.3	51.9
31/03/2022	08:00:00	00:15:00	54.9	70.1	52.3
31/03/2022	08:15:00	00:15:00	56.3	80.7	51.5
31/03/2022	08:30:00	00:15:00	57.7	81.9	51.4
31/03/2022	08:45:00	00:15:00	58.0	81.5	51.9
31/03/2022	09:00:00	00:15:00	64.1	82.7	52.7
31/03/2022	09:15:00	00:15:00	69.2	89.7	51.7
31/03/2022	09:30:00	00:15:00	65.1	85.6	51.1
31/03/2022	09:45:00	00:15:00	60.7	87.0	51.3
31/03/2022	10:00:00	00:15:00	60.1	86.1	51.8
31/03/2022	10:15:00	00:15:00	59.5	85.8	51.6
31/03/2022	10:30:00	00:15:00	63.8	85.2	50.4
31/03/2022	10:45:00	00:15:00	63.0	84.7	53.4
31/03/2022	11:00:00	00:15:00	65.7	82.6	54.2
31/03/2022	11:15:00	00:15:00	61.4	81.2	52.7

ML2

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
29/03/2022	12:00:00	00:15:00	54.2	68.1	50.6
29/03/2022	12:15:00	00:15:00	59.1	82.5	53.3
29/03/2022	12:30:00	00:15:00	58.1	75.1	52.2
29/03/2022	12:45:00	00:15:00	57.9	76.1	52.6
29/03/2022	13:00:00	00:15:00	59.9	78.0	52.7
29/03/2022	13:15:00	00:15:00	64.9	80.1	59.4
29/03/2022	13:30:00	00:15:00	67.6	84.1	62.2
29/03/2022	13:45:00	00:15:00	55.2	70.6	50.9
29/03/2022	14:00:00	00:15:00	52.5	65.6	49.6
29/03/2022	14:15:00	00:15:00	54.0	72.9	48.5
29/03/2022	14:30:00	00:15:00	54.7	66.8	50.0
29/03/2022	14:45:00	00:15:00	55.9	76.3	51.4
29/03/2022	15:00:00	00:15:00	54.7	70.8	48.9
29/03/2022	15:15:00	00:15:00	56.4	72.4	49.9
29/03/2022	15:30:00	00:15:00	59.2	81.3	50.4
29/03/2022	15:45:00	00:15:00	54.2	70.5	48.1
29/03/2022	16:00:00	00:15:00	55.0	74.6	45.8
29/03/2022	16:15:00	00:15:00	55.5	70.9	47.2
29/03/2022	16:30:00	00:15:00	55.2	72.6	49.9
29/03/2022	16:45:00	00:15:00	54.8	74.3	48.9
29/03/2022	17:00:00	00:15:00	55.9	75.1	49.9
29/03/2022	17:15:00	00:15:00	55.6	72.6	50.2
29/03/2022	17:30:00	00:15:00	53.3	62.2	50.6
29/03/2022	17:45:00	00:15:00	54.2	67.5	50.9
29/03/2022	18:00:00	00:15:00	54.3	74.4	49.9
29/03/2022	18:15:00	00:15:00	54.0	74.6	48.8
29/03/2022	18:30:00	00:15:00	58.7	78.6	49.4
29/03/2022	18:45:00	00:15:00	53.1	71.4	47.5
29/03/2022	19:00:00	00:15:00	54.6	78.4	46.8
29/03/2022	19:15:00	00:15:00	54.2	76.5	47.4
29/03/2022	19:30:00	00:15:00	48.8	56.8	45.9
29/03/2022	19:45:00	00:15:00	59.8	81.0	46.8
29/03/2022	20:00:00	00:15:00	51.6	72.5	45.4
29/03/2022	20:15:00	00:15:00	49.7	62.2	45.1
29/03/2022	20:30:00	00:15:00	48.2	58.7	44.2
29/03/2022	20:45:00	00:15:00	48.1	60.5	44.3
29/03/2022	21:00:00	00:15:00	47.3	57.9	43.3
29/03/2022	21:15:00	00:15:00	48.9	58.9	44.7
29/03/2022	21:30:00	00:15:00	49.3	60.9	45.2
29/03/2022	21:45:00	00:15:00	50.4	58.7	44.1
29/03/2022	22:00:00	00:15:00	50.7	61.5	46.0
29/03/2022	22:15:00	00:15:00	50.2	59.9	45.5
29/03/2022	22:30:00	00:15:00	50.6	61.2	46.2
29/03/2022	22:45:00	00:15:00	48.6	58.4	43.4
29/03/2022	23:00:00	00:15:00	46.8	54.8	42.4
29/03/2022	23:15:00	00:15:00	47.8	57.6	42.7
29/03/2022	23:30:00	00:15:00	48.2	55.1	42.9

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
29/03/2022	23:45:00	00:15:00	46.9	56.8	39.2
30/03/2022	00:00:00	00:15:00	48.5	60.6	42.7
30/03/2022	00:15:00	00:15:00	48.0	58.5	40.4
30/03/2022	00:30:00	00:15:00	48.7	59.0	40.0
30/03/2022	00:45:00	00:15:00	42.6	53.9	37.1
30/03/2022	01:00:00	00:15:00	43.9	56.2	37.4
30/03/2022	01:15:00	00:15:00	44.1	59.8	35.1
30/03/2022	01:30:00	00:15:00	46.1	59.1	38.9
30/03/2022	01:45:00	00:15:00	45.2	55.2	37.6
30/03/2022	02:00:00	00:15:00	45.3	54.7	37.8
30/03/2022	02:15:00	00:15:00	42.1	51.9	35.5
30/03/2022	02:30:00	00:15:00	46.8	60.5	39.0
30/03/2022	02:45:00	00:15:00	43.1	53.6	35.1
30/03/2022	03:00:00	00:15:00	41.4	54.4	36.7
30/03/2022	03:15:00	00:15:00	44.1	57.8	38.6
30/03/2022	03:30:00	00:15:00	45.2	54.8	37.5
30/03/2022	03:45:00	00:15:00	43.6	53.0	37.5
30/03/2022	04:00:00	00:15:00	41.1	50.4	35.5
30/03/2022	04:15:00	00:15:00	47.5	57.3	41.4
30/03/2022	04:30:00	00:15:00	51.6	69.4	40.2
30/03/2022	04:45:00	00:15:00	67.4	81.8	44.3
30/03/2022	05:00:00	00:15:00	67.9	82.2	40.7
30/03/2022	05:15:00	00:15:00	68.4	82.4	40.9
30/03/2022	05:30:00	00:15:00	67.8	83.1	42.6
30/03/2022	05:45:00	00:15:00	69.8	83.3	48.1
30/03/2022	06:00:00	00:15:00	66.5	82.9	48.2
30/03/2022	06:15:00	00:15:00	59.3	80.1	46.0
30/03/2022	06:30:00	00:15:00	50.9	64.0	48.7
30/03/2022	06:45:00	00:15:00	50.1	61.5	43.5
30/03/2022	07:00:00	00:15:00	53.6	70.4	43.4
30/03/2022	07:15:00	00:15:00	50.6	69.7	44.1
30/03/2022	07:30:00	00:15:00	50.4	66.3	45.5
30/03/2022	07:45:00	00:15:00	56.9	74.3	47.1
30/03/2022	08:00:00	00:15:00	48.7	66.8	44.8
30/03/2022	08:15:00	00:15:00	50.8	68.1	45.4
30/03/2022	08:30:00	00:15:00	58.7	80.5	47.0
30/03/2022	08:45:00	00:15:00	57.5	80.1	46.0
30/03/2022	09:00:00	00:15:00	56.6	75.2	45.5
30/03/2022	09:15:00	00:15:00	50.4	72.3	44.9
30/03/2022	09:30:00	00:15:00	53.9	74.7	44.3
30/03/2022	09:45:00	00:15:00	54.7	69.2	44.3
30/03/2022	10:00:00	00:15:00	55.8	72.7	44.7
30/03/2022	10:15:00	00:15:00	51.5	64.5	44.7
30/03/2022	10:30:00	00:15:00	57.6	75.2	44.8
30/03/2022	10:45:00	00:15:00	59.4	76.6	50.9
30/03/2022	11:00:00	00:15:00	62.8	80.2	52.2
30/03/2022	11:15:00	00:15:00	60.3	75.9	45.3
30/03/2022	11:30:00	00:15:00	59.0	76.6	44.4
30/03/2022	11:45:00	00:15:00	58.0	75.7	45.1

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
30/03/2022	12:00:00	00:15:00	52.9	71.6	44.8
30/03/2022	12:15:00	00:15:00	55.9	73.9	46.1
30/03/2022	12:30:00	00:15:00	51.0	70.8	45.9
30/03/2022	12:45:00	00:15:00	56.5	77.6	49.7
30/03/2022	13:00:00	00:15:00	57.2	74.1	50.2
30/03/2022	13:15:00	00:15:00	64.2	81.7	57.2
30/03/2022	13:30:00	00:15:00	64.3	79.3	52.4
30/03/2022	13:45:00	00:15:00	53.5	71.1	49.9
30/03/2022	14:00:00	00:15:00	52.3	66.2	49.7
30/03/2022	14:15:00	00:15:00	52.6	67.2	50.2
30/03/2022	14:30:00	00:15:00	52.2	65.8	49.4
30/03/2022	14:45:00	00:15:00	55.5	70.1	51.2
30/03/2022	15:00:00	00:15:00	58.3	75.4	51.3
30/03/2022	15:15:00	00:15:00	57.5	71.6	53.0
30/03/2022	15:30:00	00:15:00	56.1	71.6	53.6
30/03/2022	15:45:00	00:15:00	56.8	71.7	50.9
30/03/2022	16:00:00	00:15:00	59.3	78.6	52.2
30/03/2022	16:15:00	00:15:00	61.2	82.3	52.3
30/03/2022	16:30:00	00:15:00	58.0	74.8	52.6
30/03/2022	16:45:00	00:15:00	54.3	63.4	52.4
30/03/2022	17:00:00	00:15:00	54.0	63.0	52.1
30/03/2022	17:15:00	00:15:00	56.9	73.8	51.6
30/03/2022	17:30:00	00:15:00	54.6	68.2	52.3
30/03/2022	17:45:00	00:15:00	54.1	70.3	51.6
30/03/2022	18:00:00	00:15:00	53.3	61.9	51.1
30/03/2022	18:15:00	00:15:00	60.3	81.4	50.8
30/03/2022	18:30:00	00:15:00	52.3	61.4	49.7
30/03/2022	18:45:00	00:15:00	53.8	71.6	49.4
30/03/2022	19:00:00	00:15:00	54.0	75.4	48.7
30/03/2022	19:15:00	00:15:00	51.2	60.9	47.9
30/03/2022	19:30:00	00:15:00	49.8	56.6	47.8
30/03/2022	19:45:00	00:15:00	51.2	67.0	47.3
30/03/2022	20:00:00	00:15:00	48.7	57.5	46.2
30/03/2022	20:15:00	00:15:00	48.5	57.0	45.8
30/03/2022	20:30:00	00:15:00	47.9	57.6	45.2
30/03/2022	20:45:00	00:15:00	47.7	56.9	45.2
30/03/2022	21:00:00	00:15:00	46.6	54.6	44.4
30/03/2022	21:15:00	00:15:00	48.8	66.4	44.2
30/03/2022	21:30:00	00:15:00	47.7	57.3	45.0
30/03/2022	21:45:00	00:15:00	46.9	55.8	44.0
30/03/2022	22:00:00	00:15:00	46.2	56.3	42.9
30/03/2022	22:15:00	00:15:00	46.7	55.9	43.3
30/03/2022	22:30:00	00:15:00	44.9	55.1	41.6
30/03/2022	22:45:00	00:15:00	44.9	51.7	42.7
30/03/2022	23:00:00	00:15:00	45.6	55.6	41.9
30/03/2022	23:15:00	00:15:00	44.6	54.1	41.3
30/03/2022	23:30:00	00:15:00	45.6	54.0	42.8
30/03/2022	23:45:00	00:15:00	46.2	56.5	43.0
31/03/2022	00:00:00	00:15:00	45.9	56.4	42.4

Start Date	Start Time	Duration	L _{Aeq}	L _{AFMax}	L _{A90}
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB(A)	dB(A)	dB(A)
31/03/2022	00:15:00	00:15:00	45.2	54.5	42.3
31/03/2022	00:30:00	00:15:00	44.4	54.2	42.1
31/03/2022	00:45:00	00:15:00	44.1	52.7	41.5
31/03/2022	01:00:00	00:15:00	45.6	51.9	43.0
31/03/2022	01:15:00	00:15:00	44.7	55.8	41.8
31/03/2022	01:30:00	00:15:00	43.4	54.5	41.2
31/03/2022	01:45:00	00:15:00	45.6	58.6	42.1
31/03/2022	02:00:00	00:15:00	45.1	54.8	41.0
31/03/2022	02:15:00	00:15:00	43.9	52.7	40.6
31/03/2022	02:30:00	00:15:00	44.7	52.9	41.3
31/03/2022	02:45:00	00:15:00	44.1	53.2	41.0
31/03/2022	03:00:00	00:15:00	43.5	49.9	41.1
31/03/2022	03:15:00	00:15:00	44.4	57.2	41.2
31/03/2022	03:30:00	00:15:00	45.5	54.8	42.6
31/03/2022	03:45:00	00:15:00	46.1	60.1	42.6
31/03/2022	04:00:00	00:15:00	45.4	55.5	42.7
31/03/2022	04:15:00	00:15:00	45.7	55.0	42.9
31/03/2022	04:30:00	00:15:00	60.0	78.6	43.5
31/03/2022	04:45:00	00:15:00	65.0	82.8	44.7
31/03/2022	05:00:00	00:15:00	65.4	80.9	44.7
31/03/2022	05:15:00	00:15:00	66.3	83.0	46.8
31/03/2022	05:30:00	00:15:00	69.8	83.0	48.3
31/03/2022	05:45:00	00:15:00	64.9	81.6	50.9
31/03/2022	06:00:00	00:15:00	63.0	81.2	49.5
31/03/2022	06:15:00	00:15:00	54.4	73.8	49.3
31/03/2022	06:30:00	00:15:00	51.5	61.0	49.6
31/03/2022	06:45:00	00:15:00	51.2	58.7	49.4
31/03/2022	07:00:00	00:15:00	52.1	60.8	50.2
31/03/2022	07:15:00	00:15:00	52.6	62.8	51.2
31/03/2022	07:30:00	00:15:00	54.2	70.1	52.0
31/03/2022	07:45:00	00:15:00	54.5	65.3	52.5
31/03/2022	08:00:00	00:15:00	54.5	63.7	52.7
31/03/2022	08:15:00	00:15:00	56.1	71.2	52.2
31/03/2022	08:30:00	00:15:00	56.9	75.8	52.0
31/03/2022	08:45:00	00:15:00	54.8	71.5	51.8
31/03/2022	09:00:00	00:15:00	63.2	82.0	52.2
31/03/2022	09:15:00	00:15:00	68.0	88.4	51.1
31/03/2022	09:30:00	00:15:00	59.2	79.0	50.8
31/03/2022	09:45:00	00:15:00	57.5	78.6	51.2
31/03/2022	10:00:00	00:15:00	57.1	72.5	51.6
31/03/2022	10:15:00	00:15:00	55.8	75.9	51.0
31/03/2022	10:30:00	00:15:00	57.5	76.7	50.3
31/03/2022	10:45:00	00:15:00	60.5	75.9	52.9
31/03/2022	11:00:00	00:15:00	62.2	80.7	53.6
31/03/2022	11:15:00	00:15:00	59.0	75.1	51.9

APPENDIX D - BS12354-3:2000 CALCULATIONS

Refurb SEND Natural Ventilation / Priory School										
Room type:		Refurb classroom - SEND			Room geometry:		7.00 m x 8.00 m = 56.00 m²			
L2,nT valid:		35.0 dB			L2,nT existent / improved:		30.3 / 30.3 dB			
east facade										
					Facade geometry:		8.00 m x 2.50 m = 20.00 m²			
					L2,nTi existent / improved:		27.8 / 27.8 dB			
Assessment level Day:							56.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							56.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	11.80	55	-	= Wall	1	11.80	55	-
2	Window	1	8.00	26	-	= Window	1	8.00	26	-
3	trickle vent	2	0.10	-	26	= trickle vent	2	0.10	-	26
roof										
					Area:		56.00 m²			
					L2,nTi existent / improved:		6.8 / 6.8 dB			
Assessment level Day:							53.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							53.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	roof	1	56.00	47	-	= Wall	1	56.00	47	-
north facade										
					Facade geometry:		7.00 m x 2.50 m = 17.50 m²			
					L2,nTi existent / improved:		26.8 / 26.8 dB			
Assessment level Day:							55.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							55.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	9.30	55	-	= Wall	1	9.30	55	-
2	Window	1	8.00	26	-	= Window	1	8.00	26	-
3	trickle vent	2	0.10	-	26	= trickle vent	2	0.10	-	26

Refurb SEND MVHR / Priory School										
Room type:		Refurb classroom - SEND			Room geometry:		8.00 m x 7.00 m = 56.00 m ²			
L2,nT valid:		35.0 dB			L2,nTi existent / improved:		29.9 / 29.9 dB			
east facade										
					Facade geometry:		8.00 m x 2.50 m = 20.00 m ²			
					L2,nTi existent / improved:		27.3 / 27.3 dB			
Assessment level Day:							56.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							56.0 dB			
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Fan
1	Wall	1	12.00	55	-	= Wall	1	12.00	55	-
2	Window	1	8.00	21	-	= Window	1	8.00	21	-
Roof										
					Area:		56.00 m ²			
					L2,nTi existent / improved:		6.8 / 6.8 dB			
Assessment level Day:							53.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							53.0 dB			
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Fan
1	roof	1	56.00	47	-	= roof	1	56.00	47	-
north facade										
					Facade geometry:		7.00 m x 2.50 m = 17.50 m ²			
					L2,nTi existent / improved:		26.3 / 26.3 dB			
Assessment level Day:							55.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							55.0 dB			
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Fan
1	wall	1	9.50	55	-	= wall	1	9.50	55	-
2	window	1	8.00	21	-	= window	1	8.00	21	-

New SEND Natural Ventilation / Priory School										
Room type:		New classroom - SEND			Room geometry:		7.00 m x 8.00 m = 56.00 m²			
L2,nT valid:		30.0 dB			L2,nT existent / improved:		25.4 / 25.4 dB			
east facade										
					Facade geometry:		8.00 m x 2.50 m = 20.00 m²			
					L2,nTi existent / improved:		22.8 / 22.8 dB			
Assessment level Day:							56.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							56.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	11.80	55	-	= Wall	1	11.80	55	-
2	Window	1	8.00	31	-	= Window	1	8.00	31	-
3	trickle vent	2	0.10	-	31	= trickle vent	2	0.10	-	31
roof										
					Facade geometry:		7.00 m x 8.00 m = 56.00 m²			
					L2,nTi existent / improved:		6.8 / 6.8 dB			
Assessment level Day:							53.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							53.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	roof	1	56.00	47	-	= roof	1	56.00	47	-
north facade										
					Facade geometry:		7.00 m x 2.50 m = 17.50 m²			
					L2,nTi existent / improved:		21.8 / 21.8 dB			
Assessment level Day:							55.0 dB(A)			
Correction for facade structure by EN 12354-3							0.0 dB			
Correction by user:							0.0 dB			
Exterior level:							55.0 dB			
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	9.30	55	-	= Wall	1	9.30	50	-
2	Window	1	8.00	31	-	= Window	1	8.00	31	-
3	trickle vent	2	0.10	-	31	= trickle vent	2	0.10	-	31

APPENDIX E – GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. <i>NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.</i>
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. <i>NOTE: The ambient sound comprises the residual sound and the specific sound when present.</i>
Ambient sound level, $L_a = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T <i>NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.</i>
Background sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS 4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w , D_w , and $D_{nT,w}$) to provide a weighting against low frequency performance. <i>NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.</i>
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS 4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m ²), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. <i>NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.</i>
Free-field level	Sound pressure level away from reflecting surfaces. <i>NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e., not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.</i>

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants. <i>NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.</i>
Measurement time interval, T_m (BS 4142:2014)	Total time over which measurements are taken. <i>NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.</i>
Noise criteria	Numerical indices used to define design goals in a given space.
Noise rating, NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. <i>NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.</i>
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for $N\%$ of a specified time interval.
Reference time interval, T_r (BS 4142:2014)	Specified interval over which the specific sound level is determined. <i>NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.</i>
Residual sound (BS 4142:2014)	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, $L_r = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T .
Rating level, L_{A,r,T_r}	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise. <i>NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.</i>
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.
Sound exposure level, L_{AE}	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, D	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
Sound pressure, p	Root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound.
Sound pressure level, L_p	Quantity of sound pressure, in decibels (dB).
Sound reduction index, R	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,T_r}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
Specific sound source (BS 4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. <i>NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.</i>
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. <i>NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.</i>
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. <i>NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).</i>
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tt}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)