

River Academy Reading

Environmental Noise Survey Report

27338/ENS1

22 January 2020

For:
Mace Limited
155 Moorgate
London
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Environmental Noise Survey Report 27338/ENS1

Document Control

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1.0 Introduction

Construction of a new 900-pupil secondary school is proposed in Reading, Berkshire.

Hann Tucker Associates have therefore been commissioned to undertake a 24-hour fully automated environmental noise survey of the site to establish the currently prevailing noise climate.

This report presents the survey methodology and findings together with comment on the potential ventilation strategy. The survey data may be used as the basis for various further acoustic assessment purposes.

2.0 Objectives

To undertake a baseline external noise survey over a 24h period at 2No. secure and accessible locations, to establish the prevailing background and ambient noise levels of the proposed site.

To propose plant noise emission limits, based on the results of the noise survey and expectations of the Local Authority.

3.0 Site Description

3.1 Location

The proposed site is located at Richfield Avenue, Reading RG1 8EQ as seen on the Location Map overleaf.



Location Map (Map Data ©2020 Google)

The site falls within the jurisdiction of London Borough of Hounslow.

3.2 Description

The proposed site is the former Linerboard Golf Club and is bound by Cow Lane to the west and Richfield Avenue to the south. To the north of the site is the Rivermead Park and the river Thames with further open land to the west, beyond Cow Lane. To the east of the site is the adjacent Rivermead Leisure Centre and to the south east is the Caversham Bridge Garden Centre. The nearest premises to the south beyond Richfield Avenue are commercial buildings. Approximately 125m to the south of the site boundary are railway tracks.

The site is shown in the Site Plan overleaf.



Site Plan (Photos ©2020 Google, Photos ©2020 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data ©2020 Google)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Acoustic Standards and Guidelines

5.1 Local Authority Requirements

The site falls under the jurisdiction of Reading Borough Council. Their advice regarding criteria for atmospheric noise emissions from building service plant is outlined in the Reading Borough Local Plan adopted in November 2019:

“EN17: NOISE GENERATING EQUIPMENT

Where noise generating equipment is proposed, the noise source specific⁶¹ level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest



noise sensitive receptor.”

5.2 BS 4142:2014

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 *“Methods for rating and assessing industrial and commercial sound”*.

BS 4142 states that: *“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:*

- *“Typically, the greater this difference, the greater the magnitude of the impact.”*
- *“A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”*
- *“A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”*
- *“The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*

The determination of the “rating level” and the “background level” are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England.

5.3 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15\text{minutes})}$ at 1m from the nearest noise sensitive window, then the risk of a statutory noise



nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

6.0 Methodology

The survey was undertaken by P. Libene MSc, BSc (Hons), AMIOA.

6.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 12:30 hours on 13 January 2020 to 12:30 hours on 14 January 2020.

During the periods we were on site the wind conditions were moderate and from approximately a southerly direction. The sky was generally patchy cloud. There was no rain at the beginning or end of the survey. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} , sound pressure levels over 15 minute periods.

6.2 Measurement Positions

The noise level measurements were undertaken at 2No.positions as described in the table below.

Position No	Description
1	The microphone was positioned at a height of approximately 2.5m above ground and attached to a fence at the west boundary of the site.
2	The microphone was positioned at a height of approximately 4m above ground and attached to a fence approximately 30m from the south east boundary of the site and approximately 55m from Richfield Avenue.

The positions are shown on the plan below.



Site Plan Showing Unmanned Measurement Positions (Photos ©2020 Google, Photos ©2020 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data ©2020 Google)

6.2.1 Instrumentation

The instrumentation used during the survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 ½" Condenser Microphone	PCB	377B02	107427	Calibration on 09/10/2019
Position 1 Preamp	Larson Davis	PRM902	4154	Calibration on 09/10/2019
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3155	Calibration on 09/10/2019
Position 2 Type 1 ½" Condenser Microphone	PCB	377A02	101926	Calibration on 02/09/2019
Position 2 Preamp	Larson Davis	PRM902	4157	Calibration on 02/09/2019



Description	Manufacturer	Type	Serial Number	Calibration
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3841	Calibration on 02/09/2019
Type 1 Calibrator	Brüel & Kjær	4231	2308993	Calibration on 03/10/2019

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

7.0 Results

The results have been plotted on Time History Graphs 27338/TH1 to 27338/TH2 enclosed presenting the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

The following table presents the lowest measured $L_{A90, 15min}$ background noise levels during the survey:

Position	Lowest Measured L_{A90} Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	43	37	37
2	45	37	37

The following table presents the measured $L_{Aeq, 30 min}$ noise levels during the survey:

Position	Date	Measured $L_{Aeq, 30 min}$ Background Noise Level (dB re 2×10^{-5} Pa)	
		Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	13 January 2020	54	48
	14 January 2020	55	-
2	13 January 2020	58	51
	14 January 2020	62	-



8.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise source was noted to be road traffic noise from Richfield Avenue.

9.0 Plant Noise Emission Criteria

On the basis of the Local Authority's guidance and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window.

Plant Noise Emission Criteria (dB re 2x10 ⁻⁵ Pa)	
Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
33dBA	27dBA

The above criteria are to be achieved with all of the proposed plant operating simultaneously.

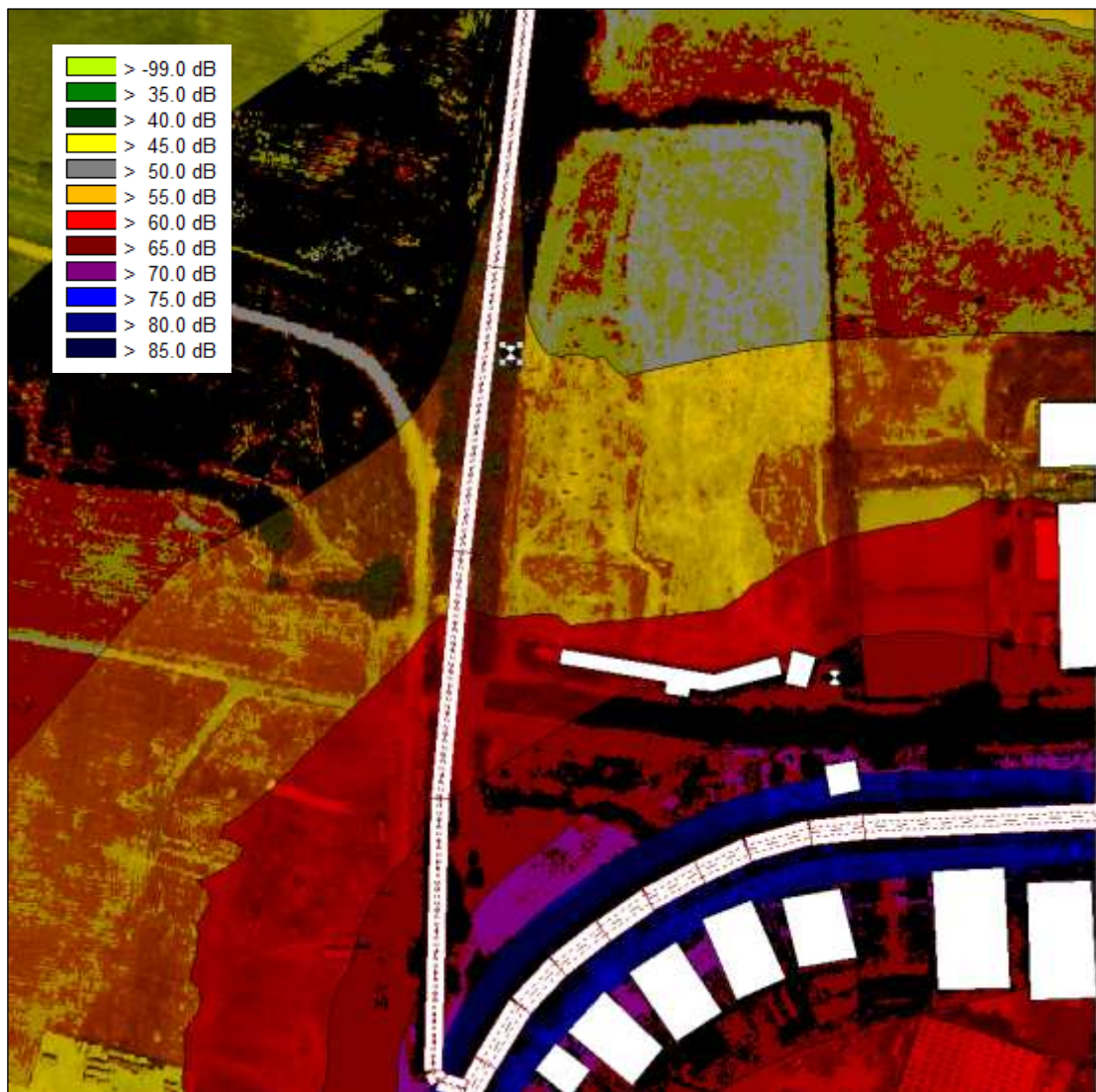
If plant contains tonal or impulsive characteristics the external design criteria should be reduced by 5dBA.

It should be noted that the above are subject to the final approval of the Local Authority.

10.0 Noise Mapping

A 3D noise map (below) for the site has been created using the CadnaA 2020 noise modelling software. This has been calibrated using our unmanned noise survey results in order to predict the noise levels around the development site due to the noise produced by the surrounding road network.

The site-wide daytime noise map predicted by the model is shown overleaf.



Daytime site-wide predicted noise levels (CadnaA 2D view)

It can be seen from the image above that the daytime noise levels prevalent at the south boundary of the proposed site exceed 75dB due to traffic on Richfield Avenue. The noise levels at the west boundary range from 45-80dB. Noise levels to the north of the site appear to be between 45-50dB and the east boundary ranges from 45-75dB.



11.0 BB93: Internal Ambient Noise Level (IANL)

11.1 Upper Limit for Internal Ambient Noise Levels

The table below is extracted from Table 1 of BB93.

Type of Room	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq,30mins}$ dB	
	New Build	Refurbishment
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	35	40
Open plan: (See also section 1.8) Teaching area, resource/breakout area	40	45
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	35	40
Ensemble room 1, recording studio 1	30	35
Control room – for recording 1, control room – not for recording	35	40
Lecture room	35	40
Teaching space intended specifically for students with special hearing and communication needs ²	30	35
SEN calming room	35	35
Study room (individual study, withdrawal, remedial work, teacher preparation)	40	45
Libraries: Quiet study area Resource area	40	45
Science laboratory	40	45
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	40	45
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	35	40
Atrium, circulation space not intended for teaching and learning	45	50
Sports hall, dance studio, gymnasium/activity studio	40	45
Swimming pool	50	55
Meeting room, interviewing/counselling room, video conference room	40	45
Dining room	45	50
Kitchen	50	55
Office, medical room, staff room	40	45
Corridor, stairwell, coats and Locker area	45	55
Changing area	50	55
Toilet	50	55

In order to protect students from regular discrete noise events, e.g. aircraft or trains, indoor ambient noise levels should not exceed 60 dB L_{A1} , 30mins. This is achieved by default for spaces with IANLs up to 40 dB L_{Aeq} , 30min, but requires assessment in spaces with higher IANL limits, e.g., 45 and 50 dB.



11.2 Building Services and Indoor Ambient Noise Levels

The table below is extracted from Table 2 of BB93.

Condition	Condition	Noise Level Limit
Normal – ventilation for normal teaching and learning activities	Mechanical ¹	Table 1 value
	Natural ²	Table 1 value + 5 dB ⁴
Normal – ventilation for normal teaching and learning activities	Hybrid ²	Mechanical system noise:
		Table 1 value
		Total noise level:
		Table 1 value + 5 dB
Summertime ⁵ – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200hrs of the year	Mechanical	Table 1 value + 5 dB ⁴
	Natural or Hybrid	≤ 55 dB
Intermittent boost ⁶ – 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 1 value + 5 dB ⁴
	Natural	≤ 55 dB
Process extract ³ - 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

Notes

¹ The normal condition for a ventilation system with purely mechanical air supply is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,000ppm with the maximum concentration not exceeding 1,500ppm for more than 20 consecutive minutes on any day during normal school operating hours. This would normally equate to a minimum ventilation rate of approximately 8l/s per person. Mechanical ventilation in this context refers to systems (or parts of systems) that use mechanical fans to mix or drive the air including those in mechanical, hybrid, mixed mode and natural ventilation systems and in fan convector heaters.

² The normal condition for a ventilation system in natural or hybrid mode is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,500ppm with the maximum concentration not exceeding 2,000ppm for more than 20 consecutive minutes on any day. This would normally equate to a minimum ventilation rate of approximately 5l/s per person. For hybrid systems, the mechanical noise excluding external noise break in, should meet the IANL figure in table 1. The mid-season design condition can be used in simple ventilation calculations and is defined as an outside temperature of 11 °C and an internal air temperature of 20 °C with no external wind effect. Where external ambient free field noise levels at the facade expressed as the $L_{Aeq,30mins}$, do not exceed the IANL figures given in Table 1 by more than 16 dB for single sided ventilated spaces and 20dB for cross ventilated or roof ventilated spaces, the criteria for natural ventilation can usually be achieved. However, the ventilation strategy still requires appropriate design of façade openings, height differences between low and high level openings, corridor transfer vents/stacks, etc, to limit the required façade open areas appropriately. Where there is a hybrid system, any mechanical system components should meet the IANL limits from table 1. The total noise level including external noise ingress may exceed the IANL limit from table 1 by up to 5dB.



³ Process extract includes the operational noise from local exhaust ventilation systems and boost ventilation under the local control of the teacher as required for fume and dust extract in design and technology, odour and steam from cookers in food technology, fume cupboard extract and similar process extract systems. See guidance on specification and measurement of operational noise levels in 'Acoustics of Schools: a design guide' Ref.1. For example, for new fume cupboards the maximum noise level should not exceed 50 dB(A), measured at a height of 1,500 mm above the floor and 1,500 mm from the face of the fume cupboard, with the sash set at a height of 200 mm.

⁴ The +5dB does not apply to teaching and learning spaces where the Table 1 IANL is greater than or equal to 45dB.

⁵ Natural, mechanical or hybrid ventilation systems may be used to improve thermal comfort in summer at the expense of higher indoor ambient noise levels. The normal ventilation IANL can be exceeded during the hottest 200 hours in peak summertime conditions and the design should show that IANLs, defined in table 3 can be met under these conditions as well as under normal operation. The ventilation must be under the local control of the teacher so that the noise level can be reduced to normal levels when needed. This does not apply to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms.

11.3 Proposed Ventilation Strategy & Achievable IANL

The new development needs to account for differing noise levels encompassing the site. When combined, the measurement positions describe the noise climate at the site boundaries.

The ventilation strategy for each façade corresponds to the predicted daytime noise levels at the most appropriate measurement boundary, which is detailed in the table and shown in the site plan overleaf.

Zone	Reference	Predicted $L_{Aeq,30mins}$
A		>75dB
B		>70dB
C		>60dB
D		>55dB
E		>50dB
F		>45dB



Site Plan Showing Daytime Noise Zones (Photos ©2020 Google, Photos ©2020 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data ©2020 Google)

11.4 Proposed Ventilation Strategy For New Builds

The table overleaf shows the likelihood of BB93 IANL criteria being met under natural ventilation conditions, for different room types and different façades. This should allow the appropriate façade design approach to be selected. This is based on subtracting 15dB loss (from a partially open window) from the expected external $L_{Aeq, 30mins}$ façade levels for comparison to the required IANL and follows the below key:

Reference	Predicted $L_{Aeq, 30mins}$
	Suitable for natural ventilation.
	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
	Not suitable for natural ventilation. Suitably specified double glazing with mechanical ventilation or attenuated façade ventilation system likely to be required.



Room Type	New Build Noise Level Zone					
	A	B	C	D	E	F
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory						
Open plan: (See also section 1.8) Teaching area, resource/breakout area						
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1						
Ensemble room 1, recording studio 1						
Control room – for recording 1, control room – not for recording						
Lecture room						
Teaching space intended specifically for students with special hearing and communication needs2						
SEN calming room						
Study room (individual study, withdrawal, remedial work, teacher preparation)						
Libraries: Quiet study area Resource area						
Science laboratory						
Design and technology: Resistant materials, CAD/CAM area, 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)						
Atrium, circulation space not intended for teaching and learning						
Sports hall, dance studio, gymnasium/activity studio						
Swimming pool						
Meeting room, interviewing/counselling room, video conference room						
Dining room						
Kitchen						
Office, medical room, staff room						
Corridor, stairwell, coats and Locker area						
Changing area						
Toilet						



12.0 Conclusions

A detailed 24 hour daytime and night time fully automated environmental noise survey has been undertaken in order to establish the currently prevailing ground level environmental noise climate around the site.

A 3D noise map has been developed using the CadnaA 2020 software in order to establish the noise levels at the boundaries of the proposed site.

Plant noise emission criteria have been recommended based on the results of the noise survey and in conjunction with the Local Authority's requirements.

Internal noise levels have been presented in accordance with Table 1 of BB93.

We have assessed potential room use and presented advice in relation to the likely required ventilation strategy.

Appendix A

The acoustic terms used in this report are defined as follows:

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).
dBA	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
L _{eq,T}	L _{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .
L _{max}	L _{max} is the maximum sound pressure level recorded over the period stated. L _{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L _{eq} noise level.
L _p	Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).
L _w	Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

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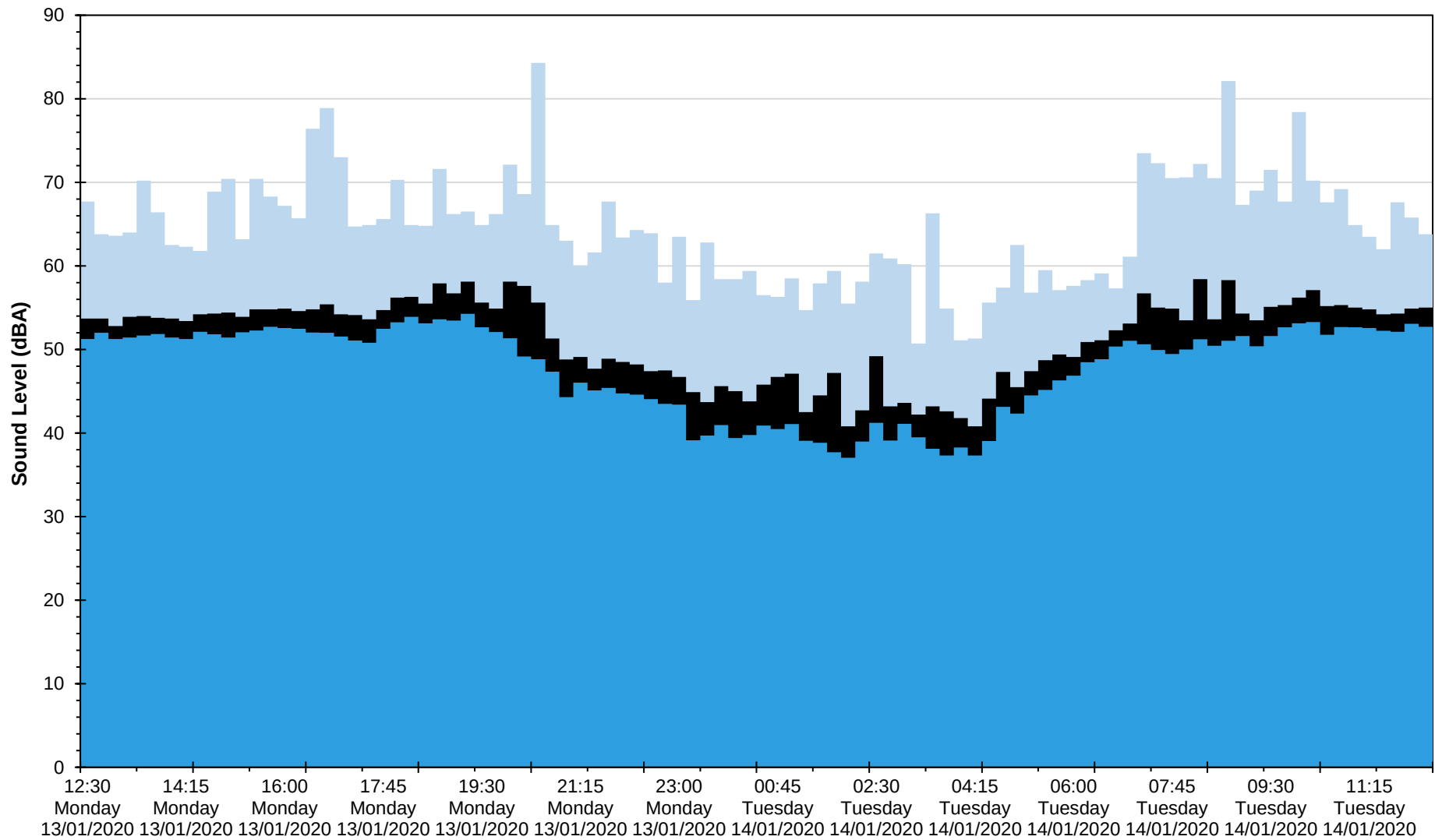
Position 1

L_{eq} , L_{max} and L_{90} Noise Levels

Monday 13 January 2020 to Tuesday 14 January 2020

L_{max} L_{eq}

L_{90}



Date and Time

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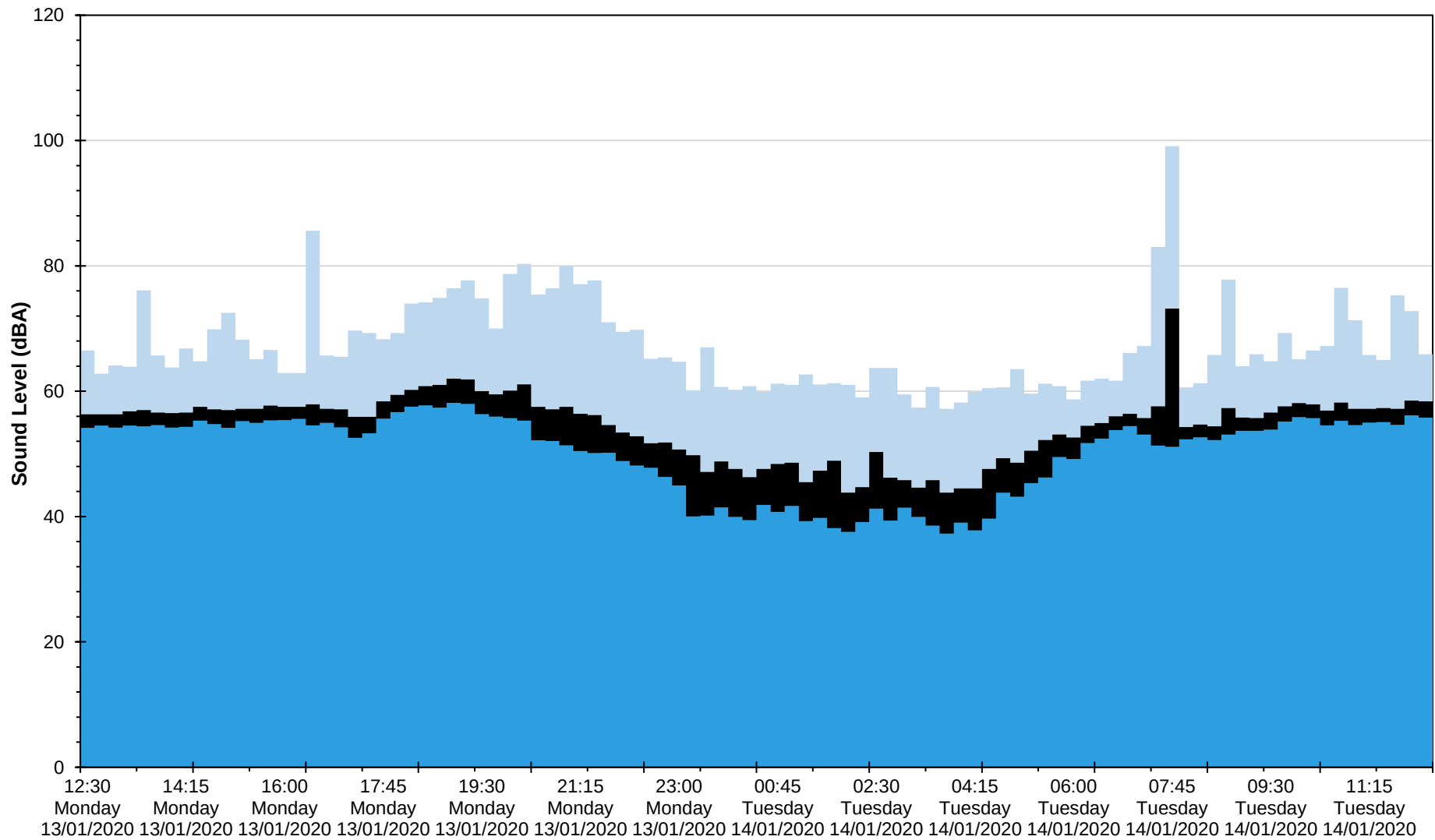
Position 2

L_{eq} , L_{max} and L_{90} Noise Levels

Monday 13 January 2020 to Tuesday 14 January 2020

L_{max} L_{eq}

L_{90}



Date and Time

27338/TH2