

**44 Waterloo Road
Uxbridge
UB8 2QX**

**Environmental Noise Survey and
Noise Impact Assessment
Report**

24399/NIA1

27 June 2017

For:

RPS CgMs
140 London Wall
London
EC2 5DN



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Document Control

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1.0 Introduction

A conversion is proposed at 44 Waterloo Road from B8 storage unit to six residential units.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and noise impact assessment in order to determine the suitability of the proposed development for residential use.

This report presents the methodology and findings of our noise survey and assessment in the context of national planning policies and the policy of the Local Authority.

2.0 Objectives

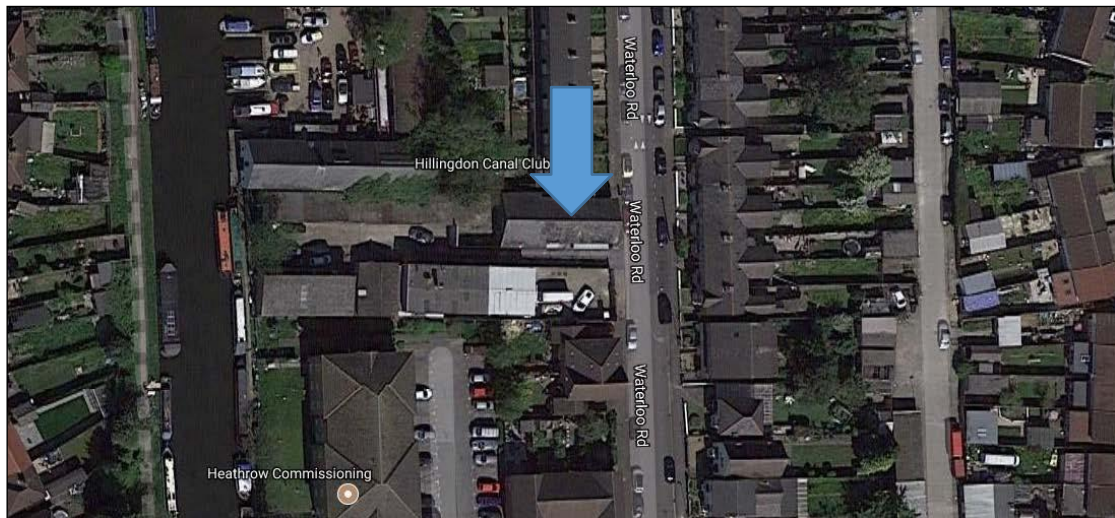
To undertake an environmental noise survey to establish the existing L_{Aeq} , L_{Amax} and L_{A90} environmental road, rail and air traffic noise levels at selected positions.

To undertake a noise assessment, based on the results of the survey, to determine the suitability of the site for residential use in accordance with the NPPF and Local Authority guidance/requirements.

3.0 Site Description

3.1 Location

The site is located off Waterloo Road. It is bound by Waterloo Road to the east, Fray's Way to the west and a mixture of commercial and residential premises to the north and south. The location is shown in the Location Map below.



Location Map (Imagery © 2017 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map Data © 2017 Google.)

The site falls within The London Borough of Hillingdon's jurisdiction.

3.2 Description

The site comprises a ground plus first storey building. The proposed conversion to residential units will be across the ground and first floor.

4.0 Acoustic Terminology

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

5.0 Methodology

The survey was undertaken by F.Baig, B.Eng. (Hons) AMIOA.

5.1 Survey

5.1.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 16:00 hours on 14 June 2017 to 16:00 hours on 15 June 2017.

During the periods we were on site the wind conditions were calm. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar. 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.

5.1.2 Measurement Positions

The noise level measurements were undertaken at two positions as described in the table below.

Position No	Description
1	The microphone was attached to a pole at a height of approximately 3 metres from ground level. The monitoring position was located in the rear courtyard of 44 Waterloo Road. The microphone was not in free field conditions, the microphone was approximately 1m away from any reflecting surfaces.
2	The microphone was attached to a pole at a height of approximately 4.5 metres from ground level at the front of 44 Waterloo Road. The monitoring position overlooked Waterloo Road. The microphone was not in free field conditions, the microphone was approximately 1m away from any reflecting surfaces.

The positions are shown on the plan below.



Plan Showing Measurement Positions (Imagery © 2017 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map Data © 2017 Google.)

5.1.3 Instrumentation

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



Description	Manufacturer	Type	Serial Number	Calibration
Type 1 Data Logging Sound Level Meter	Svantek	957	28035	Calibration on 25/07/2016
Type 1 ½" Condenser Microphone	Svantek	7052E	52450	
Type 1 Data Logging Sound Level Meter	Larson Davis	Lxt SE	4086	Calibration on 24/02/2017
Type 1 ½" Condenser Microphone	PCB	377B02	146893	
Type 1 Calibrator	Brüel and Kjær	4231	2095100	LD calibration on 27/10/2016

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant changes were found to have occurred.

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.

6.0 Results

The results have been plotted on Time History Graphs 24399/TH1.1 to 24399/TH1.2 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.

In order to compare the results of our survey with the relevant guidelines it is necessary to convert the measured $L_{Aeq(15 \text{ minute})}$ noise levels into single figure daytime $L_{Aeq(16\text{-hour})}$ (07:00-23:00 hours) and night-time $L_{Aeq(8\text{-hour})}$ (23:00-07:00 hours) levels.

The daytime $L_{Aeq(16\text{-hour})}$ and night-time $L_{Aeq(8\text{-hour})}$ noise levels for each position are presented in the tables below.

Position	Daytime $L_{Aeq(16\text{-hour})}$	Night-time $L_{Aeq(8\text{-hour})}$
1	56 dB	49 dB
2	65 dB	52 dB

N.B. The above levels have been corrected for façade reflections where appropriate, for comparison with the free field levels.



6.1 Night-time $L_{\max}$ Results

The following table presents the number of $L_{\max}$ events which would exceeded 45 dBA in the bedroom during the night-time period.

Time	No of Events	
	Position 1	Position 2
23:00-00:00	0	1
00:00-01:00	1	1
01:00-02:00	0	2
02:00-03:00	0	2
03:00-04:00	0	0
04:00-05:00	0	1
05:00-06:00	0	0
06:00-07:00	0	0

[N.B. The above levels have been corrected for façade reflections where appropriate, for comparison with the free field levels and also assume a 33 dBA road traffic noise reduction provided by a closed window with conventional double glazing construction.

7.0 Discussion of Noise Climate

The site is surrounded by a mixture of residential and commercial premises. During the periods we were on site the dominant noise sources were noted to be road traffic noise from the surrounding road network at Position 1 and children playing in the neighbouring property at Position 2, industrial noise was not perceptible at either position.

8.0 Relevant Planning Policies and Guidance

8.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010. The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

That vision is supported by the following aims which are reflected in three of the four aims for planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.3 (b) below):



“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.”*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledge in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three aims listed in paragraph (b) above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.



8.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was published in March 2012 and replaced the previous national planning guidance document Planning Policy Guidance 24: *Planning and Noise* (PPG24).

The main reference to noise within the NPPF is at paragraph 123, reproduced below:

“123. Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts²⁷ on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts²⁷ on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;²⁸ and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*

The reference numbers 27 and 28 point respectively to the Explanatory Note to the NPSE and the provisions of the Environmental Protection Act 1990 *“and other relevant law”*.

The spirit of the Localism Act and the NPPF would suggest that of the guidelines cited, it is guidelines adopted as policy by the Local Planning Authority (if such exist) that should prevail, at least until the Government publishes relevant technical guidance under the NPPF.

8.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:



Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.		
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.		Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.		Prevent

8.4 Local Planning Policy

We have requested information from the LPA, but have not received a reply at the time of writing. This section of the report will be updated accordingly once we have received a reply from the LPA. Historically Hillingdon Borough Council has used the following criteria:

“26) - Development shall not begin until a sound insulation and ventilation scheme for protecting the proposed development from road traffic noise has been submitted to, and approved in writing by, the local planning authority. The scheme shall meet the internal noise criteria set out in Table 2 Residential noise criteria on page 18 of the council’s supplementary planning document on Noise and incorporate a timetable for implementation. Thereafter, the scheme shall be implemented and maintained in full compliance with the approved scheme.”



The Council's Noise Supplementary Planning Document Table 2 is as follows.

TABLE 2: RESIDENTIAL NOISE CRITERIA

		Recommended Noise Level (dB)
Daytime Noise (07:00 - 23:00)	Outdoor living areas	As low as practicable, and < 50 $L_{Aeq,T}$ *(free field)
	Indoor living areas	< 35 $L_{Aeq,T}$ *
Night-time Noise (23:00 - 07:00)	Outside bedroom windows	< 45 $L_{Aeq,T}$ *(façade) < 60 $L_{Amax, Fast}$ (façade)
	Inside bedrooms	< 30 $L_{Aeq,T}$ * < 45 $L_{Amax, Fast}$

Source: Derived from BS8233:1999 and "Guidelines for Community Noise", World Health Organisation, 1999

* Time base T should be appropriate for the circumstances, typically 1 hour day and 5 minutes night

8.5 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance "Guidelines on Community Noise". A summary of the noise guidelines relevant to the proposed development is presented in the table below.

Residential Environment	Critical Health Effect(s)	L_{Aeq}	L_{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

The internal and external noise level criteria presented in BS8233:2014 for residential dwelling are generally consistent with the WHO guidelines, although some differences are apparent. For instance the WHO guidelines refer to research that suggests "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night." (Vallet & Vernet, 1991). The current version of BS8233 does not identify a specific L_{AFmax} level although it suggests that a guideline value may be set using that parameter



depending on the character and number of individual noise events per night.

8.6 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.

Note 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.



If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

Note 6 Attention is drawn to the Building Regulations.

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

9.0 Proposed Design Target Internal Noise Levels

On the basis of BS8233:2014 we propose the following internal noise levels be adopted as design targets in the proposed habitable rooms:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note: For this site the $L_{Aeq,T}$ noise parameter alone is considered to be sufficient (with reference to Note 4 of Section 7.7.2 of BS8233:2014) given the character of the noise climate we have measured.

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target noise levels may be relaxed (subject to the requirements of any planning conditions) by up to 5 dB and reasonable internal conditions still achieved.

10.0 Achievable Internal Noise Levels

We have predicted the levels that would be achievable in the worst-case dwellings with windows partially opened and also with windows closed.

10.1 Windows Partially Open

It is generally accepted that the typical noise reduction achieved with partially opened windows is around 15dBA (ref. BS 8233:2014 Annex G.1). This value is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.



A simple assessment thus indicates the following noise levels may be expected within the proposed worst case habitable rooms with partially opened windows.

Description	Predicted Worst Case Internal Noise Levels with Windows Partially Opened			
	Position 1		Position 2	
	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)
External free field level	56 dBA	49 dBA	65 dBA	52 dBA
Façade correction	+3 dBA	+3 dBA	+3 dBA	+3 dBA
Façade noise level	59 dBA	52 dBA	68 dBA	55 dBA
Noise reduction for conventional thermal double glazing	-15 dBA	-15 dBA	-15 dBA	-15 dBA
Predicted internal noise levels	44 dBA	37 dBA	53 dBA	40 dBA

10.2 Windows Closed

It is generally accepted that the typical noise reduction achieved by conventional thermal double glazing is 33dBA for road traffic noise. This value is taken from PPG24 (now superceded) and is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.

A simple assessment thus indicates the following noise levels may be expected within the proposed worst case dwellings with conventional thermal double glazing.

Description	Predicted Worst Case Internal Noise Levels with Windows Closed			
	Position 1		Position 2	
	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)
External free field level	56 dBA	49 dBA	65 dBA	52 dBA
Façade correction	+3 dBA	+3 dBA	+3 dBA	+3 dBA
Façade noise level	59 dBA	52 dBA	68 dBA	55 dBA
Noise reduction for conventional thermal double glazing	-33 dBA	-33 dBA	-33 dBA	-33 dBA
Predicted internal noise levels	26 dBA	19 dBA	35 dBA	22 dBA



11.0 Mitigation Measures

The predicted worst case internal noise levels with windows closed meet the proposed criteria. It is thus demonstrated that acceptable internal noise levels are achievable with conventional double glazing.

The predicted worst case internal noise levels with windows partially opened exceed the proposed target levels (as is often the case). The minimum mitigation available to future occupants would be to close their window. Ventilation (incorporating suitable acoustic attenuation) will be provided to comply with the requirements of the Building Regulations Approved Document F Ventilation. The occupants will thus have the option of keeping windows closed for most of the time and opening windows for rapid ventilation and summer cooling.

At this stage of the design scheme the precise details of window to be used are not known, nor are the precise details of the ventilation.

The external envelope of the proposed residences will incorporate suitably specified glazing so as to achieve the proposed design target internal noise levels presented above.

Where ventilation is provided through the façade it shall be suitably acoustically attenuated to ensure the achievement of the proposed target internal noise levels is not compromised.

The Local Planning Authority may expect to be provided with details of the sound insulation treatments when available. Therefore in granting consent it would be appropriate for a planning condition to be imposed along the following lines, (based on the example condition 1 drawn from PPG24):

“Construction work shall not begin until a scheme for protecting the proposed noise-sensitive development from noise from the road has been submitted to and approved by the local planning authority; all works which form part of the scheme shall be completed before [any part of] the [noise-sensitive development] is occupied.”

12.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

The environmental noise impact upon the proposed dwellings has been assessed in the context of national and local planning policies.



Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures.

The proposed development is thus considered compliant with the relevant planning policies.

The assessment shows the site is suitable for the proposed development in terms of noise.

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).

44 Waterloo Road

Position 1

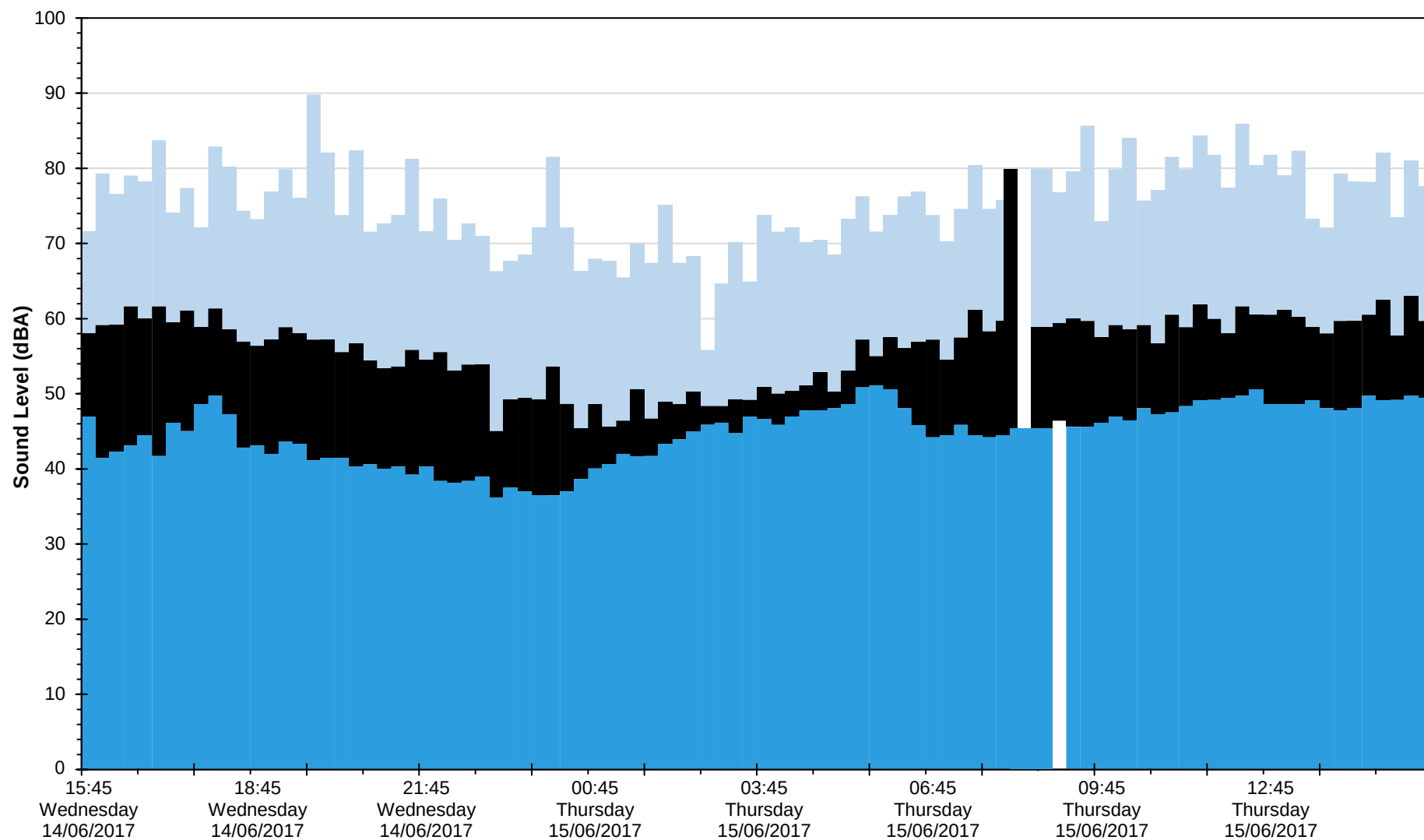
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Wednesday 14 June 2017 to Thursday 15 June 2017

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

24399/TH1.1

44 Waterloo Road

Position 2

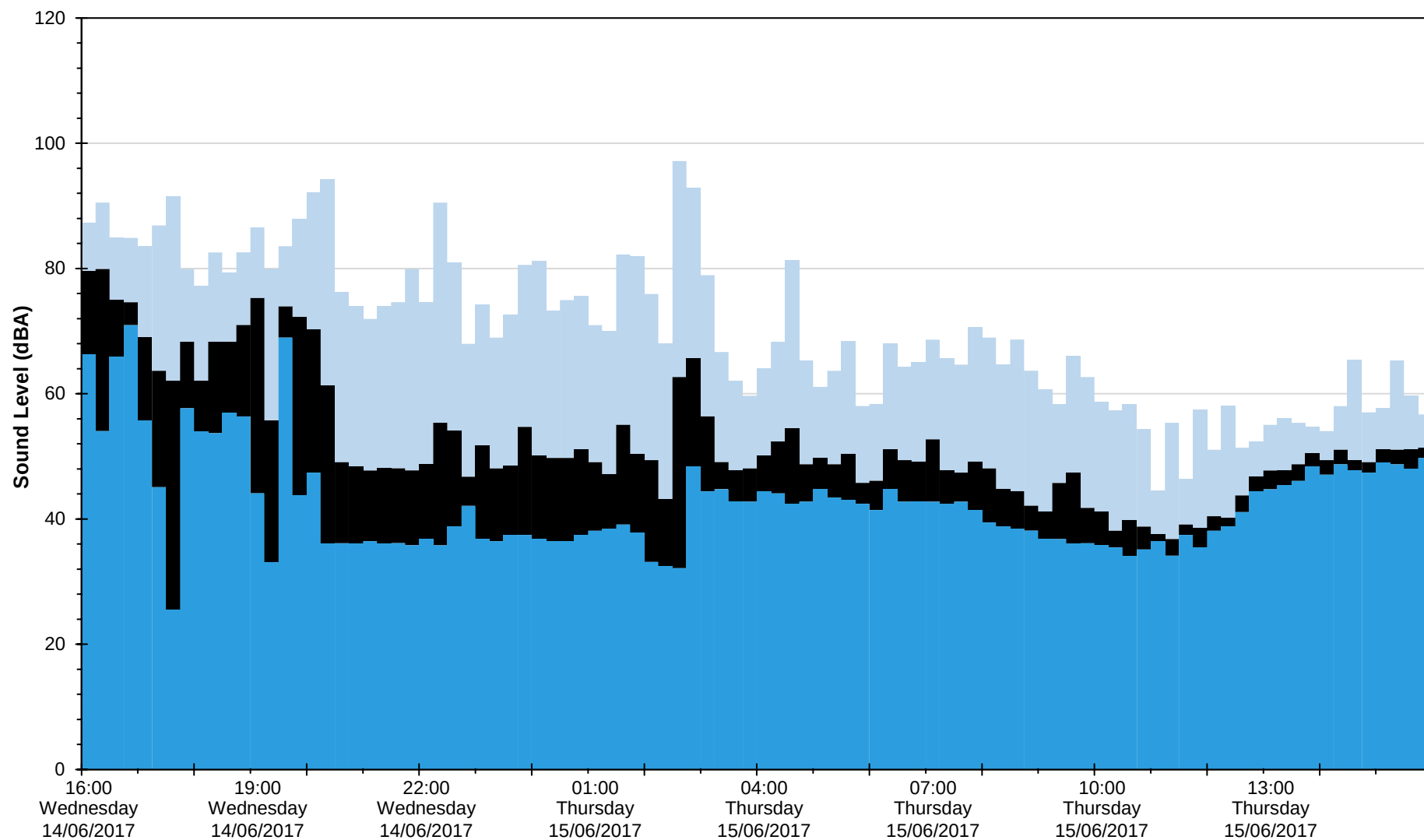
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Wednesday 14 June 2017 to Thursday 15 June 2017

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

24399/TH1.2