

Queens Wharf, 47 Queens Road Reading

Noise Impact Assessment Report
Report 27451.NIA.01

Metrix Developments
Queens Wharf, 47 Queens Road
Reading
RG1 4QE

Report 27451.NIA.01			
Revision History			
First Issue Date: 23/11/2023			
A		D	
B		E	
C		F	
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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Metrix Developments, Queens Wharf, 47 Queens Road, Reading, RG1 4QE, to assess the suitability of the site at Queens Wharf, 47 Queens Road, Reading, RG1 4QE for a residential development at Ground Floor level in accordance with Permitted Development rights as outlined in Class MA (offices to dwelling/houses) of The Town and Country Planning (General Permitted Development) (England) Order 2021.

This report presents the results of internal noise surveys undertaken in order to measure the current internal noise climate for compliance with current guidance, and presents the results of the external environmental surveys undertaken in order to measure the prevailing background noise levels.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Kennet Side, the River Kennet and Residential buildings to the north, an office building to the west, Queens Road to the south, and office and residential buildings, a Car Park and Queens Road to the east. Entrance to the site is located via Queens Road. At the time of the survey, the background noise climate was dominated by road noise from Queens Road.

It should be noted that the existing Queens Wharf building currently consist of 7 storey residential building and a Ground Floor Office unit.

2.2 Internal Noise Survey Procedure

Noise surveys were undertaken within internal areas of the building in order to assess worst-case levels with the current external building fabric configuration.

Continuous automated monitoring was undertaken for the duration of the survey between 13:03 on 01/11/2023 and 13:00 on 02/11/2023 at internal MP.A and between 12:36 on 01/11/2023 and 13:00 on 02/11/2023 at internal MP.B.

It should be noted that the Ground Floor Offices were occupied on 02/11/2023. Therefore, the noise levels measured between 7am and 13:01 on 02/11/2023 have been disregarded due to office activities within the front and rear office open plan areas.

Microphones installed internally were positioned within the diffuse field of the room, ensuring the microphone was at least 1.5m from any reflective surface. Noise measurement positions are detailed in Table 2.1 and shown in Figure 2.1.

2.3 Environmental Noise Survey Procedure

External noise surveys were undertaken on the proposed site as shown in Figure 2.1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources, including those from nearby commercial premises.

Continuous automated monitoring was undertaken for the duration of the survey between 12:08 on 01/11/2022 and 13:03 on 02/11/2022.

Weather conditions were generally wet, however with light winds and intermittent light showers and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2007 Acoustics ‘Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels’.

2.4 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

Icon	Descriptor	Location Description
1	Noise Measurement Position 1	The microphone was installed on an extendable pole at approximately 2? metres from ground level overlooking Queens Road, as shown in Figure 2.2. The microphone was located within 1.5 ? metres of the nearest surface and therefore includes local reflections.
2	Noise Measurement Position 2	The microphone was installed on a window on the Ground floor of the East façade, as shown in Figure 2.2. The microphone was located within 1.5 metres of the nearest surface and therefore includes local reflections.
A	Internal Noise Measurement Position A	Located on the Ground floor of the building within an open plan office room on the South façade overlooking Queens Road. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above ground floor
B	Internal Noise Measurement Position B	Located on the Ground floor of the building within an open plan office room on the East façade overlooking existing Car Park. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above ground floor

Table 2.1 Measurement positions and descriptions

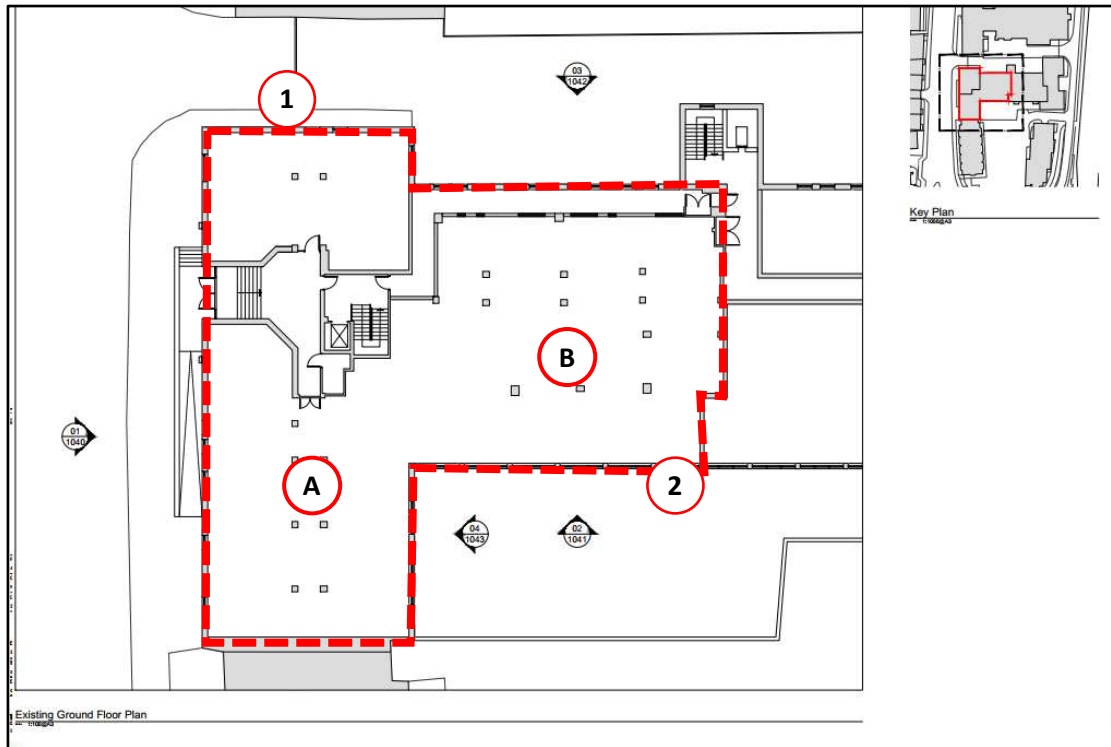


Figure 2.1 Site location and measurement positions (Image Source: Ashton Architecture)

2.5 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 23	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21143-E0	21/07/2022	UK-22-072
	Free-field microphone NTI Acoustics MC230A	A23366		
	Preamp NTI Acoustics MA220	11034		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 24	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21175-E0	21/07/2022	UK-22-066
	Free-field microphone NTI Acoustics MC230A	A23577		
	Preamp NTI Acoustics MA220	10999		
	NTI Audio External Weatherproof Shroud	-	-	-

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 25	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21141-E0	21/07/2022	UK-22-069
	Free-field microphone NTI Acoustics MC230A	A23583		
	Preamp NTI Acoustics MA220	10992		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 27	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21174-E0	21/07/2022	UK-22-070
	Free-field microphone NTI Acoustics MC230A	A23539		
	Preamp NTI Acoustics MA220	11025		
	NTI Audio External Weatherproof Shroud	-	-	-
B&K Type 4231 Class 1 Calibrator		2147411	05/06/2023	UCRT23/1739

Table 2.2 Measurement instrumentation

3.0 RESULTS

3.1 Internal Noise Surveys

The $L_{Aeq, 5min}$ and $L_{Amax, 5min}$ acoustic parameters were measured throughout the duration of the internal noise surveys. Measured levels are shown as time histories in Figures 27451.TH3-4 for internal monitoring positions A and B respectively.

Measured noise levels are representative of noise exposure levels expected to be experienced in all spaces on the south, west and east façades of the development, and are shown in Table 3.1.

Time Period	Internal Noise Measurement Position A (Measured Noise level – dBA)	Internal Noise Measurement Position B (Measured Noise level – dBA)
Daytime $L_{Aeq, 16hour}$	41	30
Night-time $L_{Aeq, 8hour}$	36	28

Table 3.1 Current internal average noise levels for daytime and night time

3.2 External Noise Surveys

The L_{Aeq} : 5min, L_{Amax} : 5min, L_{A10} : 5min and L_{A90} : 5min acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as time histories in Figures 27451.TH1-2.

Measured noise levels are representative of noise exposure levels expected to be experienced by the south, west and east façades of the proposed development, and are shown in Table 3.1.

Time Period	External Noise Measurement Position 1 (Measured Noise level – dBA)	External Noise Measurement Position 2 (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	69	58
Night-time $L_{Aeq,8hour}$	64	54

Table 3.2 Site average noise levels for daytime and night time

Please note that measurements at Noise Measurement Positions 1 and 2 are located at a distance less than 1.5 metres from the nearest reflective surface and therefore a 3dB correction has been applied to the results in Table 3.2 to obtain a free-field measurement as per ISO1996 Part 2.

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Permitted Development Rights

It is understood that the office development would be converted into residential units under the Permitted Development Rights. Therefore, this assessment would be targeted to demonstrate the noise requirement as per Citation “*Amendments in relation to change of use of offices to dwelling houses*” of The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2021:

“(2) Before beginning development under Class MA, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to –

(a) transport impacts of the development, particularly to ensure safe site access;

(b) contamination risks in relation to the building;

(c) flooding risks in relation to the building;

(d) impacts of noise from commercial premises on the intended occupiers of the development;”

The measurements undertaken on site would not only encompass noise generated by any nearby commercial units, but it would also encompass the full spectrum of noise sources in the area affecting the premises.

In order to demonstrate if the current external building fabric of the site would be sufficient to protect the future residents, the measured internal noise levels would be assessed against the recommendations of the British Standard BS8233:2014 “*Sound insulation and noise reduction for buildings*”.

4.2 BS8233:2014

BS8233:2014 ‘*Sound insulation and noise reduction for buildings*’ describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 4.1 BS8233 recommended internal background noise levels

4.3 Comments from the Local Authority

The Local authority has provided the following comments:

The site is likely to be affected by road noise from Queens Road. A noise assessment should be submitted in support of the application.

The noise assessment will be assessed against the recommendations for internal noise levels within dwellings and external noise levels within gardens / balconies in accordance with BS 8233:2014 and WHO guidelines for Community Noise. The report should identify any mitigation measures that are necessary to ensure that the recommended standard is met. Where appropriate, the noise assessment data should also include noise events (LAMax) and the design should aim to prevent noise levels from noise events exceeding 45dB within bedrooms at night. Noise levels above 45dB are linked with sleep disturbance.

5.0 DISCUSSION

As shown in Table 3.1, the noise levels measured internally in the open plan office overlooking Queen Road exceed the recommended noise levels outlined within BS8233:2014. Therefore, in order to ensure that the development is suitable for residential use, the existing building fabric overlooking Queen Road should be upgraded as outlined within Section 6.0.

Furthermore, the noise levels measured internally in the open plan office overlooking the east elevation would be generally commensurate with the design criteria of BS8233:2014, as shown in Table 3.1. If the surrounding area were to remain unchanged, the existing external building fabric overlooking the east elevation would be sufficient in controlling noise break-in from commercial sources and would provide a suitable residential environment.

It should be noted that external amenity areas, such as gardens and balconies, are not being proposed for the development, therefore, the assessment of external amenity areas is not required.

6.0 GLAZED EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the required performance from glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey as well as the non-glazed external building fabric construction.

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 6.1. The performance is specified for the whole window unit, including the frame, seals, etc. as appropriate. Sole glass performance data would not demonstrate compliance with this specification.

Elevations	Octave band centre frequency SRI, dB						$R_w(C;C_{tr})$, dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
Queen Road and West elevations 	30	32	38	36	40	49	39(-1:-3)

Table 6.1 Required glazing performance

As changes to the external building fabric cannot be made under permitted development rights, the existing windows overlooking Queen Road and West elevations (as shown in Figure 6.1 below) would need to be upgraded internally to meet the recommended internal noise levels stipulated in BS8233:2014 and meet the minimum octave band sound reduction values outlined in Table 6.1.



Figure 6.1 Glazing Type Location Plan (Image Source: Ashton Architecture)

We would therefore recommend that a secondary glazing system is installed at Queen Road and west elevations (as shown in Figure 6.1), such as those provided by SelectaGlaze, who provide several systems which would achieve the project requirements:

- S20 Vertical Sliding System, comprised of 50mm cavity from the existing window system, with 4-6.4mm standard glass (Provides 39dB R_w with primary window)
- HS10 Horizontal Sliding System, comprised of 50mm cavity from the existing window system, 4-6.4mm standard glass (Provides 39dB R_w with primary window)

It should be noted that if the windows are replaced at a later stage under a full planning application, the minimum octave band sound reduction values outlined in Table 6.1 should be met for all new window systems.

7.0 CONCLUSION

Internal noise surveys and environmental noise surveys have been undertaken at Queens Wharf, 47 Queens Road, Reading, RG1 4QE allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Noise levels measured internally demonstrate that the existing external building fabric overlooking east elevation would be sufficient in providing a suitable residential environment, and existing noise levels meet the design criteria of BS8233:2014. Therefore, no further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

However, noise levels measured internally demonstrate that the existing external building fabric overlooking Queen Road elevation would be insufficient in providing internal noise levels commensurate to the design criteria of BS8233:2014.

Mitigation measures have been provided to meet the recommended internal noise levels provided in BS8233 and to protect the proposed habitable spaces from external noise intrusion at Queen Road and west elevations.

Queens Wharf, 47 Queens Road, Reading, RG1 4QE - Position 1 External
Environmental Time History
01/11/2023 to 02/11/2023

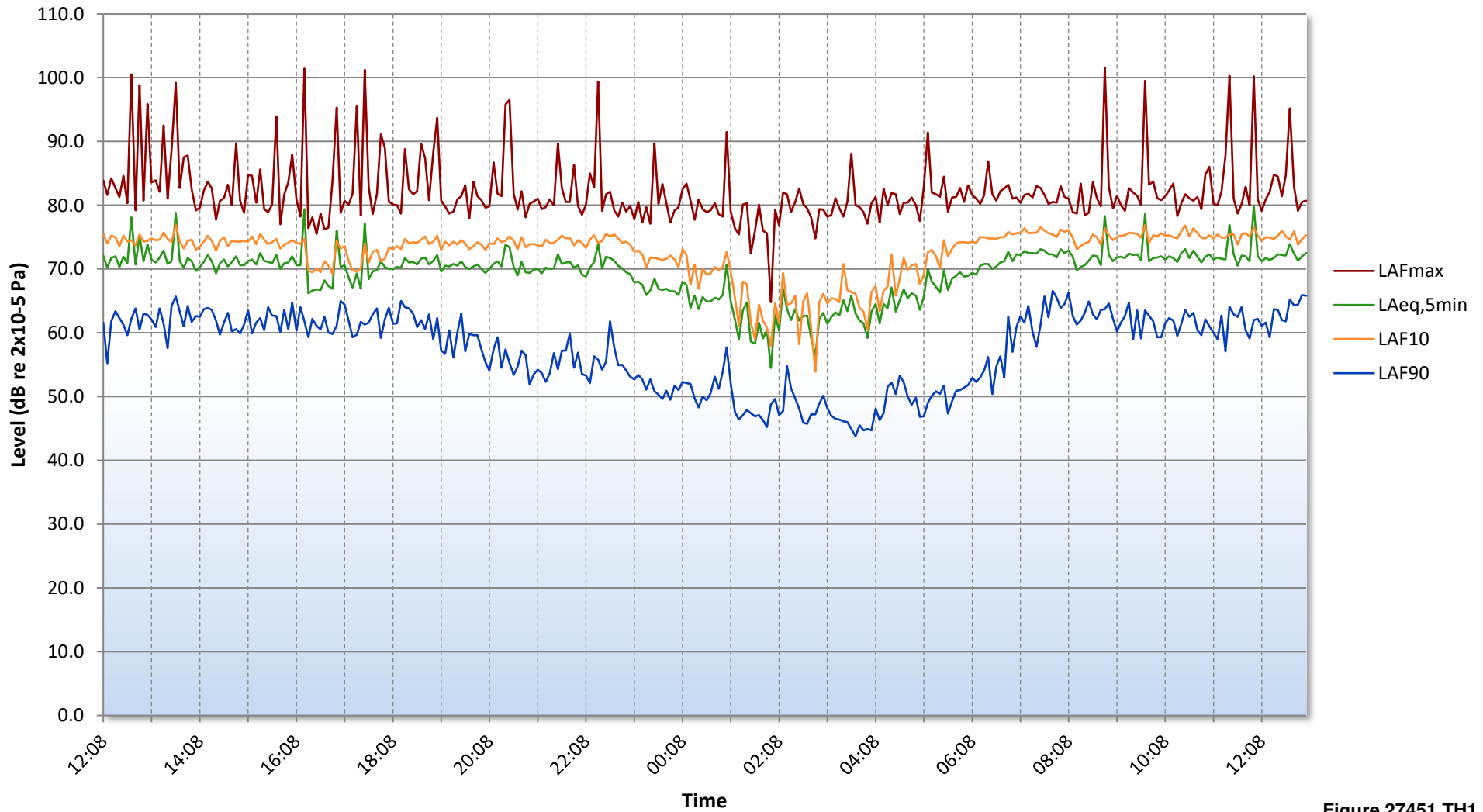


Figure 27451.TH1
External

Queens Wharf, 47 Queens Road, Reading, RG1 4QE - Position 2 External
Environmental Time History
01/11/2023 to 02/11/2023

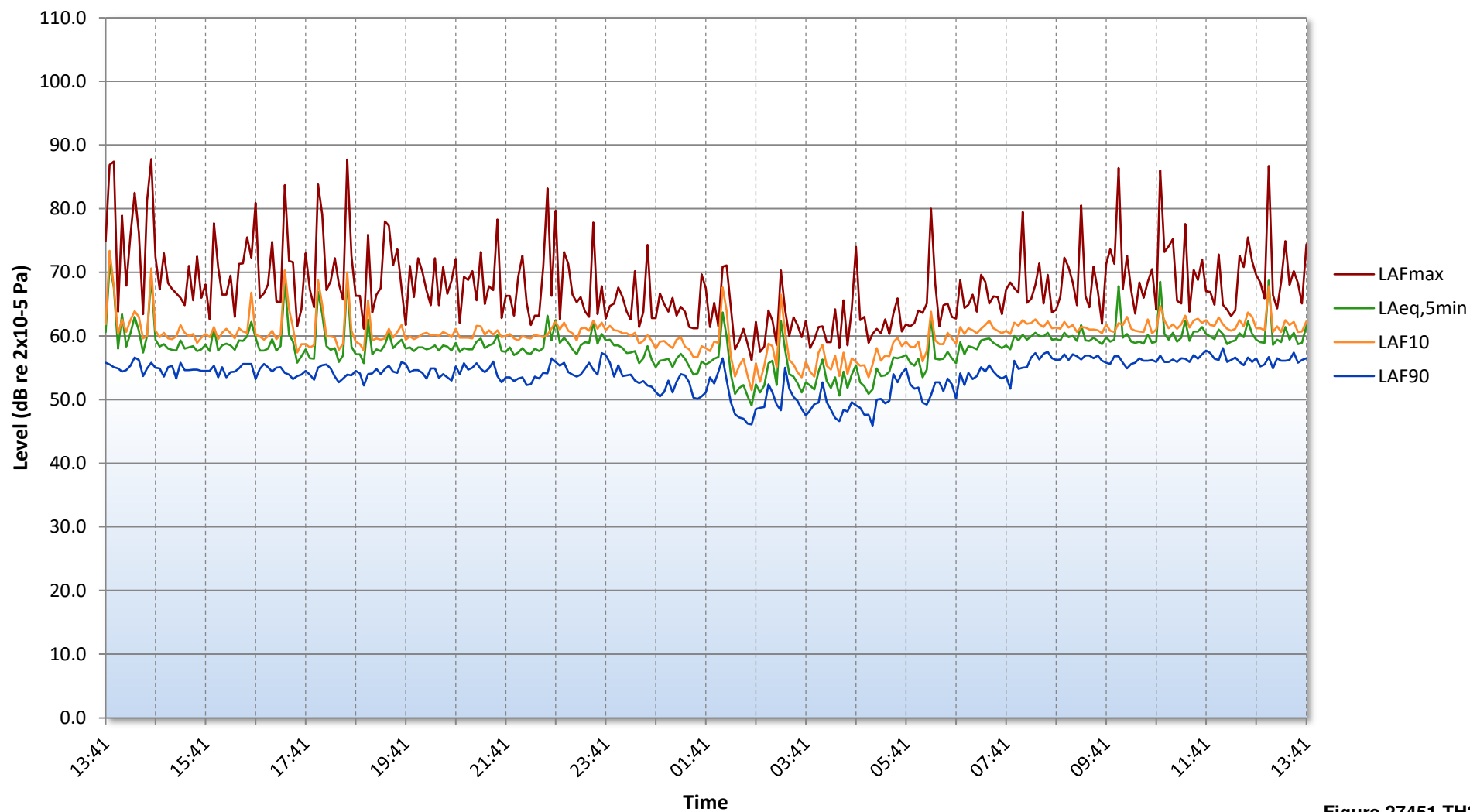


Figure 27451.TH2
External

Queens Wharf, 47 Queens Road, Reading, RG1 4QE - Position 3 Internal
Environmental Time History
01/11/2023 to 02/11/2023

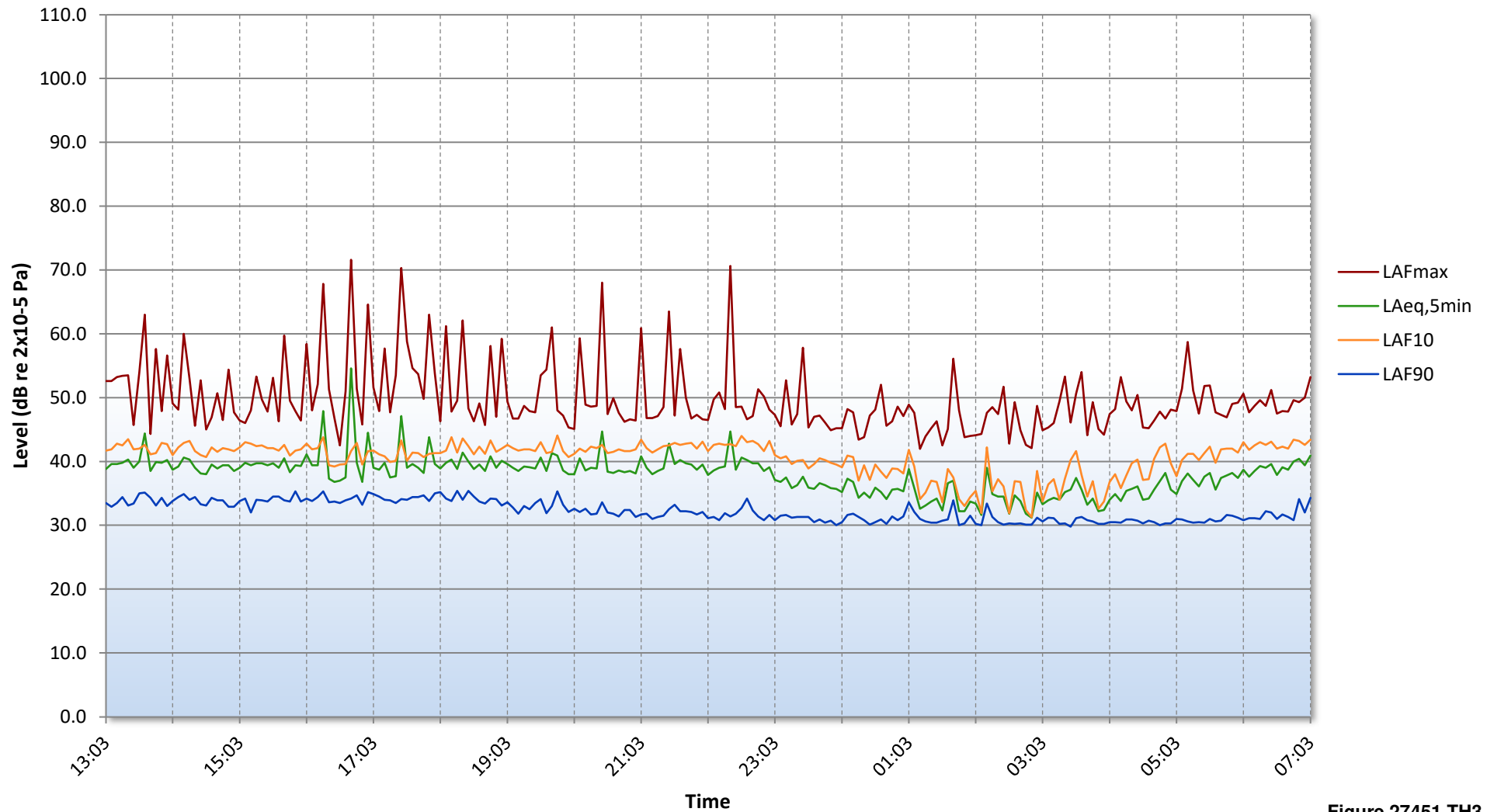


Figure 27451.TH3
Internal

Queens Wharf, 47 Queens Road, Reading, RG1 4QE - Position 4 Internal
Environmental Time History
01/11/2023 to 02/11/2023

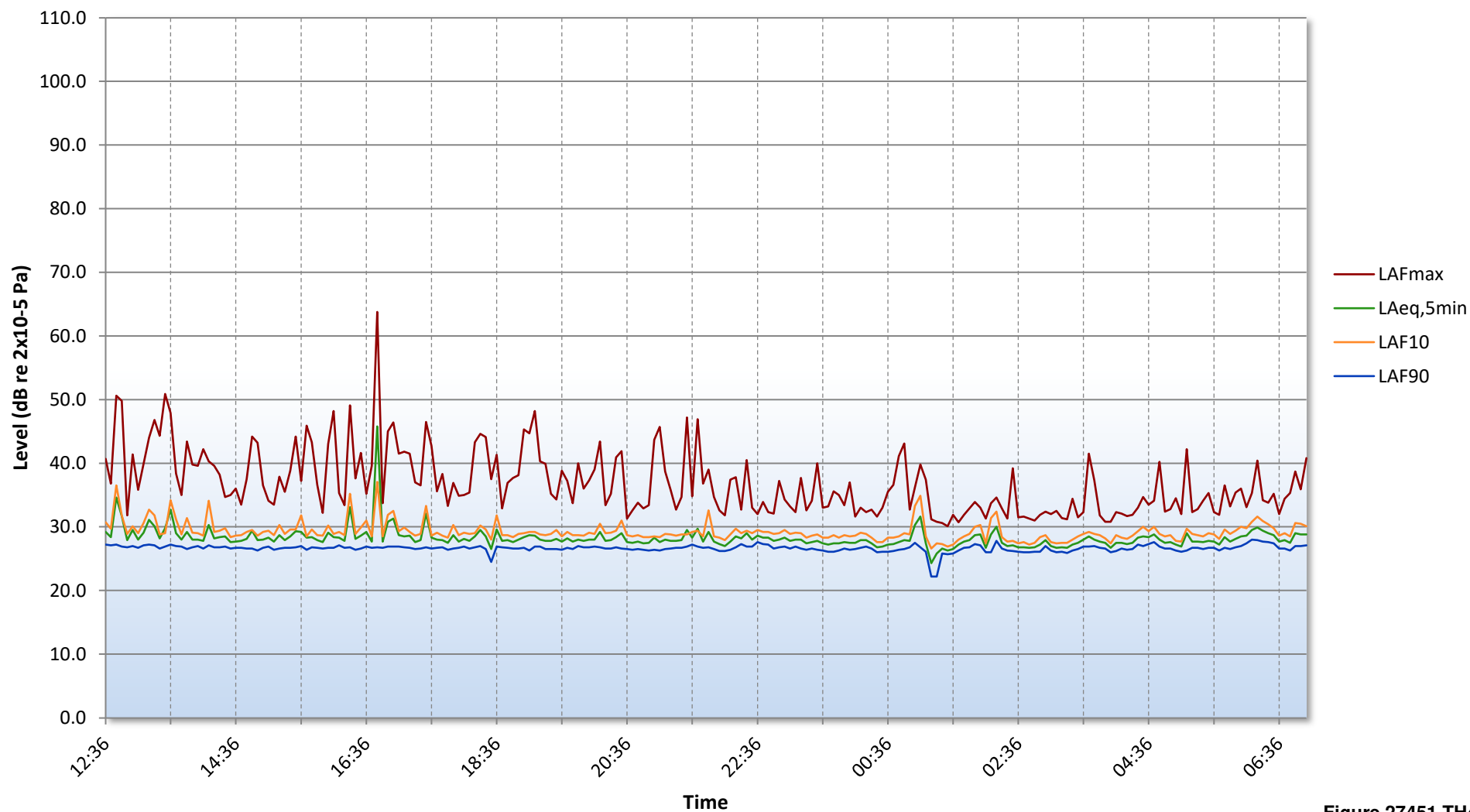


Figure 27451.TH4
Internal

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.