KP Acoustics Ltd.
info@kpacoustics.com
1 Galena Road, W6 0LT London, UK
+44 (0) 208 222 8778
www.kpacoustics.com

112 Cleveland Street, London

Noise Impact Assessment Report
Report 22910.NIA.01 Rev A

Union4 Planning
30 Stamford Street,
South Bank,
London SE1 9LQ

Report 22910.NIA.01 Revision History			
First Issue Date: 01/07/2021			
A	04/08/2021 - Changes to reflect client comments	D	
B		E	
C		F	

Written by:	Checked by:	Approved by:
Marie Gauthier AMIOA Acoustic Consultant	**Aidan Tolkien MIOA** Senior Acoustic Consultant	**Kyriakos Papanagiotou MIOA** Managing Director

Contents

List of Attachments

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Union4 Planning, 30 Stamford Street, South Bank, London SE1 9LQ, to assess the suitability of the site at 112 Cleveland Street, London W1T 6PB for a residential development in accordance with Permitted Development rights as outlined in Class MA of The Town and Country Planning (General Permitted Development) (England) Order 2015. This is an application seeking a determination as to whether prior approval is required for the conversion of the existing ground and basement floor space from a use falling within Class E (commercial, business and services) to create a single residential dwelling over the ground and basement level (Use Class C3)

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

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by residential properties to the north, south and east, and Cleveland Street to the West. It should be noted the pub The George & Dragon Fitzrovia and the restaurant Tian Fu are located on the opposite side of the road facing 112 Cleveland Street. Entrance to the site is located via Cleveland Street to the west. At the time of the survey, the background noise climate was dominated by road traffic noise from Cleveland Street and the A501 to the North.

2.2 Internal Noise Survey Procedure

An internal noise survey was undertaken within the Ground Floor of the house facing Cleveland Street 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 14:03 on 25/06/2021 and 12:05 on 28/06/2021.

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

An external noise surveys was 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 such as The George & Dragon Fitzrovia and the restaurant Tian Fu.

Continuous automated monitoring was undertaken for the duration of the survey between 14:13 on 25/06/2021 and 4:48 on 28/06/2021.

Weather conditions were generally dry with light winds 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
	Internal Noise Measurement	Internal measurement was on the Ground Floor of the building within a room on the west façade overlooking Cleveland Street. The microphone was installed on a tripod in the middle of the room at a distance of 3m from the window on the external façade and positioned at 1.5m above ground floor
	External Noise Measurement	The meter was installed on a window on the First Floor of the west façade overlooking Cleveland Street. A correction of 3dB has been applied to account for non-free field conditions

Table 2.1 Measurement positions and descriptions

Figure 2.1 Site measurement positions (Image Source: Google Maps)

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 1	Svantek Type 957 Class 1 Sound Level Meter	12399	12/03/2020	14015015-1
	Free-field microphone Aco Pacific 7052E	55951		
	Preamp Svantek 2v12L	33537		
	Svantek External windshield	-	-	-
Noise Kit 9	Svantek Type 958A Class 1 Sound Level Meter	45578	15/07/2020	14012950
	Free-field microphone PCB 377B02	169770		
	Preamp PCB 426E01	128280		
	Svantek External windshield	-	-	-
Larson Davis CAL200 Class 1 Calibrator		8932	11/02/2020	04624/2

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 survey. Measured levels are shown as time history in Figure 22910.TH1 for internal monitoring position 1.

Measured noise levels are representative of noise exposure levels expected to be experienced in all spaces on the West façade of the development, and are shown in Table 3.1.

Time Period	Internal Noise Measurement (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	39
Night-time $L_{Aeq,8hour}$	32

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 a time history in Figure 22910.TH2.

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

Time Period	External Noise Measurement (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	60
Night-time $L_{Aeq,8hour}$	54

Table 3.2 Site average noise levels for daytime and night time

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 7.1.c *"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 No 428:

"Development consisting of a change of use of a building and any land within its curtilage from a use falling within Class E (commercial, business and service) of Schedule 2 to the Use Classes Order to a use falling within Class C3 (dwellinghouses) of Schedule 1 to that Order.

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"*.

This application description is as follow:

"An application seeking a determination as to whether prior approval is required for the conversion of the existing ground and basement floorspace from a use falling within Class E (commercial, business and services) to create a single residential dwelling over the ground and basement level (Use Class C3)"

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

5.0 DISCUSSION

As shown in Table 3.1, internally measured noise levels 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 should be upgraded as outlined within Section 6.0.

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 and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Elevation	Octave band centre frequency SRI, dB						R_w (C;C_{tr}), dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
All elevations	23	23	30	39	36	43	34 (-1;-4)

Table 6.1 Required glazing performance

As changes to the external building fabric cannot be made under permitted development rights, the existing windows 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.

We would therefore recommend that a secondary glazing system is installed, 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)

- HC45 Hinged Casement System, comprised of 50mm cavity from the existing window system, 4-6.4mm standard glass (Provides 41dB 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 and external noise surveys have been undertaken at 112 Cleveland Street, London W1T 6PB 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 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.

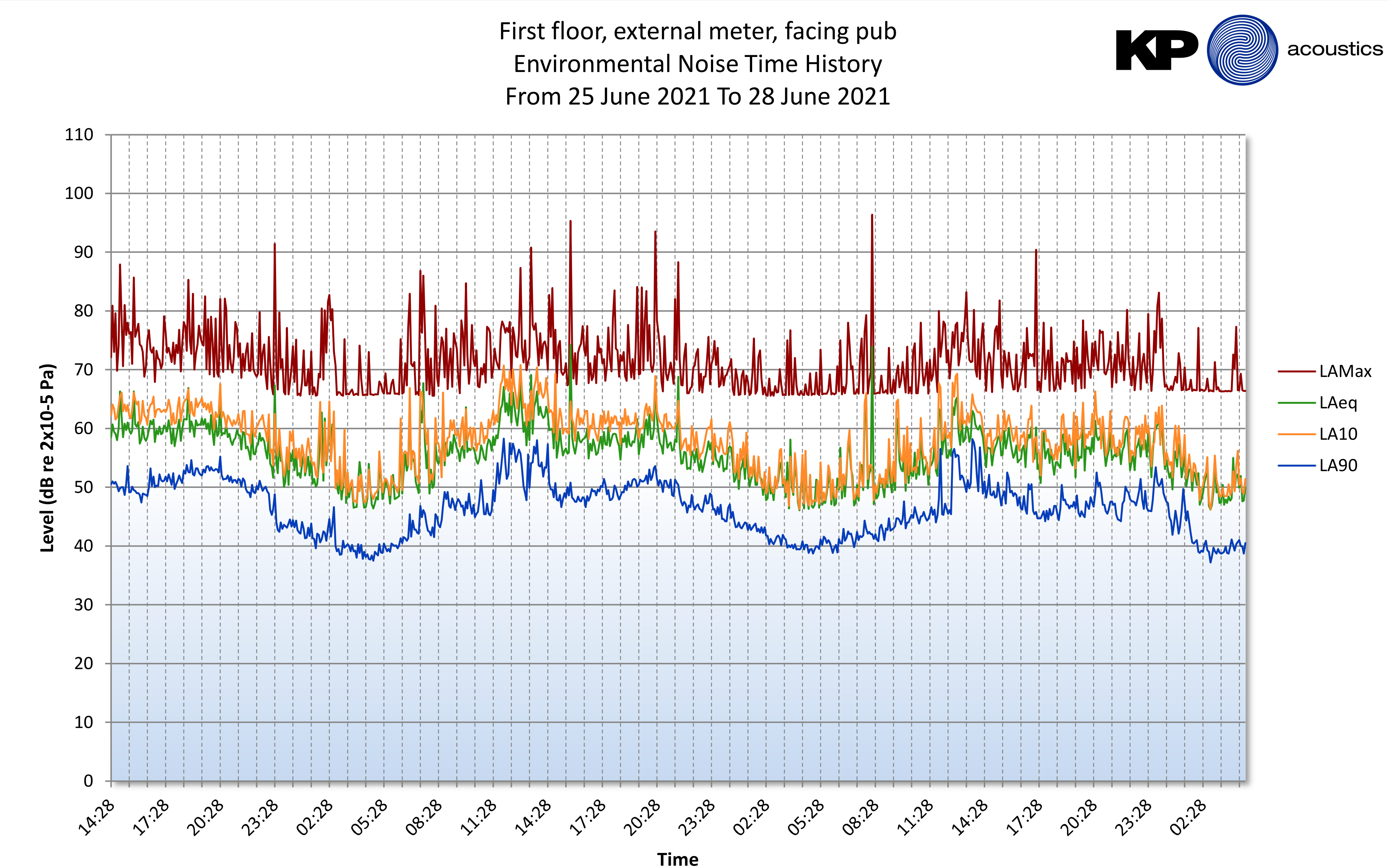

Figure 22910.TH1

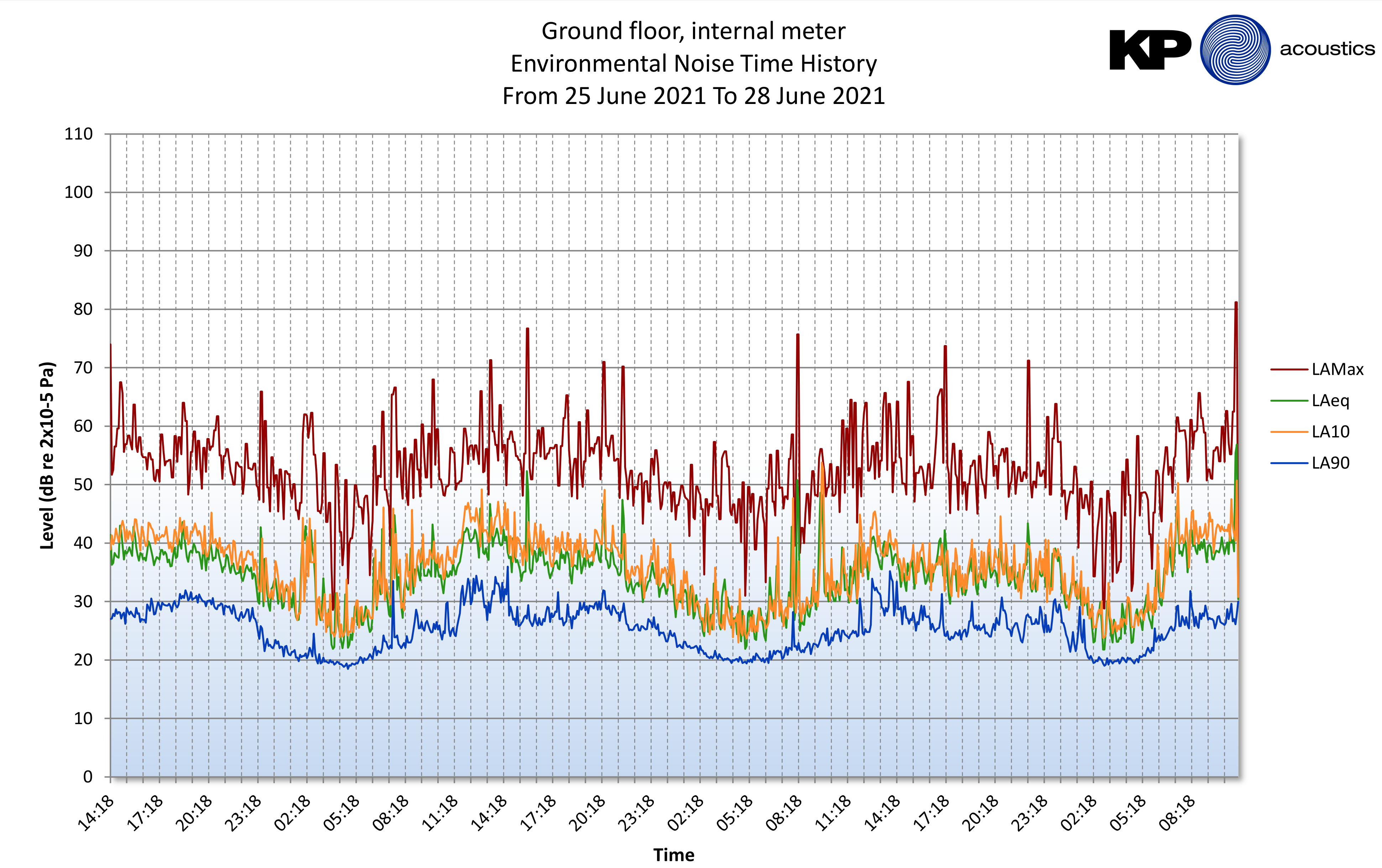

Figure 22910.TH2

APPENDIX A

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*.

APPENDIX A

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.