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COOKS GARAGE, FORGE LANE, NORTHWOOD

NOISE IMPACT ASSESSMENT

Report 17824.NIA.01

For:

Mr Raaj Radia

C/O Strata, Stanmore

Bic, Stanmore Place

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First Issue date: 27/07/2018			
Revision History **Report** 17824.NIA.01			
A	20/08/2018 – Calculations for openable windows	D	
B		E	
C		F	

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Contents

List of Attachments

1. INTRODUCTION

KP Acoustics Ltd, 1 Galena Road, London, W6 0LT, has been commissioned by Mr Raaj Radia, C/O Strata, Stanmore – Bic, Stanmore Place, Howard Road, Stanmore, HA7 1GB, to undertake a noise breakout assessment from an existing public house to the external environment, in order to facilitate the development of the site for conversion to a nursery. The measured noise levels will be used to investigate and assess the potential noise impact from the existing property to the neighbouring residential spaces, in order to establish any remedial measures necessary to facilitate the change of use.

This report presents the results of the environmental survey followed by an assessment of the measured performance of the building's external building fabric.

2. PROCEDURE AND EQUIPMENT

2.1 Environmental Noise Survey

Measurements of existing environmental noise were undertaken at the position shown on figure 2.1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver.

Continuous automated monitoring was undertaken for the duration of the survey between 11th October 2016 and 12th October 2016.

Weather conditions were generally dry with light winds, therefore deemed 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*".

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows:

Measurement instrumentation	Serial no.
Svantek Type 977 Class 1 Sound Level Meter	34104
MTG MK250 Microphone	10920
PCB 378B02 Pre-amp	124739
B&K Type 4231 Class 1 Calibrator	1897774

Table 2.1 Measurement instrumentation

2.2 Measurement Positions

Measurement positions are as described within Table 2.2 and shown within figure 2.1.

	Description
Noise Measurement Position 1	The meter was installed at the ground floor at the position as shown in Figure 2.1. A correction of 3dB has been applied to account for non-free field conditions

Table 2.2 Measurement positions and description

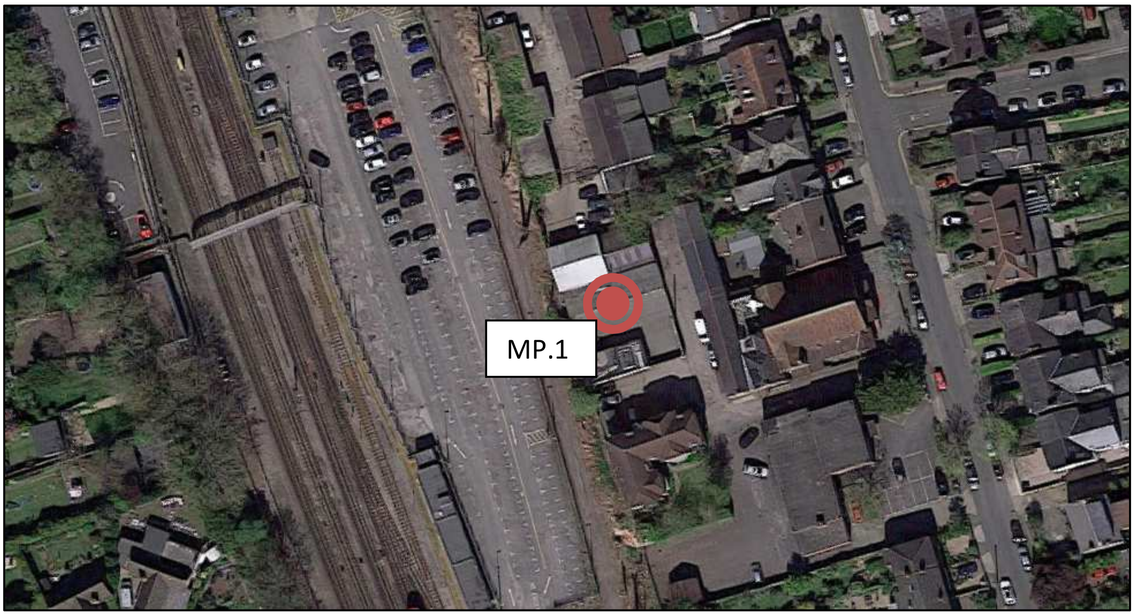

Figure 2.1 – Site Measurement position (Image Source: Google Maps)

3. RESULTS

3.1 Environmental Noise Survey

The $L_{Aeq:\ 5min}$, $L_{Amax:\ 5min}$, $L_{A10:\ 5min}$ and $L_{A90:\ 5min}$ acoustic parameters were measured and are shown as a time history in Figure 17824.TH1.

Representative background (L_{A90}) levels for the duration of the survey as determined by statistical analysis (17824.L90 Day and 17824.L90 Night) are shown in Table 4.1.

	Daytime 07:00 to 23:00	Night Time 23:00 to 07:00
Representative background noise level ($L_{A90,\ 5min}$)	40 dB(A)	26 dB(A)

Table 4.1: Representative background noise levels measured during the environmental noise survey

In order to ensure that noise levels received at the nearest noise sensitive receiver do not negatively impact on residential amenity, it would be recommended that noise emissions from the nursery do not exceed the existing daytime representative background noise on site.

4. DISCUSSION

It is understood that the current proposals are to develop a children's nursery. It would be expected that due to the nature of the noise source (children playing), noise levels within the establishment could potentially be high. As such, an overall worst case noise level of 90 dB(A) is assumed in order to render this assessment as robust as possible.

Following a visual inspection of the site, the closest noise sensitive receivers to the proposed nursery have been identified as being the residences located 15m East of the potential noise breakout points of the proposed development. It is understood that noise transmission to noise sensitive receivers may occur both through external noise breakout, in addition to noise disturbance occurring from the external play area.

4.1 Prediction for Noise Breakout through External Facade

Using the source level of 90 dB(A) as expected within the nursery, and the a nominal sound reduction index of the building façade of 25dB, Table 4.1 shows the predicted sound pressure level at the nearest noise sensitive receiver due to activity within the ground floor space, compared with the measured background noise. Detailed calculations are shown in Appendix B.

Receiver	Proposed Noise Emissions Criteria 1m from receiver window	Noise Level at Receiver (1m from window)
Nearest Noise Sensitive Window	40 dB(A)	39 dB(A)

Table 5.1: Predicted noise level at receivers via external façade

As can be seen from Table 5.1, the breakout through the external façade provides a level which will exceed the minimum background noise level on site.

4.2 Noise Assessment from Playground

In addition to the issue of noise breakout from the premises itself, it is also important to assess noise transmission from any external spaces such as playgrounds to the nearest residence.

As the site is not currently in operation as a nursery, measurements of noise emissions from a nursery playground at an existing site are used within this assessment to provide reference.

	Sound Pressure Level (dB) in each Frequency Band, at 1m								
Activity	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dB(A)**
Nursery Playground	56	58	61	61	65	61	54	41	68

Table 4.2: Measured Sound Pressure Levels of Playground Activity

Taking distance attenuation into consideration, noise levels at the nearest noise sensitive receiver have been predicted as a result of external play areas.

Receiver	Proposed Noise Emissions Criteria 1m from receiver window	Noise Level at Receiver (1m from window)
Nearest Noise Sensitive Window	40 dB(A)	44 dB(A)

Table 4.3: Predicted noise level at receivers as a result of playground

As shown in table 4.3 and Appendix B2, noise emissions from a typical nursery playground would be expected to exceed the daytime background noise levels at the nearest receiver, without the implementation of remedial measures or control methods.

5. REMEDIAL MEASURES

External Facades

In order to improve the performance of the external façade, it would be recommended that all windows and doors are kept closed during operation. It should also be ensured that all windows and doors meet a minimum overall sound reduction performance of 25dB Rw.

Playground Noise

The control of noise emissions from external areas can be achieved in this case through the implementation of a noise barrier.

It is understood that current proposals include a 1.8m wall or barrier to the East boundary of the play area. The minimum performance of any such barrier would be expected to be in the region 5dB overall. This would be expected to render received noise levels within the proposed noise emissions criterion, no further mitigation measures would be required, and it would be expected that noise disturbance would be minimised to neighbouring noise sensitive receivers.

6. OPENABLE WINDOWS

In order to cater for the event in which windows of the Nursery must be opened for ventilation additional assessment has been made for noise breakout in this eventuality.

It is anticipated that with doors/windows partially open, the composite sound reduction index would be reduced to a maximum of 15dB. This would inherently result in a noise level received at the nearest noise sensitive receiver increasing by 10dB, thereby exceeding the noise emissions criterion by 9dB.

It should be noted that noise emissions within the proposed classrooms are anticipated at a level representative of a worst case scenario, due to the inherent unpredictability associated with children.

It is likely that throughout the majority of the time within the nursery noise levels will be significantly lower, and can be maintained at a lower level with careful management by staff. With this in consideration, it would be anticipated that a lower source level of 80dB(A) would be representative of a worst case noise scenario during supervised quiet play hours. This could be implemented during times when windows are open for ventilation.

The anticipated benefit of utilising 'quiet play' hours with windows open has been calculated in Appendix B3.

Receiver	Proposed Noise Emissions Criteria 1m from receiver window	Noise Level at Receiver (1m from window)
Nearest Noise Sensitive Window	40 dB(A)	39 dB(A)

Table 6.1: Predicted noise level at receivers via external façade

As shown in Table 6.1, noise levels received at the nearest receiver with windows open would comply with the noise emissions criterion, providing that noise levels within the space do not regularly exceed 80dB(A). In order to maintain this, it would be recommended that a robust ‘quiet play’ strategy is implemented when windows are open. This includes limiting noisy activities such as the use of musical instruments, and increased child supervision.

7. CONCLUSION

An environmental noise survey has been undertaken at Cooks Garage, Forge Lane, Northwood. The results of the survey have enabled the assessment of noise propagation of proposed activity to the nearest noise sensitive receiver. Remedial measures have been proposed in order to control noise emissions in order to ensure that the amenity of the closest noise sensitive receiver is protected.

Noise levels have been predicted at the nearest noise sensitive receivers in comparison to minimum measured daytime noise levels, and would be expected to have no negative impact on the amenity of neighbouring residents, provided that the recommended mitigation measures are implemented. No other measures would be deemed necessary in order to protect the amenity of the nearest noise sensitive receivers.

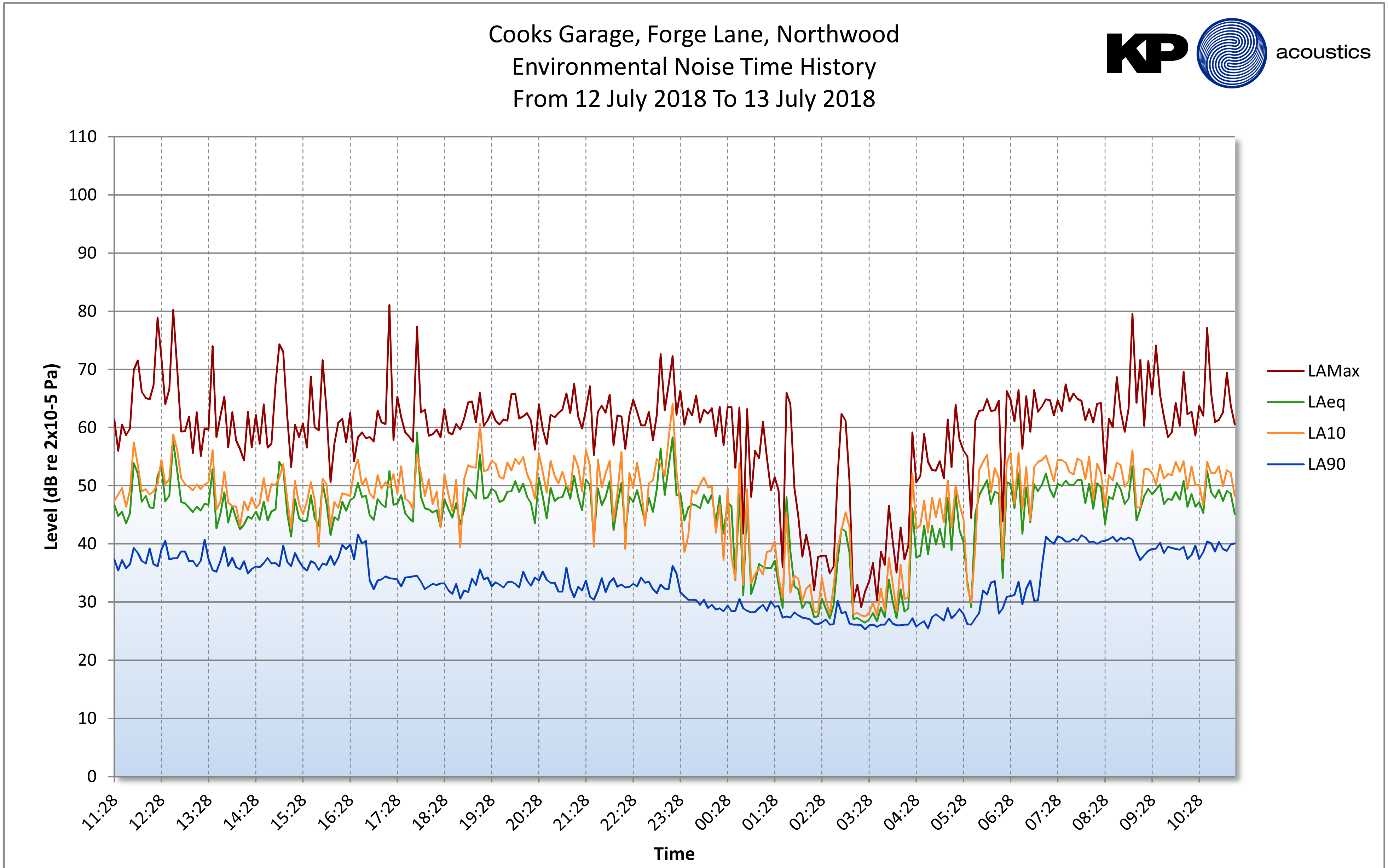

Figure 17824.TH1

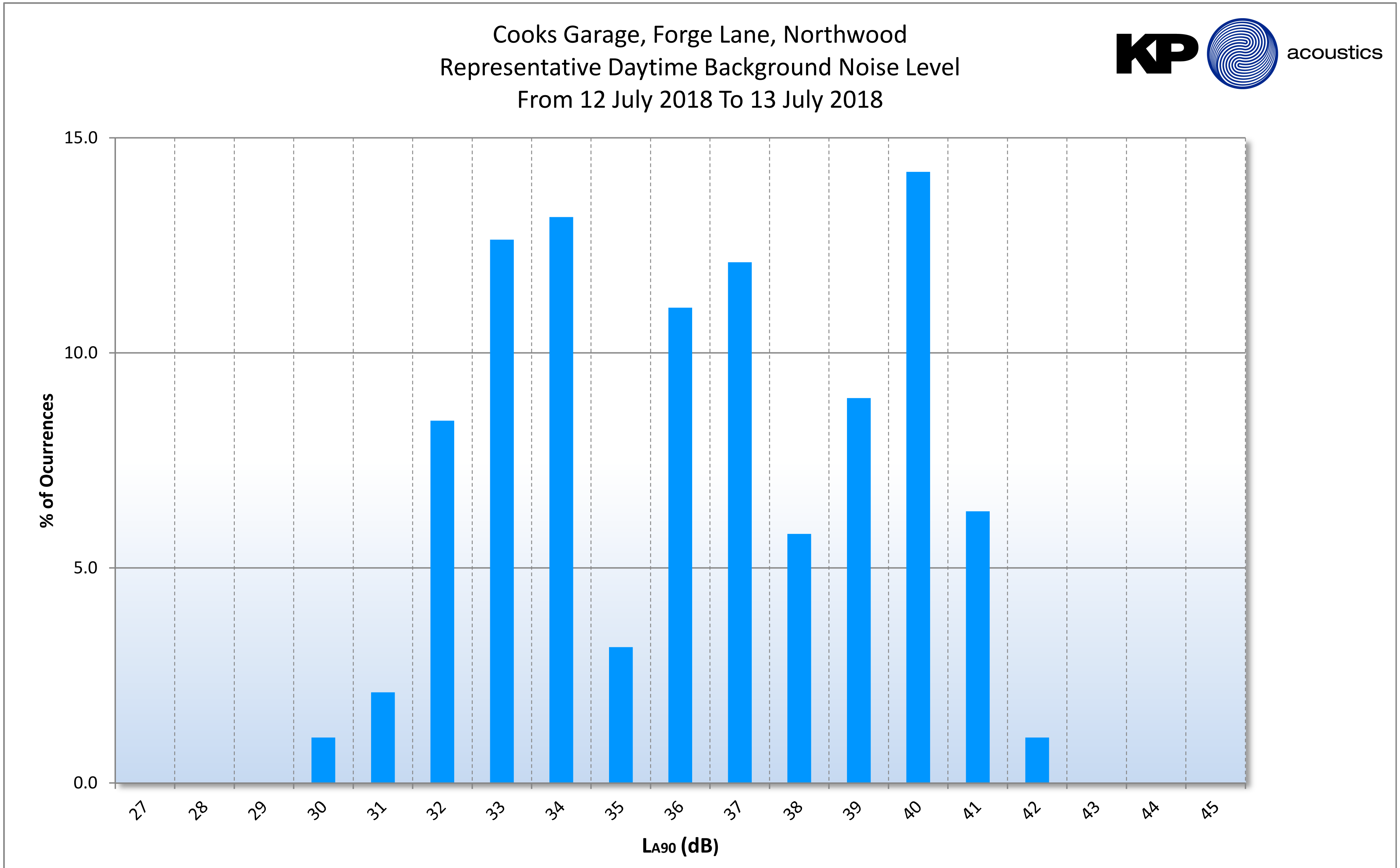

Figure 17824.L90 Day

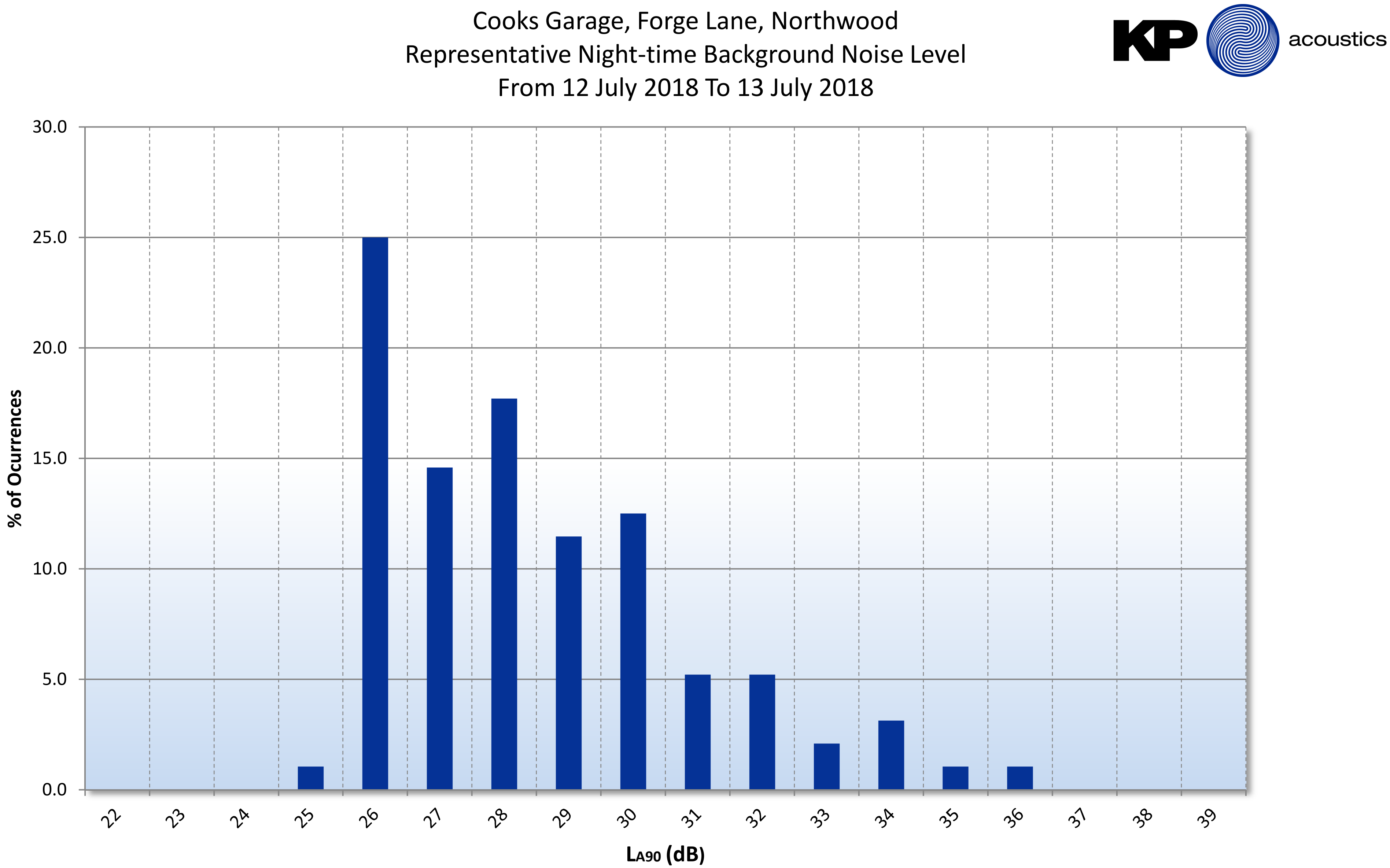

Figure 17824.L90 Night

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.

APPENDIX B1 - External Façade Breakout

Cooks Garage, Forge Lane, Northwood

NOISE BREAKOUT EMISSIONS CALCULATIONS

Source: Predicted Internal Levels	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Measured Sound Pressure Levels									
Predicted Internal Levels									90
Composite sound reduction index of façade									-25
Correction for total area of building facade (S = 17m^2)									12
Correction for directivity (Q) and distance (r) (Q=2, r = 15m)									-32
Non reverberant correction									-6
Predicted sound pressure level 1m from nearest residential receiver									**39**
								Design Criterion	**40**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Maximum Nursery Noise Levels	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									39
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**29**

APPENDIX B2

Cooks Garage, Forge Lane, Northwood

Nursery Playground Area Noise Calculations

APPENDIX B2: Noise Assessment for Receiver from Nursery Garden

Noise Source: Nursery Playground

	Frequency, Hz								
	63	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Typical Sound Pressure Levels (at 1m)									
Nursery Playground	56	58	61	61	65	61	54	41	68
Attenuation due to distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Total Sound Pressure Level from Nursery Playground	32	34	37	37	41	37	30	17	**44**

Design Criterion (Daytime Backgound Noise Level)	**40**

APPENDIX B3 - External Façade Breakout - Windows Open

Cooks Garage, Forge Lane, Northwood

NOISE BREAKOUT EMISSIONS CALCULATIONS

Source: Predicted Internal Levels Receiver: Nearest Residential Window	*Frequency, Hz* 63	125	250	500	1k	2k	4k	8k	dB(A)
Measured Sound Pressure Levels Predicted Internal Levels - During 'quiet play' hours									80
Composite sound reduction index of façade (windows open)									-15
Correction for total area of building facade (S = 17m^2)									12
Correction for directivity (Q) and distance (r) (Q=2, r = 15m)									-32
Non reverberant correction									-6
Predicted sound pressure level 1m from nearest residential receiver									**39**
								Design Criterion	**40**

Receiver: Inside Nearest Residential Window

Source: Maximum Nursery Noise Levels	*Frequency, Hz* 63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level outside window									39
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**29**