



Jackson's Corner, Reading

External Noise Assessment Report

26 June 2017

For

1-9 Kings Road LLP

11 Golden Square

London

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Project Number	13318	Issue Date	26 June 2017
Document Reference	R/ENA/1/170626	Version	01
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EXECUTIVE SUMMARY

A new development is proposed at Jackson's Corner in Reading. The new development will include 33 residential apartments and three food & beverage units and will involve the refurbishment of an existing building and construction of a new building.

Reading Borough Council has requirements in relation to external noise intrusion into the new apartments and **auricl** has been instructed to undertake an acoustic assessment based on the proposals and the previously-undertaken noise survey.

The proposed development layout has been configured to minimise the number of sensitive rooms that directly face the principal surrounding sources of noise. Only a small number of bedrooms are proposed in the façades facing High Street/King's Road, with the remainder being living rooms. The central courtyard, new residential building and new balconies will all benefit acoustically from the screening provided by the retained refurbished building around the site's boundary.

As such, it has been predicted that desirable internal ambient noise levels (as specified by BS 8233: 2014) can be achieved in the majority of the development (new building and existing façades facing away from King's Road/High Street). Reasonable internal conditions are predicted to be achieved in the façades facing King's Road/High Street, which could be considered acceptable given the need to preserve the heritage of this historical façade.

Noise levels due to night-time noise events are predicted to exceed the WHO guidelines in bedrooms on the façade, however a significant effect on sleep disturbance is not likely to occur for bedrooms in this façade. Since the remainder of the development will be exposed to lower external noise levels, it therefore follows that this also applies to the remainder of the proposed development.

1.0 Introduction

A new development is proposed at Jacksons Corner in Reading. The development will include 33 residential apartments and three food & beverage units and will involve the refurbishment of an existing building and construction of a new building.

Reading Borough Council has requirements in relation to external noise intrusion into the new apartments.

This report presents the methodology and results of a noise survey to determine affecting the proposed development site and an assessment to address Reading Borough Council's requirements.

2.0 Description of Site and Proposals

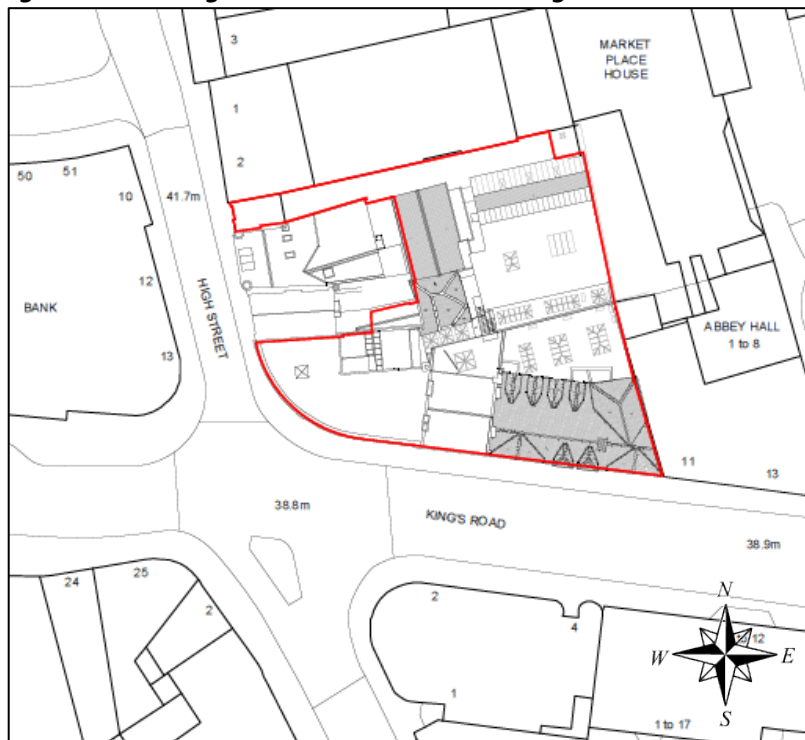
The proposed development site is at a location known as Jacksons Corner at 1-9 King's Road in the centre of Reading. The site is bounded by King's Road to the south and High Street to the west.

The majority of the site is currently occupied by a vacant retail property, with a small number of vacant residential units on the uppermost floors.

The area surrounding the site is made up of predominantly commercial uses (retail and office properties), although a residential dwelling was noted adjacent to the site within 11 King's Road to the east.

Figure 2.1 shows the existing site extent in **red** and the surrounding properties.

Figure 2.1 Existing Site Extent and Surroundings

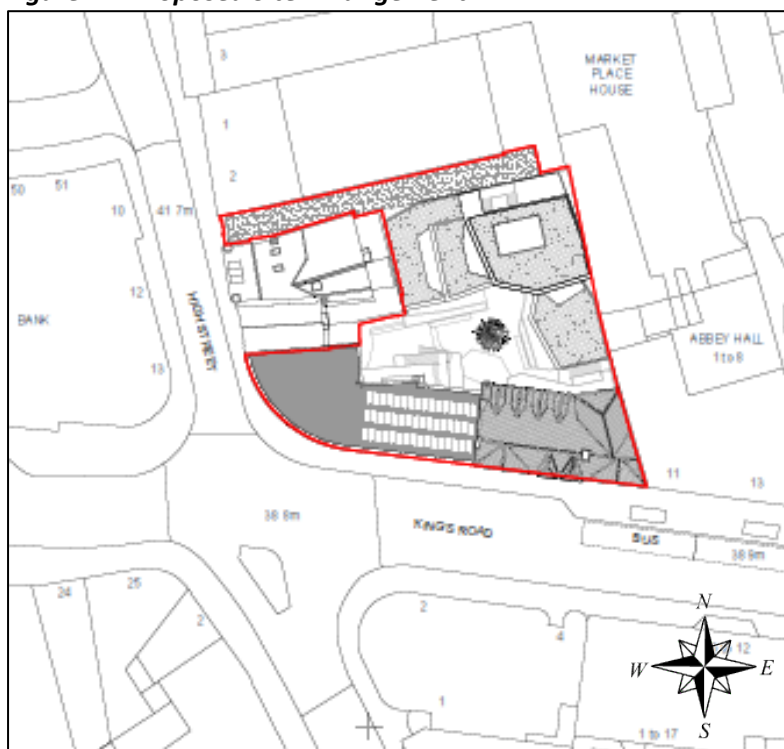


It is proposed to refurbish the main southern corner building fronting onto King's Road to provide 18 apartments at first, second and third floor levels, with three food & beverage units at ground floor level. A new building is to be constructed to the north/rear of the site, involving 15 apartments

arranged from ground to sixth floor level. A communal courtyard will occupy the centre of the site and the newly-built apartments will be equipped with balconies.

Figure 2.2 shows the proposed site arrangement in red.

Figure 2.2 Proposed Site Arrangement



3.0 Reading Borough Council Requirements

In terms of external noise intrusion into the proposed residential apartments, Reading Borough Council has recommended achieving acceptable internal noise levels as specified in BS 8233: 2014 and the WHO guidelines.

British Standard 8233: 2014 *"Guidance on sound insulation and noise reduction for buildings"* recommends acceptable internal noise limits for residential dwellings, as presented in Table 3.1.

Table 3.1 BS 8233: 2014 Internal Noise Limits

Activity	Location	07:00 – 23:00 hours	23:00 – 07:00 hours
Resting	Living room	35 dB $L_{Aeq, 16 \text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16 \text{ hr}}$	-
Sleeping / daytime resting	Bedroom	35 dB $L_{Aeq, 16 \text{ hr}}$	30 dB $L_{Aeq, 8 \text{ hr}}$

In addition, the World Health Organisation (WHO) document “*Guidelines for Community Noise*” (1999) advises the following:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)”

4.0 Environmental Noise Survey

4.1 Methodology

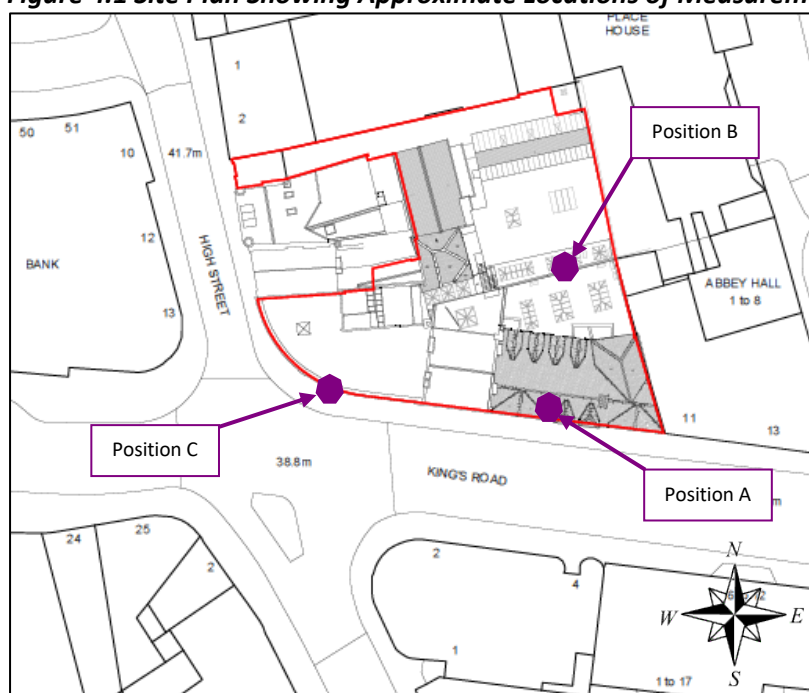
An unmanned environmental noise survey was undertaken over approximately 4 days between Thursday 17 March 2016 and Monday 21 March 2016. This survey period was selected to determine typical ambient and background noise levels during the proposed periods when the residential elements will be occupied and the commercial elements operational.

The measurement positions are described in Table 4.1 and indicated in **purple** on Figure 4.1.

Table 4.1 Description of Measurement Positions

Position	Description
A	Protruding from a window at first floor level at the southern boundary of the site overlooking King's Road
B	Fixed to a railing on a first floor level roof area in the centre of the site
C	Mounted on a tripod at a height of approximately 1.5m above pavement level at the south western corner of the site, at the intersection of King's Road and High Street

Figure 4.1 Site Plan Showing Approximate Locations of Measurement Positions



Measurement position A was selected as a worst-case location to assess noise levels affecting the proposed development site. Measurement position B was selected as being representative of background noise levels at the nearest existing noise sensitive properties.

A short manned noise survey was undertaken at position C to assess any variation in noise between the southern boundary of the site and the south western corner at the junction of King's Road and High Street.

The equipment used for the noise survey is summarised in Table 4.2.

Table 4.2 Description of Equipment used for Noise Survey

Measurement Position	Item	Make & Model	Serial Number
A	Type 1 automated logging sound level meter	01 dB Duo	10522
	Type 1 ½" external microphone	GRAS 40CD	136978
	Calibrator	01 dB CAL 21	01120237
B and C	Type 1 automated logging sound level meter	01 dB Cube	10511
	Type 1 ½" external microphone	GRAS 40CD	144879
	Calibrator	01 dB CAL 21	01120237

L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels were measured throughout the noise survey over contiguous 1 second intervals.

Due to the nature of the noise survey, i.e. unmanned, we are unable to comment on the weather conditions throughout the entire noise survey period. However, at the beginning and end of the survey period, there was noted to be no rainfall, a clear sky and only light wind. These conditions are understood to be representative of the survey period and are considered appropriate for undertaking environmental noise measurements.

The noise monitoring equipment was calibrated before and after the noise survey period. No significant change was found. Equipment calibration certificates can be provided upon request.

4.2 Results

Appendix B presents time history graphs showing the L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels measured throughout the noise survey at the unmanned measurement positions. Due to measurement position A being near to the facade of the existing building, the measured noise levels have been reduced by 2 dB to more closely resemble "free-field" conditions (in accordance with guidance from BS 8233: 2014).

Table 4.3 presents the noise levels measured externally at the south-western corner of the site (worst-case) and within the site, derived from the manned and unmanned measurement results.

Table 4.3 Measured External Noise Levels

Measurement Position	Daytime L_{Aeq} (16 hour) (dB)	Night-time L_{Aeq} (8 hour) (dB)
South Western Corner	68	62
Centre of Site	51	43

We would consider the levels measured to be reasonable, considering the location of the measurement positions and the dominant nearby noise sources.

Due to the nature of the unmanned noise survey we are unable to comment on the exact noise climate throughout the entire survey period. However, at the beginning and end of the survey period the daytime noise climate at position A was noted to be affected by noise from road traffic and buses using King's Road and High Street. We anticipate that this would also be true of night-time periods.

At position B, the daytime noise climate was noted to be affected by road traffic noise using surrounding roads (e.g. High Street, King's Road), which we expect would also be true of night-time periods.

It was found that at position C, noise levels were generally 2 dB greater than at position A, and this has been taken into account in subsequent assessments.

5.0 External Noise Intrusion Assessment

This section assesses noise intrusion within the proposed development due to external sources, in relation to Reading Borough Council's requirements.

5.1 Layout of Proposed Development

The proposed development layout has been configured to minimise the number of sensitive rooms that directly face the principal surrounding sources of noise. The existing building is to be reconfigured so that dual-aspect apartments are constructed, with mainly living rooms facing 'out' of the site and bedrooms facing 'in' towards the sheltered central courtyard. Only a small number of bedrooms are proposed in the façades facing High Street/King's Road, with the remainder being living rooms.

The central courtyard, new residential building and new balconies will all benefit acoustically from the screening provided by the retained refurbished building around the site's boundary.

5.2 Proposed External Façade Constructions

To preserve the heritage of the historical façade of the site that faces the King's Road/High Street junction, the existing sash windows in this façade are required to be retained. As such, it is proposed to acoustically upgrade the existing glazing by replacing the existing glass and refurbishing the existing frames, without the need for secondary glazing units.

It is proposed to use 4mm glass and 6.8mm laminated acoustic glass, either side of a cavity of between 4mm and 15mm (depending on site conditions). The predicted sound reduction performance is shown in Table 5.1.

Table 5.1 Predicted Sound Reduction Performance of Refurbished Existing Glazing

Predicted Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)					
125	250	500	1k	2k	4k
23	23	34	42	47	47

The performance shown in Table 5.1 equates to an overall sound insulation performance of R_w 36 dB.

5.3 Noise Impact Assessment – Ambient Noise Levels

We have undertaken calculations to predict the resultant indoor ambient noise levels in the proposed living rooms and bedrooms, based on the measured external noise levels (see Section 4.2) and the calculation methodology detailed in Appendix G of BS 8233: 2014. The predicted indoor ambient noise levels are presented in Table 5.2.

Table 5.2 Predicted Indoor Ambient Noise Levels

Measurement Position	Daytime L_{Aeq} (16 hour) (dB)	Night-time L_{Aeq} (8 hour) (dB)
Worst-Case Façade	37	31
Centre of Site	25	20

BS 8233: 2014 presents desirable internal ambient noise level limits for residential rooms (35 dB in living rooms during the daytime and 30 dB in bedrooms during the night). The document advises that the limits can be relaxed by up to 5 dB and reasonable internal conditions still achieved (resulting in 40 dB in living rooms during the daytime and 35 dB in bedrooms during the night).

As such, it can be seen that desirable internal ambient noise levels can be achieved in the majority of the development (new building and existing façades facing away from King's Road/High Street).

Reasonable internal conditions are predicted to be achieved in the façades facing King's Road/High Street, which could be considered acceptable given the need to preserve the heritage of this historical façade.

5.4 Noise Impact Assessment – Night-time Noise Events

Based on the proposed external glazing, our calculations indicate that on the worst-case façade (King's Road/High Street), night-time noise levels will exceed 45 dB $L_{Amax, F}$ more than 10-15 times during a night-time period (23:00 – 07:00 hours).

Based on the measurement results at the worst-case position (King's Road/High Street), the 45 dB $L_{Amax, F}$ threshold would be exceeded between 15-20 times during a night-time period, with the majority of these exceedances being before 00:00 hours and after 05:00 hours.

Since the remainder of the development will be exposed to lower external noise levels, night-time internal noise levels in these areas are predicted to be less than 45 dB $L_{Amax, F}$.

Various studies have linked the $L_{Amax, F}$ from individual noise events to behavioural awakenings, for example:

- M. Basner et al (2011) *"Single and combined effects of air, road and rail traffic noise on sleep and recuperation"*
- E.M. Emenhorst et al (2012) *"Examining nocturnal railway noise and aircraft noise in the field: sleep, psychomotor performance and annoyance"*
- C.G. Rice and P.A. Morgan (1982) *"A synthesis of studies on noise induced sleep disturbance"*

Based on these studies, it can be concluded that at night a significant effect on sleep disturbance (e.g. behavioural awakening) is likely to occur where the maximum sound level at the façade of a building with partially open windows exceeds:

- a) 85 dB $L_{Amax, F}$ where the number of events exceeding this value is less than or equal to 20
- or
- b) 80 dB $L_{Amax, F}$ where the number of events exceeding this value is greater than 20

From reviewing the 4 days of noise survey data at the worst-case measurement position (the King's Road/High Street façade), it has been found that the quantity of noise events exceeding 85 dB $L_{Amax, F}$ was between 2 and 5 during each night-time period (23:00 – 07:00 hours).

In addition, it was found that the quantity of noise events exceeding 80 dB $L_{Amax, F}$ was between 4 and 13 during each night-time period (23:00 – 07:00 hours).

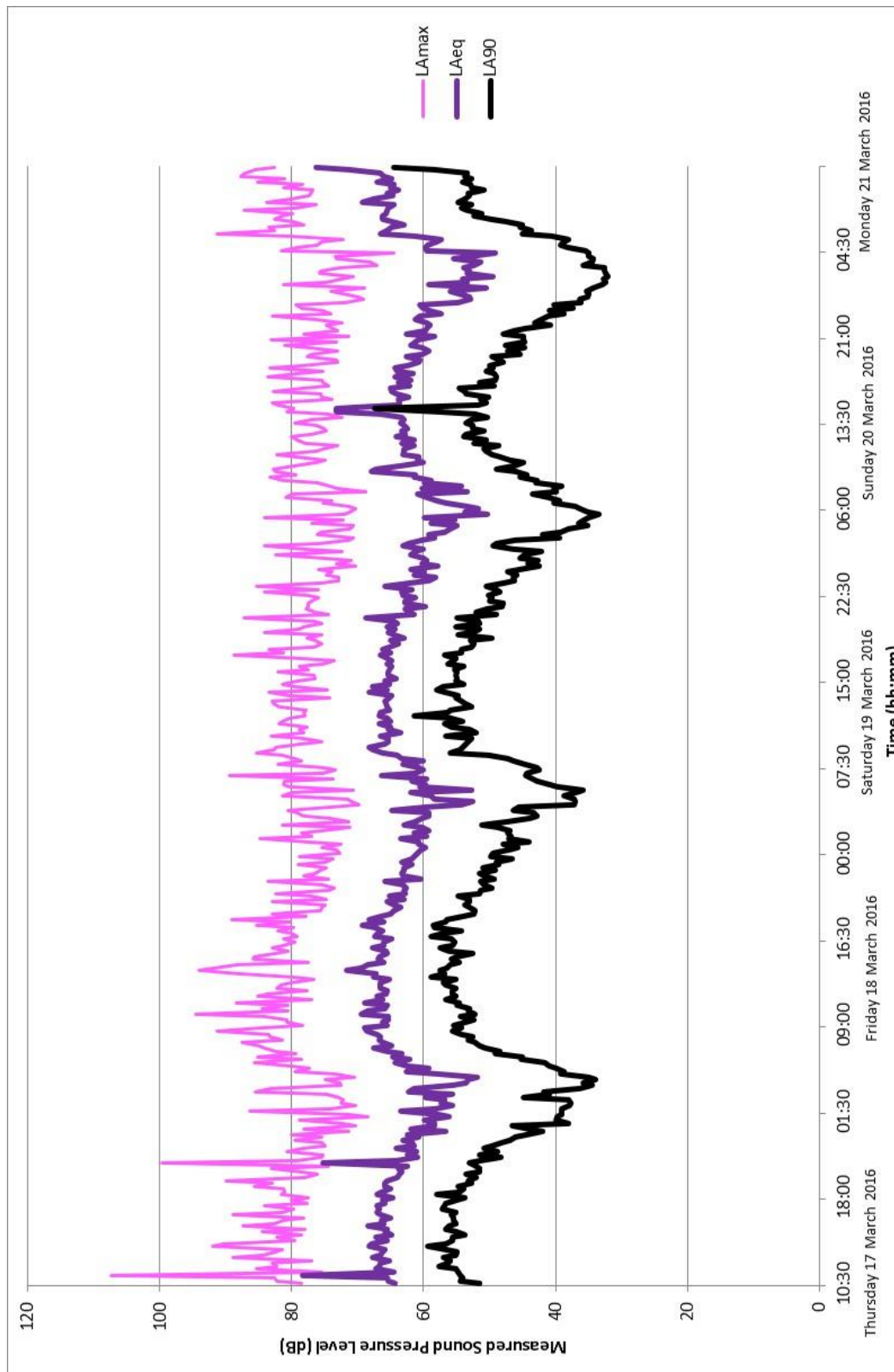
As such, it can be concluded that a significant effect on sleep disturbance is not likely to occur for bedrooms in this façade. Since the remainder of the development will be exposed to lower external noise levels, it therefore follows that this also applies to the remainder of the proposed development.

Appendix A – Acoustic Terminology

Parameter	Description
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing (20×10^{-6} Pascals).
Sound Pressure Level (L_p)	The sound pressure level is the sound pressure fluctuation caused by vibrating objects relative to the threshold of hearing.
A-weighting (L_A or dBA)	The sound level in dB with a filter applied to increase certain frequencies and decrease others to correspond with the average human response to sound.
$L_{Aeq,T}$	The A-weighted equivalent continuous noise level over the time period T (typically T= 16 hours for daytime periods, T = 8 hours for night-time periods). This is the sound level that is equivalent to the average energy of noise recorded over a given period.
L_{A90} (15 min)	The noise level exceeded for 90% of the time (also referred to as the background noise level), measured over a 15 minute period
$L_{Amax, F}$	The A-weighted maximum noise level measured during the measurement period, measured using 'fast' time weighting.
R_w	The weighted (w) sound reduction index (R), a single figure rating of the laboratory airborne sound insulation performance of a construction, usually measured across the frequency range 100-3150Hz. The higher the value, the greater the sound insulation, and the more onerous the requirement.

Appendix B – Time History Graphs

Position A



Position B

