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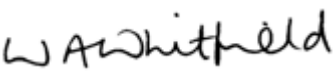
Internal Ambient Noise Survey

Prepared: 15th June 2022

Report No	21903A-1
Client	Leisure Inc (Knightsbridge) Ltd
Site	1 The Triangle Tilehurst Reading

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1. Quality Management

Report Number	21903A - 1
Issue	Issue 1
Prepared	15 th June 2022
Prepared By	 Shaun Sloan BSc, MIOA
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3. Executive Summary

- 3.1.1. An internal ambient noise survey and objective sound insulation test has been carried out for a permitted residential development at 1 The Triangle, Tilehurst, Reading ("Proposed Development").
- 3.1.2. An assessment has been carried out in line with guidance from BS8233:2014 based on the indoor ambient noise level.

3.2. Permitted Development

- 3.2.1. Permitted developments are exempt from many of the typical planning requirements of normal developments, particularly with regard to noise. However, permitted development legislation requires that noise from commercial sources should be considered as part of the planning process.¹ This guidance has been reproduced in Figure 1.

"The existing, temporary permitted development right in Class O for the change of use of office buildings to residential is made permanent, with the inclusion of a condition which will allow local the local planning authority to consider mitigation proposal in respect of noise from surrounding commercial used"

Figure 1 – Noise requirements for permitted development

3.3. Measurement, Assessment and Evaluation

- 3.3.1. The survey was carried out to BS7445-1:2003¹, BS7445-2:1991² and BS EN ISO 140-4:1998 which are covered under our UKAS Accreditation.
- 3.3.2. The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

3.4. Scope

- 3.4.1. This report covers all aspects of the noise survey, including:
- the identification of acoustic design criteria;
 - an objective sound pressure level survey and sound insulation test;
 - analysis of the data; and,
 - the design of any mitigation to meet the required internal noise criteria.

¹ BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Description of quantities and procedures"

² BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

3.5. Results Summary

Indoor Ambient Noise Level

3.5.1. The daytime and night-time internal noise measurement results are summarised in Table 1.

Room	Period	Averaging Time, T	Sound Pressure Level, $L_{Aeq,T}$	Meet Guideline Values?	
				Good	Reasonable
Kitchen/Dining/ Living Room	9 th June 2022 – 10 th June 2022	8-hour Night	28.3†	✓	✓
		16-hour Day	35.7†	X	✓

†Measurement data corrected for the absorption within a furnished room.

Table 1 - Summary of the measured internal sound pressure levels

- 3.5.2. The measurements demonstrate that the internal noise levels during the day-time did not meet the 'Good' guideline values in Table 4 of BS8233:2014 however they are within the 'Reasonable' guideline values and the $L_{Aeq,T}$ value measured during the survey was under 1dB above the 'Good' criteria.
- 3.5.3. The measurements indicate that the night-time internal ambient noise levels within the living room are within the 'Good' guideline values from BS8233:2014.
- 3.5.4. It can be expected that these results will be representative for all rooms along this façade.

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5. Background

5.1. Noise Policy Statement for England

- 5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy 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”*.
- 5.1.2. This long-term vision is supported by the following aims; 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;
 - Where possible, contribute to the improvement of health and quality of life.
- 5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

- 5.2.1. The National Planning Policy Framework (NPPF) was published on the 27th of March 2012 and was most recently updated on the 20th July 2021; it sets out the Government’s planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:
- “preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”*.
- 5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:
1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
 2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
 3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.
- 5.2.3. Existing businesses near to proposed development should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

5.3. National Planning Practice Guidance

- 5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) which was published on the 29th November 2016 and is regularly updated to reflect the changes made to the NPPF and make it more accessible.³

³ <http://planningguidance.communities.gov.uk/>

- 5.3.2. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in Table 2.

Perception	Examples of outcomes	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.	No Observed Adverse Effect (NOAEL)	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
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. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
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.	Significant Observed Adverse Effect	Avoid
Noticeable and very intrusive	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 harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 2 – Noise exposure hierarchy

- 5.3.3. There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.
- 5.3.4. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

PPG and Agent of Change

- 5.3.5. Where residential development is proposed close to existing commercial premises. Suitable mitigation measures may need to be put in place to avoid those activities having a significant adverse effect on future residents.
- 5.3.6. Where this is the case, the developer (or 'agent of change') would need to identify commercial premises that could cause a noise nuisance. This should include potential future noise sources that may not be present at the time a planning application is made. The agent of change will also need to mitigate and minimise noise to avoid potential significant adverse effects.

"Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring)."

NPPG 009 Reference ID: 30-009-20190722 - Revision date: 22nd July 2019

- 5.3.7. What constitutes noise, as opposed to sound, is subjective and there is not a simple relationship between the level of a sound and the impact on those affected but could be dependent on:
- the source and absolute level of the noise;
 - the time of day it occurs;
 - how a new noise source and/or receiver relates to the existing sound environment; and,
 - the time and frequency characteristics of the noise
- 5.3.8. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include:
- engineering the noise sources to be quiet;
 - minimising the impact of noise through layout;
 - using conditions/obligations to restrict activities; and,
 - mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

"More specific factors to consider when relevant include:"

"whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations."

Paragraph: 006 Reference ID: 30-006-20190722 Revision date: 22nd July 2019

- 5.3.9. Care should be taken when considering mitigation to ensure the envisaged measures do not make for an unsatisfactory development.
- 5.3.10. It is possible that noise effects may be counteracted by providing: quiet facades containing habitable rooms, quiet private gardens or balconies, or quiet public amenity space within 5-minute walking distance.

6. Introduction

- 6.1.1. An internal ambient noise survey has been carried out for a permitted residential development at 1 The Triangle, Tilehurst, Reading ("Proposed Development"). An image showing the proposed layout of the Proposed Development as well as the internal monitoring position is given in Figure 2.

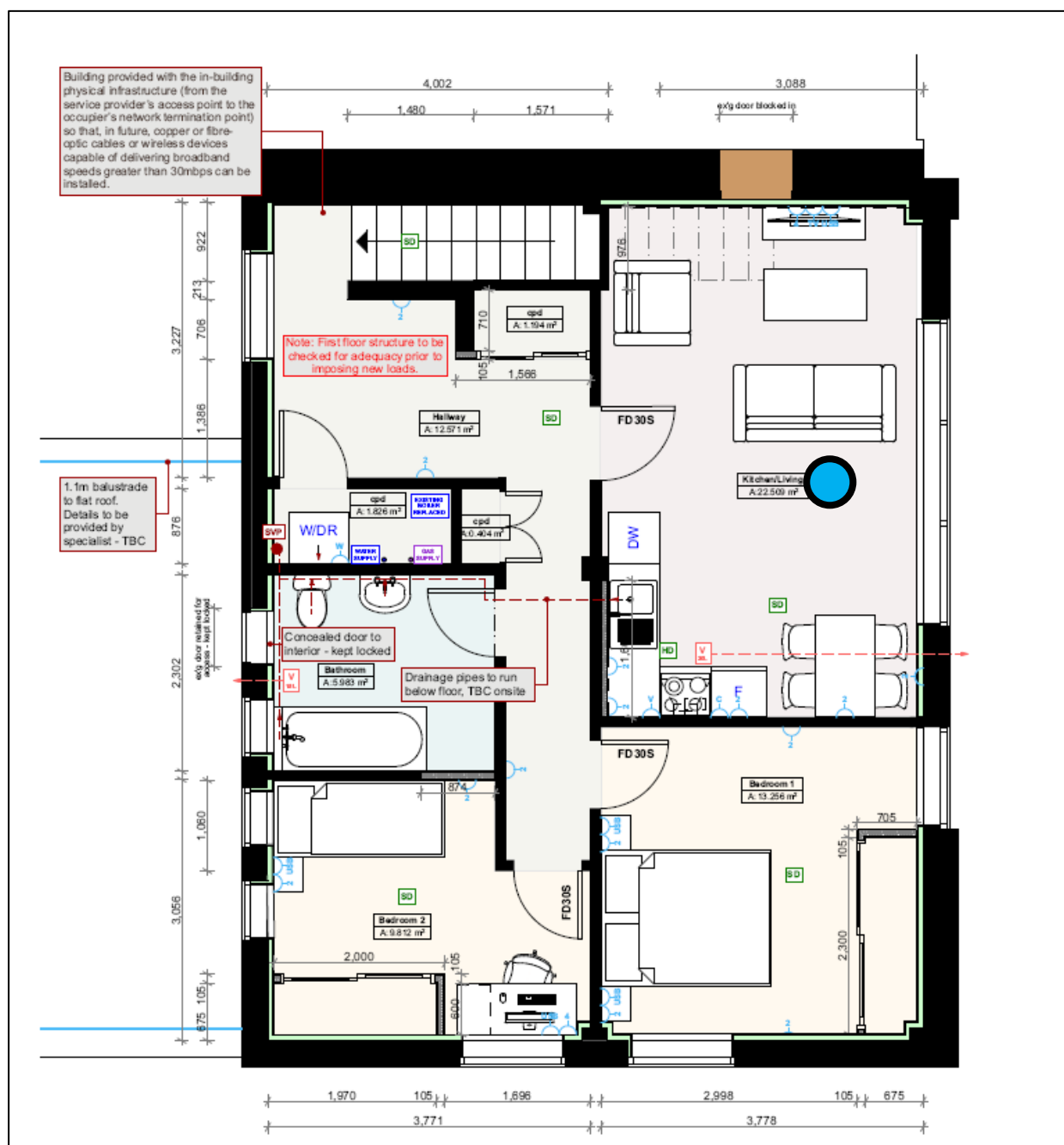


Figure 2 – Plan showing the layout of the Proposed Development

7. Assessment Criteria

7.1. Guideline Values

BS8233:2014 Internal Ambient Noise Criteria

- 7.1.1. BS8233:2014 draws on the results of research and experience to provide information on the design of buildings that have internal acoustic environments appropriate to their function. The standard provides guideline internal values for dwellings for steady external noise sources. These have been summarised in Table 3.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB LAeq,16hour	-
Dining	Dining Room	40dB LAeq,16hour	-
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hour	30dB LAeq,8hour

Table 3 – BS8233:2014 guideline values for internal ambient noise levels from steady external noise sources

- 7.1.2. The guideline values are issued by the World Health Organisation (WHO) and assume normal diurnal fluctuations in external noise. They are expected to be achieved based on normal annual data and not in all circumstances. For example, it is normal to exclude occasional events such as fireworks night or New Year's Eve.

7.2. Permitted Development

- 7.2.1. Permitted developments are exempt from many of the typical planning requirements of normal developments, particularly with regard to noise. However, permitted development legislation requires that noise from commercial sources should be considered as part of the planning process.¹ This guidance has been reproduced in Figure 1.

“The existing, temporary permitted development right in Class O for the change of use of office buildings to residential is made permanent, with the inclusion of a condition which will allow local the local planning authority to consider mitigation proposal in respect of noise from surrounding commercial used”

Figure 3 – Noise requirements for permitted development

8. Survey

8.1. Internal Measurement Location (U)

- 8.1.1. Fixed position monitoring took place in the Living room of the proposed development. The room was in a completed state with soft floor finishes in place when measurements were made; however, no furniture or curtains were present in the rooms. Acoustic wall ventilators and trickle ventilators were in the open position for the duration of the survey.
- 8.1.2. The glass thickness and air gaps were measured using a laser gauge tool. The glazing specification for the living room was measured as 4mm glass, 20mm air-gap and 4mm and was consistent throughout all rooms on the same façade.
- 8.1.3. The internal monitoring equipment was installed and removed by technicians trained to follow noise.co.uk Ltd's UKAS accredited test procedure and was located 1.5m from the floor level, approximately 1.5m from the window and at least 1m from the next nearest room boundary.

8.2. Measurement Instrumentation (U)

- 8.2.1. The measurement instrumentation used during the survey is detailed in the appendix.
- 8.2.2. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003^s before and after the surveys. The calibration details are also detailed in the appendix.

8.3. Measurement and Timescale (U)

- 8.3.1. Continuous unattended noise monitoring took place between 8th June 2022 and 9th June 2022. The following quantities were measured:

$$L_{Aeq,5min}$$

- 8.3.2. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2⁶. All sound pressure levels are in dB (re 20µPa). The measurements were subsequently averaged into daytime and night-time periods.

8.4. Correction for Room Absorption

- 8.4.1. Internal sound pressure level measurements were made inside a complete but entirely unfurnished room. After the addition of sound absorption from carpets and furnishing, the measured sound pressure level for a given source level will be lower. In order to account for this, measured sound pressure levels have been corrected for the response of the test room and the sound absorption from the example in Annex G.2 of BS8233:2014 has been used as a reference. Based on the information in the example, the reverberation time was determined based on the volume of the example room being 37.5m^3 . The resulting reverberation time, T_{60} , of a typically furnished room has been illustrated in Figure 4.

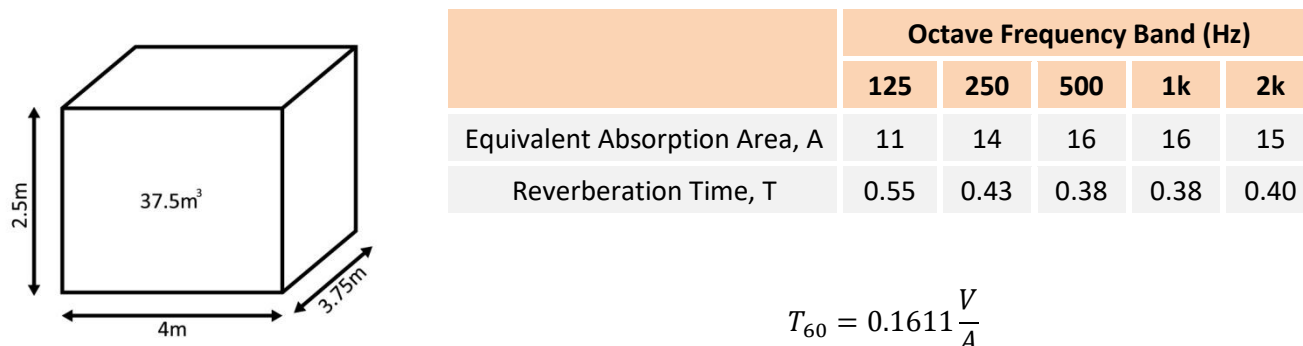


Figure 4 – Reverberation time of receive room in Annex G.2 of BS8233:2014. $T = 0.1611(V/A)$

- 8.4.2. The measured sound pressure levels have been corrected, in octave bands, using the following equation:

$$L_{p,furnished} = L_{p,unfurnished} + 10 \log_{10} \frac{T_{ref}}{T_{measured}}$$

Measurement of Reverberation Time

- 8.4.3. The reverberation time in the test room was measured according to ISO354:2003⁴. Two speaker positions were combined with three microphone positions to measure and extrapolate the room decay over 20dB, typically referred to as T_{20} . The reverberation time was measured in one-third octave bands and subsequently arithmetically averaged in octave bands.

8.5. Noise Climate (U)

- 8.5.1. At the time of the survey visits, the survey technician reported the most dominant noise was transient road traffic noise from School Road.

⁴ ISO 354: 2003 "Acoustics – Measurement of absorption in a reverberation room"

9. Results

9.1. Reverberation Time

9.1.1. The averaged reverberation time and resulting room correction have been summarised in Table 4.

	Octave Frequency Band (Hz)				
	125	250	500	1k	2k
Living Room					
Measured Reverberation Time, T_{60}	0.67	1.06	0.88	0.94	0.89
Room Correction, dB	-0.83	-3.91	-3.66	-3.95	-3.49

Table 4 – Summary of reverberation time measurement results and resulting room corrections

9.2. Measurement Results (U)

9.2.1. The daytime and night-time internal noise measurement results are summarised in Table 1.

Room	Period	Averaging Time, T	Sound Pressure Level, $L_{Aeq,T}$	Meet Guideline Values?	
				Good	Reasonable
Kitchen/Dining/ Living Room	9 th June 2022 – 10 th June 2022	8-hour Night	28.3†	✓	✓
		16-hour Day	35.7†	X	✓

†Measurement data corrected for the absorption within a furnished room.

Table 5 - Summary of the measured internal sound pressure levels

- 9.2.2. The sound pressure levels measured between the 9th – 10th June 2022 have been assessed. Although measurements have only been taken in the Kitchen/Lounge of the development, it can be assumed that these internal sound pressure levels will be representative for all rooms on the front facing façade due to the uniform glazing specifications. On this basis, it is expected that the bedroom is likely to achieve similar results. **Error! Reference source not found.** summarises the internal measurement results.
- 9.2.3. The measurements demonstrate that the internal noise levels during the day-time did not meet the ‘Good’ guideline values in Table 4 of BS8233:2014 however they are within the ‘Reasonable’ guideline values and the $L_{Aeq,T}$ value measured during the survey was under 1dB above the ‘Good’ criteria.
- 9.2.4. The measurements indicate that the night-time internal ambient noise levels within the living room are within the ‘Good’ guideline values from BS8233:2014.
- 9.2.5. It can be expected that these results will be representative for all rooms along this façade.

10. Conclusions

- 10.1.1. An internal ambient noise survey and objective sound insulation test has been carried out for a permitted residential development at 1 The Triangle, Tilehurst, Reading (“Proposed Development”) in line with guidance from BS8233:2014.
- 10.1.2. The indoor ambient noise levels measured within the living room during the night-time meet the ‘Good’ internal guideline values whereas the daytime values only meet the ‘Reasonable’ guideline values from Table 4 of BS8233:2014, although the $L_{Aeq,T}$ value measured during daytime portion of the survey was under 1dB above the ‘Good’ criteria.
- 10.1.3. As the glazing specification was measured to be uniform throughout the proposed development, it can be expected that these results will be representative for all rooms along this façade.

11. Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991 EN ISO 140-4: 1997	BS 8233:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Leisure Inc (Knightsbridge) Ltd	
D	Full site address	1 The Triangle Tilehurst Reading	
E	Date of surveys	Survey Date: 9 th June 2022 – 10 th June 2022	
F	Description & identification of Proposed Development	It is proposed to develop the site for residential use.	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

11.1.1. Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	Norsonic 140 (1405560)	Norsonic 1251 (33824)

11.1.2. The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
Norsonic 140 (1405560)	114.0 dB	114.0 dB

11.1.3. There was no adverse deviation.

APPENDIX C: Photographs



View from the living room of the proposed development

