

17 Newcastle Road Reading



Noise Impact Assessment Report
Report 27743.NIA.01 Rev A

PSD Architectural Services
189 Lynchford Road
Farnborough, Hampshire
GU14 6HD

Report 27743.NIA.01 Rev A			
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A	08/01/2024 Added Section 7.0 to include a noise impact assessment for the nearby MUGA facilities and the playground. Extended Section 8.0 to include recommendations for External Amenity Area Assessment.	D	
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C		F	
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SUMMARY

KP Acoustics Ltd has been commissioned to assess the suitability of the site at 17 Newcastle Road, Reading, for a residential development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

An environmental noise survey has been undertaken on site in order to establish the current ambient noise levels, as shown in Table 3.1.

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed elements in order to meet the requirements of BS8233:2014, taking into consideration the non-glazed external building fabric elements. The results of these calculations and the sound reduction performance requirements for the glazed elements are shown in Table 5.2.

Further advice can be provided with regards to the overheating strategy to assess the noise implications once thermal modelling calculations have been undertaken.

Noise levels within external amenity areas would be expected to meet the recommended levels provided within BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by PSD Architectural Services, 189 Lynchford Road, Farnborough, Hampshire, GU14 6HD to assess the suitability of the site at 17 Newcastle Road, Reading for a residential development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Cintra Park Playground and tennis courts to the north, residential properties and Northumberland Avenue to the west, residential properties and Newcastle Road to the south, and Newcastle Road Allotments to the east. Entrance to the site is located via Newcastle Road. At the time of the survey, the background noise climate was dominated by road traffic noise from Northumberland Avenue, Newcastle Road and activities at Cintra Park Playground and nearby tennis courts.

2.2 Environmental Noise Survey Procedure

A noise survey 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.

Continuous automated monitoring was undertaken for the duration of the survey between 14:29 on 06/12/2023 and 15:09 on 07/12/2023.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Measurement Positions

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

Icon	Descriptor	Location Description
	Noise Measurement Position 1	The microphone was installed on a tripod at the southwest of the site, near Newcastle Road, as shown in Figure 2.2. The microphone was positioned within free-field conditions at least approx. 1.5 metres from the nearest surface.

Icon	Descriptor	Location Description
2	Noise Measurement Position 2	The microphone was installed on a tripod at the northeast of the site, near Cintra Park Playground, as shown in Figure 2.2. The microphone was positioned within free-field conditions at least approx. 1.5 metres from the nearest surface.

Table 2.1 Measurement positions and descriptions



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

2.4 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 37	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21302-E0	12/09/2023	UK-23-103
	Free-field microphone NTI Acoustics MC230A	A23082		
	Preamp NTI Acoustics MA220	13798		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 38	NTI Audio XL2 Class 1 Sound Level Meter	A2A-23182-E1	12/09/2023	UK-23-104
	Free-field microphone NTI Acoustics MC230A	A25833		
	Preamp NTI Acoustics MA220	13818		
	NTI Audio External Weatherproof Shroud	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	21/03/2023	UCRT23/1363

Table 2.2 Measurement instrumentation

3.0 RESULTS

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 27743.TH1-2.

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

Time Period	Noise Measurement Position 1 (Measured Noise level – dBA)	Noise Measurement Position 2 (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	50	50
Night-time $L_{Aeq,8hour}$	43	44

Table 3.1 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Noise Policy Statement for England 2023

The National Planning Policy Framework (NPPF) has superseded and replaces Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England. Paragraph 174 of NPPF 2023 states that planning policies and decisions should aim to:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

In addition, Paragraph 185 of the NPPF states that *‘Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should’:*

- Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010 with the aim to ‘Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.’

Noise Policy Statement England (NPSE) noise policy aims are as follows:

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; and*
- *Where possible, contribute to the improvement of health and quality of life*

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- NOEL – No Observed Effect Level
 - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level
 - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level
 - This is the level above which significant adverse effects on health and quality of life occur.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

4.2 Planning Practice Guidance – Noise (PPG-N)

Planning Practice Guidance – Noise (PPG) was introduced by the Ministry of Housing, Communities & Local Government in March 2014 and revised in July 2019. It is an online digital resource that “advises on how planning can manage potential noise impacts in new development”. It gives guidance on establishing whether noise will likely cause a concern, factors of influence on noise impact and methods by which planning can address adverse effects of noise sources.

A noise exposure hierarchy table is provided within the guidance that follows the same observed effect descriptors given within the NPSE guidance, i.e. NOEL, NOAEL and LOAEL and SOAEL.

For a NOAEL descriptor: “A noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life”

4.3 ProPG: Planning and Noise

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

4.4 The London Plan: Policy D12 Agent of Change

The London Plan states the following with regards to existing noise generating sources and new residential developments:

- A. *The Agent of Change principle places the responsibility for mitigating impacts from existing noise-generating activities or uses on the proposed new noise-sensitive development.*
- B. *Boroughs should ensure that planning decisions reflect the Agent of Change principle and take account of existing noise-generating uses in a sensitive manner when new development, particularly residential, is proposed nearby.*
- C. *Development proposals should manage noise and other potential nuisances by:*
 - *Ensuring good acoustic design to mitigate and minimise existing and potential impacts of noise generated by existing uses located in the area*

- *Exploring mitigation measures early in the design stage, with necessary and appropriate provisions secured through planning obligations*
 - *Separating new noise-sensitive development where possible from existing noise-generating businesses through distance, screening, internal layout, soundproofing and insulation, and other acoustic design measures.*
- D. *Development should be designed to ensure that established noise-generating venues remain viable and can continue or grow without unreasonable restrictions being placed on them.*
- E. *New noise-generating development, such as industrial uses, music venues, pubs, rail infrastructure, schools and sporting venues proposed close to residential and other noise-sensitive development should put in place measures such as soundproofing to mitigate and manage any noise impacts for neighbouring residents and businesses.*
- F. *Boroughs should refuse development proposals that have not clearly demonstrated how noise impacts will be mitigated and managed.'*

4.5 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

It should be noted that the recommended internal noise levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally (e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods.

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

In addition to guidance on internal levels, BS8233:2014 also states the following with regards to noise within external amenity spaces:

‘For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$, which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.’

As outlined above, the resulting noise levels in external amenity areas should not be a reason for refusal, providing that the noise levels are designed to be as low as practically possible within external amenity areas.

Expected levels within the proposed external amenity areas are outlined in Section 7.0 in more detail.

4.6 WHO Guidelines for Community Noise (1999)

WHO Guidelines for Community Noise (1999) recommends that internal noise levels for individual events should not exceed 45dB L_{Amax} more than 10-15 times per night.

It should be noted that this impact is increasingly being regarded as ‘LOAEL’ for this number of exceedances, as described in Section 4.1.

The external building fabric would need to be carefully designed to ensure that the above guidance is achieved.

4.7 Approved Document O (ed. 2021)

Approved Document O (ADO) supports Part O of Schedule 1 to the Building Regulations 2010. ADO introduces requirements for residential premises in order to prevent overheating from occurring. There are two specific requirements from ADO:

Requirement O1 (1):

To limit unwanted solar gains in summer and to provide adequate means to remove heat from the indoor environment.

Requirement O1 (2):

- (a) Account must be taken of the safety of the occupant, and their reasonable enjoyment of the residence.
- (b) Mechanical cooling may only be used where sufficient heat cannot be removed from the indoor environment without it.

The statutory guidance to support Requirement O1(2)(a) contains requirements relating to noise at night.

4.7.1 Application

The guidance within ADO applies to new residential buildings only and are defined within the following table:

Title	Purpose for which the building is intended to be used.
Residential (dwellings)	Dwellings, which includes both dwellinghouses and flats.
Residential (institutions)	Home, school or other similar establishment, where people sleep on the premises. The building may be living accommodation for the care or maintenance of any of the following. A. Older and disabled people, due to illness or other physical or mental condition. B. People under the age of 5 years.
Residential (other)	Residential college, hall of residence and other student accommodation, and living accommodation for children ages 5 years or older.

Table 4.2 Residential buildings within the scope of ADO (ref. Table 0.1 of Approved Document O)

Paragraphs 3.2 and 3.3 of ADO specifically refer to noise within bedrooms at night. Whilst any habitable room could be used as a bedroom, it is proposed that the scope is confined to those rooms specifically designated as bedrooms.

4.7.2 Internal Noise Level Targets

ADO sets internal noise level targets within Paragraph 3.3 of the document:

“Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. *40dB $L_{Aeq,T}$ averaged over 8 hours (between 11pm and 7am)*
- b. *55dB L_{AFmax} more than 10 times a night (between 11pm and 7am).”*

Where an openable window for the removal of excess heat is predicted to result in the above internal noise levels to be exceeded, then the overheating mitigation strategy must adopt one of the alternative means listed within Paragraph 2.10 of ADO (presented within Section 4.7.3

of this report). This constraint applies regardless of which method is used to demonstrate compliance with Requirement O1 (1).

4.7.3 Methods to Remove Excess Heat

Paragraph 2.10 of ADO lists the means for removing excess heat from dwellings according to the following:

- Openable windows
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

5.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-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 a more robust assessment, L_{Amax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{Amax} for individual events, as recommended in WHO Guidelines.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

5.1 Non-Glazed Elements

At this project stage, the exact construction of the non-glazed external building fabric is unknown, however, it is understood that it would be based upon the construction proposed in Table 5.1 and would be expected to provide the minimum figures shown in the following table when tested in accordance with the BS EN ISO 10140 series of standards.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Brickwork Cavity Wall	41	43	48	50	55	55

Table 5.1 Assumed sound reduction performance for non-glazed elements

5.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 5.2. 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.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the L_{Amax} spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A) in bedrooms as recommended by World Health Organisation Guidelines. The combined most robust results of these calculations are shown in Table 5.2.

Elevation	Octave band centre frequency SRI, dB						$R_w(C;C_{tr})$, dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
All elevations	24	20	25	34	37	55	31 (-2;-4)

Table 5.2 Required glazing performance

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 5.2.

Example glazing types that would be expected achieve the above spectral values are shown in Table 5.3.

Elevation	Example glazing type
All elevations	4/12/4

Table 5.3 Example glazing types

All major building elements should be tested in accordance with the BS EN ISO 10140 series of standards.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an 'actual' configuration.

6.0 VENTILATION AND OVERHEATING

6.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 6.1 below in order to ensure the internal noise environment is not compromised.

Ventilation System	Whole Dwelling Ventilation	Extract Ventilation
ADF System 1	Trickle vents providing a minimum performance of 23dB $D_{n,e,w}$	Intermittent extract fans
ADF System 3	Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 23dB $D_{n,e,w}$	Continuous mechanical extract (high rate) with trickle vents providing inlet air
ADF System 4	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)

Table 6.1 Ventilation systems

Where trickle vents are proposed, a typical number has been assumed based on the room size and number of windows. As trickle vents introduce a weak point in the building façade, it should be noted that increasing the number of trickle vents will reduce the composite performance of the facade. If more trickle vents are required, the required insulation should be increased by '+10*LOG(N)' where N is the number of vents proposed. If trickle vents are proposed, the total number of trickle vents for each sensitive space should be confirmed so that calculations can be accurately revised.

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 6.2.

Room Type	L_{Aeq} , dB	NR
Bedrooms	30	25
Living Rooms	35	30
Kitchen	45-50	40-45

Table 6.2 CIBSE Guide A 2015 guidance levels for mechanical building services

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.5, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

6.2 Openable Windows

Approved Document O (ADO) only applies to Bedrooms during night. The advice within this section would therefore only apply to Bedrooms during night-time hours (23:00-07:00) to ensure that the internal noise level targets of 40dB(A) $L_{eq,T}$ and 55dB(A) L_{max} are not exceeded.

Table 6.3 presents the open area of the window as a % of the floor area which would need to be achieved to ensure that sufficient attenuation is provided from outside to inside.

Elevation	Sound Reduction Required to Achieve ADO Target Internal L_{Aeq} Noise Levels	Sound Reduction Required to Achieve ADO Target Internal L_{Amax} Noise Levels	Maximum Open Area of the Window as a Percentage of the Floor Area to Achieve ADO Target Internal Noise Levels
South elevations	3 dB	8 dB	4 %
North elevations	4 dB	6 dB	6 %

Table 6.3 Window open areas

The overheating model should inform the design team whether the % open areas above would be sufficient to remove excess heat. In the event they are insufficient, other options to limit solar gains into the building should be investigated (such as those outlined in Section 2.7 of Approved Document O), or other means of removing excess heat should be explored (as outlined in Section 2.10 of the Approved Document).

Note: Acoustic open area is the measurable, cross-sectional, geometric area of an opening. For a partially open window, this is considered to be the lesser of either the size of the hole in the window frame that is left by the opening light, or the combined cross-sectional area around the opening light through which air must pass to move from outside to inside. The area around a hinged opening light includes the triangular areas on the sides adjacent to the hinge, and the rectangular area on the side opposite the hinge. This should not be used for comparing the air-flow performance of elements because this will also be dependent on factors such as depth (length of air-path), surface roughness and tortuosity.

6.3 Overheating Control Strategies

Where the open areas specified above are not sufficient for controlling overheating, then one or more of the following strategies will need to be adhered to:

- Fixed shading devices comprising any of the following:
 - Shutters
 - External blinds
 - Overhangs
 - Awnings
- Glazing design, involving any of the following solutions
 - Size
 - Orientation

○ G-value

- Building design, e.g. the placement of balconies
- Shading provided by adjacent buildings structures or landscaping.
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

KP Acoustics would be happy to review any proposals to ensure that they adhere to the internal noise levels targeted within ADO.

7.0 MUGA AND PLAYGROUND ASSESSMENT

A further assessment has been undertaken to determine if the nearby multi use game area (MUGA) facility consisting of a tennis court and other multi use game facilities, as well as the nearby playground facilities would meet the recommended daytime noise levels internally and at the external amenities of the proposed new residential developments as per BS8233:2014.

As a worst-case scenario, the assessment has been undertaken to the north-east boundary of the site and therefore the nearest proposed residential development and assumes that all areas of the MUGA and playground are in use at the same time. The assessment assumes that the typical use of the facilities will occur during daytime only.

In order to provide representative, worst-case calculations for noise propagating from the tennis court to the nearest proposed residential property, noise emissions are based on the results of the noise survey undertaken at East Dorset Lawn Tennis & Croquet Club by Clarke Saunders Acoustics between 12:25 hours on Tuesday 19th April and 11:40 hours on Thursday 21st April 2022. As per the Noise Impact Assessment, short term measurements were made at 5m behind the baseline of a competitive doubles grass court tennis match. The measurement positions were chosen to minimise interference from extraneous noise sources, and were located to measure one of the two adjacent tennis courts, both in use by four players and, therefore at full capacity. The survey results are shown in Table 8.1 below.

Time Period	Measured Maximum Noise level – dB(A)
Tennis court 90th% L _{AMax}	70

Table 8.1 Tennis court maximum noise levels

In order to provide representative calculations of a worst-case scenario for noise propagating from the MUGA facilities to the nearest proposed residential property, noise emissions are based on 70dB $L_{A\text{Max}}$ levels as per Table 8.1 above and at 10m from the sideline halfway marking.

In order to provide representative, worst-case calculations for noise propagating from the playground to the nearest proposed residential property, noise emissions are based on attended noise monitoring undertaken at the playground of The Northwood College nursery between 12:25 hours on 22/11/2022 and 12:27 hours on 22/11/2022. The noise measurements were taken 1m from the boundary of the playground.

Time Period	Maximum Measured Noise level – dB(A)
Playground $L_{A\text{Max}}$	77

Table 8.2 Playground maximum noise levels

The Appendix B shows the calculations and the noise level at the nearest proposed residential development due to the tennis court and other MUGA facilities being in use together with the nearby playground. As demonstrated in the Appendix B, the maximum noise levels at 1m from the nearest proposed residential development due to the activities at the tennis court, MUGA facilities and the playground would be 61dB(A).

It should be noted that the distance corrections take into account the noise levels in Table 8.1 to be at 5m from the tennis court and 10m from other MUGA site boundaries, and the distance for the playground noise has been measured from the southernmost corner of the playground, nearest to the proposed residential development.

The calculations described above (shown in detail in Appendix B), compare the maximum noise level from such events as shouts, ball impacts etc against the external average noise level. Using the sound insulation provided by the proposed external building fabric (detailed in Section 5.0), the maximum internal noise level caused by activities at the MUGAs and playground has been calculated, and compared with the targets in BS8233. This represents a worst case scenario, and real world, average noise levels against which the targets in BS8233 are set would be significantly lower than those shown in these calculations. These calculations are therefore indicative.

The total maximum noise level at the residential development due to the MUGA and playground activities would not exceed the recommended internal noise levels as per BS8233:2014. Therefore, no further mitigation strategy would be required.

8.0 EXTERNAL AMENITY AREA ASSESSMENT

External amenity areas are proposed for all units. Based on the measured noise levels provided in Table 3.1, the predicted ambient noise levels at each of the external amenity areas is as follows:

- North Façade – 50 dB $L_{Aeq,T}$

This meets the BS8233:2014 target guidance for noise in external amenity areas.

The calculated worst case noise levels due to the activities at the nearby tennis court, MUGA facilities and the playground is as follows:

- North Façade – 61 dB L_{Amax}

BS8233:2014 guidelines state that for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$. Because the assumed worst-case scenario and the maximum peak levels were used to calculate the noise impact due to the tennis court, MUGA and the playground, the 61 dB level as stated above is not expected to be a regular occurrence, and it should only be used as an indicative figure to assume the worst case level at the proposed receiver, where the average daytime noise levels are expected to be considerably lower.

BS8233:2014 also states “that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted”. Therefore, it is our professional opinion that the development of external amenity spaces should not be prohibited. However, it is recommended that a 2.5m close boarded timber fence is installed on the North, East and West of the proposed site boundary, enclosing all of the proposed external amenity spaces. It should be noted that the fencing should be imperforate and should contain no gaps or openings.

9.0 CONCLUSION

An environmental noise survey has been undertaken at N17 Newcastle Road, Reading allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all residential environments of the development commensurate to the design range of BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

The maximum openable area for bedroom windows with the development has been presented based upon the requirements of Approved Document O.

An assessment of the external amenity areas with the development has been undertaken. The noise levels within the external amenity areas are in line with the guidance presented within BS8233:2014.

17 Newcastle Road, Reading - Position 1
Environmental Time History
06/12/2023 to 07/12/2023

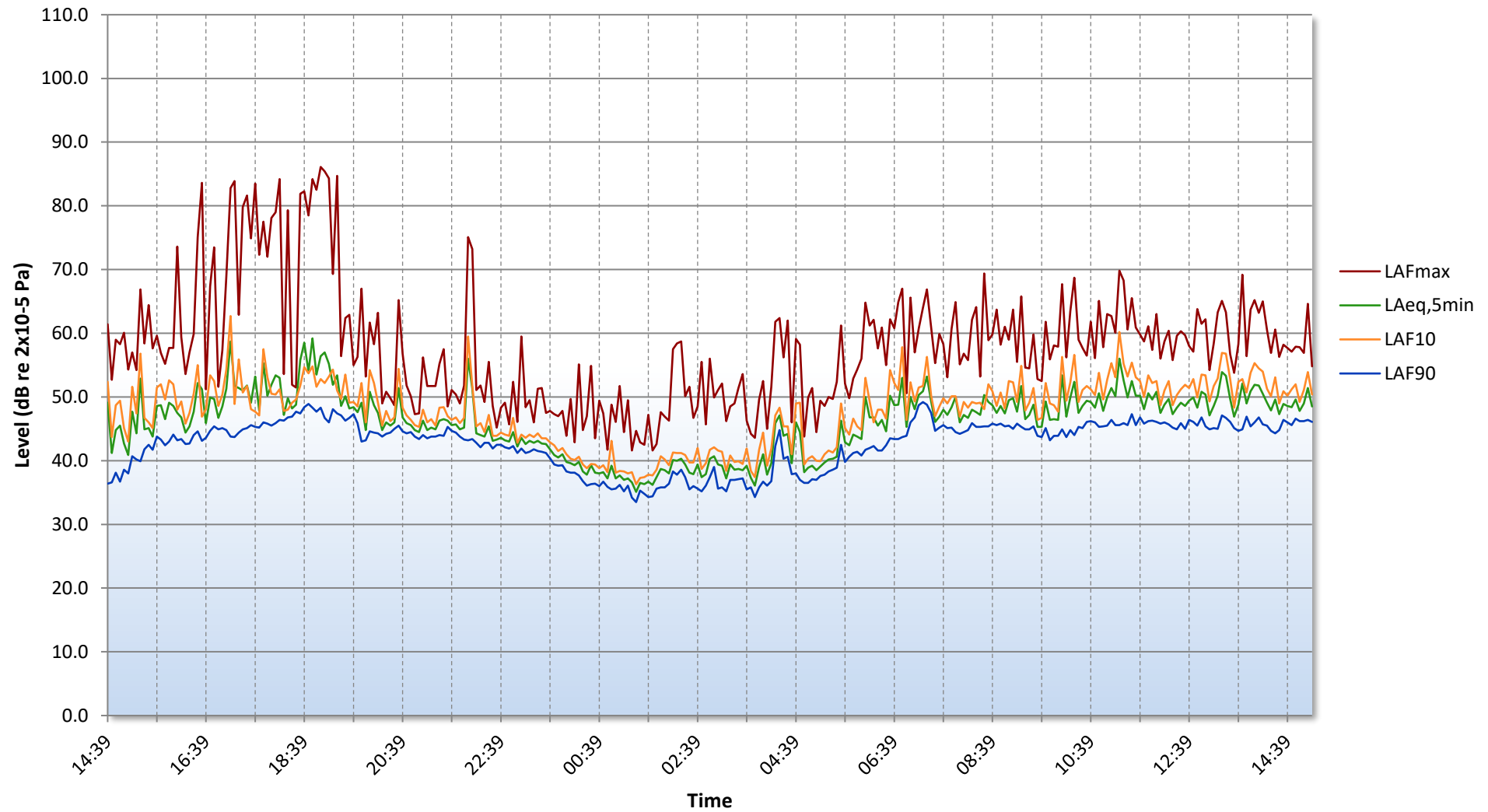


Figure 27743.TH1

17 Newcastle Road, Reading - Position 2
Environmental Time History
06/12/2023 to 07/12/2023

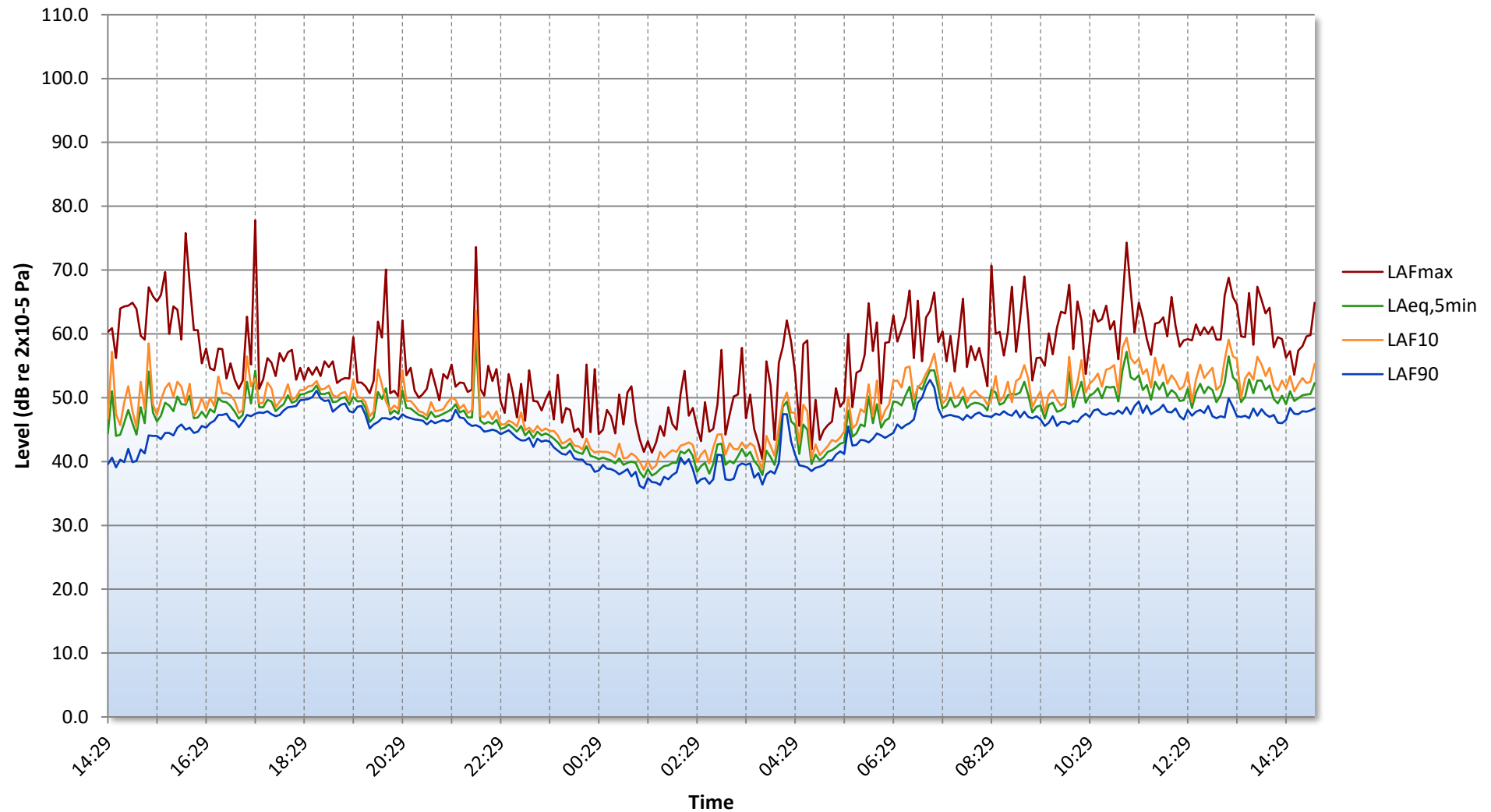


Figure 27743.TH2

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.

APPENDIX B

17 Newcastle Road, Reading

Outside activity Emissions Calculations

Source: MUGA and playground activities Receiver: Nearest proposed residential development at 17 Newcastle Road	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Tennis match (SPL @5m)	4	30	52	60	69	61	58	47	70
Minimum attenuation provided by distance (27m), dB	-15	-15	-15	-15	-15	-15	-15	-15	
SPL @1m from noise sensitive receiver due to tennis court activities	-11	15	37	45	54	46	43	32	56
MUGA 1 (SPL @10m)	4	30	52	60	69	61	58	47	70
Minimum attenuation provided by distance (48m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
SPL @1m from noise sensitive receiver due to tennis court activities	-10	16	38	46	55	47	44	33	57
MUGA 2 (SPL @10m)	4	30	52	60	69	61	58	47	70
Minimum attenuation provided by distance (66m), dB	-16	-16	-16	-16	-16	-16	-16	-16	
SPL @1m from noise sensitive receiver due to tennis court activities	-12	14	36	44	53	45	42	31	54
Playground activities (Sound Pressure Level @1m)	68	61	60	67	74	72	61	53	77
Minimum attenuation provided by distance (44m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
SPL @1m from noise sensitive receiver due to tennis court activities	36	28	27	34	42	39	28	20	44
Total Rating Noise Level of all MUGA and playground activities @1m from the noise sensitive receiver.	36	29	42	50	59	51	48	37	61