Eagle Quarter, Newbury

Cinema Noise Break-out

Report 27F7.RP.2.0 // 31 May 2023

prepared for

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Contents

1.0 Introduction

1.1 The existing Kennet Centre in Newbury is to be redeveloped. Whilst the precise extent of the redevelopment is still to be determined, it is expected to consist of mixed used residential and retail with the existing Vue cinema to be retained.

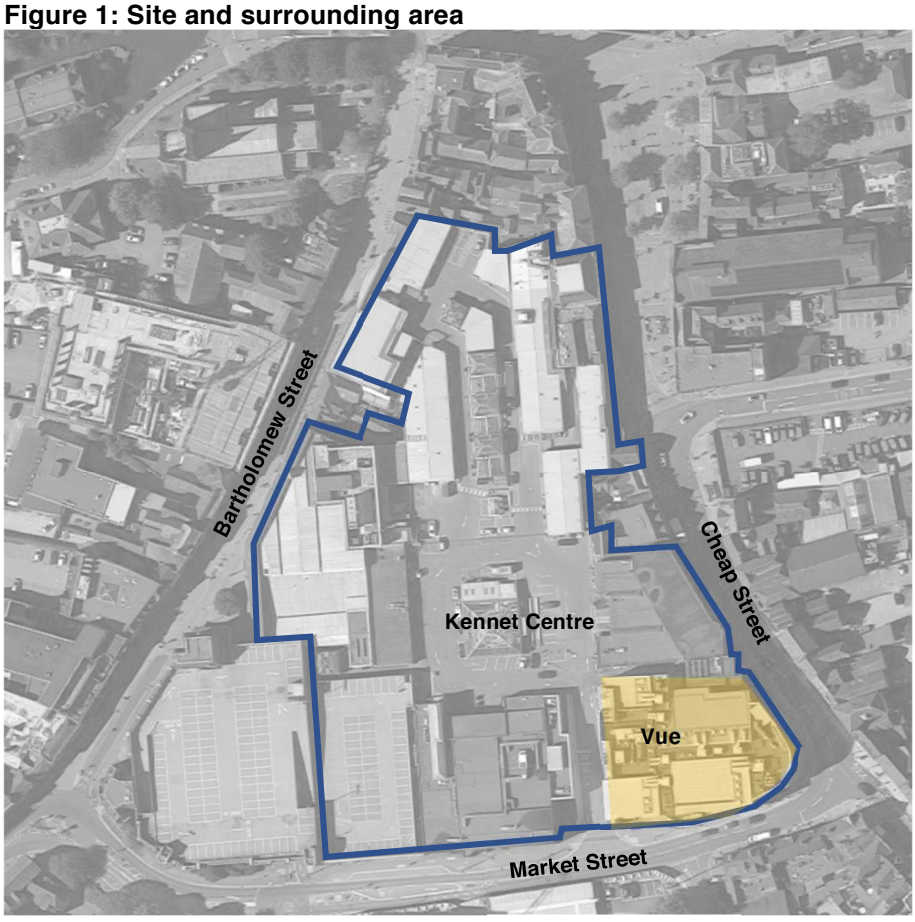
1.2 As part of the new development, it will be important to ensure any new noise sensitive properties are appropriately designed to avoid issues regarding noise break-out from the cinema auditoria.

1.3 This report details the results of the noise survey undertaken on site and the conclusions to the assessment of cinema noise break-out.

2.0 Site Locality

2.1 The Kennet Centre is located centrally within Newbury, as shown in **Figure 1** below. The site is bound by Market Stret, Bartholomew Street and Cheap Street to the south, west and east respectively.

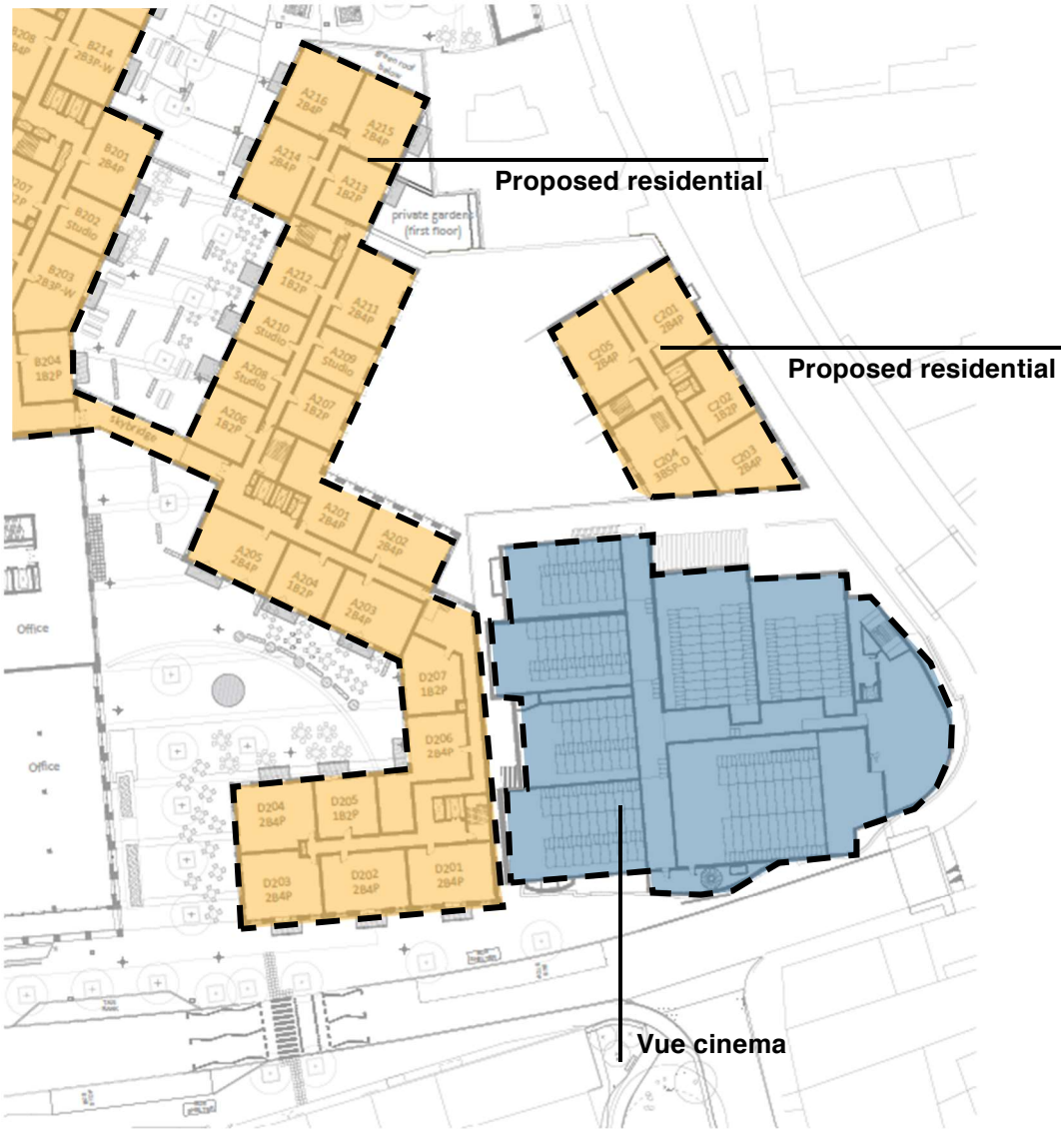
Figure 1: Site and surrounding area



2.2 The Vue cinema is located at the south-east corner of the site, which is to be retained. The remainder of the development is to be demolished with redevelopment expected to contain residential and commercial spaces.

2.3 **Figure 2** below shows the Level 02 layout issued for planning for the new development, showing the proximity of the proposed residential properties to the existing Vue cinema.

Figure 2: Proposed Level 02 development layout



3.0 Noise Criteria

3.1 Noise emissions due to elevated levels within the cinema auditoria needs to be controlled to avoid disturbance of the proposed residential properties. Whilst not reviewed by others as part of the planning application, any excessive noise experienced within the proposed residential properties may result in complaints of noise nuisance that could result in enforcement action by the Local Authority.

3.2 We have considered relevant guidance documents, as set out in the attached **Appendix A**, to develop the assessment criteria.

External Noise Levels

3.3 We have initially considered external noise levels at the nearest proposed receptors based on a Good Practice Guide on the control of noise from pubs and clubs, as issued by the Institute of Acoustics (IOA) in 2003. Whilst cinema noise is not strictly music-type noise as experienced from pubs and clubs, the type of noise can be considered similar enough for the guidance detailed to apply here.

3.4 **Table 1** below presents the provisional criteria adopted for cinema noise based on the guidance document.

Table 1 Provisional criteria for entertainment noise

Scenario	**Criteria**
A Regular events that finish by 23:00	The $L_{Aeq,\ 5minute}$ cinema noise level should not exceed the background noise level $L_{A90,5minute}$ by more than 5 dB(A), and the L_{max} cinema noise should not exceed the $L_{90,\ 5minute}$ background noise level by more than 5 dB(A) in each octave band between 63 Hz and 250 Hz.
B Regular events that continue after 23:00	The $L_{Aeq,\ 5minute}$ cinema noise level should not exceed the background noise level $L_{A90,5minute}$, and the L_{max} cinema noise should not exceed the $L_{90,\ 5minute}$ background noise level in each octave band between 63 Hz and 250 Hz.

3.5 Some screenings will continue up to 02:00 and so noise within bedroom spaces will be assessed for Scenario B. All other habitable spaces, which are typically used within daytime hours only (i.e. up to 23:00) will be assessed in accordance with Scenario A.

3.6 Details of the noise survey undertaken on site are presented in **Appendix B**. Application of the above criteria and the results of the noise survey derive the noise limits presented in **Table 2**.

Table 2 External noise limits for entertainment noise

Room	**$L_{max,f}$ Noise Limit, dB, at Octave Band Centre Frequency, Hz**			**$L_{Aeq,5min}$ Noise Limit, dB**
	63	**125**	**250**	
Bedrooms (23:00 – 02:00)	42	42	39	38
All other habitable spaces (09:00 – 23:00)	53	49	49	46

Internal Noise Levels

3.7 Where the external noise limits are exceeded, it can then be appropriate to review the internal noise levels. We would recommend that the following internal noise levels are not exceeded within habitable spaces due to cinema noise.

Table 3 Internal noise limits within proposed residential for entertainment noise

Room	Criteria
Bedrooms (23:00 – 07:00)	NR25 $L_{max,f}$
All other habitable spaces (07:00 – 23:00)	NR30 $L_{max,f}$

3.8 The criteria detailed will be used to assist with deriving an appropriate façade and ventilation design to spaces where the external noise limits are exceeded.

4.0 Cinema Noise Break-out

4.1 Cinema Noise Levels

4.1.1 Typical noise levels within cinema auditoria are expected to not exceed the following:

Table 4 Internal noise levels within cinema auditoria

Index	Internal Noise Levels within Auditoria (dB) at Octave Band Frequency (Hz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB(A)**
L_{max}	108	105	100	98	96	96	91	86	102
$L_{eq,5min}$	98	95	90	88	86	86	81	76	92

4.1.2 Levels of noise break-out from the auditoria have been assessed based on the above figures, which is expected to replicate a worst-case assessment.

4.2 Cinema Sound Insulation

4.2.1 Measurements were undertaken across a sample of auditoria to determine the fire escape doorset performances (when not lobbied), by measuring noise within the auditoria and 1m from the door externally with loud action movie trailers (specifically *Ant-Man and the Wasp: Quantumania*, *Fast X*, *Creed III* and *Guardians of the Galaxy Vol. 3*).

4.2.2 The measured noise levels have been used to determine the apparent sound reduction index of the existing doorsets, as presented in the following table. Additionally, the predicted performance of the existing façade construction (based on manufacturer's performance data) is presented in the table, with the descriptors for the construction detailed also.

Table 5 Sound insulation of external elements

Separation	Performance	Construction
On-site doorsets	R'_w 32 dB	Previously specified to be acoustic rated metal core doorsets
Façade	R'_w 65 dB	External cladding / rain screen Cavity with insulation Pyroc board Cavity with insulation 2 x 15 mm plasterboard Cavity with 100 mm glass fibre quilt Independent lining of 2 x 15 mm GTEC Sound Board

4.2.3 Auditoria which currently have fire escapes which are non-lobbied are 5, 6 and 7 and will therefore incur the highest level of noise break-out.

4.3 External Noise Levels

4.3.1 Noise levels have been assessed externally to each of the proposed residential apartments. Based on the worst-case noise levels within auditoria, external levels at the following apartment façades have been calculated to exceed the noise limits presented in **Table 2**.

Figure 3: Apartments facades where external noise limits are exceeded (in red)

4.3.2 The non-lobbied doorsets for Auditorium 5-7 are shown on the figure in blue for context (not to scale).

4.3.3 Where the limits have been exceeded, it is then necessary to mitigate noise levels to the receptors. As we are considering a new development, this mitigation can be provided with regards to the internal noise climate within the respective apartments. Additionally, no balconies should be located to façades which overlook the cinema, as currently proposed.

4.4 Internal Noise Levels

4.4.1 The following strategy is presented with controlling internal noise levels within the residential apartments due to noise break-out from the cinema auditoria. The below does not cover noise control from other sources, which has been covered by others as part of the planning application.

Ventilation Strategy

4.4.2 To reduce the amount of time that residents may open windows for and to remove the need to rely upon trickle ventilators, it is recommended that a mechanical ventilation system is implemented to apartments where the external noise limits are exceeded, to provide background ventilation.

4.4.3 The system supplied should utilise continuously operating fans with a user operated setting to allow an increased ventilation rate when desired.

4.4.4 We would recommend that the room side connections of any mechanical ventilation system should be specified to achieve the following noise levels:

- Bedrooms NR25
- Living rooms NR30
- Bathrooms NR30-35
- Corridors NR30-35

4.4.5 The above levels can be relaxed by 5 dB at any temporary boost increased ventilation rate under the occupiers' control.

4.4.6 Atmospheric air intake and outlet ductwork terminations must not cause the internal noise criteria to be exceeded due to external noise intrusion. Concealing ductwork above an imperforate plasterboard ceiling and/or potential inclusion of in-duct attenuators is expected to be sufficient. This can be reviewed fully once selections have been made.

Glazing

4.4.7 **Figure 4** overleaf presents the location of two glazing systems to control noise break-in to the affected apartments from auditoria noise. **Table 6** sets out the sound reduction performance requirements for the two glazing systems.

Table 6 Glazing sound reduction performance requirements

Glazing Type	**Sound Reduction Index (dB) at Octave Band Frequency (Hz)**						
	125	**250**	**500**	**1k**	**2k**	**4k**	R_w
G1 (orange)	22	22	28	39	39	42	33
G2 (green)	20	18	26	33	33	37	30

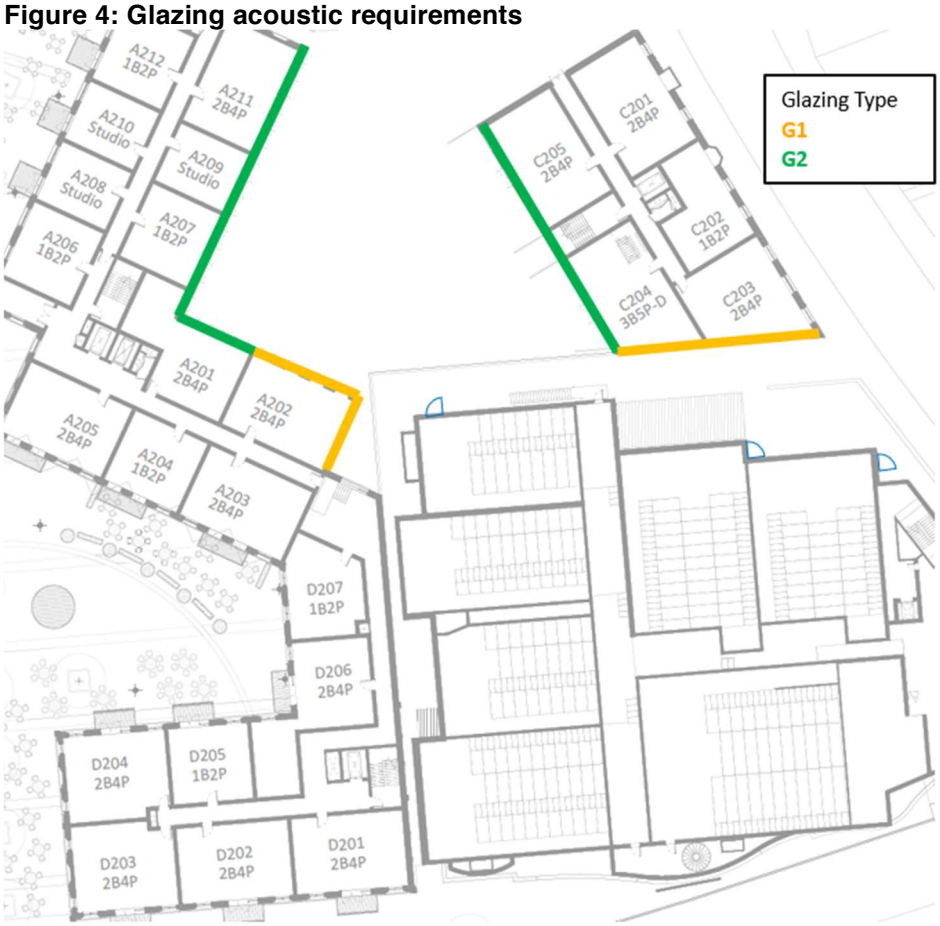
4.4.8 It is anticipated that the glazing standards can be met with the following configurations:

- G1: 6 mm glass / air gap of 12 mm / 4 mm glass
- G2: Standard thermal double glazing

4.4.9 Typical glazing configurations are quoted for guidance only and alternatives may be utilised, in any case acoustic performance of the system proposed must be demonstrated to the satisfaction of Suono. The sound reduction performances quoted above must be achieved by the glazing systems taken as a whole, in their installed condition.

4.4.10 The performance specifications therefore apply to the glazing, frames and all seals on any openable parts of the systems and any required ventilation or condensation control mechanisms. This list is not exhaustive: no part of the glazing system shall cause the above figures not to be achieved. The glazing supplier should be expected to prove that the above sound reduction figures can be achieved by the system being proposed.

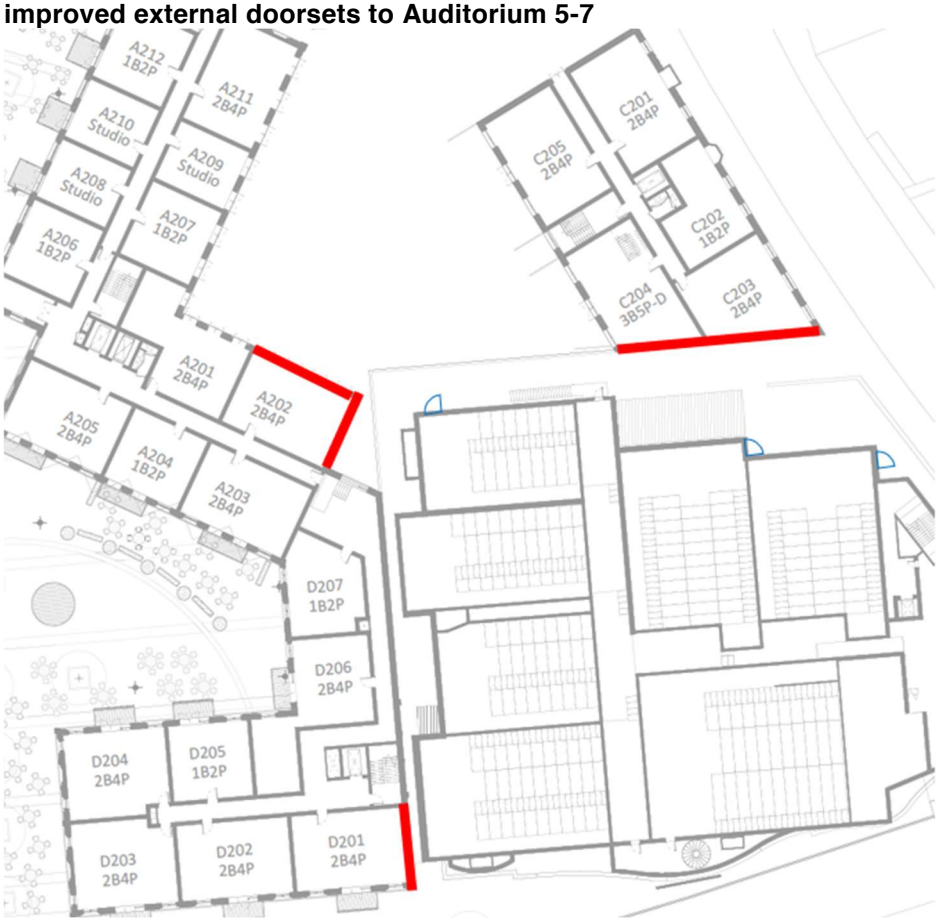
Figure 4: Glazing acoustic requirements



4.5 Cinema External Doorsets

4.5.1 It may be possible to reduce the number of façades which exceed the external limits with the introduction of upgraded doorsets to Auditorium 5-7. Noise levels have been assessed based on improved doorsets achieving a performance of R'_w 45 dB, based upon acoustic rated metal core doorsets with seals on all sites (e.g. with IAC's Noise-Lock steel acoustic door). The figure below shows apartment façades which have now been calculated to exceed the noise limits presented in **Table 2**.

Figure 5: Apartments facades where external noise limits are exceeded (in red) with improved external doorsets to Auditorium 5-7



4.5.2 The introduction of the improved auditoria doorsets reduces the number of affected apartments to four.

4.5.3 Controlling noise levels internally would then be manageable with mechanical ventilation and standard thermal double glazing (type G2) to meet the criteria.

Appendix A: Design Criteria

Summary of Noise Assessment Guidance

Institute of Acoustics

"Pubs and Clubs Draft Annex"

A Good Practice Guide on the control of noise from pubs and clubs was issued by the Institute of Acoustics (IOA) in 2003. This document is not a code of practice approved by the Secretary of State, conferred by sections 71 and 104(1) of the Control of Pollution Act 1974, and has also not been submitted for consideration as such. The guide is absent of any specific assessment criterion.

Table 7 Music noise level limits for outdoor events

Events per year and time limits	**Guideline**
Less than 30 per year, no more than once per week Ends by 2300	The $L_{Aeq,15min}$ MNL should not exceed the L_{A90} background noise level by more than 5 dB over a 15-minute period
More than 30 per year, no more than once per week Ends by 2300	The L_{Aeq} MNL should not exceed the background noise level L_{A90} by more than 5 dB(A), and the L_{10} MNL should not exceed the L_{90} background noise level by more than 5 dB(A) in each third octave band between 40 Hz and 160 Hz
More than once per week, but finishing before 2300	*This scenario is not considered in the Pubs and Clubs Annex. However, by inference it is clear noise limits need not be as onerous as for those events which finish after 2300 hours.*
More than once per week and continues beyond 2300	The L_{Aeq} MNL should not exceed the background noise level L_{A90}, and the L_{10} MNL should not exceed the L_{90} background noise level in each third octave band between 40 Hz and 160 Hz

In order to promote further discussion, however, a working draft annex to the good practice guide was published in the Nov/Dec 2003 issue of the IoA Acoustics Bulletin. As for the Noise Council code of practice, the draft annex has become authoritative following its application in the assessment of numerous such events since its publication.

The draft annex sets the limits presented in the above table for entertainment noise (the 'music noise level' or MNL) depending upon the occurrence of the events, in similar fashion to the Noise Council code of practice.

The final scenario in the above table is a quantitative form of music being practically inaudible, even though inaudibility is subjective and as described above not necessary for music noise to be acceptable. By implication, however, the above criteria might be taken as the LOAEL for varying occurrences of an event.

The third-octave values described in the above table are difficult to assess by calculation; they are intended to quantitatively conclude if an in-progress event is a disturbance. For design and pre-event assessment purposes, we would therefore advocate the following to be taken to apply to those events occurring more than once per week but finishing by 2300 hours:

> *The $L_{Aeq,\ 5minute}$ music noise level should not exceed the background noise level $L_{A90,5minute}$ by more than 5 dB(A), and the L_{max} music should not exceed the $L_{90,\ 5minute}$ background noise level by more than 5 dB(A) in each octave band between 63 Hz and 250Hz.*

Similarly, for regular events that continue after 2300 hours, we would advocate the following:

> *The $L_{Aeq,\ 5minute}$ music noise level should not exceed the background noise level $L_{A90,5minute}$, and the L_{max} music should not exceed the $L_{90,\ 5minute}$ background noise level in each octave band between 63Hz and 250Hz.*

Department for Environment, Food and Rural Affairs

NANR163 Phase II, Noise from Pubs and Clubs

Defra completed a review of The Noise Act 1996 in 2000, following a study by the University of Birmingham. The results were reported in 2001.

Defra then commissioned a review called Noise from Pubs and Clubs, Phase I, which was published in October 2005. This research clearly sets out the current state of knowledge, and concludes that *"There is a clear need for the UK to adopt a single rigorous method for assessing noise from pubs and clubs".* This Defra research also supports the use of Noise Rating (NR) Curves as an absolute criterion.

Defra commissioned further research. The report was based on actual measured data and was published as a Final Report called Noise from Pubs and Clubs, Phase II in May 2006.

The purpose of this research was to explore a likely objective criterion to use as an action threshold for the Noise Act 1996, and therefore is intended to be for one off music sources. However, it is the most relevant information available on human response to amplified music noise intruding into their homes and could constitute a reasonable basis for guiding the protection of residential amenity.

The report specifically reaches two important conclusions based on the results of that work. The purpose is to help clarify the direction that a planning condition should take if its intention is to adequately control noise from a licensed music venue within a person's home to within levels judged by them to be "acceptable".

Firstly, it concludes on "inaudibility" in paragraph 5.59 that:

> *"it is clear in many cases that subjects who were able to hear the entertainment noise nonetheless considered it to be acceptable".*

Therefore "inaudibility" is clearly not "necessary" or "reasonable" as a criterion and as a result does not satisfy paragraph 56 of the NPPF.

Secondly, the "Absolute L_{Aeq}" method was found to consistently provide the highest correlation with people's level of acceptability, and table 4 of the NANR report sets out subjective scale to varying levels of entertainment noise, as repeated here in **Table 8**.

As this table shows, it would be possible to determine a level below the "just unacceptable" threshold where music was both audible and "just acceptable" to provide a more useful criterion to protect amenity.

However, we note a number of other metrics were found to correlate to a similarly good degree. We also note that the report says nothing regarding socio-economic or demographic factors, nor does it fully consider the acceptability of noisier events that occur less frequently.

Table 8 NANR163 Table 4 “Semantic descriptor and associated value of acceptability” for noise inside dwellings

Semantic Descriptor	**Score**	**Absolute $L_{Aeq,5min}$**
Clearly acceptable	1	17.0
	2	20.4
	3	23.8
	4	27.2
Just acceptable	5	30.6
Just unacceptable	6	34.0
	7	37.4
	8	40.8
	9	44.2
Clearly unacceptable	10	47.5

Nevertheless, the data reveals that it would be possible to determine a level where music was both audible and below the threshold for “just acceptable” to provide a more useful criterion to protect amenity. In this case the level would be approximately $L_{Aeq,5minutes}$ 27 dB.

Obviously, noise and noise induced annoyance is very subjective, and it is reasonable to expect a bell-curve of response; as such values closer to the “just unacceptable” level can be expected to have increasing risks of complaints, albeit below 31 dB(A) the risk might be small.

We note that 27 dB(A) might be equivalent to approximately $L_{eq,5minutes}$ NR20, inside dwellings. It is noted that this criterion is derived on the basis of regular events which continue beyond 2300 hours.

Appendix B: Noise Survey

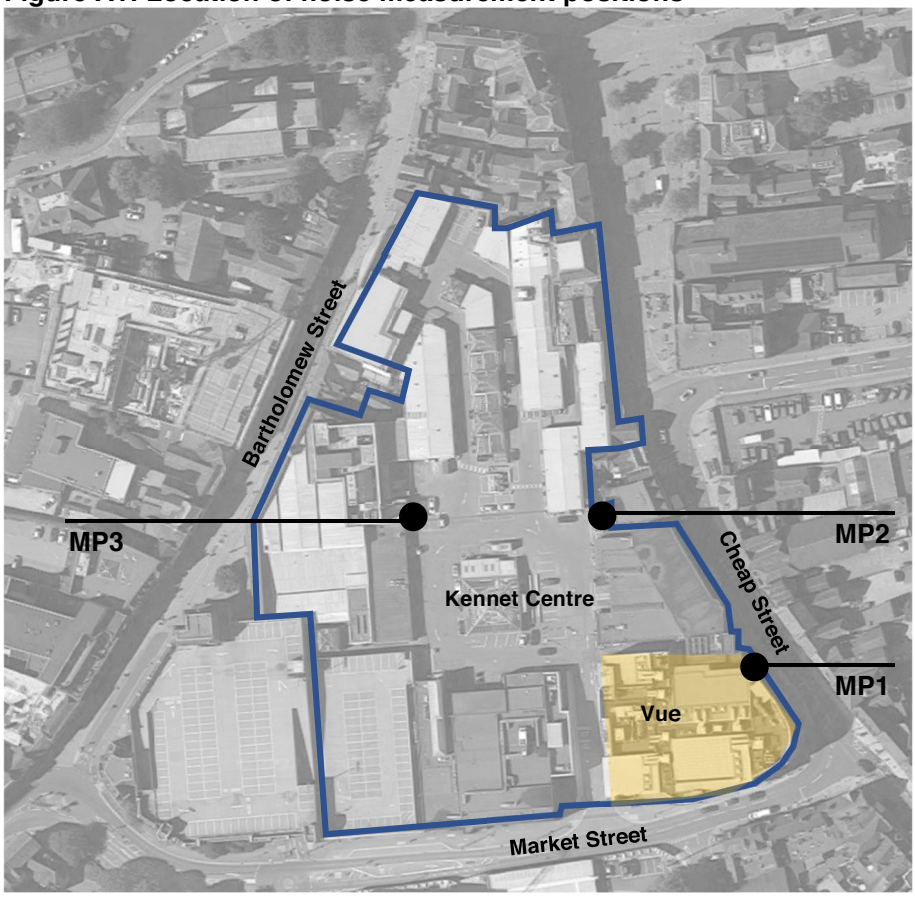
Noise Measurements Around Eagle Quarter

Methodology

An unattended noise survey was conducted on site to quantify the existing noise climate around the site.

Noise measurements were taken at three positions commencing at 10:00 on Wednesday 5th April and concluding at 12:00 on Thursday 6th April 2023. The monitoring positions are indicated on **Figure A1** below and described subsequently.

Figure A1: Location of noise measurement positions



- MP1 – microphone at approximately 1.5 m above local ground level, 1 m from the fire escape door to Auditorium 7
- MP2 – microphone at approximately 1.5 m above local ground level along the eastern side of the Kennet Centre roof top car park
- MP3 – microphone at approximately 1.5 m above local ground level along the western side of the Kennet Centre roof top car park

Noise measurements were made using the equipment set out within the following table. The unattended sound level meters were fitted within weatherproof enclosures, and all meters were calibrated before and after the survey to confirm an acceptable level of accuracy.

Table 9 Measurement equipment

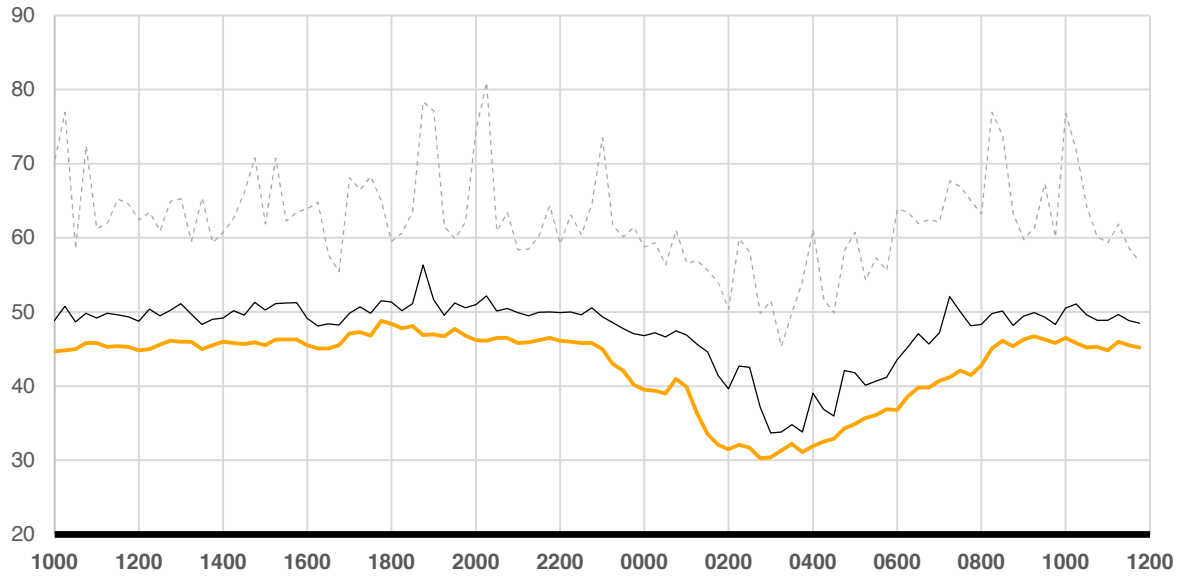
Measurement Position	Equipment Used
MP1	Svantek 971A
MP2	Norsonic 140
MP3	Svantek 971A

Measurements of the L_{Aeq}, L_{Amax} and L_{A90} indices were recorded over consecutive 5-minute periods for the duration of the survey. One minute noise profile information was also recorded.

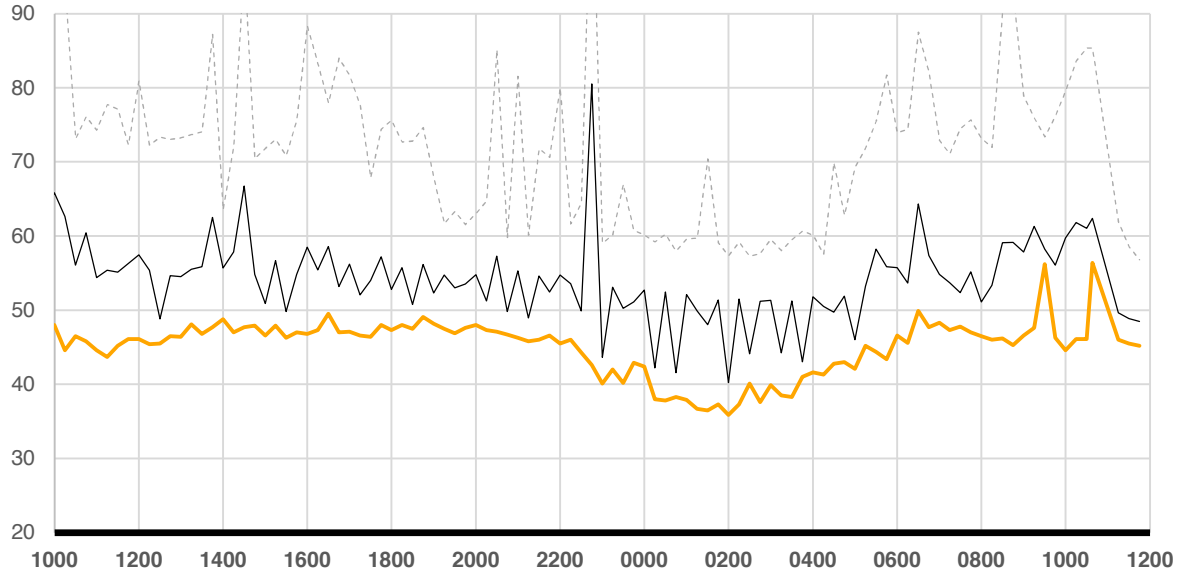
Results

Results of the measurements at all three positions are shown in the time history plots below.

Noise Measurement Results at Location MP1



Noise Measurement Results at Location MP2



Noise Measurement Results at Location MP3