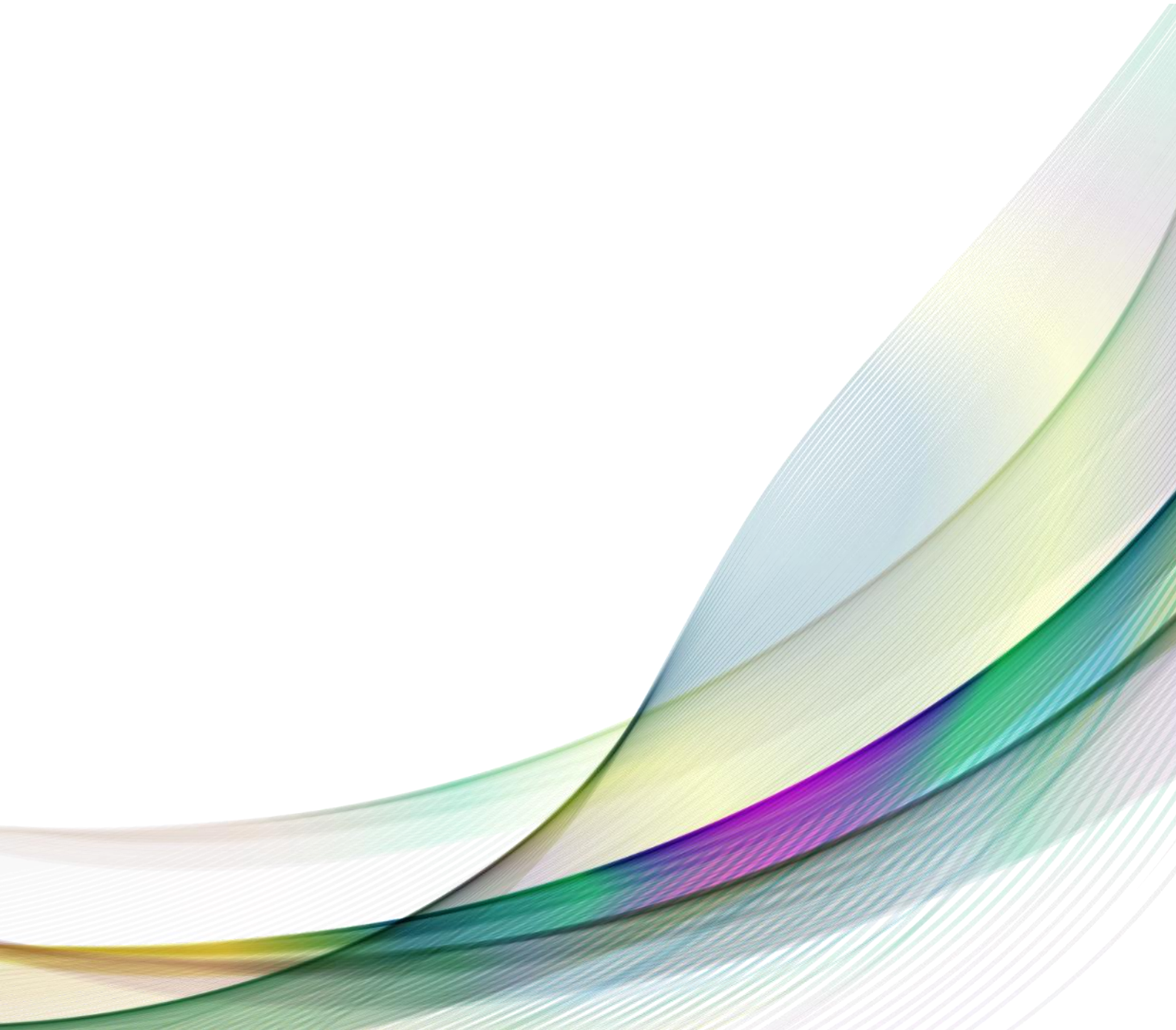
MACH GROUP

THINKING **DIFFERENTLY**

PENISTONE TOWN HALL

Noise Break Out Assessment

T.A.D. Architects



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1.0 INTRODUCTION

This report summarises the results of a break-out assessment of operational noise from newly proposed cinema screen, bar and café room as part of refurbishment works at the existing Penistone Town Hall.

2.0 SITE LOCATION & NEAREST NOISE SENSITIVE RECEIVER LOCATIONS

The site location as illustrated below. The nearby noise sensitive receiver (NSR) has been identified as being worst affected and has also been highlighted below.

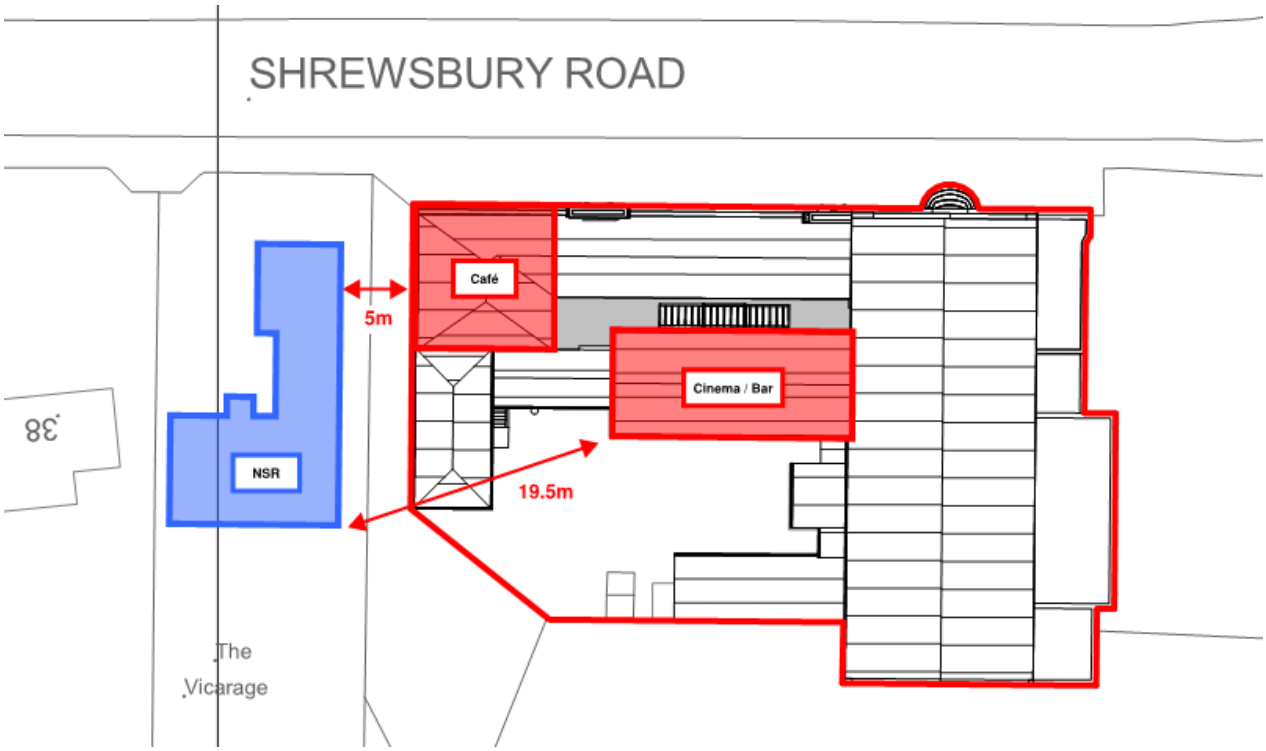


Figure 2.1: Site Location Nearest Noise Sensitive Receivers (highlighted blue)

Location	Type	Minimum Distance from Noise Source (m)	
The Vicarage - Shrewsbury Road	Residential	Cinema / Bar	19.5
		Café	5

Table 2.1: Worst-affected noise sensitive receivers

For any distance corrections made to the data in subsequent sections, the following equation has been used:

$$Distance\ Correction = 20 \times \log_{10}\left(\frac{d1}{d2}\right)$$

Where:

d1 = distance the original measurement was conducted at

d2 = distance the measurement is being corrected to.

3.0 DESIGN CRITERIA

At this stage, MACH is not aware of any existing conditions imposed on the development other than concern has been raised regarding the potential risk of noise break out from the development impacting nearby noise sensitive receivers. Therefore, MACH has determined a performance specification to provide a robust assessment of the operational noise breakout from both the cinema / bar space, and the café.

3.1 Design Guidance – BS 8233:2014

The most onerous target for operational noise for this development is determined from noise incident on the nearest residential façade (The Vicarage - Shrewsbury Road, see Figure 2.1), in order to ensure no adverse impact on the residents.

BS 8233:2014 – "Guidance on sound insulation and noise reduction for buildings" provides internal noise limits for residential dwellings, these are provided in Figure 3.1 below.

Table 4 **Indoor ambient noise levels for dwellings**

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Figure 3.1: Indoor Ambient Noise Level for Dwellings – BS8233 Extract

The most onerous design target provided by BS8233 is 30 dB $L_{Aeq,8hour}$ for a bedroom at night, this target is taken forward as operational hours of the cinema are unknown, and it is also seen to provide the most onerous assessment.

3.2 Noise Limits at Residential Façade

The noise limits at the residential façade are calculated such that subsequent internal noise level does not exceed the 30 dB $L_{Aeq,8hour}$ target (see Section 3.1 above), where a worst-case would be noise break-in through an open window.

An open window typically provides between 10 to 15 dBA of sound attenuation as referenced within multiple documents. MACH Acoustics typically take 13 dBA as the sound attenuation provided by an open window ventilation strategy.

The façade limit is calculated to be 5 dB below the theoretical maximum level assuming an openable window, such that combined contributions from other elements of the environmental noise climate does not result in façade levels exceeding the internal noise limits.

The above factors are summarised in Table 3.1 below.

	$L_{Aeq,T}$ (dB)
Design Target	≤ 30
Open window attenuation	+13
Safety Adjustment	-5
Proposed Noise Limit at the NSR Façade	38

Table 3.1: Proposed Noise Limit at the NSR Façade

As shown in Table 3.1 above, the following assessment will be based on a limit at the nearest residential façade of 38 dB $L_{Aeq,T}$.

4.0 OPERATIONAL NOISE BREAK OUT ASSESSMENT

4.1 Assessment Noise Levels

The section below presents the noise levels assumed to be generated within the spaces in question.

4.1.1 Cinema and Bar

For the purposes of this assessment, noise levels in the cinema and adjacent bar are assumed to be the same. The assessment will therefore be robust for the case where the separating door is open and noise levels in the bar raise to be comparable with the cinema. The cinema levels used in this assessment are taken from a Vue cinema specification, as shown in Table 4.1 below.

Screen Type	Sound Measurement Index	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Normal	$L_{max,s}$ (98 dBA)	105	105	95	90	93	93	87	82
	$L_{eq,5min}$ (93 dBA)	95	95	90	85	88	88	82	72
Extreme	$L_{max,s}$ (108 dBA)	110	110	100	95	98	98	92	82
	$L_{eq,5min}$ (93 dBA)	100	100	90	85	88	88	82	72

Table 4.1: Typical Program Sound Levels in Vue Auditorium - Noise Spectrum Used in Noise Break-Out Calculations

As the proposed cinema room capacity is seen to be less than that of a Vue standard cinema, MACH have taken the 'normal' screen $L_{Aeq,5min}$ measurements for the assessment. This specification, although the Vue 'minimum', is seen to feature higher levels than those predicted to feature in the proposed screen, therefore providing a robust assessment.

4.1.2 Café

The assessment of the café uses measurements MACH have taken inside a busy café. These noise levels are seen to represent an onerous use case for the proposed café. The noise levels are shown in Table 4.2 below.

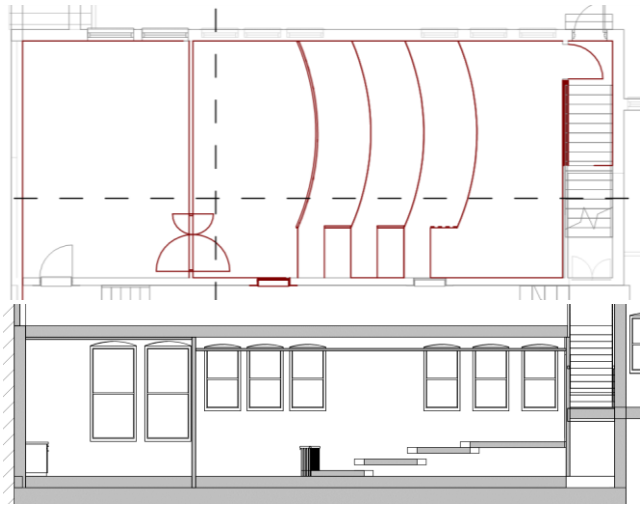
Noise Source	Sound Power Level (dB)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	dB(A)
Café	66	66	64	66	64	61	58	69

Table 4.2: Café Noise Spectrum Used in Noise Break-Out Calculations

4.2 Spaces Considered

The cinema/bar and café are understood to have the following building envelope elements.

4.2.1 Cinema and Bar



Façade Parameters – Cinema and Bar:

Windows = 15.9m^2
Solid Façade = 36.5m^2

Figure 4.1: Plan (Top) and Section (Bottom) of Proposed Cinema Room

4.2.2 Café

Façade Parameters – Café:

Windows = 30m^2
Solid Façade = 18.8m^2
Roof = 55.7m^2

Figure 4.2: Plan of Proposed Café Room

Please note: Sections have not been provided for the proposed café therefore, parameters have been estimated to represent the worst-case areas of lower performing elements (windows).

4.3 Ventilation Strategy

It is understood that the space will be mechanically ventilated and that there is no dependence on openable windows as part of the ventilation strategy. Therefore, the assessment has been based on windows being closed.

4.4 Façade Constructions

The following constructions and assumed sound reduction indices have been used in the assessment. The sound reduction indices stated in Table 4.3 and Table 4.4 are indicative of the build ups listed and are considered the minimum sound Insulation Performance achievable by the proposed build-up.

4.4.1 Cinema and Bar

Element	Build Up (From Outside to Inside)	Assumed Sound Reduction Indices (dB)						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Façade	Solid Masonry – Approx. 300mm	37	41	43	48	50	55	55
Windows	Secondary Unit Over Existing Window: 6mm Primary Glazing* (Existing) 100mm Air Void 4mm Secondary Glazing	19	26	34	44	44	38	38
*Estimated.								

Table 4.3: Cinema Proposed Constructions & Assumed Sound Insulation Performance

4.4.2 Café

Element	Build Up (From Outside to Inside)	Assumed Sound Reduction Indices (dB)						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Façade	Solid Masonry – Approx. 300mm	37	41	43	48	50	55	55
Windows	6mm Single Glazing* (Existing)	10	20	24	31	35	27	36
Roof	Tiled/Slated Roof 100mm Mineral Wool 12mm Plasterboard Ceiling	16	24	34	40	45	49	49
*Estimated.								

Table 4.4: Café Proposed Constructions & Assumed Sound Insulation Performance

4.5 Predicted Operational Noise Levels at Nearest Noise Sensitive Receivers

These noise levels, along with the façade constructions and areas as covered in previous sections have been used to estimate noise break out at the nearest noise sensitive receiver for each space presented.

4.5.1 Cinema and Bar

Noise Break-Out Calculation From One Facade		63	125	250	500	1000	2000	4000	dB(A)
Sound Pressure Level within Room, i.e. on internal facade		95.0	95.0	90.0	85.0	88.0	88.0	82.0	**93**
3dB Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Directivity of facade, **Q**	4								
10*log(S)	17.2 m2								
Distance to reciever	19 m2								
Screening Losses		0	0	0	0	0	0	0	
FAÇADE Elements									
Façade Area	**52.4 m2**								
Element 1 (Glazing)	16 m2	19	26	34	44	44	38	38	
Double - 6/100/4									
Predicted noise level in building from glazing		54.3	47.3	34.3	19.3	22.3	28.3	22.3	34.7
Element 2 (Solid Façade)	37 m2	37	41	43	48	50	55	55	
Solid Masonry – Approx. 300mm									
Predicted noise level through solid façade		39.9	35.9	28.9	18.9	19.9	14.9	8.9	25.9
Combined Noise Levels (1+2+3+4+5)		**54.4**	**47.6**	**35.4**	**22.1**	**24.2**	**28.5**	**22.5**	**36.0**

4.5.2 Café

Noise Break-Out Calculation From One Facade		63	125	250	500	1000	2000	4000	dB(A)
Sound Pressure Level within Room, i.e. on internal facade		66	66	64	66	64	61	58	**69**
3dB Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Directivity of facade, **Q**	4								
10*log(S)	20.2 m2								
Distance to reciever	5 m2								
Screening Losses		0	0	0	0	0	0	0	
FAÇADE Elements									
Façade Area	**104.5 m2**								
Element 1 (Glazing)	30 m2	10	20	24	31	35	27	36	
Single - 6mm									
Predicted noise level in building from glazing		48.5	38.0	32.0	27.6	21.9	26.8	14.7	31.7
Element 2 (Solid Façade)	19 m2	37	41	43	48	50	55	55	
Solid Masonry – Approx. 300mm									
Predicted noise level through solid façade		19.4	14.9	10.9	8.5	4.8	-3.3	-6.4	9.9
Element 3 (Roof)	56 m2	16	24	34	40	45	49	49	
Tiled/slated roof, 12mm p/bd ceiling, 100mm m/w									
Predicted noise level through solid façade		45.2	36.7	24.7	21.3	14.6	7.5	4.4	24.1
Combined Noise Levels (1+2+3+4+5)		**50.1**	**40.4**	**32.7**	**28.5**	**22.7**	**26.8**	**15.1**	**33.0**

5.0 ASSESSMENT RESULT

The table below provides a summary of this assessment.

NSR	Assessment Period	Façade Limit at NSR (dB $L_{Aeq,T}$)	Source	Specific Noise Level at Façade (dB $L_{Aeq,T}$)	Acoustic Feature Correction	Rating Level at Façade (dB $L_{Ar,Tr}$)	Assessment Outcome
Residence: The Vicarage - Shrewsbury Road	24hr	38 (See Section 3.2)	Cinema and Bar	36	+ 0	36	- 2
			Café	33	+ 0	33	- 5

Table 5.1: Summary of Assessments

It can be seen from the Table 5.1 above that the current proposals show that noise levels assessed at the worst affected NSRs would comply with the proposed criteria for operational noise. As outlined at the start of the report, no specific criteria have been provided for the operational noise breakout of either space, but as the above summarises, this is likely to be below the most onerous targets presented by BS 8233:2014 for the nearest residential dwellings.

5.1 Ventilation Plant Limits

MACH understands that new mechanical ventilation plant is to be installed for the new cinema space, but at the time of writing details are not yet available. Noise generated from the proposed plant should not exceed 29 dB $L_{Aeq,T}$ at the nearest residential façade to also comply with the above limit.

5.2 Proposed Secondary Glazing

MACH understands that secondary glazing is to be installed throughout the Town Hall. As shown by the assessment presented in Section 4.0, operational noise breakout from the café meets the proposed targets without the use of secondary glazing. Therefore there are no acoustic requirements for the proposed secondary glazing in the café.

For the cinema / bar, an indicative specification has been used for the above assessment as a product selection has not yet been determined. The whole window system (existing single glazing, void and new secondary glazing) should achieve at minimum the specification shown in Table 4.3. To assist procurement of the additional windows, a specification for the additional secondary glazing alone is provided below.

Element	Minimum Required Void Size	Minimum Secondary Glazing Sound Reduction Indices (dB)						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Window	100mm (Required for low frequency performance)	21	27	29	33	37	39	43

Table 5.2: Cinema Proposed Constructions & Assumed Sound Insulation Performance

The recommended product to meet the secondary glazing specification provided in Table 5.1 is 'Saint-Gobian Stadip Silence (Laminated) 8.4mm.'

6.0 CONCLUSION

In summary the following points set out the conclusions of this report:

- An operational noise break-out assessment has been conducted. The two estimated noise levels have been calculated and compared to façade limits at the nearest noise sensitive residence.
- The results of the assessment show that noise levels at the nearest sensitive façade assessed will be lower than the proposed limits, assuming the proposed window specification requirements are achieved. This demonstrates that the impact from the operational noise is likely to be low and have no adverse impact on the nearest noise sensitive receivers.

APPENDIX A LEGISLATION FOR NOISE

A.1 National Planning Policy Framework (NPPF)

In March 2014 the Government published the National Planning Policy Framework (NPPF) for noise which sets out the Government's planning policies for England and how these are expected to be applied.

The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

With regards to noise the Framework states that 'Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved."

It also states that:

"The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."

A.2 Noise Policy Statement for England (NPSE)

The aim of the Noise Policy Statement for England (NPSE) is to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. The NPSE applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

Noise Policy Vision: Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

Noise Policy 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; and
- where possible, contribute to the improvement of health and quality of life

A.3 National Planning Policy Guidance - Noise

Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The current guidance contained in the NPPG is summarised in the table below. This advice has not changed since the introduction of the 2018 version of the NPPF.

Perception	Examples of Outcomes	Increasing 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	No specific measures required
Lowest Observed Adverse Effect Level			
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			
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 disruptive	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 A.1: Noise exposure hierarchy