



Noise Impact Assessment

Site Address: The Swan Inn Pub, Basingstoke Road, Three Mile Cross, RG7 1AT

Client Name: Tait Architects

Project Reference No: NP-011505



Authorisation and Version Control

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Contents

1.	INTRODUCTION	4
1.1	Standards, Legislation, Policy & Guidance	4
1.2	Proposal Brief and Background	4
1.3	Local Authority Guidance	6
1.4	Proposed Assessment Criteria	6
2.	ENVIRONMENTAL NOISE SURVEY	8
2.1	Measurement Methodology	8
2.1	Context & Subjective Impression.....	9
2.2	Environmental Noise Survey Results	9
3.	EXTERNAL PATRON NOISE ASSESSMENT.....	12
4.	NOISE BREAKOUT ASSESSMENT	13
4.1	Proposed Construction	13
4.2	Noise Breakout Modelling & Specific Sound Levels	14
4.3	Noise Breakout Assessment	16
5.	BS4142 PLANT NOISE LIMIT LEVELS	18
6.	CONCLUSION AND ACTION PLAN	19
	APPENDIX A – ACOUSTIC TERMINOLOGY	20
	APPENDIX B – STANDARDS, LEGISLATION, POLICY, AND GUIDANCE	21
	B.1 – National Planning Policy Framework (2023)	21
	B.2 – Noise Policy Statement for England (2010)	21
	B.3 – BS8233:2014 ‘Guidance on Sound insulation and noise reduction for buildings’	22
	B.4 – Entertainment Noise Legislation	23
	APPENDIX C – ADDITIONAL DRAWING	26
	APPENDIX D – ENVIRONMENTAL SURVEY	28
	D.1 – Time History Noise Data	28
	D.2 – Surveying Equipment	28
	D.3 – Meteorological Conditions	29

List of Figures

<i>Figure 1 – Proposed Development Drawings</i>	<i>5</i>
<i>Figure 2 – Measurement Locations and Site Surroundings</i>	<i>8</i>
<i>Figure 3 – MP1 Daytime Background Sound Level Analysis</i>	<i>10</i>
<i>Figure 4 – MP1 Night-time Background Sound Level Analysis</i>	<i>11</i>
<i>Figure 5 – Proposed Extension Elevation Drawings</i>	<i>13</i>
<i>Figure 6 – Noise Breakout Map – Doors Open (4m Grid Height)</i>	<i>15</i>
<i>Figure 7 – Noise Breakout Map – Doors Closed (4m Grid Height)</i>	<i>15</i>
<i>Figure 8 – Moorhouse Low Frequency Noise Rating Curve</i>	<i>24</i>
<i>Figure 9 – MP1 Noise Survey Time History</i>	<i>28</i>

List of Tables

<i>Table 1 – IEMA Guidelines Effect Descriptors</i>	<i>7</i>
<i>Table 2 – Measurement Methodology</i>	<i>8</i>
<i>Table 3 – Identified NSRs</i>	<i>9</i>
<i>Table 4 – Background Sound Level Summary – Noise Breakout Assessment</i>	<i>10</i>
<i>Table 5 – Reference Internal Ambient Noise Levels within a Busy Restaurant</i>	<i>14</i>
<i>Table 6 – Noise Breakout Assessments</i>	<i>16</i>
<i>Table 7 – BS4142 Plant Noise Limit Levels</i>	<i>18</i>
<i>Table 8 – BS8233:2014 Internal Ambient Noise Level Criteria</i>	<i>23</i>
<i>Table 9 – Surveying Equipment</i>	<i>28</i>
<i>Table 10 – Survey Weather Conditions</i>	<i>29</i>

1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise impact assessment for the extension ('the proposed development') to the existing public house, The Swan Inn Pub, Basingstoke Road, Three Mile Cross, RG7 1AT ('the site').

The applicant is preparing a to submit a full planning application to the Local Planning Authority ('LPA'), Wokingham Borough Council. This report has been prepared to accompany the planning application and provides supplementary technical information regarding the acoustic suitability of the proposal.

A noise survey has been undertaken to establish the prevailing ambient and background sound levels at the closest Noise Sensitive Receptors ('NSRs'). The report details the existing ambient and background sound climate and the predicted noise emissions associated with the proposed development. Measures required to mitigate noise impact from the proposed development have been recommended where necessary and assessed in accordance with the relevant performance standards, legislation, policy and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy and guidance have been considered to ensure good acoustic design in the assessment:

- Pre-application advice provided by the LPA, dated December 2023.
- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- BS4142:2014+A1:2019 – 'Methods for rating and assessing commercial and industrial sound'.
- IEMA 'Guidelines on Noise Impact Assessments' (2014).
- Entertainment Noise Legislation.

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief and Background

The proposal is for the demolition of an existing rear extension to allow for a new extension to be built. The new extension shall provide additional indoor and outdoor seating to the restaurant, as well as creating space for additional toilet facilities and a new kitchen. The existing Swan Inn Pub is a grade II listed building, with the proposed extension allowing for the maximum capacity of the pub to be increased whilst requiring minimal changes to the listed element of the building.

Using the plans provided by the client, externally under a large pergola there will be capacity for 36 no. seated patrons. Internally, the restaurant capacity shall be increased by 48 no. seated patrons. It should be recognised at present there is external seating available to the rear, which to NOVA Acoustics knowledge has not resulted in any previous noise complaints. Therefore, it is assumed that the noise emissions from the proposed external seating areas will fall in line with the current operating practices under the existing licence and will not present an entirely new noise source.

It is understood that the applicant is hoping to extend the operating hours from 09:00 – 00:00 Monday to Thursday and 09:00 – 01:00 hours Friday to Sunday so that service can start from 08:00 hours, allowing the service to include breakfast. Background music will be played through the FoH system; however, it is only intended to be used for background ambience. During the site visit, it was noted that the facility currently uses a small 'Alexa' speaker that is not capable of producing high levels of noise, particularly at lower frequencies.

The venue already holds live music performances, open mic nights, quiz nights and shows live sports events, with indoor and outdoor screens already in situ. The type of events held and frequency are expected to remain the same, with any live events not considered to be new noise sources to the area.

The figure below shows the proposed development.

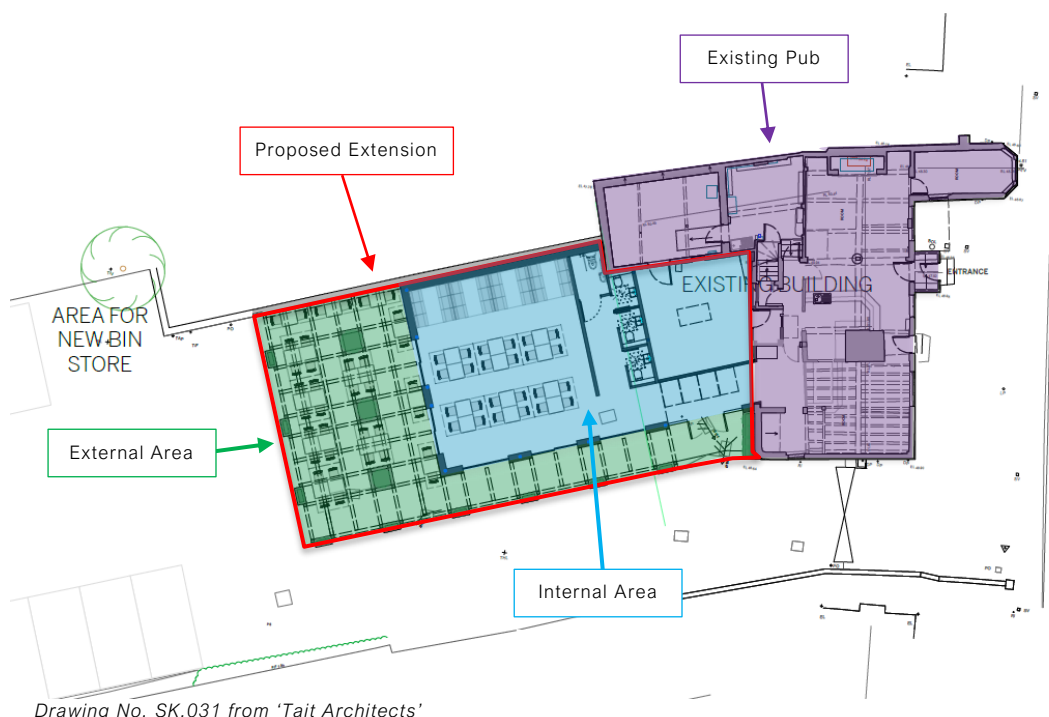


Figure 1 – Proposed Development Drawings

Additional events (such as wedding or functions) may be hosted at the site but are anticipated to be individually applied through a Temporary Event Notice (TEN). Through this application process, the event type, duration and associated activities for each event would require prior approval from the LPA prior. Therefore, such events are outside of the scope for this planning report and are not considered further.

1.3 Local Authority Guidance

The applicant has sought pre-application advice from the LPA under application number 232771. A response was received on the 11th of December 2023, with the following points made in relation to noise:

“The proposed extension to the ancillary restaurant has the potential to give rise to additional noise concerns over and above those emitted by the existing public house use. This may have an adverse impact on surrounding neighbouring amenity unless noise receptors and potential mitigation measures are thoroughly explored and mitigated. The Council’s Environmental Officer has suggested a noise assessment should be conditioned if planning permission is eventually granted, however, I would recommend that any noise assessment is submitted ‘up front’ with the planning application as the results and recommendations from this report may impact on the eventual size and location of the proposed extension. Similarly, the Council’s Environmental Officer has suggested a condition to secure details of plant/machinery which would be better provided up front as part of any noise assessment.

On submission of any formal planning application, the applicant should identify what hours of use are currently imposed via licencing arrangements and an assessment of existing planning conditions that limit hours of use of the public house shall be assessed to see if these are also satisfactory for the restaurant expansion given the considerable number of additional ‘covers’ proposed.”

1.4 Proposed Assessment Criteria

IEMA Guidance – External Patron Noise Assessment

There are no standards or guidance that are specifically designed to be used for the assessment of patron noise. Further to this, the assessment of noise from people and recreation is specifically precluded in the scope of BS4142:2014. BS8233:2014 is intended to be used for the assessment of anonymous sources, such as road traffic and rail noise, and is generally aimed towards the design phase of residential development; as such, is also not appropriate.

Given this, the following assessment is based primarily on guidance presented in the IEMA ‘Guidelines for Environmental Noise Impact Assessment’ document. The level of impact from the site is calculated considering the increase in ambient noise level due to the patron noise emissions.

It should be highlighted that the example criteria presented within the IEMA guidelines are generally for anonymous noise sources (i.e. from road traffic, rail, etc). Given the character of noise associated with the development (i.e. patron noise) and the associated impacts at nearby NSRs, it is considered appropriate to adapt the criteria accordingly. Noise from patrons is likely to be distinguishable in most environments and has the potential to cause higher levels of impact than anonymous noise sources.

The table below outlines the adopted criteria for the assessment and the associated NPPF/NPSE impact levels.

IEMA Effect Descriptors	
Substantial	Greater than 5dB change in L_{Aeq} sound level at a noise sensitive receptor.
Significant Observed Adverse Effect Level ('SOAEL')	
Moderate	A 3dB to 4.9dB L_{Aeq} change in L_{Aeq} sound level at a noise sensitive receptor.
Lowest Observed Adverse Effect Level ('LOAEL')	
Slight	A 1dB to 2.9dB L_{Aeq} change in L_{Aeq} sound level at a noise sensitive receptor.
No Observed Adverse Effect Level ('NOAEL')	
None/Not Significant	Less than 1 dB L_{Aeq} change in L_{Aeq} sound level at a noise sensitive receptor.

Table 1 – IEMA Guidelines Effect Descriptors

It is important to note however that the external area / beer garden has been operational for a significant amount of time, which means that nearby residents are likely to be accustomed to this type of noise. For this reason, it could be argued that the noise emissions should not be considered an entirely new noise source in terms of auditory sensation, reducing the sensitivity of the nearby receptors potential noise impacts associated with the development.

NANR92 'Noise from Pubs & Clubs' (2005) – Noise Breakout Assessment

It is stated in 'The Good Practice Guide on the Control of Noise from Pubs and Clubs' (NANR92) that where entertainment noise takes place on a regular basis, music and associated sources should ideally be inaudible within noise-sensitive properties.

Noise is considered 'inaudible' when is it at a sufficiently low level as to not be recognisable as emanating from the source(s) in question, and it does not alter the perception of the ambient noise environment that would prevail in the absence of the noise source(s) in question.

In general, NOVA Acoustics assumes that 'relative' inaudibility can be achieved internally providing the noise emissions do not exceed the measured background sound levels external to the façade of the closest NSRs.

2. Environmental Noise Survey

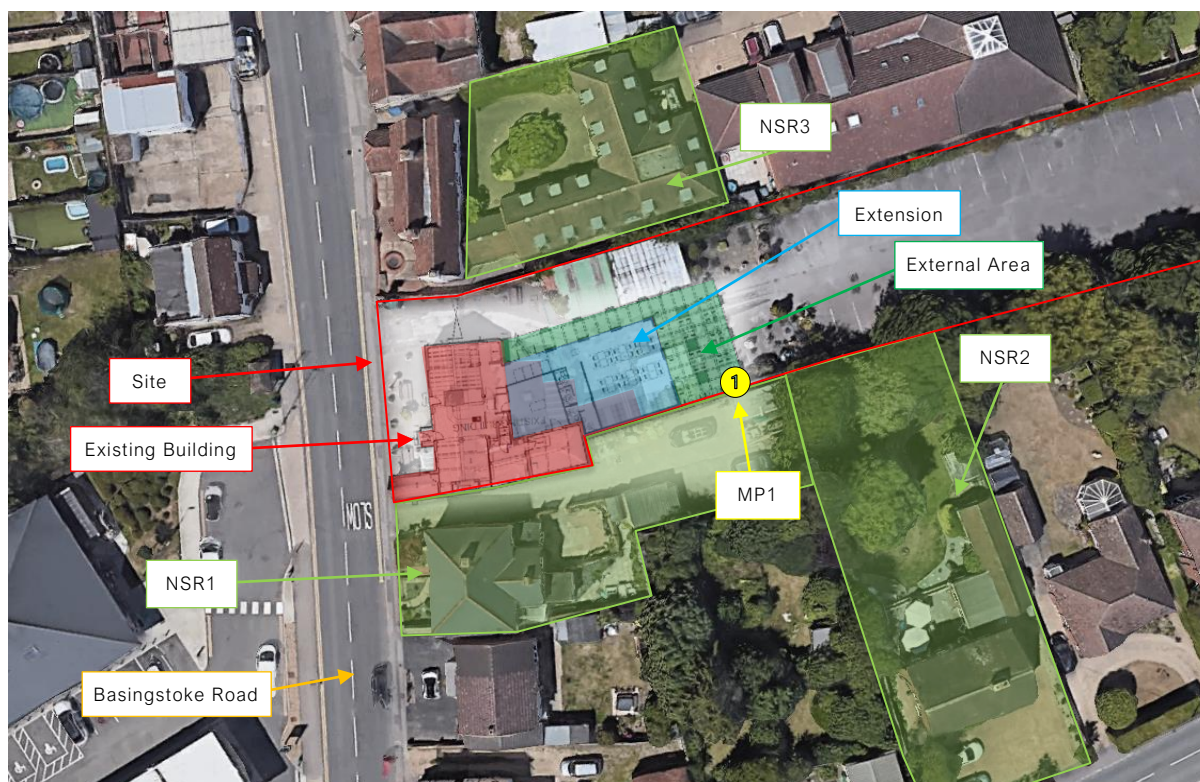
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. Weather conditions during the environmental noise survey can be found in Appendix D. In all instances, a 130mm diameter windshield was fitted to the microphones and the equipment was field calibrated before and after the survey; negligible drift was noted. All measurements were in free-field conditions.

Location	Survey Dates	Measurement Particulars
MP1	16-19/08/2024	Equipment attached to a pole just above the existing wooden fence line, approximately 3m above local ground and free from any obstructions.

Table 2 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2024 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2024

Figure 2 – Measurement Locations and Site Surroundings

2.1 Context & Subjective Impression

The area surrounding the site is predominantly residential in nature, with dwellings located to the immediate south as well as further to the north-west and north-east. Along the west of the site is Basingstoke Road, which is one of the primary roads running through the village 'Three Mile Cross' in which the site resides. Opposite the site, off Basingstoke Road, is a fuel station and small shop open from 06:00 hours to 23:00 hours. Neighbouring the site to the north is commercial business 'Woolf Bond Planning' and the local church. The plot in which the current public house resides in is rather large, with a substantial car park and grassy overflow parking area available to the rear and bordering many residential gardens.

At the time of the survey, the acoustics environment at MP1 was moderate in level and consisted primarily of distant vehicular movement on Basingstoke Road. Traffic flows were light to moderate, although relatively consistent during the daytime. Secondary noise sources included vehicular movement in car park. No noise from fixed plant associated with the existing public house or the surrounding businesses was noted. Upon collection, it was noted that there were garden works happening to the southeast, however this was for a limited duration of time.

Considering the location of the proposed development, the dwellings to the south are considered to be the most affected NSRs. The following table identifies the closest NSRs in relation to the proposed development site.

NSR	Description	Approx. Distance from Development
1	Rear first-floor window of no. 2 Basingstoke Road, overlooking the site.	12m
2	Rear first-floor window of Westgate, Church Lane, overlooking the site. A centre point of the rear garden has also been included as a receptor point.	32m (20m from garden)
3	Rear first-floor window of Mitford Court overlooking the site.	11m

Table 3 – Identified NSRs

2.2 Environmental Noise Survey Results

It is understood that an event/sports showing were taking place on the Friday and Sunday. Consequently, measured noise levels during these evenings were elevated.

Background Sound Level Summary – Noise Breakout Assessment

Shown in the following table are the average background sound levels ($L_{90,T}$) measured during the most sensitive operational periods of the public house. As events or sports showing were taking place on the Friday and Sunday, the levels during the quietest day (Saturday) are reported below. Due to the limited period, an arithmetic average of the measured $L_{90,15min}$ sound levels has been undertaken ascertain the 'typical' background sound level.

Assessment Period	Octave Frequency Band (Hz, L _{90,T} , dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Sensitive Evening Op Hours								
19:00 – 21:00	49	48	49	53	50	44	36	55
21:00 – 23:00	53	50	49	50	49	43	35	52
Night-Time Op Hours								
23:00 – 01:00	43	43	43	39	39	32	20	42

Table 4 – Background Sound Level Summary – Noise Breakout Assessment

Background Sound Level Analysis – BS4142 External Fixed Plant Limit Levels

The figures below show histogram graphs of the background sound levels measured during the day and night-time periods and have been used to inform the subsequent plant noise limits in Section 5. The time history results can be found in Appendix D.

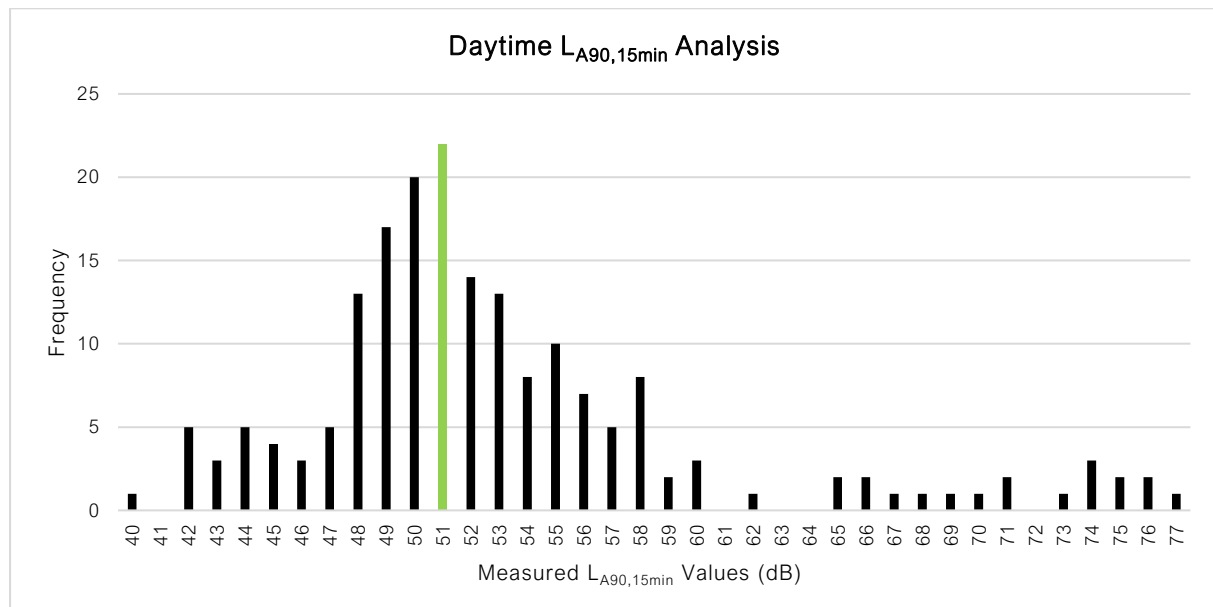


Figure 3 – MP1 Daytime Background Sound Level Analysis

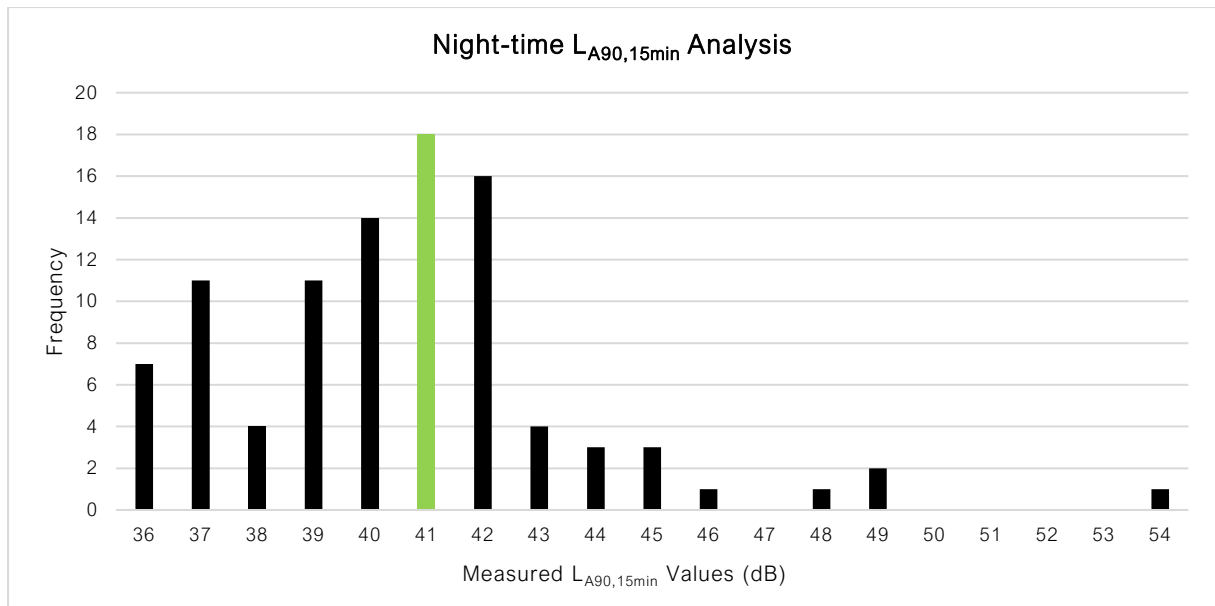


Figure 4 – MP1 Night-time Background Sound Level Analysis

Both periods have a wide range of $L_{A90,15min}$ noise levels, with the 'typical' level highlighted in green.

Based on the distribution of measured levels, a 'typical' $L_{A90,15min}$ of 51dB has been used as the background sound level within the daytime assessment. Periods above 60dB $L_{A90,15min}$ are generally during the scheduled events/sports showing and are not considered to be typical for use in the BS4142 assessment.

During the night-time, the 'typical' background sound level of 41dB has been used.

3. External Patron Noise Assessment

The proposed external patron area shall replace the existing patron area, and thus there will be no noise sources introduced as part of the proposals. The patron area will be covered by the existing license which includes the following:

- External entertainment and service until 23:00 hours every night, including the use of external music and TVs.
- No fixed external noise level limit, however, the noise emissions are to not cause a nuisance to the surrounding NSRs.
- The license for the main pub is 09:00 to 00:00 hours Monday to Thursday, and 09:00 to 01:00 hours Friday – Sunday.

The applicant intends to apply for an adjustment to the license allowing for the restaurant to operate in the same manner as the main pub.

The current landlords of the pub work closely with the Local Council and have historically acted on their suggestions. The pub shall continue to operate within best practicable means, conducting hourly noise level checks and regularly monitoring all noise emissions. As no new noise sources are being introduced, it is viewed that providing the premises operate the external patron area as they do currently and routinely monitor the noise emissions to ensure that no noise nuisance is being caused, the updated external patron area would be classed as 'No Observed Adverse Effect Level' ('NOAEL') when assessed in accordance with the NPSE and NPPF.

It is understood that at NOAEL, *"noise can be heard, but does not cause any change in behaviour, attitude or other physiological response"*. In addition, noise at this level *"can slightly affect the acoustic character of the area but not such that there is a change in the quality of life"*.

4. Noise Breakout Assessment

The following section assesses noise breakout from the proposed restaurant extension and discusses the potential impact this could have on the surrounding NSRs and residential amenity.

4.1 Proposed Construction

The provided drawings indicate that the proposed extension shall be single storey of a flat roof build. The core structure shall be of a masonry construction with large, glazed areas in the form of glass sliding doors. Above the glazed areas are either charred or black timber clad sections, the lower portion of which shall be used as ventilation louvres as necessary.

The proposed north and west elevations of the extension are presented below.

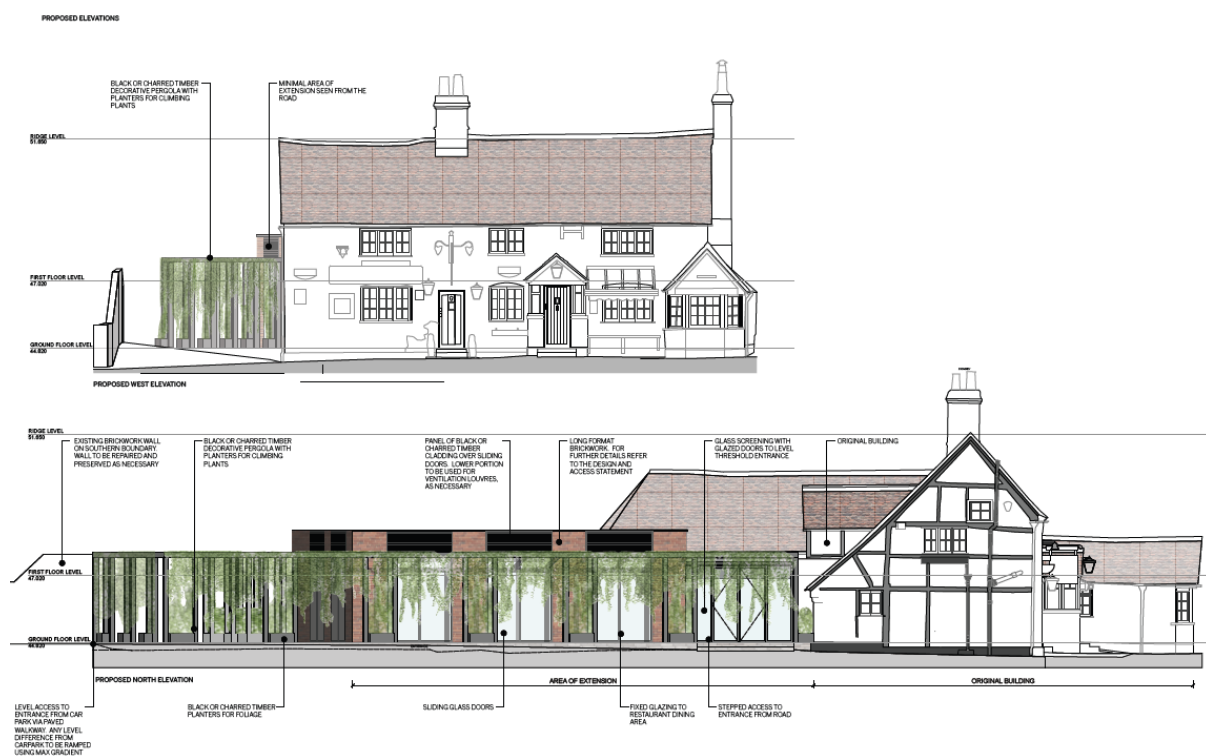


Figure 5 – Proposed Extension Elevation Drawings

It is expected that the masonry element of the outer envelope shall be of a cavity wall construction, capable of providing sound insulation upwards of 59dB R_w and being acoustically the strongest element of the façade.

Glazing is typically seen to be one of the weakest elements of the façade acoustically and can lower the overall composite sound insulation performance of the outer envelope should the area of glazing be particularly large. The glazing should have a minimum performance of 37dB R_w , achievable by installing double glazing in a 6mm glass, 16mm air cavity, and 10mm laminated glass configuration. Note that this is applicable to the new windows, sliding doors, and framing elements.

The current drawings indicate that the flat roof shall be of a lightweight construction. To avoid the roof being a significant point of weakness, it is recommended the roof provides sound insulation upwards of 38dB R_w . An example build-up that could achieve this is as follows:

- 18mm Plywood / timber cladding
- 15mm OSB or similar
- 112mm Kingspan KS1000/RW insulated panel
- 15mm OSB or similar

4.2 Noise Breakout Modelling & Specific Sound Levels

Internal Ambient Noise Levels

Reference noise levels from the 'Little Red Book of Acoustics' have been used as an internal ambient noise level within the proposed restaurant. The levels for a busy restaurant are replicated in the following table.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Internal Ambient Noise Levels within a Busy Restaurant (L_{eq})	60	70	75	75	75	75	70	80

Table 5 – Reference Internal Ambient Noise Levels within a Busy Restaurant

Noise Modelling

The proposed development has been modelled within SoundPlan 9.0 and the following assumptions have been made within the software:

- To accurately model the land surrounding the site, the topographical data has been obtained from the EA's 'National LIDAR Programme' on the DEFRA Data Services Platform.
- The ground between the source and receivers is considered a mixture of acoustically 'hard' and 'soft' surfaces (0.4 coefficient).
- Octave band source data was used to facilitate noise modelling in accordance with ISO 9613-2.
- SoundPlan 9 calculates the level of noise breakout in accordance with BS 12354 considering:
 - The internal noise levels seen in Table 5.
 - The sound reduction performances from section 4.1.
 - A -6dB C_d correction to account for the change in 'reverberant' internal conditions to external non-reverberant conditions.
 - The building fabric elements are deemed to behave as area sources.
 - The timber cladding is assumed to only have an open area equivalent to the lower half of the entire cladded area, with the upper portion assumed to have the same SRI value as the brick wall.
 - The lower part of the louvre must be an acoustic louvre, with an SRI performance equal to or exceeding that of a Caice SS150 acoustic louvre (11dB R_w).

The following noise map below show the specific breakout noise emissions from the proposed extension. Scenarios have been modelled with the doors open and the doors closed.



Figure 6 – Noise Breakout Map – Doors Open (4m Grid Height)



Figure 7 – Noise Breakout Map – Doors Closed (4m Grid Height)

4.3 Noise Breakout Assessment

The below table presents the noise breakout assessment at the most affect NSR(3). Due to the increased noise emissions associated with the development, the external doors should be kept closed from 21:00 hours to avoid more sensitive periods. Note that the spectral background sound levels utilised in the assessment are from Table 4, outlined earlier in the report.

Description	Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Doors Open Assessment								
Breakout Specific Sound Level at NSR3 (first floor window, L_{eq})	40	48	53	54	54	54	49	60
Background Sound Level $L_{90,T}$ (MP1: 19:00 – 21:00 hours)	49	48	49	53	50	44	36	55
Exceedance of $L_{90,T}$	-9	-1	+4	+1	+4	+10	+13	+5
Doors Closed Assessment - Evening								
Breakout Specific Sound Level at NSR3 (first floor window, L_{eq})	28	37	40	38	34	34	28	41
Background Sound Level $L_{90,T}$ (MP1: 21:00 – 23:00)	53	50	49	50	49	43	35	52
Exceedance of $L_{90,T}$	-25	-21	-16	-21	-21	-23	-28	-16
Doors Closed Assessment – Night-time								
Breakout Specific Sound Level at NSR3 (first floor window, L_{eq})	28	37	40	38	34	34	28	41
Background Sound Level $L_{90,T}$ (MP1: 23:00 – 01:00)	43	43	43	39	39	32	20	42
Exceedance of $L_{90,T}$	-15	-7	-3	-1	-5	+2	+8	-1

Table 6 – Noise Breakout Assessments

The above sound map and tables show that the breakout noise level through the external envelope of the extension is expected to be below the background sound level from 21:00 hours until 00:00 hours (i.e. when the external doors to the premises will be closed).

However, there are exceedances of the adopted criteria during the daytime hours when the external sliding doors may be open (i.e. before 21:00 hours). It should be highlighted that the premises currently has a licence for outdoor service and entertainment, including the use of TVs and music. Although breakout noise emissions are anticipated to exceed the lowest typical background sound level by +5dB, the noise levels would significantly less than that from the external patron area. Therefore, it is not deemed necessary to strictly impose the adopted criteria during periods before 21:00 when noise break-out would likely be secondary in nature to existing external beer garden noise generation.

Additionally, whilst this assessment assumes that doors will be closed from 21:00 hours onwards, during unfavourable weather or the winter period the doors will likely close earlier than this cut off. Considering the above, this exceedance is viewed to be acceptable.

When compared to the louder days, when events are understood to have been on, the exceedance would be significantly lower. When assessed using NPPF and NPSE, the doors open scenario would be between the 'NOAEL' and LOAEL' considering the context of the site, and between 'NOEL' and 'NOAEL' with doors closed.

It should be recognised that the 2.2m wall around the perimeter of external patron area 2 has provided a degree of acoustic screening from the noise breakout emissions. If the wall was reduced to 1.8m in height, an increase of 2dB in the noise breakout emissions has been predicted.

Recommendations & Mitigation Measures

At present, the pub has no FoH speaker system and is using an 'Alexa' speaker for music, however, as the premises is known to host live music and events, internal noise levels within the extension can be up to the following levels before the breakout noise emissions exceed the background sound levels. External noise levels during external service and events should be set in line with the requirements of the licence.

In addition, all external doors must be fitted with automatic soft closers to ensure that doors do not remain open when the restaurant is in use. In line with good acoustic practices, suitable noise control measures should be implemented.

5. BS4142 Plant Noise Limit Levels

At this stage of the development, no external fixed plant specification is available. However, it is anticipated that an AHU unit may be installed within the loft space. As such, plant noise limit levels have been defined to ensure that the cumulative noise emissions from new external fixed plant do not actively contribute to the existing acoustic environment.

The limit levels are inclusive of any rating penalties applicable, as defined in BS4142, to account for audible characteristics of the noise which could be deemed to cause increased annoyance, such as intermittency, impulsivity, or tonality.

Adopted BS4142 Assessment Criteria

As detailed earlier in the report, the 'typical' background sound level during the daytime and night-time periods are 51dB and 41dB respectively. Given that existing plant for the pub is likely already present, although not audible whilst on site, a plant rating level limit has been set to ensure that noise emissions from the new plant are inaudible.

The calculated plant noise limit levels are shown in the table below.

Description	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Background Sound Level ($L_{A90,15min}$)	51	41
Cumulative Plant Noise Limit Level at NSR ($L_{Ar,Tr}$)	41	31
BS4142 Assessment Outcome	Low Impact	
NPPF & NPSE Outcome	No Observed Effect Level ('NOEL')	

Table 7 – BS4142 Plant Noise Limit Levels

BS8233 prescribes a night-time internal ambient noise level within bedrooms of ≤ 30 dB(A). Therefore, it is considered that an **external** rating level limit of 31dB(A) would not result in unacceptable internal conditions within the neighbouring bedrooms with windows open. This is a very strong positive indication that the new plant will have no impact on the surrounding receptors.

Nonetheless, good acoustic design should still be implemented to reduce the likelihood of any tonality, intermittency and any other features not described. The plant proposed is not impulsive and as such this characteristic is not expected to be present.

6. Conclusion and Action Plan

The proposed development has been assessed against an adopted criteria and a scheme of mitigation has been recommended where necessary to reduce any potential noise impact by as much as practicable.

The proposed external seating area has indicated that the proposed development would cause a 'not significant' impact throughout the entire evening/night-time providing it operates in line with the current external license. Current best practicable means, such as hourly noise level checks and routine noise monitoring should be continued, and patrons asked to relocate internally if they repeatedly shout after 23:00 hours.

The noise breakout assessment shows that during typical restaurant use, the breakout noise emissions with the doors open (permissible up to 21:00 hours) are expected to result in a +5dB increase over the lowest typical background sound level. However, considering the external patron area, breakout noise emissions will be subdominant to that from external noise. Considering there is already a pub and external area present, as the worst-case receptor position is a first-floor window of NSR3 rather than a garden area, this exceedance is viewed to be acceptable.

Noise breakout emissions with the doors closed are not predicted to exceed the lowest typical background sound level during the evening and night, providing the external envelope provides sound insulation equal to that contained within Section 4.1. This is a positive indication that the proposed development would be unlikely to adversely impact the nearby NSRs.

The proposed development has also been assessed against the requirements of BS4142 and fixed plant noise limit levels have been derived. Both the daytime and night-time limit level is derived from the 'typical' $L_{A90,15min}$ measurement and has been set so to not actively construct to the existing acoustic environment. These limit levels should be adhered to, and further calculations and assessment may be required once a complete plant specification has been defined.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Background Sound	Underlying level of sound over a period, T , which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T , has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for $N\%$ of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10 \log_{10} (p/p_0)^2$. Where: p is the root-mean-square sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 180e, it states:

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;

Paragraph 191 states:

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:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 191 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision 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.

To achieve this vision the Statement identifies the following three 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.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

This is further expanded using the updated “Noise Exposure Hierarchy Table” which includes an additional level of impact referred to as the ‘No Observed Adverse Effect Level’ (‘NOAEL’). It is stated that at this level: *“noise can be heard, but does not cause any change in behaviour, attitude or other physiological response”*. In addition, noise at this level *“can slightly affect the acoustic character of the area but not such that there is a change in the quality of life”*.

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 ‘Guidance on Sound insulation and noise reduction for buildings’

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, ‘WHO Guidelines on Community Noise, 1999’. The Guidelines on Community Noise (1999) document defines community noise to include noise from “industries” and “construction”. The desirable criteria levels of

steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below.

BS8233:2014 Internal Ambient Noise Level Criteria			
Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 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 $L_{Aeq,8hour}$ 45 dB L_{AFmax}^*

Table 8 – BS8233:2014 Internal Ambient Noise Level Criteria

**ProPG:2017 states that's good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 time a night within noise sensitive rooms such as bedrooms. However, where it is not reasonably practicable to achieve the guideline then the judgment of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number distribution, predictability and regularity of noise events.*

It is noted, however, that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the 'LOAEL' as defined in the NPSE in Appendix B.

B.4 – Entertainment Noise Legislation

Noise from entertainment venues, e.g., noise from recorded music, live bands or karaoke, can be particularly annoying for residents and business if it is not adequately contained within the venue. When considering the potential impact of a proposal for a entertainment premises or residential near to entertainment premises a consideration for the overall noise level (L_{Aeq}) and the 63Hz and 125Hz octave band noise levels. Music noise in the 63Hz and 125Hz octave bands, which is described as 'bass noise' is particularly difficult to contain and the impulsive and non-steady character of low frequency music noise is particularly disturbing for residents exposed to it.

A lively city centre bar can operate around 95 dB L_{Aeq} and nightclubs can be even higher at 105 dB L_{Aeq} . The range of level of 63Hz and 125Hz octave bands is wider than the a-weighted levels and can be up to 115 dB L_{eq} and 110 dB L_{eq} respectively (Davies et al 2005).

There is a lack of consensus on an assessment method for noise levels within habitable rooms regarding entertainment noise. The design aim should be to design to 'inaudible'*. The building structure is therefore key and will usually involve a high performing solution in either the music venue or residential premises. Existing noise standards/criteria are not appropriate for evaluating low frequency noise; in almost all other

situations the established noise descriptors are based on the A-weighted sound level (dBA) which effectively filters out low frequency sound (Moorhouse et al 2011).

**Noise is considered to be inaudible when it is at a sufficiently low level such that it is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question. The DEFRA report 'Noise from Pubs and Clubs – Phase 1', which, on page 17 reproduces the Institute of Acoustics (IOA) working group guidance to achieve music noise levels which are 'virtually inaudible' inside a residential property.*

When dealing with noise control, especially at the lower frequencies it is usual to look at the octave band data as a Z-weighting (linear) and not the A-weighting, due in main to the amount you have to 'take off', resulting in meaningless data (-26.2dB at 63Hz) and also with respect to the sound insulation performance of various constructions materials. Rather than just A-weighted levels being assessed e.g., internal noise levels as per BS8233:2014; a low frequency band analysis should be carried out (McCullough et al 2004).

In the 'Procedure for the assessment of low frequency noise complaints – Revision 1', Moorhouse et al (2011) use limits for low frequency noise levels in 1/3 octave bands between 10Hz and 160Hz. For the assessment of low frequency music noise, it is more practical to consider the 63Hz and 125 Hz octave bands. The Noise Council's Code of Practice on 'Environmental Noise Control at Concerts' suggests limits on both these octave bands. The DEFRA report 'Noise from Pubs and Clubs – Phase 1' suggests limits on 1/3 octave bands. However, the problem with this suggestion, and one of the reasons it is not widely used, is due to the difficulty in obtaining 1/3 octave band sound insulation performance data for various construction materials. With regards to assessing music noise at the 63 Hz and 125 Hz octave band levels a good correlation is shown between the NR 15 curve and Moorhouse curve at low frequencies. See figure below.

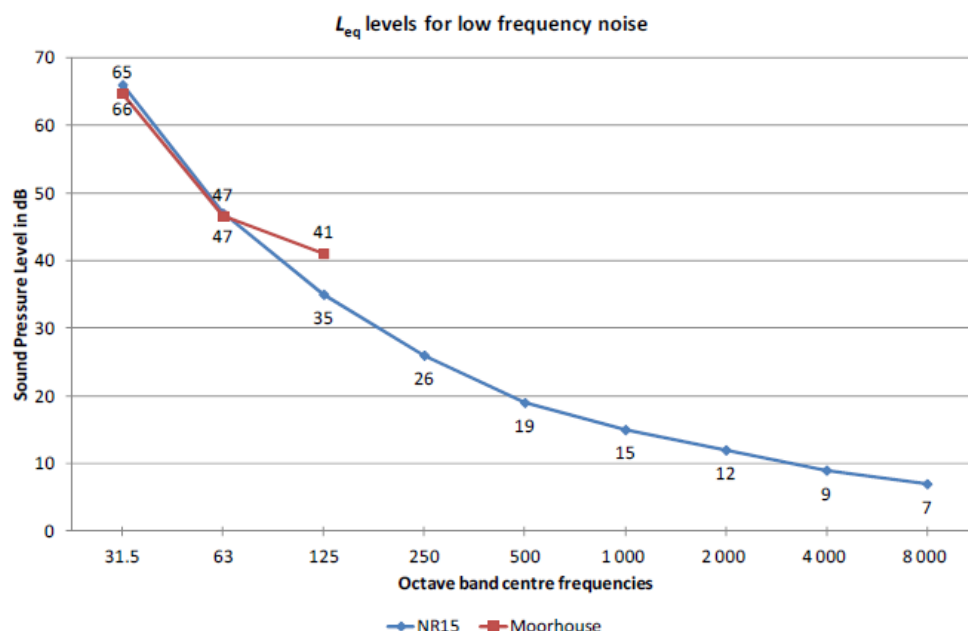


Figure 8 – Moorhouse Low Frequency Noise Rating Curve

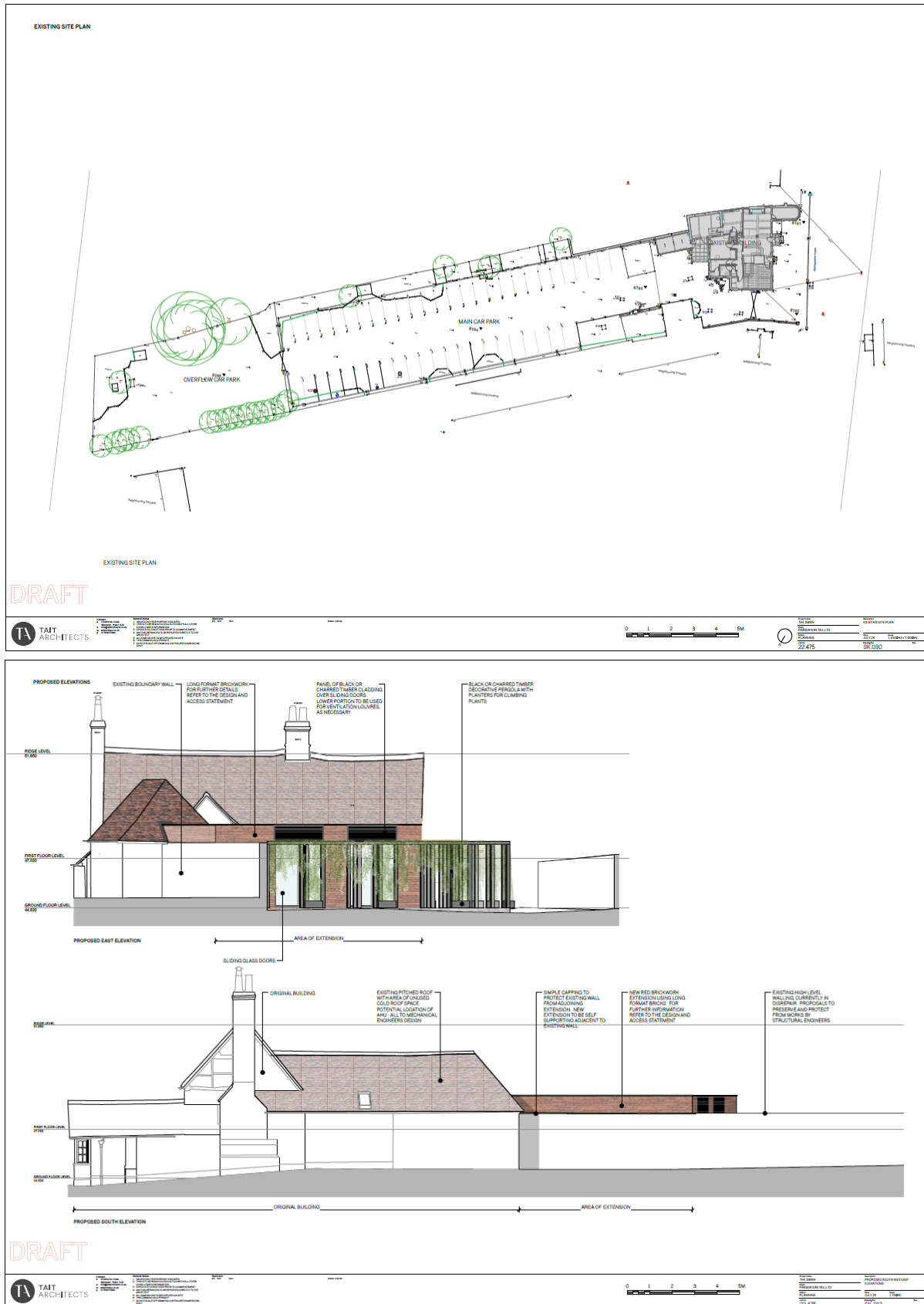
However, The NR curve may be too stringent at mid and higher frequencies and may be lower than background sound levels in habitable spaces. Further, the NR curve is most commonly used to set limits

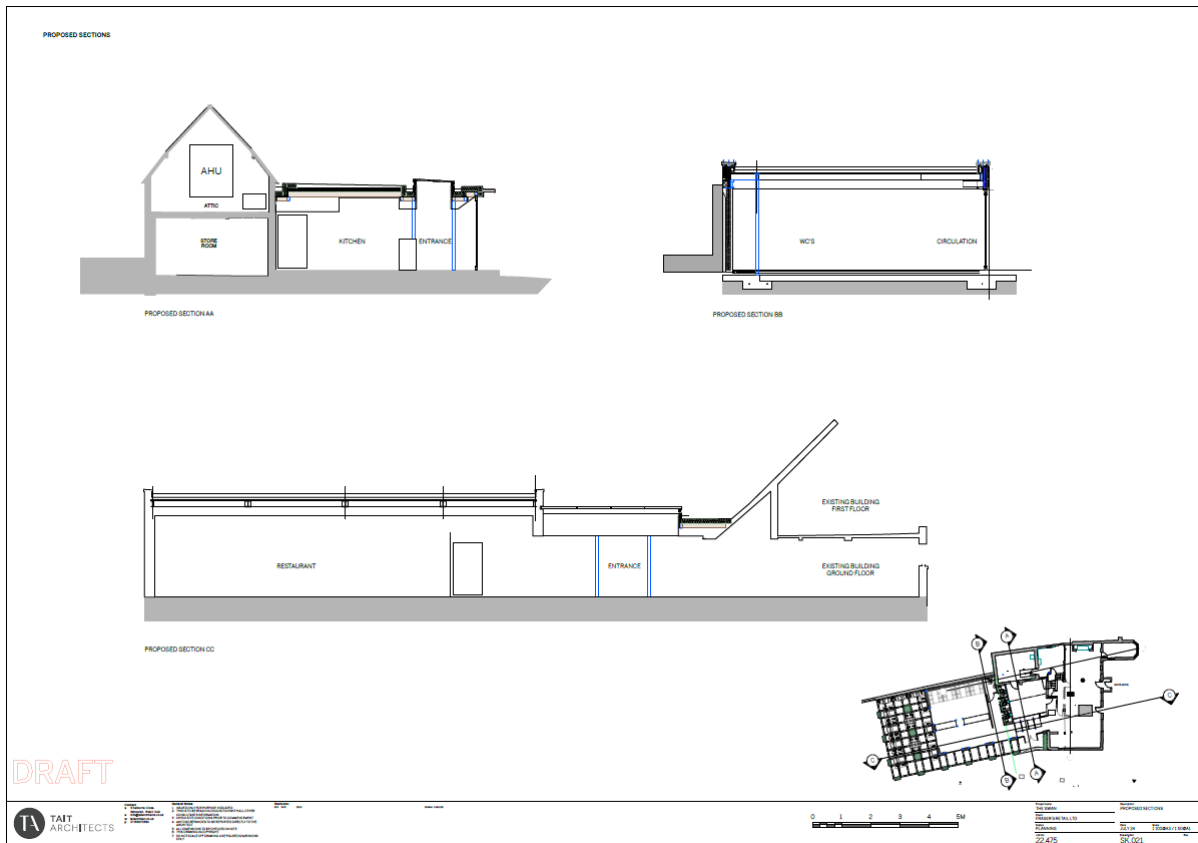
for mechanical services noise in buildings i.e., steady, continuous noise sources. Music noise has distinctive characteristics and as such can be described as unsteady and non-continuous in comparison. Even though the Moorhouse curve does not specifically relate to entertainment noise (as per the caveat in the revised edition) these levels provide a good practical basis to assess low frequency music noise. They also provide a workable prediction for planning applications and a measurement method and assessment for in-situ low frequency issues in existing habitable spaces. Therefore, a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be: 'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively'. This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

References:

- i) Institute of Acoustics (2002) – Good practice guide on the control of noise from pubs and clubs – Draft Annex 2.
- ii) McCullough et al (2004) A practical evaluation of objective noise criteria used for the assessment of disturbance due to entertainment music
- iii) Moorhouse et al (2005) Proposed criteria for the assessment of low frequency noise disturbance, Defra (updated in 2008 and 2011)

Appendix C – Additional Drawing





Appendix D – Environmental Survey

D.1 – Time History Noise Data

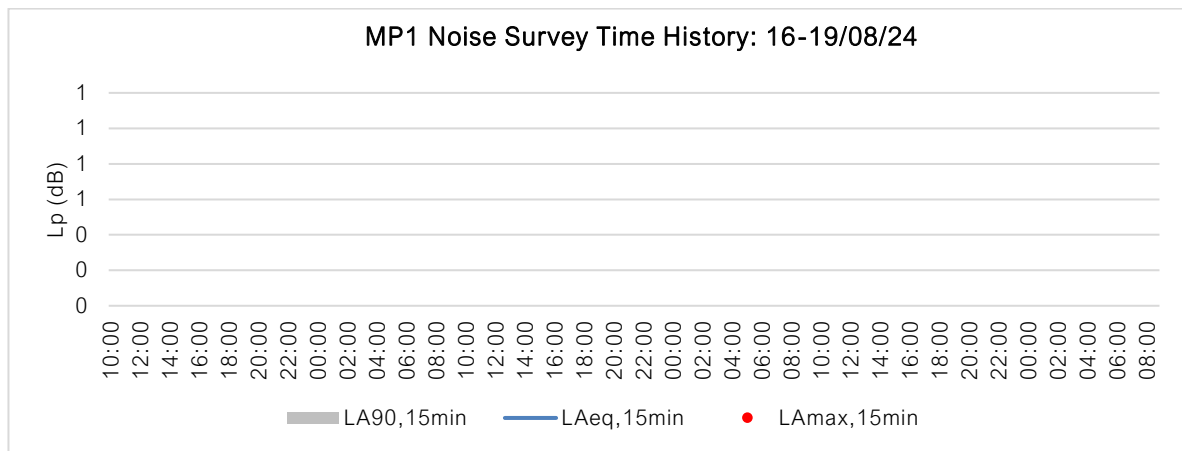


Figure 9 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141413	0.0
Svantek SV33B Class 1 Calibrator	125636	

Table 9 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with no deviation. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

All long-term measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Ravenglass, Earley (Approx. 5.0km NE of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s) ^[1]
16/08/24: 00:00 – 23:59	12.7 – 27.0	0.0	SSE	0.0 – 1.6
17/08/24: 00:00 – 23:59	10.4 – 24.4	0.0	SSW	0.0 – 2.0
18/08/24: 00:00 – 23:59	12.5 – 24.6	0.0	SW	0.0 – 1.9
19/08/24: 00:00 – 23:59	9.8 – 19.9	0.0	SSW	0.0 – 1.9

Table 10 – Survey Weather Conditions



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