NoiseAir
ACOUSTICS & AIR QUALITY

Tel: 0116 272 5908
Email: info@noiseair.co.uk
Web: www.noiseair.co.uk

FRONTIER MODULAR SERVICES LIMITED

NOISE IMPACT ASSESSMENT REPORT

THE OLD BAKEHOUSE, HORNSEA HU18 1BQ

Client: Frontier Modular Services Limited

Report Ref: P6090-R2-V1

Issue Date: 19th March 2023

Document Status: Version 1

Unit 4, Chapel Court, Wervin, Chester, Cheshire, CH2 4BT
The Counting House, High Street, Lutterworth, Leicestershire, LE17 4AY

DATE ISSUED: **19th MARCH 2023**

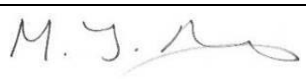
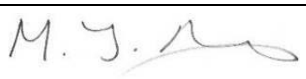
REPORT REFERENCE **P6090-R2-V1**

FRONTIER MODULAR SERVICES LIMITED

NOISE IMPACT ASSESSMENT REPORT

THE OLD BAKEHOUSE, HORNSEA HU18 1BQ

REPORT VERSION CONTROL:

Document Reference	Date	Report Prepared by	Report Checked / Authorised by
P6090-R2-V1	19/03/23	M. J. Malone, MIOA	M. J. Malone, MIOA
			

CONTENTS

APPENDICES

1 INTRODUCTION

1.1.1 By instruction from Frontier Modular Services Limited ('the client'), NoiseAir was commissioned to undertake a noise impact assessment (NIA) for a proposed residential development at The Old Bakehouse, Hornsea HU18 1BQ, herein referred to as the 'development site'.

1.1.2 This noise report has been prepared in support of a proposed planning application and assesses the results of a noise survey carried out in accordance with current guidance and includes recommendations and mitigation as appropriate.

1.1.3 General limitations of this report are outlined in **Appendix A**.

1.2 Site Description

1.2.1 At the time of writing the development site is a vacant building located to the suburban area of Hornsea. The development site is located within a mixed use, residential and commercial area.

1.2.2 Located to the north of the development site is The New Inn public house, it is noted that The New Inn public house has an outdoor smoking area located to the rear and therefore adjacent from the northwest corner of the development site, at an approximate distance of 10 m.

1.2.3 It is also noted that the Maa Indian restaurant and takeaway is also located opposite the development site to the northeast, located at approximately 10 m distance. It was noted that a kitchen extract flue was located in close proximity to the development site and that the business rear door appeared to be left open (assumed for heat/ ventilation purposes).

1.2.4 **Figure 1** shows an aerial photograph of the development site with respect to the local area and its context.

Figure 1: Site aerial photograph.

1.3 Development Proposals

1.3.1 Proposals for the development site outline the renovation of the existing building structure to form two one bedroom self contained apartments over three floors.

1.3.2 The proposed site layout is presented in **Figure 2** below.

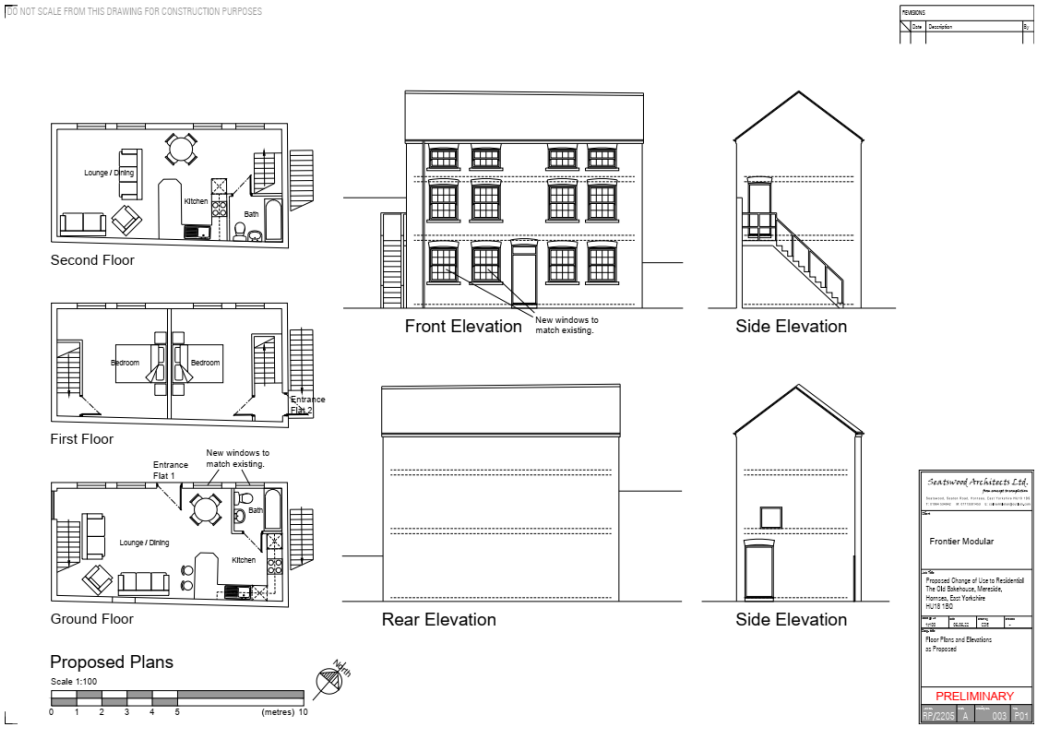


Figure 2: Proposed Site Layout.

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Planning Guidance and Noise

2.1.1 This acoustic report has been prepared in support of a proposed planning application and therefore it is considered that reference should be made to the appropriate planning guidance documentation, specifically:

- National Planning Policy Framework (NPPF), 2021;
- Noise Policy Statement for England (NPSE), 2010;
- Planning Practice Guidance – Noise, 2019;

2.1.2 A summary of the relevant planning documentation and its relevance with respect to noise is provided below.

National Planning Policy Framework [NPPF 2021]

2.1.3 The NPPF was initially published in March 2012 with the most recent version updated in July 2021. The NPPF sets out the Governments planning policies for England and how these are expected to be applied across a number of areas.

2.1.4 With respect to noise specifically, Section 15, Paragraph 170 of the NPPF 2021 states:

> *'Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> - *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;'*

2.1.5 The NPPF 2021 continues to state in Paragraph 180:

> *'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; and,*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

Noise Policy Statement for England [NPSE 2010]

2.1.6 The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to "*promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*".

2.1.7 This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

2.1.8 The NPSE also introduces the below categories with respect to 'adverse impacts'.

'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'.*

2.1.9 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, the requirement to mitigate and minimise the adverse effects of noise does not mean that such adverse effects cannot occur.

Planning Practice Guidance - Noise [PPG 2019]

2.1.10 The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF[1].

2.1.11 The PPG advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category, the noise category was most recently updated in July 2019.

2.1.12 The PPG provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.

2.1.13 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

2.1.14 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise.

2.1.15 **Table 1** summarises the noise exposure hierarchy outlined within the PPG.

[1] https://www.gov.uk/guidance/noise--2

Table 1: National Planning Practice Guidance noise exposure hierarchy			
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 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 non-awakening 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 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

2.2 Consultation and Scope of Works

2.2.1 The scope of the assessment includes consideration of noise at sensitive areas of the proposed development, i.e., proposed residential areas/ bedrooms, specifically in terms of the potential impact of local noise sources such as public house patron noise and noise breakout from the neighbouring Maa Indian Restaurant and Takeaway

2.2.2 The local Environmental Health Officer (EHO) has commented on the application and outlined potential concerns with respect to noise which were communicated via email on 9th November 2022. The email is reproduced below for clarity:

> *"Hi Leanne,*
>
> *I am in receipt of the above planning application.*
>
> *I have concerns about noise at these proposed self-contained flats, as this is quite a noisy area given what is surrounding the proposal - next to the New Inn pub, Indian Restaurant/Takeaway, Children's Nursey and Electricity substation.*
>
> *I see on Google streetview (dated June 22) that the New Inn has a gazebo to the rear which is directly next to the proposal which concerns me.*
>
> *I therefore request that the applicant submits a noise report taking into account all of the above or else I may be looking to object on this.*
>
> *I also have concerns of odour which may arise from the Indian Restaurant/Takeaway, as the odour arising from this may affect any future tenants. Therefore, an odour management plan would be welcomed by the applicant.*
>
> *Kind regards*
> *Niamh Gartland (she/her/hers)*
> *Environmental Health Officer*
> *(01482) 396215*
> *www.eastriding.gov.uk"*

2.2.3 As outlined above the EHO has identified various potential noise sources which may affect the development site. It is noted that the assessment of potential noise sources have been identified via Google Streetview assessment.

2.2.4 Following multiple site visits, specifically on 01/02/2023, 03/02/2023 (during the late evening hours) and 08/02/2023 by a NoiseAir consultant, there were two main noise sources that were noted. The first noise source was patron noise located in a smoking area approx. 10 m

to the north of the development site. The second was the Maa Indian Restaurant and Takeaway, specifically its associated kitchen extract system.

2.2.5 The gazebo which was referenced within the email from the EHO was not present, however it is noted that the view on Streetview shows a white coloured building which could be mistaken for a gazebo. It is also considered that there would not be enough room to the rear of The New Inn public house to accommodate a gazebo. Based on the aforementioned, assessment of noise breakout from a gazebo will not be considered in this report.

2.3 Assessment Criteria

2.3.1 In order to achieve noise levels which are considered to be in alignment with the planning approaches and policies discussed in Section 2.1, it is considered that all efforts are made to ensure that future occupants are unlikely to be exposed to noise levels which might breach the LOEL criteria.

2.3.2 It should be noted however that planning guidance does not preclude development where the LOEL is likely to be breached in certain circumstances as long as reasonable efforts are made to mitigate and reduce such an effect.

2.3.3 It is therefore considered that the noise assessment and subsequent criteria should be undertaken in accordance BS 8233:2014.

2.3.4 In addition, it has also been identified that noise breakout from the adjacent kitchen extract may cause adverse impact and should therefore be assessed in accordance with BS 4142:2014+A1:2019.

2.3.5 A summary of both the aforementioned documents has been provided below.

British Standard 8233:2014 (BS 8233:2014)

2.3.6 British Standard 8233:2014 – *Guidance on sound insulation and noise reduction for buildings* (BS 8233) provides guidance on internal ambient noise levels, resulting from break-in of external environmental noise that should not be exceeded in various locations within dwellings.

2.3.7 Guidelines for buildings in terms of internal noise level are reported in TABLE.

Table 2: Summary of internal noise guidelines.			
Activity	**Location**	**0700 – 2300 hours**	**2300 – 0700 hours**

Table 2: Summary of internal noise guidelines.			
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 $L_{Aeq,8hour}$

2.3.8 The standard clarifies that these values are based on the existing guidelines issued by the World Health Organisation (WHO). In addition, it states that the internal noise levels may be relaxed by up to 5 dB whilst maintaining a reasonable living condition. Conversely, in terms of internal maximum levels to be achieved during the night, the standard does not recommend any limits for individual noise events. However, a guideline value may be set in terms of SEL or L_{AFmax}, depending on the type and the number of events per night.

2.3.9 Furthermore, BS 8233:2014 provides guidance on desirable noise levels in areas that are intended to be used for external amenity space, such as gardens, balconies and roof gardens which are intended to be used for relaxation. For these spaces it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ up to a level of 55 dB $L_{Aeq,T}$ for noisier environments.

British Standard 4142:2014 (BS 4142:2014)

2.3.10 British Standard 4142:2014 - Methods for rating and assessing industrial and commercial sound, sets the methodology for rating and assessing sound of an industrial and commercial nature, which includes sound from fixed installations such as mechanical and electrical plant and equipment.

2.3.11 In BS 4142:2014, a noise rating is determined and compared with the existing local background sound level based on several more cumulative acoustic feature corrections to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional cumulative penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

2.3.12 BS 4142:2014 seeks to determine a “representative” background sound level, stating that “…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”.

2.3.13 The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS

4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

- Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.3.14 Therefore, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is below the background sound level.

3 ACOUSTIC SURVEY

3.1 Acoustic Survey Details

3.1.1 NoiseAir carried out fixed position noise monitoring between 3rd February 2023 to 8th February 2023 at the development site.

3.1.2 Noise monitoring was undertaken at one monitoring location (ML1), the position is shown in **Figure 3** and detailed in **Table 3** below.

Figure 3: Site layout plan and noise monitoring location.

Table 3: Summary of Noise Monitoring Locations

Monitor Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End/ Duration	
ML1	To the northern corner of the existing building structure, microphone was mounted on a boom at first floor level overlooking both The New Inn public house rear smoking area and the Maa Indian Restaurant and Takeaway.	20:00 03/02/23	12:45 08/02/23	Unattended

3.1.3 The monitor location were positioned to be representative of the noise levels at the approximate location of the development site and so data from this locations will be used for the noise impact assessment.

3.1.4 The noise measurements were made using one Class 1, integrating sound level meter (SLM).

3.1.5 The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003[2] before and after the noise monitoring periods.

3.1.6 Details of the SLM and associated field calibration can be found in **Table 4** below;

Table 4: Summary of SLM's used for survey and associated field calibration

SLM (Serial Number)	Preamp (Serial Number	Microphone (Serial Number)	Calibrator (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1405015)	NOR1209 (14517)	NOR1225 (42327)	Svan S30A (10818)	-26.0 dB	-26.1 dB	0.1 dB

3.1.7 The weather conditions were noted to be as outlined in **Table 5** during the site visits at the start and end of the monitoring periods.

Table 5: Summary of weather conditions noted at the start and end of the monitoring duration.

	25th May 2022	8th February 2023
Roads (Wet / Dry)	Dry	Dry
Temperature (˚C)	8	7
Wind speed (ms^{-1})	Up to 4.1 (gusts) from W	Up to 2.4 (gusts) from SW
Cloud Cover (Approx. %)	100	40
Humidity (%)	83	76

3.1.8 A-weighted[3] L_{eq}[4] and L_{AMax}[5] noise levels were measured to comply with the requirements of BS 8233:2014 and BS 4142:2014. A-weighted L_{90}[6] were also measured to provide additional information. The measured noise levels are set out in full in Appendix B.

3.1.9 Attending the development site at the start and end of the survey monitoring period provided opportunity for observations and detailed notes to be made of the significant noise sources which contribute to each of the measured levels.

[2] BS7445-2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.
[3] An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[4] Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.
[5] The instantaneous maximum noise level recorded for a measurement period.
[6] The noise level which is exceeded for 90% of the measurement period.

ML1

Local Road Traffic Noise: Non-descript/ anonymous road traffic noise was noted to be dominant at ML1 at a relatively low level.

Noise Breakout from Public House Patrons: noise breakout from the patrons of the public house located to the north of the development site was noted on Friday 3rd February during the late evening hours. Patrons aggregate within a smoking area to the rear of the public house, it was noted that around 8-10 patrons at any one time may use the smoking area.

3.2 Overall Measured Sound Levels – Noise Monitoring (ML1)

3.2.1 Data is shown in **Figure 4** detailing a level vs. time graph of the recorded L_{Amax}, L_{Aeq} and L_{A90} sound level over 15-minute time periods for ML1.

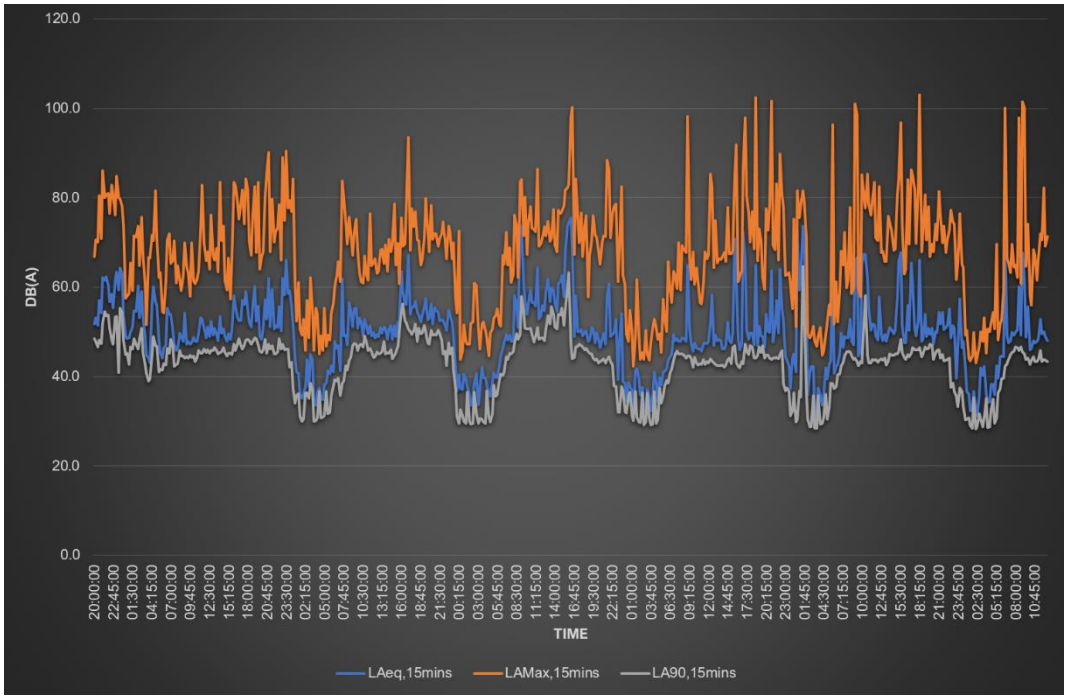


Figure 4: Level vs. time graph showing L_{Amax}, L_{Aeq} and L_{A90} sound levels – ML1.

3.2.2 The results for monitoring location ML1 during the daytime and night-time periods are presented in **Table 6**.

Table 6: Average Measured Daytime and Night-time Noise Levels				
Monitoring Location	**Time**	**Measured Noise Level**		
		dB $L_{Aeq,16hour}$ / dB $L_{Aeq,8hour}$	**dB $L_{Aeq,1hour}$ / dB $L_{Aeq,15mins}$**	**dB $L_{A90,1hour}$ / dB $L_{A90,15mins}$**
ML1	07:00-23:00	53.4 – 64.2*	46.6 – 72.5	38.3 – 55.4
	23:00-07:00	42.7 – 62.4	31.1 – 73.6	28.3 – 64.7
* 16 hour time period (note that some measurements were not made over the entire period, however an appropriate proportion of this period was included such that a typical / conservative noise climate was derived).				

3.2.3 The maximum noise level exceeded more than 10 times in one night-time period is summarised in **Table 7**.

Table 7: Summary of the Maximum Noise Level Exceeded More than 10 Times in One Night-time Period (Figures in dB L_{Amax}).	
Monitoring Location	**Maximum Noise Level (dB)**
ML1	72

3.3 Measured Sound Levels – Public House Patron Noise

3.3.1 ML1 was positioned to be in direct line of sight with the smoking area which was observed to be in use on 3rd February 2023.

3.3.2 **Figure 5** shows a line graph of the measured sound levels for Friday night.

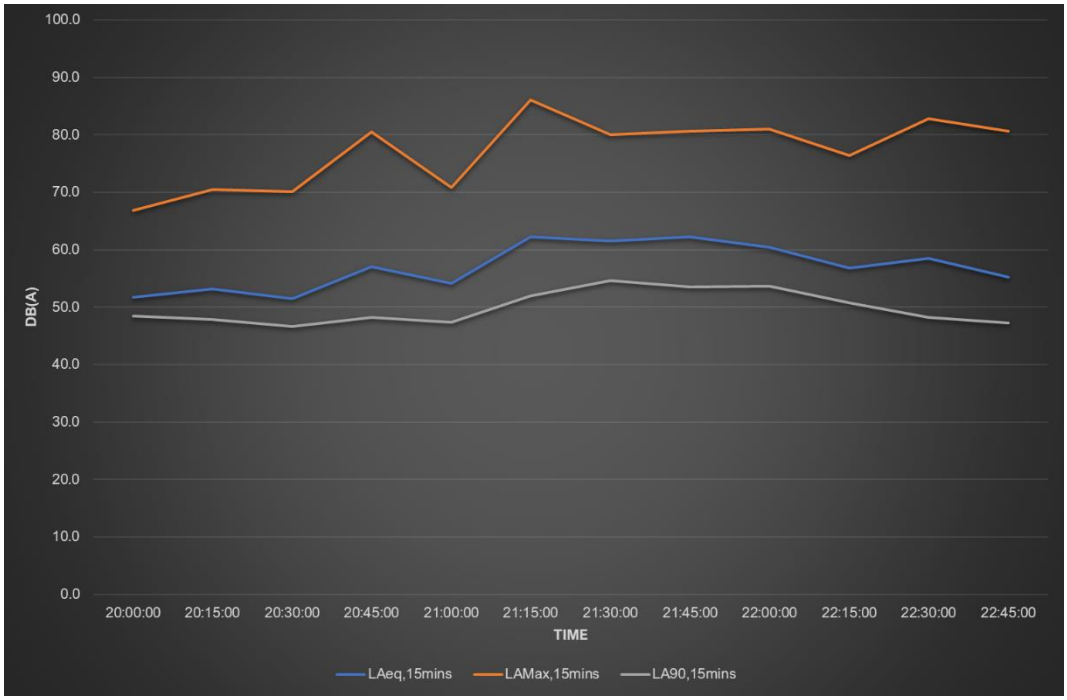


Figure 5: Level vs. time graph showing L_{Amax}, L_{Aeq} and L_{A90} sound levels – Friday Night.

3.3.3 The noise measurement results are presented in **Table 8** below.

Table 8: Public House Patron Noise Measurements – Rear Smoking Area		
Monitoring Location	**Time**	**Measured Noise Level**
		dB $L_{Aeq,15mins}$
ML1	20:00 – 23:00	51.5 – 62.3

4 BS 8233:2014 ASSESSMENT

4.1 Assessment of Noise Levels in Living Rooms and Bedrooms – Windows Closed

4.1.1 The measured noise levels at the façades of the proposed building structure, as detailed in **Table 6** and **Table 7** for the daytime and night-time period, together with the level of attenuation required in accordance with BS 8233: 2014, are presented in **Table 9**.

4.1.2 It is noted that at certain times the dominant source of noise incident on the development site building façade is likely to have distinguishable character and therefore the BS 8233:2014 target internal noise levels have been reduced by 5 dB(A) in each scenario case.

Table 9: Level of Attenuation Required to Achieve the Internal Noise Guideline Levels.

Façade	Daytime ($L_{Aeq,16hours}$) / Night-Time ($L_{Aeq,8hours}$ / L_{Amax})	Worst Case Noise Level at the Façade of the Property (dB(A))	BS 8233:2014 Target Internal Level (dB(A)) – With Additional 5 dB(A) Reduction for Noise with Distinguishable Characteristics	Worst Case Level of Attenuation Required (dB(A))
All/ Worst Case	Daytime $L_{Aeq,16hours}$	64	30	34
	Night-Time $L_{Aeq,8hours}$	62	25	37
	Night-Time L_{Amax}	72	40	32

4.2 Assessment of Noise Levels in Living Rooms and Bedrooms – Windows Partially Open

4.2.1 The building façade attenuation requirements outlined in TABLE are based on windows being in the closed position, with windows in the partially open position the building façade attenuation will likely be up to 15 dB(A).

4.2.2 Given the magnitude of exceedance outlined being greater than 15 dB(A) this is indicative that windows are likely to have to remain in the closed position to achieve acceptable average noise levels over the course of a typical 16 hour daytime period. The same can be said for a typical 8 hour night-time period.

4.2.3 It should be noted that that the aforementioned is based on complete day/ night average noise levels, however the general noise climate is dynamic in nature and therefore discrete periods may fall below the guideline threshold values discussed.

4.2.4 A more detailed analyses of the data therefore indicates that during the daytime hours the internal noise levels are likely to exceed the BS 8233:2014 threshold values for 74% of the

time therefore the remaining 26% of the time residents are likely to be able to partially open their windows and achieve acceptable internal sound levels. This assessment calculation has been undertaken based on $L_{Aeq,1hour}$ measurements.

4.2.5 During the night-time hours we calculate that residents are likely to be able to partially open their window for up to 79% of the time and achieve acceptable internal noise levels. This assessment calculation has been undertaken based on $L_{Aeq,15min}$ measurements.

5 SOUND INSULATION SCHEME

5.1 Building Envelope Requirements – Windows Closed

5.1.1 Proposals for the development site at the time of writing outline residential use to all floors.

5.1.2 Noise sensitive rooms are proposed to all facades of the property. Therefore, internal noise levels are required to not exceed 35 dB L_{Aeq} during the daytime hours in all rooms and 30 dB L_{Aeq} and 45 dB L_{Amax} during the night-time hours in bedrooms. As discussed in Section 5 however, an additional 5 dB(A) constraint has been applied to the sound insulation requirements in order to account for noise with distinguishable characteristics.

5.1.3 When assessing sound levels in habitable areas of the proposed development, the sound attenuation provided by the overall building facade should be considered. To mitigate sound levels, the composition of the building facade can be designed to provide the level of attenuation required. Glazing is generally the building element which attenuates noise the least, so the proportion of glazing in a building facade is an important consideration when assessing overall sound attenuation. Additionally, any façade penetrations should also be considered such as for ventilation i.e., trickle ventilation.

5.1.4 Based on the design details forwarded, worst case façade attenuation calculations have been undertaken in accordance with BS EN ISO 12354-3:2017.

5.1.5 Calculations show that to achieve a reasonable internal acoustic environment in habitable rooms as specified within BS 8233:2014, the building envelope constructions should be selected to meet the sound reduction index (SRI) values presented in **Table 10**.

Table 10: Building Envelope Requirements

Façade	Room Type	Estimated Building Façade Requirements[1]
All	Bedroom	Window – 41 dB R_w+C_{tr}[2]
	Living / Dining Room	Window – 41 dB R_w+C_{tr}[2]

[1] Wall construction assumed to be not less than 50 dB R_w+C_{tr}, roof construction assumed to be not less than 47 dB R_w+C_{tr}. Calculations have been conducted in accordance with BS EN ISO 12354-3:2017 methodology.
[2] Window area assumed to be not more than 3.0 m^2 per room.

5.1.6 **Table 11** below outlines typical examples for the building elements considered in **Table 10**. It should be noted that the typical examples presented in **Table 11** are for information only and specialist manufacturer design/ advice should be sought. Alternative options to those

outlined in **Table 11** can be considered however the performance criteria should be confirmed.

Table 11: Summary Examples of Building Envelope Performance Elements.		
Walls	50 R_w+C_{tr}	Typical Example: Concrete/ Brick exterior wall with min. 100 mm insulated (60 kg / m3 rockwool) cavity constructed with timber studwork and resilient bars with min. 10 mm plasterboard lining.
Glazing	41 R_w+C_{tr}	Typical Example: Double glazed unit with laminated pane of 8.8 mm – 20 mm argon filled cavity – pane of 12.8 mm Pilkington Optiphon.

5.1.7 The glazing element typical examples outlined in **Table 11** are based on the performance of the glazing panes only, advice should be sought from the manufacturer at detailed design stage to ensure that the window framing does not undermine the overall performance requirement recommended in **Table 10**.

5.1.8 Building envelope performance elements outlined in **Table 10** and **Table 11** are based on the information provided at the time of writing and assumptions based on typical requirements for such projects. The building envelope final design should be confirmed through detailed design at the appropriate stage including the consultation of specialist manufacturers to confirm individual building element performance.

5.2 Acoustic Ventilation Requirements

5.2.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations 2000 Approved Document F1 Means of Ventilation and British Standard BS5925 1991: “Code of Practice for Ventilation Principles and Designing for Natural Ventilation”. Acoustic ventilation is only recommended for noise sensitive rooms, which are bedrooms and living/dining rooms.

5.2.2 The implementation of the recommended glazing together with appropriate acoustic ventilation would ensure that the required internal daytime and night-time noise limits are achieved.

5.2.3 It should be further noted that the glazing and ventilation configurations within this report are for guidance only. Similar products to those used in NoiseAir calculations may achieve a similar level of sound reduction however this should be verified by the manufacturer.

5.2.4 Given the character of noise observed at the development site, the noise levels measured and the observation that all habitable room windows are located on the façade overlooking the public house rear patron area, while the measured noise levels are not considered

particularly elevated, we however recommend that an active ventilation system, such as mechanical ventilation with heat recovery, is installed to all habitable rooms.

5.2.5 Where a mechanical ventilation system is installed within habitable rooms at the development site, the cumulative ambient noise breakout within any room should not exceed NR25.

6 CONCLUSIONS

6.1.1 NoiseAir has carried out a noise impact assessment with respect to the proposed residential development to be located at The Old Bakehouse, Hornsea HU18 1BQ.

6.1.2 Proposals for the development site outline the renovation of the existing building structure to form two one bedroom self contained apartments over three floors.

6.1.3 Predominant noise sources identified at the development site consist of general ambient non-descript traffic noise and, at certain times, patron noise breakout from the adjacent public house.

6.1.4 A noise impact assessment has been undertaken in accordance with BS 8233:2014. Given the observation that noise levels incident at the development site building façade are likely to be distinguishable, the sound insulation calculations contained within this report are based on additional 5 dB(A) target level above those normally recommended within BS 8233:2014.

6.1.5 During the daytime hours the internal noise levels are likely to remain below the BS 8233:2014 recommended threshold for 26% of the time with windows partially open. During the night-time hours we calculate that residents are likely to be able to partially open their window for up to 79% of the time and achieve acceptable internal noise levels.

6.1.6 Sound insulation requirements are presented within Section 6 of this report. The recommended glazing specification should achieve not less than 41 R_w+C_{tr}. This is based on an active ventilation system being implemented at the development site such as mechanical ventilation with heat recovery.

APPENDIX A - REPORT LIMITATIONS

This Report is presented to Frontier Modular Services Limited and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this report.

Notwithstanding anything to the contrary contained in the report, NoiseAir Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Frontier Modular Services Limited and NoiseAir shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by NoiseAir Limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from who it has been requested and that such information is accurate. Information obtained by NoiseAir Limited has not been independently verified by NoiseAir Limited unless otherwise stated in the report and should be treated accordingly.

Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

Where / if estimates and projects are made within this report, are made based on reasonable assumptions as of the date of this report, such statements however by their very nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. NoiseAir Limited specifically does not guarantee or warrant any estimates or projects contained in this report.

DISCLAIMER- This report was prepared by NoiseAir Limited. The material in it contains NoiseAir Limited best judgment in light of the information available at the time of preparation of this report. Any use which a third party makes of this report, or any reliance on, or decisions based on it are the responsibility of such third parties. NoiseAir Limited accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

APPENDIX B - GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. *NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.*
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. *NOTE: The ambient sound comprises the residual sound and the specific sound when present.*
Ambient sound level, $L_a = L_{Aeq,T}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T *NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.*
Background sound	Underlying level of sound over a period, *T*, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) to provide a weighting against low frequency performance. *NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.*
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.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m2), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. *NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.*
Free-field level	Sound pressure level away from reflecting surfaces. *NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.*

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
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. *NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.*
Measurement time interval, T_m (BS4142:2014)	Total time over which measurements are taken. *NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*
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.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. *NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.*
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.
Reference time interval, T_r (BS4142:2014)	Specified interval over which the specific sound level is determined. *NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.*
Residual sound (BS4142:2014)	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, $L_r = L_{Aeq,T}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
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. *NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.*
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 exposure level, *L*AE	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, *D*	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
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).
Sound reduction index, *R*	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Specific sound source (BS4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. *NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.*
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. *NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.*
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. *NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).*
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tr}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$LAeq,T$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)

NoiseAir Limited

Specialist acoustic and air quality engineers providing a fast, professional, cost-effective service for all types of Acoustic Consultancy services across the UK.

Over 25 years of experience in the field.

Contact us now for a free, no obligation quote or to discuss your requirements.

NOISEAIR LIMITED, THE COUNTING HOUSE, HIGH STREET,
LUTTERWORTH. LE17 4AY

TEL. 0116 272 5908

EMAIL. INFO@NOISEAIR.CO.UK

WWW.NOISEAIR.CO.UK

NoiseAir
ACOUSTICS & AIR QUALITY