Noise Assessment

16 Lord Street, Wrexham

July 2024

www.phlorum.com

Noise Assessment

16 Lord Street, Wrexham

November 2024

Wrexham Property Holdings

Document Control:

Project No.	Project
13028A	16 Lord Street, Wrexham - Noise Assessment

Report No.	Ver/rev	Written By:	Checked By:	Authorised By:	Date
13028A	V0 Draft	R. Peirce	M. Batchelor	J. Ferguson-Moore	19/07/2024
	V1				15/11/2024

Phlorum Limited

Southern Office: Unit 12, Hunns Mere Way, Woodingdean, Brighton, East Sussex, BN2 6AH

T: 01273 307 167 E: info@phlorum.com W: www.phlorum.com

Contents

Figures:

Appendices

1. Introduction

Client & Project

1.1 Phlorum Limited have been instructed by Wrexham Property Holdings, on behalf of John D. Wood and Leith Planning Limited, to undertake a Noise Assessment for a residential development at 16 Lord Street, Wrexham. The application is for a residential development on the Ground, 1st , 2nd and 3rd floors consisting of nine 2-bed apartments and thirteen 1-bed apartments.

1.2 The noise climate at the site has been established by direct measurement and the suitability of the site for the proposed development considered against national and local planning policy, and guidelines on noise. Where necessary, mitigation measures have been recommended so that a noise climate suitable for the proposed development can be achieved.

1.3 Whilst reasonable efforts have been made to produce a report that is easy to understand, it is technical in nature. To assist the reader, an introduction to noise, and an explanation of the terminology used in this report are contained in Appendix A.

2. Site Description

Site Description

2.1 The proposed residential development is in a mixed commercial/residential area in the city centre of Wrexham. It was observed that Duke Street, that passes the north-west elevation of the building, is a busy road with a steady flow of traffic, including buses from the nearby bus depot and pedestrians. There is car parking and commercial properties to the rear of the site. The front of 16 Lord Street is a pedestrianised area.

2.2 The dominant noise sources at all measurement locations were observed to be from road traffic. At street level, there is a significant contribution from pedestrians, especially from groups congregating outside of the front of the building.

2.3 The noise measurement locations are shown on the 'Site Location Plan' in Figure 1 and proposed layout plans for each floor are shown in Figure 2.

3. Guidance

Summary of Guidance for Residential Development

3.1 The advice provided in Technical Advice Note:11 Noise, published in 1997 is now 27 years old and references to other more recent guidance should also be considered for residential noise assessments in Wales. For residential development the guidance in ProPG Planning and Noise and BS8233:2014 has been considered in this noise assessment and the following noise criteria applies:

- Bedrooms - 30dB $L_{Aeq,8hr}$ (23:00 to 07:00 hours);
- Living rooms - 35dB $L_{Aeq,16hr}$ (07:00 to 23:00 hours); and
- All habitable rooms - 45dB L_{Amax} (not to be exceeded more than ten times per night).

National Planning Policy Framework in Wales

3.2 The Well-being of Future Generations (Wales) Act 2015 (WFGA) requires that noise and soundscape management through planning decisions should be carried out by:

- Pursuing long-term, enduring solutions to any existing instances of noise nuisance;
- Seeking to manage noise and soundscapes at the same time as achieving other, related outcomes;
- Keeping exposure to noise (that is, unwanted or harmful sound) as low as reasonably practicable across the whole of the population, looking out in particular for areas where noise levels might qualify as a statutory nuisance or noise action planning priority area, or where public amenity might be adversely affected by noise at some point in the future, and acting pre-emptively to prevent these things happening.

3.3 Planning Policy Wales, edition 10 (PPW) considers that soundscape and noise are factors that should affect initial policy choices when preparing development plans and, similarly, they must feature as considerations in the initial choice of location of development, where appropriate, and in the early design stages of developments and projects.

3.4 Technical Advice Note: 11 Noise (TAN 11) was published in 1997 and it is advised that other more recent guidance should be considered, where appropriate. The annexes of Tan 11 set out noise exposure categories for dwellings; noise assessments from different sources and noise planning conditions.

ProPG

3.5 *Professional Practice Guidance on Planning and Noise* (ProPG) was released in May 2017. A joint publication by the Chartered Institute of Environmental Health, the Institute of Acoustics, and the Association of Noise Consultants, the document sets out a recommended approach for the management of noise within the planning system in England.

3.6 ProPG sets out a two-stage risk based approach for new residential development:

- **Stage 1**: initial noise risk assessment of the proposed development;
- **Stage 2**: a systematic consideration of four key elements:
  - Element 1: demonstrating a 'Good Acoustic Design Process';
  - Element 2: observing internal 'Noise Level Guidelines';
  - Element 3: undertaking an 'External Amenity Area Noise Assessment'; and
  - Element 4: consideration of 'Other Relevant Issues'.

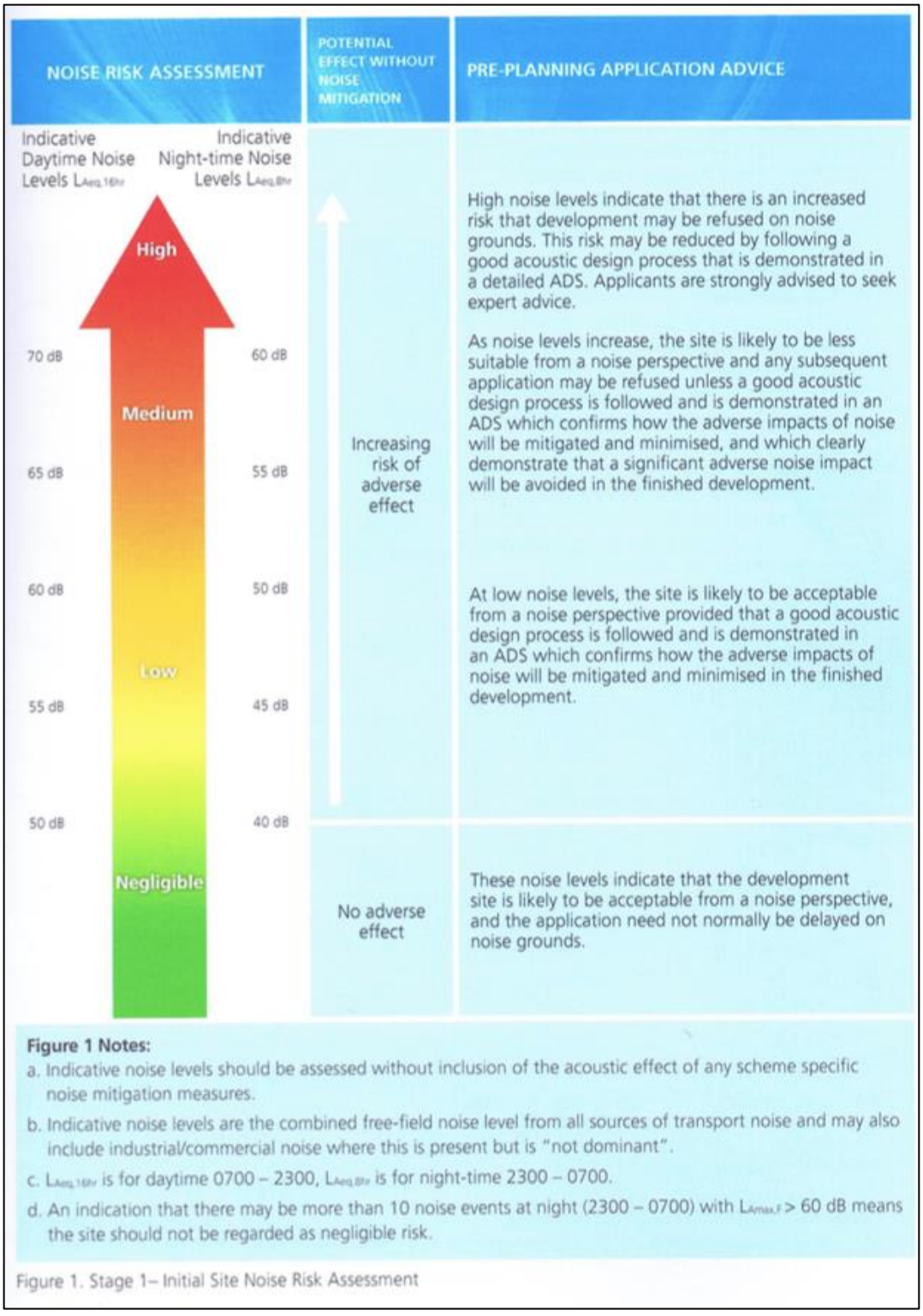
3.7 The Stage 1 initial noise risk assessment should provide an indication of the likely risk of adverse effects from noise should no mitigation be included as part of the development proposals.

3.8 ProPG provides an illustrative noise risk scale, derived from current guidelines values and experience. The scale suggests that the risks are negligible where noise levels are below 50dB L_{Aeq} during the daytime and 40dB L_{Aeq} during the night-time. The scale suggests that a site would start to tend from a medium to a high risk when noise levels are above approximately 70dB L_{Aeq} during the daytime and above approximately 60dB L_{Aeq} during the night-time. Between these values, the level of risk increases through low to medium as noise levels increase. These values are all stated as indicative in the ProPG.

3.9 The ProPG states that this initial noise risk assessment is intended to support wider Government planning and noise policies and guidance, i.e. the NPPF, NPSE and PPG-Noise.

3.10 Figure 1 of the ProPG, which is replicated here as Figure 3, presents the risk hierarchy, with indicative noise levels that broadly equate to the different risk categories.

Figure 3: ProPG Stage 1 Risk Assessment



3.11 The Stage 2 full assessment should consider good acoustic design, internal noise levels, external amenity area noise levels, and assessment of any other issues.

3.12 The ProPG states that good acoustic design should consider factors such as reducing noise at source, site layouts, and building orientation. Solely relying on the sound insulation of building fabric to achieve acceptable acoustic conditions is not considered good acoustic design. Noise control measures should be considered against other requirements, such as ventilation, fire regulation and cost.

3.13 The ProPG refers to the criteria set out in BS8233: 2014 and the World Health Organisation's *Guidelines for Community Noise* for internal noise levels and noise levels in external amenity areas. The ProPG notes that internal noise levels should always be considered alongside requirements for ventilation and overheating. Note 5 under Figure 2 in the ProPG, which sets out the internal noise level guidelines replicated from BS8233: 2014 and the WHO guidelines, states:

"Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7."

3.14 It is clear that the internal noise guidelines should be met for *'whole dwelling ventilation'* conditions, which are effectively background ventilation. 'Whole dwelling ventilation' is defined in Approved Document F of the Building Regulations 2010.

3.15 Note 7 under Figure 2 of the ProPG states:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

3.16 The ProPG allows for the relaxation of the internal guideline noise levels by up to 5dB and the internal noise levels would still be regarded as reasonable.

3.17 For *'purge ventilation'* conditions, the ProPG does not specify internal noise criteria, stating at paragraph 2.35:

"It should also be noted that the internal noise level guidelines are generally not applicable under "purge ventilation" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food)."

3.18 For thermal control, i.e. overheating conditions, ProPG states that the potential noise levels should be assessed, stating at paragraph 2.38:

"Where mechanical services are used as part of the ventilation or thermal comfort strategy for the scheme, the impact of noise generated by these systems on occupants should also be assessed."

3.19 The ProPG goes on to state in paragraph 2.72(h):

"Reasonable steps should be taken to minimise overheating during summer months through good design. Where openable windows / ventilators are proposed to mitigate overheating and where the internal noise level guidelines are likely to be exceeded when they are open a more detailed assessment of the potential impact on occupants during the overheating condition should be provided in the ADS. This more detailed assessment may include: (i) the alternative design measures considered / applied to reduce noise impact on occupants, (ii) the expected internal noise levels when windows / ventilators are opened to provide relief from overheating, and (iii) an estimate of the amount of time that windows are likely to be open to provide relief from overheating."

3.20 Consideration of overheating issues is outside the scope of this noise assessment. However, it is clear that while the ProPG does require internal noise levels to be considered under thermal control conditions, no internal noise criteria are applied.

3.21 The ProPG states that other relevant issues include compliance with relevant national and local policies, magnitude of compliance with the ProPG itself, the likely occupants of the development, acoustic design against unintended adverse consequences and acoustic design against wider planning objectives.

British Standard 8233

3.22 The scope of British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

3.23 BS8233: 2014 suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3.2.

Table 3.2: BS8233 Recommended Internal Noise Levels, dB

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

3.24 BS8233 contains the following relevant guidance in footnotes to the above information:

"Note 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. [...]

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

3.25 Although Note 4 above refers to setting a guideline value for maximum noise levels, BS8233: 2014 does not provide any guidance on a suitable criterion.

3.26 Placing the BS8233: 2014 guidance into the context required by the NPPF and the NPSE, it is considered that where the internal noise levels meet the guideline values set out in Table 3.2, there is considered to be no observed effect.

3.27 Since BS8233: 2014 allows for a 5dB relaxation in the guideline values in Table 3.2 (Note 7 above), it is considered that internal noise levels up to 5dB above the guideline values in Table 3.2 may still be acceptable.

3.28 Section 7.7.3.2 of BS8233, titled Design criteria for external noise states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB LAeq,T, with

an upper guideline value of 55dB LAeq,T which would be acceptable in noisier environments."

3.29 BS8233: 2014 goes on to note that the upper guideline value may be exceeded in certain circumstances:

"However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

3.30 Achieving the lowest practicable noise levels in gardens is deemed acceptable in BS8233: 2014 in circumstances where development is needed in areas where the upper 55dB limit cannot be achieved.

3.31 As BS8233: 2014 states that it is desirable that garden noise levels do not exceed 50dB $L_{Aeq,T}$, this implies some adverse effect above this level. Therefore, an external daytime noise level of 50dB $L_{Aeq,16hrs}$ can be defined as the Lowest Observed Adverse Effect Level (LOAEL).

3.32 However, it would not be appropriate to equate the 55dB criterion with the Significant Observed Adverse Effect Level (SOAEL), since it is clear from BS8233: 2014 that 55dB is not a threshold that should never be exceeded. Equating the 55dB criterion to the SOAEL would mean that, in national policy terms, exceeding this threshold should be avoided, which is not what the standard requires.

World Health Organisation

3.33 The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The guidance on internal and external noise levels is the same as set out in BS8233: 2014 in terms of L_{Aeq} values, but the WHO guidelines also provide guidance on night-time maximum noise levels, stating:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAFmax more than 10-15 times per night."

3.34 The WHO guidelines suggest the possibility of sleep disturbance if continuous noise in bedrooms exceeds 30dB $L_{Aeq.8hrs}$ during the night-time, and therefore internal noise levels above this value can be considered to be above the LOAEL. This internal value can be translated to an external value by the addition of 10dB, to account for the typical reduction through an open window. Therefore, external night-time noise levels of 40dB $L_{Aeq,8hrs}$ can be defined as the LOAEL.

3.35 The WHO published their *Night Noise Guidelines for Europe* in 2009. This document sets an external 'night noise guideline' (NNG) of 40dB. This is consistent with the LOAEL value determined above. The NNG also sets an interim target of 55dB in situation where the 40dB value cannot be met. Above 55dB the NNG notes that the situation is considered increasingly dangerous for public health. On the basis of the above, a free-field external value of 55dB $L_{Aeq,8hrs}$ is considered to be the night-time SOAEL.

3.36 Based on the above guidance from BS8233:2014 and the WHO guidelines the LOAEL and SOAEL for the site in the day and night-time periods along with comments on these noise effects are shown in Table 3.3.

Table 3.3: LOAEL and SOAEL for the Site

Effect	Daytime $L_{Aeq,16hrs}$ (dB)	Night-time $L_{Aeq,8hrs}$ (dB)	Comments
No Observed Effect	<50	<40	The parts of the site that have noise levels below these values are considered acceptable for residential development without the need for further mitigation
LOAEL	**50**	**40**	
Observed Adverse Effect	50-55	40-45	Although the parts of the site that have noise levels between these values are above the LOAEL, BS8233 suggests that they would be acceptable.
	55-63	45-55	The parts of the site that have noise levels between these values are above the LOAEL, and are considered acceptable for residential development, although mitigation may be required.
SOAEL	**63**	**55**	
Significant Observed Adverse Effect	63-72	55-66	The parts of the site that have noise levels between these values are above the SOAEL but below the point at which an unacceptable adverse effect occurs. Planning policy states that Significant

Effect	Daytime $L_{Aeq,16hrs}$ (dB)	Night-time $L_{Aeq,8hrs}$ (dB)	Comments
			Adverse Effects should be avoided and the Noise PPG states that the planning process should be used to do this by use of appropriate mitigation.
Unacceptable Adverse Effect	>72	>66	The noise PPG states that this situation should be prevented; however, no indication is given of how to do this.
Notes: (1): Below these ranges adverse comment is not expected. (2): Above these ranges adverse comment is very likely.			

3.37 It is considered that the above values can also be related to the levels of risk described in the ProPG:

- noise levels below the LOAEL, i.e. below 50dB $L_{Aeq,16hrs}$ during the daytime and below 40dB $L_{Aeq,8hrs}$ during the night-time, are considered to be a negligible risk;
- noise levels above the LOAEL but below the SOAEL, i.e. between 50dB $L_{Aeq,16hrs}$ and 63dB $L_{Aeq,16hrs}$ during the daytime and between 40dB $L_{Aeq,8hrs}$ and 55dB $L_{Aeq,8hrs}$ during the night-time, are considered to range from a low to medium risk;
- noise levels above 63dB $L_{Aeq,16hrs}$ i.e. the SOAEL, but below 72dB $L_{Aeq,16hrs}$ during the daytime, and above 55dB $L_{Aeq,8hrs}$, i.e. the SOAEL, but below 66dB $L_{Aeq,8hrs}$ during the night-time, are considered to range from a medium to high risk; and
- noise levels that result in an unacceptable adverse effect, i.e. above 72dB $L_{Aeq,16hrs}$ during the daytime and above 66dB $L_{Aeq,8hrs}$ during the night-time, are considered to be a high risk.

3.38 The lower and upper ends of these ranges, representing negligible and high risks respectively, accord with the advice set out the ProPG.

4. Environmental Surveys

Noise

4.1 A noise survey was undertaken to establish typical sound levels at the site. The measurements were taken over a day and night-time period starting at 14:15 hours on Wednesday 10th July 2024 to provide the day and night-time noise levels at the site.

4.2 The survey methods and results are set out below.

Sound Survey Method

4.3 The equipment used during the survey is summarised in Appendix B. The sound level meters were field calibrated immediately before and after the measurements using the listed acoustic calibrator. No significant calibration drifts were found to have occurred.

4.4 The sound level meters have been laboratory-calibrated to a traceable standard within the two years preceding the survey. The acoustic calibrator had been laboratory-calibrated to a traceable standard within the year preceding the survey.

4.5 The proposal is for a residential development on the Ground, 1st , 2nd and 3rd floors consisting of nine 2-bed apartments and thirteen 1-bed apartments. Based on site observations, and considering the security of the equipment, it was considered that the best option was to measure the noise at 2nd floor level.

4.6 Noise measurements were carried out at three long term locations. The measurement locations are described as follows:

- Position 1 - The microphone was located 1m from the rear façade at 2nd floor level overlooking a car parking area with commercial properties on the far side of the parked cars.
- Position 2 - The microphone was located 1m from the side façade at 2nd floor level overlooking Duke Street, the bus depot and the pedestrianised area at the front of 16 Lord Street.
- Position 3 - The microphone was located 1m from the side/front façade at 2nd floor level overlooking the pedestrianised Lord Street and Egerton Street access road, which is a no through road.

Sound Survey Results

4.7 The weather during the survey was suitable for noise measurement, it being dry with wind speeds of less than 5m/s.

4.8 At sites 1 and 2, the noise was dominated by traffic on Duke Street and Regent Street with a contribution from the bus depot. At site 3, the noise was dominated by pedestrians and distant road traffic.

4.9 The sound survey results are summarised in Table 4.1, aggregated across the daytime and night-time periods. Full survey results are set out graphically in Appendix C.

Table 4.1 Summary of Measured Façade Sound Levels, dB

Measurement Position	Date	Period	Duration, T	$L_{Aeq,T}$	L_{AFmax}	$L_{A10,T}$	$L_{A90,T}$
1	10/11 July 2024	Day	16 hours	57.3	74.3	58.7	52.6
		Night	8 hours	52.8	71.2	52.5	43.2
2		Day	16 hours	65.5	83.2	67.0	57.6
		Night	8 hours	58.8	74.6	56.1	41.8
3		Day	16 hours	56.8	70.0	56.6	49.1
		Night	8 hours	53.1	69.6	51.9	39.7

Note: (1) – The $L_{A90,T}$, L_{Amax} and $L_{A10,T}$ and values are the arithmetic means of the $L_{A90,T}$, L_{Amax} and $L_{A10,T}$ measurements for each period.

4.10 The measured 2nd floor facade noise levels have been corrected by subtracting 3 dB to provide free-field noise levels. The following corrected free field noise levels have been used in the noise assessment:

- Daytime Noise Level – Position 1 $L_{Aeq,16\ hr}$ 54 dB, Position 2 $L_{Aeq,16\ hr}$ 63 dB, Position 3 $L_{Aeq,16\ hr}$ 54 dB
- Night-time noise level – Position 1 $L_{Aeq,8\ hr}$ 50 dB, Position 2 $L_{Aeq,8\ hr}$ 56 dB, Position 3 $L_{Aeq,8\ hr}$ 50 dB
- 10th highest maximum noise level at night – Position 1 $L_{Amax,f}$ 73 dB, Position 2 $L_{Amax,f}$ 75 dB, Position 3 $L_{Amax,f}$ 70 dB (derived from the measured night-time noise levels shown in Appendix C)

5. Assessment

5.1 The plan showing the three noise measurement locations is shown on Figure 1. At each location the microphone was located 1m in front of the building elevation.

5.2 At Position 1, the corrected free-field daytime value of 54 dB $L_{Aeq,16hr}$ and the night-time value of 50 dB $L_{Aeq,8hr}$ are between the adopted LOAEL and SOAEL and noise levels are considered acceptable for residential development although mitigation may be required.

5.3 At Position 2, the corrected free-field daytime value of 63 dB $L_{Aeq,16h}$ and the night-time value of 56 dB L_{Aeq8hr} are at or just above the adopted SOAEL, and appropriate mitigation is required.

5.4 At Position 3, the corrected free-field the daytime value of 54 dB $L_{Aeq,16h}$ and the night-time value of 50 dB L_{Aeq8hr} are between the adopted LOAEL and SOAEL and noise levels are considered acceptable for residential development although mitigation may be required.

5.5 In terms of the level of noise risk, as described in ProPG, it is considered that overall the site ranges from low to high risk. The site is considered acceptable for residential use, subject to the incorporation of suitable mitigation, which is considered in the next section of this report.

6. Mitigation

6.1 The measured noise levels at 16 Lord Street are either just above SOAEL or between LOAEL and SOAEL so the inclusion of mitigation measures should meet the requirements of WFGA and PPW.

6.2 Consideration has been given to the specification of building materials to control internal noise levels, so that they achieve the following criteria:

- Bedrooms - 30dB $L_{Aeq,8hr}$ (23:00 to 07:00 hours)
- Living rooms - 35dB $L_{Aeq,16hr}$ (07:00 to 23:00 hours)
- All habitable rooms - 45dB L_{Amax} (not to be exceeded more than ten times per night).

6.3 The calculated sound reduction performance requirements apply to the whole external building fabric. However, since windows are typically the weakest link in the external building fabric, in terms of acoustic performance, the values below will particularly apply to the windows.

6.4 Façade noise levels have been used for the sound insulation assessment and include a +3 dB correction to the noise levels used in the ProPG assessment as shown in the noise assessment (section 5). The sound reduction performances required of the external building fabric are shown in Table 6.1, below.

Table 6.1: Required Sound Reduction Performances, dB

Location	Period	Target Noise Level	Facade Noise Level	Required Sound Reduction Performance
Position 1	Day	35dB LAeq,16hrs	57	22
	Night	30dB LAeq,8hrs	53	23
	Night	45dB LAFmax	76	31
Position 2	Day	35dB LAeq,16hrs	66	31
	Night	30dB LAeq,8hrs	59	29
	Night	45dB LAFmax	78	33
Position 3	Day	35dB LAeq,16hrs	57	22
	Night	30dB LAeq,8hrs	53	23
	Night	45dB LAFmax	73	28

6.1 Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window, and by extension, the resulting noise levels within the property.

6.2 However, many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates, known as the R_{TRA}.

6.3 It can be seen from Table 6.1 that a sound reduction performance of up to R_{TRA} 31 dB and R_w 33 dB (for maximum noise levels) would be required at Position 2 overlooking Duke Street to achieve the criteria. Acoustic double glazing such as 6mm/16mm argon/8.8mm Pilkington Optiphon provides 34 dB R_{TRA} and 41 dB R_w and provides the required acoustic performance to meet the internal noise targets in BS8233:2014.

6.4 On the front elevation, overlooking Duke Street, the required sound reduction is R_{TRA} 31 dB and this reduces to R_{TRA} 23 dB at the far end of the building overlooking Egerton Street where the glazing specification can be reduced to standard thermal glazing such as 6mm/(6 to 16mm)/4mm construction, which provides R_{TRA} 28 dB and R_w 32 dB.

6.5 For the rear and side elevation overlooking Egerton Street (positions 1 and 3), a sound reduction performance of up to R_{TRA} 23 dB and R_w 31 dB (for maximum noise levels) would be required. Standard thermal glazing such as 6mm(6-16mm)/4mm would provide the required acoustic performance to meet the internal noise targets in BS8233:2014

6.6 It is noted that the sound reduction performances stated as achievable by the identified glazing units are based on laboratory tests. In practice, the actual on-site performance may be lower, depending on the quality of the fitting. The sound reduction performances in Table 6.1 should be interpreted as in-situ sound reduction performances.

6.7 Glazing units other than those suggested may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis demonstrates that a design solution is feasible at the site for the purposes of a planning application. Further detailed calculations may be necessary to inform glazing procurement decisions.

6.8 Internal noise levels should be considered in the context of room ventilation and overheating requirements. As the sound reduction performance requirements are greater than 10dB, the windows will need to be closed to achieve the internal noise criteria. However, the windows should be openable so that the choice of opening or closing windows is with the occupants. Therefore, an alternative form of ventilation and/or cooling will be required so that occupants can retain access to fresh air and retain thermal comfort without compromising their noise climate. The ventilation and/or cooling system chosen should be designed so that it does not compromise the sound insulation performance of the building fabric.

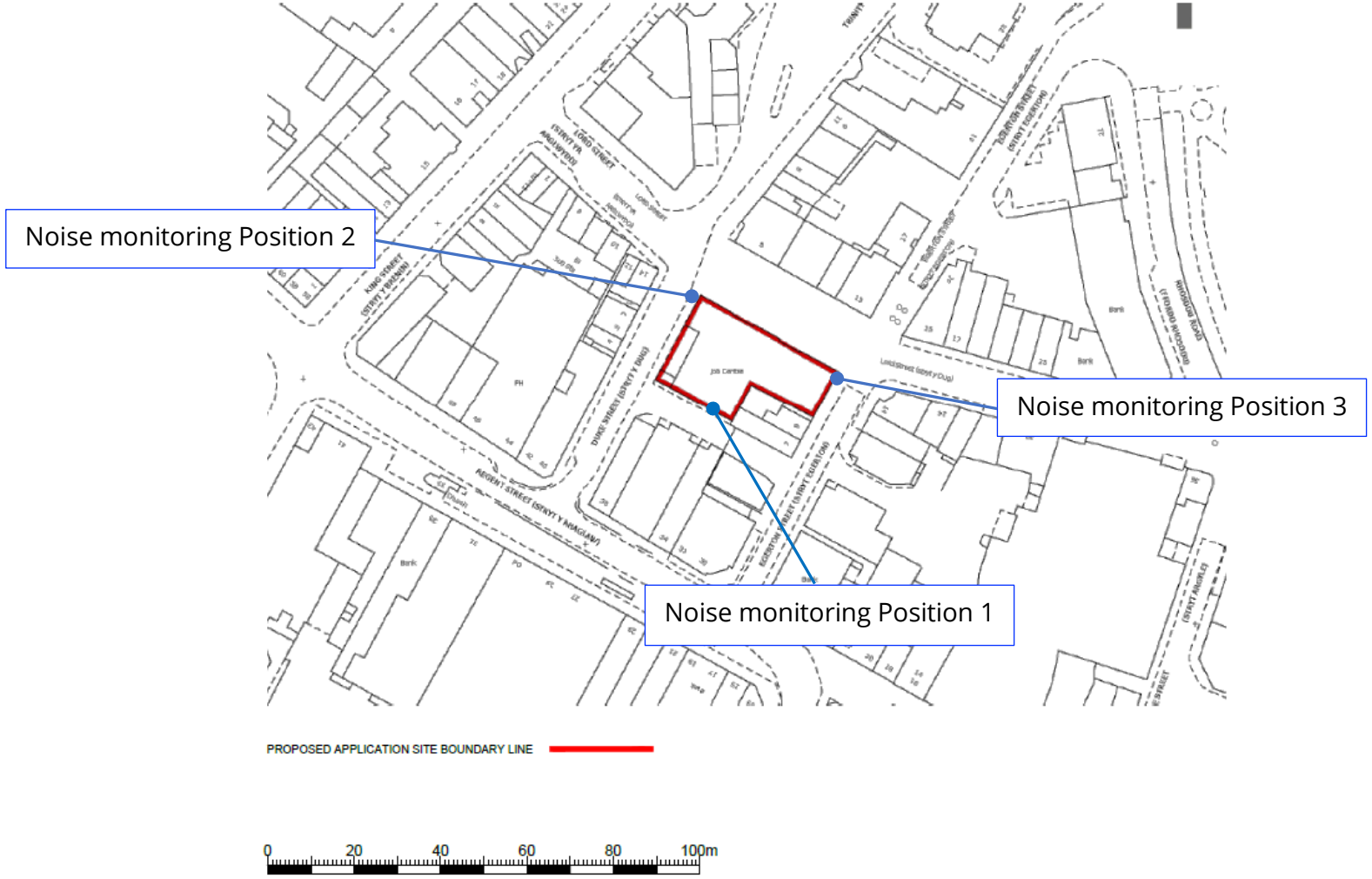
7. Conclusion

7.1 Phlorum Limited have been instructed by Wrexham Property Holdings, on behalf of John D. Wood and Leith Planning Limited, to undertake a Noise Assessment for a residential development at 16 Lord Street, Wrexham. The application is for a residential development on the Ground, 1st , 2nd and 3rd floors consisting of nine 2-bed apartments and thirteen 1-bed apartments.

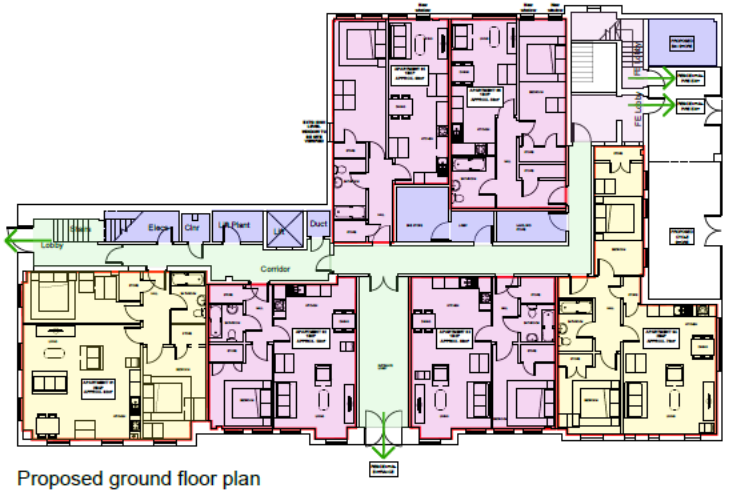
7.2 The noise assessment indicates that, with appropriate noise mitigation measures the internal noise targets within the residential properties will be achieved.

7.3 On the basis of this noise assessment, it is considered that noise does not pose a constraint to the Proposed Development.

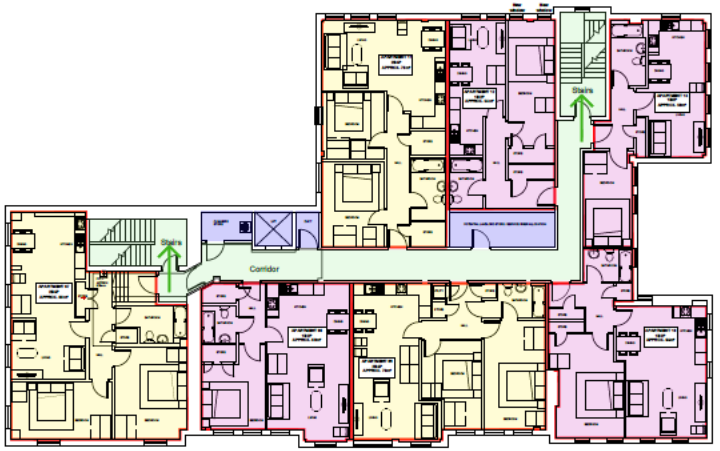
Figures



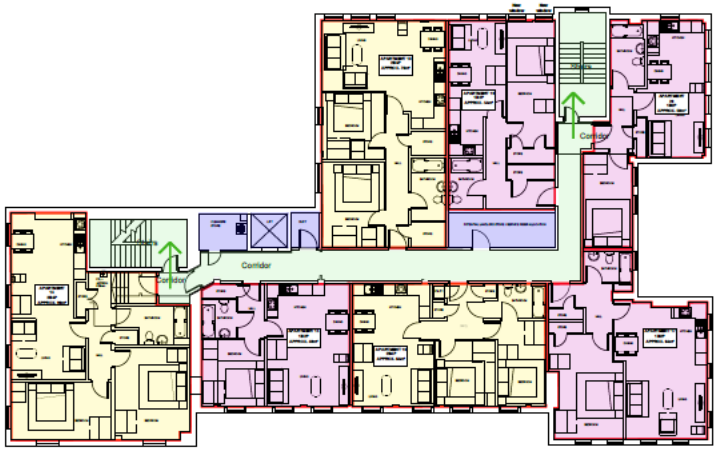
phlorum	**Plan showing Noise Measurement Locations**	**Job No. 13028A** **Figure No. 1**



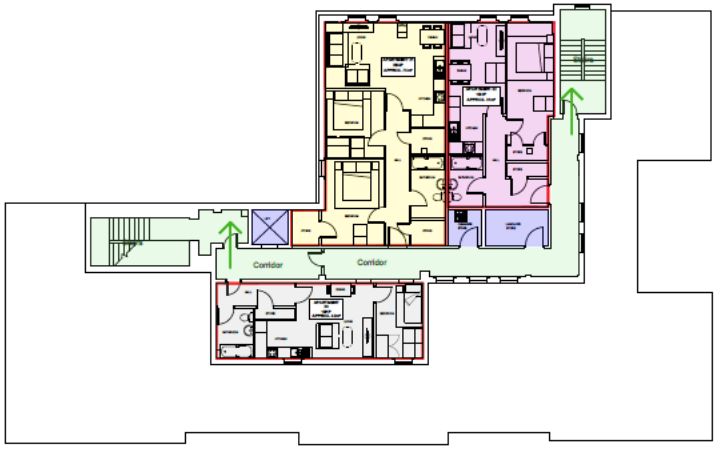
Proposed ground floor plan



Proposed first floor plan



Proposed second floor plan



Proposed third floor plan

phlorum	**Proposed Layout Plans**	**Job No. 13028A** **Figure No. 2**

Appendix A -
Introduction to Noise & Glossary of Terminology

Noise is defined as unwanted sound. The human ear is able to respond to sound in the frequency range 18Hz (deep bass) to 18,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the onset of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting (filtering) mechanism is used. This reduces the importance of lower and higher frequencies, approximating the response of the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. Noise can be perceived to be louder or more noticeable if the source of the noise is observed; e.g. roads, trains, factories, building sites etc. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. Various noise indices have been derived to describe the fluctuation of noise levels that vary over time. Usually, these noise indices relate to specific types of noise, and as such different noise indices are used to describe road traffic noise, background noise, construction noise, etc.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and the levels are denoted as dB(A) or L_{Aeq}, L_{A10}, etc, according to the parameter being measured.

Noise is measured on the decibel scale, which is logarithmic rather than linear. As a result of this, a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change. Table A.1 sets out examples of noise levels typically experienced during everyday activities. Table A.2 sets out an explanation of the terminology used in this report.

Table A1: Typical Sound Levels Found in the Environment.

Sound Level	Location
0 to 10dB(A)	Threshold of hearing
10 to 20dB(A)	Broadcasting studio
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory or noisy pub
100 to 110dB(A)	Burglar Alarm at 1m
110 to 130dB(A)	Pneumatic drill at 1m away
140dB(A)	Threshold of Pain

Table A2: Terminology Relating to Noise

Term	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Façade	At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS EN 61672.

Appendix B -
Monitoring Equipment

Table B1: Noise Monitoring Equipment

Position	Equipment	Serial Number	Calibration Date
1	LD824 Sound Analyser	A1420	20/10/2022
	Mic	37023	
	Preamp	1812	
2	LD820 Sound Meter	A1350	
	Mic	37024	
	Preamp	1568	
3	LD820 Sound Meter	A1144	
	Mic	31825	
	Preamp	2054	
All positions	LD CAL200 Calibrator	3054	13/10/2023

Appendix C -
Full Noise Survey Results

Figure C1: Measured Noise Levels at Position 1, Facade dB

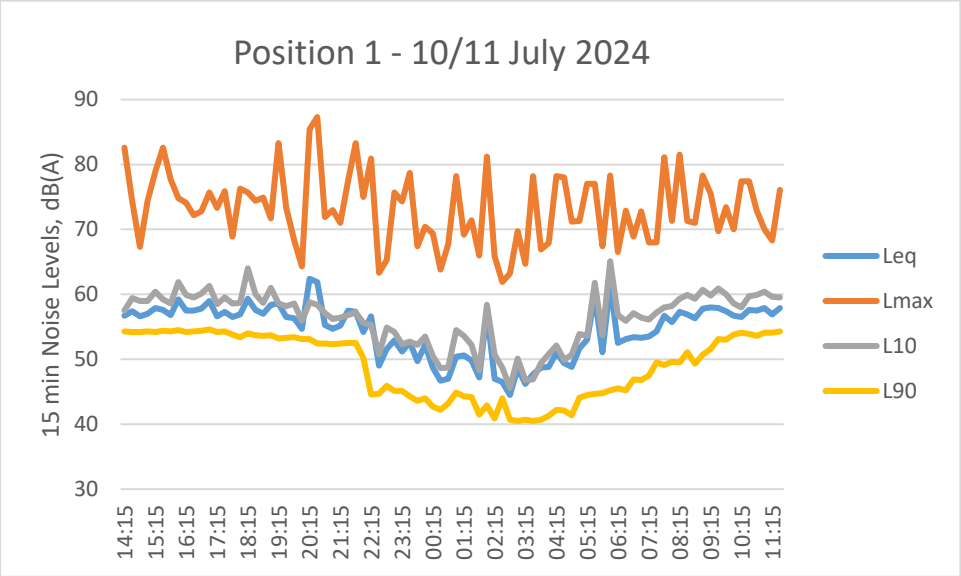


Figure C2: Measured Noise Levels at Position 2, Facade dB

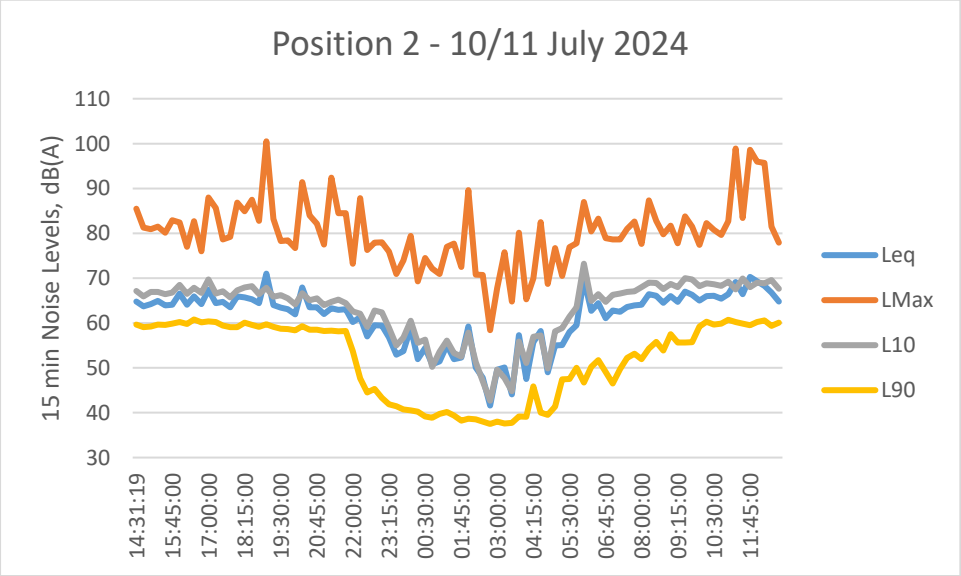
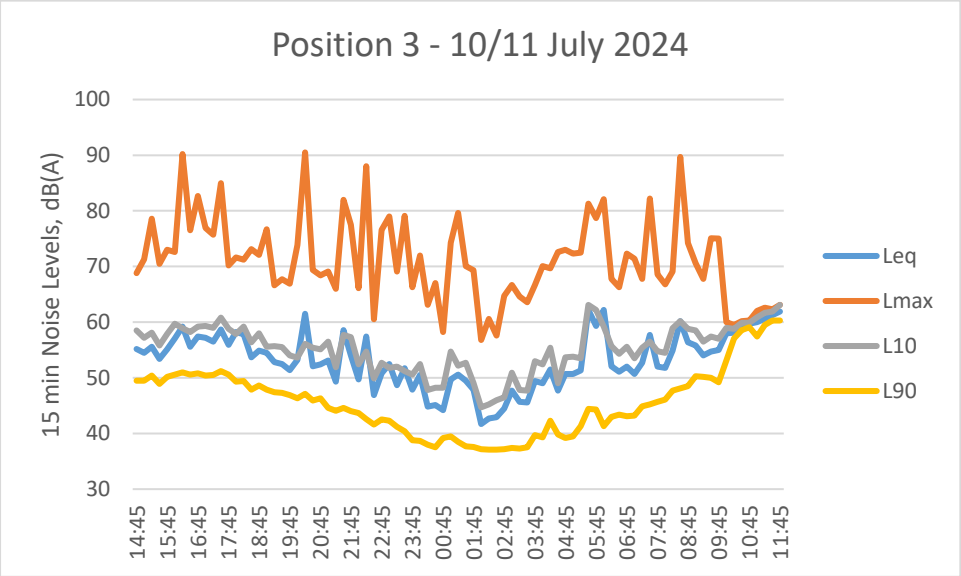


Figure C3: Measured Noise Levels at Position 3, Facade dB



Phlorum Limited

Head Office & Registered Office:
Unit 12
Hunns Mere Way
Woodingdean
Brighton
East Sussex
BN2 6AH
T: 01273 307 167

Northern Office:
Ground Floor
Adamson House
Towers Business Park
Wilmslow Road
Didsbury
Manchester
M20 2YY
T: 0161 955 4250

Western Office:
One Caspian Point
Pierhead Street
Cardiff Bay
Cardiff
CF10 4DQ
T: 029 2092 0820

info@phlorum.com
www.phlorum.com

Registered in England & Wales. Reg No. 4967256