PROFESSIONAL CONSULT

FUTURE ENVIRONMENTS

NOISE IMPACT ASSESSMENT

Proposed Residential Development

Site to the Rear of Y Garnedd, Llanfairpwll

QUALITY ASSURANCE & REPORT INFORMATION

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EXECUTIVE SUMMARY

This Assessment has shown that, through inclusion of an acoustic barrier at 4m in total height (comprised of both an earth bund with an acoustic fence located on top) along the boundary of the Site with the A55 and a number of timber acoustic gardens fences integrated within the scheme to further suppress road traffic noise levels, the resulting noise levels in garden areas are considered to be the lowest practicable given the size of the Site and whilst adhering to other design factors that needed to be included within the layout of the Site. In context of the immediate locality of the Site, there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55 and it is expected that noise levels in gardens of the Site will be lower than at the neighbouring development.

This Assessment has shown that acceptable internal noise levels can be achieved for living rooms and bedrooms, both in terms of the average noise levels and night-time maximum noise levels, subject to the incorporation of the specified upgraded glazing units and a scheme of alternative ventilation for certain dwellings.

This Assessment has set a maximum permissible specific noise level, for both daytime and night-time periods, at the closest proposed residential dwellings, for any noise generated by the proposed substation.

The future noise climate at the Development can be controlled through appropriate noise mitigation measures to meet acceptable noise levels in both internal and external amenity areas which accord with the requirements of the appropriate British Standard and as such, noise should not be deemed to be a determining factor in the granting of planning permission for this Site.

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1 INTRODUCTION

1.1 Appointment

1.1.1 Professional Consult Limited was instructed by Cadnant Planning, on behalf of DU Construction Limited, to complete a Noise Impact Assessment (the Assessment) for a proposed residential development ('the Development') comprising of 27 residential dwellings and associated substation on a parcel of land located to the rear of Y Garnedd in Llanfairpwll, Anglesey to be referred to hereafter as 'the Site'.

1.1.2 Professional Consult have previously issued a Noise Impact Assessment (Ref. 20.139.1.R3, dated 20th September 2021) ('the previous Assessment) in support of the Development. Given the duration time that has elapsed since the noise survey was completed, and the addition of a number of new guidance documents required to be considered for acoustics, ventilation and over-heating within new dwellings as well as Part-O, it was recommended that the noise survey be repeated and the previous Assessment updated.

1.1.3 By way of background to the previous Assessment, the Executive Summary from the previous Assessment stated:

> *'This Assessment has shown that, through inclusion of an acoustic barrier at 4m in total height (comprised of both an earth bund with an acoustic fence located on top) along the boundary of the Site with the A55 and a number of timber acoustic gardens fences integrated within the scheme to further suppress road traffic noise levels, the resulting noise levels in garden areas are considered to be the lowest practicable given the size of the Site and whilst adhering to other design factors that needed to be included within the layout of the Site. In context of the immediate locality of the Site, there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55 and it is expected that noise levels in gardens of the Site will be lower than at the neighbouring development.*
>
> *This Assessment has shown that acceptable internal noise levels can be achieved for living rooms and bedrooms, both in terms of the average noise levels and night-time maximum noise levels, subject to the incorporation of the specified upgraded glazing units and a scheme of alternative ventilation for certain dwellings.*
>
> *This Assessment has set a maximum permissible specific noise level, for both daytime and night-time periods, at the closest proposed residential dwellings, for any noise generated by the proposed substation.*
>
> *In conclusion, the resulting noise levels in garden areas are considered to be the lowest practicable and acceptable with regards to the locality of the Site and in the internal noise levels accord with the noise criteria levels presented in BS8233:2014. Accordingly, the predicted mitigated noise levels at the proposed residential receptors are sufficiently low enough for noise not to be deemed a determining factor in the granting of planning permission for the Development.'*

1.1.4 The principles of the previous Assessment will be adopted within this Assessment, particularly with regards to the agreement of the 4m high acoustic barrier with the A55 and the adoption of lowest practicable noise levels in dwelling garden areas.

1.2 Purpose of Assessment

1.2.1 Given the proximity of the A55 North Wales Expressway to the Development, it is expected that Isle of Anglesey County Council will require a Noise Impact Assessment to accompany the scheme planning application to ensure that road traffic noise levels at the Development are suitable for residential use.

1.2.2 Accordingly, this Assessment has been completed with due regard to Technical Advice Note (Wales) 11, Noise (TAN 11) which is the over-arching guidance document adopted in Wales for determining potential noise impacts and the associated British Standards referenced therein, namely BS8233:2014.

1.3 The Development

1.3.1 The Development will be used to house up to 27 residential dwellings and associated infrastructure.

1.4 The Site, Locality & Soundscape

1.4.1 The Site is bound by the A55 North Wales Expressway to the north west and to the south east a number of residential dwellings located off Y Garnedd. To the north east and south west of the Site lies open land. Within the immediate locality of the Site there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55.

1.4.2 The soundscape across the Site is dominated by road traffic noise associated with vehicles using the A55.

1.5 Limitations

1.5.1 The limitations of this report are presented in Appendix 1.

1.6 Confidentiality

1.6.1 Professional Consult has prepared this report solely for the use of the Client. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Professional Consult; a charge may be levied against such approval.

2 POLICY & GUIDANCE

2.1 Planning Guidance (Wales), Technical Advice Note 11, Noise

2.1.1 Technical Advice Note 11 (Wales) (TAN 11) should be taken into account by local planning authorities in Wales in the preparation of development plans. They may be material to decisions on individual planning applications and will be taken into account by the Secretary of State and his Inspectors in the determination of called-in planning applications and appeals.

2.1.2 TAN 11 provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.1.3 TAN 11 adopts Noise Exposure Categories (NECs) which were used in the now revoked Planning Policy Guidance Note 24 (PPG 24) - the NECs were derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources. The NECs are detailed in Table 1.

Table 1. Noise Exposure Categories

Category	Advice
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

2.1.4 A recommended range of noise levels is given for each of the NECs for dwellings exposed to noise from road, rail, air and mixed sources as detailed in Table 2.

Table 2. Noise Levels[1] Corresponding to Noise Exposure Categories for New Dwellings

Noise Source		Noise Exposure Category			
		A	B	C	D
Road Traffic	07:00 – 23:00	<55	55-63	63-72	>72
	23:00 - 07:00	<45	45-57	57-66	>66
Rail Traffic	07:00 – 23:00	<55	55-66	66-74	>74
	23:00 - 07:00[2]	<45	45-59	59-66	>66
Air Traffic[3]	07:00 – 23:00	<57	57-66	66-72	>72

	23:00 - 07:00	<48	48-57	57-66	>66
Mixed Sources[4]	07:00 – 23:00	<55	55-63	63-72	>72
	23:00 - 07:00	<45	45-57	57-66	>66

Notes:

(1) Noise levels: the noise level(s) (LAeq,T) used when deciding the NEC of a site should be representatives of typical conditions.
(2) Night-time noise levels (2300-0700): sites where individual noise events regularly exceed 82dBLAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8H (except where the LAeq,8H already puts the site in NEC D).
(3) Aircraft noise: daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.
(4) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.
To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs. If the dominant source is industrial noise see paragraph B17 of Annex B.
If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

2.1.5 The NEC noise levels should not be used to assess the impact of industrial noise on proposed residential development because the nature of this type of noise, and local circumstances, may necessitate individual assessment and because there is insufficient information on people's response to industrial noise to allow detailed guidance to be given. However, at a mixed noise site where industrial noise is present but not dominant, its contribution should be included in the noise level used to establish the appropriate NEC.

2.1.6 Determining the NEC category for a given Site is useful for determining the likely level of noise mitigation that may be required in order to make a Site suitable for residential use. TAN 11 goes on to cite specific British Standards which should be used for the assessment of transportation noise and industrial/commercial noise. Indeed, TAN 11 references BS8233 and BS4142 which offer noise criteria for residential habitable areas with regards to transportation and industrial noise sources.

2.2 BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Noise Criteria Limits

2.2.1 The scope of this standard 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 buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

2.2.2 The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 3.

Table 3. BS8233:2014 Internal Target Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting / sleeping conditions	Living Room	35
	Bedroom*	30

*For a Reasonable standard in bedrooms at night, individual noise evens (measured with fast time weighting) should not exceed 45dB L_{max}

2.2.3 BS8233 goes on to recommend noise levels for gardens as follows:

> *"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised 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 might be warranted".*

2.2.4 BS8233 goes on to say:

> *"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited".*

2.2.5 With regards to external noise within balcony areas, BS8233: 2014 provides the following advice:

> *"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels"*

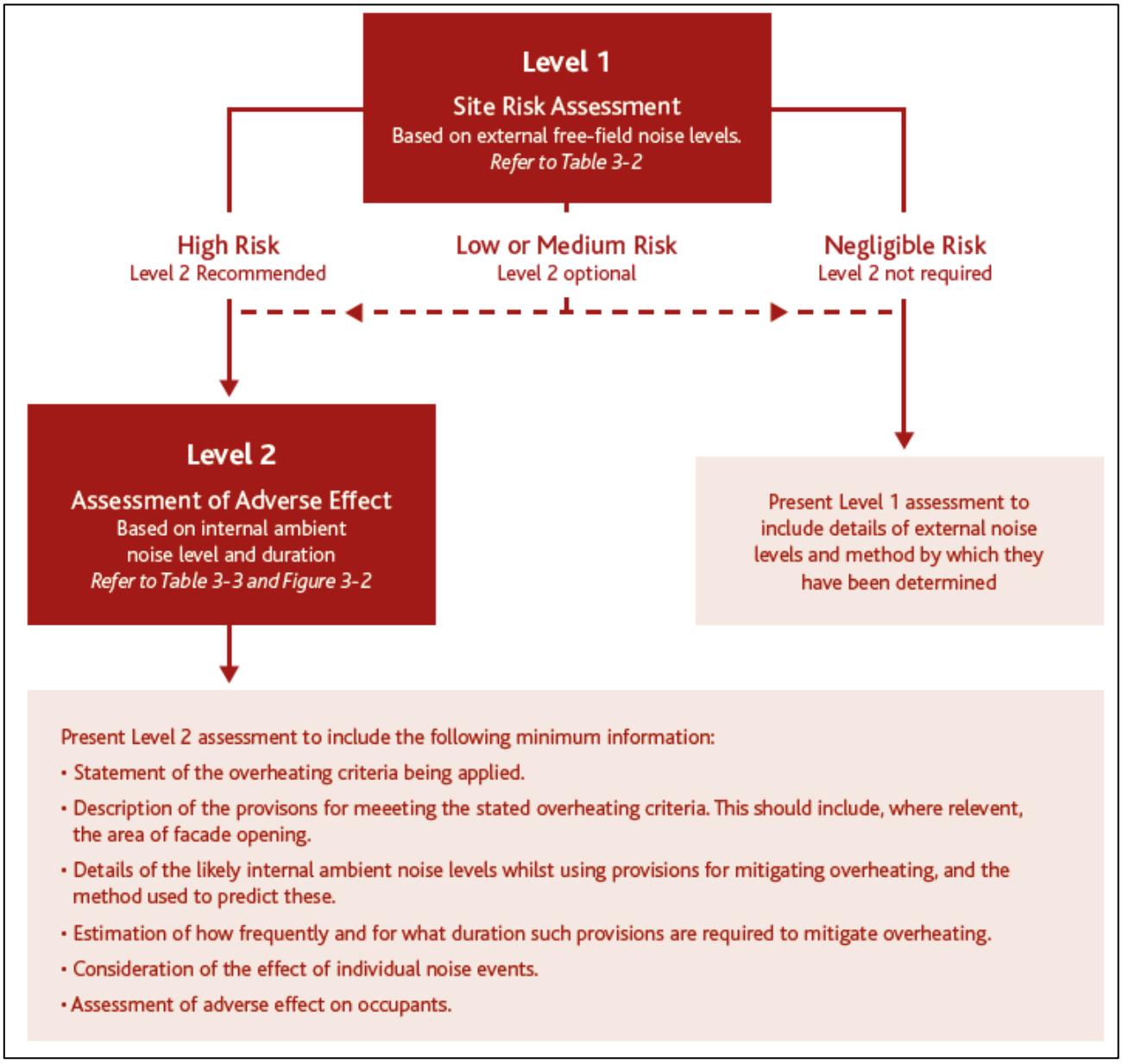
Ventilation Requirements

2.2.6 Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

> *"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.*
>
> *Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."*
>
> Section 7.7.2 states:
>
> *"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."*

2.3 INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION & OVERHEATING: RESIDENTIAL DESIGN GUIDE

2.3.1 The Acoustics Ventilation and Overheating (AVO) Residential Design Guide provides an approach as to how the competing aspects of thermal and acoustic comfort can be managed. The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements. The AVO Guide provides a method for assessing the impact of opening windows and providing whole house ventilation due to the impact of noise via a two-level noise assessment procedure, as below:



2.3.2 A level 1 risk assessment is based on external free-field noise levels with the assumption of a partially opened window in use for mitigation of overheating. A level 1 assessment is appropriate for scenarios where the risk to a development is deemed 'Negligible'. 'Low' and 'Medium' risk sites only require a level 2 assessment on an optional basis in order to give further confidence in the suitability of internal noise conditions.

2.3.3 The noise levels suggested in Tables 4 and 5 assume steady road traffic noise source but can be adapted for other transport sources.

Table 4. Guidance for Level 1 Site Risk Assessment for Transportation Noise Sources Relating to Overheating Condition

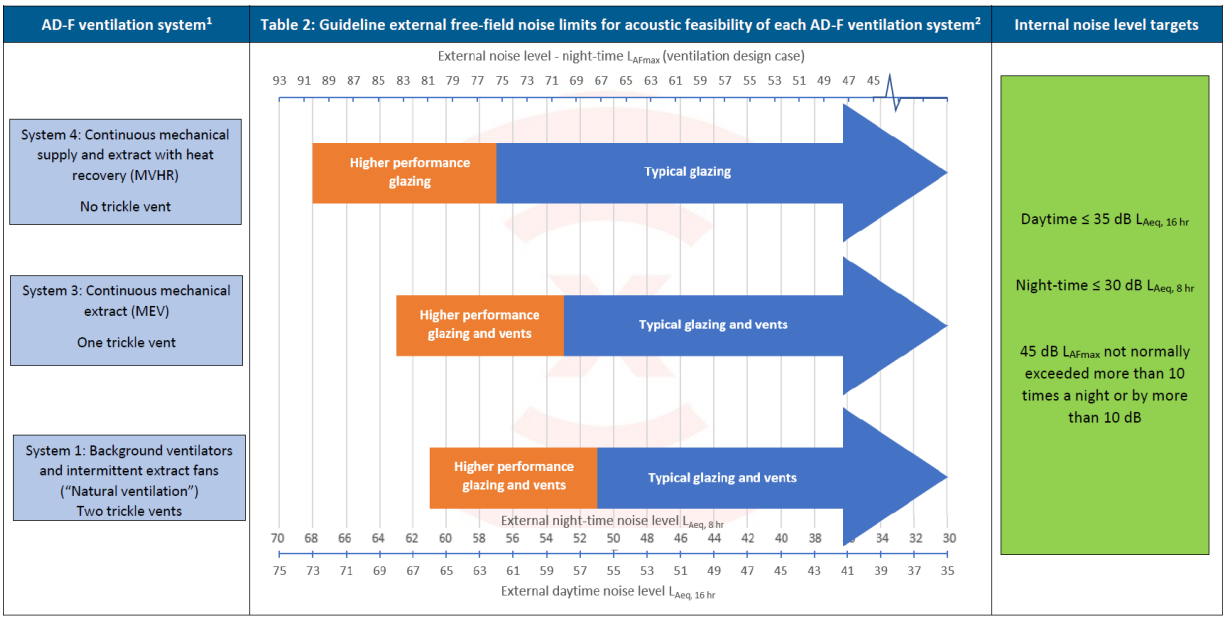
Risk Category for Level 1 Assessment - External		Risk Level	Potential Effect Without Mitigation	Recommendation for Level 2 Assessment
Daytime Noise Level, $L_{Aeq,t}$ (07:00 – 23:00)	Night-time Noise Level, $L_{Aeq,t}$ (23:00 – 07:00)			
≥65dB	≥55dB	High	Increasing risk of adverse effect	Recommended
>55dB & <63dB	>45 & <55dB	Medium		Optional
>50dB & <55dB		Low		
≤50dB	≤45dB	Negligible	Use of opening windows as means of mitigating overheating is not likely to result in in adverse effect	Not required

2.3.4 A level 2 assessment will be carried out when the risk of adverse effect is 'High' or it is deemed appropriate for a 'low' or 'medium' risk site. An increase in internal ambient noise level can cause a change in human behaviour. At high levels this creates situations where occupants can no longer open windows for ventilation due to high external noise levels. A level 2 assessment identifies these situations and allows for appropriate alternative ventilation systems to be recommended.

Table 5. Guidance for Level 2 Assessment of Noise from Transport Noise Sources Relating to Overheating Condition

Internal Ambient Noise Level			Example of Outcome
Daytime $L_{Aeq,t}$ (07:00 – 23:00)	Night-time $L_{Aeq,t}$ (23:00 – 07:00)	Individual Noise Events During 23:00 – 07:00	
>50dB	>42dB	Normally exceeds 65dB $L_{Af,max}$	Noise causes a material change in behaviour eg. having to keep windows closed most of the time
Increasing noise level			Increasing the likelihood of impact on reliable speech communication during the daytime or sleep disturbance at night

2.3.5 The Table below details guideline external free-field noise limits and determines the appropriate AD-F ventilation system (Systems 1 – 4).



Approved Document O of the Building Regulations 2022

2.3.6 This approved document supports Part O of Schedule 1 to the Building Regulations 2010 and took effect on 15th June 2022 for use in England.

2.3.7 Section 3 of the approved document details the requirements for noise ingress into a bedroom and states the following:

> *'In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*
>
> *Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*
>
> *a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am); and*
> *b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).'*

2.3.8 The above internal noise criteria levels are higher than those presented in BS8233:2014 and so the trigger point for alternative ventilation for bedrooms, where required, will be dictated primarily by the assessment which considers compliance with the BS8233:2014 internal noise criteria levels. Nevertheless, compliance with the above noise criteria levels will be observed where the internal average and maximum noise levels with a partially open window, or where recommended appropriate alternative ventilation for the bedroom, results in noise levels not exceeding the above noise criteria levels.

2.3.9 With regards to windows being opened, BS8233:2014 refers to a partially open window and so for the purposes of AD-O and Standard Assessment Procedure (SAP) calculations a 'partially open' window should be taken as being 'fully open' for SAP calculations.

2.4 BS4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

2.4.1 This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

2.4.2 The procedure detailed in the standard compares the measured or predicted noise level 'the specific noise level' from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is 'typical.'

2.4.3 The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 - 23:00): 1 hour; and

- Night-time (23:00 - 07:00): 15 minutes.

2.4.4 There are a number of 'penalties' which can be attributed to the specific sound level, either subjectively or objectively, depending upon the 'acoustic features' of the sound level under investigation as follows. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows (with regards to the subject method):

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

2.4.5 Where the assessment is carried out using the objective method, the tonality penalty is either 0dB or 6dB and the impulsivity penalty can range from 0dB up to 9dB in increments of 1dB, depending on the level of impulsivity identified.

2.4.6 In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though is readily distinctive against the acoustic environment.

2.4.7 BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

2.4.8 Assessment of the rating level relative to the background noise level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

2.4.9 Whilst the amended 2019 Standard does make various references to it not being intended to assess noise impacts at indoor locations, section 1.1 does state 'The methods described in this British Standard use outdoor sound

levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident'. Example 6 in the Standard states 'In addition to the rating/background sound level comparison shown in Table A.6, the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows. Other guidance, such as BS 8233, might also be applicable in this instance'.

2.4.10 With the above in mind, and for a clear need to ensure that any potential commercial or industrial noise impacts at the building façade do not give rise to internal noise level which causes sleep disturbance in bedrooms, this Assessment will ensure that the predicted rating level (specific sound level including any character corrections) does not exceed 30dB in bedrooms.

2.5 Local Authority Guidance and Criteria – Isle of Anglesey County Council's Environmental Health Department

2.5.1 Consultation was provided to Mick Goodfellow at Isle of Anglesey County Council on 18th November 2020 which stated:

> *'We have been appointed by a client to complete a Noise Impact Assessment for a proposed residential development on a parcel of land adjacent to Y Garnedd in Llanfair – I understand that you have already had sight of the feasibility layout and you have provided commentary with regards to noise, as follows:*
>
> *'Given the location of the proposed development of the 27 dwellings to the A55 (estimated housing façade to roadside is around 30 metres on Plot 26/27), the Public Protection department requests a full noise impact assessment based upon TAN 11 (noise) principles to establish the NEC (Noise Exposure Category) rating for each property in this development area prior to any granting of permission. The assessment shall take account of CRTN (Calculation of Road Traffic Noise) principles and must provide all the proposed mitigation measures to protect the future occupants from road traffic noise along the A55.'*
>
> *We have completed a comprehensive road traffic noise survey over a full 24-hour period on the boundary of the Site with the A55 during a period of weather suitable for the measurement of environmental noise. Noise measurements were completed after Wales came out of lockdown recently and, accordingly, we have worked with the scheme transport consultant to agree on a suitable correction factor to apply to the measured noise levels to bring these noise levels in line with the pre-covid situation.*
>
> *With regards to the Noise Impact Assessment, we will complete an initial assessment in line with the Noise Exposure Categories presented in TAN 11 as you have requested. We will also adopt the noise criteria presented in BS8233:2014 which presents noise criteria limits for both external and internal habitable areas of residential dwellings. With regards to external noise levels in garden areas, I propose that we work to achieving the lowest practicable noise levels as a result of good acoustic design of the proposed development. This approach accords with the requirements of the British Standard which 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 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. 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.'

I am proposing that we work to achieving lowest practicable noise levels in garden areas as I am keen to not place reliance on unduly high acoustic barriers, instead relying more on the proposed dwellings as noise barriers, with short-runs of acoustic fences placed in between the dwellings wherever possible.

It should also be noted that context for this Site is also an important consideration as there are many other residential dwellings located in equally close proximity to the A55 including a recently built residential development at Llys Eilian off Ffordd Penmynydd to the east of our Site, and so aiming to achieve lowest practicable noise levels in garden areas is considered reasonable on balance.

With regards to internal noise levels in bedrooms and living rooms, we will have no issue in achieving the criteria noise levels presented in BS8233:2014 – where standard thermal glazing is not adequate, then we can specify upgraded glazing units and alternative ventilation where required to ensure acceptable internal amenity.

We will issue to the client a Noise Impact Assessment suitable to accompany the scheme planning application which will identify all proposed noise mitigation measures, including all reasonable measures taken to ensure good acoustic design of the scheme and to achieve noise levels in garden areas which are in keeping with – if not better than – noise levels in garden areas of other dwellings in the locality.

3 NOISE SURVEYS

3.1 Road Traffic Noise Survey

3.1.1 A road traffic noise survey has been completed for the A55 as follows:

- Noise Measurement Position 1: Located 22m from the centre of the A55, close to the boundary of the Site with the A55. Noise measurements were completed between 12:00 on 11th January – 12:00 on 12th January 2024 in free-field conditions. Noise sources at the microphone location comprised of road traffic using the A55.

3.1.2 Table 6 presents the measured road traffic noise levels.

Table 6. Measured Road Traffic Noise Levels

Measurement Position	Period	Measured Sound Pressure Level (dB)	
		$L_{Aeq,T}$	$L_{Amax,fast}$
NMP1	Daytime (07:00 – 23:00)	77.0 $L_{Aeq,16hr}$	-
	Night-time (23:00 – 07:00)	69.5 $L_{Aeq,8hr}$	85.5

3.2 Background Sound Survey

3.2.1 The measured noise levels at NMP1 have also been used to quantify the existing background sound climate at the Site and Table 7 summarises the measured background sound levels over the daytime and night-time periods.

Table 7. Summary of Measured Background Sound Levels

Measurement Position	Period	Range of Measured Background Sound Levels, $L_{A90,15mins}$ (dB)	Calculated Typical (Mode) Background Sound Level, $L_{A90,15mins}$ (dB)
NMP1	Daytime (07:00 – 23:00)	32 - 72	67
	Night-time (23:00 – 07:00)	23 - 63	26

3.3 Noise Survey Equipment

3.3.1 The following equipment was used for the noise and vibration surveys.

Table 8. Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No	Serial No.	Calibration Due Date
NMP1	Sound Level Meter	01dB Fusion	15440	23 November 2025
	Pre-amplifier	01dB PRE22	2214039	
	Microphone	GRAS 40CD	585117	
	Calibrator	01dB CAL-31	87280	2 July 2024

3.3.2 The sound level meter was field calibrated prior to and following the noise surveys and there was no drift beyond the allowable limit of 1dB.

3.3.3 Table 9 indicates a summary of the measured weather conditions for the noise survey.

Table 9. Range of Measured Wind Speeds

Period	Range of Measured Wind Speeds (m/s)	Rainfall Recorded?
All periods	0 – 2.7	No

4 NOISE IMPACT ASSESSMENT

4.1 Assessment Information

4.1.1 There have been various discussions with Mick Goodfellow at Isle of Anglesey County Council with regards establishing a proposed layout that is robust for minimising noise levels to the lowest practicable level in garden areas. Due to the size of the Site, it has not been possible to orientate gardens to face away from the A55, thus using the dwelling envelope as a noise barrier. Instead, and in agreement with Mick Goodfellow, an acoustic barrier has been integrated into the scheme which lies adjacent to the A55 to minimise sound transmission from road traffic noise across the Site. The height and extent of the barrier is at its greatest, whilst adhering to other factors and considerations.

4.2 Noise Exposure Categories - Planning Guidance (Wales), Technical Advice Note 11, Noise

4.2.1 It is necessary to identify the appropriate Noise Exposure Category (NEC) across the Site and this is completed in Table 10.

Table 10. Identification of Appropriate NEC for Site

Boundary	Measured Noise Level (dB)	Measurement Distance (m)	Distance to Boundary (m)	Calculated Noise Level at Boundary (dB)	Applicable NEC
North West (Closest to A55)	77.0 $L_{Aeq,16hr}$	22	32	75.4	D
	69.5 $L_{Aeq,8hr}$	22	32	67.9	D
	85.5 $L_{Amax,slow}$	22	32	80.2*	D (C)
South East (Furthest from A55)	77.0 $L_{Aeq,16hr}$	22	103	70.3	C
	69.5 $L_{Aeq,8hr}$	22	103	62.8	C
	85.5 $L_{Amax,slow}$	22	103	72.1	C

Notes:

*Noise level does not exceed 82dB $L_{Amax,slow}$, however Site is already categorised as NEC D
** $L_{Amax,slow}$ = $L_{Amax,fast}$ -2dB

4.2.2 Table 10 indicates that the Site falls into NEC D on the north western boundary and NEC C on the south eastern boundary. The advice contained in Planning Guidance (Wales), Technical Advice Note 11 (Noise) is:

NEC C

'Planning permission should not normally be granted. Where it is considered that permission should be given, conditions should be imposed to ensure a commensurate level of protection against noise.'

and;

NEC D

'Planning permission should normally be refused'.

4.2.3 It should be noted that the above categorisation is for an open Site with no development incorporated. By implementation of good acoustic design and effective noise barriers incorporated into the scheme design, noise levels in external amenity space can be designed to be acceptable, in the context of the area. Furthermore, internal noise levels within habitable rooms can be controlled by upgraded glazing and alternative ventilation, where necessary, in order to meet the internal noise criteria levels stated in BS8233: 2014.

4.3 Road Traffic

4.3.1 For the purposes of this Assessment, Professional Consult has used noise modelling software CadnaA to determine the impact of noise from The A55 at the proposed residential dwellings. A noise model has therefore been constructed in order to calculate façade noise levels and external noise levels in amenity areas.

4.3.2 The following inputs have been included in the model:

- Proposed Scheme Layout;
- Site elevations have been taken as existing using 1m contours;
- Existing buildings or features that provide shielding from the road have been included in the model;
- Noise Measurement Position 1 has been used in order to calibrate the noise model;
- A floor height of 2.5m has been assumed for all proposed dwellings which is a standard separation distance between ground and first floors in a typical dwelling;
- A reflection order of 2 has been used in all calculations;
- All dwellings have been taken to be 7.5m to apex (2-storey); and,
- Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into CadnaA software.

External Noise Impact in Garden Areas of Proposed Dwellings

4.3.3 In order to assess noise levels in external private amenity areas across the Site without the acoustic barrier in place, a grid noise map was calculated in the noise model which can be viewed in Figure 1 of Appendix 4. The following section considers the effect of acoustic barriers, both on the boundary of the Site with the A55 and internally within the Development, on noise levels across the Site.

Internal Noise Impact for Proposed Dwellings

4.3.4 With regards internal noise levels, BS8233:2014 suggests that standard thermal double glazing will afford 33dB R_w of sound reduction, however this is for the pink noise spectrum and the same configuration will afford 30dB R_w+C_{tr} for average noise levels from road traffic noise and so this value has been used to calculate internal noise levels. With regard to the maximum noise level ($L_{Amax,fast}$), the value of 33dB R_w has been used. The AVO Residential Design Guide states that a partially open window provides approximately 13dB of attenuation.

4.3.5 Professional Consult uses a library database of glazing configurations issued by Saint Gobain and the glazing configuration 6mm glass / 12mm air space / 6mm glass affords 30dB R_w+C_{tr} and 33dB R_w respectively.

4.3.6 Appendix 7 calculates the average daytime noise levels at the various facades of the plots and determines the requirement for upgraded glazing and alternative ventilation. Appendix 7 indicates that there is a requirement to increase the glazing specification for a number of living rooms and there is a requirement for alternative

ventilation for a number of living rooms also. Appendix 9 details an examples of the various types of alternative ventilation available.

4.3.7 Appendix 8 calculates the average night-time noise levels at the various facades of the plots and determines the requirement for upgraded glazing and alternative ventilation. Appendix 8 indicates that there is a requirement to increase the glazing specification for a number of bedrooms and there is a requirement for alternative ventilation for a number of bedrooms also. Appendix 9 details an examples of the various types of alternative ventilation available.

4.3.8 It is also necessary to consider maximum noise levels, for the night-time period for bedrooms only, in addition to the average noise levels. Tables 11 calculates the internal noise level at the closest façade with windows closed and with a partially open window and compares the predicted noise level to the internal $L_{Amax,fast}$ noise criteria in BS8233 and Part O for Bedrooms.

Table 11. Calculation of Maximum Noise Levels within Bedrooms

Noise Source	Applicable Standard / Guidance Document	10th Highest Measured Max Noise Level	Measurement Distance to Centre (m)	Distance to Closest Proposed Dwelling (m)	Calculated Maximum Noise Level at Dwelling	Windows Closed / Open	Sound Reduction of Partially Open Window	Calculated Maximum Noise Level Inside Bedroom	Applicable Internal Noise Criteria Level	Difference +/- (dB)
A55	BS8233:2014	85.5	22	38	80.8	Open	13	67.8	45	**+22.8**
		85.5	22	38	80.8	Closed	33	47.8	45	**+2.8**
	Approved Document O	85.5	22	38	80.8	Open	13	67.8	55	**+12.8**
		85.5	22	38	80.8	Closed	33	47.8	55	-7.2

4.3.9 Table 11 indicates that standard thermal glazing will not be adequate in controlling maximum noise levels during the night-time period with windows closed. With windows open, there will also be exceedances of the noise criteria and so the following section considers appropriate noise mitigation.

4.4 Noise from Substation

4.4.1 At the time of issuing this Assessment, details of the mechanical and electrical plant to be installed a the substation were unknown and so it is necessary to set mechanical and electrical plant noise emission limits for the closest proposed residential dwellings, as completed in Table 12.

Table 12. Summary of Measured Background Sound Levels

Period	Calculated Typical (Mode) Background Sound Level, $L_{A90,15mins}$ (dB)	Acoustic Character Correction for Substation Noise (dB)	Maximum Permissible Specific Noise Level at Closest Dwelling (dB)
Daytime (07:00 – 19:00)	67	+2 (just perceptible tonality)	65
Night-time (23:00 – 07:00)	26		24

4.4.2 Table 12 shows the maximum specific noise level (the measurable noise level) which should not be exceeded at the closest residential dwellings to the proposed substation.

5 MITIGATION

5.1 Road Traffic

5.1.1 The previous section has shown high levels of noise in garden areas of the dwellings due to road traffic using the A55. As such, the scheme has benefited from the inclusion of an acoustic barrier located on the boundary of the Site with the A55 – the barrier is proposed to be 4m in total height (comprised of both an earth bund with an acoustic fence located on top) and Figure 1 in Appendix 6 shows the grid noise map which includes for the acoustic barrier. Figure 1 in Appendix 6 also includes for a number of timber garden fence noise barriers at 2m in height to further minimise road traffic noise transmission into garden areas. These timber garden fence noise barriers are also shown on Figure 1 in Appendix 6. The timber garden fences will need to have a minimum mass of 15kg/m^2 and be free from holes.

5.1.2 The resulting noise levels in garden areas are considered to be the lowest practicable given the size of the Site and whilst adhering to other design factors that needed to be included within the layout of the Site. In context of the immediate locality of the Site, there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55 and it is expected that noise levels in gardens if the Site will be lower than at the neighbouring development.

5.1.3 With regards to internal average noise levels in habitable rooms, the previous section has indicated that various living room and bedroom windows will require upgraded glazing and an appropriate scheme of alternative ventilation (shown as Systems 1 – 4) and Appendix 9 at the rear of this Assessment provides examples of such systems.

5.1.4 With regards to maximum noise levels in bedrooms, the previous section has shown that the dwellings closest to the A55 will require upgraded glazing for bedrooms as there is a 2.8dB (rounded to 3dB) exceedance with standard glazing. Accordingly, these closest dwellings will require glazing with a sound reduction index of 36dB Rw (33dB Rw for maximum noise events +3dB exceedance). Further calculation indicates that any bedroom window within 52m of the centre of the A55, with either full or partial line of sight to the A55, will require this glazing specification.

5.1.5 The previous section has indicated that there will be an exceedance of the internal maximum noise criteria level and Table 13 calculates the distance at which maximum noise levels are sufficiently low so as not to require alternative ventilation.

Table 13. Identification of Bedrooms Requiring Alternative Ventilation for Maximum Noise Events

Noise Source	Applicable Standard / Guidance Document	10th Highest Measured Max Noise Level	Measurement Distance to Centre (m)	Required Distance for No Alternative Ventilation (m)	Calculated Maximum Noise Level at Dwelling	Windows Closed / Open	Sound Reduction of Partially Open Window	Calculated Maximum Noise Level Inside Bedroom	Applicable Internal Noise Criteria Level	Difference +/- (dB)
A1237	BS8233:2014	85.5	22	520	58.0	Open	13	45.0	45	0.0
		85.5	22	520	58.0	Closed	33	25.0	45	-20.0
	Approved Document O	85.5	22	520	58.0	Open	13	45.0	55	-10.0
		85.5	22	520	58.0	Closed	33	25.0	55	-30.0

5.1.6 Table 13 indicates that any bedroom window located within 520m of the centre of road will require the System 1 acoustic trickle ventilator detailed in Appendix 9 of this Assessment. Where a System of greater magnitude is shown in Appendix 8, then this takes priority.

6 CONCLUSION

6.1.1 Professional Consult Limited was instructed by Cadnant Planning, on behalf of DU Construction Limited, to complete a Noise Impact Assessment for a proposed residential development comprising of 27 residential dwellings and associated substation on a parcel of land located to the rear of Y Garnedd in Llanfairpwll, Anglesey.

6.1.2 Professional Consult have previously issued a Noise Impact Assessment (Ref. 20.139.1.R3, dated 20th September 2021) ('the previous Assessment) in support of the Development. Given the duration time that has elapsed since the noise survey was completed, and the addition of a number of new guidance documents required to be considered for acoustics, ventilation and over-heating within new dwellings as well as Part-O, it was recommended that the noise survey be repeated and the previous Assessment updated.

6.1.3 The principles of the previous Assessment will be adopted within this Assessment, particularly with regards to the agreement of the 4m high acoustic barrier with the A55 and the adoption of lowest practicable noise levels in dwelling garden areas.

6.1.4 Given the proximity of the A55 North Wales Expressway to the Development, it is expected that Isle of Anglesey County Council will require a Noise Impact Assessment to accompany the scheme planning application to ensure that road traffic noise levels at the Development are suitable for residential use.

6.1.5 Accordingly, this Assessment has been completed with due regard to Technical Advice Note (Wales) 11, Noise (TAN 11) which is the over-arching guidance document adopted in Wales for determining potential noise impacts and the associated British Standards referenced therein, namely BS8233:2014.

6.1.6 The Site is bound by the A55 North Wales Expressway to the north west and to the south east a number of residential dwellings located off Y Garnedd. To the north east and south west of the Site lies open land. Within the immediate locality of the Site there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55.

6.1.7 The soundscape across the Site is dominated by road traffic noise associated with vehicles using the A55.

6.1.8 This Assessment has shown that, through inclusion of an acoustic barrier at 4m in total height (comprised of both an earth bund with an acoustic fence located on top) along the boundary of the Site with the A55 and a number of timber acoustic gardens fences integrated within the scheme to further suppress road traffic noise levels, the resulting noise levels in garden areas are considered to be the lowest practicable given the size of the Site and whilst adhering to other design factors that needed to be included within the layout of the Site. In context of the immediate locality of the Site, there has been recent residential development at Llys Eilian with residential dwellings and garden areas in close proximity to the A55, several of which have garden areas unscreened from the A55 and it is expected that noise levels in gardens of the Site will be lower than at the neighbouring development.

6.1.9 This Assessment has shown that acceptable internal noise levels can be achieved for living rooms and bedrooms, both in terms of the average noise levels and night-time maximum noise levels, subject to the incorporation of the specified upgraded glazing units and a scheme of alternative ventilation for certain dwellings.

6.1.10 This Assessment has set a maximum permissible specific noise level, for both daytime and night-time periods, at the closest proposed residential dwellings, for any noise generated by the proposed substation.

6.1.11 The future noise climate at the Development can be controlled through appropriate noise mitigation measures to meet acceptable noise levels in both internal and external amenity areas which accord with the requirements of the appropriate British Standard and as such, noise should not be deemed to be a determining factor in the granting of planning permission for this Site.

APPENDIX 1: LIMITATIONS

This report and its findings should be considered in relation to the terms of reference and objectives agreed between Professional Consult Limited and the Client.

The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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APPENDIX 2: GLOSSARY OF ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold 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 mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. 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 or impulsiveness 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.

The most widely used 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_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 1: Typical Sound Pressure Levels

Sound Pressure Level (dB)	Location/Example
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Table 2: Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	2A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX 3: SITE LOCATION PLAN & NOISE MEASUREMENT POSITION

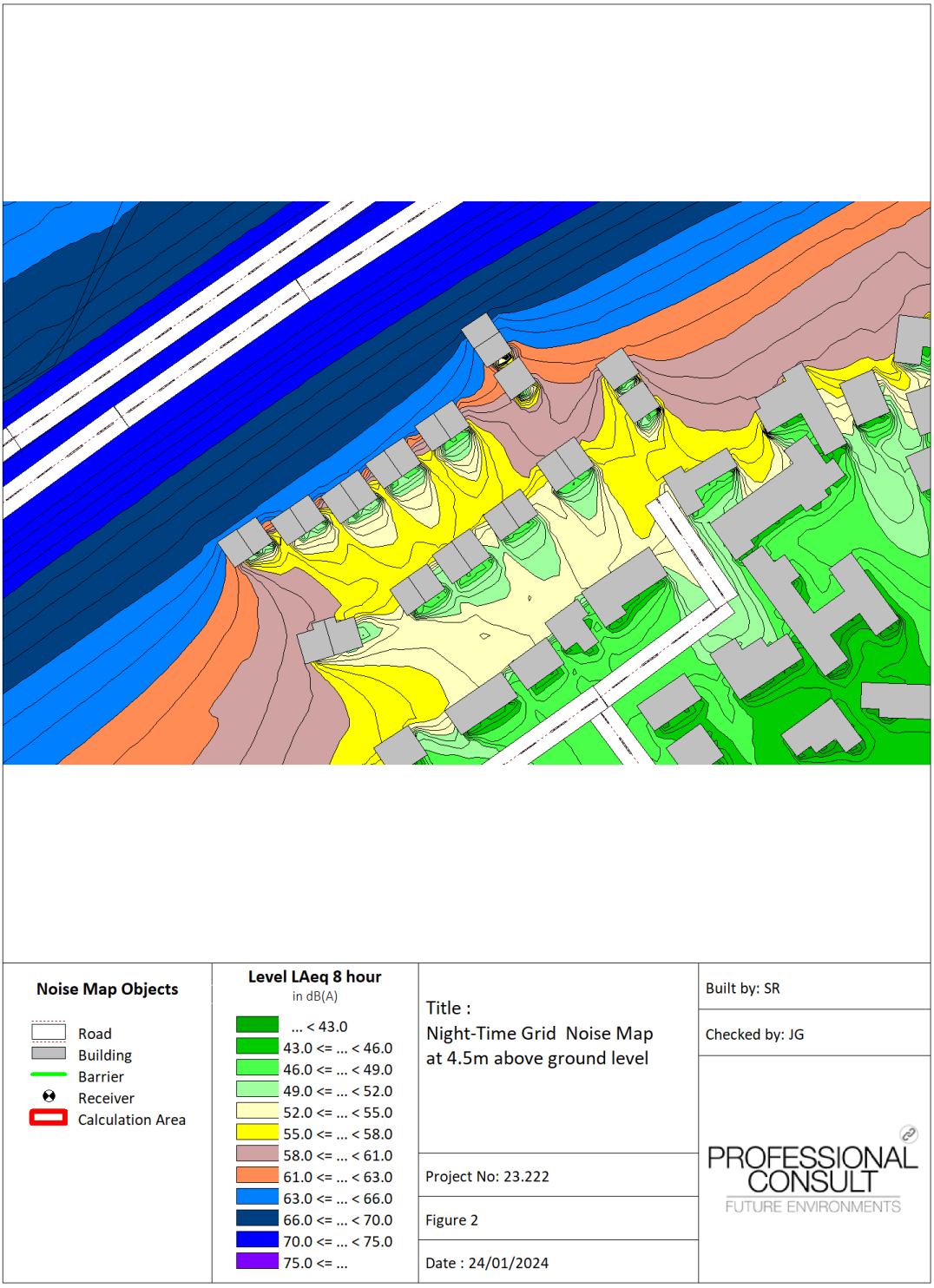
Figure 1 **Proposed Site Plan**

APPENDIX 4: DAYTIME GRID NOISE MAP

Figure 1 **Daytime Grid Noise Map**

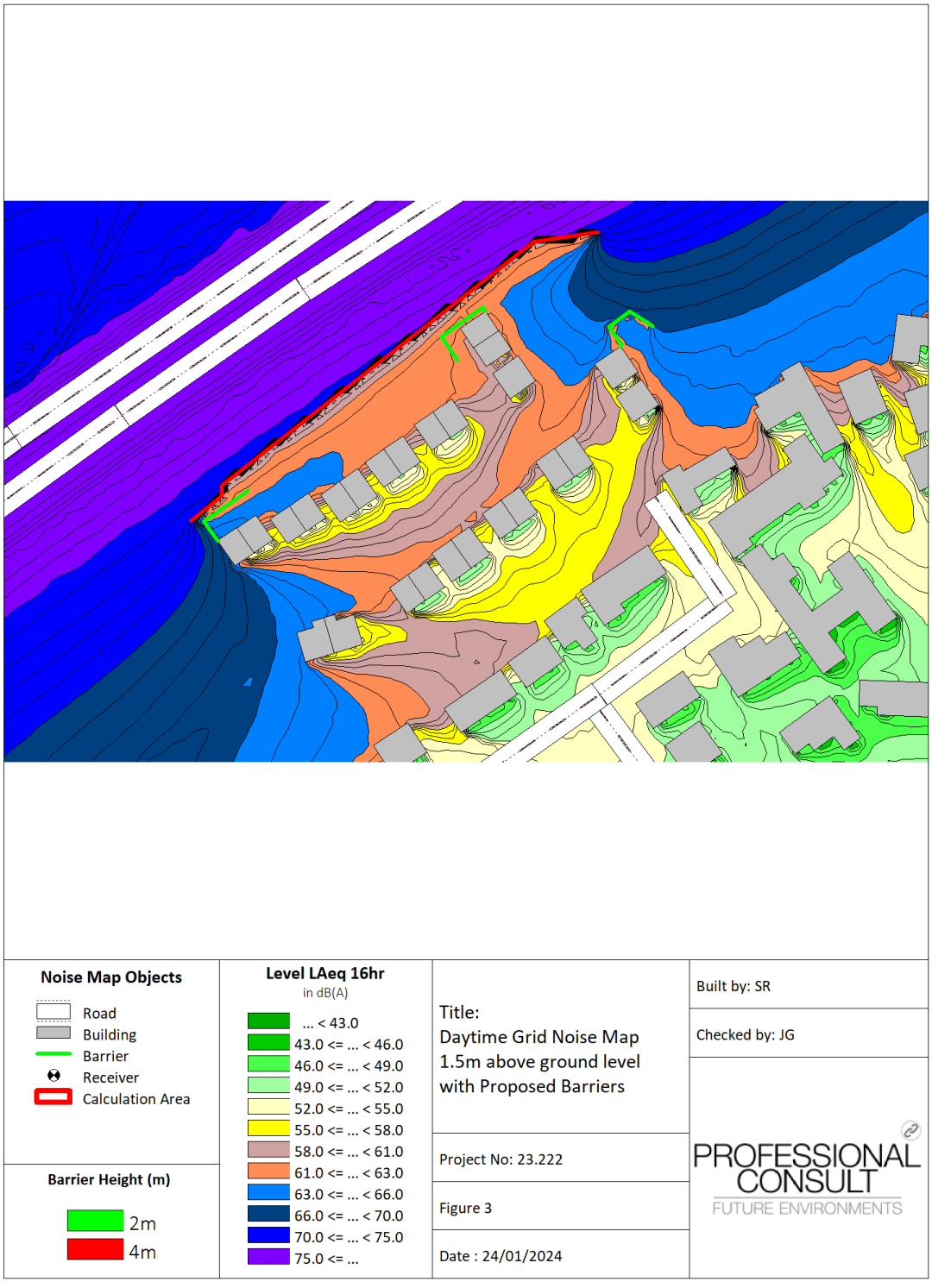
APPENDIX 5: NIGHT-TIME GRID NOISE MAP

Figure 1 **Night-time Grid Noise Map**



APPENDIX 6: DAYTIME GRID NOISE MAP – WITH ACOUSTIC BARRIERS

Figure 1



APPENDIX 7: DAYTIME FAÇADE NOISE LEVELS

Plot	Floor	Façade Direction	Calculated LAeq,16hr at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Commentary on Required Glazing	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?	Acoustics Ventilation & Overheating Assessment - Appropriate AD-F System	Eg. Alt' Ventilation Scheme
Plot 1	Ground	NW	62.2	30	32.2	35	-2.8	27	Standard thermal glazing	49.2	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 1	Ground	NE	58.5	30	28.5	35	-6.5	24	Standard thermal glazing	45.5	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 1	Ground	SE	50.4	30	20.4	35	-14.6	15	Standard thermal glazing	37.4	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 2	Ground	SW	58	30	28	35	-7	23	Standard thermal glazing	45	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 2	Ground	NW	62.3	30	32.3	35	-2.7	27	Standard thermal glazing	49.3	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 2	Ground	SE	50.4	30	20.4	35	-14.6	15	Standard thermal glazing	37.4	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 3	Ground	NW	61.9	30	31.9	35	-3.1	27	Standard thermal glazing	48.9	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 3	Ground	NE	56.4	30	26.4	35	-8.6	21	Standard thermal glazing	43.4	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 3	Ground	SE	50.3	30	20.3	35	-14.7	15	Standard thermal glazing	37.3	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 4	Ground	SW	56.1	30	26.1	35	-8.9	21	Standard thermal glazing	43.1	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 4	Ground	NW	61.9	30	31.9	35	-3.1	27	Standard thermal glazing	48.9	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 4	Ground	SE	50.3	30	20.3	35	-14.7	15	Standard thermal glazing	37.3	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 5	Ground	NW	62	30	32	35	-3	27	Standard thermal glazing	49	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 5	Ground	NE	55.5	30	25.5	35	-9.5	21	Standard thermal glazing	42.5	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 5	Ground	SE	50.2	30	20.2	35	-14.8	15	Standard thermal glazing	37.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 6	Ground	SW	54.6	30	24.6	35	-10.4	20	Standard thermal glazing	41.6	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 6	Ground	NW	62.2	30	32.2	35	-2.8	27	Standard thermal glazing	49.2	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 6	Ground	SE	50.2	30	20.2	35	-14.8	15	Standard thermal glazing	37.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 7	Ground	NW	62.6	30	32.6	35	-2.4	28	Standard thermal glazing	49.6	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 7	Ground	NE	54.6	30	24.6	35	-10.4	20	Standard thermal glazing	41.6	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 7	Ground	SE	50.2	30	20.2	35	-14.8	15	Standard thermal glazing	37.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 8	Ground	SW	61.3	30	31.3	35	-3.7	26	Standard thermal glazing	48.3	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 8	Ground	NW	62.8	30	32.8	35	-2.2	28	Standard thermal glazing	49.8	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 8	Ground	SE	50.2	30	20.2	35	-14.8	15	Standard thermal glazing	37.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	Ground	N	64.5	30	34.5	35	-0.5	30	Standard thermal glazing	51.5	Yes	ADF System 4	MVHR without T.V.
Apt 9-10	Ground	S	54.8	30	24.8	35	-10.2	20	Standard thermal glazing	41.8	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	Ground	E	55.7	30	25.7	35	-9.3	21	Standard thermal glazing	42.7	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	Ground	S	55.7	30	25.7	35	-9.3	21	Standard thermal glazing	42.7	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	Ground	W	65.8	30	35.8	35	0.8	31	Upgraded glazing	52.8	Yes	ADF System 4	MVHR without T.V.
Apt 11-12	Ground	N	65.2	30	35.2	35	0.2	30	Standard thermal glazing	52.2	Yes	ADF System 4	MVHR without T.V.
Plot 13	Ground	SE	52.5	30	22.5	35	-12.5	18	Standard thermal glazing	39.5	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 13	Ground	SW	68.4	30	38.4	35	3.4	33	Upgraded glazing	55.4	Yes	ADF System 4	MVHR without T.V.
Plot 13	Ground	NW	68.8	30	38.8	35	3.8	34	Upgraded glazing	55.8	Yes	ADF System 4	MVHR without T.V.
Plot 14	Ground	NE	61.3	30	31.3	35	-3.7	26	Standard thermal glazing	48.3	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 14	Ground	SE	52.5	30	22.5	35	-12.5	18	Standard thermal glazing	39.5	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 14	Ground	NW	67.5	30	37.5	35	2.5	33	Upgraded glazing	54.5	Yes	ADF System 4	MVHR without T.V.
Plot 15	Ground	SE	52.2	30	22.2	35	-12.8	17	Standard thermal glazing	39.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 15	Ground	SW	57.7	30	27.7	35	-7.3	23	Standard thermal glazing	44.7	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 15	Ground	NW	64.6	30	34.6	35	-0.4	30	Standard thermal glazing	51.6	Yes	ADF System 4	MVHR without T.V.
Plot 16	Ground	NE	60	30	30	35	-5	25	Standard thermal glazing	47	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 16	Ground	SE	52.2	30	22.2	35	-12.8	17	Standard thermal glazing	39.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 16	Ground	NW	65.3	30	35.3	35	0.3	30	Standard thermal glazing	52.3	Yes	ADF System 4	MVHR without T.V.
Plot 17	Ground	SW	57.2	30	27.2	35	-7.8	22	Standard thermal glazing	44.2	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 17	Ground	SE	52	30	22	35	-13	17	Standard thermal glazing	39	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 17	Ground	NW	64.3	30	34.3	35	-0.7	29	Standard thermal glazing	51.3	Yes	ADF System 4	MVHR without T.V.
Plot 18	Ground	SE	52	30	22	35	-13	17	Standard thermal glazing	39	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 18	Ground	NE	58.1	30	28.1	35	-6.9	23	Standard thermal glazing	45.1	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 18	Ground	NW	64.9	30	34.9	35	-0.1	30	Standard thermal glazing	51.9	Yes	ADF System 4	MVHR without T.V.
Plot 19	Ground	SW	57.9	30	27.9	35	-7.1	23	Standard thermal glazing	44.9	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 19	Ground	NW	63.9	30	33.9	35	-1.1	29	Standard thermal glazing	50.9	Yes	ADF System 4	MVHR without T.V.
Plot 19	Ground	SE	52.1	30	22.1	35	-12.9	17	Standard thermal glazing	39.1	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 20	Ground	NW	63.7	30	33.7	35	-1.3	29	Standard thermal glazing	50.7	Yes	ADF System 4	MVHR without T.V.
Plot 20	Ground	NE	58.2	30	28.2	35	-6.8	23	Standard thermal glazing	45.2	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 20	Ground	SE	52.1	30	22.1	35	-12.9	17	Standard thermal glazing	39.1	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 21	Ground	SW	59.8	30	29.8	35	-5.2	25	Standard thermal glazing	46.8	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'

Plot 21	Ground	SE	52.1	30	22.1	35	-12.9	17	Standard thermal glazing	39.1	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 21	Ground	NW	64	30	34	35	-1	29	Standard thermal glazing	51	**Yes**	ADF System 4	MVHR without T.V.
Plot 22	Ground	SE	52.1	30	22.1	35	-12.9	17	Standard thermal glazing	39.1	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 22	Ground	NE	58.9	30	28.9	35	-6.1	24	Standard thermal glazing	45.9	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 22	Ground	NW	63.7	30	33.7	35	-1.3	29	Standard thermal glazing	50.7	**Yes**	ADF System 4	MVHR without T.V.
Plot 23	Ground	SW	60.8	30	30.8	35	-4.2	26	Standard thermal glazing	47.8	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 23	Ground	SE	52.1	30	22.1	35	-12.9	17	Standard thermal glazing	39.1	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 23	Ground	NE	63.2	30	33.2	35	-1.8	28	Standard thermal glazing	50.2	**Yes**	ADF System 4	MVHR without T.V.
Plot 23	Ground	NW	62.5	30	32.5	35	-2.5	28	Standard thermal glazing	49.5	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 24	Ground	NE	63	30	33	35	-2	28	Standard thermal glazing	50	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 24	Ground	SE	53	30	23	35	-12	18	Standard thermal glazing	40	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 24	Ground	SW	62.3	30	32.3	35	-2.7	27	Standard thermal glazing	49.3	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 25	Ground	NE	62.5	30	32.5	35	-2.5	28	Standard thermal glazing	49.5	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 25	Ground	SW	62.3	30	32.3	35	-2.7	27	Standard thermal glazing	49.3	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 25	Ground	NW	65	30	35	35	0	30	Standard thermal glazing	52	**Yes**	ADF System 4	MVHR without T.V.
Plot 26	Ground	SW	58	30	28	35	-7	23	Standard thermal glazing	45	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 26	Ground	NW	65.1	30	35.1	35	0.1	30	Standard thermal glazing	52.1	**Yes**	ADF System 4	MVHR without T.V.
Plot 26	Ground	NE	64	30	34	35	-1	29	Standard thermal glazing	51	**Yes**	ADF System 4	MVHR without T.V.
Plot 26	Ground	SE	51.2	30	21.2	35	-13.8	16	Standard thermal glazing	38.2	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	Ground	SW	58	30	28	35	-7	23	Standard thermal glazing	45	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	Ground	NW	57.2	30	27.2	35	-7.8	22	Standard thermal glazing	44.2	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	Ground	NE	63	30	33	35	-2	28	Standard thermal glazing	50	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 27	Ground	SE	50.6	30	20.6	35	-14.4	16	Standard thermal glazing	37.6	**Yes**	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	1st	N	65.9	30	35.9	35	0.9	31	Upgraded glazing	52.9	**Yes**	ADF System 4	MVHR without T.V.
Apt 9-10	1st	S	58.5	30	28.5	35	-6.5	24	Standard thermal glazing	45.5	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Apt 9-10	1st	E	58.2	30	28.2	35	-6.8	23	Standard thermal glazing	45.2	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Apt 11-12	1st	S	59.2	30	29.2	35	-5.8	24	Standard thermal glazing	46.2	**Yes**	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Apt 11-12	1st	W	67.2	30	37.2	35	2.2	32	Upgraded glazing	54.2	**Yes**	ADF System 4	MVHR without T.V.
Apt 11-12	1st	N	66.6	30	36.6	35	1.6	32	Upgraded glazing	53.6	**Yes**	ADF System 4	MVHR without T.V.

APPENDIX 8: NIGHT-TIME FAÇADE NOISE LEVELS

Plot	Floor	Façade Direction	Calculated LAeq,8hr at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Commentary on Required Glazing	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?	Do Average Night-time Internal Noise Levels Achieve Compliance with AD-O?	Acoustics Ventilation & Overheating Assessment - Appropriate AD-F System	Eg. Alt' Ventilation Scheme
Plot 1	1st	NW	56.5	30	26.5	30	-3.5	27	Standard thermal glazing	43.5	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 1	1st	NE	52.9	30	22.9	30	-7.1	23	Standard thermal glazing	39.9	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 1	1st	SE	46.7	30	16.7	30	-13.3	17	Standard thermal glazing	33.7	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 2	1st	SW	52.7	30	22.7	30	-7.3	23	Standard thermal glazing	39.7	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 2	1st	NW	56.6	30	26.6	30	-3.4	27	Standard thermal glazing	43.6	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 2	1st	SE	46.7	30	16.7	30	-13.3	17	Standard thermal glazing	33.7	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 3	1st	NW	56.3	30	26.3	30	-3.7	26	Standard thermal glazing	43.3	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 3	1st	NE	51.2	30	21.2	30	-8.8	21	Standard thermal glazing	38.2	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 3	1st	SE	46.6	30	16.6	30	-13.4	17	Standard thermal glazing	33.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 4	1st	SW	51	30	21	30	-9	21	Standard thermal glazing	38	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 4	1st	NW	56.3	30	26.3	30	-3.7	26	Standard thermal glazing	43.3	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 4	1st	SE	46.6	30	16.6	30	-13.4	17	Standard thermal glazing	33.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 5	1st	NW	56.3	30	26.3	30	-3.7	26	Standard thermal glazing	43.3	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 5	1st	NE	50.6	30	20.6	30	-9.4	21	Standard thermal glazing	37.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 5	1st	SE	46.5	30	16.5	30	-13.5	17	Standard thermal glazing	33.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 6	1st	SW	49.9	30	19.9	30	-10.1	20	Standard thermal glazing	36.9	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 6	1st	NW	56.4	30	26.4	30	-3.6	26	Standard thermal glazing	43.4	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 6	1st	SE	46.5	30	16.5	30	-13.5	17	Standard thermal glazing	33.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 7	1st	NW	56.7	30	26.7	30	-3.3	27	Standard thermal glazing	43.7	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 7	1st	NE	50.2	30	20.2	30	-9.8	20	Standard thermal glazing	37.2	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 7	1st	SE	46.5	30	16.5	30	-13.5	17	Standard thermal glazing	33.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 8	1st	SW	55	30	25	30	-5	25	Standard thermal glazing	42	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 8	1st	NW	56.8	30	26.8	30	-3.2	27	Standard thermal glazing	43.8	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 8	1st	SE	46.5	30	16.5	30	-13.5	17	Standard thermal glazing	33.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	1st	N	58.3	30	28.3	30	-1.7	28	Standard thermal glazing	45.3	Yes	Yes	ADF System 4	MVHR without T.V
Apt 9-10	1st	S	50.9	30	20.9	30	-9.1	21	Standard thermal glazing	37.9	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	1st	E	50.5	30	20.5	30	-9.5	21	Standard thermal glazing	37.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	1st	S	51.6	30	21.6	30	-8.4	22	Standard thermal glazing	38.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	1st	W	59.6	30	29.6	30	-0.4	30	Standard thermal glazing	46.6	Yes	Yes	ADF System 4	MVHR without T.V
Apt 11-12	1st	N	59	30	29	30	-1	29	Standard thermal glazing	46	Yes	Yes	ADF System 4	MVHR without T.V
Plot 13	1st	SE	48.8	30	18.8	30	-11.2	19	Standard thermal glazing	35.8	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 13	1st	SW	62.5	30	32.5	30	2.5	33	Upgraded glazing	49.5	Yes	Yes	ADF System 4	MVHR without T.V
Plot 13	1st	NW	65.3	30	35.3	30	5.3	35	Upgraded glazing	52.3	Yes	Yes	ADF System 4	MVHR without T.V
Plot 14	1st	NE	58.6	30	28.6	30	-1.4	29	Standard thermal glazing	45.6	Yes	Yes	ADF System 4	MVHR without T.V
Plot 14	1st	SE	48.8	30	18.8	30	-11.2	19	Standard thermal glazing	35.8	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 14	1st	NW	64.6	30	34.6	30	4.6	35	Upgraded glazing	51.6	Yes	Yes	ADF System 4	MVHR without T.V
Plot 15	1st	SE	48.6	30	18.6	30	-11.4	19	Standard thermal glazing	35.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 15	1st	SW	54.8	30	24.8	30	-5.2	25	Standard thermal glazing	41.8	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 15	1st	NW	62.2	30	32.2	30	2.2	32	Upgraded glazing	49.2	Yes	Yes	ADF System 4	MVHR without T.V
Plot 16	1st	NE	56.2	30	26.2	30	-3.8	26	Standard thermal glazing	43.2	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 16	1st	SE	48.5	30	18.5	30	-11.5	19	Standard thermal glazing	35.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 16	1st	NW	62.2	30	32.2	30	2.2	32	Upgraded glazing	49.2	Yes	Yes	ADF System 4	MVHR without T.V
Plot 17	1st	SW	53.6	30	23.6	30	-6.4	24	Standard thermal glazing	40.6	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 17	1st	SE	48.4	30	18.4	30	-11.6	18	Standard thermal glazing	35.4	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 17	1st	NW	61.2	30	31.2	30	1.2	31	Upgraded glazing	48.2	Yes	Yes	ADF System 4	MVHR without T.V
Plot 18	1st	SE	48.3	30	18.3	30	-11.7	18	Standard thermal glazing	35.3	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 18	1st	NE	54.3	30	24.3	30	-5.7	24	Standard thermal glazing	41.3	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'

Plot 18	1st	NW	61.4	30	31.4	30	1.4	31	Upgraded glazing	48.4	Yes	Yes	ADF System 4	MVHR without T.V
Plot 19	1st	SW	53.8	30	23.8	30	-6.2	24	Standard thermal glazing	40.8	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 19	1st	NW	60	30	30	30	0	30	Standard thermal glazing	47	Yes	Yes	ADF System 4	MVHR without T.V
Plot 19	1st	SE	48.4	30	18.4	30	-11.6	18	Standard thermal glazing	35.4	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 20	1st	NW	59.8	30	29.8	30	-0.2	30	Standard thermal glazing	46.8	Yes	Yes	ADF System 4	MVHR without T.V
Plot 20	1st	NE	53.9	30	23.9	30	-6.1	24	Standard thermal glazing	40.9	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 20	1st	SE	48.3	30	18.3	30	-11.7	18	Standard thermal glazing	35.3	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 21	1st	SW	55.7	30	25.7	30	-4.3	26	Standard thermal glazing	42.7	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 21	1st	SE	48.4	30	18.4	30	-11.6	18	Standard thermal glazing	35.4	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 21	1st	NW	60.2	30	30.2	30	0.2	30	Standard thermal glazing	47.2	Yes	Yes	ADF System 4	MVHR without T.V
Plot 22	1st	SE	48.4	30	18.4	30	-11.6	18	Standard thermal glazing	35.4	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 22	1st	NE	54.3	30	24.3	30	-5.7	24	Standard thermal glazing	41.3	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 22	1st	NW	59.9	30	29.9	30	-0.1	30	Standard thermal glazing	46.9	Yes	Yes	ADF System 4	MVHR without T.V
Plot 23	1st	SW	56.5	30	26.5	30	-3.5	27	Standard thermal glazing	43.5	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 23	1st	SE	48.4	30	18.4	30	-11.6	18	Standard thermal glazing	35.4	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 23	1st	NE	57.8	30	27.8	30	-2.2	28	Standard thermal glazing	44.8	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 23	1st	NW	58.1	30	28.1	30	-1.9	28	Standard thermal glazing	45.1	Yes	Yes	ADF System 4	MVHR without T.V
Plot 24	1st	NE	58.4	30	28.4	30	-1.6	28	Standard thermal glazing	45.4	Yes	Yes	ADF System 4	MVHR without T.V
Plot 24	1st	SE	49.3	30	19.3	30	-10.7	19	Standard thermal glazing	36.3	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 24	1st	SW	59.5	30	29.5	30	-0.5	30	Standard thermal glazing	46.5	Yes	Yes	ADF System 4	MVHR without T.V
Plot 25	1st	NE	59.6	30	29.6	30	-0.4	30	Standard thermal glazing	46.6	Yes	Yes	ADF System 4	MVHR without T.V
Plot 25	1st	SW	61.2	30	31.2	30	1.2	31	Upgraded glazing	48.2	Yes	Yes	ADF System 4	MVHR without T.V
Plot 25	1st	NW	65.1	30	35.1	30	5.1	35	Upgraded glazing	52.1	Yes	Yes	ADF System 4	MVHR without T.V
Plot 26	1st	SW	53	30	23	30	-7	23	Standard thermal glazing	40	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 26	1st	NW	59.7	30	29.7	30	-0.3	30	Standard thermal glazing	46.7	Yes	Yes	ADF System 4	MVHR without T.V
Plot 26	1st	NE	58.8	30	28.8	30	-1.2	29	Standard thermal glazing	45.8	Yes	Yes	ADF System 4	MVHR without T.V
Plot 26	1st	SE	47.5	30	17.5	30	-12.5	18	Standard thermal glazing	34.5	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	1st	SW	52.6	30	22.6	30	-7.4	23	Standard thermal glazing	39.6	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	1st	NW	53	30	23	30	-7	23	Standard thermal glazing	40	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Plot 27	1st	NE	57.6	30	27.6	30	-2.4	28	Standard thermal glazing	44.6	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Plot 27	1st	SE	46.9	30	16.9	30	-13.1	17	Standard thermal glazing	33.9	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	Ground	N	56.9	30	26.9	30	-3.1	27	Standard thermal glazing	43.9	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'
Apt 9-10	Ground	S	47.1	30	17.1	30	-12.9	17	Standard thermal glazing	34.1	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 9-10	Ground	E	48.1	30	18.1	30	-11.9	18	Standard thermal glazing	35.1	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	Ground	S	48.1	30	18.1	30	-11.9	18	Standard thermal glazing	35.1	Yes	Yes	ADF Systems 1 or 2	Acoustic-grade T.V.
Apt 11-12	Ground	W	58.2	30	28.2	30	-1.8	28	Standard thermal glazing	45.2	Yes	Yes	ADF System 4	MVHR without T.V
Apt 11-12	Ground	N	57.6	30	27.6	30	-2.4	28	Standard thermal glazing	44.6	Yes	Yes	ADF System 3	MEV System & Acoustic-grade 'T.V.'

APPENDIX 9: EXAMPLE ALTERNATIVE VENTILATION SYSTEMS

System	Description	Example Product*
1 / 2	Window-frame mounted trickle ventilator.	**Greenwoods Acoustic Trickle Ventilator EAQ42W.** Provides a sound reduction performance of 42dB $D_{n,e,w}+C_{tr}$ in its open position. EAQ42W is an acoustic window vent suitable for new build and refurbishment and can be applied to most window profiles with add on sections.
	Through-wall ventilator.	**Greenwoods Wall Ventilator MA3051.** Provides a sound reduction performance of 55dB $D_{n,e,w}+C_{tr}$ in its open position. Highest performing acoustic wall ventilator in the UK - the MA3051 is ideal for new build applications where noise planning restrictions are in place. Providing up to 55dB reduction and suitable for wall thicknesses of 140mm and above
3	Continuous Mechanical Extract Ventilation (MEV) system. Centralised Mechanical Extract Ventilation (cMEV) is a whole-house extract system should be installed in conjunction with acoustic trickle ventilators which provide the air inlet.	**Greenwoods CMEV.4e/CMEV.4eHT** The low energy continuously running whole house extract system is ideal for apartments and houses. The HT model is available with additional SMART technology for humidity and timer sensor controls.
	Positive Input Ventilation (PIV) system. De-centralised PIV system is a room-by-room (bedroom / living room) wall mounted ventilation input fan. Can be installed in conjunction with acoustic trickle ventilators which provide air expulsion.	**Blauberg Fresher 50 PIV** Self-contained. low energy, acoustic positive input filtered supply air ventilation input fan. The unit provides a sound reduction performance of 41dB(A) with an internal (motor) noise level of 29dB(A) at 1m.
4	Mechanical Ventilation Heat Recovery (MVHR).	**Zehnder ComfoAir Q350 ST** Wall or floor mounted mechanical supply and extract ventilation with heat recovery (MVHR) with humidity sensor. **Nuaire MRXBOXAB-ECO2B**
*Example products detailed; other products are available.		