TECHNICAL REPORT

KINSALE ROAD LRD
NOISE IMPACT ASSESSMENT
CORK

For:

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1.0 INTRODUCTION

BKD Architects is assisting a planning permission submission in respect of a large scale residential development proposed to be located off the Kinsale Road in Cork. The proposed development is to consist of 170 no. residential units (158 no. apartments and 12 no. townhouse apartments, to include 51 no. 1-bed units, 84 no. 2-bed units, 35 no. 3-bed units) arranged in 4no. blocks varying in height from four to nine storeys over ground. It also includes a crèche; café; management office; 4 no. retail units; car parking and cycle parking.

In order to assist this planning permission submission, CLV was engaged to carry out both inward and outward noise impact assessments for the proposed development.

The purpose of the outward noise impact assessment was to consider the potential for the proposed residential development to impact on identified noise sensitive receptors in the vicinity during both the construction and operational stages and either confirm acceptability or recommend necessary noise mitigation measures as required.

The purpose of the inward noise impact assessment was to quantify the external noise environment in the vicinity of the development buildings and determine the noise mitigation measures required to be incorporated into the design of the development in order to ensure that any potential noise impacts on the proposed development are minimised in accordance with the established criteria limits.

The following document details the results of this assessment.

2.0 PROPOSED DEVELOPMENT LOCATION & LAYOUT

The proposed development is a large scale residential development (with heights of 4 - 8 storeys) proposed to be located on an existing brownfield land area located between Pearse and Kinsale Roads in Cork. The proposed development site is bordered to the west, north and east by residential dwellings and to the south by Virgin Media Park and a McDonalds restaurant.

Each of the nearest noise sensitive receptors are listed along with their nearest approximate distances away from the nearest development buildings as follows:

Residential Dwellings to Northwest	29m
Residential Dwellings to Northeast	10m
Residential Dwellings to East	25m
McDonalds Restaurant to South	29m

Note that the McDonald's Restaurant would not be considered as being noise sensitive but has been assessed as a standard receptor for completeness purposes.

See Figure 1 on the following page.

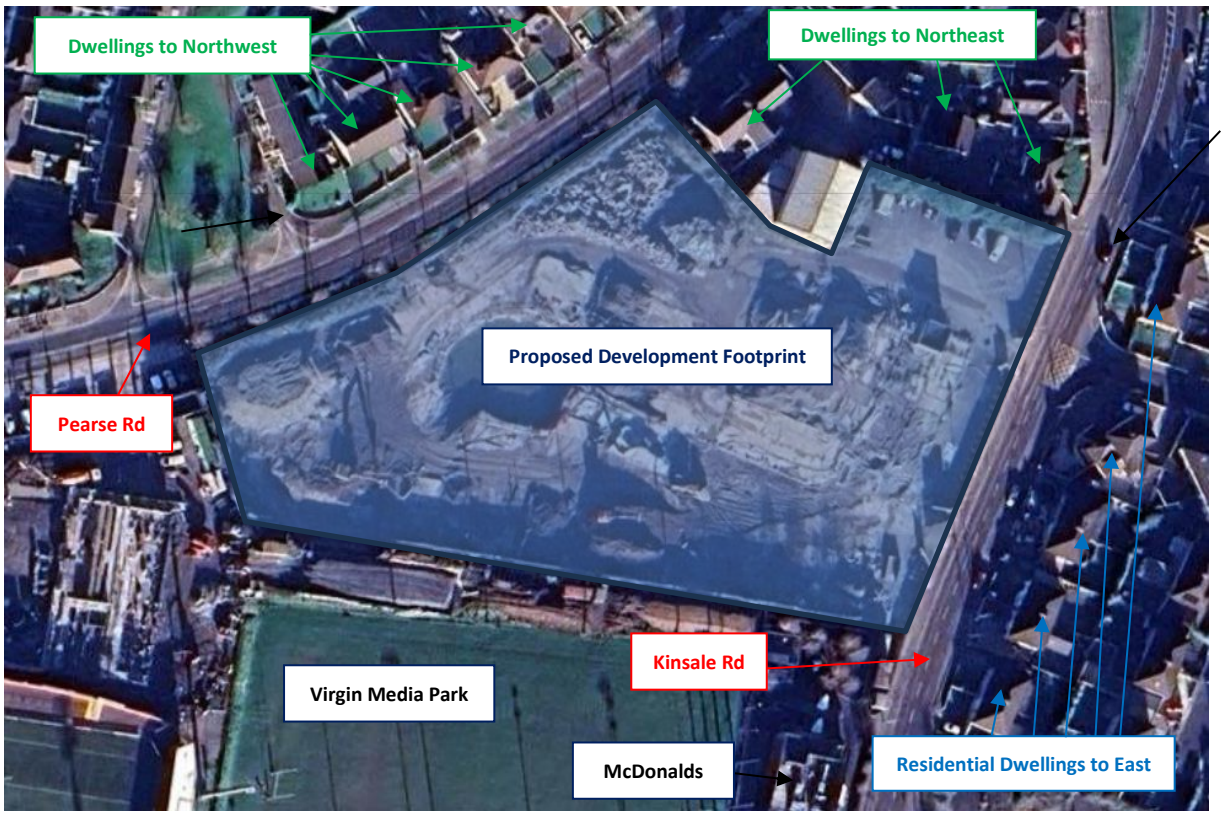


Figure 1 Proposed Development Location & Nearest Noise Sensitive Receptors

A general layout of the proposed development is provided in Figure 2 below.

Figure 2 Proposed Development Layout

3.0 NOISE MONITORING SURVEY

An environmental noise monitoring survey was conducted in order to quantify the ambient external noise environment in the vicinity of the proposed development site. The survey was conducted in general accordance with *ISO 1996-2: 2017: Acoustics - Description, measurement and assessment of environmental noise.*

Specific details are set out in the following sections.

3.1 Measurement Locations

Although the proposed development site is a relatively large area, it is fairly concentrated and the external noise sources (adjacent roadways) and noise sensitive receptors are located in close proximity to each other.

Given the similar orientation of both the external noise sources and noise sensitive receptors, two measurement locations were deemed to be appropriate in order to obtain calibration data for the noise model that will be constructed to consider the inward noise impact (refer to Section >>) as well as providing a sufficient and robust measure of the ambient noise level in the vicinity in this instance. Note that the locations were chosen to be across the street from the noise sensitive receptors within the proposed development grounds (for long term monitoring security purposes) but would be representative of the ambient noise levels at the same distance from the opposite site of the road as well.

NML 1: near the façade of Block 2 and in the vicinity of the dwellings to the northwest.

NML 2: **near the façade of Block 4 and** in the vicinity of the dwellings to the east.

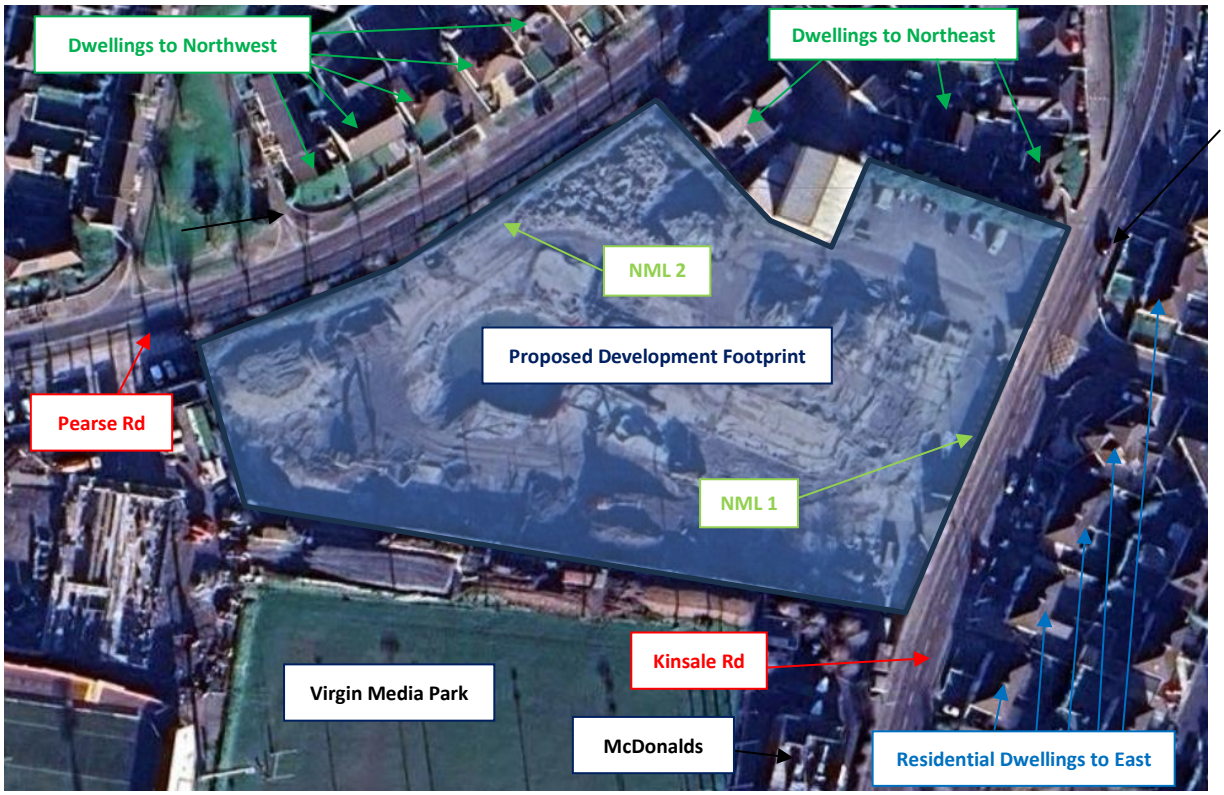


Figure 3 Site Layout Showing Approximate Position of Measurement Locations

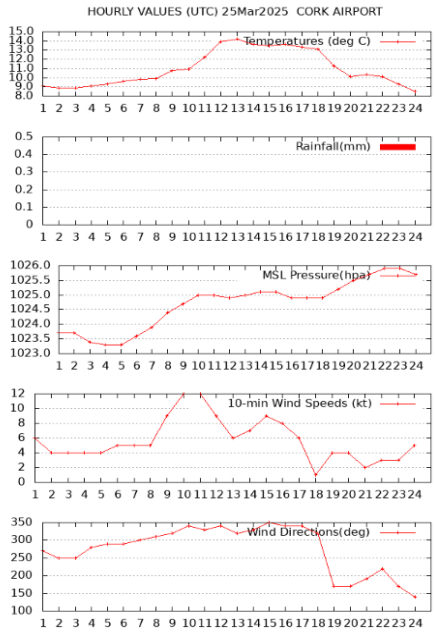
3.2 Survey Periods

Noise monitoring was conducted over the course of the mid-week weekday survey periods as follows:

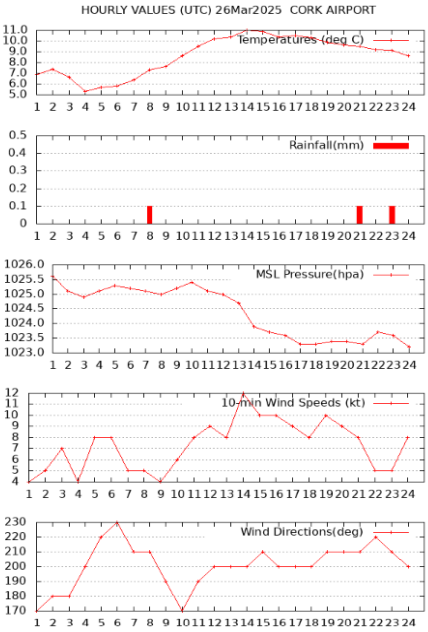
07:00 hrs on 25 March 2025 - 07:00 hrs on 28 March 2025

The meteorological conditions that were observed at Cork Airport on the days of the survey period are summarised in Figure 4 below.

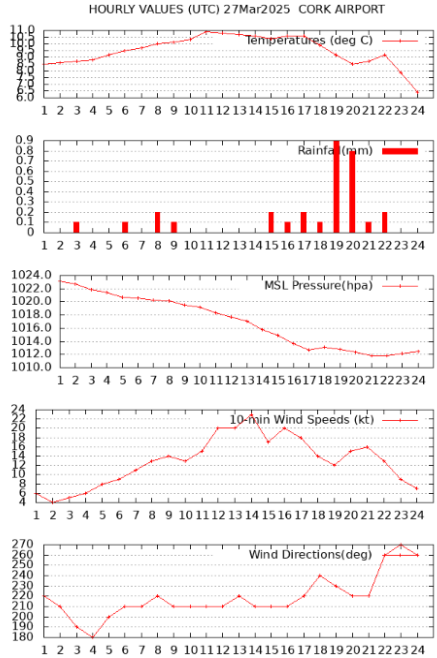
Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
25/03/2025	tr	14.6	8.3	5.5	5.7		4.7



Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
26/03/2025	0.4	11.1	5.0	1.8	7.3		0.0



Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
27/03/2025	3.1	11.2	6.3	4.3	12.8		0.1



Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
28/03/2025	0.6	10.6	3.6	1.1	11.5	36	9.3

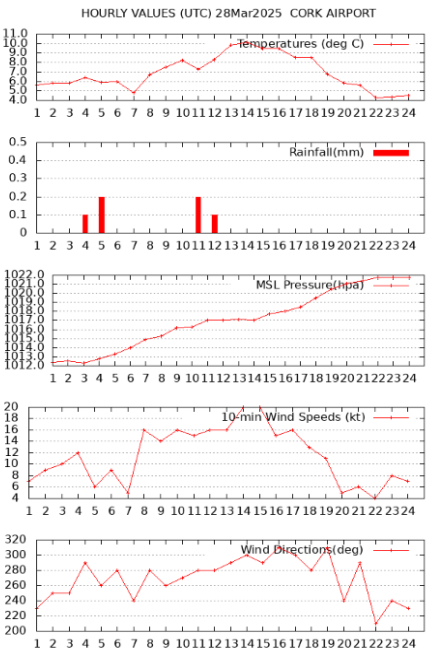


Figure 4 Meteorological Conditions Observed at Cork Airport During the Noise Monitoring Survey

3.3 Personnel & Instrumentation

Brian S. Johnson (CLV) carried out the noise level monitoring. He is an internationally experienced acoustic consultant who has been working in the fields of architectural / building acoustics and noise control since 1994. He has been based in America, Europe, Asia and Australia and is a member of the Institute of Acoustics. Brian also has extensive knowledge in the field of environmental acoustics and holds a Certificate of Competence in Environmental Noise Measurements from the Institute of Acoustics.

The measurements were conducted using two NTI Audio Type XL2 Sound Level Meters (Serial #A2A-18085-EO & #A2A-18385-EO). The microphones were fitted with 90mm windshields and the measurement apparatuses were check calibrated both before and after the survey using a Larson Davis CAL200 Acoustic Calibrator (Serial #18882). The microphones were positioned approximately 1.4m and 2.5m above the ground at NML 1 & 2 respectively.

The calibration certificates for the sound level meters and calibrator are provided in Appendices B & C of this document respectively.

3.4 Procedure

Measurements were conducted continuously over the full extent of the survey period. The sound level meters were set to average over periods that were 60 minutes in duration. The results were saved to the instrument memory for later download and analysis.

3.5 Measurement Parameters

The statistical noise monitoring results are presented in terms of the following five parameters:

- L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. It is typically used as a descriptor for the ambient noise level.
- L_{Amax} is the instantaneous maximum sound level measured during the sample period.
- L_{Amin} is the instantaneous minimum sound level measured during the sample period.
- L_{A10} is the sound level that is exceeded for 10% of the sample period.
- L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa. Noise characteristics in this report are also considered in respect of the following two aspects:

Tonal Noise: Sounds which cover a range of only a few Hz which contain a clearly audible tone, i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.

Impulsive Noise: A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background (pressurised air release, gunshot etc.).

3.6 Monitoring Results

The full hourly survey results for all quantities are detailed in Appendix A. However, the daytime (dB $L_{Aeq,16hr}$) and night time (dB $L_{Aeq,8hr}$) noise levels for each of the days surveyed are summarised in Tables 1 & 2 below.

Weekday	Daytime Period dB $L_{Aeq,16hr}$	Night Time Period dB $L_{Aeq,8hr}$
Tuesday	68.5	60.3
Wednesday	68.0	60.3
Thursday	67.8	60.0
Average	**68**	**60**

Table 1 Summary of Measured Daytime & Night Time Noise Levels at NML #1 (Kinsale Road Location)

Weekday	Daytime Period dB $L_{Aeq,16hr}$	Night Time Period dB $L_{Aeq,8hr}$
Tuesday	60.7	53.4
Wednesday	62.8	53.8
Thursday	62.4	55.3
Average	**62**	**54**

Table 2 Summary of Measured Daytime & Night Time Noise Levels at NML #2 (Pearse Road Location)

As can be seen from the measurement results above, the ambient noise environment was relatively consistent at both measurement locations across all daytime and night time periods over the three days.

4.0 OUTWARD NOISE IMPACT ASSESSMENT

4.1 Noise Emission Criteria

Construction Phase

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and may consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard *BS 5228 - 1: 2009+A1: 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise*.

The approach adopted in this instance calls for the designation of a noise sensitive location into a specific category (A, B or C) based on exiting ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded, indicates a significant noise impact is associated with the construction activities.

Table 3 below sets out the values which, when exceeded, indicate a significant effect at the facades of residential receptors as recommended by BS 5228 - 1. Please note that these are cumulative levels, i.e. the sum of both ambient and construction noise levels.

Assessment Category & Threshold Value Period (L_{Aeq})	Threshold Value, Decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-Time (23:00 to 07:00hrs)	45	50	55
Evenings & Weekends [D]	55	60	65
Daytime (07:00 - 19:00) & Saturdays (07:00 - 13:00)	65	70	75

Table 3 Example Threshold of Significant Effect at Dwellings

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

D) 19:00 - 23:00 weekdays, 13:00 - 23:00 Saturdays and 07:00 - 23:00 Sundays.

For the appropriate period (e.g. daytime), the ambient noise level is determined and rounded to the nearest 5dB. In this instance, the measured daytime ambient noise levels in the vicinity of the proposed development were measured in the range of 62 - 68dB $L_{Aeq,16hr}$ during daytime periods. It is therefore recommended that the residential dwellings in the vicinity be considered as Category B receptors.

It should also be considered that the established noise emission criterion detailed above is for residential dwellings. For construction noise impact on the less acoustically sensitive McDonalds restaurant, a relaxation of the applicable residential criteria is typically applied which would make it a Category C receptor.

The maximum daytime criteria limits summarised in Table 4 (on the following page) will therefore be applied at the facades of the nearest receptors in respect of construction noise emissions from the proposed development.

Noise Sensitive Receptor	Threshold Value, Decibels (dB $L_{Aeq,T}$)		
	Daytime Periods (07:00 - 19:00) & Saturdays (07:00 - 13:00)	Evening Periods 19:00 - 23:00 Weekdays 13:00 - 23:00 Saturdays & 07:00 - 23:00 Sundays	Night Periods (23:00 to 07:00hrs)
Residential Buildings	70	60	50
McDonalds Restaurant	75	65	55

Table 4 Established Threshold / Maximum Construction Noise Criteria Limits for Proposed Development

If the total noise level (i.e. construction noise plus existing ambient noise level) exceeds the appropriate category value (e.g. 70dB $L_{Aeq,T}$ during daytime periods for residential dwellings and 75dB $L_{Aeq,T}$ for the McDonalds restaurant), then a relative noise impact would be deemed to have occurred.

Note also that the levels listed in Table 4 are $L_{Aeq,T}$ noise levels (defined in Section 3.5) are typically averaged over hourly periods.

Operational Phase

Due consideration must be given to the nature of the primary noise sources when setting noise emissions criteria. In this instance, there are six primary sources of noise associated with the development once operational. Criteria for noise from each of these sources, will be considered in terms of the $L_{Aeq,T}$ parameter (the equivalent continuous sound level).

There is no Irish Standard containing guidance that is applicable to noise emissions from developments in this instance. In the absence of such standards, best practice dictates that the potential noise impact of the proposed development is assessed against appropriate British and / or International Standards.

In this instance, appropriate guidance is contained within *BS 8233 (2014): Guidance on Sound Insulation and Noise Reduction for Buildings*. This British Standard sets out recommended noise limits for indoor ambient noise levels in residential buildings as detailed in Table 5 below.

Activity	Room Type	Design Criterion $L_{Aeq,T}$ (dB)	
		Daytime (07:00 - 23:00hrs)	Night Time (23:00 - 07:00hrs)
Resting / Sleeping Conditions	Living Rooms	35dB $L_{Aeq,16hr}$	-
	Bedrooms	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

Table 5 Recommended Indoor Ambient Noise Levels from *BS 8233 (2014)*

For the purposes of this assessment, it is necessary to derive external limits based on the internal criteria listed in the table above. This is done by factoring in a degree of noise reduction afforded by an open window, which is defined in the standard as being 15dB.

Applying the 15dB factor to the values from the *BS 8233* table, the following criteria would apply at the façades of all the nearby residential dwellings:

- *Daytime (07:00 to 23:00 hours)* *50dB $L_{Aeq,16hr}$*
- *Night-time (23:00 to 07:00 hours)* *45dB $L_{Aeq,8hr}$*

In consideration of the adjacent McDonalds restaurant, there is no specific criteria guidance provided in BS 8233. However, the standard does list a 'typical' internal noise level design criteria range of 40 - 55dB L_{Aeq} for restaurants which would be considered applicable in this instance. An internal noise emission criterion of 40dB L_{Aeq} was therefore applied to the McDonalds restaurant.

Operable windows aren't located in the McDonalds restaurant and the entry doors are on the south façade so a nominal sound reduction of 25dB was assumed for a worst case standard external glazing construction to obtain an external noise criterion of 65dB L_{Aeq}.

In summary, the established noise emission criteria at the facades of the various noise sensitive receptors in the vicinity of the proposed development is detailed in Table 6 below.

Location	Design Criteria $L_{Aeq,T}$ (dB)	
	Daytime	Night Time
Residential Dwellings	50dB $L_{Aeq,16hr}$	45dB $L_{Aeq,8hr}$
McDonalds Restuarant	65dB L_{Aeq}	

Table 6 Summary of Established Noise Emission Criteria, dB $L_{Aeq,T}$

In order to assist with the interpretation of the noise associated with changes in noise level, Table 7 below offers guidance as to the likely impact associated with any particular relative change.

Change in Sound Level (dB L_{Aeq})	Subjective Perception	Impact
< 3	Inaudible	Imperceptible
3 - 5	Perceptible	Slight
6 - 10	Up to a doubling of loudness	Moderate
11 - 15	Over a doubling of loudness	Significant
> 15		Profound

Table 7 Likely Impact Associated with Change in Noise Level

Vibration Criteria

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- *British Standard BS 7385-2 (1993): Evaluation and measurement vibration in buildings Part 2: Guide to damage levels from ground borne vibration;*
- *British Standard BS 5228-2 (2009): Code of practice for noise and vibration control on construction and open sites Part 2: Vibration;*

BS 7385 states there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced by 50% or less for more critical buildings or structures that are considered to be compromised.

BS 5228 recommends that for soundly constructed residential property, light commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and increasing to 50mm/s at 40Hz and above for intermittent vibration.

For reinforced or framed structures or industrial and heavy commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 50mm/s at 40Hz and above again for intermittent vibration.

In the case of continuous vibration, it states that these figures may need to be reduced by up to 50%. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage, these limits may be reduced by up to 50%.

4.2 Outward Noise Impact Assessment Strategy Overview

In order to assess the potential for noise impacts from the proposed development, the following prediction methodology was adopted in this instance:

- ✓ Noise measurements were conducted in order to quantify the ambient noise level environment in the vicinity of the nearest noise sensitive receptors (refer to Section 3.0).
- ✓ The measured ambient noise levels were used to establish construction maximum noise emission criteria limits (refer to Section 4.1).
- ✓ Construction noise emission levels were calculated in accordance with *BS 8233* at each of the nearest noise sensitive receptors based on sound power / pressure levels for expected equipment / processes and estimated utilisation periods along with standard appropriate corrections for attenuation with distance, screening from buildings / perimeter site hoarding and the presence of nearby reflecting surfaces (refer to Section 4.3).
- ✓ Operational noise emission levels were calculated at each of the nearest noise sensitive receptors (in accordance with *BS 8233*) based on all identified operational noise source sound power / pressure levels along with standard appropriate corrections for attenuation with distance, screening from buildings and the presence of nearby reflecting surfaces (refer to Section 4.4).

- ✓ The cumulative results of these operational calculations were then used to assess the potential for a noise impact based on a comparison with the criteria limits at the nearest noise sensitive receptors (refer to Section 4.4).

All noise prediction calculations were conducted in general accordance with ISO 9613: *Acoustics - Attenuation of sound outdoors, Part 2: General method of calculation, 1996.*

4.3 Construction Phase

During the construction phase, a variety of plant items will be in use such as lifting equipment, dumper trucks and general construction plant items. Each of these items will generate significant levels of noise and will need to have noise emissions predictions carried out in respect of same.

The nearest noise sensitive receptors to the proposed development were identified and detailed in Section 2.0 as follows:

Residential Dwellings to Northwest	29m
Residential Dwellings to Northeast	10m
Residential Dwellings to East	25m
McDonalds Restaurant to South	29m

Note that these distances represent the closest distance of the nearest proposed development block facade to each noise sensitive receptor. It must be stated that, for most of the time, plant and equipment will be at a greater distance than these and, consequently, will have a lesser impact. Calculations to the furthest distance of the proposed development façade were also calculated. This allows for both an estimate of the range as well as the "worst-case" scenario in respect of construction noise emissions.

The following assumptions have been made in the preparation of these construction noise prediction calculations:

- utilisation of all equipment of 66% of the 12-hour working day (i.e. 8 hours)
- the proposed site will be surrounded by a 2.4m high solid hoarding

Table 8, on the following page, indicates typical noise levels that would be expected from the proposed construction site during the various phases of the construction project and their predicted level at each of the nearest noise sensitive receptors.

Phase	Plant Item (BS 5228 Ref)	At 10m (dB) [1]	Predicted Noise Level (dB L_{Aeq})			
			Dwellings to Northwest	Dwellings to Northeast	Dwellings to East	McDonalds to South
Excavation / Site Preparation	Tracked Excavator (C2.22)	72	48 - 63	51 - 72	47 - 64	49 - 63
	Dumper (C3.100)	74				
	Wheeled Loaded Lorry (D3.1)	75				
Foundation Laying	Compressor (C6.19)	72	46 - 61	49 - 70	45 - 62	47 - 61
	Poker Vibrator (C6.40)	73				
	Cement Mixers (C6.6)	71				
Steel Erection	Crane (C7.120)	76	46 - 61	49 - 70	45 - 62	47 - 61
	Lorry (C7.121[2])	70				
Bored Piling	Bored Pile (D.24)	76	49 - 64	52 - 73	48 - 65	50 - 64
General Construction	Compressor (C7.70)	70	55 - 69	57 - 78	53 - 70	55 - 69
	Diesel Hoist (C7.97)	73				
	Pneumatic Circular Saw (C.79)	75				
	Generator (C7.51)	72				
	Dumper (C3.100)	74				
Roadworks	Surfacing	73	42 - 57	45 - 66	41 - 58	43 - 52

Table 8 Predicted Noise Emission Levels at Nearest Noise Sensitive Receptors During Construction Phases

[1] Sound data from BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration on construction and open sites*.

[2] Assumes the methods for noise reduction outlined in Table B1 of BS5228: Part 1 are considered when operation is being carried out on site.

As confirmed by the results in Table 8, construction noise emissions are predicted to be within the established 70dB $L_{Aeq,1hr}$ daytime criterion at most of the nearby noise sensitive receptors. The only noise impact from the construction phase expected to occur is at the semi-detached dwelling located immediately adjacent to the site (4 Pearse Road). Noise emissions at the southwest facade of this dwelling are predicted to exceed the established criterion by 2 - 8dB during some construction phases when construction activities are occurring at the nearest development building.

Reference to Table 7 indicates that these exceedances would be considered as slight to moderate noise impacts. However, it should be considered that noise levels of this order will only occur during periods when activities are occurring in respect of the nearest proposed development building location. This is typical in instances where buildings are constructed in close proximity to noise sensitive receptors and cannot be avoided (especially when all practical mitigation measures are already being provided). However, it is apparent from a review of the predicted noise level ranges that construction noise emissions will be below the recommended thresholds for activities occurring across the majority of construction areas. In addition, once the building located immediately adjacent to this dwelling is constructed, construction noise emission levels will decrease significantly even below those predicted due to shielding from the constructed building and increased distances away from the noise sensitive receptors.

Construction noise emission levels predicted at the McDonalds restaurant are all below the 75dB L_{Aeq} criterion. There should therefore be no resultant noise impacts on it.

All practical source / path noise control mitigation measures that can be provided are being provided in this instance (refer to Section 4.5). Unfortunately, construction activities that occur in close vicinities to noise sensitive receptors will always be expected to cause noise impacts. The necessity for these activities to be managed / coordinated with local residents (in conjunction with the other best practice noise reduction measures detailed in Section 4.5) therefore becomes critical for minimising these impacts.

In respect of vibration, the potential for impact at neighbouring sensitive locations during construction will be limited to excavation works and lorry movements on uneven road surfaces. However, lorry movements will be mostly on existing roads which are free of significantly sized speed bumps and other similar impediments so any potential vibration impact will therefore be minimised.

4.4 Operational Phase

In this instance, there were six principal sources of noise that were identified as having the potential to arise from the proposed development during its operational phase. These are as follows:

- Building Services Plant
- Café Noise Emissions
- Creche External Play Area Noise Emissions
- Retail Unit Delivery Truck Events
- Car Parking
- Additional Vehicular Traffic on Public Roads

Each one of these potential sources of noise is considered in turn in the following sections.

Building Services Plant

As part of the design of the proposed development, there will be a limited number of electrical / mechanical plant operating to service it; most of it will be capable of generating noise to some degree.

Although the MEP design isn't advanced at this stage, it is understood that the noise producing element of the development building services strategy for the apartment blocks will consist of exhaust air heat pumps (EAHP) which will locate in dedicated EAHP cupboards within each apartment. This will ensure that radiated noise emissions from these units are sufficiently low as to be negligible / inaudible along the proposed development external building facades.

The only connection these units will have to the environment will be for two ventilation / extract ducts for each unit to terminate along the building facades. Given that these units have not been selected yet, it has been assumed for the purposes of this assessment that the sound pressure level at a distance of 1m from these openings will be of the order of 45dB(A) (or have mitigation measures incorporated to achieve same).

In the absence of an MEP design, it has also been assumed that a similar approach will be taken for the creche, retail units and café which would be considered reasonable in this instance.

There is also an electrical substation proposed to be located near the northeastern corner boundary with Kinsale Road but it will be fully enclosed within a concrete enclosure. Although the selection of the substation equipment is not known at this stage, typical noise emissions from enclosed substations are typically in the range of 30 - 45dB(A). A worst case condition of 45dB(A) at a distance of 1m from the enclosure has therefore also been considered for the purpose of this assessment.

Taking into consideration the noise levels for each of these units along with appropriate corrections for distance, screening and the presence of nearby reflecting surfaces and assuming that 75% of plant is operating simultaneously, the resultant noise levels at the nearest noise-sensitive receptors for each strategy have been calculated and are predicted to be as follows:

- Residential Dwelling to Northwest 30 dB L_{Aeq}
- Residential Dwelling to Northeast 38 dB L_{Aeq}
- Residential Dwelling to East 31 dB L_{Aeq}
- McDonalds Restaurant 28 dB L_{Aeq}

All of these absolute predicted levels are well within both the daytime and night time criteria at all adjacent noise sensitive receptors.

In respect of tonal noise emission elements, it is not typically possible to carry out a tonal analysis of building services plant during the planning stage given that actual unit selections (and often actual unit types) are not made until the detailed design stage of a project. Whilst it is not expected that low level building services plant of this nature will contain significant enough tonal elements that would be manifest above the background noise levels in the

vicinity, it is nonetheless recommended that a noise assessment be carried out by a qualified acoustic consultant during the design stage to confirm.

No impulsive elements are expected from building services plant.

The mitigation measures that are therefore be required in this instance in respect of building services plant are the following:

- ✓ EAHP extract / ventilation duct systems are designed such that radiated sound pressure levels at a distance of 1m from their external facade openings will be of the order of 45dB(A) (or have mitigation measures incorporated to achieve same)
- ✓ a noise assessment survey should be carried out by a suitably qualified acoustic consultant during the design stage to confirm compliance of the design with the established criteria limits and that there are no tonal elements present.

Café Noise Emissions

The café is to be located on the ground floor of the proposed development Block 3 building. It will have a frontage onto the public amenity area to the north. Refer to Figure 5 below.

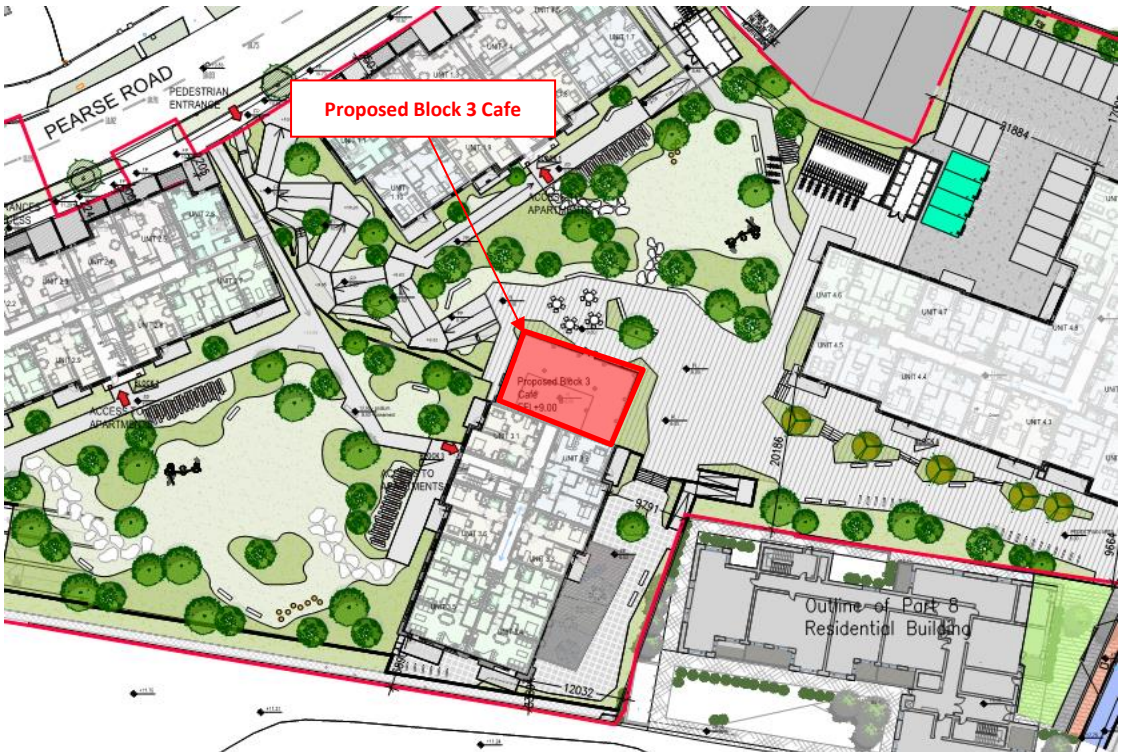


Figure 5 Proposed Development Café Location

The café could have a number of moderate noise level sources associated with its operation such as coffee bean grinders and background music in addition to general patron noise.

Noise levels measured in similar street cafés in Cork were of the order of 75 - 78dB L_{Aeq} during busy periods. Note that the building services noise emissions were considered separately in the preceding section.

Assuming a source noise level of 78dB L_{Aeq} and a conservative noise reduction of 30dB R_w for the external glazing, the predicted noise level emissions from the café at the various receptors are summarised as follows:

Receptor	Noise Level
➢ Residential Dwelling to Northwest	< 10 dB L_{Aeq}
➢ Residential Dwelling to Northeast	11 dB L_{Aeq}
➢ Residential Dwelling to East	< 10 dB L_{Aeq}
➢ McDonalds Restaurant	< 10 dB L_{Aeq}

All of these predicted levels are well within the daytime criteria at all nearby noise sensitive receptors. The café is not expected to be in operation during night time hours but it is worth noting that these levels would be within the established night time criteria as well.

No significant impulsive or tonal elements are expected from café noise emissions.

No further mitigation measures would therefore be required in respect of external noise emissions from the proposed development café.

Creche External Play Area Noise Emissions

The creche will also be located on the ground floor of the proposed development Block 3 building. It will have a frontage on the east façade of the building and will have a 2m high solid fence surrounding it. Refer to Figure 6 below.

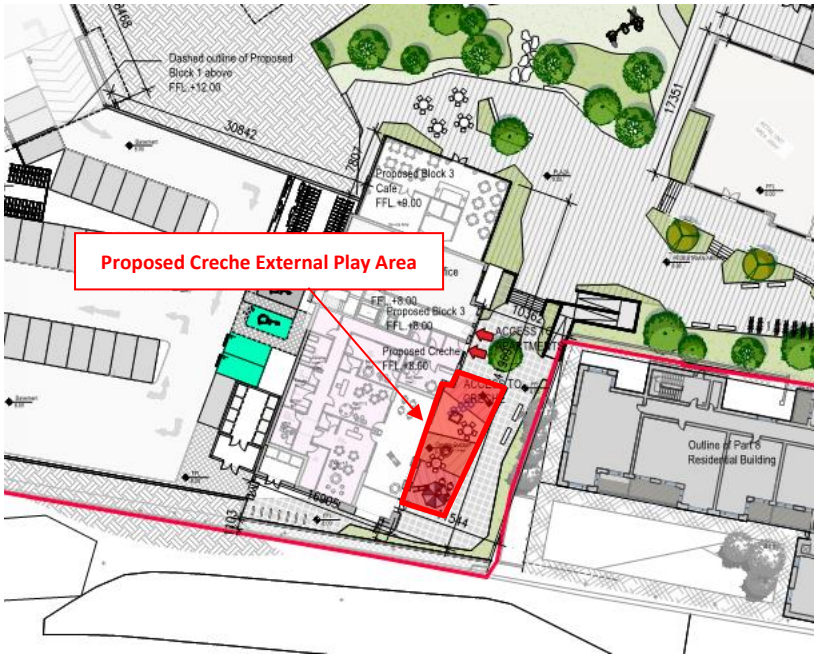


Figure 6 Proposed Development Creche External Play Area Location

The creche play area will likely have periods of relatively significant noise emissions due to children playing / laughing. Noise levels measured in similar external creche play areas in Cork were of the order of 84 - 88dB L_{Aeq} during periods of significant children playing activities.

Assuming a source noise level of 88dB L_{Aeq} and standard barrier and distance corrections applied, the predicted noise level emissions from the creche external play area at the various receptors are summarised as follows:

Receptor	Noise Level
➢ Residential Dwelling to Northwest	30 dB L_{Aeq}
➢ Residential Dwelling to Northeast	37 dB L_{Aeq}
➢ Residential Dwelling to East	36 dB L_{Aeq}
➢ McDonalds Restaurant	41 dB L_{Aeq}

All of these predicted levels are within the daytime criteria at all nearby noise sensitive receptors. The creche will not be in operation during night time hours but it is worth noting that these levels would be within the established night time criteria as well.

No significant tonal elements are expected from creche external play area noise emissions and any impulsive noise due to shouting or yelling is expected to be sufficiently below the ambient noise level at all nearby noise sensitive receptors to not impart any noise impact.

No further mitigation measures would therefore be required in respect of external noise emissions from the proposed development creche.

Retail Unit Delivery Truck Events

Deliveries will be required for the four retail units that are located in Block 4. The units will likely have regular deliveries that are made with large trucks which will unload in the parking area adjacent to the units (refer to Figure 7 below). Deliveries to the retail units will likely be made by smaller lorries parked at the side of the internal roads.

Note that deliveries will be restricted to daytime periods (07:00 - 19:00hrs) periods only.

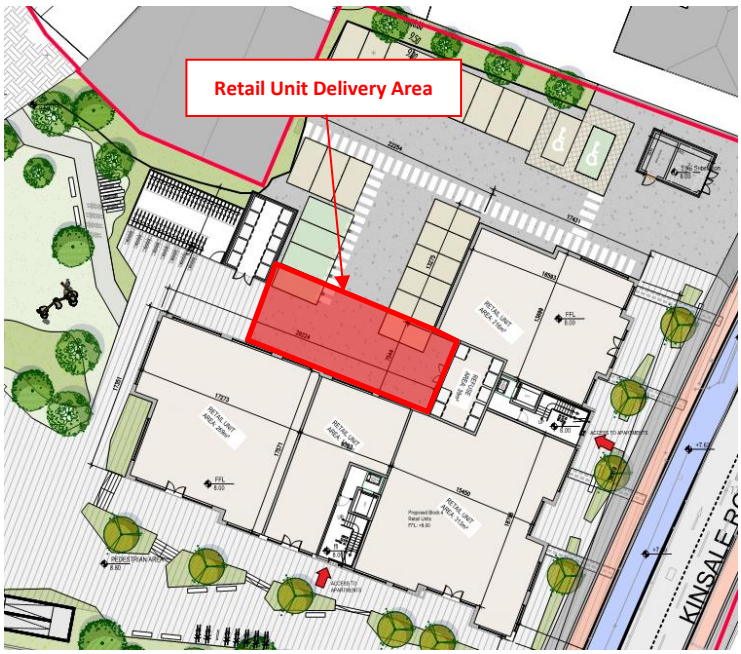


Figure 7 Proposed Development Retail Unit Delivery Area Location

The noise level at a distance of 3m from a typical small lorry delivery is of the order of 58dB $L_{Aeq,1hr}$. This noise level includes the effects of reflections from building façades / delivery yard boundaries and contributions from all sources of delivery event noise, i.e. vehicle manoeuvring and trolleys. Note that the duration of these deliveries will likely be much less than an hour but it has been considered in this instance anyway as a worst case scenario.

As discussed above, the delivery area for the retail units will be located in the rear area of Block 4 so will be relatively shielded from most nearby receptors. Taking into account the delivery noise level referred to above as well as the distance between the delivery area and the various receptors, the resultant noise levels at the façades of the nearest noise-sensitive locations have been calculated and are predicted to be as follows:

Receptor	Noise Level
➢ Residential Dwelling to Northwest	19 dB L_{Aeq}
➢ Residential Dwelling to Northeast	33 dB L_{Aeq}
➢ Residential Dwelling to East	19 dB L_{Aeq}
➢ McDonalds Restaurant	18 dB L_{Aeq}

All of these absolute predicted levels are well within the daytime criteria at all nearby noise sensitive receptors. Delivery events will take place during daytime periods only but it is worth noting that these levels would be within the established night time criteria as well.

Any potential tonal or impulsive elements generated during delivery truck events is expected to be sufficiently below the ambient noise level at all nearby noise sensitive receptors to not impart any noise impact.

No mitigation measures would therefore be required in respect of delivery truck events.

Car Parking

In this instance, the car parking locations for the residential buildings will all be in an underground car park. This will prevent residential car parking noise from having any significant noise impact on any of the nearby receptors.

In terms of surface car parking, there are only 24 no. surface car parking spaces being provided for the retail areas of the proposed development. Given this extremely low number of vehicles, any noise contributions from development car parking activity in the vicinity of the proposed development would therefore be considered insignificant when compared with noise emissions from traffic on Kinsale Road.

No significant impulsive or tonal elements are expected from car parking activities.

No mitigation measures are therefore required in respect of the proposed development car parking noise emissions.

Additional Vehicular Traffic on Public Roads

The proposed development will introduce some additional traffic onto public roads in the locality of the site. The percentage increase to AM Peak (worst case) traffic flows with the opening of the proposed development were calculated by PUNCH. The results of our analysis based on this information are presented in Table 9 on the following page.

Junction	% Increase in AM Peak Traffic Flows	Change in Noise Level (dB)
Kinsale Road / Pearse Road	6.351%	+ 0.3
Kinsale Road / Tramore Road	4.169%	+ 0.2
Kinsale Road / Mick Barry Road	4.596%	+ 0.2
Kinsale Road / Slieve Marsh Road	8.490%	+ 0.4

Table 9 Estimated Increase in Traffic Noise Level Emissions with Proposed Development

The increase in noise level due to proposed development traffic flows with are predicted to be ≤ 0.4dB on the surrounding road networks.

The impact of this increase is therefore considered to be imperceptible and therefore negligible.

Cumulative Operational Noise Levels

The total level of combined noise emissions from the proposed development noise sources can be determined by summing together all their individual contributions. The total levels of each are summarised and totalled in Tables 10 & 11 as follows.

Noise Source	Daytime Noise Level Emissions (dB L_{Aeq})			
	Dwellings to Northwest	**Dwellings to Northeast**	**Dwellings to East**	**McDonalds Restaurant**
Building Services Plant	30	38	31	28
Café Noise Emissions	< 10	11	< 10	< 10
Creche Noise Emissions	30	37	36	41
Delivery Events	19	33	19	18
Car Parking on Site	Negligible			
Additional Vehicular Traffic	Negligible			
Cumulative Noise Level	**33**	**41**	**37**	**41**

Table 10 Proposed Development Cumulative Daytime Noise Level Emission Summary

Noise Source	Night Time Noise Level Emissions (dB L_{Aeq})			
	Dwellings to Northwest	Dwellings to Northeast	Dwellings to East	McDonalds Restaurant
Building Services Plant	30	38	31	28
Café Noise Emissions	N/A			
Creche Noise Emissions	N/A			
Delivery Events	N/A			
Car Parking on Site	Negligible			
Additional Vehicular Traffic	Negligible			
Cumulative Noise Level	**30**	**38**	**31**	**28**

Table 11 Proposed Development Cumulative Night Time Noise Level Emission Summary

These cumulative noise levels are compared with the established project noise emission criteria in Tables 12 & 13 below.

Location	Predicted Noise Level Range	Daytime Noise Emission Criteria	Compliant?
Dwellings to the Northwest	33 dB L_{Aeq}	**50dB $L_{Aeq,16hr}$**	✓
Dwellings to the Northeast	41 dB L_{Aeq}		✓
Dwellings to the East	37 dB L_{Aeq}		✓
McDonalds Restaurant	41 dB L_{Aeq}	**65dB L_{Aeq}**	✓

Table 12 Proposed Development Cumulative Noise Emission Level Comparison with Daytime Criteria

Location	Predicted Noise Level Range	Night Time Noise Emission Criteria	Compliant?
Dwellings to the Northwest	30 dB L_{Aeq}	**45dB $L_{Aeq,8hr}$**	✓
Dwellings to the Northeast	38 dB L_{Aeq}		✓
Dwellings to the East	31 dB L_{Aeq}		✓
McDonalds Restaurant	28 dB L_{Aeq}	**65dB L_{Aeq}**	✓

Table 13 Proposed Development Cumulative Noise Emission Level Comparison with Night Time Criteria

As can be seen in the preceding tables, the expected levels of noise emissions from the proposed development are within the established criteria at all adjacent noise sensitive receptors during all time periods.

The predicted cumulative noise levels for each of the residential receptors have also been compared with the measured ambient noise levels measured in their vicinity in Tables 14 & 15 below.

Location	Period	Predicted Noise Level	Measured Daytime Ambient Noise Level	Noise Level Above or Below Ambient?
Dwellings to the Northwest	Daytime	33 dB $L_{Aeq,16hr}$	62 dB $L_{Aeq,16hr}$	Below
Dwellings to the Northeast		41 dB $L_{Aeq,16hr}$	62 dB $L_{Aeq,16hr}$	Below
Dwellings to the East		37 dB $L_{Aeq,16hr}$	68 dB $L_{Aeq,16hr}$	Below

Table 14 Noise Emission Level Comparison with Daytime Period Ambient Noise Levels

Location	Period	Predicted Noise Level	Measured Night Time Ambient Noise Level	Noise Level Above or Below Ambient?
Dwellings to the Northwest	Night Time	30 dB $L_{Aeq,8hr}$	54 dB $L_{Aeq,8hr}$	Below
Dwellings to the Northeast		38 dB $L_{Aeq,8hr}$	54 dB $L_{Aeq,8hr}$	Below
Dwellings to the East		31 dB $L_{Aeq,8hr}$	60 dB $L_{Aeq,8hr}$	Below

Table 15 Noise Emission Level Comparison with Night Time Period Ambient Noise Levels

As can be seen in the preceding tables, the predicted levels of noise emissions from the proposed development are well below the existing ambient noise levels at the nearest noise sensitive receptors in the vicinity and would therefore be expected to be nominally inaudible for the vast majority of the time.

It should also be highlighted that the noise level conditions that were assessed would be considered worst case.

There are therefore no significant operational noise impacts that are expected from the proposed development on any of the identified adjacent noise sensitive receptors.

4.5 Avoidance, Remedial & Reductive Measures

The following measures are recommended to minimise the potential for disturbance due to noise emissions from the proposed development. Proper application of these measures should reduce noise emissions less than those predicted in this report.

Construction Phase

With regard to construction activities, reference will be made to *BS 5228: Noise control on construction and open sites*. This document provides detailed guidance on the control of noise from demolition and construction activities.

In particular, it is proposed that various practices be adopted during general construction activities including:

- ✓ Establishing channels of communication between the contractor / developer, Local Authority and residents.
- ✓ Appointment of a site representative responsible for matters relating to noise.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These should include:

- ✓ Provision of 2.4m high perimeter hoarding around the site boundary.
- ✓ Selection of plant with low inherent potential for generation of noise.
- ✓ Erection of barriers as necessary around items such as generators or high duty compressors.
- ✓ Placement of noisy plant as far away from sensitive properties as permitted by site constraints.
- ✓ Avoiding unnecessary revving of engines and switch off idling engines / equipment when not in use.
- ✓ Restricting construction activities to daytime periods only.

Operational Phase

Building Services Plant

The predicted noise levels from proposed development building services plant are within the adopted criteria for both the daytime and night-time periods. The only mitigation considerations that would be deemed as being required in this instance are as follows:

- ➢ EAHP extract / ventilation duct systems are designed such that radiated sound pressure levels at a distance of 1m from their external facade openings will be of the order of 45dB(A) (or have mitigation measures incorporated to achieve same).
- ➢ a noise assessment survey should be carried out by a suitably qualified acoustic consultant during the design stage to confirm compliance of the design with the established criteria limits and that there are no tonal elements present.

Café Noise Emissions

The noise impact assessment has demonstrated that ameliorative measures are not required in respect of café noise emissions.

Creche External Play Area Noise Emissions

The noise impact assessment has demonstrated that ameliorative measures are not required in respect of the creche external play area noise emissions (apart from the perimeter fencing already being provided).

Retail Unit Delivery Truck Events

The noise impact assessment has demonstrated that ameliorative measures are not required in respect of delivery truck events to the proposed development retail units.

Car Parking

The noise impact assessment has demonstrated that ameliorative measures are not required in respect of car parking noise.

Additional Vehicular Traffic on Public Roads

The noise impact assessment has demonstrated that ameliorative measures are not required in respect of additional vehicular traffic on public roads.

4.6 Summary of Resultant Outward Noise Impact

This section summarises the likely residual noise impact associated with the proposed development, taking into account the ameliorative measures described in Section 4.5.

Construction Phase

During the construction phase of the project, there is only expected to be a slight to moderate noise impact on the nearest residential dwelling to the northeast (4 Pearse Road) during some construction phases when they occur in close proximity. Predicted construction noise emission levels at all other noise sensitive receptors in the vicinity would be compliant with the recommended thresholds.

As stated in Section 4.3, construction activities are typically expected to impact significant impacts on noise sensitive receptors when carried out in close proximities with the receptors immediately adjacent to the proposed development. In this instance, it is worth noting that these significant noise levels will only occur when construction works are being carried out on building elements in close proximity to the 4 Pearse Road dwelling. Construction activities carried out across the remainder of the site are predicted to be within the recommended thresholds and once the portions of the development nearest to the 4 Pearse Road dwelling are constructed, noise emissions from the remaining construction activities will be significantly attenuated through shielding by these elements and the increased distances. Construction activities in close proximity to the 4 Pearse Road dwelling should therefore be managed / coordinated with local residents to minimise their potential noise impact.

Limiting the hours of noisy operations and continuous noise monitoring along with implementation of appropriate noise control measures detailed in this report will also serve to minimise noise impact as far as practicable in this instance.

Operational Phase

Building Services Plant

The predicted noise levels associated with building services plant are within the criteria of 45 / 50dB $L_{Aeq,T}$ at the nearby residential receptors for daytime and night time periods respectively and 60dB $L_{Aeq,T}$ at the McDonalds restaurant as well as being below the ambient noise levels in the vicinity.

The predicted noise levels associated with the proposed development building services plant are therefore negligible.

Café Noise Emissions

The predicted noise levels associated with the café activities are within the daytime criterion of 50dB $L_{Aeq,T}$ at the nearby residential receptors and 60dB $L_{Aeq,T}$ at the McDonalds restaurant as well as being below the ambient noise levels in the vicinity.

The predicted noise levels associated with the proposed development café are therefore negligible.

Creche External Play Area Noise Emissions

The predicted noise levels associated with the creche external play area are within the daytime criterion of 50dB $L_{Aeq,T}$ at the nearby residential receptors and 60dB $L_{Aeq,T}$ at the McDonalds restaurant as well as being below the ambient noise levels in the vicinity.

The predicted noise levels associated with the proposed development creche external play area are negligible.

Retail Unit Delivery Truck Events

The predicted noise levels associated with the retail unit delivery truck events are within the daytime criterion of 50dB $L_{Aeq,T}$ at the nearby residential receptors and 60dB $L_{Aeq,T}$ at the McDonalds restaurant as well as being below the ambient noise levels in the vicinity.

The predicted noise levels associated with delivery truck events to the proposed development retail units are negligible.

Car Parking

The noise levels associated with car parking are predicted to be negligible.

Additional Vehicular Traffic on Public Roads

The noise levels associated with additional vehicular traffic on roads are predicted to be negligible.

5.0 INWARD NOISE IMPACT ASSESSMENT

As stated in Section 2.0, the proposed development is proposed to be located between Pearse and Kinsale Roads in Cork. The area of concern in this instance is noise emissions from these two roads impacting the residential blocks of the proposed development.

5.1 INWARD NOISE IMPACT ASSESSMENT STRATEGY OVERVIEW

In order to assess the potential for inward noise impacts from the development, the following prediction methodology was adopted in this instance:

- ✓ An initial survey was conducted of the site, during which it was observed that the ambient noise environment on the site is controlled almost exclusively by traffic along the perimeter roadways (Pearse & Kinsale Roads). Given this situation, noise monitoring was conducted over a 3-day mid-week period to quantify existing levels of noise emissions from the roadways (refer to Section 3.0).
- ✓ Ambient noise level criteria for the proposed development were established based on best practice guidance (refer to Section 5.2).
- ✓ A noise model of the site was constructed using iNoise Prediction Software. The results of the model were then 'calibrated' with the results of the noise monitoring survey (refer to Section 5.3).
- ✓ Noise prediction modelling was carried out to determine the predicted traffic noise emission levels on the various proposed development facades and in external balconies / amenity areas (refer to Section 5.3).
- ✓ An Initial Site Noise Risk assessment was carried out by comparing the predicted noise levels and with ProPG 2017 criteria (refer to Section 5.4).
- ✓ The ambient noise levels in the proposed development external amenity areas and external balconies were assessed in accordance with the established criteria (refer to Section 5.5).
- ✓ The ambient noise levels were considered in respect of the proposed development specified building façade elements in order to either confirm that the proposed façade elements design will ensure that the established internal noise levels will comply with the established criteria or recommend upgrade specifications as required (refer to Section 5.6).

All noise prediction calculations were conducted in general accordance with *ISO 9613: Acoustics - Attenuation of sound outdoors, Part 2: General method of calculation, 1996.*

5.2 Ambient Noise Level Design Criteria

External Noise Level Criteria

Guideline criteria for external noise levels in the proposed development's porch / balcony / external amenity areas can be found in both the *BS 8233 Guidance on Sound Insulation and Noise Reduction for Buildings* and *ProPG 2017: Planning & Noise (Professional Guidance on Planning & Noise For New Residential Developments)* guidance documents. Both documents state that ambient noise levels in external residential areas should ideally not be above 50 - 55dB $L_{Aeq,16hr}$.

This criteria range is reiterated in *ProPG 2017* in 3(ii):

> *The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 - 55 dB $L_{Aeq,16hr}$.*

Although exceedances of this criteria are naturally not desirable, both the *BS 8233* and *ProPG 2017* guidance documents recognize that their stated guideline values are not achievable in all instances and that external noise levels in excess of this criteria would not be prohibitive provided additional considerations are made in relation to the development.

From *BS 8233*:

> *It is 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.*
>
> *In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.*

From *ProPG* documents:

> *These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.*
>
> *Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
>
> - *A relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
> - *A relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
> - *A relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
> - *A relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).*

Given the above guidance, the following general approach was developed as the development's external noise level strategy in order to provide an acceptable external ambient noise environment:

- ✓ The 50 - 55dB(A) $L_{Aeq,16hr}$ criteria will be designed for in all development porch / balcony / public amenity areas where it is practically possible to be achieved.
- ✓ A relatively quiet external amenity space will be incorporated into the development.
- ✓ The façade design of the development buildings will incorporate superior sound insulation glazing / façade elements to achieve a quiet internal acoustic environment that will comply with criteria applicable to low level residential bedroom environments.

Internal Noise Level Criteria

In setting appropriate target internal noise levels, the *ProPG 2017* again refers to *BS 8233*. The *BS 8233* recommended noise limits for indoor ambient noise levels in residential dwellings are summarised in Table 16 below.

Activity	Room Type	Design Criterion $L_{Aeq,T}$ (dB)	
		Daytime (07:00 - 23:00hrs)	Night Time (23:00 - 07:00hrs)
Resting / Sleeping Conditions	Living / Dining Rooms	35dB $L_{Aeq,16hr}$	-
	Bedrooms	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

Table 16 Recommended Indoor Ambient Noise Levels from *BS 8233 (2014)*

In order to demonstrate ADS compliance with the *ProPG 2017* and *BS 8233* internal noise level criteria, the glazing and external façade elements of the proposed apartment blocks must be designed to ensure that the maximum levels in the above table are achieved throughout.

5.3 Noise Modelling Results

In order to assess roadway noise emissions across the full extent of the proposed development facades and external areas, an *iNoise®* acoustic software model was developed based on architectural drawings and geographical information received from BKD Architects. Once the geographical and architectural aspects of the modelling were completed, the model was 'calibrated' based on the results of the noise monitoring survey in order to ensure that an accurate representation of roadway noise level emissions were obtained.

The *iNoise* model was then used to assess the predicted noise emissions from the roadways across the subject site for each of the quantities of interest (i.e. Daytime dB $L_{Aeq,16hr}$ & Night Time dB $L_{Aeq,8hr}$,). The results of these modelling assessments are plotted and discussed in the following sections.

Daytime Noise Emission Prediction Results (dB $L_{Aeq,16hr}$)

The *iNoise* model results for the daytime period road noise emissions at each of the development building facades are shown in isometric views in Figures 8 & 9 below.

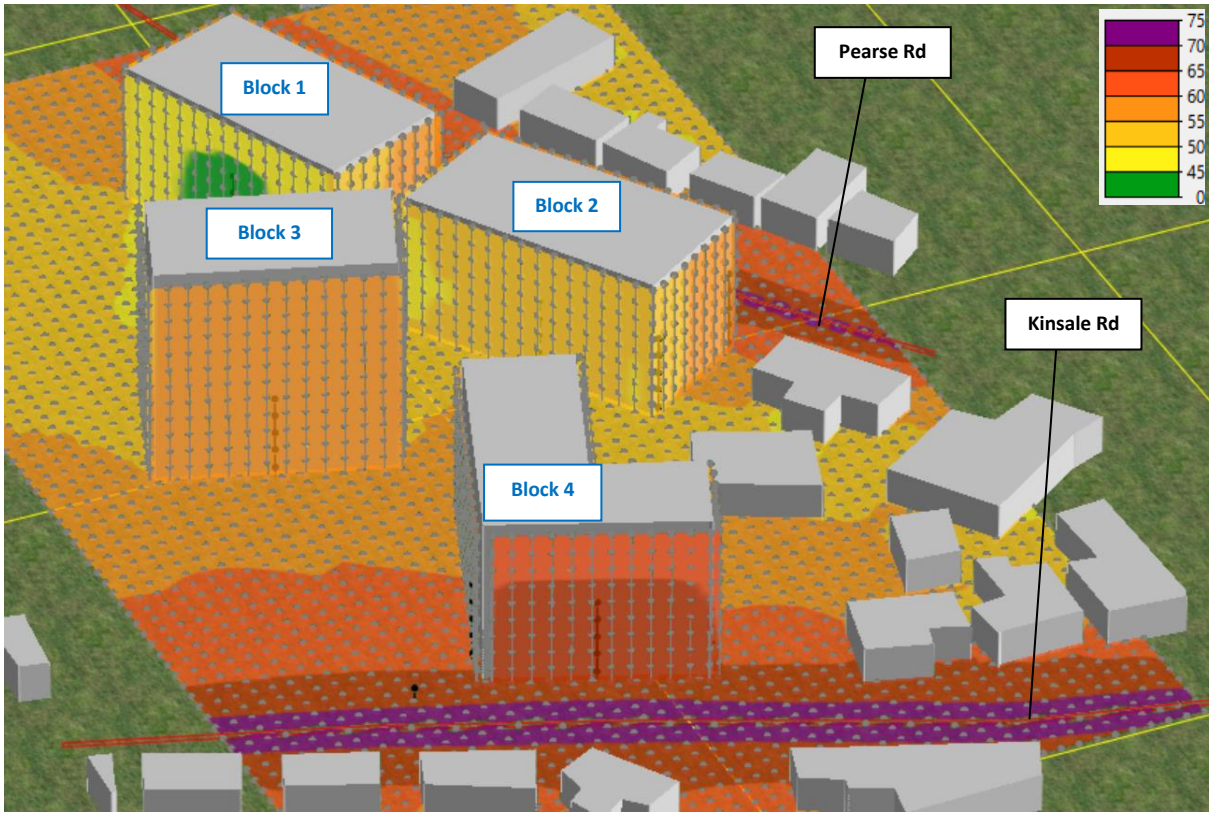


Figure 8 Daytime Period Traffic Noise Level Emission Contour Map (Kinsale Road View)

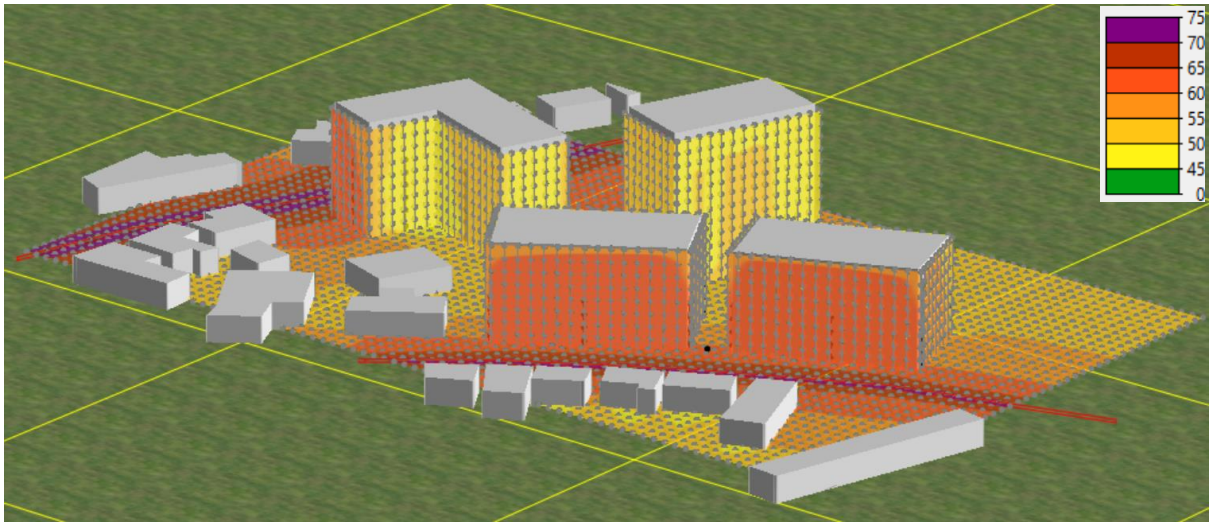


Figure 9 Daytime Period Traffic Noise Level Emission Contour Map (Pearse Road View)

A summary of the predicted daytime period noise levels at the various development building facades is provided in Table 17 on the following page.

Block	Facade	Height (metres above ground)	Predicted Daytime Noise Level (dB $L_{Aeq,16hr}$)
Block 1	Northern	GF + 1.5	61
		1F + 1.5	61
		2F + 1.5	60
		3F + 1.5	60
	Eastern	GF + 1.5	52 - 59
		1F + 1.5	52 - 59
		2F + 1.5	52 - 58
		3F + 1.5	52 - 58
	Southern	GF + 1.5	45
		1F + 1.5	44
		2F + 1.5	44
		3F + 1.5	44
	Western	GF + 1.5	53 - 59
		1F + 1.5	53 - 58
		2F + 1.5	53 - 58
		3F + 1.5	53 - 57
Block 2	Northern	GF + 1.5	61
		1F + 1.5	61
		2F + 1.5	60
		3F + 1.5	60
	Eastern	GF + 1.5	52 - 59
		1F + 1.5	52 - 58
		2F + 1.5	52 - 58
		3F + 1.5	52 - 57
	Southern	GF + 1.5	52
		1F + 1.5	51
		2F + 1.5	51
		3F + 1.5	51
	Western	GF + 1.5	52 - 59
		1F + 1.5	52 - 59
		2F + 1.5	52 - 59
		3F + 1.5	52 - 58

Block 3	Northern	GF + 1.5	52
		1F + 1.5	52
		2F + 1.5	52
		3F + 1.5	52
		4F + 1.5	52
		5F + 1.5	52
		6F + 1.5	51
		7F + 1.5	51
		8F + 1.5	50
	Eastern	GF + 1.5	56
		1F + 1.5	55
		2F + 1.5	55
		3F + 1.5	55
		4F + 1.5	55
		5F + 1.5	55
		6F + 1.5	55
		7F + 1.5	54
		8F + 1.5	54
	Southern	GF + 1.5	50
		1F + 1.5	49
		2F + 1.5	49
		3F + 1.5	49
		4F + 1.5	49
		5F + 1.5	49
		6F + 1.5	49
		7F + 1.5	48
		8F + 1.5	48
	Western	GF + 1.5	50
		1F + 1.5	49
		2F + 1.5	49
		3F + 1.5	49
		4F + 1.5	49
		5F + 1.5	49
		6F + 1.5	49
		7F + 1.5	48
		8F + 1.5	48

Block 4	Northern	GF + 1.5	49 - 60
		1F + 1.5	49 - 60
		2F + 1.5	49 - 60
		3F + 1.5	50 - 60
		4F + 1.5	50 - 59
		5F + 1.5	50 - 59
	Eastern	GF + 1.5	66
		1F + 1.5	65
		2F + 1.5	65
		3F + 1.5	64
		4F + 1.5	64
		5F + 1.5	63
	Southern	GF + 1.5	55 - 63
		1F + 1.5	55 - 63
		2F + 1.5	55 - 62
		3F + 1.5	55 - 61
		4F + 1.5	55 - 61
		5F + 1.5	55 - 61
	Western	GF + 1.5	46 - 48
		1F + 1.5	46 - 48
		2F + 1.5	46 - 48
		3F + 1.5	46 - 47
		4F + 1.5	46 - 47
		5F + 1.5	46 - 48

Table 17 Predicted Daytime Period Ambient Noise Level Summary

Predicted noise levels at all development building facades ranged between 44 - 66dB $L_{Aeq,16hr}$.

Night Time Noise Emission Prediction Results ($L_{Aeq,8hr}$)

The *iNoise* model results for the night time period road noise emissions at each of the development building facades are shown in isometric views in Figures 10 & 11 on the following page.

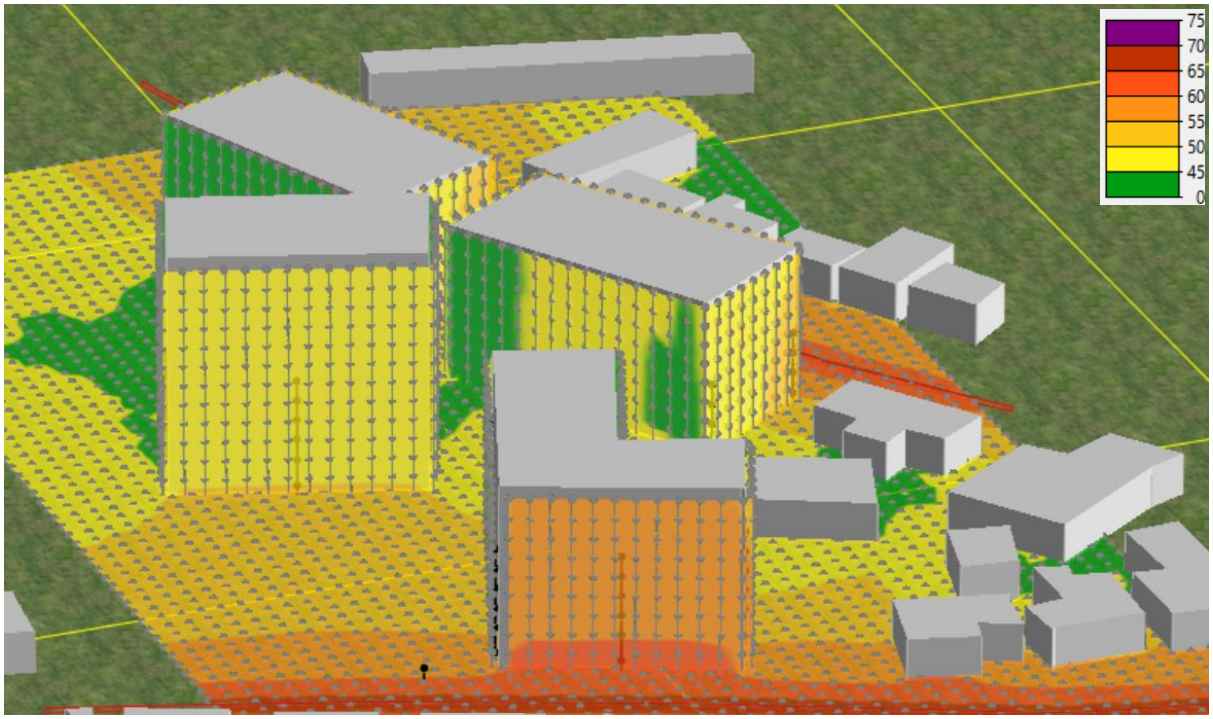


Figure 10 Night Time Period Traffic Noise Level Emission Contour Map (Kinsale Road View)

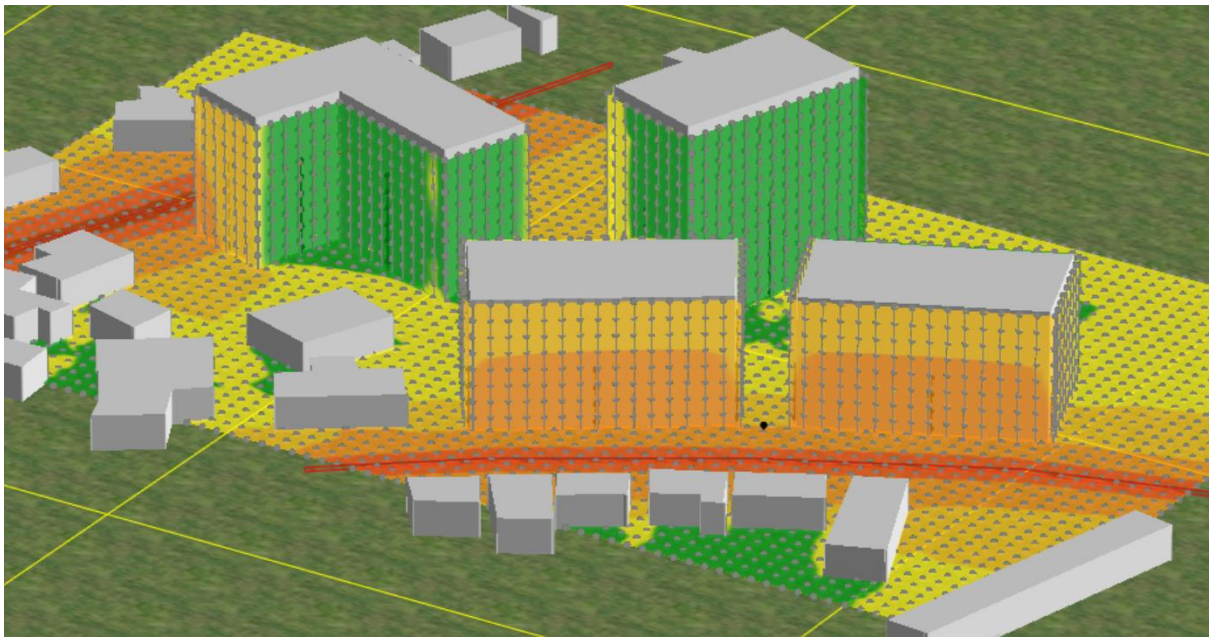


Figure 11 Night Time Period Traffic Noise Level Emission Contour Map (Pearse Road View)

A summary of the predicted night time period noise levels at the various development building facades is provided in Table 18 on the following page.

Block	Facade	Height (metres above ground)	Predicted Night Time Noise Level (dB $L_{Aeq,16hr}$)
Block 1	Northern	GF + 1.5	55
		1F + 1.5	54
		2F + 1.5	54
		3F + 1.5	53
	Eastern	GF + 1.5	46 - 52
		1F + 1.5	45 - 52
		2F + 1.5	45 - 52
		3F + 1.5	45 - 51
	Southern	GF + 1.5	37
		1F + 1.5	36
		2F + 1.5	36
		3F + 1.5	36
	Western	GF + 1.5	46 - 52
		1F + 1.5	46 - 52
		2F + 1.5	46 - 51
		3F + 1.5	46 - 51
Block 2	Northern	GF + 1.5	55
		1F + 1.5	54
		2F + 1.5	54
		3F + 1.5	53
	Eastern	GF + 1.5	45 - 52
		1F + 1.5	45 - 52
		2F + 1.5	45 - 51
		3F + 1.5	45 - 51
	Southern	GF + 1.5	44
		1F + 1.5	44
		2F + 1.5	44
		3F + 1.5	44
	Western	GF + 1.5	45 - 53
		1F + 1.5	45 - 53
		2F + 1.5	45 - 52
		3F + 1.5	45 - 52

Block 3	Northern	GF + 1.5	45
		1F + 1.5	44
		2F + 1.5	44
		3F + 1.5	44
		4F + 1.5	44
		5F + 1.5	44
		6F + 1.5	44
		7F + 1.5	43
		8F + 1.5	43
	Eastern	GF + 1.5	48
		1F + 1.5	48
		2F + 1.5	48
		3F + 1.5	48
		4F + 1.5	47
		5F + 1.5	47
		6F + 1.5	47
		7F + 1.5	47
		8F + 1.5	46
	Southern	GF + 1.5	42
		1F + 1.5	42
		2F + 1.5	42
		3F + 1.5	42
		4F + 1.5	42
		5F + 1.5	41
		6F + 1.5	41
		7F + 1.5	41
		8F + 1.5	40
	Western	GF + 1.5	43
		1F + 1.5	42
		2F + 1.5	42
		3F + 1.5	42
		4F + 1.5	42
		5F + 1.5	42
		6F + 1.5	42
		7F + 1.5	41
		8F + 1.5	41

Block 4	Northern	GF + 1.5	53
		1F + 1.5	53
		2F + 1.5	52
		3F + 1.5	52
		4F + 1.5	51
		5F + 1.5	51
	Eastern	GF + 1.5	58
		1F + 1.5	58
		2F + 1.5	57
		3F + 1.5	56
		4F + 1.5	56
		5F + 1.5	55
	Southern	GF + 1.5	48 - 56
		1F + 1.5	47 - 55
		2F + 1.5	47 - 55
		3F + 1.5	47 - 54
		4F + 1.5	47 - 54
		5F + 1.5	47 - 53
	Western	GF + 1.5	39 - 41
		1F + 1.5	39 - 41
		2F + 1.5	39 - 41
		3F + 1.5	39 - 40
		4F + 1.5	39 - 40
		5F + 1.5	39 - 40

Table 18 Predicted Night Time Period Ambient Noise Level Summary

Predicted noise levels at all development building facades ranged between 36 - 58dB $L_{Aeq,8hr}$.

5.4 Initial Site Noise Risk Assessment (ADS Stage 1)

In order to provide a preliminary indication of the likely risk of adverse effects from external noise prior to consideration for provision of noise mitigation, a comparison is carried out between the average noise levels measured during the daytime and night time periods against noise risk assessment indicators detailed in the *ProPG 2017*.

The results of this comparison are detailed in Figure 12 on the following page.

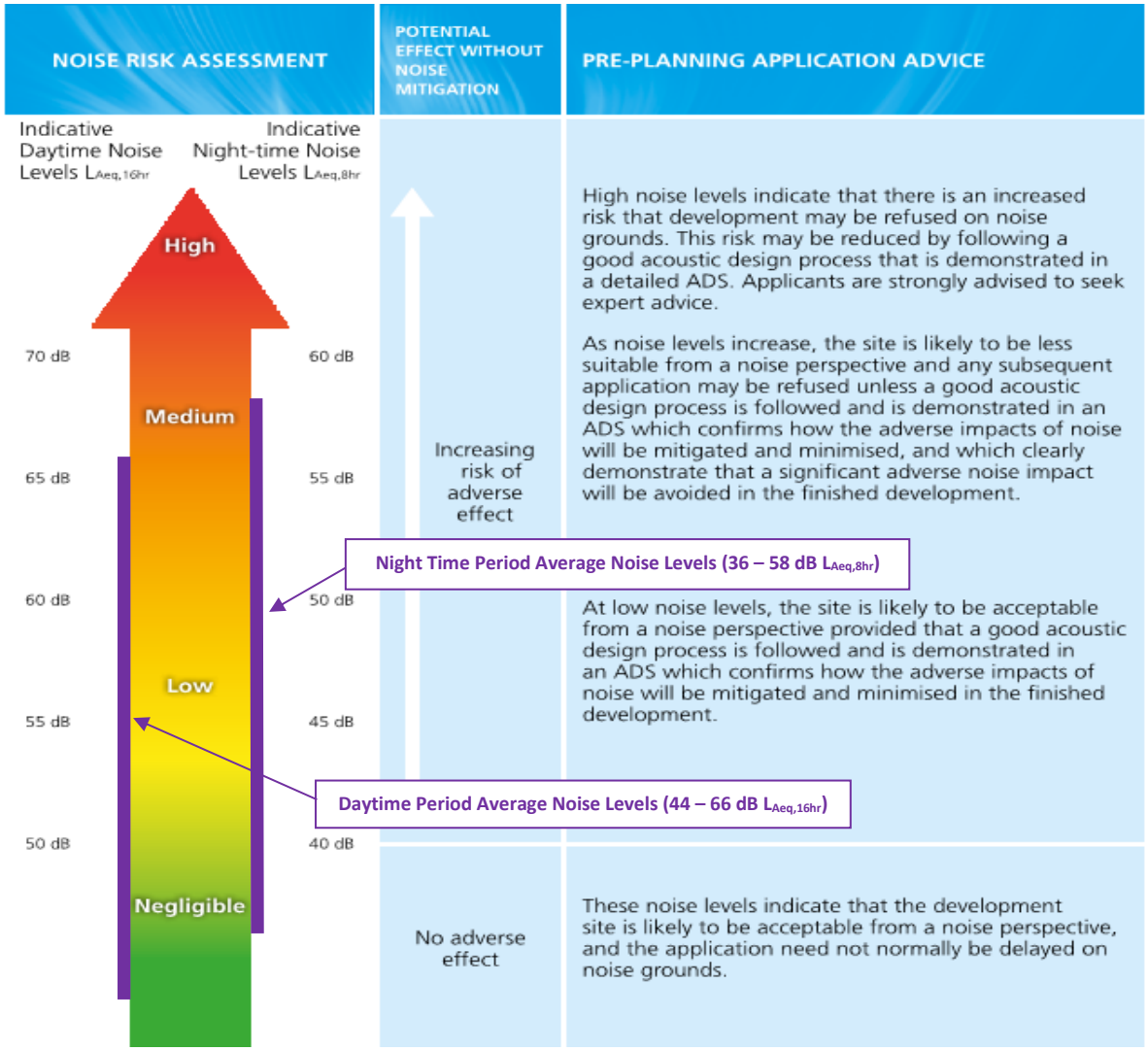


Figure 12 ProPG 2017 - Stage 1 Initial Noise Risk Assessment for Proposed Development

Overall, the noise level averages of 44 - 66 dB $L_{Aeq,16hr}$ for daytime periods and 36 - 58 dB $L_{Aeq,8hr}$ for night time periods would fall predominately within the 'Negligible' to 'Low' magnitude range but do extend slightly into the 'Medium' range.

Ambient noise levels in this range indicate that the site is 'likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and demonstrated' but that is important that the elements of this process should be clearly demonstrated in an ADS. Provision of some mitigation measures will therefore likely be required in order to confirm an acceptable level of both internal and external noise levels across the entire development.

The predicted residual internal / external noise levels for the development and the mitigation measures that were deemed as being required are discussed in the following sections.

5.5 External Area Acoustic Design Assessment (ADS Stage 2)

Communal Space Amenity Area

There is an external communal space amenity area planned for the proposed development. It is located in the central portion of the proposed development formed by its four residential blocks.

See Figure 13 below.

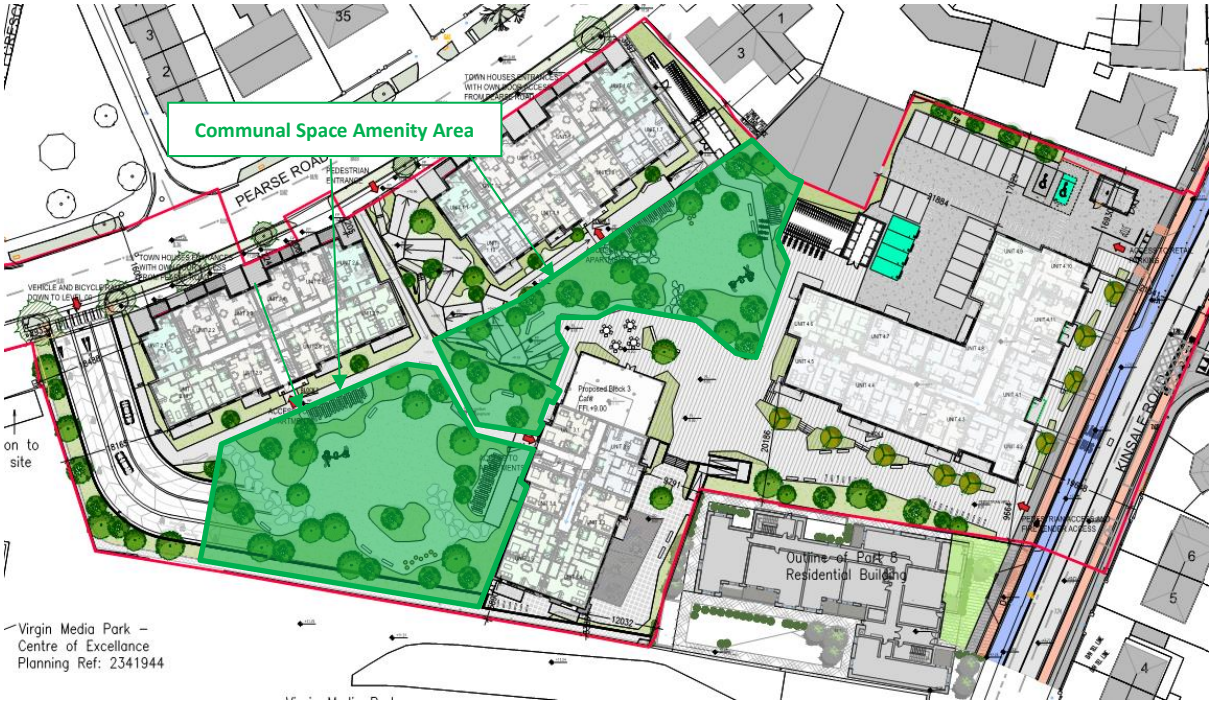


Figure 13 Communal Space Amenity Area for Proposed Development

The daytime noise level contours for this communal area are shown in Figure 14 below.

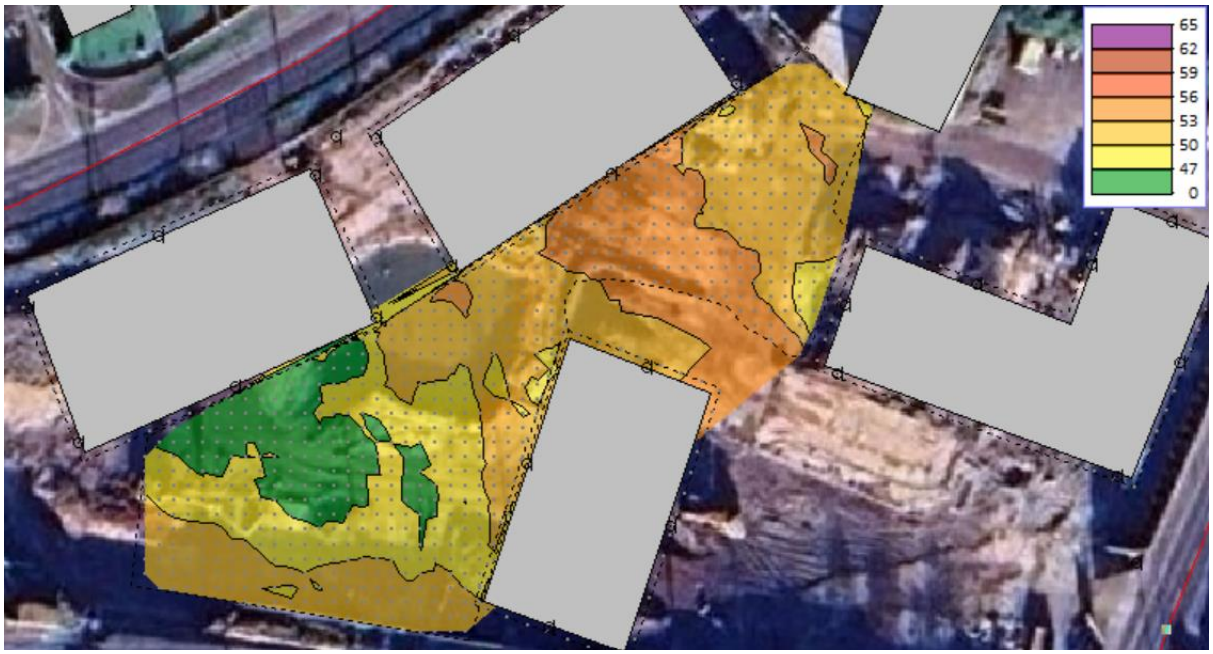


Figure 14 Daytime Ambient Noise Level Contour Map for Proposed Development Communal Area

The ambient noise levels predicted in this area range between 45 - 56dB $L_{Aeq,16hr}$. Levels of this order are consistent with the ProPG 2017 recommended criteria requirement range of 50 - 55dB(A) dB $L_{Aeq,16hr}$.

No further mitigation measures would therefore be required in respect of the proposed development communal open areas.

Apartment Block Balconies / Patios

The proposed apartment balconies / patios are located on most facades of the proposed development buildings. The balconies will protrude from the facades in most instances but will be recessed into the Blocks 1, 2 & 4 apartment blocks on façades that directly overlook Pearse & Kinsale Roads.

See Figure 15 below for a drawing of a typical floor showing the external balconies / patios.

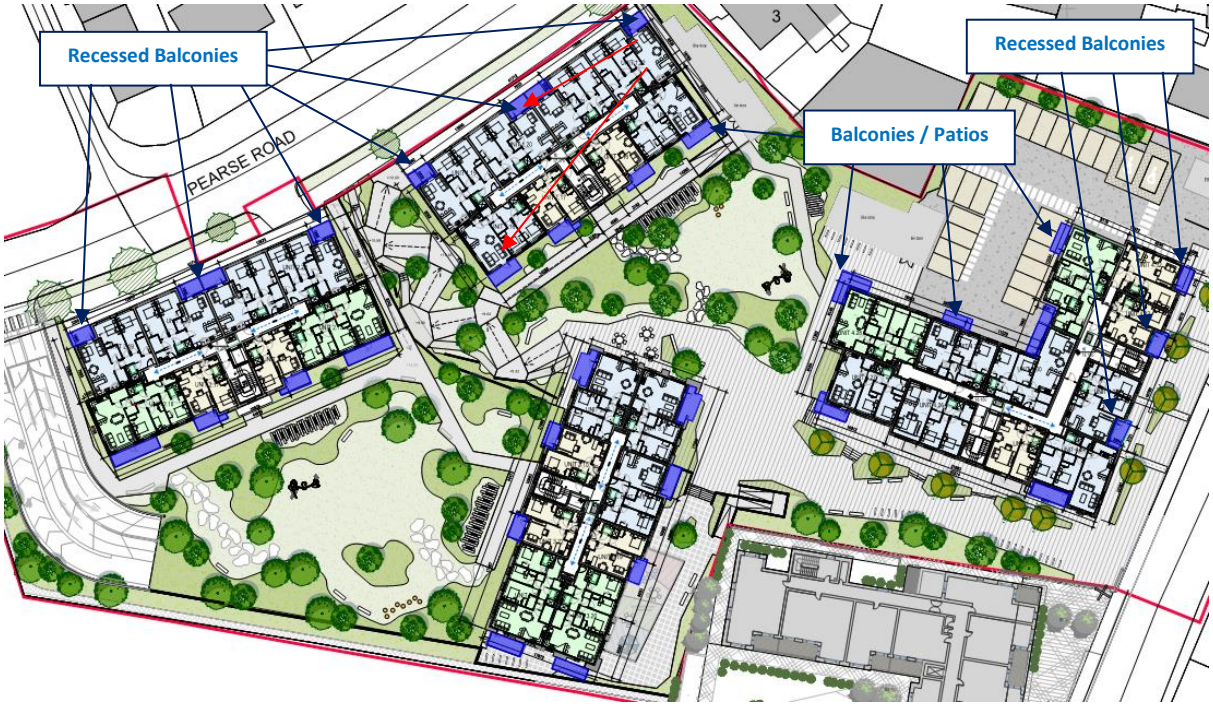


Figure 15 Proposed Development Balcony / Patios Locations (Typical Floor)

Given the location of the development, the ambient noise levels on all balconies / patios will be controlled primarily by traffic noise in all instances.

A summary of the predicted balcony noise levels at the various development building facades is provided in Table 19 as follows.

Block	Balcony / Patio Facade	Predicted Daytime Noise Level (dB $L_{Aeq,16hr}$)
Block 1	Northern	57 - 58
	Eastern	N/A
	Southern	44 - 45
	Western	N/A
Block 2	Northern	57 - 58
	Eastern	N/A
	Southern	48 - 49
	Western	N/A

Block	Balcony / Patio Facade	Predicted Daytime Noise Level (dB $L_{Aeq,16hr}$)
Block 3	Northern	N/A
	Eastern	53 - 55
	Southern	48 - 50
	Western	47 - 49
Block 4	Northern	49 - 50
	Eastern	60 - 63
	Southern	50 - 58
	Western	46 - 48

Table 19 Predicted Balcony / Patio Daytime Ambient Noise Level Summary

The predicted daytime noise levels for the balconies / porches were generally < 58dB $L_{Aeq,16hr}$ which would be consistent with the ProPG 2017 recommended criteria requirement range of 50 - 55dB(A) dB $L_{Aeq,16hr}$.

The only balcony areas that are likelyto exceed this recommended criteria range are the upper floor balconies directly overlooking Kinsale Road on the east façade of Block 4. However, these balconies are recessed into the line of the building faced which will help to mitigate external noise ingress.

In addition to the above, it is also recommended that the balcony balustrades for these apartments are imperforate so that an additional measure of acoustic shielding will be provided for occupants in seated positions.

Acoustic calculation predictions for a seated occupant with a head height of approximately 1.3m on external balconies with solid, imperforate balcony balustrades provided confirms that noise levels experienced for occupants of these balconies would be reduced to within the ≤ 58dB(A) range consistent with both ProPG 2017 requirements as well as the other balcony areas in the proposed development.

External Area Noise Recommended Mitigation Measures

Based on our assessment, the only additional noise mitigation measure that is recommended for external areas in this instance is as follows:

- ✓ Balcony balustrades on the Block 4 east façade upper floor balconies should be solid and imperforate with no gaps.

5.6 Internal Area Acoustic Design Assessment (ADS Stage 2)

The following sections detail the requirements for the various building façade elements based on the noise modelling results.

External Façade / Roof Constructions

As directly confirmed by our noise modelling assessment, external ambient noise levels at the outward facing façades of the proposed development buildings ranged between 44 - 66dB $L_{Aeq,16hr}$ (daytime) and 36 - 58dB $L_{Aeq,8hr}$ (night time).

Based on the upper limits of these predicted noise level ranges, the following minimum sound insulation performances were determined for the development building external wall and roof constructions:

- Provision of minimum ≥ 48dB R_w external walls.
- Provision of minimum ≥ 43dB R_w roof constructions.

We understand that the following building constructions are being provided uniformly throughout the development:

External Wall Construction

40mm thick stone cladding – 50mm void – 120mm rockwool insulation – 12.5mm cement bonded particle board – 150mm steel framing system with 150mm thick rockwool insulation – 15mm fireline board – 12.5mm plasterboard – 3mm skim finish

Roof Construction

275mm reinforced concrete slab – 200 - 250mm PIR insulation – 250mm concrete slab – green roof system with 225mm gap and 12.5mm plasterboard ceiling underneath

The sound insulation performances of these constructions are estimated and compared against the established design criteria in Table 20 below.

Construction Element	Minimum Sound Insulation Performance	Estimated Sound Insulation Performance	Acceptable?
External Walls	≥ 45dB R_w	**≈ 60 dB R_w**	✓
Roof	≥ 40dB R_w	**≈ 61 dB R_w**	✓

Table 20 Proposed External Wall & Roof Construction Estimated Sound Insulation Performance Summary

As can be seen in Table 20, the proposed external wall and roof constructions would comply with the established design criteria and therefore are acceptable as specified.

External Glazing Constructions

Given the predicted range of the ambient noise level environment, only two minimum glazing specifications were deemed as being required in this instance.

This specification is summarised in Table 21 on the following page.

Glazing Spec	Octave Band Centre Frequency (Hz)						dB Rw	Indicative Glazing Configuration
	125	250	500	1k	2k	4k		
A	19	20	29	33	35	35	**33**	6mm glass - 12mm air space – 8mm glass
B	26	27	34	38	40	40	**37**	6mm glass - 12mm air space – 10mm glass

Table 21 Development Buildings External Glazing Sound Insulation Performance Requirement, SRI (dB)

The detail in Figure 16 below details the locations where these glazing specifications should be applied for all floors on all the various development building facades.

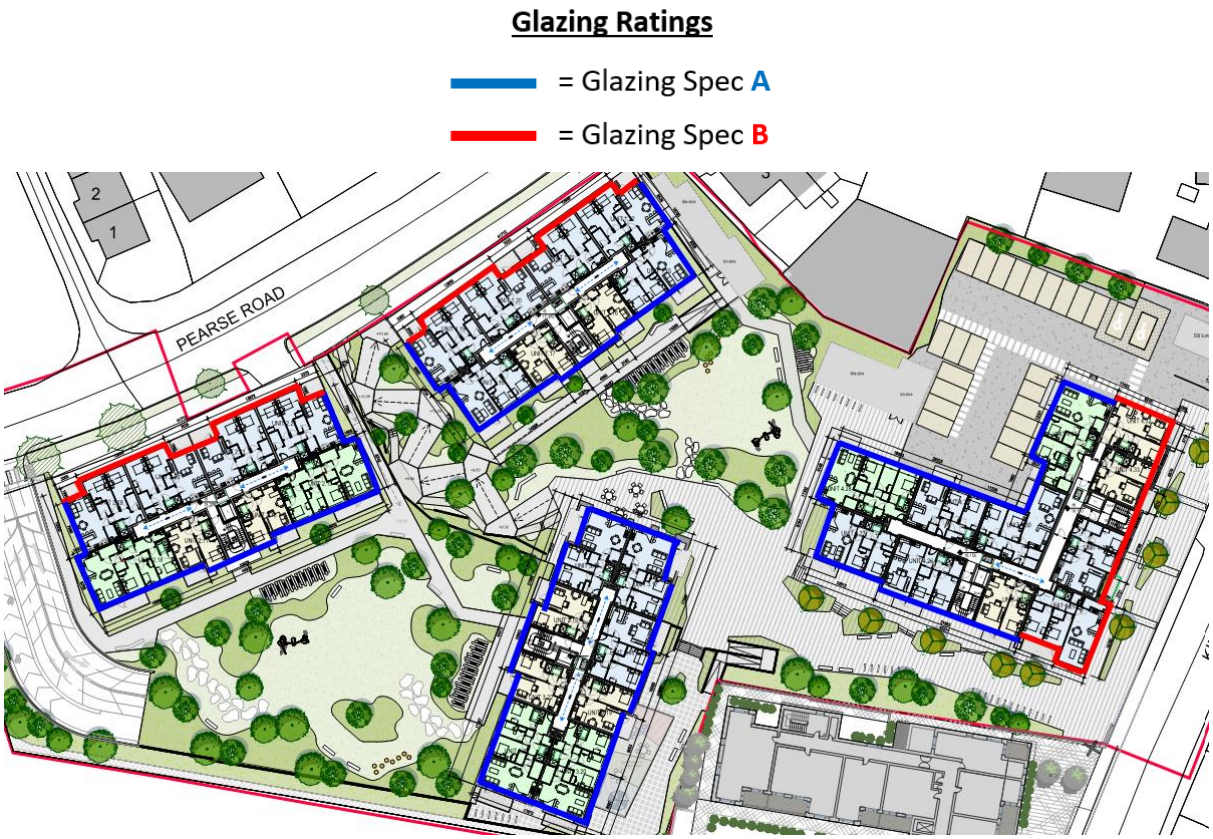


Figure 16 Development Block External Glazing Minimum Sound Insulation Specifications (All Floors)

It should be noted that the octave band performance values detailed in Table 21 are the basis of the assessment and that the configuration detailed is merely a typical example which can be expected to afford these values. Alternative products with an equivalent or better performance would also provide sufficient sound insulation; however, glazing thicknesses of individual panes should not be similar to each other in order to avoid unwanted resonance dips in the presence of traffic noise.

For operable windows, the proposed framing design will need to be acoustically reviewed during the design stage and acoustic treatment may be required. At a minimum, operable windows would need to incorporate compressible gasket seals to the full perimeter of the frame and any sliding windows will need to be installed in a rebated frame and sealed so that no gaps exist around the perimeter when closed.

Acoustic test data should be obtained from the façade supplier to confirm that all primary window constructions to be supplied perform to the required acoustic specification as given above. If acoustic performance data is not available for any of the specific systems, then it must be provided in accordance with the following details:

- The performance requirements shall be obtained from laboratory measurements obtained in accordance with *ISO 140-3: 1995 "Measurement of sound insulation in buildings and of building elements*" and weighted in accordance with *ISO 717-1: 1997 "Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation"*.
- Laboratory measurements shall be obtained from an independent acoustic test laboratory accredited by a recognized body and shall be a fully representative part of the system including associated framing / support systems / seals.
- Ratings / measurements obtained in accordance with other equivalent standards may be permitted but should be submitted to the client representative for approval.
- The Trade Contractor shall provide Tender test certificates demonstrating compliance with the specified acoustic performance for the products offered. Failing this, the Trade Contractor shall allow for the expense of such necessary testing as demonstrating compliance with the specification. The tests shall be carried out at an independent acoustic test laboratory approved by a recognized acoustic institution.

Trickle Vents

It is also important that the sound insulation performance of trickle vents does not significantly compromise the integrity of the window performance. Provision should therefore be made for provision of acoustic trickle vents in building façades that achieve the minimum sound reduction values listed in Table 22 below in the opened position (based on the façade's corresponding glazing specification).

Glazing Specification	Minimum Trickle Vent Sound Insulation Performance in Opened Position (dB $D_{n,e,w}$)
A	28
B	32

Table 22 Trickle Vent Minimum Sound Reduction Performance Specifications

External Doors

The other design element consideration is in relation to the external facade balcony / patio entry doors. All residential unit entry doors should be selected with the minimum performance specifications listed in Table 23 on the following page (based on the façade's corresponding glazing specification).

Glazing Specification	Minimum External Door Sound Insulation Performance (dB R_w)
A	25
B	30

Table 23 External Door Minimum Sound Insulation Performance Specifications

Acoustic test data should be obtained from the façade supplier to confirm that all external door constructions supplied perform to this specification. If acoustic performance data is not available, then it must be provided in accordance with the details outlined in the External Glazing section above.

5.7 Predicted Internal Area Residual Noise Levels

The predicted internal daytime and night time period noise level ranges with the recommended mitigation measures in place are summarised in Table 24 below.

Internal Area	Predicted Internal Area Noise Level Ranges	
	Daytime Period dB $L_{Aeq,16hr}$	Night Time Period dB $L_{Aeq,8hr}$
All Development Block Internal Areas	≤ 35	≤ 30

Table 24 Predicted Internal Noise Levels in Proposed Development Buildings

The predicted results in the summary table above confirm that the development would be fully compliant with the internal area ambient noise strategy requirements of *ProPG 2017*.

5.8 Summary of Inward Noise Impact

External Areas

In accordance with the *ProPG 2017* and *BS 8233* guidance documents, a suitable approach was adopted in order to ensure an acceptable external ambient noise environment could be achieved.

This approach is summarised as follows:

- ✓ The 50 - 55dB(A) $L_{Aeq,16hr}$ criteria will be designed for in all back garden / public amenity areas where it is practically possible to be achieved.
- ✓ A relatively quiet external amenity space will be incorporated into the development.

- ✓ The façade design of the development buildings will incorporate superior sound insulation glazing / façade elements to achieve a quiet internal acoustic environment that will comply with criteria applicable to low level residential bedroom environments.

Following an ambient noise measurement and subsequent noise modelling assessment, it was determined that (with provision of imperforate balcony balustrades on the Block 4 east façade upper floor balconies) ambient noise levels in all of the proposed development external amenity areas are expected to be consistent with or below the requirements of the *ProPG 2017* and *BS 8233* guidance documents.

Internal Areas

Appropriate guidance for internal noise levels within residential spaces was taken from *BS 8233 (2014): Guidance on Sound Insulation and Noise Reduction for Buildings* as summarised in the table below.

Activity	Room Type	Design Criterion $L_{Aeq,T}$ (dB)	
		Daytime (07:00 - 23:00hrs)	Night Time (23:00 - 07:00hrs)
Resting / Sleeping Conditions	Living / Dining Rooms	35dB $L_{Aeq,16hr}$	-
	Bedrooms	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

Given the requirements in the above table together with the predicted external noise levels with the development in place, the following mitigation measures were developed for development apartment blocks:

- ➢ Provision of 60 dB R_w performance external walls.
- ➢ Provision of 61 dB R_w performance roof constructions.
- ➢ Provision of acoustic trickle vents with minimum sound reduction values similar to those detailed in Table 21 (in the opened position).
- ➢ Provision of glazing with minimum acoustic performance specification as detailed in Table 22.
- ➢ Provision of acoustic external entry doors with minimum sound reduction values similar to those detailed in Table 23 (in the opened position).

Provided the above developed mitigation measures are appropriately incorporated into the development design, the development should be fully compliant with the internal area noise requirements contained within the *ProPG 2017* and *BS 8233* guidance documents and the magnitude of the inward noise impact on the proposed development internal areas would therefore be considered negligible.

APPENDIX A

NML #1 (KINSALE ROAD) - FULL NOISE MONITORING RESULTS

Date	Time Period		Measured Sound Pressure Levels (dB)				
	Start	Finish	$L_{Aeq,1hr}$	L_{AFmax}	L_{AFmin}	L_{AF10}	L_{AF90}
25/03/2025	07:00	08:00	68.5	82.1	45.9	73.6	50.7
25/03/2025	08:00	09:00	70.0	85.1	46.7	74.1	53.2
25/03/2025	09:00	10:00	69.1	84.2	46.5	73.5	53.8
25/03/2025	10:00	11:00	68.7	85.8	46.2	73.6	53.9
25/03/2025	11:00	12:00	68.9	86.0	46.2	73.8	54.1
25/03/2025	12:00	13:00	68.9	86.0	46.2	73.8	54.1
25/03/2025	13:00	14:00	70.7	87.8	48.0	75.6	55.9
25/03/2025	14:00	15:00	69.9	87.0	47.2	74.8	55.1
25/03/2025	15:00	16:00	68.2	85.3	46.8	73.1	53.4
25/03/2025	16:00	17:00	68.7	81.4	44.8	72.5	54.1
25/03/2025	17:00	18:00	68.3	86.4	44.6	72.3	53.1
25/03/2025	18:00	19:00	68.5	83.0	45.5	72.5	53.0
25/03/2025	19:00	20:00	67.9	79.0	47.4	72.4	52.9
25/03/2025	20:00	21:00	66.8	79.0	46.3	71.8	51.1
25/03/2025	21:00	22:00	65.3	80.6	43.1	70.4	48.8
25/03/2025	22:00	23:00	63.0	81.4	36.9	66.9	42.2
25/03/2025	23:00	00:00	60.5	84.2	35.5	60.9	42.2
26/03/2025	00:00	01:00	57.3	84.0	40.7	54.5	47.8
26/03/2025	01:00	02:00	55.2	77.5	39.7	53.6	46.7
26/03/2025	02:00	03:00	55.5	80.7	36.5	53.3	46.2
26/03/2025	03:00	04:00	56.7	80.5	38.8	53.8	46.4
26/03/2025	04:00	05:00	58.5	84.9	39.4	54.0	45.2
26/03/2025	05:00	06:00	62.8	82.7	39.8	63.5	46.3
26/03/2025	06:00	07:00	65.0	83.7	43.4	69.2	48.0
26/03/2025	07:00	08:00	69.0	84.1	46.7	74.0	51.9
26/03/2025	08:00	09:00	69.4	84.6	46.6	74.1	53.2
26/03/2025	09:00	10:00	69.1	84.2	46.5	73.5	53.8
26/03/2025	10:00	11:00	68.7	85.8	45.3	73.6	53.9
26/03/2025	11:00	12:00	67.8	84.9	44.4	72.7	53.0
26/03/2025	12:00	13:00	68.2	85.3	44.8	73.1	53.4
26/03/2025	13:00	14:00	67.4	84.5	44.0	72.3	52.6
26/03/2025	14:00	15:00	66.2	83.3	42.8	71.1	51.4
26/03/2025	15:00	16:00	67.9	82.0	43.5	72.2	51.8

Date	Time Period		Measured Sound Pressure Levels (dB)				
	Start	Finish	$L_{Aeq,1hr}$	L_{AFmax}	L_{AFmin}	L_{AF10}	L_{AF90}
26/03/2025	16:00	17:00	68.7	81.0	45.0	73.1	52.9
26/03/2025	17:00	18:00	68.6	80.9	44.9	72.6	52.8
26/03/2025	18:00	19:00	69.0	78.9	44.3	72.4	51.2
26/03/2025	19:00	20:00	67.8	82.6	43.0	71.9	50.3
26/03/2025	20:00	21:00	66.8	79.9	38.9	71.9	48.1
26/03/2025	21:00	22:00	66.1	78.6	38.8	70.3	44.3
26/03/2025	22:00	23:00	63.2	79.4	35.4	67.2	40.1
26/03/2025	23:00	00:00	62.1	82.3	34.9	63.7	46.8
27/03/2025	00:00	01:00	60.5	60.5	60.5	60.5	60.5
27/03/2025	01:00	02:00	57.3	57.3	58.1	57.3	57.3
27/03/2025	02:00	03:00	56.0	56.0	55.7	56.0	56.0
27/03/2025	03:00	04:00	56.0	56.0	54.8	56.0	56.0
27/03/2025	04:00	05:00	56.0	56.0	55.9	56.0	56.0
27/03/2025	05:00	06:00	61.8	61.8	62.0	61.8	61.8
27/03/2025	06:00	07:00	64.2	64.2	65.0	64.2	64.2
27/03/2025	07:00	08:00	69.0	69.0	67.6	69.0	69.0
27/03/2025	08:00	09:00	68.0	68.0	70.0	68.0	68.0
27/03/2025	09:00	10:00	69.7	69.7	69.9	69.7	69.7
27/03/2025	10:00	11:00	69.5	69.5	68.0	69.5	69.5
27/03/2025	11:00	12:00	67.1	67.1	67.8	67.1	67.1
27/03/2025	12:00	13:00	68.2	68.2	70.0	68.2	68.2
27/03/2025	13:00	14:00	67.4	67.4	66.8	67.4	67.4
27/03/2025	14:00	15:00	65.6	65.6	65.5	65.6	65.6
27/03/2025	15:00	16:00	67.2	67.2	69.5	67.2	67.2
27/03/2025	16:00	17:00	68.9	82.9	44.6	72.7	53.4
27/03/2025	17:00	18:00	68.5	80.4	46.9	72.8	52.4
27/03/2025	18:00	19:00	68.1	80.2	44.5	72.7	50.7
27/03/2025	19:00	20:00	67.7	80.2	42.7	72.2	49.9
27/03/2025	20:00	21:00	66.5	83.8	39.9	71.4	47.3
27/03/2025	21:00	22:00	65.2	79.7	38.3	70.5	43.9
27/03/2025	22:00	23:00	62.8	81.9	35.0	66.5	40.0
27/03/2025	23:00	00:00	60.5	80.7	34.5	60.8	37.9
28/03/2025	00:00	01:00	54.9	78.3	34.7	47.4	37.4
28/03/2025	01:00	02:00	53.3	80.9	33.0	43.5	36.2
28/03/2025	02:00	03:00	55.7	78.8	32.3	46.5	35.9
28/03/2025	03:00	04:00	57.3	81.2	31.6	47.2	34.5
28/03/2025	04:00	05:00	58.5	81.1	33.1	52.8	36.5
28/03/2025	05:00	06:00	61.9	82.5	35.5	63.1	41.0
28/03/2025	06:00	07:00	65.0	82.2	38.5	69.4	44.1

APPENDIX B

NML #2 (PEARSE ROAD) - FULL NOISE MONITORING RESULTS

Date	Time Period		Measured Sound Pressure Levels (dB)				
	Start	Finish	$L_{Aeq,1hr}$	L_{AFmax}	L_{AFmin}	L_{AF10}	L_{AF90}
25/03/2025	07:00	08:00	60.3	81.8	42.2	64.7	44.9
25/03/2025	08:00	09:00	60.3	78.0	44.4	63.8	50.3
25/03/2025	09:00	10:00	60.1	88.7	42.9	62.7	49.5
25/03/2025	10:00	11:00	57.5	72.0	40.6	61.5	46.9
25/03/2025	11:00	12:00	58.2	77.3	41.2	62.1	47.1
25/03/2025	12:00	13:00	58.1	75.6	39.9	61.9	46.0
25/03/2025	13:00	14:00	58.0	73.1	41.4	61.7	46.6
25/03/2025	14:00	15:00	60.8	76.3	42.9	64.7	49.7
25/03/2025	15:00	16:00	60.2	79.5	41.6	64.3	47.1
25/03/2025	16:00	17:00	62.8	80.7	39.4	66.8	48.5
25/03/2025	17:00	18:00	63.2	74.7	38.7	67.3	47.4
25/03/2025	18:00	19:00	63.4	78.6	39.0	67.8	45.6
25/03/2025	19:00	20:00	62.5	76.8	45.6	67.0	51.8
25/03/2025	20:00	21:00	61.7	75.6	45.9	66.5	50.0
25/03/2025	21:00	22:00	59.8	77.2	40.8	64.6	44.1
25/03/2025	22:00	23:00	57.1	75.0	35.8	60.2	41.4
25/03/2025	23:00	00:00	55.4	77.3	33.3	56.0	38.2
26/03/2025	00:00	01:00	50.3	74.4	38.0	46.3	41.2
26/03/2025	01:00	02:00	48.3	72.2	36.8	47.0	39.4
26/03/2025	02:00	03:00	45.5	73.6	33.6	45.7	36.7
26/03/2025	03:00	04:00	45.3	72.6	35.7	43.0	38.0
26/03/2025	04:00	05:00	48.5	72.6	35.7	51.4	39.6
26/03/2025	05:00	06:00	55.8	80.5	37.7	55.8	41.7
26/03/2025	06:00	07:00	58.6	80.2	41.5	61.3	45.1
26/03/2025	07:00	08:00	61.0	82.4	45.5	65.3	49.5
26/03/2025	08:00	09:00	61.4	74.6	48.8	65.3	53.0
26/03/2025	09:00	10:00	60.5	80.7	49.5	64.1	53.5
26/03/2025	10:00	11:00	58.5	77.9	47.4	61.9	51.1
26/03/2025	11:00	12:00	59.5	78.4	50.0	62.7	52.8
26/03/2025	12:00	13:00	60.4	84.8	50.3	63.0	53.9
26/03/2025	13:00	14:00	61.2	78.4	51.1	64.0	55.1
26/03/2025	14:00	15:00	68.9	88.5	51.4	69.4	55.0
26/03/2025	15:00	16:00	62.2	84.1	49.8	65.6	53.9

Date	Time Period		Measured Sound Pressure Levels (dB)				
	Start	Finish	$L_{Aeq,1hr}$	L_{AFmax}	L_{AFmin}	L_{AF10}	L_{AF90}
26/03/2025	16:00	17:00	63.5	81.5	48.5	67.7	52.8
26/03/2025	17:00	18:00	64.4	78.9	47.3	68.7	51.6
26/03/2025	18:00	19:00	64.2	76.9	48.3	68.6	51.2
26/03/2025	19:00	20:00	63.3	76.2	46.9	67.8	51.2
26/03/2025	20:00	21:00	61.3	80.9	42.7	66.2	47.9
26/03/2025	21:00	22:00	60.7	76.2	42.7	65.5	46.2
26/03/2025	22:00	23:00	58.2	77.0	38.8	61.8	42.7
26/03/2025	23:00	00:00	55.3	76.5	37.6	55.6	41.2
27/03/2025	00:00	01:00	51.4	73.3	33.6	44.5	37.8
27/03/2025	01:00	02:00	46.1	71.6	33.5	42.0	36.1
27/03/2025	02:00	03:00	48.7	73.1	33.7	41.8	36.1
27/03/2025	03:00	04:00	46.4	75.3	33.6	41.9	36.7
27/03/2025	04:00	05:00	52.4	75.2	36.7	53.6	40.1
27/03/2025	05:00	06:00	54.5	76.7	36.2	55.6	41.6
27/03/2025	06:00	07:00	59.2	80.4	41.4	62.1	47.1
27/03/2025	07:00	08:00	60.2	77.4	50.8	63.7	53.4
27/03/2025	08:00	09:00	60.1	78.1	49.7	63.0	54.0
27/03/2025	09:00	10:00	60.7	74.3	51.1	64.5	53.7
27/03/2025	10:00	11:00	60.1	73.9	51.0	63.9	54.0
27/03/2025	11:00	12:00	60.9	74.3	51.8	64.6	54.3
27/03/2025	12:00	13:00	61.6	79.4	52.2	65.0	55.4
27/03/2025	13:00	14:00	61.8	75.4	52.0	65.5	55.5
27/03/2025	14:00	15:00	61.5	76.4	52.6	65.0	55.3
27/03/2025	15:00	16:00	62.6	82.6	52.3	66.1	56.2
27/03/2025	16:00	17:00	64.0	75.9	51.3	67.7	56.2
27/03/2025	17:00	18:00	65.0	82.3	49.4	69.0	53.9
27/03/2025	18:00	19:00	64.9	77.1	50.8	68.9	54.1
27/03/2025	19:00	20:00	64.7	77.0	49.6	69.1	53.2
27/03/2025	20:00	21:00	63.8	79.4	49.2	68.5	51.7
27/03/2025	21:00	22:00	62.1	77.8	41.8	67.0	49.5
27/03/2025	22:00	23:00	58.4	76.6	38.7	61.7	42.1
27/03/2025	23:00	00:00	56.7	79.0	38.4	57.3	41.8
28/03/2025	00:00	01:00	53.9	74.3	40.9	51.0	44.5
28/03/2025	01:00	02:00	52.0	75.4	40.8	48.8	43.8
28/03/2025	02:00	03:00	49.1	75.4	36.1	46.0	41.1
28/03/2025	03:00	04:00	50.1	74.4	34.4	43.5	38.2
28/03/2025	04:00	05:00	49.9	74.5	36.8	48.3	39.3
28/03/2025	05:00	06:00	55.5	77.3	37.7	55.5	42.6
28/03/2025	06:00	07:00	60.9	78.9	44.2	64.6	48.1

APPENDIX C

SOUND LEVEL METER CALIBRATION CERTIFICATES

NSAI
National Metrology Laboratory

Certificate of Calibration

Issued to
CLV Consulting
The NSC Campus
Mahon
Co. Cork

Certificate Number	244768
Item Calibrated	NTi Audio XL2-TA Sound Level Meter with NTi Audio MC230A Microphone
Serial Number	A2A-18085-E0 (SLM) and A23626 (Microphone)
ID Number	None
Order Number	2410107
Date Received	22 Oct 2024
NML Procedure Number	TFAP-NM-16
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 24 Jan 2025] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 24 Jan 2025] B&K 4180 Measuring Microphone, No. 1069 [Cal Due Date: 15 Sep 2025] B&K 4228 Pistonphone, No. 0741 [Cal Due Date: 14 Sep 2025] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 24 Jan 2025]

Calibrated by David Fleming — Approved by Dubhaltach MacLochlainn

Date of Calibration 09 Jan 2025 — Date of Issue 13 Jan 2025

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

NSAI
National Metrology Laboratory

Certificate of Calibration

Issued to
CLV Consulting
The NSC Campus
Mahon
Co. Cork

Certificate Number	244769
Item Calibrated	NTi Audio XL2-TA Sound Level Meter with NTi Audio MC230A Microphone
Serial Number	A2A-18385-E0 (SLM) and A19398 (Microphone)
ID Number	None
Order Number	2410107
Date Received	22 Oct 2024
NML Procedure Number	TFAP-NM-16
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 24 Jan 2025] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 24 Jan 2025] B&K 4180 Measuring Microphone, No. 1069 [Cal Due Date: 15 Sep 2025] B&K 4228 Pistonphone, No. 0741 [Cal Due Date: 14 Sep 2025] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 24 Jan 2025]

Calibrated by David Fleming — Approved by Dubhaltach MacLochlainn

Date of Calibration 09 Jan 2025 — Date of Issue 13 Jan 2025

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

APPENDIX D

ACOUSTIC CALIBRATOR CALIBRATION CERTIFICATE

NSAI
National Metrology Laboratory

Certificate of Calibration

Issued to
CLV Consulting
The NSC Campus
Mahon
Co. Cork

Certificate Number	244771
Item Calibrated	Larson Davis CAL200 Acoustic Calibrator
Serial Number	18882
ID Number	None
Order Number	2410107
Date Received	22 Oct 2024
NML Procedure Number	TFAP-NM-11
Method	The above calibrator was allowed to stabilize for a suitable period in laboratory conditions. It was then calibrated by measuring the sound pressure level generated in its measuring cavity (half-inch configuration). The calibrator's operating frequency was also measured.
Calibration Standards	Norsonic 1504A Calibration System incorporating: Agilent 34401A Multimeter, No. 0736 [Cal due date: 24 Jan 2025] B & K 4180 Measuring Microphone, No. 1069 [Cal due date: 15 Sep 2025] B & K 4228 Pistonphone, No. 0741 [Cal due date: 14 Sep 2025]

Calibrated by David Fleming
Approved by Dubhaltach MacLochlainn

Date of Calibration 07 Jan 2025
Date of Issue 07 Jan 2025

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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