

Kilgobbin Road, Co. Dublin

Acoustic Design Statement
26 August 2025

WDA250421RP_A_01

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Executive Summary

Wave Dynamics were engaged by Kilgobbin Apartments Limited as the acoustic consultants to undertake an Inward Noise Impact, External Amenity Noise Assessment and Operational Noise Assessment for the planning application for the proposed new Large-Scale residential development on Kilgobbin Road, Stepside, Co. Dublin.

“The proposed Large-Scale Residential Development (LRD) will provide 120 no. apartment units within 2 no. blocks ranging in height from 4- to 6-storeys. The development will consist of; Block A, consisting of 44 no. units (27 no. 1 bed (2-person), 13 no. 2 bed (3-persons), 1 no. 2 bed (4-persons) and 3 no. 3 bed (5-persons) of 4- to 5-storeys height and of Block B, consisting of 76 no. units (40 no. 1 bed (2-persons), 12 no. 2 bed (3-persons), 16 no. 2 bed (4-persons) and 8 no. 3 bed (4-persons) of 5- to 6-storeys height.

The proposed development will provide all associated public open space and play area, 54 no. car parking spaces including accessible parking and Electric Vehicle parking, 273 no. bicycle parking spaces, 3 no. motorcycle parking spaces, bin/waste store and a plant room at ground floor level, 1 no. detached ESB substation, and 1 no. detached bicycle store for Block A residents. The proposed development will also provide for all associated site development and infrastructural works including foul and surface water drainage, roads, footpaths, landscaping, boundary treatment and a pedestrian and cycling pathway connecting Belarmine Vale and Kilgobbin Road. Vehicular access to the development will be via Belarmine Vale.”

Noise Impact Assessment

A Stage 1 and Stage 2 ProPG assessment have been undertaken. As part of the stage one assessment to categorise the site, a baseline noise survey was undertaken to measure the existing noise levels. Following a review of the noise levels on the site, including the L_{AFmax} and L_{Aeq} , the site has been characterised as low risk for both day and nighttime noise, therefore mitigation measures are required to control the onset noise levels.

Internal Noise Levels

Following the baseline survey, a noise impact assessment was undertaken, this included break-in noise calculations to predict the internal noise levels from road traffic noise. Consideration has also been given to the future growth of the roads. Following the assessment, the building envelope performance requirements were determined. The performance specification for the building envelope has been provided in this report which includes the external walls, glazing, roof and ventilation requirements.

External Amenity Noise Levels

The external amenity spaces on the development include surrounding playground areas, courtyard areas and greenfield areas. Appropriate amenity has been provided on the development using a combination of the surroundings greenfield areas and centre courtyard areas. This is in line with element 3(v) of ProPG.

Based on the recommendations in this report it is predicted that the internal and external noise levels will achieve the targeted noise levels in line with BS 82233:2014 and ProPG 2017 guidance.

Operational Noise

An operational noise impact assessment has been conducted to assess noise generated from road traffic, external amenity spaces, car parking and outdoor play areas. It is predicted that the development will not cause a negative noise impact on the nearby noise sensitive locations.

In the absence of information regarding operational plant and equipment at this planning stage, the approach has been taken to determine suitable operational noise emission limits for any proposed mechanical plant and equipment. The acoustic consultant at design stage for the project should ensure that the specific noise limits outlined in Section 6.3 of this report and the criteria outlined in Section 3 of this report are adhered to and achieved.

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1 Introduction

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Appendix A outlines a glossary of the acoustic terminology used in this report.

1.1 Statement of Competence

This report was completed by Wave Dynamics, an acoustic consultancy that specialises in noise and vibration. Our consultants have completed numerous similar projects in the Ireland the UK and Europe.

This assessment and report were completed by Saoirse Mulvaney, Technical Engineer. Saoirse holds a BSc in Physics with Astronomy from Dublin City University and has conducted numerous similar planning stage noise impact assessments.

This report was peer reviewed by James Cousins, Managing Director | Principal Consultant with Wave Dynamics who has extensive experience in assessing noise and vibration from road and rail infrastructure on commercial and residential developments. James is an experienced consultant. His qualifications include; BSc (Hons) in Construction Management and Engineering, Pg Cert in Construction Law and Diploma in Acoustics and Noise Control (Institute of Acoustics) and an IOA Competence Cert in Building Acoustic Measurements. James is a member of both Engineers Ireland (MIEI) and the Institute of Acoustics (MIOA) and is the current SITRI Chairman.

2 Site Description

The site is located on Lands at Riverside Cottage, Kilgobbin Road, Stepaside, Co. Dublin. There are residential developments to the north, east, west and south of the site location. To the east of the site, Kilgobbin road is located. There are greenfield areas located to the south of the site location, with a school to the west.



Figure 1: Site location and measurement locations L1 and A1-A3.

3 Project Criteria

The acoustic criterion for the project is set out in this section, the purpose of the criteria is to ensure reasonable:

- Internal noise levels and
- External amenity noise levels and;
- Operational noise from the development.

To provide adequate conditions Wave Dynamics have developed the project criteria for:

- Façade sound insulation performance,
- Ventilation requirements,
- External amenity requirements and,
- Operational Noise.

Assessment Standards

The criteria for the project have been developed based on the following industry standards:

- ✓ BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.
- ✓ Dublin Agglomeration Noise Action Plan 2024-2028
- ✓ ProPG Professional Practice Guidance on Planning & Noise.
- ✓ ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures
- ✓ EPA Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)
- ✓ BS 4142:2014 Methods for rating and assessing industrial and commercial sound
- ✓ Previous experience on similar projects.

3.1 Inward Noise Impact Assessment Criteria

The internal ambient noise levels requirements have been developed from the following standards:

Dublin Agglomeration Noise Action Plan 2024 - 2028

The Dublin Agglomeration Noise Action Plan 2024 – 2028 states the following with respect to the prevention of excessive noise levels for proposed new developments:

“Applications for new residential developments in the Agglomeration will be assessed in accordance with the policies and goals outlined in the relevant City and County Development Plans. Where applicable, these include adoption of the principles of Professional Planning Guidance (ProPG) on Planning & Noise: New Residential Development, as described in Section 7.5.1.

Where the assessment outcome determines the likelihood of an adverse noise impact, planning applications should be supplemented by an Acoustic Design Statement carried out by appropriately qualified acousticians and competent persons.”

ProPG: Professional Practice Guidance on Planning & Noise

ProPg 2017 is used to assess airborne noise from transport sources including road, rail and aircraft noise. The aim of the document is to provide a good design process which considers the internal acoustic environment at an early stage in the design process. The guidance was prepared by the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health and is based on the findings by the World Health Organisation in

relation to noise impact on humans. Its adoption is considered best practice for assessing the potential noise impact on the future occupants for residential developments.

The guidance is primarily designed for residential developments however it can be applied to other development types including developments where people require appropriate noise levels for rest and sleep. This includes residential care homes, hospitals etc. The guidance advocates a holistic design process which considers the site, its location and likely suitability for the development at an early stage.

The two primary stages of the ProPg design approach are summarised as follows:

Stage 1 – The first stage is to undertake an initial high-level noise risk assessment of the proposed site considering the noise levels (measured and or predicted) to identify any noise risks. This would include consideration of the current noise environment, future use and future noise levels ; and,

Stage 2 –The second stage is a full detailed assessment of the proposed development covering the “*Four Key Elements*”:

1. *“Good Acoustic Design Process,*
2. *Internal Noise Level Guidelines,*
3. *External Amenity Area Noise Assessment; and*
4. *Assessment of Other Relevant Issues.”*

As part of the process an Acoustic Design Statement is produced and submitted to the planning authority. This document sets out the design process used to come to the conclusions and recommendations in the report.

Following the ProPg the following conclusions are recommended by ProPg in relation to the findings of the Acoustic Design Statement based on the recommendations of the Acoustic Consultant:

- a. *“Planning consent may be granted without any need for noise conditions;”*
- b. *“Planning consent may be granted subject to the inclusion of suitable noise conditions; “*
- c. *“Planning consent should be refused on noise grounds in order to avoid significant adverse effects (“avoid”); or, “*
- d. *“Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects (“prevent”).”*

Section 3 of the ProPG outlines the recommended approach decision makers should following in coming to their conclusions based on the recommendations of the Acoustic Design Statement Figure 2 on the next page illustrates the ProPG approach.

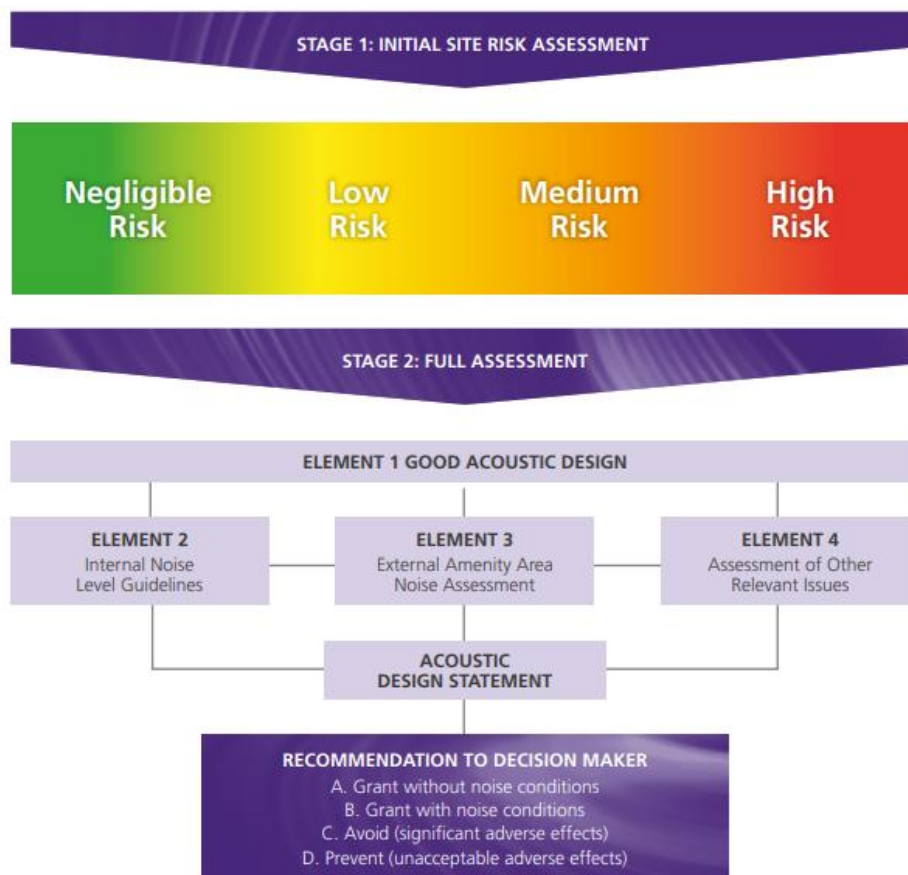


Figure 2: Summary of overall ProPG approach

Internal Noise Levels

Table 1 below outlines the recommended internal noise levels from BS 8233:2014 within living accommodation for residential buildings for dining, resting and sleeping. These limits are in line with the ProPG and the World Health Organisation Guidelines.

Table 1: BS 8233:2014 internal noise criteria –Residential Buildings.

Activity	Location	07:00 to 23:00 Hrs	23:00 to 07:00 Hrs
Resting	Living Room	35 dB $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining Room/Area	35 dB $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 \text{ hour}}$	30 dB $L_{Aeq, 8 \text{ hour}}$ 45dB L_{AFmax} (See Note 1)

1: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB L_{AFmax} more than 10 times a night.

External Amenity Space Noise Levels

With regard to noise levels in external amenity spaces ProPG 2017 refers to the BS8233:2014 guidance which states that:

“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 $L_{Aeq, 16hr}$ ”.

It also states that:

“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 but should not be prohibited.”

After mitigation/with mitigation if the adverse noise impacts are still above the recommended noise levels they can be offset by providing an alternative amenity space to partially offset the noise impact by providing 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*
- *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, publically 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). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.”*

BS 8233:2014 elaborates on this further, it acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within the guideline values. In respect of gardens and patios, BS 8233:2014 states:

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

Both BS8233:2014 and ProPG 2017 do not advise that development should be restricted in areas with undesirable noise levels. The standards recommend that mitigation measures are put in place where practicable to achieve the recommended noise levels for the external amenity spaces. It notes that this may not be practical in all situations and local or governmental policy should take precedence in these situations.

3.2 Operational Noise Criteria

Local authorities can set noise limits from typical residential developments pertaining to noise however there is currently no national policy for operational noise limits from residential developments for planning noise assessments. Noise limits for new developments are typically sought from local council's noise action plan, EPA NG4 or BS4142. On review of the Dublin Agglomeration Noise Action Plan no specific guidance has been outlined for noise limits from residential premises and therefore the criteria from EPA NG4 and BS4142 has been adopted for the project.

BS 4142:2014+A1:2019

The standard describes a method for the assessment of commercial, industrial and background noise to quantify its impact on persons outside of a residential dwelling. BS 4142 has become the de facto standard for compliance investigation. In addition to the specified broadband noise levels the standards provide objective and subjective methods for the assessment of the impulsivity and tonality of the noise sources. This allows for a penalty/ correction to be applied to the measured noise level of the source (L_{Aeq}) to give the rating level ($L_{Ar,T}$).

It considers the likelihood of complaints by considering the margin by which the noise is source the background noise level.

BS 4142 states that an exceedance of the noise source of the background noise by:

- +10 dB or more indicates that complaints are likely,
- + 5 dB is of marginal significance, and;
- The rating level is more than 10 dB below the measured background noise level, then this is a positive indication that complaints are unlikely.

BS4142 outlines guidance for penalty corrections to be applied to the noise sources in question should the noise source have one of the following characteristics:

- The noise contains a distinguishable, discreet, continuous tone (whine, or hum);
- The noise contains distinct impulses (i.e. bangs),
- The noise is intermittent or:
- The noise is irregular.

EPA NG4

EPA NG4 outlines that noise attributable solely to onsite activities from a licenced premises should not exceed the following limits:

- Daytime (07:00hrs – 19:00hrs) – 55dB $L_{Ar,T}$
- Evening (19:00hrs – 23:00hrs) – 50dB $L_{Ar,T}$
- Night time (23:00hrs – 07:00hrs) – 45dB $L_{Aeq,T}$

During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{Ar,T}$). In all cases, an assessment by a competent person will be required.

During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

4 ProPG Stage 1 – Assessment

The stage one risk assessment is used to assess the site for potential risks that may occur in terms of noise impact. The ProPG sets out four categories of risk: 1) negligible, 2) low, 3) medium or 4) high risk. Figure 3 below illustrates the ProPG risk assessment and the values associated with each risk category.

The risk assessment also considers the risk based on the number of L_{AFmax} events per night as follows;

- A site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and;
- A site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times per night.

Paragraph 2.9 of ProPG states that,

“The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a “typical worst case” 24 hour day either now or in the foreseeable future.”

To assess the noise impact with the ProPG risk categories a baseline noise survey was undertaken on the site to quantify the existing noise environment.

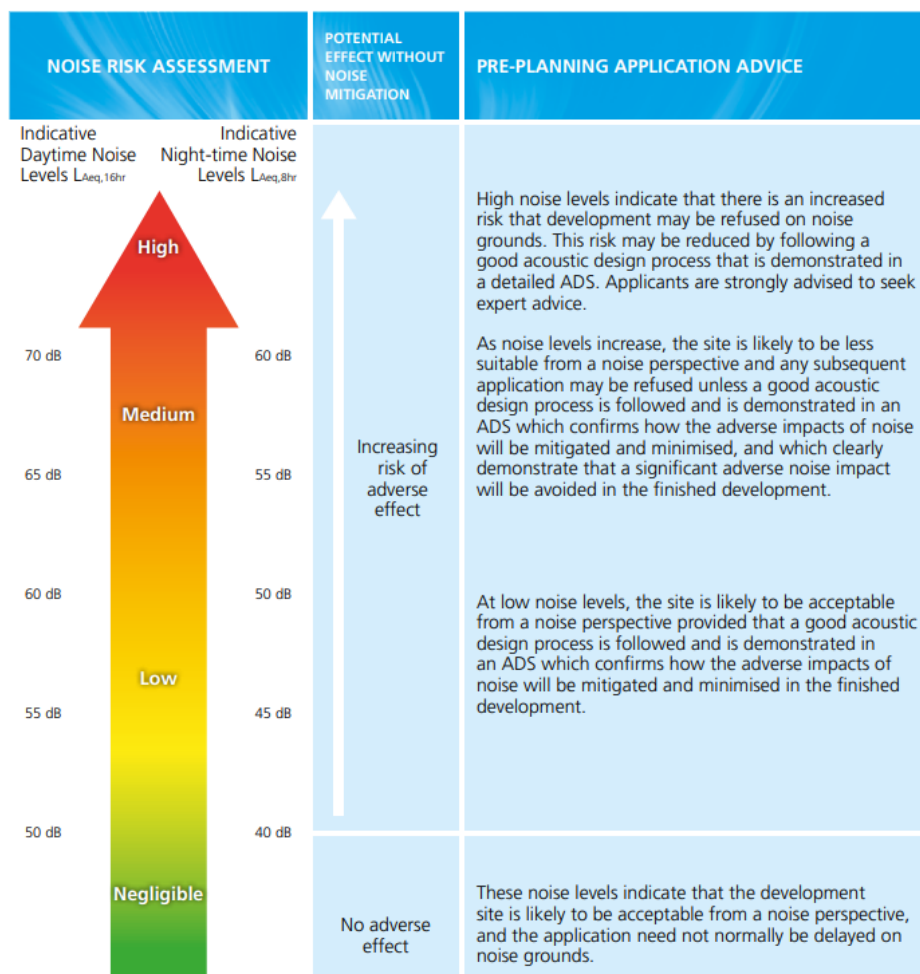


Figure 3: ProPG Risk Analysis

4.1 Baseline Noise Survey

An unattended and attended noise survey was conducted to quantify the existing noise environment and current noise levels experienced Kilgobbin Road and the surrounding existing residential areas. The purpose of the measurements was to quantify the existing noise environment to assess the break in noise.

4.1.1 Site Description and Measurement Locations

The site is located on Lands at Riverside Cottage, Kilgobbin Road, Stepside, Co. Dublin. There are residential developments to the north, east, west and south of the site location. To the east of the site, Kilgobbin road is located. There are greenfield areas located to the south of the site location, with a school facility to the west.



Figure 4: Site location and measurement locations L1 and A1-A3.

4.1.2 Survey Methodology and Personnel

The attended survey, unattended logger deployment and collection was completed by Daniel Cousins (Field engineer) on the 13th of May 2025 and on the 15th of May 2025.

Attended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using ISO Class 1 sound analysers. Attended measurements were taken for a duration of 15 minutes in the locations L1 and A1 as noted in Figure 4 and paused where required to avoid noise from car movements. Attended measurements were taken for a duration of 60 minutes in the locations A1, A2 and A3 as noted in Figure 4 and paused where required to avoid noise from car movements. Care was taken to avoid any effect on the measurement of extraneous noise, acoustic vibration, or interference. During the attended noise measurements, the sound level meter was positioned at approximately 1.5m above the ground level. The weather conditions were calm (wind less than 5m/s) with no rain, a wind shield was used for the duration of the attended surveys. The noise logger was calibrated before and after the survey and no significant drift was noted.

Unattended Noise Measurements

An unattended noise logger was deployed in location L1 as per Figure 5 at approximately 3.8m above ground level. The monitor was deployed on the 13th of May 2025 at 14:00hrs and collected on 15th of May 2025 at 12:00hrs. The logger was calibrated before and after the measurements and no significant drift was noted. Measurements were filtered for periods of unsuitable weather conditions



Figure 5: Noise Logger Setup

4.1.3 Survey Period

The attended noise measurements were undertaken on the 13th of May 2025 and the 15th of May 2025. The noise logger was deployed on the 13th of May at 14:00hrs and collected on 15th of May at 12:00hrs.

4.1.4 Noise Measurement Equipment

A Class 1 sound level meter/noise logger in general accordance with IEC 61672-1:2013 was used for the attended measurements. Table 2 below summarises the measurement equipment used.

Table 2: Noise Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Calibrator	CAL3	Nor 1251	32096	AC240251	03/07/2025
Sound Level Meter	SLM3	Nor 140	1403082	SLM50651/50650	13/04/2027
Sound Level Meter	SLM7	Nor 140	1405924	U48184/ U47386	25/07/2026

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Sound Level Meter	SLM8	Nor 140	1403345	SLM250258	09/05/2027

4.1.5 Subjective Noise Environment

During the attended noise survey and logger deployment the following noise sources were identified:

- Traffic noise from Kilgobbin Road
- Children playing in the distance
- Birdsong

4.2 Noise Measurement Results

This section outlines the results of both the unattended and attended noise measurements.

Attended Measurement Results

Table 3 outlines the results of the attended measurement survey.

Table 3: Attended Noise Measurement Results

Measurement				Measured Noise Levels		
Location	Date	Time (hrs)	Duration (mins)	L _{Aeq} dB	L _A F _{max} dB	L _{A90} dB
A1	13/05/2025	12:35	15:00	55	66	50
A1	13/05/2025	12:50	15:00	49	62	45
L1	13/05/2025	13:36	15:00	48	58	45
A2	13/05/2025	14:04	60:00	46	72	42
A2	13/05/2025	15:04	60:00	48	63	43
A1	15/05/2025	12:09	60:00	50	70	44
L1	15/05/2025	12:21	15:00	55	70	43
A3	15/05/2025	12:41	60:00	50	67	42

Unattended Monitoring Results

Table 4 outlines the results of noise measurements at the unattended monitoring location L1. A full breakdown of all of the unattended measurement results are provided in Appendix A of this report.

Table 4: unattended Measurement Results

Start Date	L _{Aeq,16hour} (07:00 - 23:00)	L _{night} dB (L _{Aeq,8hour} 23:00 - 07:00)	L _{den} dB (00:00 - 00:00)	10th highest night-time L _A F _{max} ³	L _{A90} (23:00 - 07:00) dB	L _{A90} (07:00 - 23:00) dB
13/05/2025	55	49	58	66	33	42
14/05/2025	56	49	58	67	34	43
15/05/2025	56	N/A	58	N/A	N/A	45

- (1) Where night-time period is referred to the date is the date the measurement commenced on at 23:00hrs and finished at 07:00hrs on the following calendar day.

LAF_{max} Noise Levels

Based on the project criteria outlined in Section 3, the internal LAF_{max} 15min inside the dwelling bedrooms cannot exceed 45dBA more than 10 times per night. With regard to the maximum noise levels ProPg states:

“A site should not be regarded as negligible risk if the L_{Amax,F} exceeds, or is likely to exceed 60 dB more than 10 times a night. A site should be regarded as high risk if the L_{Amax,F} exceeds, or is likely to exceed 80 dB more than 20 times a night.”

Figure 6 below highlights the average number of LAF_{max} events recorded on the noise logger per night based on a 15min measurement interval. Based on the ProPG risk assessment of the LAF_{max} noise levels, the site is not considered high risk as there are not typically more than 20 occurrences exceeding 80dB LAF_{max}.

The façade specification outlined in Table 6 below has been determined in accordance with achieving the internal noise levels for both L_{Aeq} and the LAF_{max} incident noise levels below.

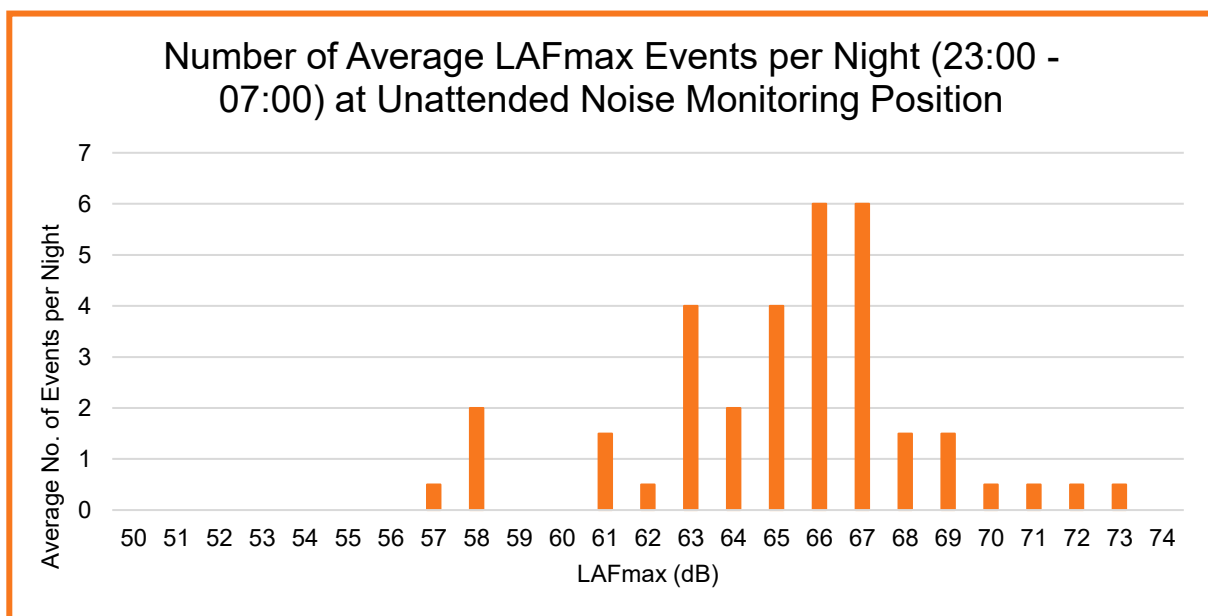


Figure 6: Average recorded LAF_{max} events per night based on 15min measurement intervals

Discussion of Measurement Results

The measurements were taken on weekdays to provide an understanding of the noise climate of the existing surrounding residential units and the road traffic noise. From the noise levels recorded there, the dominating noise sources included passing traffic and local residential noise.

Based on the ProPG risk assessment of the LAF_{max} noise levels, the site is not considered high risk as there are not typically more than 20 occurrences exceeding 80dB LAF_{max}.

4.3 Weather Conditions for Monitoring Period

Good weather conditions were noted in general during the deployment and collection during the attended survey, with winds of less than 5 m/s and no rain.

Where weather conditions during the unattended survey impacted on the results they were filtered where required.

4.4 Future Noise Levels

Based on data from the TII (2017) the average rate of growth on Irish roads is a 3.9%, assuming linear growth of 3.9% over the next 10 years an increase in noise levels from road traffic of 1-2 dB would be expected. WDA have allowed for this growth in our assessment.

4.5 ProPG Stage 1 – Initial Risk Assessment

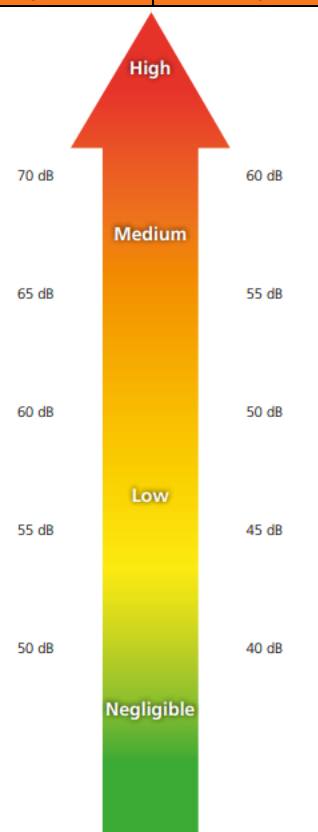
The measured noise levels on the site and future noise levels have been predicted for road and the existing residential noise to assess the probability of an adverse impact.

Table 5 below identifies the Noise Risk Categorisation of the site based on the predicted free field façade noise levels. The site has been categorised as medium to high risk. Considering this risk categorisation of the development mitigation measures will be required to mitigate the noise risk in following with ProPG guidance and good acoustic design process.

It should be noted that the ProPG 2017 states the following with regard to how the initial site noise risk is to be used:

“2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design.”

Table 5: ProPG Stage 1 Risk Assessment of Existing Noise Levels

Noise Risk Assessment		Risk Assessment Rating	
Indicative Daytime Noise Levels L _{Aeq,16hour}	Indicative Night-time Noise Levels L _{Aeq,8hour}	Daytime Noise Levels	Night-time Noise Levels
		High Risk	High Risk
		N/A.	N/A.
		Medium Risk	Medium Risk
		N/A.	N/A.
		Low Risk	Low Risk
		The site is at low risk at daytime.	The site is at low risk at night-time.
		Negligible Risk	Negligible Risk
		N/A	N/A

5 ProPG Stage 2- Full Assessment

This section outlines the full acoustic design assessment in line with ProPG guidance.

5.1 Element 1: Good Acoustic Design Process

ProPg States the following in relation to Good Acoustic Design Process:

"A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally (inside noise-sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes)."

"Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions (these terms are defined in Element 2). Good acoustic design does not mean overdesign or gold plating of all new development but seeking to deliver the optimum acoustic outcome for a particular site"

The following considerations are recommended by ProPG:

- *"Check the feasibility of relocating, or reducing noise levels from relevant sources.*
- *Consider options for planning the site or building layout.*
- *Consider the orientation of proposed building(s).*
- *Select construction types and methods for meeting building performance requirements.*
- *Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.*
- *Assess the viability of alternative solutions.*
- *Assess external amenity area noise."*

5.1.1 Discussion of Good Acoustic Design

Mitigation of Sources

The development is located close to the road and residential noise sources which are not on or part of the development therefore it is not possible to reduce or relocate the relevant noise sources.

Site Layout and Orientation

The eastern elevation of the site will be most exposed to noise with direct line of sight to the road. The other elevations of the site will see some benefit from screening from the development itself.

Construction Methods

Section 5.2.1 considers the construction methods required to meet the building performance control measures. The construction measures are in general robust, providing standard external wall and façade details to meet thermal, fire and weathertightness requirements will in general provide adequate performance to achieve good levels of sound insulation.

Impact of Noise Control Measures

The effects for noise control measures on other building elements including ventilation are considered in Section 5.2.1. It is generally impractical to provide ventilation via openable windows in urban/built up areas. An open window will provide 10-15dB of attenuation which in build-up urban areas is not practical. In general, the good acoustic design process in these areas is to provide ventilation via attenuated natural vents or mechanical ventilation. This allows the occupants to have adequate ventilation with adequate noise levels.

External Amenity

ProPG states the following with regard to external amenity spaces:

“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 LAeq,16hr.”

The external amenity source noise levels are considered in section 5.3.

5.2 Element 2 – Assessment of Internal Noise Levels

This section outlines the assessment of the building envelope including the façade noise modelling, and specification of the glazing requirements.

A noise intrusion assessment for the proposed development has been completed in accordance with the methodology outlined International Standard *ISO EN 12354-3:2017 Building acoustics — Estimation of acoustic performance of buildings from the performance of elements — Part 3: Airborne sound insulation against outdoor sound*. The standard provides a method for calculating the indoor noise levels due to for instance Rail Traffic Noise.

The calculation method accounts for multiple factors including:

- The external noise level at the affected building façade.
- The frequency characteristics of the specific noise source (i.e. Aircraft Noise).
- The sound insulation performance of each façade element (i.e. Windows, Walls, Roof...).
- The area of each façade element.
- Direct and flanking transmission paths.

5.2.1 Building Envelope Specification

This section outlines the building envelope requirements based on the measurements outlined in Section 3. Facade, wall, glazing, roof and ventilation specifications have been determined to achieve the internal noise level criteria for the development. The specification has been determined in accordance with EN ISO 12354-3: 2017 based on the predicted façade day and night noise levels, the room and facade dimensions from the drawings provided.

The building envelope specification should be confirmed by the acoustic consultant at design stage once the internal layouts and design development has been completed. Any changes to the assumed ventilation strategy and glazing requirement should be considered as part of the review and it should be based on the internal noise levels cited in this report.

Glazed Elements and Ventilation

The glazed elements and ventilation openings are typically the acoustically weakest elements of any façade. The required sound insulation performance of façade glazed elements and ventilation openings is outlined in Table 6 below.

It is required that the glazing, frame and seals as a whole achieve the performance when the window is in the closed position. The performance requirements outlined in Table 6 below are considered to provide adequate sound insulation to achieve the relevant day and night internal design goals respectively. A markup outlining the performance requirements for each façade are included in Appendix B.

Table 6: Sound Insulation performance requirements for glazed elements and ventilation

Façade	Glazed Elements (Frame & Glazing) Sound Insulation Requirements (Indicative requirements equal or approved)							Façade Ventilation Requirement ²
	Octave Band Frequency Requirements ¹ R dB						Glazing Acoustic Performance dB R _w	
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
RED	14	18	26	35	44	21	30 dB R _w	Mechanical Ventilation OR 34 <i>D</i> _{n,e,w} Trickle Vent

It is important to note that the requirements outlined above are minimum requirements for the glazed element as a whole. The octave band values are indicative and specific to the assessed glazing type, equal or approved to meet the minimum project requirements is acceptable.

We understand the ventilation strategy for the development has not been confirmed at this stage of the design. It has been assumed that ventilation will be provided via mechanical ventilation system. Should the ventilation strategy change to natural ventilation strategy Wave Dynamics have advised an appropriate ventilation sound insulation performance requirement for any wall/trickle vents. Typically, the use of a natural ventilation strategy will lead to an enhanced glazing specification compared to a sealed mechanical ventilation system. This assessment is based on the windows in closed position and vents in the open position. The ventilation specification is provided for vents in the open position.

It is recommended that the facade supplier provide laboratory tests confirming the airborne sound insulation performance in the absence of suitable laboratory data a composite sound reduction index calculation undertaken by a suitably qualified acoustic consultant can be used to demonstrate compliance.

External Wall Construction

The façade wall construction has been assumed to achieve a minimum sound insulation performance of 54dB R_w. Typical façade construction such as concrete, blockwork, timber frame and brick offer high levels of sound insulation and will meet this requirement.

Roof Construction

The roof construction has been assumed to achieve a minimum sound insulation performance of 55dB R_w. Any skylights and glazing in the roof system should achieve the same performance as that outlined in Table 6.

5.3 Element 3- External Amenity Spaces

The external amenity spaces on the development include the surrounding playground areas, courtyard areas and greenfield areas. Based on the measured noise levels at the site, it is predicted the surroundings areas will achieve the desirable external amenity noise levels as set out in ProPG and BS 8233.

The noise levels in the external amenity spaces have been assessed for compliance with element 3(v) of ProPG which states:

“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, 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, publically 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)”.

Based on the measured noise levels at the site it is predicted that the external noise levels in the majority of the external amenity spaces, courtyards and surrounding areas will achieve the ProPG recommendations for desirable external amenity noise levels of 50-55dBA $L_{Aeq,16hour}$. All private amenity spaces will also achieve the requirements based on the measured noise levels.

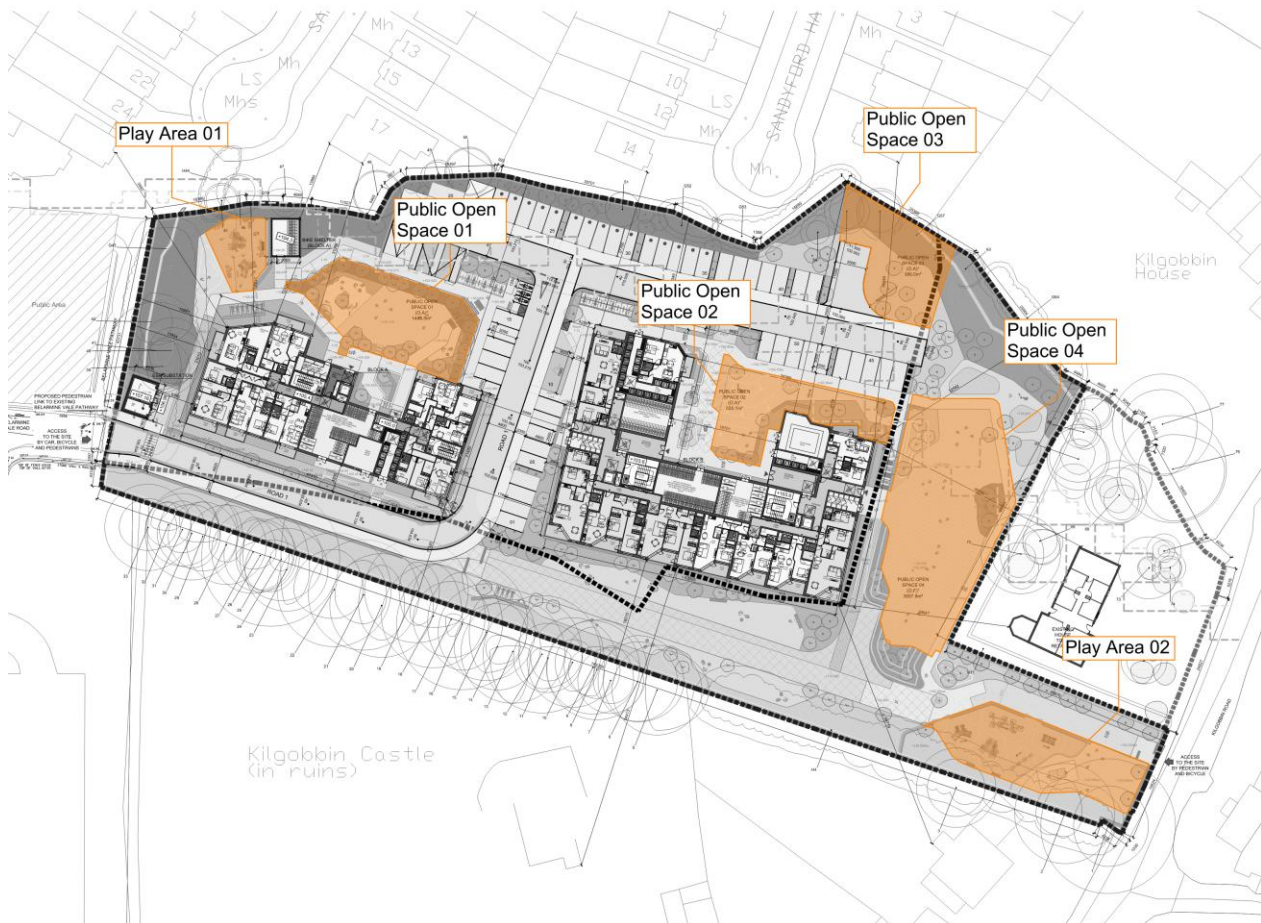


Figure 7: External Amenity Spaces.

5.4 Element 4- Assessment of Other Relevant Issues

This section of the acoustic design report considered the other relevant issues. Element 4 considers other issues which may remain relevant to the assessment, these issues are as follows:

- 4(i) compliance with relevant national and local policy.
- 4(ii) magnitude and extent of compliance with ProPG.
- 4(iii) likely occupants of the development.
- 4(iv) acoustic design v unintended adverse consequences and;
- 4(v) acoustic design v wider planning objectives.

5.4.1 Compliance with Relevant National and Local Policy

There are no specific noise guidance or policy documents for residential developments. The Dublin Agglomeration Noise Action Plan refers to the ProPG as the relevant document for assessment of the noise impact on new residential developments as followed in this acoustic design statement.

5.4.2 Magnitude and Extent of Compliance with ProPG

This report demonstrates that all dwellings will meet the specified internal noise level requirements provided the guidance in this report is followed. External amenity spaces have been provided in line with the guidance set out in ProPG. Based on this the development is in general compliance with the ProPG requirements.

5.4.3 Likely Occupants of The Development

Additional needs of the future occupants are not known at this stage however the needs of all potential occupants have been considered with the assessment of adequate internal noise levels and provision of adequate external amenity spaces to meet the needs of potential occupants.

5.4.4 Acoustic Design v Unintended Adverse Consequences

The design has considered the impact of adverse consequences, mitigation has been provided by specification of the sound insulation and ventilation requirements.

5.4.5 Acoustic Design v Wider Planning Objective

Where possible the wider planning objectives have been considered including the need for residential housing with good transport links. It is assumed that the wider planning objectives have been adhered to by following the ProPG guidance.

5.5 Stage 2 Assessment Conclusion

The stage 2 assessment considers all four (4) elements, the principals of good acoustic design have been followed.

The element 2 assessment has considered the measures required to provide an adequate acoustic environment with appropriate noise levels for internal spaces. The sound insulation and ventilation requirements have been specified based on the predicted façade noise levels.

The element 3 assessment of external amenity spaces has considered the noise impact on the development and the external amenity spaces. Appropriate provision of external amenity space has been provided in line with the ProPG guidance.

Other relevant issues have been considered including, local policy, unintended consequences and the wider planning objectives.

6 Operational Noise Impact

The operational noise sources from the development include road traffic noise, traffic noise from cars parking in the parking spaces provided and the operational noise from the external amenity spaces.

This section includes an assessment of the operational noise impacts for noise from the external amenity spaces and noise from the car park movements. The plant and equipment for the project has not been determined at this time. The heating and cooling methodology will be developed at design development stage. Therefore, plant noise limits have been set out in this section of the report. As part of the building design an acoustic consultant should be engaged to review the plant noise emissions from the development to ensure that the upper noise limits outlined in this report are achieved.

6.1 Noise Sensitive Locations

The Proposed Development site is located on Lands at Riverside Cottage, Kilgobbin Road, Stepaside, Co. Dublin. The local area is considered predominantly residential, with residential properties located north on Sandyford Hall Drive (NSL1), east along Kilgobbin Road (NSL2, NSL3, NSL4, NSL5).

A desk-based review was carried out to identify existing noise sensitive locations within proximity to the proposed development site. Noise sensitive locations relevant to the Proposed Development site are illustrated in Figure 8.



Figure 8: Noise Sensitive Locations (NSL 1-5)

6.2 Noise Prediction Modelling

Following the survey a model of the development using SoundPLAN 9.1 modelling software was developed to establish the noise levels from the development in a worst-case scenario. The software implements the algorithms contained in ISO 9613-1 and ISO 9613-2. The noise model considers:

- Distance attenuation,
- Source and receptor locations,
- Barrier effects (buildings, walls etc)
- Topographical elevations,
- Ground effects and absorption,
- Source sound power levels,
- Directivity and orientation of the source,
- Atmospheric attenuation and meteorological effects,

The noise model has been calibrated against the attended noise measurements. SoundPLAN 9.1 software predicts road traffic noise levels in accordance with *Calculation of Road Traffic Noise* (UK Department for Transport, 1998). This is the recognised appropriate standard for road traffic noise prediction as per TII (Transport Infrastructure Ireland).

The following information was input into the model:

- Development layout provided by architect's drawings.
- Google Maps terrain and elevation data of surrounding area.
- Road traffic noise levels calibrated based on attended measurement survey onsite.
- Annual traffic growth rate of 3.9%.
 - This has been assessed based on pre-covid traffic growth data.

The acoustic model for the new development has been developed based on attended and unattended noise survey and the proposed site location and predicted noise sources. As the site has potential to create noise impact at both day and nighttime, a worst-case scenario has been developed for both predicting the noise impact at the nearest noise sensitive locations. The assessment considers the noise impact of the communal space on the nearby residential receptors.

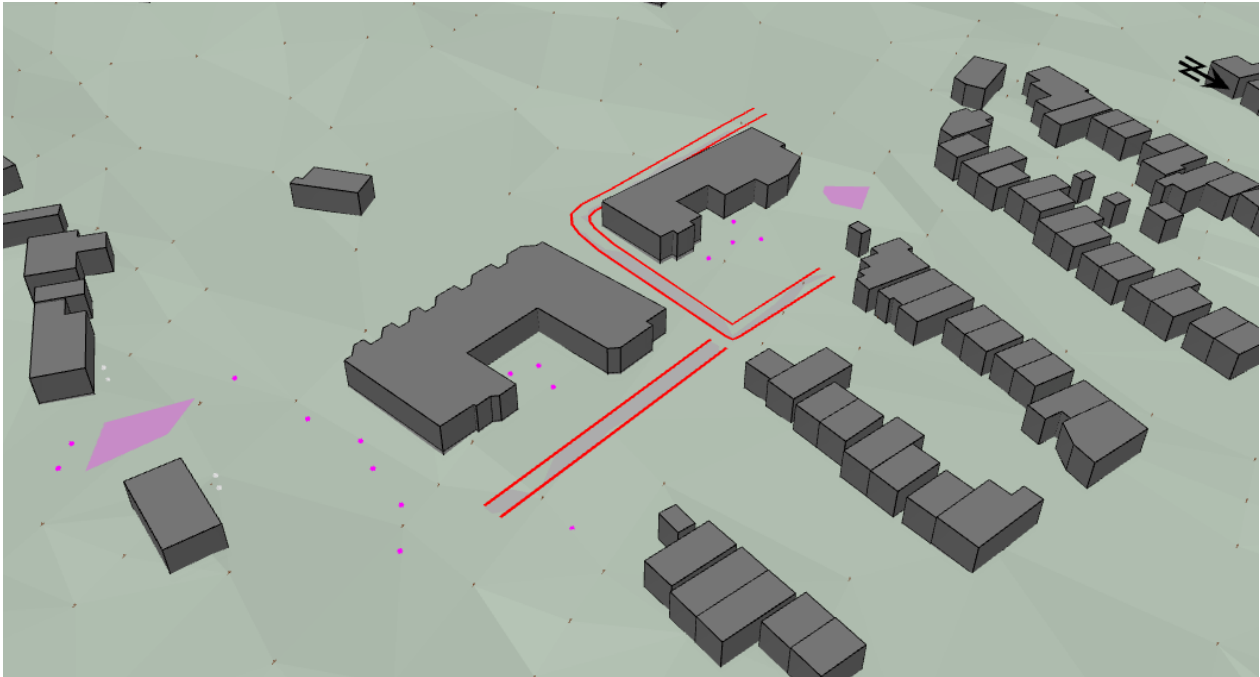


Figure 9: Screenshot from the model showing the proposed development.

6.2.1 Operational Noise Sources

External Amenity Spaces

There are a total of 5 outdoor communal areas/ public open spaces located across the proposed development site, all varying in size. These are as follows.

- Play Area 01, area 98 m²
- Public Open Space 01, area 1445.5 m²
- Public Open Space 02, area 555.1 m²
- Public Open Space 03, area 386.0 m²
- Public Open Space 04/Play Area 02, area 3697.8 m²

For the purpose of the model, it is assumed that each external amenity space will be operational during daytime hours 07:00hrs-23:00hrs, and night-time hours 23:00hrs – 02:00hrs, assuming 24 persons within the larger amenity spaces during the daytime hours and 12 persons during nighttime hours and up to 12 persons within the smaller amenity spaces during the daytime hours and 6 persons during the nighttime hours. It is assumed that 1 in 3 persons will be talking as a worst-case scenario. Table 4 below outlines the noise spectrum used to model an amenity space with up to 20 persons.

Table 7: AAAC Patron noise levels at 1m distance for the outdoor amenity space.

Description	Source Sound Power Level L _w (dB) at Octave Band Centre Frequency, Hz							Overall dBA L _w
	125	250	500	1000	2000	4000	8000	
1 person talking with normal voice	58	67	69	63	59	55	50	72

Play Area Noise Levels

It has been assumed that the play area will be in use from 08:00hrs to 18:00hrs and will have a noise level of 60dBA L_w / m² as per the SoundPLAN 9.1 library source levels for a small children's playground.

Car Parking

The proposed development will have a total 54 no. parking spaces on ground level. Operational noise from surface car parking will be spread across the site, isolated, and of short duration, it will not have a negative impact on nearby noise sensitive locations (NSLs) as discussed in Section 5.3 of this report.

6.3 Assessment of The Operational Noise Impact

This section outlines the operational noise impact from the proposed development, which includes the external amenity spaces and outdoor play areas. The operational noise impact considers the noise impact of all noise sources at the nearest noise sensitive locations.

6.3.1 Daytime Scenario

As the new development has the potential to generate noise with different characteristics for both the day and nighttime, a model has been undertaken for both the day and nighttime operations of the proposed development.

The daytime situation assumes the following noise sources:

- Use of all external amenity spaces during the hours of 07:00-23:00.
- Assumed occupancy of 24 persons within the larger amenity spaces and up to 12 persons within the smaller amenity spaces. It is assumed that 1 in 3 persons will be talking as a worst-case scenario.
- Play area to be in use from 08:00hrs to 18:00hrs.

Noise Impact (BS 4142 Assessment) for Daytime Hours

The noise impact at the nearest noise sensitive location (NSL1-NSL5) has been assessed in accordance with BS 4142. The predicted noise from the development is worst case at NSL3 first floor due to its proximity to the development. NSL3 is also representative of lower background noise levels than other noise sensitive locations and therefore has the most stringent criteria. The BS4142 at NSL3 is outlined in Table 8 below.

Table 8: BS4142 Assessment for daytime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (daytime)	$L_{Aeq(15min)} = 43dB$	7.3.6	As the new development is not yet existing, the noise levels have been predicted using SoundPlan modelling software. Worst case specific sound predicted at NSL3 as this is closest to the proposed development.
Residual sound level (daytime)	$L_{Aeq(60min)} = 55dB$	7.3.2	The residual sound level was dominated by road traffic noise. Background location L1 assessed as this is representative for worst case receptor (NSL3).
Background sound level (daytime)	$L_{A90(60min)} = 42dB$	8.1.2 8.4	The L_{A90} sound level was measured at the noise sensitive location with the source absent.
Assessment made during the daytime, so the reference time interval is 1 hour		7.2	
Specific sound level as predicted	$L_{Aeq(15min)} = 43dB$	7.3.6	The specific sound has been predicted by calculation alone as the new development was not existing at the time.

Results		Relevant BS 4142 Clause	Commentary
Acoustic feature correction	+0dB	9.2 9.3.2	It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics.
Rating level	(43 + 0) dB = 43dB	9.2	
Background sound level	$L_{A90(60min)} = 42dB$	8	
Excess of rating over background sound level	(43 - 42) dB = +1dB	11	The specific sound is 1dB above the background levels and is lower than the residual sound. It is unlikely that operational nighttime noise from the proposed development will have an adverse impact or a significant adverse impact on NSL's. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes large groups of persons occupying the amenity spaces during daytime hours and one in three speaking with raised voice, and children playing in the play area during the morning and evening hours.

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed development will not have any adverse impact on the surrounding noise sensitive locations.

NG4

NG4 recommends a daytime criteria of (07:00hrs – 19:00hrs) 55dB $L_{Aeq,T}$, the predicted noise emissions from the development are 43 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

6.3.2 Night-time Scenario

The proposed development has potential to generate noise impact at nighttime.

The nighttime situation assumes the following noise sources:

- Use of all external amenity spaces during the hours of 23:00-02:00.
- Assumed occupancy of 12 persons within the larger external amenity spaces and up to 6 persons within the smaller external amenity spaces. It is assumed that 1 in 3 persons will be talking as a worst-case scenario.

BS4142 Nighttime Assessment

The noise impact at the nearest noise sensitive location NSL3 first floor has been assessed in accordance with BS 4142.

Table 9: BS4142 Assessment for nighttime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (nighttime)	$L_{Aeq(15min)} = 36dB$	7.3.6	As the new development is not yet existing, the noise levels have been predicted using SoundPlan modelling software. Worst case specific sound

Results		Relevant BS 4142 Clause	Commentary
			predicted at NSL3 as this is closest to the proposed development.
Residual sound level (nighttime)	$L_{Aeq(15min)} = 49dB$	7.3.2	The residual sound level was dominated by road traffic noise. Background location L1 assessed as this is representative for worst case receptor (NSL3).
Background sound level (nighttime)	$L_{A90(15min)} = 33dB$	8.1.2 8.4	The L_{A90} sound level was measured at the noise sensitive location with the source absent.
Assessment made during the daytime, so the reference time interval is 15 minutes		7.2	
Specific sound level as predicted	$L_{Aeq(15min)} = 36dB$	7.3.6	The specific sound has been predicted by calculation alone as the new development was not existing at the time of the survey.
Acoustic feature correction	+0dB	9.2 9.3.2	It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics.
Rating level	$(36 + 0) dB = 36dB$	9.2	
Background sound level	$L_{A90(15min)} = 33dB$	8	
Excess of rating over background sound level	$(36 - 33) dB = +3dB$	11	The specific sound is 3dB above the background levels and is lower than the residual sound. It is unlikely that operational nighttime noise from the proposed development will have an adverse impact or a significant adverse impact on NSL's. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes large groups of persons occupying the amenity space during nighttime hours and one in three speaking.

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed development may have any adverse impact on the surrounding noise sensitive locations.

NG4

NG4 recommends a night time criteria of 45dB $L_{Aeq,T}$, the predicted noise levels from the new development are 36 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

Impact of Traffic Movements on Communal Outdoor Spaces

The impact of noise from cars entering/leaving the site via local access roads and parking at the various car parking spaces onsite were assessed with regard to ensuring the noise levels in the outdoor amenity spaces are recommended to achieve <50-55dBA. Based on the modelling and assessment the predicted noise levels from the car park movements are expected to achieve <50 dBA when considered over the full day time period ($L_{Aeq,16hr}$).

6.3.3 Modelling Assumptions

The following assumptions were made throughout the modelling and assessment:

- Assessment based on the noise measurements undertaken on the 13th and 15th of May 2025.
- Noise source data for the assessment was based on the measurements undertaken onsite.
- Model assumes a worst-case operating scenario as outlined in Section 6 above.
- Modelling based on the drawings, layouts and information provided.
- Assessment based on proposed new development only.

6.3.4 Mechanical Plant & Equipment

As the proposed development is currently at planning stage, the mechanical plant and equipment information is not available for the project. It is currently understood that specific mechanical plant and equipment will not be further developed and specified until further in the design process as this is a design and build project. The acoustic consultant at design stage for the project should ensure that the above criteria outlined in Section 3 of this report is achieved.

In the absence of information regarding the operational plant at this planning stage, the approach has been taken to determine suitable operational noise emission limits for any proposed mechanical plant and equipment.

The closest NSL to the proposed development site is NSL3. The closest representative noise monitoring location to NSL 3 is noise monitoring location L1.

To be reflective of a worst-case scenario, the lowest L_{A90} measurements from the daytime L_{A90} , 1hour (07:00-23:00) and night-time L_{A90} , 15min (23:00-07:00) at noise monitoring location L1 have been used to determine suitable operational noise emission limits.

Table 9 below contains the daytime and nighttime noise threshold limit to be adhered to for any plant/equipment noise from the proposed development at the nearest noise sensitive locations (NSL 3).

Table 10: Derived Noise Threshold Limits for Plant/Equipment Noise

Noise Sensitive Location	Background Sound Levels L_{A90} dB	Penalty for Tonality dB(A)	Derived Noise Threshold Limit dB(A) Leq at Noise Sensitive Receptors
NSL 1-5	42 (Daytime)	TBC	42
	33 (Night-time)	TBC	33

The final detailed design and location of building services, such as heat pumps, must avoid the generation of potential conflicts in terms of noise amenity affecting adjoining land uses. At detailed design stage mitigation measures, if required, may need to be incorporated into the design of external mechanical plant and equipment if applicable.

7 Conclusion

Wave Dynamics were engaged by Kilgobbin Apartments Limited as the acoustic consultants to undertake an Inward Noise Impact, External Amenity Noise Assessment and Operational Noise Assessment for the planning application for the proposed new Large-Scale residential development on Kilgobbin Road, Stepaside, Co. Dublin.

“The proposed Large-Scale Residential Development (LRD) will provide 120 no. apartment units within 2 no. blocks ranging in height from 4- to 6-storeys. The development will consist of; Block A, consisting of 44 no. units (27 no. 1 bed (2-person), 13 no. 2 bed (3-persons), 1 no. 2 bed (4-persons) and 3 no. 3 bed (5-persons) of 4- to 5-storeys height and of Block B, consisting of 76 no. units (40 no. 1 bed (2-persons), 12 no. 2 bed (3-persons), 16 no. 2 bed (4-persons) and 8 no. 3 bed (4-persons) of 5- to 6-storeys height. The proposed development will provide all associated public open space and play area, 54 no. car parking spaces including accessible parking and Electric Vehicle parking, 273 no. bicycle parking spaces, 3 no. motorcycle parking spaces, bin/waste store and a plant room at ground floor level, 1 no. detached ESB substation, and 1 no. detached bicycle store for Block A residents. The proposed development will also provide for all associated site development and infrastructural works including foul and surface water drainage, roads, footpaths, landscaping, boundary treatment and a pedestrian and cycling pathway connecting Belarmine Vale and Kilgobbin Road. Vehicular access to the development will be via Belarmine Vale.”

Noise Impact Assessment

A Stage 1 and Stage 2 ProPG assessment have been undertaken. As part of the stage one assessment to categorise the site, a baseline noise survey was undertaken to measure the existing noise levels. Following a review of the noise levels on the site, including the L_{AFmax} and L_{Aeq} , the site has been characterised as low risk for both day and nighttime noise, therefore mitigation measures are required to control the onset noise levels.

Internal Noise Levels

Following the baseline survey, a noise impact assessment was undertaken, this included break-in noise calculations to predict the internal noise levels from road traffic noise. Consideration has also been given to the future growth of the roads. Following the assessment, the building envelope performance requirements were determined. The performance specification for the building envelope has been provided in this report which includes the external walls, glazing, roof and ventilation requirements.

External Amenity Noise Levels

The external amenity spaces on the development include surrounding playground areas, courtyard areas and greenfield areas. Appropriate amenity has been provided on the development using a combination of the surroundings greenfield areas and centre courtyard areas. This is in line with element 3(v) of ProPG.

Based on the recommendations in this report it is predicted that the internal and external noise levels will achieve the targeted noise levels in line with BS 82233:2014 and ProPG 2017 guidance.

Operational Noise

An operational noise impact assessment has been conducted to assess noise generated from road traffic, external amenity spaces, car parking and outdoor play areas. It is predicted that the development will not cause a negative noise impact on the nearby noise sensitive locations.

In the absence of information regarding operational plant and equipment at this planning stage, the approach has been taken to determine suitable operational noise emission limits for any proposed mechanical plant and equipment. The acoustic consultant at design stage for the project should ensure that the specific noise limits outlined in Section 6.3 of this report and the criteria outlined in Section 3 of this report are adhered to and achieved.

Appendix A- Glossary of Terms

Ambient Noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from all the noise sources in the area.
Background Noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μ Pa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz	The unit of sound frequency in cycles per second.
L_{A90}	A-weighted, sound level just exceeded for 90% of the measurement period and calculated by statistical analysis. See also the background noise level.
L_{Aeq}	A-weighted, equivalent continuous sound level.
L_{AFmax}	A-weighted, maximum, sound level measured with a fast time-constant - maximum is not peak
L_{den}	day-evening-night noise level, the A-weighted, L_{eq} (equivalent noise level) over a whole day, but with a penalty of 10 dB(A) for night-time noise (23:00-07:00) and 5 dB(A) for evening noise (19:00-23:00), also known as the day evening night noise indicator

Appendix B- Façade Mark Up

