WAVE DYNAMICS
ACOUSTIC CONSULTANTS

Leopardstown Road

Acoustic Design Statement
14 February 2025

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www.wdacoustics.com

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Document Information

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A	Issued	Acoustic Design Statement	Sean Rocks	James Cousins	24/10/2024
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Executive Summary

Wave Dynamics were engaged by Dún Laoghaire-Rathdown County Council as the acoustic consultants to undertake an Inward Noise Impact assessment for the Planning Development Act Part 8 application for the proposed new residential development at Leopardstown Road, Sandyford, Dublin.

Pursuant to the requirements of Section 179 of the Planning and Development Act 2000 (as amended), Winterbrook, on behalf of (and pursuant to a contract entered into by) Dún Laoghaire-Rathdown County Council (DLR) hereby gives notice to construct a Housing Development on a site of 0.8861 hectares at Leopardstown Road. The development will consist of 80 no. residential units together with associated infrastructure including open space and car/cycle parking and is a mixture of duplexes and apartments in 2 no. blocks ranging in height from three to six storeys.

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 medium to high risk for full site for the daytime period and high risk for the nighttime period, 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 and the local access road on the development. 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 private balconies and terraces, and open amenity spaces at ground level. Appropriate amenity has been provided on the development for residents using a combination of the open amenity spaces and nearby local parks. 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.

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1 Introduction

Wave Dynamics were engaged by Dún Laoghaire-Rathdown County Council as the acoustic consultants to undertake an Inward Noise Impact for the Planning Development Act Part 8 application for the proposed new residential development at Leopardstown Road, Sandyford, Dublin.

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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 Sean Rocks, Director | Senior Consultant, Sean has experience of numerous planning stage assessments. Sean's qualifications include; BEng (Hons) in Mechanical and Manufacturing Engineering, Diploma in Acoustics and Noise Control (Institute of Acoustics), IOA Certificate of Competence in Environmental Noise Measurement and SITRI certified sound insulation tester. Sean is a member of both Engineers Ireland and the Institute of Acoustics.

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 Leopardstown Road, Sandyford, Dublin. The site is bounded by the M50 junction 13 northbound slip road and the M50 motorway to the north, residential dwellings to the west, Leopardstown Rise dwellings to the south and Leopardstown Road to the south and east.

Figure 1: Site Location, measurement locationsA1-A3, logger location L1and the surrounding area.

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.

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

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

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
- ✓ 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

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 one 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 1 on the next page illustrates the ProPG approach.

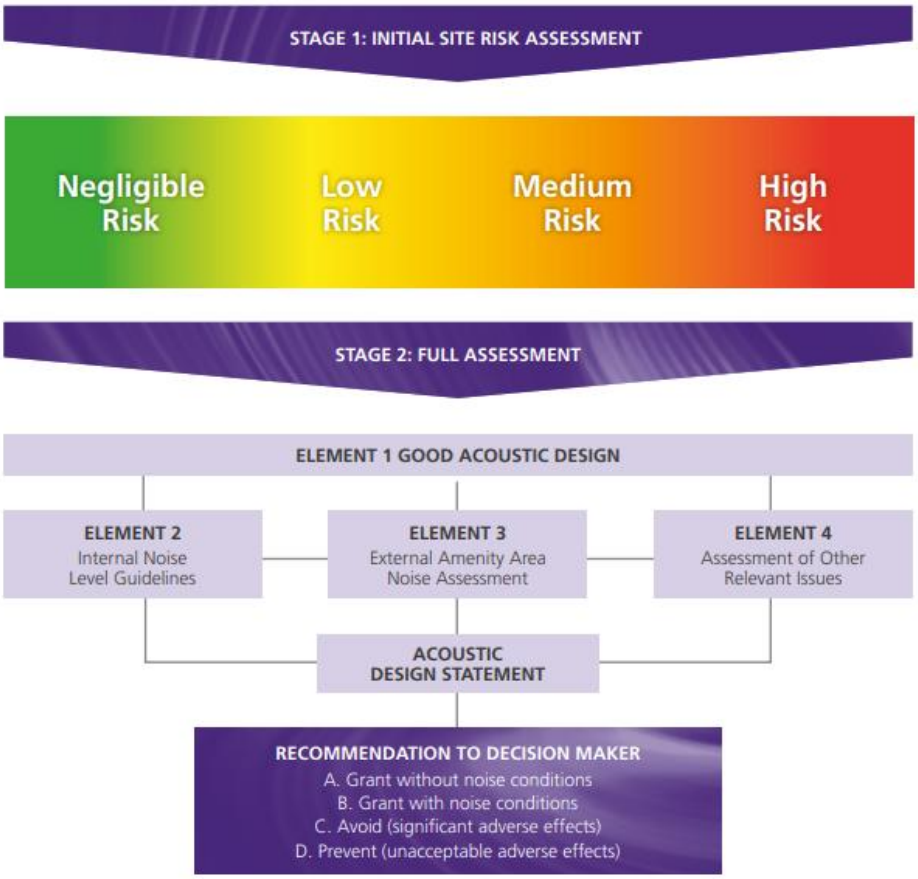


Figure 2: Summary of overall ProPG approach

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 $L_{Aeq,\ 16\ hour}$	-
Dining	Dining Room/Area	35 dB $L_{Aeq,\ 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,\ 16\ hour}$	30 dB $L_{Aeq,\ 8\ hour}$ 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.

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 2 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.

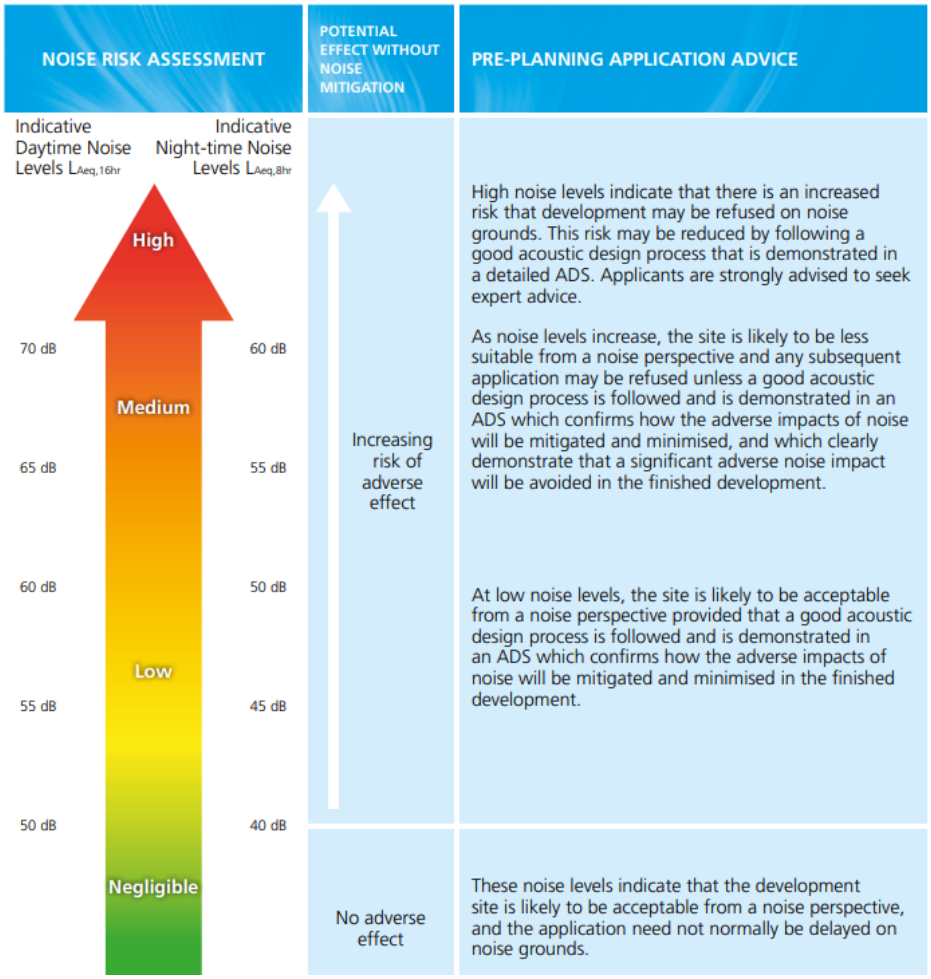


Figure 3: ProPG Risk Analysis

4.1 Baseline Noise Survey

A noise survey was completed at planning stage on the development to quantify the existing noise environment. The following section outlines the results of the baseline noise survey.

4.1.1 Site Description and Measurement Locations

The site is located on Leopardstown Road, Sandyford, Dublin. The site is bounded by the M50 junction 13 northbound slip road and the M50 motorway to the north, residential dwellings to the west, Leopardstown Rise dwellings to the south and Leopardstown Road to the south and east.

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

4.1.2 Survey Methodology and Personnel

The attended surveys were completed by Daniel Cousins (Field Engineer).

Unattended Noise Measurements

An unattended noise logger was deployed in location L1. The monitor was deployed on the 19th September 2024 at 12:26hrs and collected on the 23rd September 2024 at 12:03hrs. The logger was positioned on the site boundary approximately 3m above ground level. The logger was calibrated before and after the measurements and no significant drift was noted. Measurements were filtered for periods of unsuitable weather conditions (where appropriate).

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 varying durations based on objective. Background noise measurements were taken over a 15-minute period for the daytime period and over 15 minutes for the nighttime period. Care was taken to avoid any effect on the measurements, the sound level meter was positioned at approximately 1.2m above ground level.

Figure 5: Attended Noise monitor Setup

4.1.3 Survey Period

The attended noise measurements were undertaken on the 19th September 2024 and the 23rd September 2024. The unattended noise measurements were taken from the 19th September 2024 at 12:26hrs to 23rd September 2024 at 12:03hrs.

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
Sound Level Meter	SLM1	Nor 140	1405554	U45343/U45344 /U45342	27/07/2025
Sound Level Meter	SLM4	Nti XL2-TA	A2A-23316-E1	UK-23-100	01/09/2025
Calibrator	CAL3	Nor 1251	32096	AC240251	03/07/2025
Calibrator	CAL4	Larson Davis CAL200	21085	AC240249	29/06/2025

4.1.5 Subjective Noise Environment

During the attended noise survey, the following noise sources were identified:

- Road traffic noise from the M50 motorway.
- Road traffic noise from the Leopardstown Road (R113).
- Birdsong.
- Occasional passing aircraft overhead.

4.2 Noise Measurement Results

This section outlines the results of the 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_{AFmax} dB**	**L_{A90} dB**
A3	19/09/2024	11:26	15	58	67	56
A1	19/09/2024	11:50	15	68	78	63
A2	19/09/2024	12:02	15	68	76	60
A1	19/09/2024	12:07	15	69	79	63
A2	19/09/2024	12:31	15	67	77	59
A3	19/09/2024	12:48	15	58	63	56
L1	23/09/2024	12:07	15	66	71	64

Unattended Monitoring Results

Table 4 outlines the results of noise measurements at the unattended monitoring location L1. The noise logger was positioned at location L1 at approximately 3m height.

Table 4: Unattended Measurement Results

Start Date	$L_{Aeq,16hour}$ 07:00 - 23:00 dB	L_{night} ($L_{Aeq,8hour}$ 23:00 - 07:00) dB	L_{den} (00:00 - 00:00) dB	10th highest night-time L_{AFmax}	L_{AF90} (23:00 - 07:00) dB
19/09/2024	64[1]	58	67[1]	66	52
20/09/2024	65	57	67	66	51
21/09/2024	65	57	67	66	51
22/09/2024	65	59	66	67	50
23/09/2024	66[1]	N/A	68[1]	N/A	N/A

(1) Shortened measurement duration.

(2) 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.

(3) Arithmetic average of L_{AF90}.

4.2.1 L_{AFmax} Noise Levels

Based on the project criteria outlined in Section 3, the internal $L_{AFmax\ 15min}$ 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 L_{AFmax} events recorded on the noise logger per night based on a 15min measurement interval. Based on the ProPG risk assessment of the L_{AFmax} noise levels, the site is not considered high risk as there are not typically more than 20 occurrences exceeding 80dB L_{AFmax}.

The façade specification outlined in 5.2.3 has been determined in accordance with achieving the internal noise levels for both L_{Aeq} and the L_{AFmax} incident noise levels below.

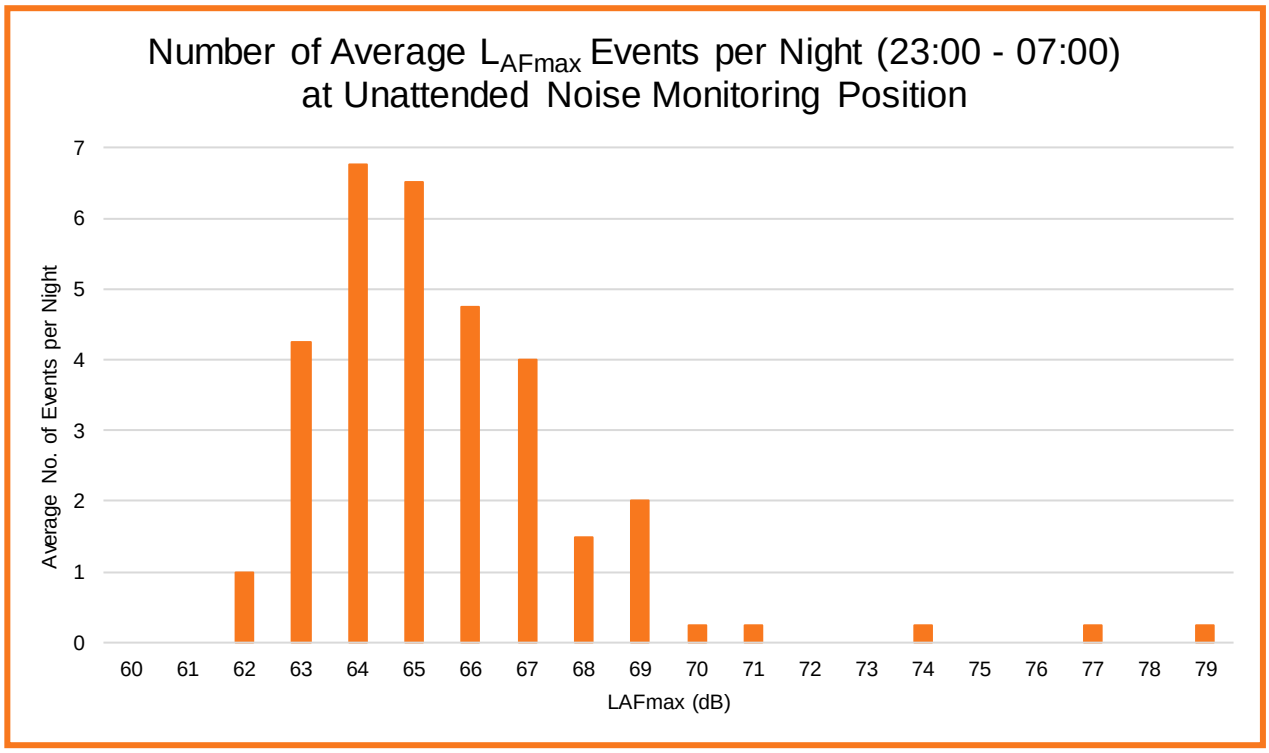


Figure 6: Average recorded L_{AFmax} events per night based on 15min measurement intervals.

Discussion of Measurement Results

The attended background measurements were taken on weekdays establish the existing noise conditions within and at the boundary of the site. The boundary noise measurements primarily consisted of road traffic noise from the M50 motorway. Other noise sources included road noise from the Leopardstown Road (R113) and birdsong.

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

4.3 Weather Conditions for Monitoring Period

Good weather conditions were noted during the attended survey, with winds typically less than 5 m/s and no rain and clear skies.

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 3 dB would be expected. WDA have allowed for this growth in our assessment.

4.5 ProPG Stage 1 – Initial Risk Assessment

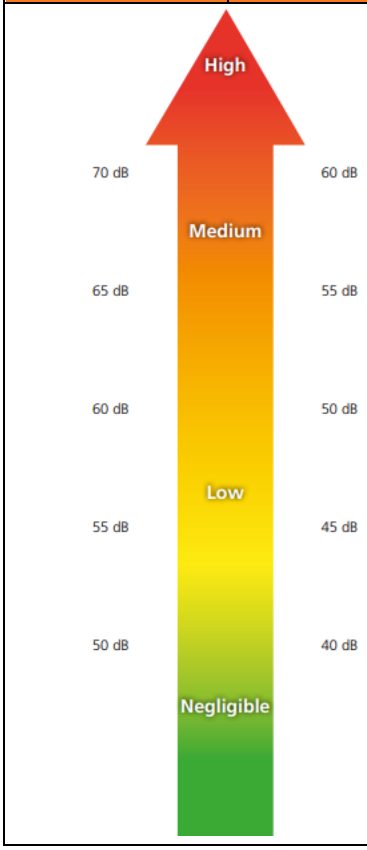
The measured noise levels on the site and future noise levels have been predicted for road traffic noise to assess the probability of an adverse impact.

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 in accordance with the ProPg risk assessment. 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	The full site is at medium – high risk of noise for the nighttime period. Good acoustic design should be considered.
		Medium Risk	**Medium Risk**
		The full site is at medium risk of noise for the daytime period. Good acoustic design should be considered.	The full site is at medium – high risk of noise for the nighttime period. Good acoustic design should be considered.
		Low Risk	**Low Risk**
		N/A	N/A
		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.

5.1.1 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."*

5.1.2 Discussion of Good Acoustic Design

Mitigation of Sources

The development is located close to road traffic 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 southern elevations are the most exposed to road traffic noise. The northern elevations will benefit from screening from the proposed buildings and will be subject to lower onset noise levels.

Construction Methods

Section 5.2.3 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 5.2.3. 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 Road 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. Road Traffic 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 Noise Prediction Modelling

Following the survey, a computational noise model of the development using SoundPLAN 9.0 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 and unattended noise measurements. SoundPLAN 9.0 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 architects drawings.
- Google Maps terrain and elevation data of surrounding area.
- Traffic speeds observed as per local signage and onsite observation.
- Percentage of HGV assumed at 3.8% based on TII traffic count.
- Annual traffic growth rate of 3.9%.
    - This has been assessed based on pre-covid traffic growth data.

5.2.2 Predicted Road Noise Levels

Incident road traffic noise levels have been predicted across all facades of the development for both the day and nighttime period. The noise contours outlined in this section include the boundary wall mitigation outlined in Section 5.3.

Daytime Noise Levels

Figure 7, Figure 8 and Figure 9 below outline the predicted road traffic noise levels across the proposed site for the day time period at 1.5m, 4m and 6.5m height respectively.

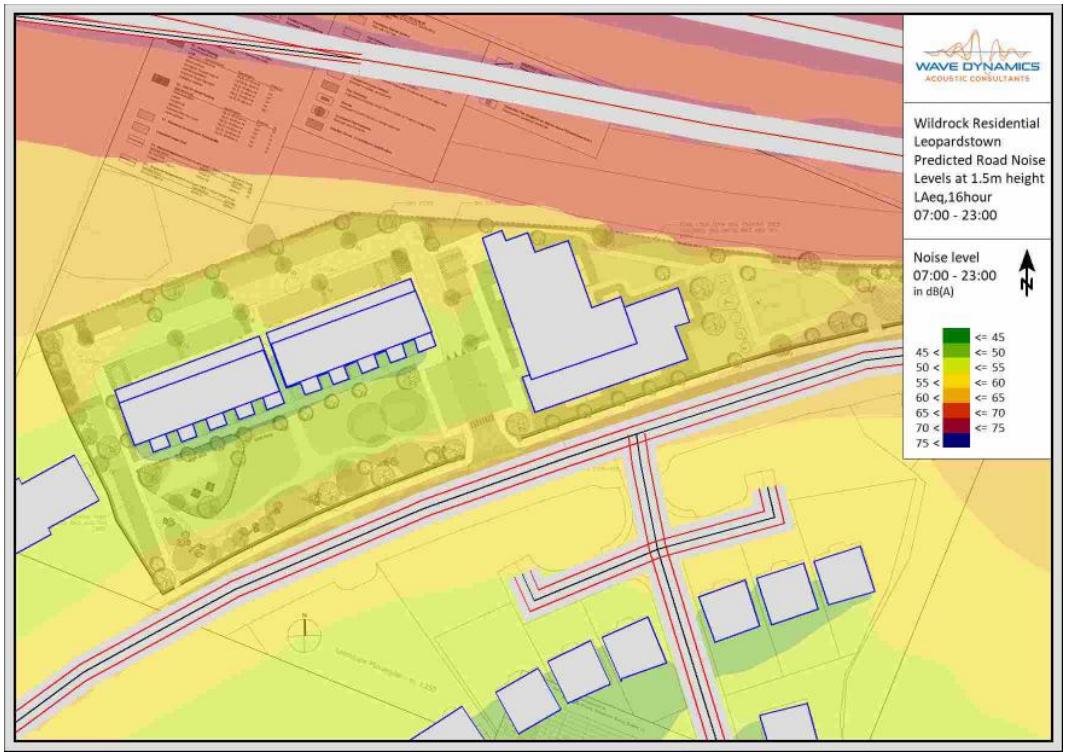


Figure 7: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 1.5m height for the future development.

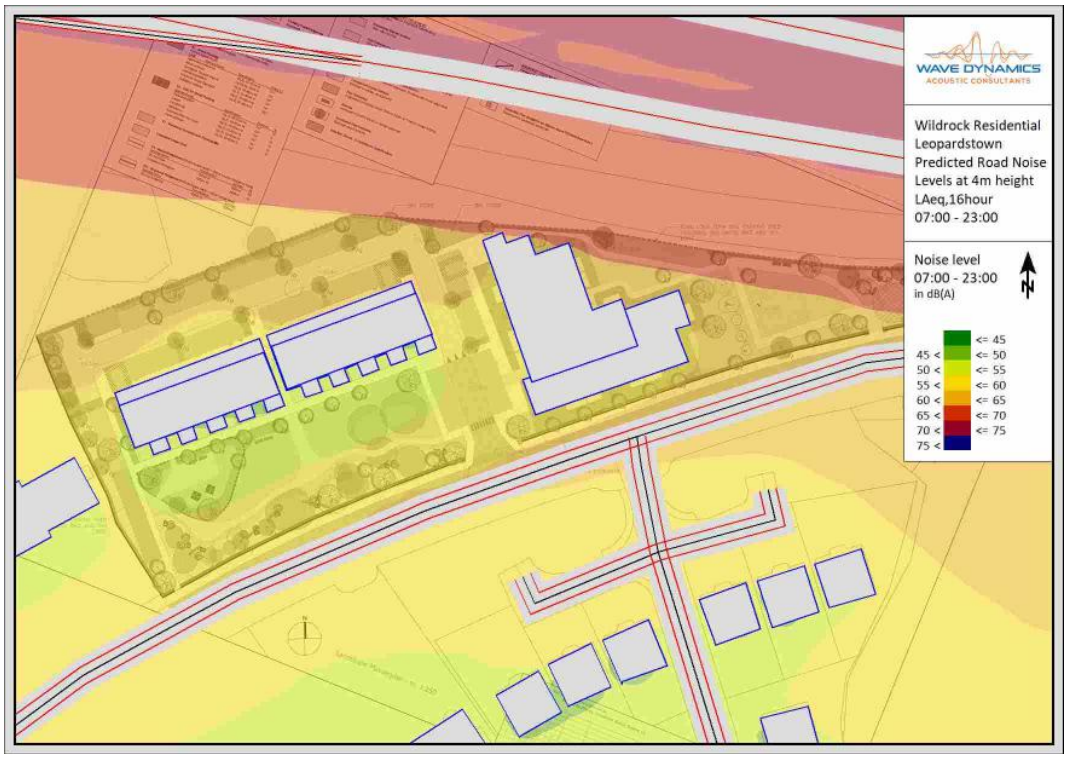


Figure 8: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 4m height for the future development.

Figure 9: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 6.5m height for the future development.

Nighttime Noise Levels

Figure 10, Figure 11 and Figure 12 below outline the predicted road traffic noise levels across the proposed site for the nighttime period at 1.5m, 4m and 6.5m height respectively.

Figure 10: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) at 1.5m height for the future development.

Figure 11: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) at 4m height for the future development.

Figure 12: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) at 6.5m height for the future development.

Vehicle Access

It should be noted that the development has a vehicle access to on-site car parking, vehicles will enter from the Leopardstown Road. Break in noise through the façade has been considered as part of this assessment for vehicles entering and exiting the road and car parking.

5.2.3 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	28	28	37	40	44	38	39dB R_w	Mechanical Ventilation
GREEN	25	26	31	37	42	34	36dB R_w	Mechanical Ventilation

(1) Mechanical ventilation assumed throughout. Should this change to natural ventilation the above specification may be increased. An acoustic consultant should be engaged to assess the level of reduction appropriate to maintain the internal noise level criteria.

(2) The calculation assumes a fully sealed system with no passive openings or trickle vents.

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 is proposed as a fully mechanical ventilation system. Based on the information provided to us on the ventilation system, it has been assumed that this system is a fully sealed with no passive openings or trickle vents. Should the ventilation strategy change to natural ventilation strategy Wave Dynamics should be engaged to provide an appropriate natural ventilation sound insulation performance requirement for any passive ventilation openings including 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.

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 60dB 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 50dB R_w. Any skylights and glazing in the roof system to corridor or communal areas should be of standard double-glazed construction to meet a performance of minimum 29 dB R_w. If there are any skylights to habitable bedrooms Wave Dynamics should be informed to provide specific guidance in each case.

5.3 Element 3- External Amenity Spaces

The external amenity spaces on the development include private amenity in the form of terraces and balconies and open amenity space at ground level. Based on the assessment of the private amenity spaces, the noise levels are predicted to exceed the ProPG desirable external amenity noise level criteria of 55dB $L_{Aeq,16hour}$ due to the road traffic noise from the M50 and surrounding roads.

To reduce the noise levels in the open amenity spaces on ground level of the development, it is recommended that a 2m solid boundary wall is built to the northern boundary of the site. In addition to reducing the noise levels in open amenity spaces as far as practical, there is also a local park located at Mount Eagle Drive within a 5 minute walk of the proposed development which is expected to achieve the ProPG desirable external amenity noise levels. This is in line 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, 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)".

It is recommended that the noise levels in the open amenity spaces on the development are mitigated to reduce a large section of the open amenity external noise levels to within the desirable level and as far as reasonably practical throughout. The implementation of a minimum 2m noise wall is predicted to reduce the open amenity noise levels to achieve the 55dB $L_{Aeq,16hour}$ criteria in the majority of the space at the rear of the duplex block and the western open space, and to within 5dB of the recommended desirable noise level criteria for the eastern open space as shown in Figure 7. The recommended extent of the wall and location are shown in Figure 13 below. The noise wall should be of solid construction with no gaps or holes, suitable materials for noise walls are listed below.

- Timber fence barrier with a minimum surface density 20kg/m2 such as that supplied by Mulligan Fencing.
- 100mm concrete block.
- Sonant acoustic noise barrier.

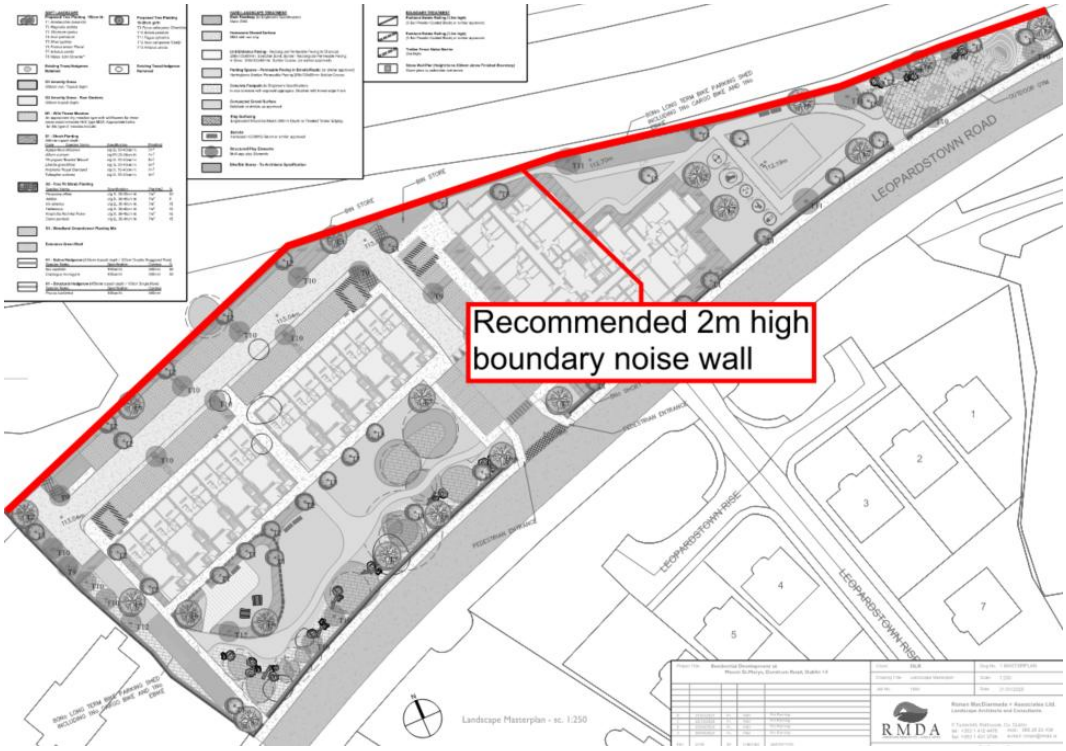


Figure 13: Recommended wall location and height.

Figure 14 below shows the extent of the open amenity space which is predicted to comply with the recommended external amenity noise level criteria.

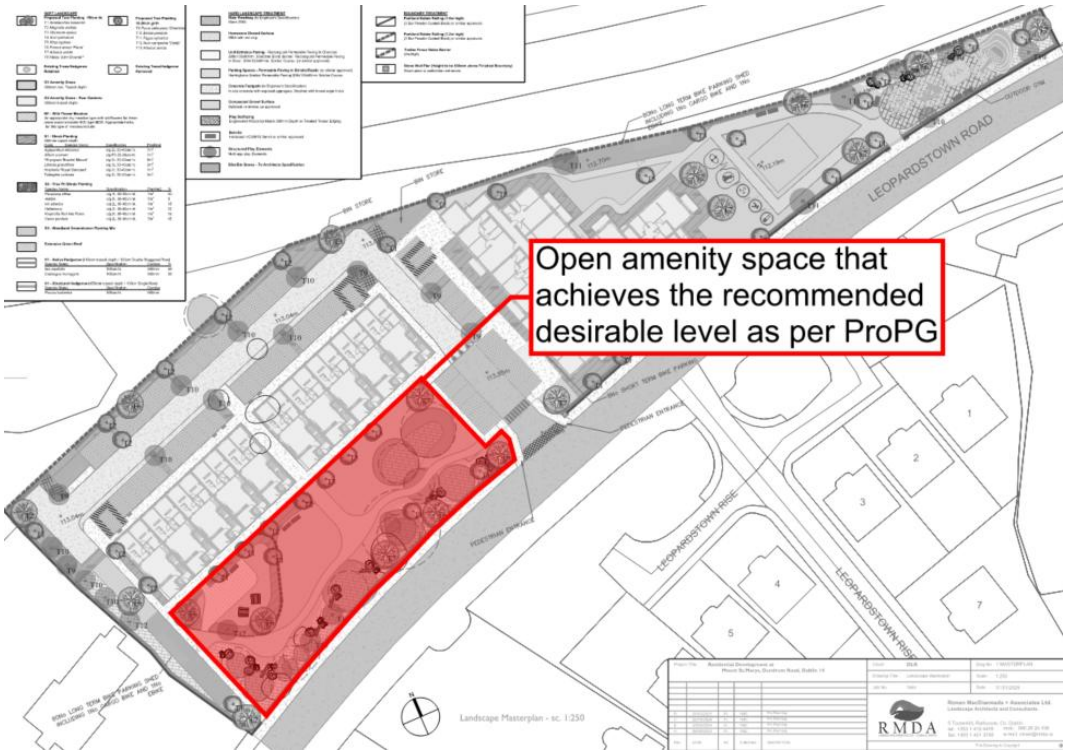


Figure 14: Open amenity space predicted to achieve the desirable noise levels.

Based on the measured noise levels at the site it is predicted that the external noise levels at the development will satisfy element 3(v) of ProPG recommendations for external amenity noise levels of 50-55dBA $L_{Aeq,16hour}$.

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 winder 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. The appropriate provision of external amenity space has been provided through the use of mitigation in the open amenity spaces within the criteria in much of the open space and as far as practical for the remainder of the open space and provision of nearby local park in line with the ProPG guidance.

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

6 Conclusion

Wave Dynamics were engaged by Dún Laoghaire-Rathdown County Council as the acoustic consultants to undertake an Inward Noise Impact assessment for the Planning Development Act Section 179A application for the proposed new residential development at Leopardstown Road, Sandyford, Dublin.

Pursuant to the requirements of Section 179 of the Planning and Development Act 2000 (as amended), Winterbrook, on behalf of (and pursuant to a contract entered into by) Dún Laoghaire-Rathdown County Council (DLR) hereby gives notice to construct a Housing Development on a site of 0.8861 hectares at Leopardstown Road. The development will consist of 80 no. residential units together with associated infrastructure including open space and car/cycle parking and is a mixture of duplexes and apartments in 2 no. blocks ranging in height from three to six storeys.

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 medium to high risk for full site for the daytime period and high risk for the nighttime period, 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 and the local access road on the development. 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 private balconies and terraces, and open amenity spaces at ground level. Appropriate amenity has been provided on the development for residents using a combination of the open amenity spaces and nearby local parks. 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.

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 µPa).
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, Leq (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 Ups

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project:	Wildrock, Leopardstown Road
Title:	Glazing Markup - Duplex Block Ground Floor
Prepared By:	Cathal Reck
Reviewed By:	Sean Rocks
Date:	07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project:	Wildrock, Leopardstown Road
Title:	Glazing Markup - Duplex Block First Floor
Prepared By:	Cathal Reck
Reviewed By:	Sean Rocks
Date:	07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project:	Wildrock, Leopardstown Road
Title:	Glazing Markup - Duplex Block Second Floor
Prepared By:	Cathal Reck
Reviewed By:	Sean Rocks
Date:	02/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block Ground Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block First Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block Second Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block Third Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block Fourth Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024

Glazed Elements Specification

- 39 dB R_w
- 36 dB R_w

WAVE DYNAMICS
ACOUSTIC CONSULTANTS
DUBLIN WEXFORD CORK LONDON

Project: Wildrock, Leopardstown Road

Title: Glazing Markup - Apartment Block Fourth Floor

Prepared By: Ryan Cox

Reviewed By: Sean Rocks

Date: 07/10/2024