WAVE DYNAMICS

ACOUSTICS MONITORING ENVIRONMENTAL

Summerhill

Acoustic Design Statement

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Executive Summary

Wave Dynamics were engaged by D/Res as the acoustic consultants to undertake an Inward Noise Impact Assessment, Construction Noise Impact Assessment, and Operational Noise Impact Assessment for planning compliance for the proposed large-scale residential development at Summerhill, Dunboyne, Co. Meath.

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 from road noise, aircraft and railway noise. Following a review of the noise levels on the site, including the L_{AFmax} and $L_{Aeq,}$ the site has been characterised as medium – high risk for day and night, with the western/northwestern boundary occupies the high-risk contour for nighttime noise levels and the medium risk contour for daytime noise levels. The remainder of the site is deemed low to medium risk during the daytime and nighttime respectively.

Consideration has been given to future road and aircraft noise levels that may subject the site to higher noise levels than those measured during the baseline noise survey. It was noted during the attended measurements that train activity was inaudible due to the presence of road traffic noise dominance at the site and the distance between the site and the M3 Parkway rail line to the east. The building envelope has been designed to ensure adequate internal noise levels for the future residents of the development from all noise sources.

Aircraft Noise Impact

The site's noise exposure was assessed by analysing 2024 Dublin Airport noise contours, noise levels measured at the development site and projected 2035 contours, which account for the new planning grant for extended nighttime flights. The report confirms that the site's existing noise levels from aircraft are lower than local road traffic noise from the R157 and the M3 and that the calculated noise levels for the project, based on 2024 flight data, align with the 2035 L_{den} and L_{night} contours. Finally, the report concludes that the proposed building's envelope and design will ensure internal noise levels are within acceptable limits for future residents.

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 and aircraft noise. Consideration has also been given to the future growth of the roads and the future nighttime flights permitted from Dublin Airport. 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 external amenity in the form of rear gardens to the houses, balconies and terraces, and several open spaces across the development. Some sections of open spaces, rear gardens and balconies or terraces facing towards the western/northwestern boundary which is adjacent to the R157 are predicted to exceed the recommended desirable levels by 3-5dB(A) L_{eq}. Appropriate amenity has been provided on the development for residents using a combination of the rear gardens, balconies and terraces, and several open spaces across the development. This is in line with element 3(v) of ProPG.

Construction Noise Impact

The construction noise impact is predicted to exceed the BS 5228 requirements **without any mitigation** measures for the Site Set Up, Substructure and Superstructure stages of the project.

General and site-specific mitigation measures have been provided in this report to bring the construction noise levels down within the limits of BS 5228. Following **the noise mitigation recommendations in this report, the construction phase is expected to meet the requirements** of BS 5228 based on the information provided to WDA.

In addition to the mitigation measures, guidance has been provided in this report for construction noise monitoring during the construction period to manage construction noise levels.

Operational Noise

An operational noise impact assessment has been conducted to assess noise generated from plant and equipment, external amenity space usage, creche external play area and car parking movements across the development. It is predicted that operational noise from the proposed development will cause a **low impact** on the nearby noise sensitive locations during both daytime and nighttime operations. The mechanical plant and equipment specification is not available at this stage of the project. Specific noise limits have been provided in this report for mechanical plant and equipment, at design development stage once the plant and equipment information are available it should be assessed for compliance with the criteria outlined in this report.

LRD Opinion

The noise-related items raised in point 12 a. of the LRD Opinion have been addressed within this report, including consideration of inward noise impacts, external amenity noise, construction noise and vibration, and operational noise associated with the proposed development.

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1 Introduction

Wave Dynamics were engaged by D/Res as the acoustic consultants to undertake an Inward Noise Impact Assessment, Construction Noise Impact Assessment, and Operational Noise Impact Assessment for planning compliance for the proposed large-scale residential development at Summerhill, Dunboyne, Co. Meath.

The development shall comprise:

a) Construction of 248 no. residential units as follows:
   - 170 no. 2 storey houses in a mix of terraced, semi-detached and detached unit types consisting of 27 no. 2-bedroom units, 124 no. 3-bedroom units and 19 no. 4-bedroom units. Each house will have an associated rear private garden.
   - 26 no. apartment units in a single 4 storey block consisting of 13 no. 1-bedroom units and 13 no. 2-bedroom apartments. All apartment units will be provided with private open space areas in the form of balconies.
   - 52 no. duplex units in 4 no. 3 storey blocks (A-D) consisting of 26 no. 2-bedroom units and 26 no. 3-bedroom units. All duplex units will be provided with private open space areas in the form of balconies/terraces.
   - Communal open space associated with the proposed apartment / duplex units will be provided in the form of 5 no. landscaped areas located in the vicinity of the units (total approx. 1,340.4 sqm).

b) 1 no. childcare facility at ground floor of apartment Block A with dedicated external open space (GFA approx. 285.7 sqm).

c) Total provision of 388 no. car parking spaces including 6 no. accessible spaces and 24 no. EV charging spaces (357 no. resident car parking spaces, 18 no. residential visitor car parking spaces and 13 no. car parking spaces dedicated for the creche facility) and a total of 429 no. bicycle parking spaces (319 no. secure resident spaces and 88 no. visitor spaces for the apartment / duplex / mid-terrace units; and 14 no. childcare facility staff spaces and 8 no. childcare facility visitor spaces).

d) Landscaped public open space areas including children's play areas totalling approx. 10,775 sqm;

e) A new vehicular and pedestrian access point is proposed via a simple priority junction on Summerhill Road (L2228).

f) All associated site and infrastructural works including a foul pump station with 24hr storage and associated rising main (580m) discharging to an existing foul line at the Navan Road and Dunboyne Business Park Road junction; diversion of an existing 600 mm diameter storm pipe and proposed storm drain outfall to the R157 / Summerhill Road roundabout; internal roads, road markings, homezones, footpaths and cycle infrastructure; provision of 3 no. ESB substations; bin stores and associated bin staging areas; public lighting; all hard and soft landscaping works; natural and formal play equipment; boundary treatment works including retaining walls; green roof; PV panels and all associated site clearance, excavation, landscape and development works.

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 across Ireland, the UK and Europe.

This assessment and report were completed by Cathal Reck | Acoustic Consultant, Cathal has experience of numerous planning stage noise impact assessments. Cathal's qualifications include; BSc (Hons) in Music Technology & Production, IOA Certificate of Competence in Environmental Noise Measurement and a Certificate in Building Acoustics and Noise Control. Cathal is a member of the Institute of Acoustics and a SITRI certified sound insulation tester.

This report was peer reviewed by James Cousins, Managing Director | Principal Consultant with Wave Dynamics who has extensive experience in assessing planning stage noise impacts. James is an experienced acoustic 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 to the northwest of Dunboyne town in Co. Meath. The site is bounded by the R157 to the northwest and the L2228 to the south with the M3 motorway and M3 Parkway rail line located further to the east/northeast circa. 850m, an existing housing estate to the southeast and commercial and agricultural lands to the east across the Dunboyne Business Park Road. Figure 1 outlines the site location the surrounding area.

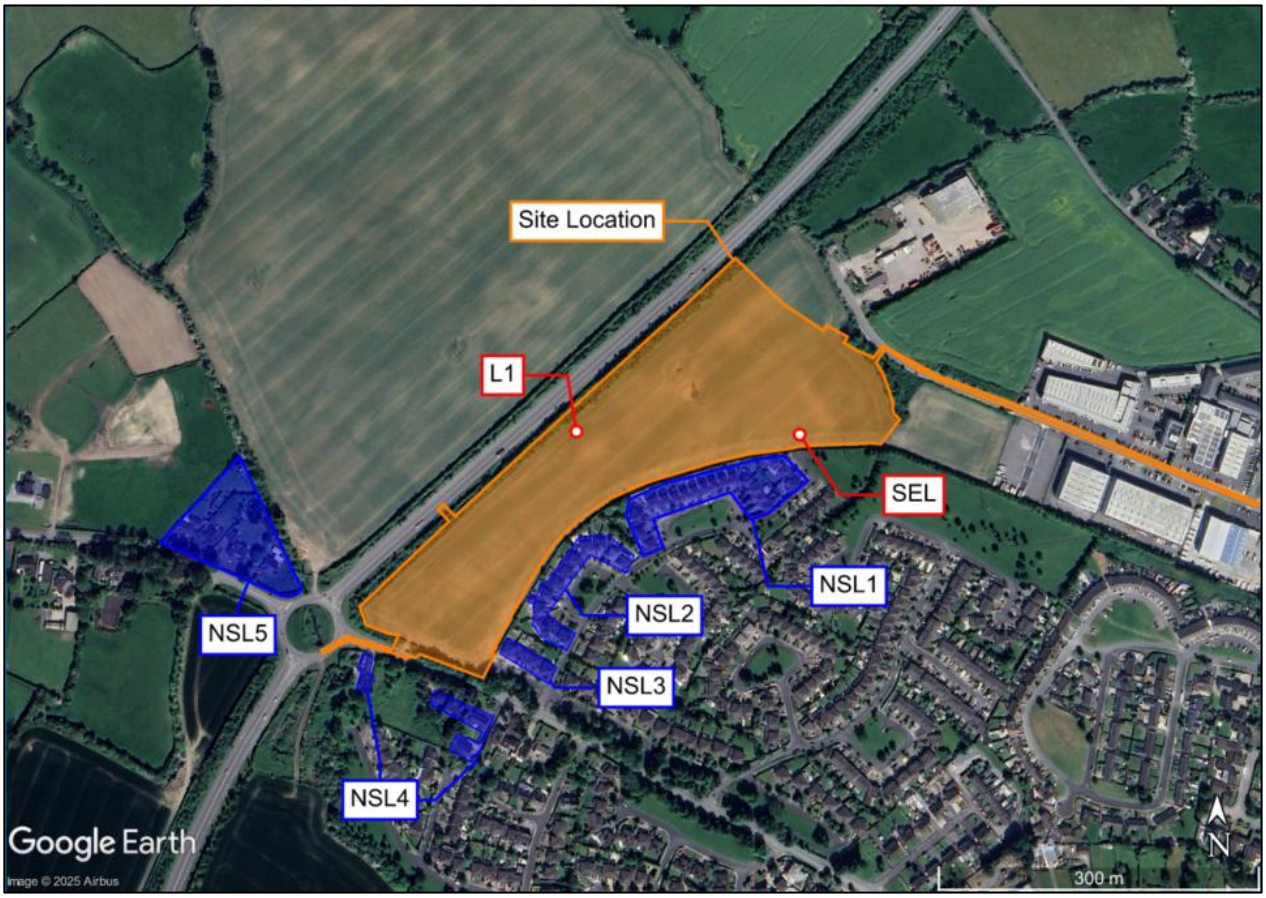


Figure 1: Site Location, Measurement Locations L1 & SEL, Noise Sensitive Locations, and the Surrounding Area.

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,
- External amenity noise levels.
- Construction noise and vibration, and
- Operational noise.

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

- Façade sound insulation performance,
- Ventilation requirements,
- External amenity requirements,
- Construction noise and vibration, 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.
- ✓ Meath County Council – Noise Action Plan 2024-2028.
- ✓ ProPG 2017 Professional Practice Guidance on Planning & Noise.
- ✓ Fingal Development Plan Policy on Aircraft Noise.
- ✓ BS 5228-1 2009 A12014 Noise and Vibration Control of Open Sites.
- ✓ BS 5228-2 2009 A12014 Noise and Vibration Control of Open Sites.
- ✓ BS 4142 2014-A1 2019: Methods for rating and assessing industrial and commercial sound.
- ✓ EPA NG4: Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities.
- ✓ 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 Noise Assessment Criteria

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

Meath County Council Noise Action Plan

The Meath County Council Noise Action Plan does not specifically outline noise limits for new residential developments; however, it does emphasise a preventative approach when it comes to noise impact on new residential developments. The plan indicates that if a proposed new residential development is located near a major road where noise impacts are likely, developers are required to consider existing noise mapping data and incorporate appropriate acoustic design features into the project. This aims to ensure residents are not exposed to excessive noise levels.

Aircraft Noise Zone C

While not in the Fingal County Council catchment area, the development occupies noise zone C, as the Fingal County Council Development Plan 2023-2029 sets out the current policy framework in relation to aircraft noise associated with Dublin Airport. This includes defined Aircraft Noise Zones (A-D) and corresponding development management standards, as outlined in Table 14.16: Aircraft Noise Zones of the Development Plan.

The proposed development is located within Aircraft Noise Zone C, as identified in the Development Plan and outlined in Section 4.3 of this report. These zones represent the potential exposure of the site to aircraft noise during airport operations and inform the suitability of noise-sensitive development, including residential uses. Specific residential developments or developments for residential purposes located in Zone C may be required to demonstrate that aircraft noise intrusion has been considered in the design.

Table 1 (adapted from Table 8.1 and 14.16 of the Fingal Development Plan 2023-2029) outlines the development management objectives for each noise zone.

Table 1 outlines the objectives for new developments in each noise zone.

Table 1: Airport Noise Zones

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 and < 54 dB $L_{Aeq,16hr}$ and ≥ 40 and < 48 dB L_{night}	**To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.** *All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non- residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.* *Applicants are **advised** to seek expert advice.*
C	≥ 54 and < 63 dB $L_{Aeq,\ 16hr}$ and ≥ 48 and < 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment **must** be undertaken in order to demonstrate good acoustic design has been followed.* *The noise assessment must demonstrate that relevant internal noise guidelines will be met. This **may** require noise insulation measures.* *An external amenity area noise assessment **must** be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants are **strongly advised** to seek expert advice.*

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
B	≥ 54 and < 63 dB $L_{Aeq, 16hr}$ and ≥ 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment **must** be undertaken in order to demonstrate good acoustic design has been followed.* *Appropriate well-designed noise insulation measures **must** be incorporated into the development in order to meet relevant internal noise guidelines.* *An external amenity area noise assessment **must** be undertaken where external amenity space is intrinsic to the developments design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants **must** seek expert advice.*
A	≥ 63 dB $L_{Aeq, 16hr}$ and/or ≥ 55 dB L_{night}	**To resist new provision for residential development and other noise sensitive uses.** *All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.*

Notes:

- 'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017;
- Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Noise Action Plan (NAP) for Dublin Airport 2024 - 2028

The Noise Action Plan for Dublin Airport (2024 – 2028) outlines the following objective in relation to the noise abatement objectives for aircraft noise:

> *"Limit and reduce the long-term adverse effects of aircraft noise on health and quality of life, particularly at night, as part of the sustainable development of Dublin Airport."*

The plan primarily focuses on the outward noise impact and encroachment of the airport activities on the existing uses of nearby lands. The consideration of the noise impacts from aircraft noise on residential amenity is considered in more detail in the Dublin Agglomeration Noise Action Plan.

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 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 illustrates the ProPG approach.

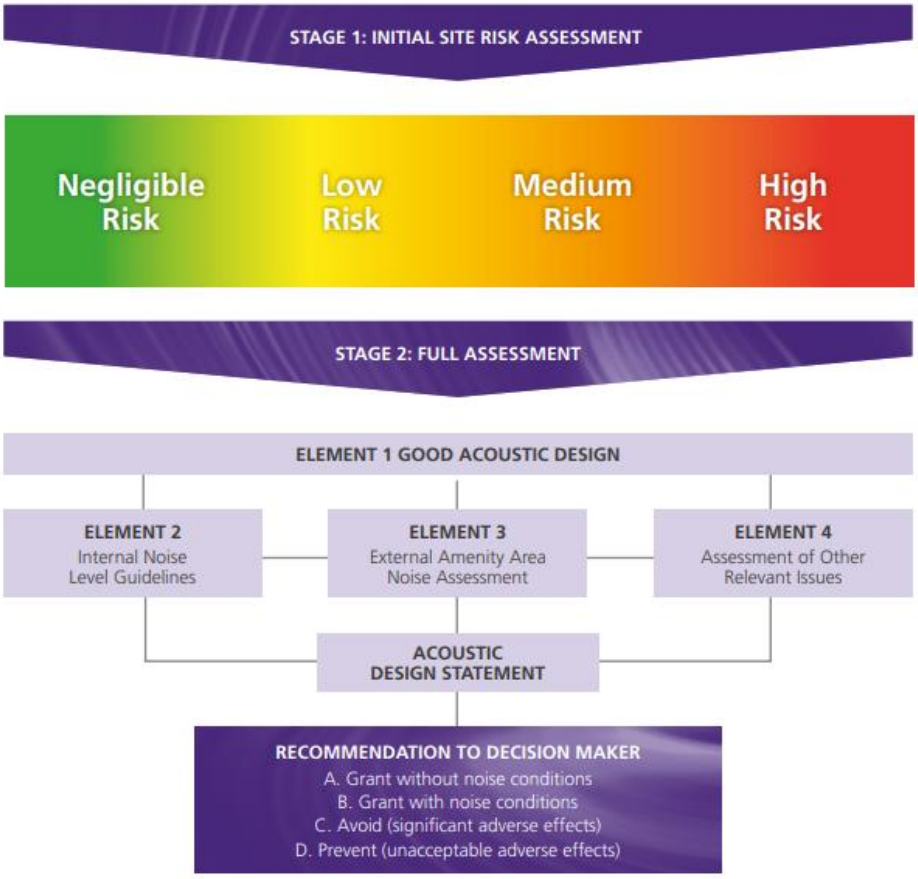


Figure 2: Summary of overall ProPG approach

Internal Noise Levels

Table 2 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 2: 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.

3.2 Construction Noise Assessment Criteria

There is currently no statutory Irish guidance for construction noise requirements from noise during the construction phase of a project.

In the absence of specific noise limits, the appropriate criteria for the allowable construction noise levels may be found in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.

The standard (BS5228-1:2009+A1) provides examples of acceptable limits for construction and/or demolition noise in both subjective and objective form. For example, paragraph E.2 of the standard states:

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state:

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*

- *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Typically, the local councils refer to BS 5228 Part 1 as a method to control construction noise from sites on the local environment. This standard is therefore the de facto appropriate standard in the absence of regulatory guidance.

Based on paragraph E.2 of BS 5228 the following criteria is adopted for this project:

- For residential properties it is considered appropriate to adopt the 70dB(A) criterion for
- non-residential locations it is considered appropriate to adopt the higher category values of 75dB(A) during the day. These will only be assessed as noise sensitive during office hours.

For the purpose of this assessment buildings other than dwellings which have a residential function will be considered for the lower noise limit, this includes Hotels, B&B's, Student Accommodation, Co Living Developments etc. This is in line with the guidance and definition of noise sensitive residences of EPA NG4. Table 3 below outlines the project criteria in tabular form.

Table 3: BS 8233:2014 threshold levels.

Assessment category and threshold value period	Threshold value, in decibels (dB) (L_{Aeq})		
	Category A[1]	Category B [2]	Category C[3]
Daytime (07:00 – 19:00) and Saturdays (07:00 – 14:00)	65	70	75
Evenings and weekends [4]	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

1) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
2) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
3) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category B values.
4) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

3.3 Construction Vibration Criteria

Best practice guidance is taken from British Standard BS 5228:2009 + A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2 Vibration.

The standard recommends that for a soundly constructed residential property and similar structures (in good repair), the threshold for minor or cosmetic (i.e. non- structural) damage should be taken as a Peak Particle Velocity (PPV) (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:

Table 4: Likely Construction Noise Impact

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:			
Building Type	**Less than 15Hz**	**15 to 40Hz**	**40Hz and above**
Light framed structures/residential buildings	15 mm/s	20 mm/s	50 mm/s

3.4 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 ($L_{Ar,T}$).

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

Adverse impacts include, but are not limited to, annoyance and sleep disturbance.

Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood.

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.

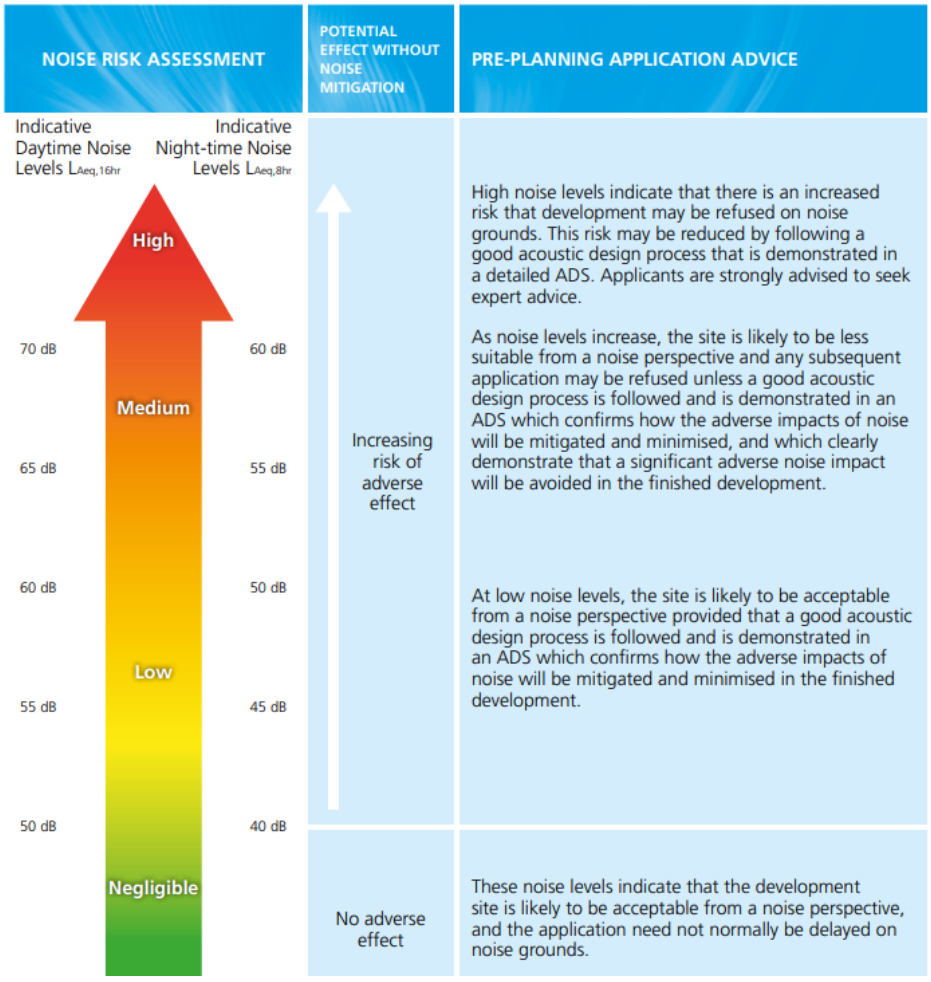


Figure 3: ProPG Risk Analysis

4.1 Baseline Noise Survey

A baseline noise survey was conducted from the 14th to the 19th of January 2026 to assess the impact of surrounding noise sources. The purpose of the survey was to quantify the existing noise environment. This section outlines the results of the survey, the measurement procedure and the equipment used. The attended noise measurements were undertaken on the 14th and the 19th of January 2026.

4.1.1 Site Description and Measurement Locations

The site is located to the northwest of Dunboyne town in Co. Meath. The site is bounded by the R157 to the northwest and the L2228 to the south with the M3 motorway and M3 Parkway rail line located further to the east/northeast circa. 850m, an existing housing estate to the southeast and commercial and agricultural lands to the east across the Dunboyne Business Park Road. Figure 4 outlines the site location the surrounding area.

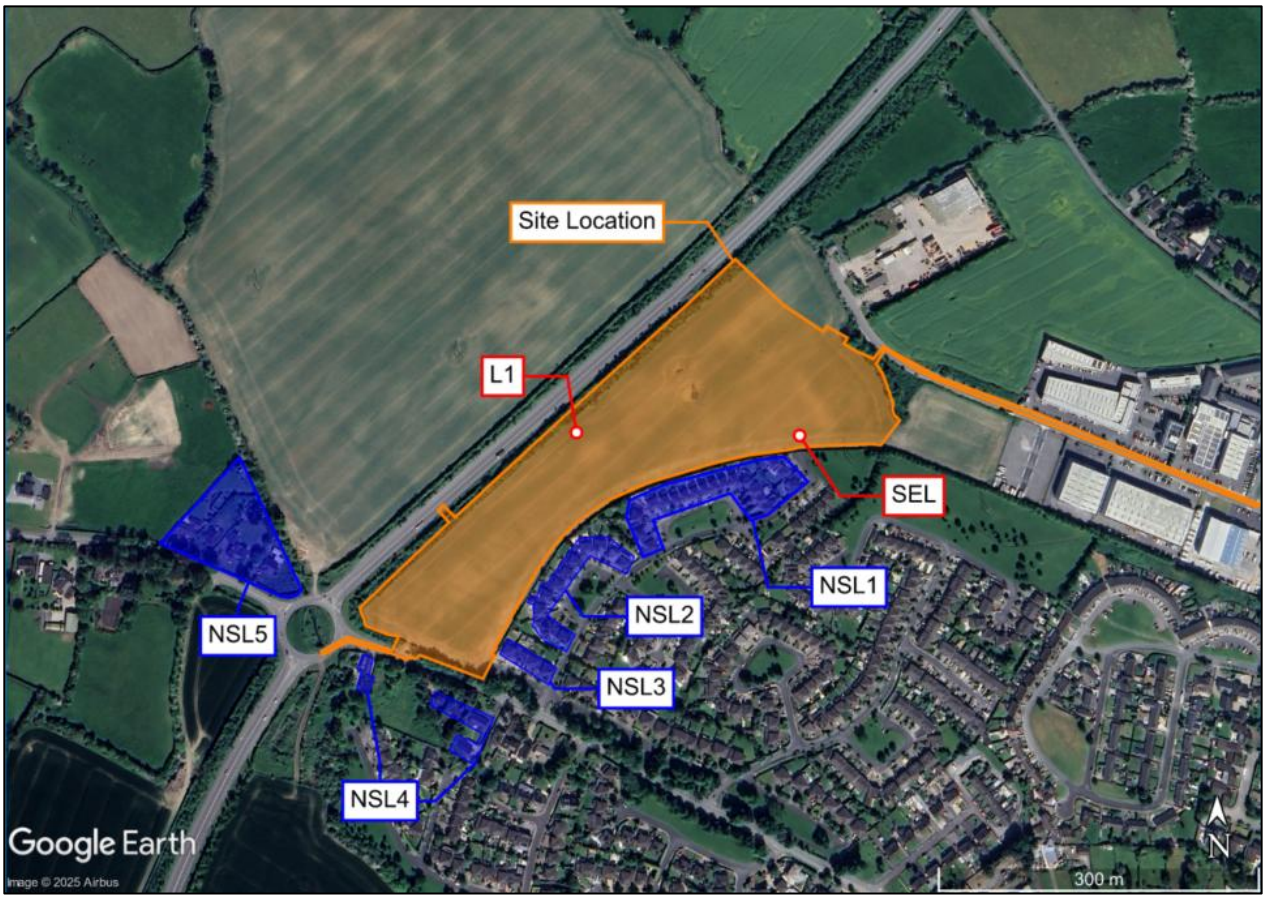


Figure 4: Site location and measurement locations L1 and SEL.

4.1.2 Survey Methodology and Personnel

The attended and unattended survey was completed by Paraic Hayden (Field Engineer) and Tom Ó Faogáin (Technical Engineer).

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 SEL as noted in Figure 4. 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 at SEL and 4m above the ground for location L1. 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. The monitor was deployed on the 14th of January 2026 at 11:04hrs and collected on the 19th of January 2026 at 07:19hrs. The logger was fixed in a free field position and extended upwards approximately 4m above the ground. 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).



Figure 5: Measurement Location L1.

4.1.3 Survey Period

The attended noise measurements were undertaken on the 14th and the 19th of January 2026. The unattended measurements were undertaken from the 14th of January 2026 at 11:04hrs and collected on the 19th of January 2026 at 07:19hrs, additional attended measurements were undertaken on the 17th of February 2026.

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 and unattended measurements. Table 5 summarises the measurement equipment used.

Table 5: Noise Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Calibrator	CAL3	Nor 1251	32096	AC250308	22/07/2026
Sound Level Meter	SLM13	Nti XL2	A2A-21117-E0	TCRT25/1740	29/09/2027
Sound Level Meter	SLM3	Nor 140	1403082	50651/50650	13/04/2027

4.1.5 Subjective Noise Environment

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

- Road traffic noise from the adjacent R157 and the M3 motorway,
- Overhead aircraft noise,
- Birdsong,
- Low wind generated noise on foliage.

4.1.6 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 for the attended surveys.

4.2 Noise Measurement Results

Attended and unattended measurements were taken to measure the noise levels across the site. This section outlines the results of the noise measurements.

Attended Measurement Results

Table 6 outlines the results of the attended measurement survey.

Table 6: Attended Noise Measurement Results

Measurement				Measured Noise Levels (re 20µPa)		
Location	**Date**	**Time (hrs)**	**Duration (mins)**	**L_{Aeq} dB**	**L_{AFmax} dB**	**L_{A90} dB**
L1	14/01/2026	10:48	15:00	64	73	62
L1	19/01/2026	07:18	15:00	68	73	67

Aircraft Sound Exposure Measurement Results

Table 7 outlines indicative levels of aircraft noise for the site located in Dunboyne, Co. Meath taken from the results of the attended measurements for aircraft flyover noise levels at the site on the 17th and 19th of January 2026, with additional measurements taken on the 17th of February 2026 to account for varying wind conditions. The flyover sound exposure levels have been calculated from the measured L_{Aeq} levels. SEL measurements were taken at the northeastern boundary of the site to reduce effect of road traffic noise levels on the measurements.

The sound exposure level (SEL) from aircraft flyovers has been calculated using the following equation:

$$L_{AX} = L_{Aeq} - 10\log_{10}(N) + 10\log_{10}(T)$$

Where:
L_{Ax} measured SEL
N number of vehicle movements
T time (seconds)

Table 7: Aircraft Flyover Noise Levels

Measurement				Aircraft Type	Measured Noise Levels		Sound Exposure Level
Location	Date	Time (hrs)	Duration (s)		L_{Aeq} dB	L_{AFmax} dB	L_{AX} dB
Aircraft Take-off							
SEL	17/02/2026	06:00	38	Boeing 737 MAX 8-200	58	65	74
SEL	17/02/2026	06:04	46	Boeing 737-346	60	63	75
SEL	17/02/2026	06:08	35	Boeing 737 MAX 8-200	61	64	75
SEL	17/02/2026	06:13	28	Boeing 737 MAX 8-200	61	64	76
SEL	17/02/2026	06:14	43	Boeing 737 MAX 8-200	63	65	79
SEL	17/02/2026	06:16	38	Boeing 737-8AS	63	65	79
SEL	17/02/2026	06:17	27	Boeing 737-8K2	63	66	77
SEL	17/02/2026	06:21	25	Boeing 737 MAX 8-200	59	62	73
SEL	17/02/2026	06:23	38	Airbus A320	61	65	77
SEL	17/02/2026	06:25	38	Boeing 737 MAX 8-200	61	64	77
SEL	17/02/2026	06:26	42	Airbus A320-214	65	71	81
SEL	17/02/2026	06:29	42	Airbus A320-214	64	70	80
Aircraft Landing							
SEL	19/01/2026	06:27	53	Boeing 737 MAX 8-200	59	67	76
SEL	19/01/2026	06:58	41	-	56	58	72
SEL	19/01/2026	07:02	42	Boeing 737-800	54	58	70
SEL	19/01/2026	07:05	46	-	53	64	70
SEL	19/01/2026	07:07	57	Boeing 737-800	54	62	72
SEL	19/01/2026	07:13	67	Boeing 737 MAX 8-200	53	59	71
SEL	19/01/2026	07:21	52	Airbus A320	53	60	70
SEL	19/01/2026	07:24	74	Airbus 321N	53	57	72
SEL	19/01/2026	07:29	51	Boeing 737-800	54	63	71
SEL	19/01/2026	07:31	64	Boeing 737 MAX 8-200	55	62	73

Unattended Monitoring Results

Table 8 outlines the results of noise measurements at the unattended monitoring location L1.

Table 8: 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} dB	L_{A90} (23:00 - 07:00) dB
14/01/2026	65[1]	60	67[1]	73	47
15/01/2026	66	60	68	73	43
16/01/2026	66	58	69	71	43
17/01/2026	66	59	68	73	44
18/01/2026	64	60	66[1]	72	43

(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) Dates where periods of unsuitable weather have been screened.

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.

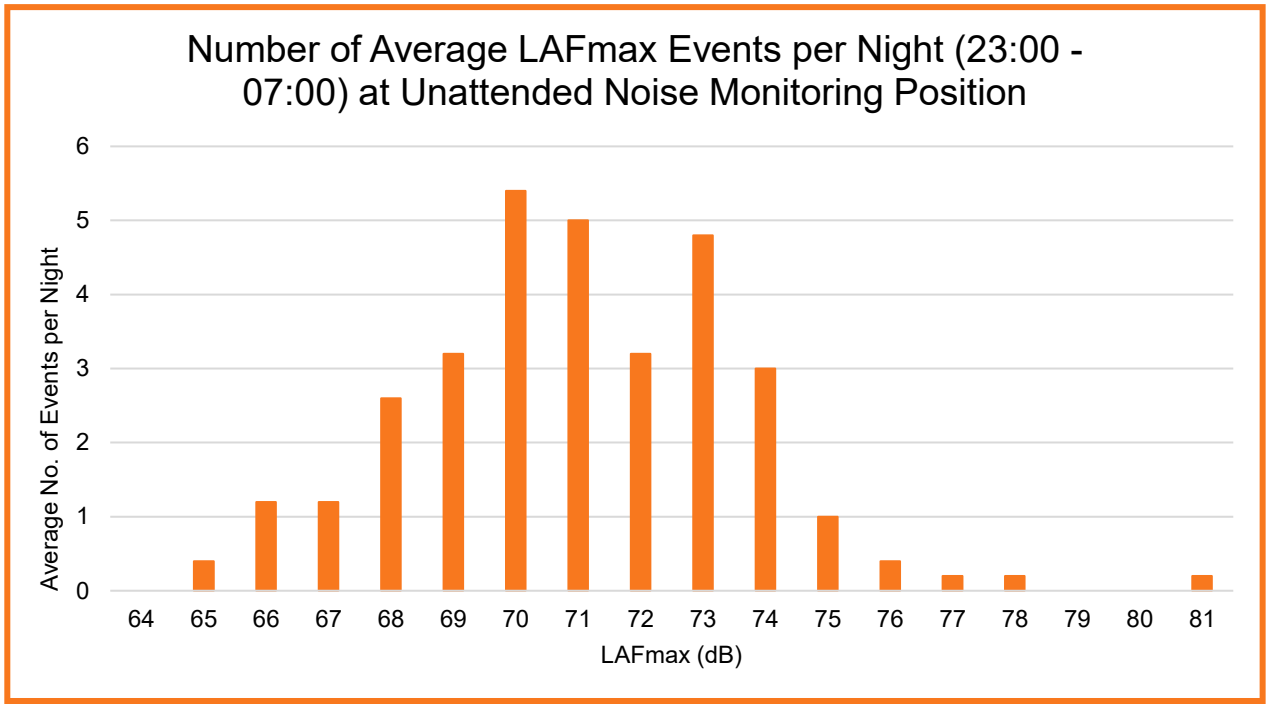


Figure 6: Average recorded L_{AFmax} events per night based on 15min measurement intervals.

Discussion of Measurement Results

The measurements were taken on weekdays and the weekend to provide an understanding of the noise climate around the site. From the noise levels recorded it can be seen that the levels were steady for the duration of the full survey.

The ambient noise consisted of traffic noise from all immediate surrounding roads, in particular the R157 and the M3.

Other sources of noise that impacted on the noise climate were the low wind generated noise on foliage, overhead aircraft noise and birdsong. It was noted that railway noise was not audible during the attended measurements.

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 Future Noise Levels

Road Traffic

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.

Rail Traffic

The existing rail line located approx. 850m to the east of the closest dwelling on the site is used for transit between Dublin Connolly / Docklands and M3 Parkway. There are currently a total of 47 scheduled commuter train passes on the line per day, 25 southbound and 22 northbound mostly concentrated around the morning/evening peak commuting hours and 1 pass each direction outside of these hours based on information from Iarnrod Eireann website. There are a total of 5 passes scheduled for the nighttime period currently.

We understand that Iarnrod Eireann are currently engaging in planning for a new expansion project Dart+ West which will increase the frequency of transit services between Dublin and M3 parkway stations. The Dart+ West project also

plans to electrify the majority of the fleet which services these stations. Based on our experience of previous similar developments, the use of the dart will lead to lower onset noise levels over commuter and intercity type trains.

Based on the information in Appendix D of the Iarnrod Eireann Public Consultation Brochure the number of proposed trains that will transit the rail line adjacent the proposed site is not currently available. An allowance of up to 100% increase in train passes has been allowed for in the assessment.

Aircraft

The development currently resides just inside the Dublin Airport Noise Zone C:

Based on the Fingal County Council website noise contours 2024, the site is located within the 50-54dB L_{den} noise contour and the 45-49 L_{night}. Figure 7 and Figure 8 outlines the L_{den} and L_{night} 2024 contours respectively. A review of the measured sound exposure levels taken of aircraft flying over the site reveals that the noise levels are lower than the existing road traffic noise on the surrounding road network.

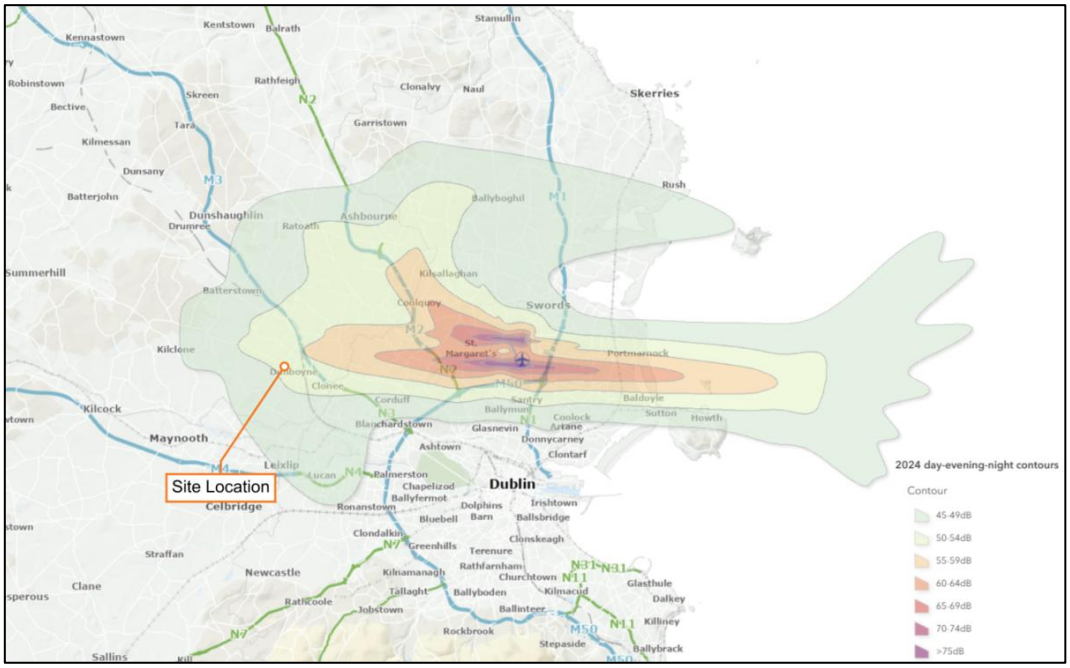


Figure 7: 2024 Dublin Airport L_{den} Noise Contour.

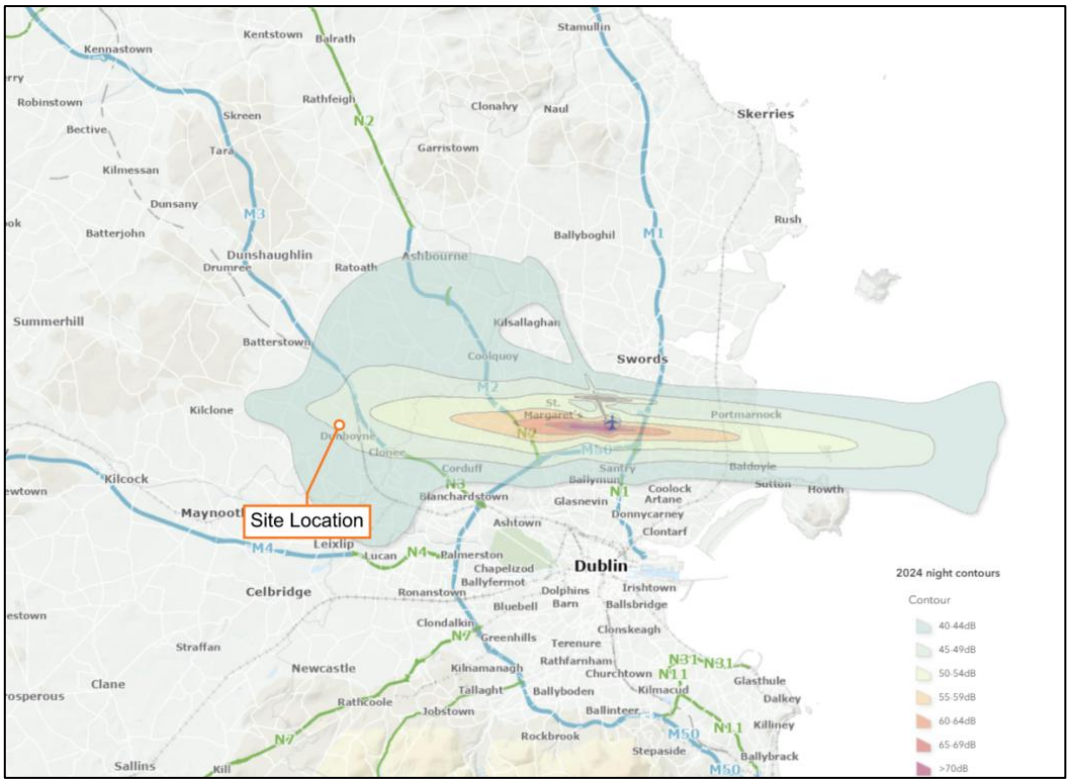


Figure 8: 2024 Dublin Airport L_{night} Noise Contour.

An Coimisiún Pleanála have recently granted permission for the extension of operations at the Dublin Airport North Runway which will allow for nighttime departures. Under prevailing wind conditions (south-westerly), aircraft will depart from the North Runway towards the west, and aircraft coming in to land at Dublin airport will approach from the east. This is the common scenario for approximately >80% of the time. The departure procedure from the north runway takes aircraft North shortly after departing and therefore the departure noise impact on Dunboyne is reduced. Despite the proposed extension of operations to the North Runway, the current operations during westerly winds consist of aircraft departing the south runway towards the west and fly directly over Dunboyne before turning north/south between the hours of 05:00hrs – 07:00hrs. It is anticipated that this will not occur when the North Runway commences nighttime departures however the building envelope performance requirements outlined in this report consider both current and future operations.

During easterly winds (non-prevailing), aircraft will depart from the south runway towards the east, and for landings, aircraft will approach Dublin Airport from the West and are permitted to land on either the north or south runway.

Figure 9 and Figure 10 below outline the proposed L_{den} and L_{night} contours for 2035. The proposed development is located in the lowest predicted contour for aircraft noise for L_{den}, with that being 45-49 L_{den} and the lowest predicted contour for aircraft noise for the L_{night}.

Section 5.2.3 outlines the proposed building envelope performance to ensure internal noise levels are within project criteria and to provide a suitable acoustic climate for future residents of the development.

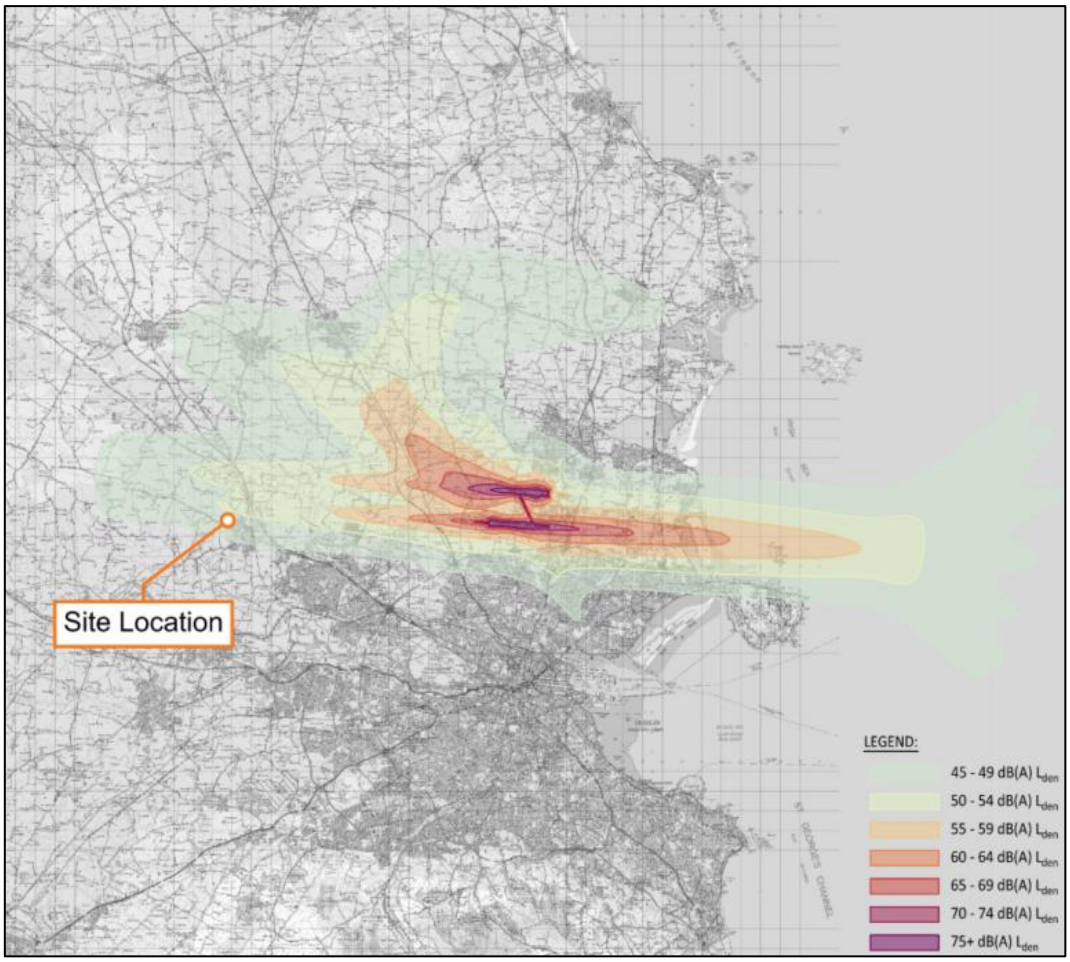


Figure 9: Proposed L_{den} Noise Contour 2035.

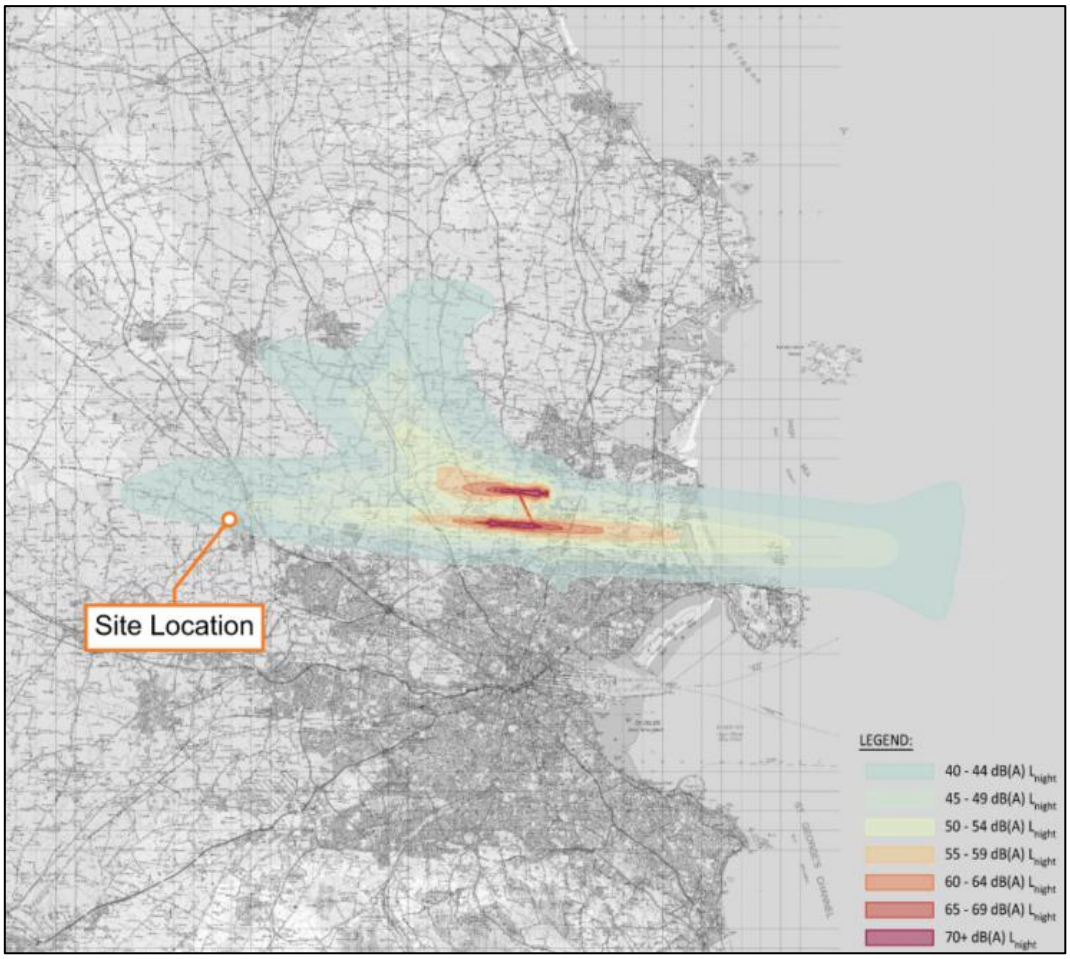


Figure 10: Proposed L_{night} noise contour 2035.

4.4 ProPG Stage 1 – Initial Risk Assessment

The measured noise levels on the site and future noise levels have been predicted for road and rail traffic noise to assess the probability of an adverse impact. Figure 11 and Figure 12 outline the ProPG initial risk assessment through detailed grid noise contour maps of the existing noise climate in the surrounding area.



Figure 11: ProPG Initial Risk Assessment - Daytime (07:00-23:00).



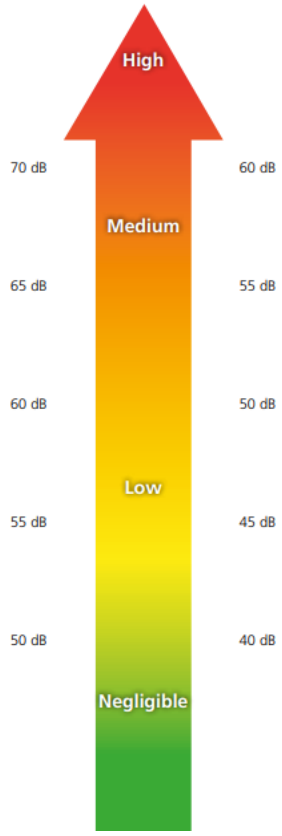
Figure 12: ProPG Initial Risk Assessment - Nighttime (23:00-07:00).

Table 9 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 – 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 9: 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 western/northwestern boundary occupies the high risk contour for nighttime noise levels. Good acoustic design should be observed.
		Medium Risk	**Medium Risk**
		The western/northwestern boundary occupies the medium risk contour for daytime noise levels. Good acoustic design should be observed.	The remainder of the site occupied the medium risk contour for nighttime noise levels. Good acoustic design should be observed.
		Low Risk	**Low Risk**
		The remainder of the site occupies the low risk contour for daytime noise levels.	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 the road and rail 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

At the principal site, the western/northwestern boundary of the site is most exposed to road traffic noise from the R157 while the remainder of the development benefits from the proposed buildings providing extensive screening from road traffic noise levels from the R157.

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 built-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 and 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. Road and railway 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 9.1 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 and unattended 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.
- Traffic speed of 80km/hr on the R157 and 120km/hr on the M3 motorway as per local signage and onsite observation.
- Percentage of HGV assumed at 4% based on assessment of similar local roads. Percentage HGV assigned 6% for the M3 motorway based on TII Traffic Count data for 2025.
- Assessment conducted during peak traffic times.
- 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.

Daytime Noise Levels

Figure 13, Figure 14 and Figure 15 below outline the predicted road traffic noise levels across the proposed site for the daytime period at 1.5m, 4m and 6.5m height respectively.



Figure 13: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 1.5m height for the future development.



Figure 14: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 4m height for the future development.



Figure 15: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) at 6.5m height for the future development.

Nighttime Noise Levels

Figure 16, Figure 17 and Figure 18 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.

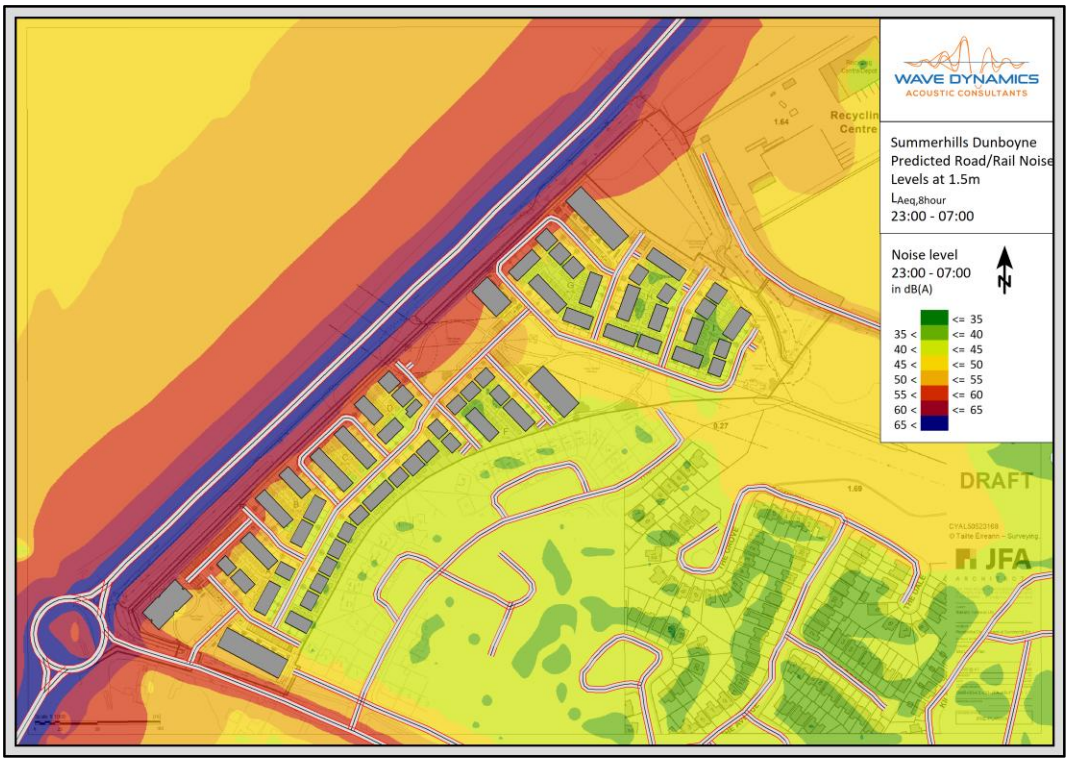


Figure 16: Predicted L_{night} (23:00Hrs – 07:00Hrs) at 1.5m height for the future development.

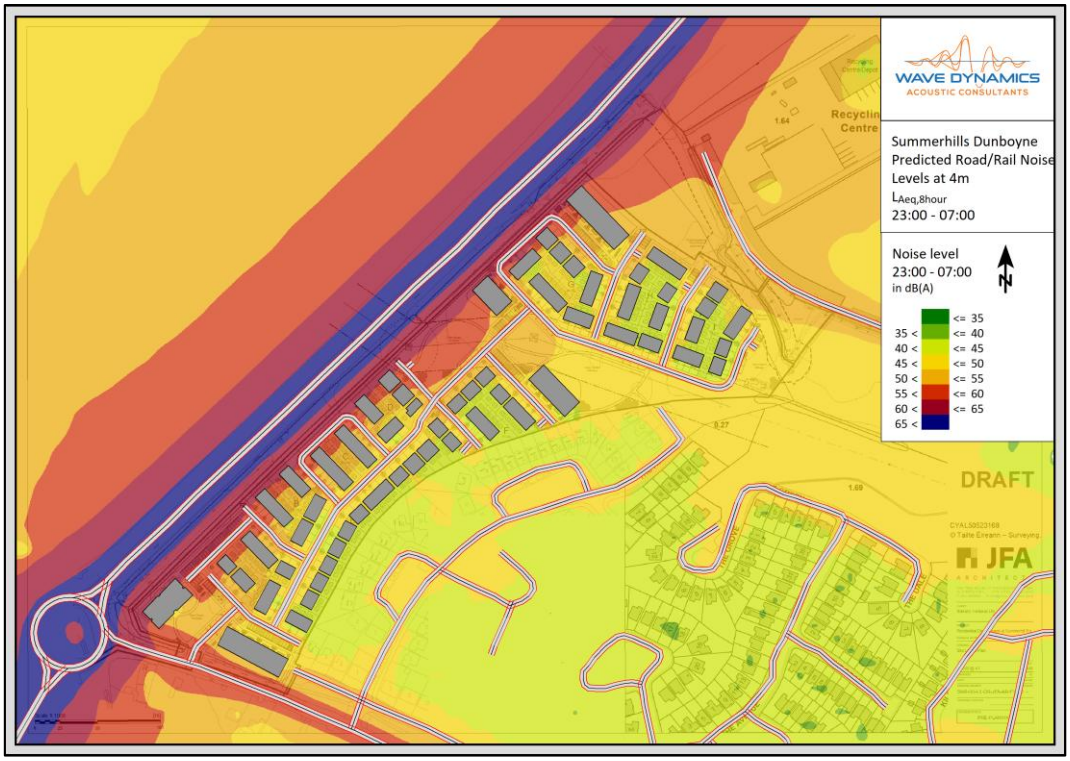


Figure 17: Predicted L_{night} (23:00Hrs – 07:00Hrs) at 4m height for the future development.

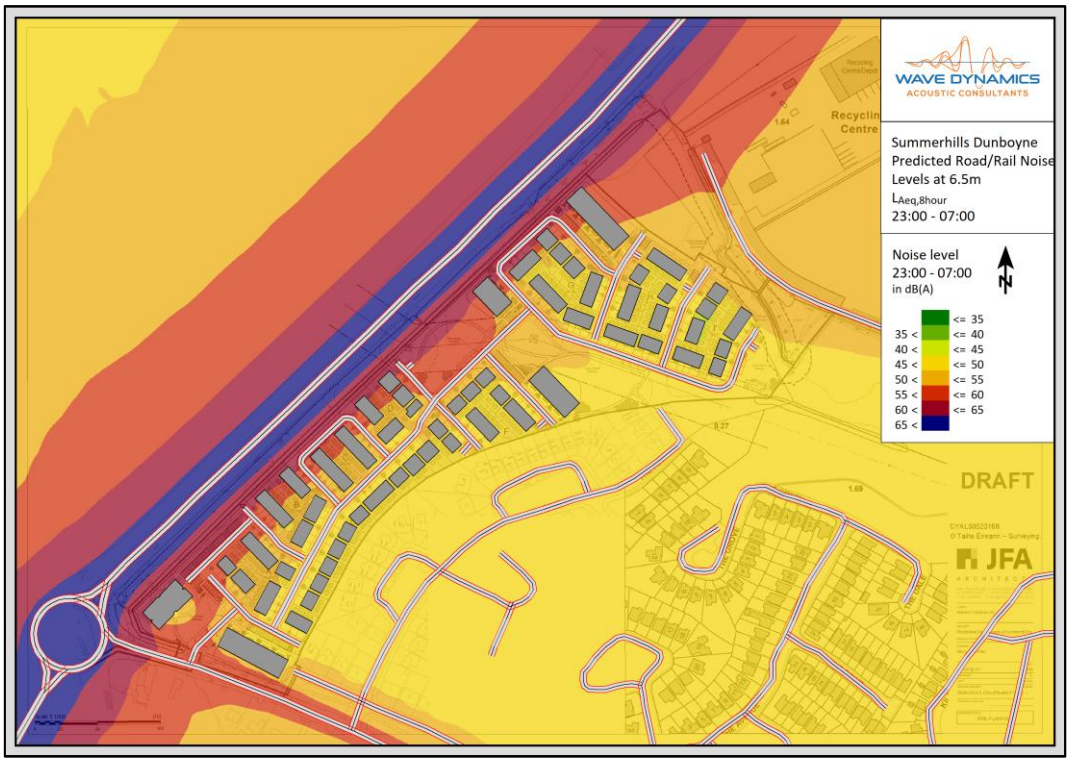


Figure 18: Predicted L_{night} (23:00Hrs – 07:00Hrs) at 6.5m height for the future development.

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 specification outlined in this section is based on the measured noise levels at the site and has taken into consideration aircraft noise.

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 10.

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 10 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 10: 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
	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	26	26	35	38	41	35	37dB R_w	40dB $D_{n,e,w}$ (1) Standard Natural Ventilation
BLUE	14	19	25	33	42	21	29dB R_w	32dB $D_{n,e,w}$ (1) Standard Natural Ventilation

(1) Natural ventilation assumed throughout, the performance cited for the ventilator is in the open position. Should this change to mechanical ventilation the above specification may be reduced. 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 maximum of 1 ventilation opening per bedroom at the specification outlined in Table 10.

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 natural ventilation system. Should the ventilation strategy change to mechanical ventilation strategy Wave Dynamics should be notified. 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.

The calculations for the glazing figures in Table 10 are based on the use of basic trickle vents. The performance value, and that used in the calcs is given in Table 11 below.

Table 11: Recommended Ventilation Specification.

Façade	Description	Octave Band Centre Frequency (Hz) Sound Reduction Index $D_{n,e}$ dB					
		125	250	500	1k	2k	4k
RED	Acoustically rated ventilator ≥ $D_{n,e,w}$ 40dB	45	42	36	40	43	53
BLUE	Acoustically rated ventilator ≥ $D_{n,e,w}$ 32dB	31	31	31	37	28	31

External Wall Construction

The façade wall construction has been assumed to achieve a minimum sound insulation performance of 56dB 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 external amenity in the form of rear gardens to the houses, balconies and terraces, and several public open spaces across the development. All external amenity spaces have been assessed, and it can be concluded that the majority of rear gardens of the houses (assumed to feature boundary walls with a minimum height of 1.8m), majority of balconies and terraces and several public open spaces across the site are predicted to achieve the external amenity noise levels in accordance with BS8233:2014 of 55dBA $L_{Aeq,16hr}$. Some sections of public open spaces, rear gardens and some balconies or terraces on the duplex units along the western boundary of the site facing the R157 are predicted to exceed the recommended desirable levels by 3-5dB(A) L_{eq}. Figure 19 outlines the compliance with external noise levels across the development.



Figure 19: External Amenity Space Noise Levels at 1.5m.

Suitable alternate amenity space has been provided on the development in the form of multiple open spaces which are predicted to comply with the recommended external amenity noise criteria as outlined in ProPG and BS8233. 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, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or

a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)".

Based on the measured noise levels at the site it is predicted that the external amenities in the form of rear gardens to the houses, balconies and terraces and several public open spaces across the development, except for public open spaces, some rear gardens and balconies or terraces facing towards the R157 will achieve the ProPG recommendations for desirable external amenity noise levels of 50-55dBA $L_{Aeq,16hour}$.

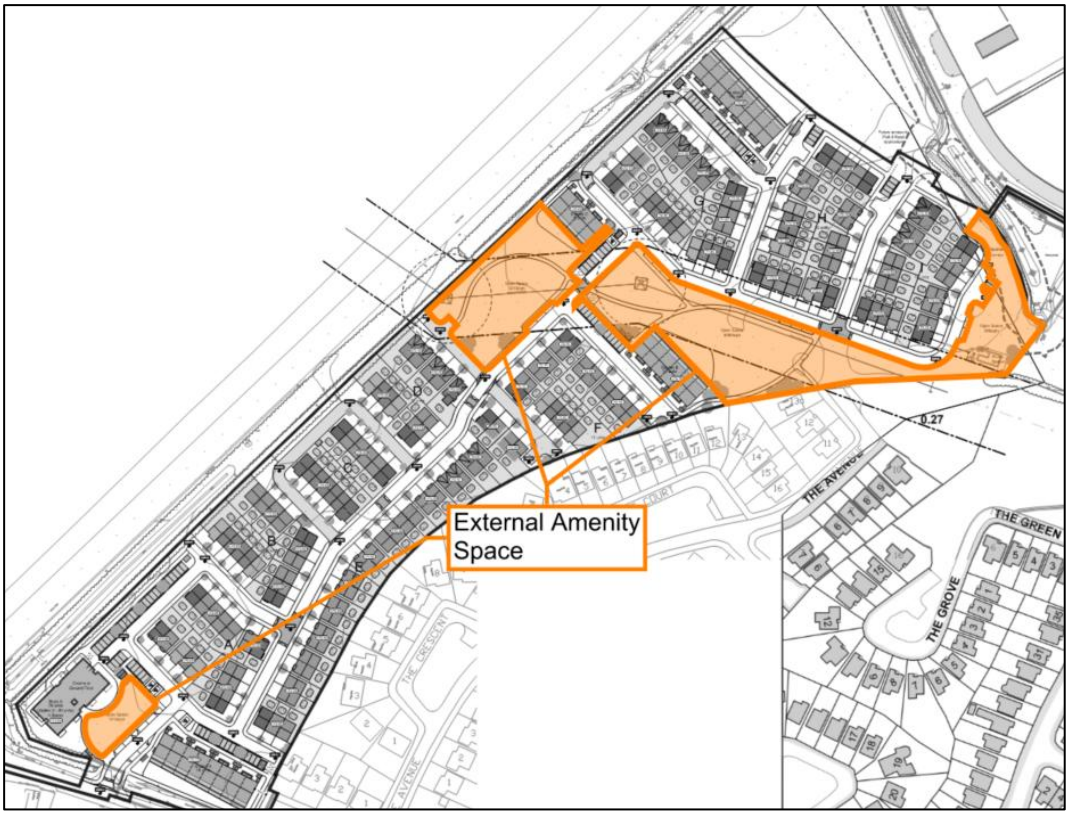


Figure 20: Markup of the amenity spaces.

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 Meath County Council Noise Action Plan does not specifically outline noise limits for new residential developments; however, it does emphasise a preventative approach when it comes to noise impact on new residential developments. The plan indicates that if a proposed new residential development is located near a major road where noise impacts are likely, developers are required to consider existing noise mapping data and incorporate appropriate acoustic design features into the project. This aims to ensure residents are not exposed to excessive noise levels.

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. The appropriate provision of external amenity space has been provided through the use of balconies and terraces on the upper floors, the ground level open spaces and rear gardens in line with the ProPG guidance.

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

6 Construction Noise Assessment

6.1 Noise Sensitive Locations and Noise Limits

Based on the location of the site, the construction works and its proximity to the residential receptors the following noise sensitive receptors have been identified:

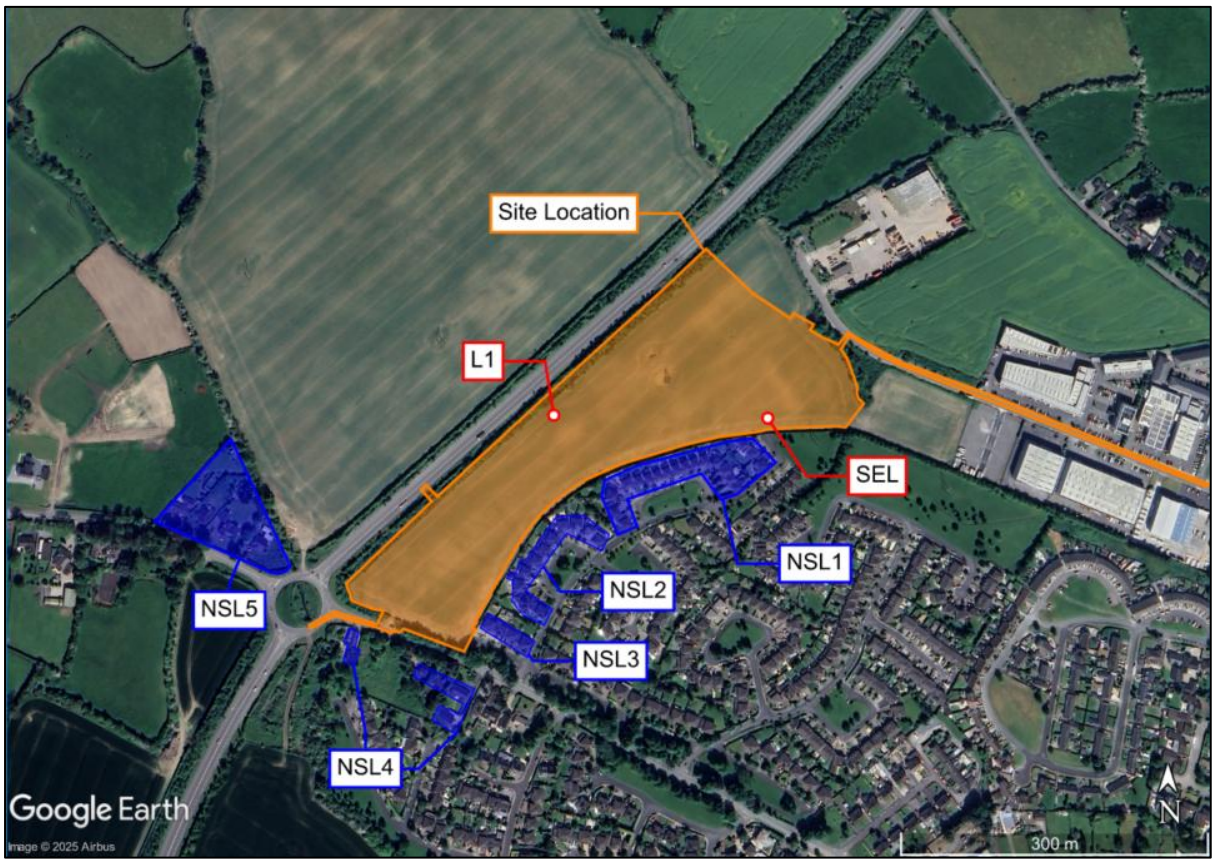


Figure 21: Site location and noise sensitive locations 1-5.

Noise Limits

The criteria for the project based on the criteria outlined in section 3 and the background noise in the area the project criteria for construction noise is outlined below in Table 12. Reference to the baseline survey results and guidance contained in BS 5228 Part 1 for construction noise levels threshold for significant effect from constriction activities is set as follows for the closest noise sensitive locations:

Table 12: Project Criteria

Construction Noise Limits			
Noise Sensitive Location	**Distance To the Centre of The Site (m)**	**Ambient Noise dB(A)**	**Noise Limit dB(A) [1]**
NSL1	65	64	65
NSL2	105	64	65
NSL3	200	64	65

Construction Noise Limits			
Noise Sensitive Location	**Distance To the Centre of The Site (m)**	**Ambient Noise dB(A)**	**Noise Limit dB(A) [1]**
NSL4	300	64	65
NSL 5	330	64	65

(3) 65 dB (A) lower threshold limit

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5dB. If the noise generated by construction activities exceeds the appropriate category value, then a significant effect is deemed to occur.

For this project a limit of 65dB(A) is set as the appropriate upper limit for construction noise. Given the urban location of the development and its proximity to local transport infrastructure, this is considered an appropriate upper limit for construction noise.

6.1.1 Construction Noise Predictions

Construction noise for the site has been predicted based on the information provided. A summary of the expected equipment, durations and operating times are provided in Table 13. The noise sources are assumed to be located at the centre of the new developments. The prediction methodology in BS5228 has been used to calculate the noise level over a typical day for each of the main construction stages.

Table 13: Proposed construction equipment, noise levels and duration.

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L_{Aeq} at 10m dB(A))	On Time of 10 hr day
Site Setup	Digger	77	4 hours
	Carpentry tools	78	3 hours
	Skill saw	84	2 hours
Substructure	Excavators	77	2 Hours
	Con saws	84	3 Hours
	Rail saw	85	2 Hours
	Drills	89	3 Hours
	Dumper 7t	81	4 Hours
	Cement Mixer	75	4 Hours
	Lorry Idling	80	2 Hours
	Telescopic Handler	71	4 Hours
	Concrete Pump	78	3 Hours

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L_{Aeq} at 10m dB(A))	On Time of 10 hr day
Superstructure	Drills	89	2 Hours
	Power tools	70	3 Hours
	Impact steel	69	2 Hours
	Hammer	69	4 Hours
	Dumper 7t	81	3 Hours
	Cement Mixer	75	2 Hours
	Lorry Idling	80	2 Hours
	Telescopic Handler	71	5 Hours
External finishes	Tools	70	5 hours
	Con saw	84	2 hours

Table 14 summarises the predicted construction noise level at the noise sensitive locations. Examination of the results indicate the construction noise without mitigation is predicted to exceed the noise limits during all stages of the development with the exception of external finishes.

*Table 14: Predicted noise levels **without** mitigation for each stage.*

Location	Noise Limit dB L_{Aeq}	Predicted noise level (construction noise + ambient) with no mitigation L_{Aeq}, dB			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1	65	67	72	69	64
NSL2	65	65	68	67	64
NSL3	65	53	66	65	64
NSL4	65	64	65	64	64
NSL5	65	64	65	64	64

The calculations set out above are based on assumed site construction works and a combination of the plant operating at the same time i.e. worst-case scenario.

Table 15: Attenuation required based on the construction noise predictions.

Location	Noise Limit dB L_{Aeq}	Noise reduction required at each stage of works to meet criteria (dBA)			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1	65	2	7	4	0
NSL2	65	0	3	2	0
NSL3	65	0	1	0	0
NSL4	65	0	0	0	0
NSL5	65	0	0	0	0

Noise mitigation measures will be required at all stages of construction except for the external finishes stage. A combination of the mitigation measures outlined in section 6.2 should be used to reduce the levels of construction noise by the values listed in Table 15 above.

6.2 Noise Mitigation Recommendations

Best practice control measures for noise from construction sites are found within BS 5228 (2009 +A1 2014) part 1. Construction noise impacts are expected to vary during the construction phase of the project, this impact will depend on the distance between the construction activities and noise sensitive receptor. The contractor will ensure that all best practice noise and control methods will be used, to ensure any negative noise impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Part 1 includes guidance on several aspects of construction site mitigation measures, this includes the

- selection of quiet plant and equipment;
- noise control at source of the noise;
- screening, and;
- public liaison.

6.2.1 General Recommendations

This section of the report sets out noise mitigation options and detailed comment on each one specifically for this site.

Selection of Plant and Equipment

The noise impact of all plant and equipment should be assessed prior to selection of plant for the project. Where an item of plant is identified as noisy with the potential to cause a negative noise impact it should be reviewed to check if there is an alternative quieter version of the same plant to undertake the same construction task.

Noise Control at Source

Where replacing a noisy item of plant is not viable or practical, consideration should be given to control that noise at source. This includes modifying the piece of plant or equipment to generate less noise, using dampening to control vibration induced noise or rattling. Example best practice mitigation measures to be considered are as follows:

- All plant and equipment to be switched off when idling.
- The use of white noise reversing alarms.
- Restriction on the dropping and loading of materials to less sensitive hours.
- The use of local screening for noisy activities or works with hand tools
- Not dropping materials onto hard surfaces and using rubber mats etc for the dropping of materials.
- Ensure all plant and equipment is well maintained and cleaned, all lubrication should be in line with manufacturers guidelines.

Screening

Screening when used correctly can be an effective method of reducing the construction noise impact on the NSL's. The use of site hoarding and careful selection of areas for noise works, using buildings on the site, site offices and the building being constructed to screen noise from the works.

Local screening of noisy works with the use of temporary acoustic barriers, examples are provided below:

- https://ventac.com/acoustic-products/noisebreak-acoustic-barrier/
- https://echobarrier.com/



Figure 22: Temporary Construction Noise Barrier © Ventac

Public Engagement

It is recommended that a public liaison officer should be put forward by the contractor to liaise with the local residents on matters relating to noise. Occupants should be informed of any noise works scheduled where there is the potential to generate high levels of construction noise or if specialist works etc need to be conducted out of the working hours. This person should also be the point of contact for all complaints and be responsible for reviewing the noise monitoring results and exceedances.

Construction Noise Monitoring

Construction noise monitoring should be undertaken at periodic sample periods on the boundary with the nearest noise sensitive receptors.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

6.2.2 Site Specific Recommendations

Table 16 below outlines the recommended site-specific noise mitigation measures based on the attenuation required in Table 15.

Table 16: Attenuation required based on the construction noise predictions.

Construction Stage	Recommended Noise Mitigation Measure
Site Setup	Erect a minimum 2.4m high site hoarding that blocks the line of sight between noise source and receiver. Example construction for the site hoarding would be as follows: • A 2.4m high and 9mm plywood (4.5 kg/m^2). Barrier must be solid and not contain gaps at the bottom or between adjacent panels Local screening using the examples provided in General Recommendations section 6.2.1 are required around hand tools in addition to hoarding. An absorptive lining should be considered for screening around hand tools to avoid reflections increasing noise at other receivers. On this project 5 NSL's have been identified it is recommended that a noise monitor should be placed on the boundary with each of nearest noise sensitive locations closest to the works.
Substructure	Site hoarding to block line of sight. Local screening around noisy plant and equipment. An absorptive lining should be considered for screening around large plant to avoid reflections increasing noise at other receivers Noise monitoring as above
Superstructure	Local screening around saws/hammers where possible. Use new buildings to screen noise from works where possible. Noise monitoring as above
External finishes	Local screening around hand tools. Noise monitoring as above

6.3 Vibration

Prediction of vibration levels at receptors is complex and dependent on a number of factors. As the development will likely consist of earthworks and substructure works precautionary vibration monitoring at the boundary with the nearest sensitive receptors will be undertaken as required during construction (for vibration generating works).

6.3.1 Vibration Monitoring

Where required vibration monitors can be erected during the substructure phase of the development between the site and the noise sensitive locations as these are closest vibration sensitive locations on the boundary of the site.

The Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with BS ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.

Vibration Limits

The recommended vibration limits to avoid cosmetic damage to buildings, as set out in:

- British Standard BS7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- British Standard BS5228-2: 2009 + A1: 2014: Code of practice for noise and vibration control on construction and open sites – Vibration.

The standards note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in Table 17 and major damage to a building structure is possible at vibration magnitudes greater than four times the values set out in Table 17. Definitions of the damage categories are presented in BS 7385-1:1990.

Table 17: Transient vibration guide values for cosmetic damage

Vibration PPV at the closest part of sensitive property to the source of vibration Frequency		
4 to 15 Hz	**15 to 40Hz**	**40Hz and above**
15 mm/s	20 mm/s	50 mm/s

Note 1: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded
Note 2: It should be noted that these values are at the base of the building.

7 Operational Noise Impact

This section includes an assessment of the operational noise impacts for noise from the plant and equipment, creche activities, external amenity usage, and car parking and movements across the development. The plant and equipment for the project has not been determined at this time and therefore has been assumed for the purpose of the assessment. The heating and cooling methodology will be developed at design development stage. 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.

7.1 Noise Sensitive Locations

The Proposed Development site is located Dunboyne, Co. Meath.

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 23.

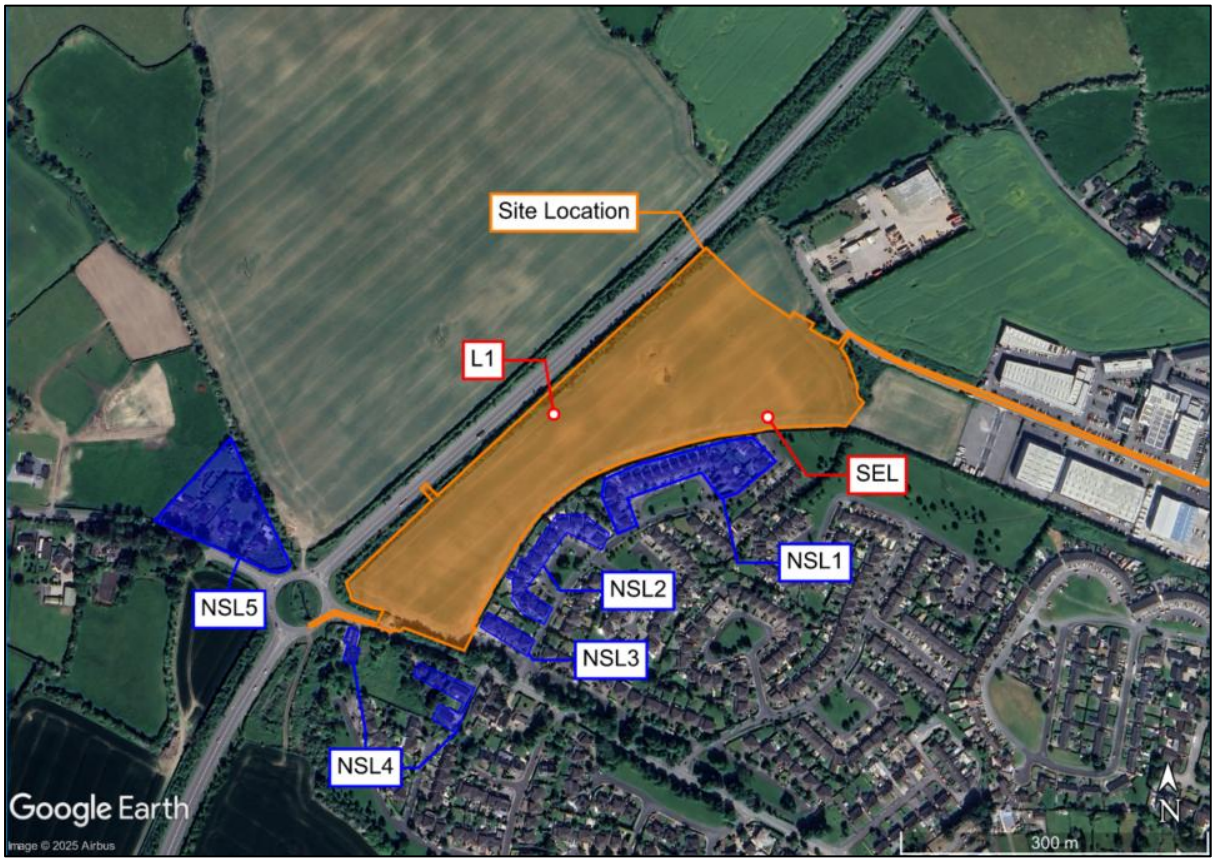


Figure 23: Noise Sensitive Locations.

7.2 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 acoustic model for the new development has been developed based on the attended 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 plant and equipment, creche activities, external amenity usage, and car parking and movements across the development on the nearby residential receptors.

7.3 Assessment of Operational Noise Impact

This section outlines the operational noise impact from the proposed development.

7.3.1 Noise Sources

Plant and Equipment

As the proposed heating/cooling strategy for the development is not yet confirmed, WDA have made assumptions regarding the plant and equipment specification for the residential development. The modelled scenario represents the worst-case situation whereby each dwelling is provided with a designated heat pump.

Table 18: Heat Pump Sound Power Levels Used to Predict Noise Impact.

Description	Source Sound Power Level L_w (dB) at Octave Band Centre Frequency, Hz								L_{wA} (dB)
	63	125	250	500	1000	2000	4000	8000	
Indicative Domestic Heat Pump Specification	78	63	62	59	52	49	49	43	61

1) It is assumed that there will be one of the above heat pump units per dwelling.

Creche Play Area

This section outlines the noise levels utilised in the noise model to predict the noise impact of the creche external play area on the surrounding noise sensitive receptors. The noise levels are outlined in Table 19 in octave band sound power format.

Table 19: Creche Play Area Sound Power Levels.

Description	Octave Band Sound Power Level L_W dB at Centre Frequency (Hz)								Overall Sound Power Level L_{WA} dB
	63	125	250	500	1000	2000	4000	8000	
Creche Play Area	80	77	75	76	75	71	65	55	79

External Amenity Space

Table 20 outlines the spectra used to assess the external amenity space usage across the development. The table outlines the spectra in octave band sound power format used in the noise model to conduct the assessment.

Table 20: External Amenity Assessment Sound Power Levels.

Description	Octave Band Sound Power Level L_W dB at Centre Frequency (Hz)								Overall Sound Power Level L_{WA} dB
	63	125	250	500	1000	2000	4000	8000	
Normal Vocal Effort (Male)	56	58	67	69	63	59	55	50	69
Raised Vocal Effort (Male)	66	67	74	76	73	68	63	57	77

7.4 Assessment of The Operational Noise Impact

This section outlines the operational noise impact from the proposed development, which includes the external plant and equipment, creche activities, external amenity usage, and car parking and movements across the development. The operational noise impact considers the noise impact of all noise sources at the nearest noise sensitive locations.

7.4.1 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:

- Assumed plant operational 100% of the time based on sound power spectra outlined in Table 18.
- Assumed external amenity usage between the hours of 16:00-23:00, based on spectra outlined in Table 20.
- Assumed creche operational hours from 08:00-18:00, with external play area usage 3 hours per day, based on spectra outlined in Table 19.
- Carpark operational 10% of the time during daytime hours of 07:00-23:00.

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 NSL4 due to its proximity to the development. The BS4142 at NSL4 is outlined in Table 21 below.

Table 21: BS4142 Assessment for daytime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (daytime)	$L_{Aeq(15min)}$ = 35dB	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 NSL4 as this is exposed to the most operational noise from the proposed development during the daytime period.
Residual sound level (daytime)	$L_{Aeq(16hour)}$ = 64dB	7.3.2	The residual sound level was dominated by road traffic noise. Measurement location L1 was assessed as this is representative for worst case receptor (NSL4).
Background sound level (daytime)	$L_{A90(16hour)}$ = 62dB	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	$L_{Aeq(15min)}$ = 35dB	7.3.6	The specific sound has been predicted by calculation alone as the new development was not existing at the time.
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	(35 + 0) dB = 35dB	9.2	
Background sound level	$L_{A90(16hour)}$ = 62dB	8	
Excess of rating over background sound level	(35 - 62) dB = -27dB	11	Assessment indicates that no adverse impact is likely on the noise sensitive locations as the specific sound is 27dB below the background levels and is lower than the residual sound. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes plant and equipment is operational 100% of the time, usage of the external amenity spaces, creche external play area and multiple car park movements through the nighttime period.

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 have a **low impact** on the surrounding noise sensitive locations.

Tonality and Impulsivity

Based on the predicted noise emissions from the proposed development during the daytime period, it is unlikely that there will be any tonal or impulsive aspects to the noise. The predicted noise levels are 26dB below existing background noise levels and significantly below residual noise levels in the area. Therefore, tonal and impulsive noise is unlikely to cause impact at the surrounding sensitive receptors.

EPA NG4 - Daytime

EPA NG4 recommends a daytime criteria of (07:00hrs – 19:00hrs) 55dB $L_{Aer,T}$, the predicted noise emissions from the development are 35 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved. Table 22 below outlines the predicted noise impact at each noise sensitive location, the project criteria and compliance with the project criteria.

Table 22: Model results for each NSL during the daytime period.

NSL	Distance from centre of the site to NSL (m)	Criteria (07:00hrs – 19:00hrs) $L_{Ar,T}$ EPA NG4	Result ($L_{Aeq,16hour}$ dB)	Compliance
NSL1	65	55	32	Compliant
NSL2	105	55	35	Compliant
NSL3	200	55	34	Compliant
NSL4	300	55	35	Compliant
NSL5	330	55	28	Compliant

EPA NG4 – Evening

EPA NG4 recommends an evening criteria of (19:00hrs – 23:00hrs) 50dB $L_{Ar,T}$, the predicted noise emissions from the development are 36 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

7.4.2 Night-time Scenario

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

The nighttime situation assumes the following noise sources:

- Assumed plant operational 100% of the time based on sound power spectra outlined in Table 18.
- Assumed external amenity usage between the hours of 23:00-01:00, based on spectra outlined in Table 20.
- Assumed creche not operational during the nighttime period.
- Carpark operational 5% of the time during nighttime hours of 23:00-07:00.

BS4142 Nighttime Assessment

The noise impact at the nearest noise sensitive location (NSL2) has been assessed in accordance with BS 4142.

Table 23: BS4142 Assessment for nighttime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (nighttime)	$L_{Aeq(15min)}$ = 34dB	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 NSL2 as this is exposed

Results		Relevant BS 4142 Clause	Commentary
			to the most operational noise from the proposed development during the nighttime period.
Residual sound level (nighttime)	$L_{Aeq(8hour)}$ = 58dB	7.3.2	The residual sound level was dominated by road traffic noise. Measurement location L1 was assessed as this is representative for worst case receptor (NSL2).
Background sound level (nighttime)	$L_{A90(8hour)}$ = 43dB	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 nighttime, so the reference time interval is 15 minutes		7.2	
Specific sound level as predicted	$L_{Aeq(15min)}$ = 34dB	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	(34 + 0) dB = 34dB	9.2	
Background sound level	$L_{A90(8hour)}$ = 43dB	8	
Excess of rating over background sound level	(34 - 43) dB = -9dB	11	The specific sound is 9dB lower than the background levels and is lower than the residual sound at the worst-case sensitive receptor during nighttime hours, there will be a low impact on the surrounding area based on this assessment. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes plant and equipment is operational 100% of the time, usage of the external amenity spaces and multiple car park movements through the nighttime period.

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 have a **low impact** on the surrounding noise sensitive locations.

Tonality and Impulsivity

Based on the predicted noise emissions from the proposed development during the nighttime period, it is unlikely that there will be any tonal or impulsive aspects to the noise. The predicted noise levels are 9dB below existing background noise levels and significantly below residual noise levels in the area. Therefore, tonal and impulsive noise is unlikely to cause impact at the surrounding sensitive receptors.

NG4

NG4 recommends a nighttime criteria of (23:00hrs – 07:00hrs) 45dB $L_{Aeq,T}$, the predicted noise levels from the new development are 34 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved. Table 24 below outlines the predicted noise impact at each noise sensitive location, the project criteria and compliance with the project criteria.

Table 24: Model results for each NSL during the nighttime period.

NSL	Distance from centre of the site to NSL (m)	Criteria (23:00hrs – 07:00hrs) $L_{Aeq,T}$ EPA NG4	Result ($L_{Aeq,8hour}$ dB)	Compliance
NSL1	65	45	31	Compliant
NSL2	105	45	34	Compliant
NSL3	200	45	33	Compliant
NSL4	300	45	28	Compliant
NSL5	330	45	23	Compliant

7.4.3 Modelling Assumptions

The following assumptions were made throughout the modelling and assessment:

- Assessment based on the noise measurements undertaken on the 14th to the 19th of January 2026.
- Noise source data for the assessment was based on the measurements undertaken onsite.
- Model assumes a worst-case operating scenario as outlined in Section 7 above.
- Modelling based on the drawings, layouts and information provided.
- Model based on assumptions outlined in Section 7.3.1.
- Assessment based on proposed new development only.

8 LRD Opinion

The development was subject to review by Meath County Council to determine if the proposed development constitutes a reasonable basis for submitting a planning application. The LRD Opinion issued by Meath County Council features 1 no. point in relation to acoustics which is as follows:

12.
   a. *"Noise mitigation should be incorporated into the building design and layout of the scheme, as necessary. Sensitive noise receptors, including the childcare facility, should be considered in the EIAR.*

This section provides a summary of the noise mitigation measures identified throughout this report in response to Point 12 a. of the LRD Opinion. The mitigation measures relate to the inward noise impact assessment, external amenity noise assessment, construction noise assessment and operational noise assessment. The purpose of the mitigation measures is to ensure that the proposed development provides an appropriate acoustic environment for future residents, while also controlling potential noise impacts at nearby noise sensitive receptors during construction and operation.

Inward Noise

The inward noise impact assessment has considered the potential impact of external environmental noise sources on future occupants of the proposed development, including road traffic noise, aircraft noise and other relevant surrounding noise sources. The assessment has identified that mitigation is required through the specification of the building envelope.

The principal inward noise mitigation measure is the provision of suitable façade sound insulation performance, including appropriate glazing specifications. The glazing performance requirements have been developed to ensure that internal noise levels within habitable rooms achieve the relevant internal noise criteria during daytime and nighttime periods. This approach ensures that future occupants will be afforded an appropriate internal acoustic environment, with the building envelope designed to control external noise ingress.

External Amenity

The assessment of external amenity areas has considered private gardens and the communal open spaces across the proposed development. The rear gardens are predicted to achieve the relevant external amenity noise criteria, based on the inclusion of boundary walls to a typical height of 1.8m. These boundary treatments provide acoustic screening from surrounding road traffic noise sources and assist in achieving compliant noise levels within the garden areas.

The main open amenity space to the northwest is predicted to exceed the desirable external amenity noise levels due to its proximity to surrounding road noise sources. However, the assessment has demonstrated that adequate external amenity is provided elsewhere across the development in the form of rear gardens and open space located to the east of the site that meet compliance with external amenity noise levels of 50 – 55 dB $L_{Aeq,}$ which is in line with ProPG guidance.

Construction Noise Mitigation

The construction noise assessment has identified the potential for construction activities to generate elevated noise levels at nearby noise sensitive receptors, particularly during noisier phases of the works. Mitigation measures have therefore been recommended to control construction noise emissions and manage potential impacts during the construction phase.

The recommended construction noise mitigation measures include the use of site hoarding, the selection and use of low-noise plant and equipment, appropriate maintenance of construction plant, and the implementation of good site management practices. In addition, public liaison procedures should be put in place to provide a clear mechanism for communication with nearby residents and for the management of any noise-related complaints.

Noise and vibration monitoring is also recommended at the closest sensitive receptors during relevant construction activities, where required, to verify compliance with the adopted construction noise and vibration criteria and to allow corrective actions to be implemented if necessary.

Operational Noise Mitigation

The operational noise assessment has considered noise associated with the completed and occupied development, including typical residential operational activities and relevant plant and equipment where applicable. The predicted operational noise levels are significantly below the existing residual and background sound levels at the nearest noise sensitive receptors.

On this basis, no specific operational noise mitigation measures are considered necessary. The assessment concludes that operational noise from the proposed development is not expected to result in adverse noise impacts at nearby noise sensitive receptors. Where any future mechanical plant selections are developed in more detail, these should be reviewed to ensure that they remain consistent with the operational noise criteria set out in this report.

Summary

In summary, the report has identified appropriate mitigation measures for the key noise considerations associated with the proposed development. Inward noise impacts will be controlled through the specification of suitable building envelope and glazing performance. External amenity noise has been addressed through boundary screening and the provision of compliant alternative amenity areas across the development. Construction noise will be managed through standard best-practice mitigation measures, public liaison and monitoring where required. Operational noise is predicted to be sufficiently low such that no specific mitigation measures are required.

Collectively, these measures demonstrate that the proposed development has incorporated appropriate acoustic design and mitigation to protect residential amenity and minimise potential noise impacts during both the construction and operational phases.

9 Conclusion

Wave Dynamics were engaged by D/Res as the acoustic consultants to undertake an Inward Noise Impact Assessment, Construction Noise Impact Assessment, and Operational Noise Impact Assessment for planning compliance for the proposed large-scale residential development at Summerhill, Dunboyne, Co. Meath.

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 from road noise, aircraft and railway noise. Following a review of the noise levels on the site, including the L_{AFmax} and $L_{Aeq,}$ the site has been characterised as medium – high risk for day and night, with the western/northwestern boundary occupies the high risk contour for nighttime noise levels and the medium risk contour for daytime noise levels. The remainder of the site is deemed low to medium risk during the daytime and nighttime respectively.

Consideration has been given to future road and aircraft noise levels that may subject the site to higher noise levels than those measured during the baseline noise survey. It was noted during the attended measurements that train activity was inaudible due to the presence of road traffic noise dominance at the site and the distance between the site and the M3 Parkway rail line to the east. The building envelope has been designed to ensure adequate internal noise levels for the future residents of the development from all noise sources.

Aircraft Noise Impact

The site's noise exposure was assessed by analysing 2024 Dublin Airport noise contours, noise levels measured at the development site and projected 2035 contours, which account for the new planning grant for extended nighttime flights. The report confirms that the site's existing noise levels from aircraft are lower than local road traffic noise from the R157 and the M3 and that the calculated noise levels for the project, based on 2024 flight data, align with the 2035 L_{den} and L_{night} contours. Finally, the report concludes that the proposed building's envelope and design will ensure internal noise levels are within acceptable limits for future residents.

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 and aircraft noise. Consideration has also been given to the future growth of the roads and the future nighttime flights permitted from Dublin Airport. 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 external amenity in the form of rear gardens to the houses, balconies and terraces, and several open spaces across the development. Some sections of open spaces, rear gardens and balconies or terraces facing towards the western/northwestern boundary which is adjacent to the R157 are predicted to exceed the recommended desirable levels by 3-5dB(A) L_{eq}. Appropriate amenity has been provided on the development for residents using a combination of the rear gardens, balconies and terraces, and several open spaces across the development. This is in line with element 3(v) of ProPG.

Construction Noise Impact

The construction noise impact is predicted to exceed the BS 5228 requirements **without any mitigation** measures for the Site Set Up, Substructure and Superstructure stages of the project.

General and site-specific mitigation measures have been provided in this report to bring the construction noise levels down within the limits of BS 5228. Following **the noise mitigation recommendations in this report, the construction phase is expected to meet the requirements** of BS 5228 based on the information provided to WDA.

In addition to the mitigation measures, guidance has been provided in this report for construction noise monitoring during the construction period to manage noise levels to manage construction noise.

Operational Noise

An operational noise impact assessment has been conducted to assess noise generated from plant and equipment, external amenity space usage, creche external play area and car parking movements across the development. It is predicted that operational noise from the proposed development will cause a **low impact** on the nearby noise sensitive locations during both daytime and nighttime operations. The mechanical plant and equipment specification is not available at this stage of the project. Specific noise limits have been provided in this report for mechanical plant and equipment, at design development stage once the plant and equipment information are available it should be assessed for compliance with the criteria outlined in this report.

LRD Opinion

The noise-related items raised in point 12 a. of the LRD Opinion have been addressed within this report, including consideration of inward noise impacts, external amenity noise, construction noise and vibration, and operational noise associated with the proposed development.

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 Up

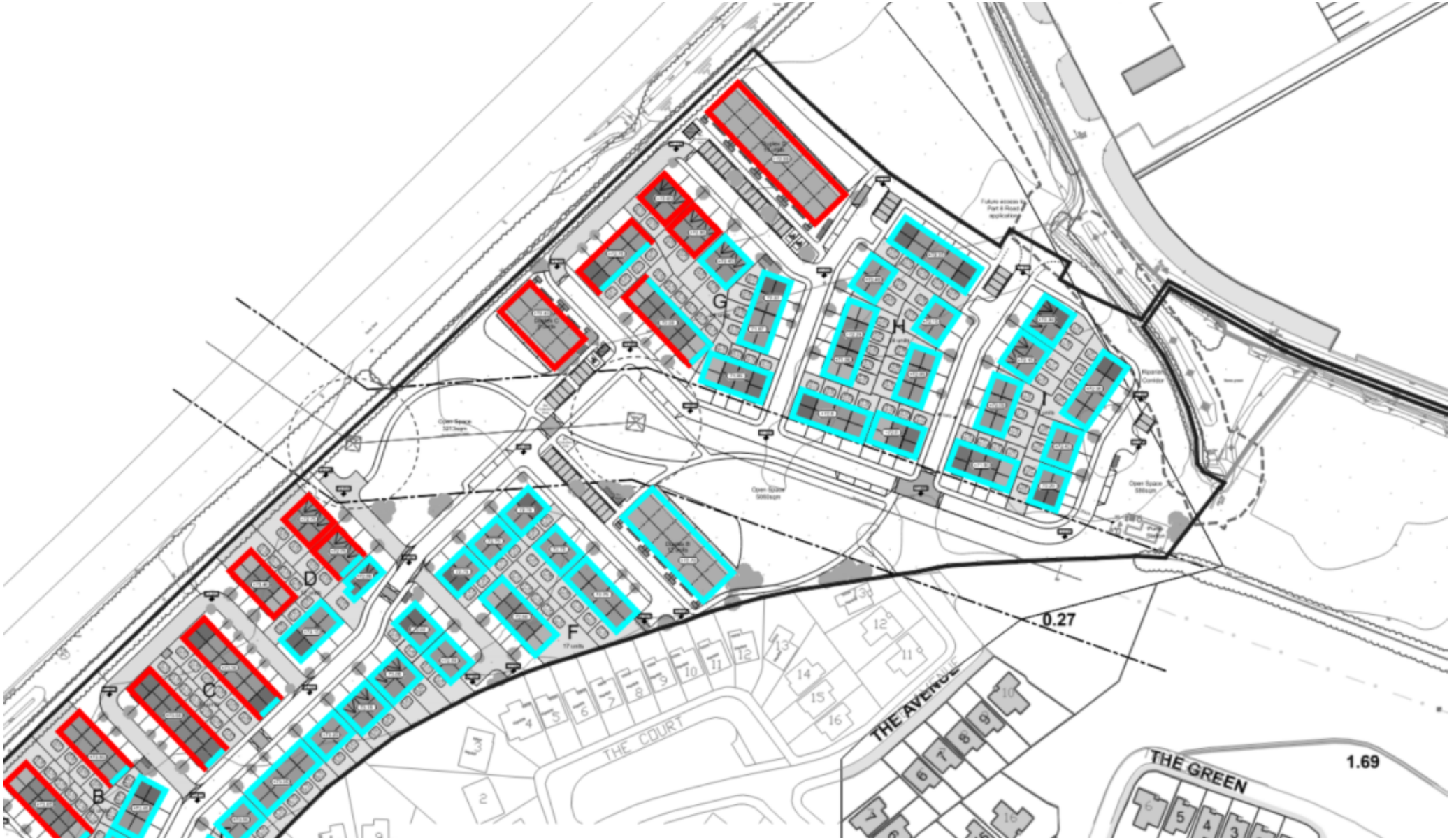


Glazed Elements Specification

- 37 dB R_w
- 29 dB R_w

WAVE DYNAMICS
ACOUSTICS MONITORING ENVIRONMENTAL

Project:	Summerhills Dunboyne
Title:	Glazing Markup Site Part 1
Prepared By:	Cathal Reck
Reviewed By:	James Cousins
Date:	27/07/2026



Glazed Elements Specification

- 37 dB R_w
- 29 dB R_w

WAVE DYNAMICS
ACOUSTICS MONITORING ENVIRONMENTAL

Project:	Summerhills Dunboyne
Title:	Glazing Markup Site Part 2
Prepared By:	Cathal Reck
Reviewed By:	James Cousins
Date:	27/07/2026