



Thornton O'Connor Town Planning

PROPOSED RESIDENTIAL DEVELOPMENT AT KARUNA & GLENINA, SANDYFORD

Noise Impact Assessment

603894 (02)

APRIL 2022

RSK

EXECUTIVE SUMMARY

RSK Ireland Limited (RSK) was instructed by Thornton O'Connor Town Planning to conduct a noise impact assessment and Acoustic Design Statement (ADS) in respect of a proposed 137 no. unit residential development at Karuna & Glenina, Sandyford.

The aim of this study is to assess the potential impacts to nearby receptors and to provide recommendations, where necessary, to the risk of nuisance arising from construction and operational phase noise and/or vibration emissions.

Baseline monitoring has found pre-existing noise levels are typical of a suburban location in the vicinity of a busy regional road. Local and distant traffic were the primary contributor to the noise environment on site. Baseline noise measurement data has been corrected to account for the impacts relating to Covid-19 restrictions.

An assessment of the potential construction phase noise impacts has been conducted, following the procedures as outlined in BS 5228-1:2009+A1:2014. At the majority of locations, and for the majority of phases, calculated noise levels are within construction noise significance thresholds. At locations closest to the site boundary, potential significant construction noise effects are predicted, this is primarily due to the short distance between the works area and these neighbouring dwellings. The adoption and implementation of the noise control measures outlined in the relevant sections of this document is expected to reduce impacts to an acceptable level.

In the developments operational phase, criteria have been set for new building services plant items in accordance with the methodologies outlined in BS 4142:2014+A1:2019. It has been concluded that the likely noise impact of the developments in its operational phase is not significant.

This report also considers the potential inward impact of road traffic on the proposed development. Assessment methodologies use guidance from *The Professional Guidance on Planning & Noise* (ProPG), May 2017. The two primary stages of the ProPG assessment are the "Stage 1" initial noise risk assessment of the proposed site and "Stage 2" detailed appraisal of the proposed development and preparation of an Acoustic Design Statement (ADS).

The site noise survey has also been used to assess the sites noise risk categories, as per the ProPG "Stage 1" assessment. The ProPG noise risk categories are as follows:

Daytime: **Medium**

Night-time: **Medium**

Recommendation to mitigate noise emissions, as specified in the "Stage 2" Acoustic Design Statement, include the following:

- Provision of glazing with minimum sound insulation properties as outlined in Table 12 (Figure 9) of this document.
- Provision of acoustic attenuation to ventilation systems for dwellings exposed to the highest levels of traffic noise (Ref Table 13).

In summary, once consideration is given to the range of mitigation measures outlined in this report, the expected noise impact of the proposed development, on existing and future residents, is not significant.



RSK GENERAL NOTES

Project No.: 603894 (02)

Title: Noise Impact Assessment for Proposed Residential Development at Karuna & Glenina, Sandyford

Client: Thornton O'Connor Town Planning

Date: 21st April 2022

Office: Dublin

Status: **FINAL**

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Date:	21 st April 2022	Date:	21 st April 2022

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Ireland Ltd.

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1 INTRODUCTION

Thornton O' Connor Town Planning instructed RSK Ireland Ltd, on behalf of Midsal Homes Limited, to conduct an assessment of the potential noise impact associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. The potential inward noise impact of traffic noise on the proposed apartments has also been considered in this report.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure its minimal impact on the receiving noise climate.

1.1 Aim and Objectives

The aim of the assessment is as follows:

- Quantify the baseline noise environment at locations that are representative of nearby noise sensitive locations.
- Provide an assessment of the likely impacts of construction and operational phase noise and/or vibration emissions to nearby receptors.
- Provide design advice and recommendations for mitigation measures, where necessary, to reduce impacts to an appropriate level.

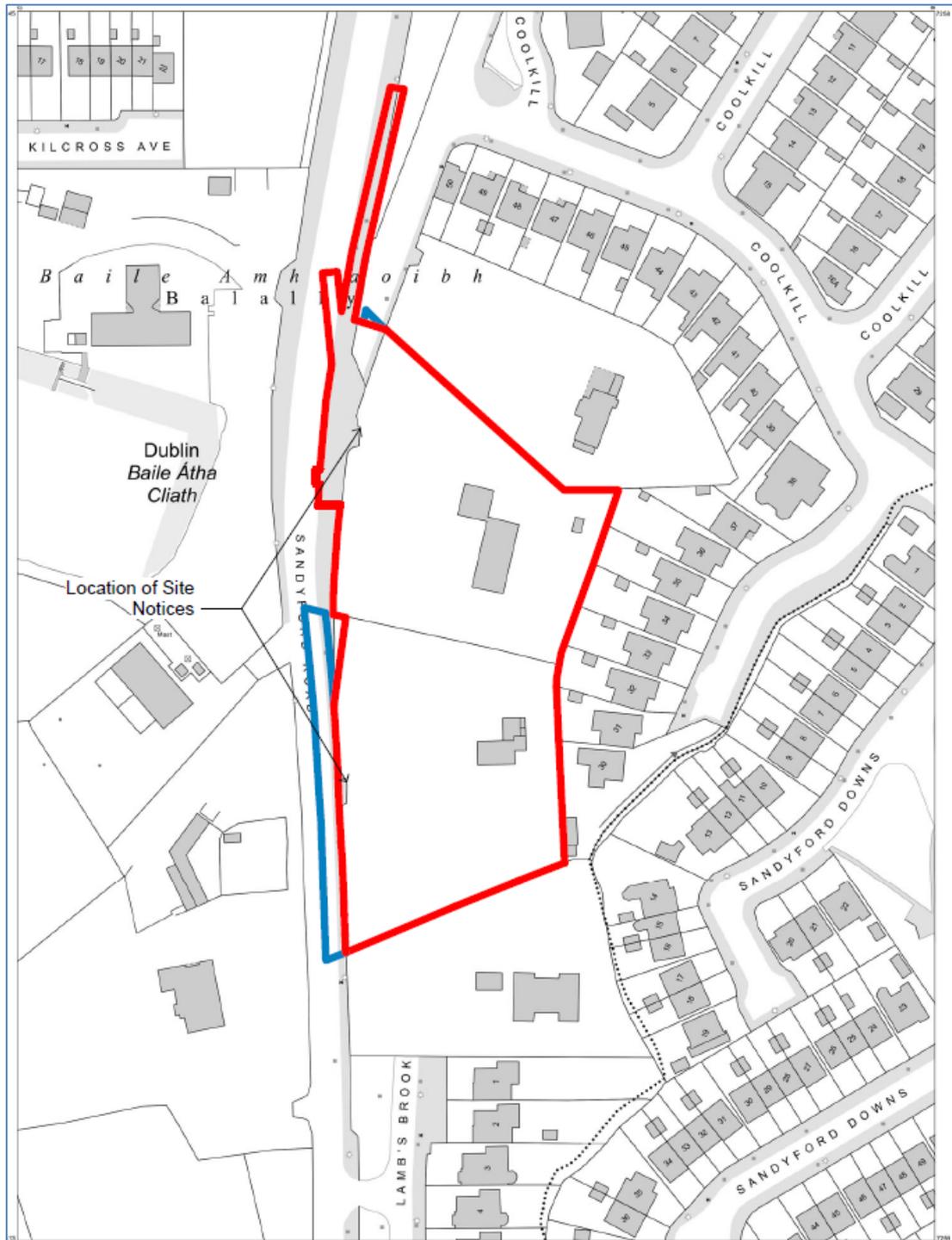
The objective of this assessment is to reduce the risk of nuisance to nearby noise sensitive locations (NSL's) resulting from construction and/or operational phase noise and/or vibration emissions and to provide a performance specification for the proposed building façade to control road traffic noise ingress to the proposed apartments.

2 THE PROPOSED DEVELOPMENT

The site is in a residential area with nearby dwellings surround the site to the north, east and south. To the west of the site is the R117 Sandyford Road.

Figure 1 shows the proposed site location in the context of the surrounding environment.

Figure 1: Existing Site in the Context of the Surrounding Environment



The development will consist of a Strategic Housing Development principally comprised of 137 No. residential units. Figure 2 shows the proposed new site layout and development plan.

Figure 2: Proposed Site Layout Plan



3 NOISE CRITERIA

In deriving noise criteria for the development, consideration has been given to the following documents:

- *Dublin Agglomeration Environmental Noise Action Plan, 2018 – 2023, Volume 2, Dún Laoghaire-Rathdown County Council (NAP).*
- *BS 5228: 2009+A1:2014 Code of practice for noise and vibration control on construction and open sites.*
- *BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.*
- *The Professional Guidance on Planning & Noise (ProPG), May 2017.*

Reference is also made to Chapters 5 (Transport and Mobility), 10 (Chapter 10 Environmental Infrastructure and Flood Risk) & 12 (Development Management) of the Dún Laoghaire-Rathdown County Development Plan 2022-2028, which provide some relevant information in relation to noise.

3.1 Construction Phase

During the construction phase, the range of activities with potential to generate noise and vibration emissions to off-site sensitive receptors will include site preparation works, demolition of the existing building, construction of the proposed development, landscaping and erection of any temporary buildings/compounds that may be required.

3.1.1 Noise

The closest neighbouring NSL's to the proposed development are the residential houses primarily to the south and east of the site. The distance between the construction site and nearby NSL's varies, the closest distance between the site and neighbouring dwelling will be approximately 13 metres. Generally, construction works will occur between 15 and 35 metres from existing dwellings, depending on the location where specific works are occurring.

Whilst no specific construction noise limits are set by Dun Laoghaire - Rathdown County Council, the *Dublin Agglomeration Noise Action Plan 2018 to 2023, Volume 2 Dun Laoghaire- Rathdown County Council* states the following in relation to construction phase noise emissions:

"8.2.6 Noise Complaint Investigation and Control procedures

Although the noise maps and the Environmental Noise Regulations are aimed at developing strategic policy, it is acknowledged that when most people complain about noise, it relates more to local issues such as neighbour, entertainment and construction noises. However, it is envisaged that this noise action plan should solely concentrate on strategic issues identified by the noise mapping as systems are already in place to deal with noise nuisances, including neighbour, entertainment and construction noises. Local noise issues will be dealt with by each Local Authority as required by the Environmental Protection Agency Act 1992 (EPA Act 1992).

In lieu of no official guidance by Dun Laoghaire-Rathdown County Council on construction sites reference is made to the "Industry Standard" guidelines in relation to construction phase noise

i.e. BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites.*

BS 5228:2009+A1:2014 is considered to represent the industry standard methodology for the assessment of construction noise and describes two methods for deriving noise significance thresholds for construction sites.

BS 5228:2009+A1:2014 (Appendix E.1) describes a method for identifying ‘*Potential significance based upon noise change*’. Following this methodology, BS 5228:2009+A1:2014 designates a noise sensitive location (NSL) into a specific category based on pre-existing ambient noise levels and then sets a threshold noise value that, if exceeded, indicates a significant construction noise impact.

Table 1 presents the threshold values for significant noise impacts for weekday daytime and Saturday morning activity.

Table 1 BS5228 Construction Noise Thresholds for Significant Effects

Assessment category and threshold value period (LAeq)	Threshold value, in decibels (dB)		
	Category A ^A	Category B ^B	Category C ^C
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

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

Annex E.2 of BS 5228-1:2009+A1:2014 also provides the following comments in relation to ‘*Potential significance based on fixed noise limits*’:

“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. The noise can be measured with a simple sound level meter, as we hear it, in A-weighted decibels (dB(A))– see note below. 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 and urban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*

These limits are for daytime working outside living rooms and offices. In noise-sensitive situations, for example, near hospitals and educational establishments – and when working outside the normal hours say between 19.00 and 22.00 hours – the allowable noise levels from building sites will be less: such as the reduced values given in the contract specification or as advised by the Environmental Health Officer (a reduction of 10 dB(A) may often be appropriate). Noisy work likely to cause annoyance locally should not be permitted between 22.00 hours and 07.00 hours.”

Taking account of the measured ambient noise levels and BS5228 significance thresholds, the recommended noise limits for construction activity are as follows:

<i>Monday to Friday</i>	<i>07.00 – 19.00</i>	<i>70 dB L_{Aeq,11hrs}</i>
<i>Saturday</i>	<i>08.00 – 14.00</i>	<i>70 dB L_{Aeq,6hrs}</i>

The proposed construction working hours have been amended from those proposed in BS5228 (i.e. Mon-Fri 07:00-19:00hrs and Saturday 07:00-13:00hrs) to the guideline standard times outlined in Section 12.9.5 of the Dún Laoghaire-Rathdown County Development Plan 2022-2028 (i.e. Mon-Fri 07:00-19:00hrs and Saturday 08:00-14:00hrs¹). It is assumed that construction works will take place during the above working hours only.

3.1.2 Vibration

Following the same approach, BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites*. *Vibration* recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above.

The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. The recommended construction vibration criteria are presented in Table 2.

Table 2 Vibration Criteria During Construction Phase

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:-		
Less than 15Hz	15 to 40Hz	40Hz and above
15 mm/s	20 mm/s	50 mm/s

¹ ref. <https://www.dlrcoco.ie/en/environment/noise-pollution>

3.2 Operational Phase

3.2.1 Plant Noise Levels

Reference is made to British Standard BS4142:2014+A1:2019: ‘*Methods for Rating and Assessing Industrial and Commercial Sound*’ in setting criteria for any new mechanical plant items. This standard outlines methods for analysing building services plant sound emissions to residential receptors. BS 4142:2014 is frequently referenced in DCC Planning Conditions and is considered the relevant assessment standard for noise from mechanical plant items in the Dublin region.

BS4142:2014 describes methods for rating and assessing sound of an industrial and/or commercial nature, using outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling upon which the sound is incident.

The BS4142:2014 assessment methodology compares the measured external background sound level (in the absence of plant items) to the rating sound level, of the plant items, when operational. Where sound emissions are found to be tonal, impulsive, intermittent or to have other sound characteristics that are readily distinctive against the residual acoustic environment, BS4142:2014 advises that penalties be applied to the specific level to arrive at the rating level.

Based upon measured day and night-time background sound levels on the site (as referred in Section 4.0), appropriate plant noise criteria to nearby dwellings are as follows:

- Daytime (07:00 to 23:00hrs) 50 dB $L_{Aeq,1hr}$
- Night-time (23:00 to 07:00hrs) 40 dB $L_{Aeq,15-min}$

Plant noise emissions should not contain any characteristics that would warrant any acoustic feature penalties under the BS 4142:2014 assessment procedure.

3.3 Inward Noise Impact

3.3.1 Dublin Agglomeration Environmental Noise Action Plan (2018 – 2023): Volume 2, Dun Laoghaire – Rathdown County Council

With regard to inward noise impact on the proposed dwellings reference is made to The *Dublin Agglomeration Environmental Noise Action Plan, December 2018 – July 2023, Volume 2, Dún Laoghaire-Rathdown County Council* (NAP) provides guidance for the scenario whereby a residential development is proposed in an area exposed to pre-existing levels of environmental noise. Section 8.2.3 discusses *Noise in the Planning Process*, and this section is reproduced below:

“8.2.3 Noise in the Planning Process

The planning system has the potential to exercise a significant influence on the control of future exposure to environmental noise and can play a key role in the improvement of amenity. The appropriate use of the planning system can help avoid, or minimise, the adverse impacts of noise without placing unreasonable restrictions on development. Scope exists within the planning and development management process to manage increased levels of noise arising from new development where exposure levels can be harmful to health.

There are two main scenarios in development where noise could be considered as being a material issue, namely:

1) Introducing people into potentially noisy areas through the provision new residential housing, hospital, schools nursing homes etc in the vicinity of existing road rail industrial or airport noise, or where there are potential high levels of noise with buildings or in adjoining gardens or public open spaces.

2) Introducing potentially noisy developments such as new or altered roads, railways, industrial sites, and airports, commercial or large sporting recreational developments into the vicinity of noise sensitive locations.

In the scenario where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise, there is currently no clear national guidance on appropriate noise exposure levels. The EPA has suggested that in the interim that Action Planning Authorities should examine the planning policy guidance notes issued in England titled, „ProPG Planning and Noise: Professional Practice Guidance on Planning and Noise“. This has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England”.

The noise levels measured on site will therefore be compared to relevant guidance for assessing the suitability of the site for residential development i.e. ProPG: *ProPG: Professional Practice guidance on Planning and Noise for new Residential Development* (May 2017).

3.3.2 Dún Laoghaire-Rathdown County Development Plan 2022-2028

Section 12.9.2 *Noise Pollution and Noise Nuisance* of the Dún Laoghaire-Rathdown County Development Plan 2022-2028 states the following in relation to a scenario where a residential development is located in an area potentially exposed to environmental noise sources.

“To require developers to produce an Acoustic Design Assessment (informed by guidance such as is set out in ‘ProPG Planning and Noise’, 2018, as referenced in the ‘Dublin Agglomeration Noise Action Plan 2018 – 2023’), where a noise-sensitive use is proposed in an area that may have high pre-existing environmental sound levels”.

3.3.3 ProPG: Professional Practice Guidance on Planning and Noise for new Residential Development

ProPG provides a two staged approach for evaluating noise exposure on a proposed residential development. The two stages of the approach can be summarised as follows:

Stage 1 - Involves a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels.

Stage 2 – Involves a full detailed appraisal of the proposed development covering four “key elements” that include.:

Element 1 - Good Acoustic Design Process;

Element 2 - Noise Level Guidelines;

Element 3 - External Amenity Area Noise Assessment, and;

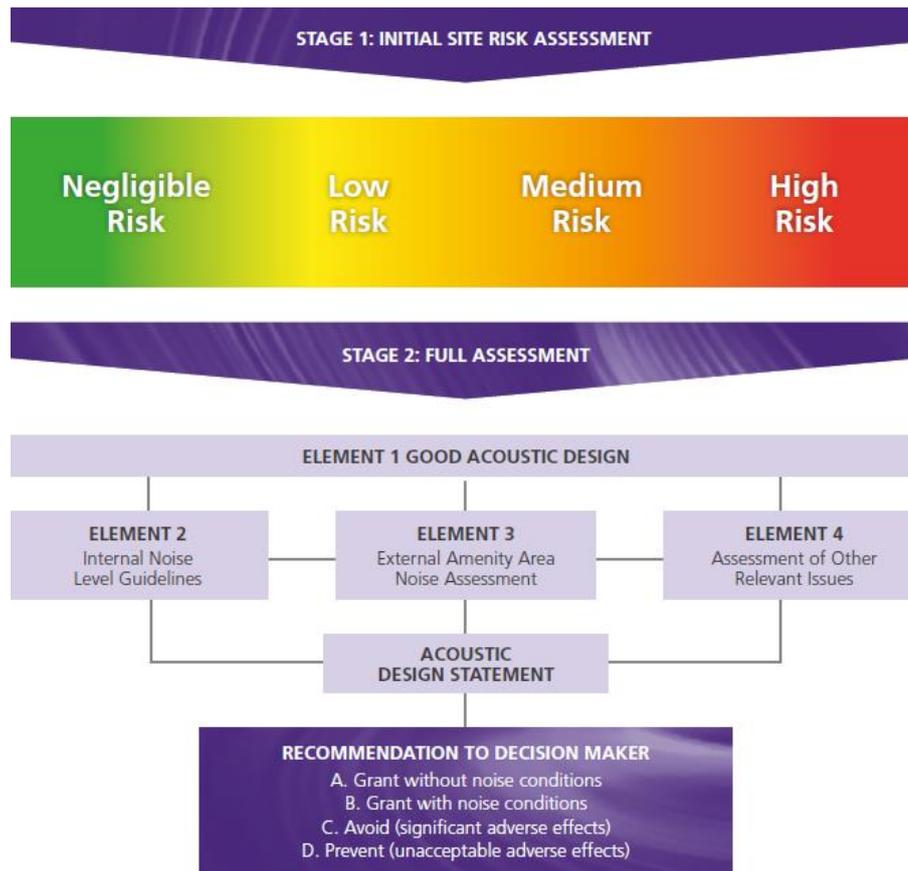
Element 4 - Other Relevant Issues.

An Acoustic Design Statement (ADS) is then prepared for submission to the planning authority. This ADS outlines the findings of the Stage 1 and Stage 2 assessments; and allows the planning authority to make an informed decision on the suitability of the site for development, with consideration of noise control measures where required. The ProPG document outlines the following potential outcome with respect of the ADS:

- 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”).

A summary of the ProPG approach is illustrated in Figure 3.

Figure 3: ProPG Assessment Strategy (Source: ProPG)



3.3.4 ProPG and BS 8233 *Guidance on sound insulation and noise reduction for buildings*

BS 8233 is referenced in ProPG with regard to internal noise levels within the proposed new dwellings. The following internal noise targets are presented as derived from BS 8233 (2014).

Table 3: ProPG Internal Noise Targets (derived from BS 8233:2014)

Activity	Location	Daytime (07:00 to 23:00hrs)	Night-time (23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$ *

* internal $L_{Amax,T}$ noise level may be exceeded up to 10 times per night without a significant impact occurring.

4 BASELINE NOISE SURVEY

Environmental noise surveys have been conducted on site in order to establish the baseline noise environment. Noise surveys have been conducted in accordance with ISO 1996-2:2017 “Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of sound pressure levels”.

4.1 Monitoring Location

Unattended noise measurements were conducted at Location N1. The approximate noise measurement location is shown in Figure 4. A photograph of the measurement position can be seen below.

Figure 4: Proposed Site Plan Showing Baseline Monitoring Position



Location N1 to the west of the site with the microphone positioned at a location representative of the proposed development facade that is closest to the R117 Sandyford Road. This noise survey position comprised of unattended monitoring for an approximate 7-day period. Noise data captured at this location is used as reference in order to estimate noise levels at the proposed development façade closest to the R117 during both day and night-time periods.



4.2 Survey Periods

Noise measurements were conducted over the source of the following periods:

Table 4: Noise Survey Periods

Period	Location	Date	Start Time	Stop Time
Daytime 07:00 – 23:00hrs	N1	04 Nov – 11 Nov 2021	04 Nov at 17:00	11 Nov at 19:00
Night-time 23:00 – 07:00hrs	N1	04 Nov – 11 Nov 2021	04 Nov at 23:00	11 Nov 07:00

4.3 Weather

The weather during the unattended survey of 4th to 11th November 2021 is summarised as follows (ref. <https://www.met.ie/climate/available-data/daily-data>) from the Casement met station.

Table 5: Weather Conditions

Date	Period	Temperature Degrees Celsius	Precipitation	Wind Speed m/s	Wind Direction
04/11	Daytime	4 – 10	No	2 – 5	W
04-05/11	Night- time	6 – 8	No	3.5 – 5	SW
05/11	Daytime	8 – 11	No	4.5 – 6.5	WSW
05-06/11	Night-time	8 – 9	No	7 – 10	SW
06/11	Daytime	7 – 14	No	7 – 14	W
06-07/11	Night-time	6 – 7	No	6 – 7	WSW
07/11	Daytime	4 – 11	No	1 – 7	WSW
07-08/11	Night-time	9 – 12	No	2 – 7	SSW
08/11	Daytime	12 – 16	No	7 – 10	SW
08-09/11	Night-time	13 – 14	No	8 – 10	SSW
09/11	Daytime	8 – 14	No	3 – 6	SW
09-10/11	Night-time	6.5 – 10	No	2.5 – 5	WSW
10/11	Daytime	6.5 – 11	No	1.5 – 3.5	WSW
10-11/11	Night-time	6 – 9	No	0 – 3	SE
11/11	Daytime	9 -14	No	1 – 11.5	SSW

In line with best practice, periods of rain and elevated winds have been omitted from the study.

4.4 Instrumentation

The noise measurements were undertaken using the following equipment.

Table 6: Survey Equipment

Equipment	Type	Serial No.
Class 1 Sound Level Meter	Bruel & Kjaer 2250	211108

The equipment used has a calibration history that is traceable to a certified calibration institution. The calibration of the sound level meter was field checked prior to commencing measurements and prior to removing the equipment from site upon completion. A calibration drift of -0.1dB was noted upon commencement of the survey and +0.1 upon survey completion. The sound level meter calibration certificates are available on request.

The sound level meter conformed to the Class 1 requirements of BS EN 61672-1:2013 'Electroacoustics. Sound level meter, Specifications'. The calibrator used conforms to the requirements of BS EN IEC 60942:2018 'Electroacoustics. Sound calibrators'.

4.5 Measurement Parameters

The noise survey results are presented in decibels (dB), using the following parameters:

$L_{Aeq,T}$	is the equivalent continuous sound level and is used to describe a fluctuating sound as a single value over the sample period (T).
$L_{AFmax,T}$	The maximum A-weighted sound pressure level occurring within a specified time period (T). Measured using the "Fast" time weighting.
$L_{AF10,T}$	Refers to those A-weighted noise levels in the top 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period (T). It is used to determine the intermittent high noise level features of locally generated noise and usually gives an indicator of the level of road traffic. Measured using the "Fast" time weighting.
$L_{AF90,T}$	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval (T). It is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to describe a background level without contribution from intermittent sources.

All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa. Noise measurements use a reference time period (T) of 15-minutes.

4.6 Measurement Results

4.6.1 Location N1

Table 7 summarises the measured daytime (i.e. 07:00 to 23:00) noise levels at Location N1.

Table 7: Measured Daytime Noise Levels at Location N1

Period	Date	Time	Measured Noise Levels (dB re. 2×10^{-5} Pa)				Notes
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
Daytime	04/11 Thu	17:00-23:00	62	85	66	52	Road traffic dominant
	05/11 Fri	07:00-23:00	63	82	66	53	
	06/11 Sat		63	84	66	54	
	07/11 Sun		62	80	65	51	
	08/11 Mon		62	80	66	54	
	09/11 Tue		62	86	65	51	
	10/11 Wed		62	83	66	51	
	11/11 Thur		07:00-19:00	63	87	66	

The daily daytime ambient noise levels were in the range 62 to 63 dB $L_{Aeq,16hr}$. Road traffic movements were noted to be the dominant source of noise at this measurement position.

Table 8 summarises the measured night-time (i.e. 23:00 to 07:00hrs) noise levels at Location N1.

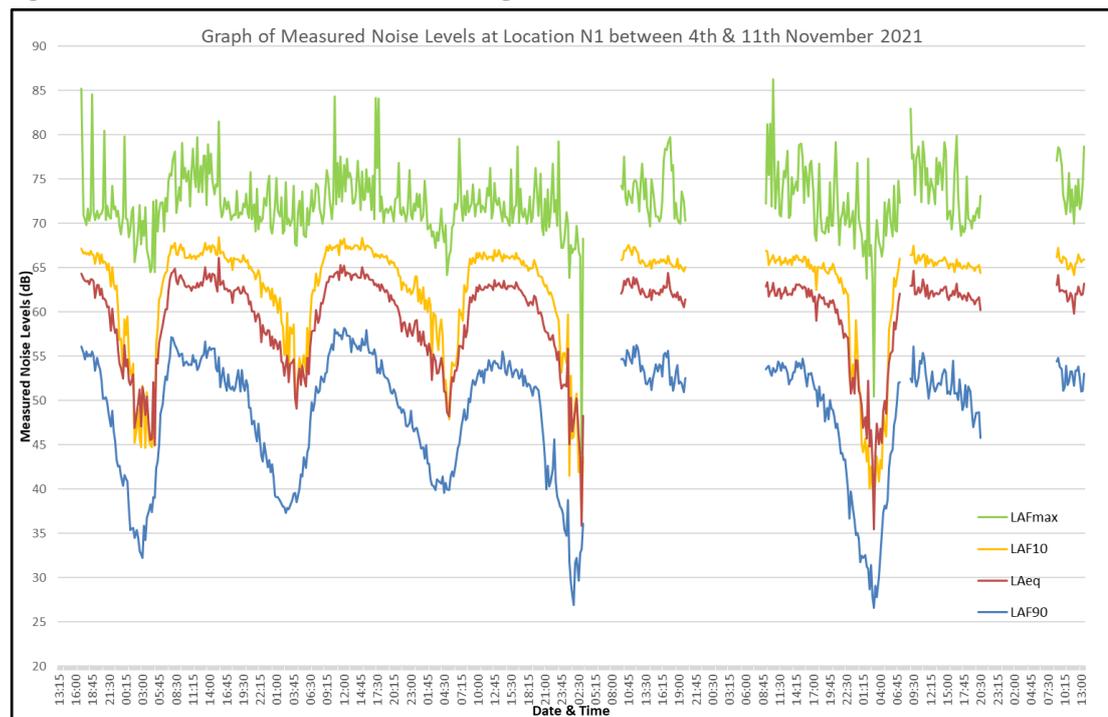
Table 8: Measured Night-time Noise Levels at Location N1

Period	Date	Time	Measured Noise Levels (dB re. 2×10^{-5} Pa)				Notes
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
Night-time	04-05/11	23:00 - 07:00	54	80	53	40	Local and distant road traffic dominant
	05-06/11		55	75	58	41	
	06-07/11		55	75	58	43	
	07-08/11		51	79	50	34	
	08-09/11		Elevated winds (data omitted)				
	09-10/11		53	77	50	36	
	10-11/11		Elevated winds (data omitted)				

The night-time ambient noise levels were in the range 51 to 55 dB $L_{Aeq,8hr}$. Local and distant road traffic were dominant noise sources during night-time periods.

Figure 5 shows the time-history graph of measured noise levels between 23rd November and 1st October 2021 at Location N1.

Figure 5: Profile of Baseline Noise Monitoring Results at Location N1



4.7 Traffic Flows

4.7.1 Impact of Covid-19 on Traffic Flows

Due to the Covid-19 pandemic, there have been reduced traffic flows on many roads around the country. Corrections have therefore been applied in order to account for the potential impact that reduced traffic flows may have had on the baseline noise survey.

At the time of the baseline noise survey (i.e. Sept/Oct 2021) there had been a general easing of travel restrictions and this was apparent upon conducting the site baseline noise surveys whereby the surrounding road network was witnessed to be generally busy.

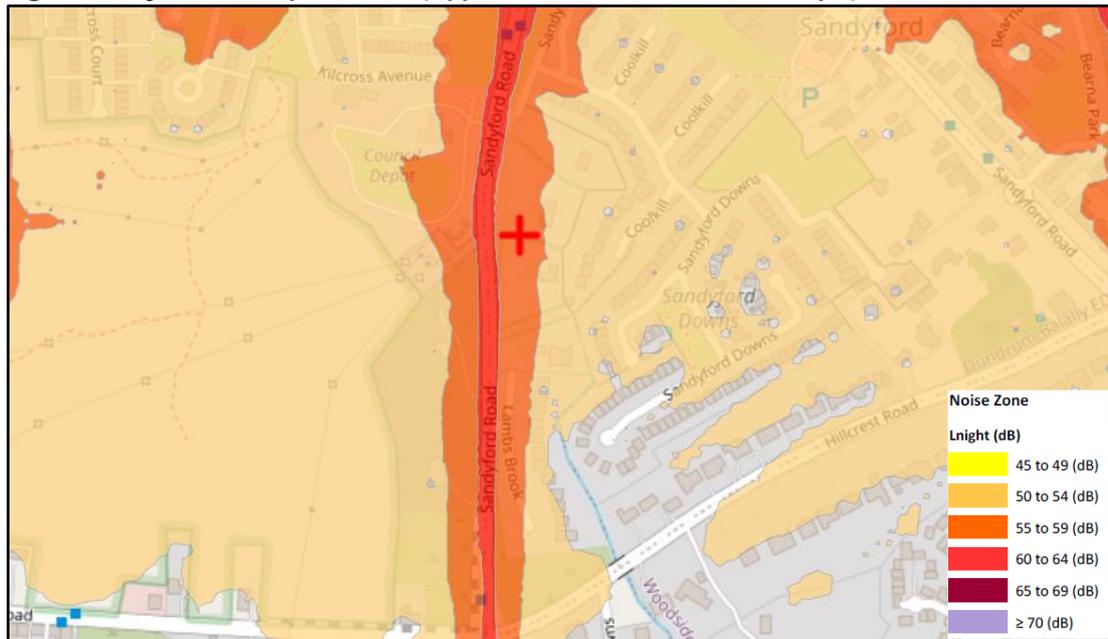
Using the guidance outlined in the *Calculation of Road Traffic Noise* (CRTN), 1988, (HMSO), it is noted that a doubling of traffic flows on a road can be expected to increase noise levels by approximately 3dB. As the road network was witnessed to be generally busy, this would indicate that any change in noise level due to reduced traffic flows would be relatively small (i.e. less than 3dB), depending on the extent of the reduced traffic flows over the week of the baseline noise survey.

Information in relation to the traffic flow numbers for surrounding road network would be required for both the period of the baseline noise survey, and for a similar period pre-Covid-19, in order to provide a calculation of the expected reduction (if any) of noise levels that may be attributed to temporarily reduced traffic flows. This information was not available to assist with this review. However, in order to investigate this further, reference is made to published noise mapping and a comparison is made between the day and night-time noise levels measured at the unattended noise monitoring location N1, and night-time noise mapping noise levels on the site at the approximate same location.

4.7.2 EPA Published Noise Mapping

Reference is also made to published noise mapping available on the EPA website (ref. <https://gis.epa.ie/EPAMaps/>) for the proposed site. Figure 6 present the published noise mapping in terms of the calculated L_{night} values for Road Traffic Sources.

Figure 6: L_{night} Noise Map, Round 3 (Approx. Site Location Indicated by +)



The L_{night} noise mapping values may be discussed in the context of the measured values, in order to provide a comparison between on-site measurement data and noise mapping data. Figure 6 indicates L_{night} values of approx. 55 to 59 dB at the location of the noise monitoring location N1. Reference to Table 8 presents measured night-time noise levels in the range 51 to 55 dB $L_{\text{Aeq},23:00}$ – 08:00hrs. The EPA noise mapping data will be considered in preparation of the façade sound insulation performance specification.

5 ASSESSMENT OF CONSTRUCTION IMPACTS

The following sections discuss the methodologies followed in conducting the construction noise assessment and arriving at the various requirements for noise mitigation.

5.1 Noise Calculation Details

Calculations are made in accordance with BS 5228-1:2009+A1:2014, taking into account a range of factors affecting the propagation of sound, including:

- the sound power level (dB L_w) of the sound source;
- the % of time that the sound source operates;
- the height of the sound source;
- the direction and angle that the source is pointing;
- the distance between the sound source and the receiver;
- the provision of obstacles such as buildings and/or barriers in the path between the source and receiver;
- the presence of sound reflecting/absorbing surfaces;

The noise calculations were generated from a plan of the proposed site and nearby buildings, with building heights, noise source heights and receiver locations derived from site sectional/elevation drawings. Noise levels are then calculated to specific receiver locations (i.e. nearby residential receptors) for comparison to the projects' noise significance thresholds.

5.2 Phases Considered in Noise Assessment

BS 5228-1:2009+A1:2014 provides catalogue of noise levels for various construction plant, machinery and activity that can be used for the prediction of noise levels. This allows for an assessment of the likely impacts of construction activity to nearby receptors.

Table 9 presents construction plant items that are typical for a site of this nature, along with the reference noise emission values.

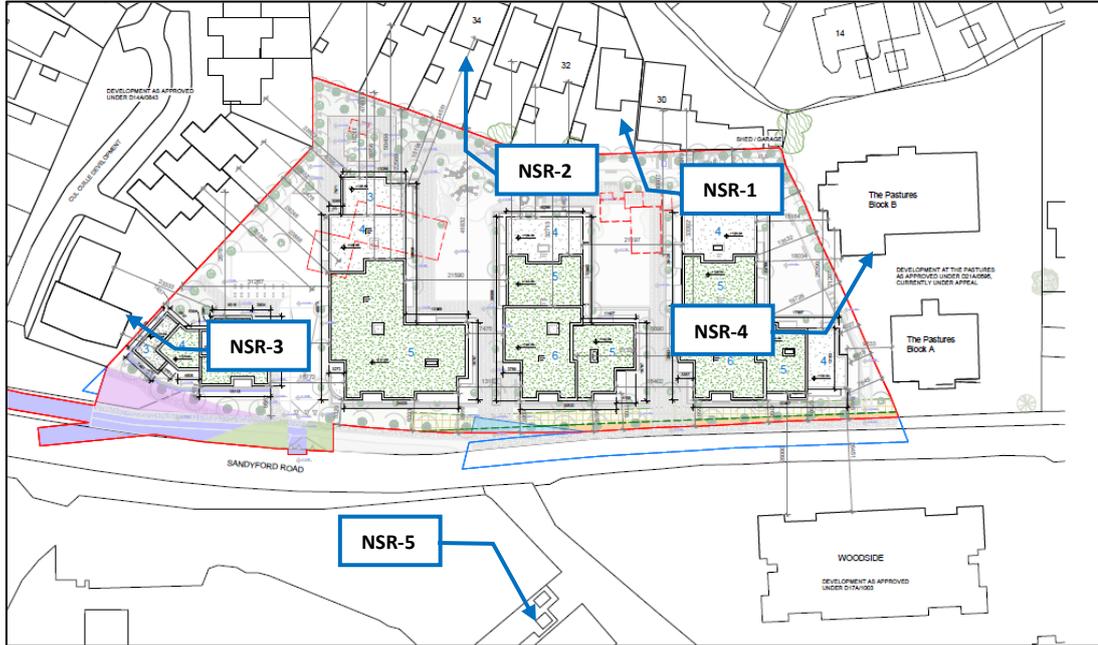
Table 9: Typical Construction Plant Items and Reference Noise Emission Values

Phase	Item of Plant (BS 5228-1 Ref.)	Reference Sound Power Level dB L _{WA}	Sound Level at Reference Distance (10m) dB L _{Aeq,1hr}
(i) Site Clearance / Preparation	Wheeled Loader Lorry (C2.28)	105	76
	Diesel Generator (C4.76)	89	61
	Track Excavator (C2.22)	100	72
	Dozer (C2.13)	106	78
	Dump Truck (C4.2)	106	78
(ii) Foundation Formation	Bored Pile, Crane Mounted Auger (D4.39)	112	82
	Track Excavators (C2.22)	100	72
	Wheeled Loader Lorry (C2.28)	105	76
	Concrete Pump (C3.25)	106	78
	Compressor (C3.19)	103	75
	Poker Vibrator (C4.33)	106	78
(iii) General Construction	Tower Crane (C4.48)	104	76
	Articulated lorry (C11.10)	105	77
	Hand tools	109	81
	Pneumatic Circular Saw (D7.79)	103	75
	Internal fit-out	97	70
(iv) Landscaping	Dozer (C2.13)	106	78
	Dump Truck (C4.2)	106	78
	Road Roller (D8.27)	104	76

5.3 Assessment of Predicted Construction Noise Levels

Construction noise levels are predicted, for the four scenarios presented in Table 9, to the following receptors.

Figure 7: Receptors for Construction Noise Impact Assessment



Calculations assume that the equipment 'on-time' will be ~66% of a typical working day, and that a standard 2.5-metre high site hoarding will be provided around the site perimeter.

Table 10 summarises the construction noise predictions to each location, and comparison to the noise significance thresholds.

Table 10: Assessment of Predicted Construction Noise Levels

Location	Construction Phase	Predicted Construction Noise Level dB L _{Aeq,T}	Construction Noise Significance Threshold dB L _{Aeq,11hrs}	Complies?
NSR-1 (Dwelling)	(i) Site Clearance / Preparation	72	70	x
	(ii) Foundation Formation	75		x
	(iii) General Construction	73		x
	(iv) Landscaping	71		x
NSR-2 (Dwelling)	(i) Site Clearance / Preparation	64	70	✓
	(ii) Foundation Formation	67		✓
	(iii) General Construction	65		✓
	(iv) Landscaping	63		✓
NSR-3 (Dwelling)	(i) Site Clearance / Preparation	72	70	x
	(ii) Foundation Formation	75		x
	(iii) General Construction	73		x
	(iv) Landscaping	71		x
NSR-4 (Potential Future Dwellings)	(i) Site Clearance / Preparation	72	70	x
	(ii) Foundation Formation	75		x
	(iii) General Construction	73		x
	(iv) Landscaping	71		x
NSR-5 (Dwelling)	(i) Site Clearance / Preparation	55	70	✓
	(ii) Foundation Formation	58		x
	(iii) General Construction	57		x
	(iv) Landscaping	55		x

At the majority of locations, and for the majority of phases, calculated construction noise levels are within the noise significance thresholds.

At locations NSR-1, NSR-3 & NSR-4, potential significant noise effects are predicted for the majority of construction phases; this is primarily due to the short distance between the works area and the dwelling at these locations.

Noise mitigation measures that can be expected to further reduce construction phase noise impacts are presented in the following sections.

The proposed approach for construction noise management involves the following items:

- A review of noise sensitive locations in the vicinity of the site;
- Review of baseline noise levels at noise sensitive locations;
- Noise modelling of construction activities;

- Ongoing noise and vibration monitoring during construction;
- Implementation of best practice noise control measures, and;
- Regular noise control audits.

Further details in respect of these and other considerations are provided below. This report and associated recommendations shall be considered in conjunction with the detailed guidance set out in BS 5228:2009+A1:2014 .

5.4 Construction Noise & Vibration Mitigation

5.4.1 Noise Monitoring

It is recommended that continuous construction noise monitoring be provided, to be maintained on an ongoing basis by the contractor for the duration of the project.

It is proposed that a noise monitor be installed at the site boundary adjoining the dwelling at NSR-1 and/or NSR-3. The noise monitoring equipment shall meet the following minimum specification (or similar approved):

- Logging of hourly L_{Aeq} & L_{AFMax} samples;
- E-mail alert on threshold exceedance;
- E-mail alert on low battery and low memory;
- Remote access to measured data, and;
- Live display of noise levels.

Data shall be reported on a monthly basis.

5.4.2 Introducing New Noise Sources onto the Site

It is required that the contractor considers potential noise emissions and associated impacts prior to selecting a new plant item to be used on the site.

Where practicable, preference should always be given to the unit with the lowest noise output. This may necessitate the use of manufacturers' proprietary acoustic enclosures or other forms of noise control.

If there are any concerns in relation to the level of noise emissions from an item of plant already on the site, or if there is doubt over the output from an item that has recently been introduced, this should be investigated by way of in-situ noise level measurements.

5.4.3 Noise Control Audits

It is required that the Contractor conduct regular noise control audits throughout the construction programme. The audits will ensure that all appropriate steps are being taken to control construction noise emissions, including:

- hours of operation being correctly observed;
- opportunities for noise control “at source”;
- optimum siting of plant items;
- plant items being left to run unnecessarily;
- correct use of proprietary noise control measures;
- materials handling;
- poor maintenance, and;
- correct use of screening provided and opportunities for provision of additional screening.

The outcome of noise control audits shall be reported on a monthly basis.

5.4.4 Best Practice Guidelines for the Control of Construction Noise & Vibration

BS5228 provides guidance on construction site noise mitigation, including the following:

- liaison with neighbours;
- noise monitoring;
- hours of work;
- selection of quiet plant;
- control of noise sources, and;
- screening.

Noise control measures that will be considered include the selection of suitable plant, enclosures and screens around noise sources, limiting the hours of work and ongoing monitoring.

Liaison with Neighbours

The Contractor shall be proactive in engaging with neighbours and notify occupants of the closest noise sensitive locations before the commencement of any works forecast to generate appreciable levels of noise, explaining the nature and duration of the works.

A designated noise liaison should be appointed by the contractor for the duration of the construction works. This person should log any complaints and follow up in a prompt fashion.

Noise & Vibration Monitoring

Noise and vibration monitoring should be conducted throughout the construction period. The noise monitoring programme should be complemented by regular noise control audits.

Hours of Work

The proposed hours for site operation are Monday to Friday, 07.00 – 19.00 and Saturdays, 08.00 – 14.00.

Selection of Quiet Plant

Consideration must be given to the noise emission levels of plant items when they are being considered for use on the site.

Control of Noise Source

If the use of low noise plant or replacing a noisy item of plant are not viable or practicable options, consideration shall be given to noise control “at source”.

This refers to the modification of an item of plant or the application of improved sound reduction methods, in consultation with the supplier.

BS5228 states that “*as far as reasonably practicable sources of significant noise should be enclosed*”. In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators.

Demountable enclosures that could be moved around site as necessary may also be used to screen operatives using hand tools, such as Angle Grinders.

Proposed techniques should also be evaluated with regard to their potential effect on occupational health and safety.

BS5228 makes a number of recommendations in relation to “*use and siting of equipment*”. These recommendations should be fully implemented on the site.

“Plant should always be used in accordance with manufacturers’ instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.

Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.

Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.

Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material.”

All items of plant should be subject to regular maintenance to prevent unnecessary increase in plant noise.

Screening

The use of screens can be effective in reducing noise to a receiver. The effectiveness of an acoustic screen will depend on the height and length of the screen and its position relative to both the source and receiver. To be effective, the height and length of any screen should be such that there is no direct line of sight between the source and the receiver.

BS5228 advises screens should be placed as close as possible to either the source or the receiver. The construction of the screen should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the barrier rather than the transmission through the barrier itself. Screens constructed of materials with a surface mass greater than 10kg/m² typically offer adequate sound insulation performance.

Annex B of BS5228 (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials. BS5228 Figure B2 is included below for information purposes.

Figure B.2 Typical acoustic shed

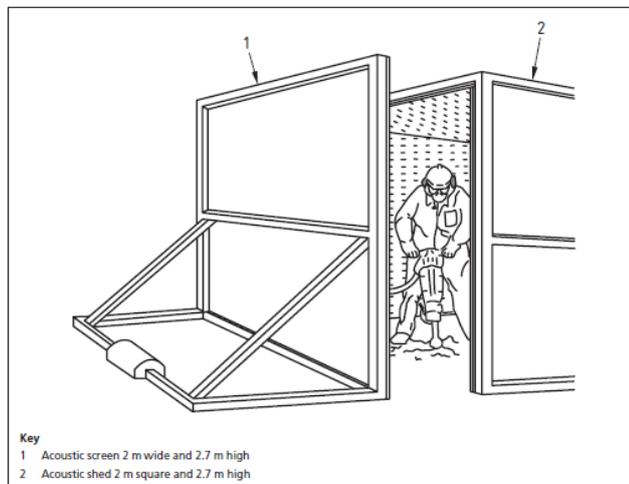


Table B.4 Measured sound reduction given by types of partial enclosure

Type of enclosure (see Figure B.3)	Reduction dB(A)		
	Facing the opening(s)	Sideways	Facing rear of shed
Open-sided shed lined with absorbent material; no screen	1	9	14
Open-sided shed lined with absorbent material; with reflecting screen in front	10	6	8
Open-sided shed lined with absorbent material; with absorbent screen in front	10	10	10

6 ASSESSMENT OF OPERATIONAL PHASE IMPACTS

6.1 Plant Noise Emissions from Proposed Development

Reference is made to British Standard BS4142:2014+A1: 2019 in setting criteria for any new mechanical plant items. This standard outlines methods for analysing building services plant sound emissions to residential receptors. BS 4142 is frequently referenced in Planning Conditions and is widely considered the 'industry standard' methodology for the assessment of industrial noise in the Dublin region.

Based upon measured day and night-time background sound levels on the site, appropriate plant noise criteria to nearby dwellings are as follows:

- Daytime (07:00 to 23:00hrs) 50 dB $L_{Aeq,1hr}$
- Night-time (23:00 to 07:00hrs) 40 dB $L_{Aeq,15-min}$

Plant noise emissions should not contain any characteristics that would warrant any acoustic feature penalties under the BS 4142:2014 assessment procedure.

At detailed design stage, noise emissions from new plant servicing the development shall be designed so as not to exceed the above limit values.

6.2 Impact of Existing Traffic Noise Sources on the Proposed Development

ProPG outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels, and;

Stage 2 – Involves a full detailed appraisal of the proposed development covering four “key elements” that include:

- Element 1 - Good Acoustic Design Process;
- Element 2 - Noise Level Guidelines;
- Element 3 - External Amenity Area Noise Assessment, and;
- Element 4 - Other Relevant Issues.

ProPG is intended to outline the methodology and findings of the assessments, so as the planning authority can make an informed decision on the permission. ProPG outlines the following possible recommendations in relation to the findings:

- 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”).

The following sections present the results of both the Stage 1 and Stage 2 studies.

6.2.1 ProPG Stage 1 (Initial Noise Risk Assessment)

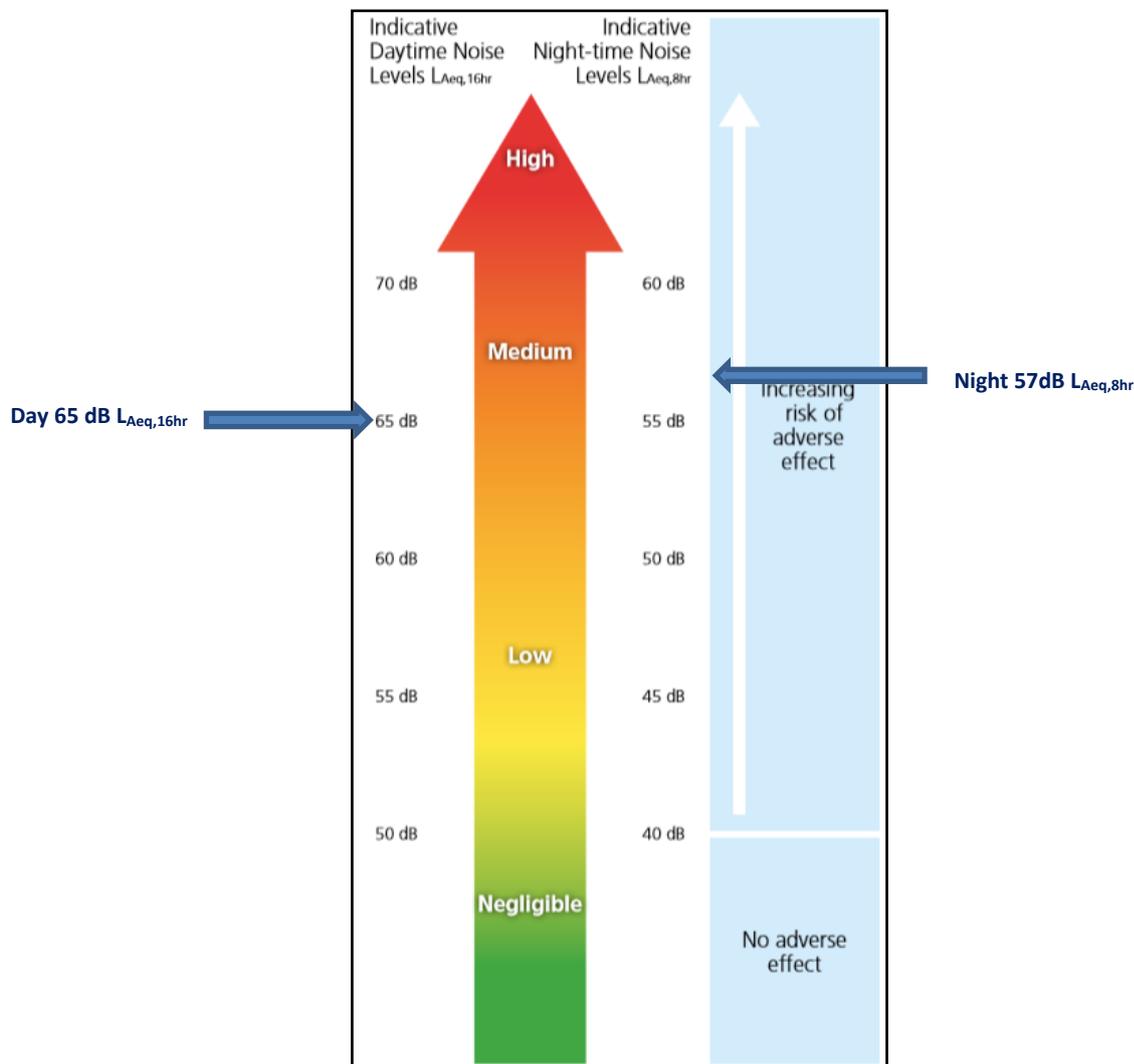
The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorization of the site as a negligible, low, medium or high risk based on the pre-existing noise environment.

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.”

Figure 8 presents the basis of the initial noise risk assessment; it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site. The highest daily measured noise levels (when corrected for potential increased noise levels) on the site are indicated on Figure 8.

Figure 8 ProPG Stage 1 - Noise Risk Assessment Categories (Site Noise Levels Indicated)



ProPG also states that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night. Reference to Figure 5 confirms that 80dB L_{AFmax} was exceeded only 1 times over the course of the 7-day survey, thus would not fall within the high risk category.

A Stage 1 noise risk assessment of the proposed site has been conducted, based on measured noise levels on site and expected noise levels on site in the foreseeable future, with comparison to the categories outlined in Figure 8.

With reference to the existing noise levels measured on site (as presented in Tables 7 and 8), the initial ProPG noise risk categories, for the facades most exposed to road traffic noise, are summarised as follows:

Daytime: **Medium**

Night-time **Medium**

6.2.2 ProPG Stage 2 (Acoustic Design Statement)

With consideration of the Stage 1 review, as presented above, it is considered that the site is suitable for residential development, provided that an appraisal of the proposed development is carried out, covering four key elements that include:

- Element 1 - Good Acoustic Design Process.
- Element 2 - Noise Level Guidelines.
- Element 3 - External Amenity Area Noise Assessment.
- Element 4 - Other Relevant Issues.

6.2.2.1 Element 1: Good Acoustic Design (GAD) Process

Good acoustic design should aim to deliver optimum acoustic design for a site without adversely affecting amenity or quality of life or compromising other sustainable design objectives ProPG states that good acoustic design is not equivalent to overdesign of all new development but that it seeks to deliver an optimum acoustic environment for a given site. ProPG outlines the following checklist for GAD:

- 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.

Each item listed above have been addressed in the following sections.

Relocation or Reduction of Noise from Source

The dominant noise source impacting upon the site is road traffic from the R117 Road. Given that the road is located outside the site boundary, additional reduction of noise output from vehicles cannot be considered in respect of this development.

Planning, Layout and Orientation

Development buildings are set back from the nearby transport network in accordance with local planning guidelines. It is considered that the layout and orientation of the proposed development is sufficient in the context of noise emissions and GAD.

Select Construction Types for meeting Building Regulations

Concrete constructions will be used for external walls of dwellings. Solid concrete constructions provide high levels of sound insulation performance.

Glazing and ventilation paths are typically the weakest façade elements in terms of sound insulation performance. The provision of glazing and ventilators offering an appropriate level of sound insulation will therefore be provided.

Calculations indicate that it will be possible to achieve the desirable internal acoustic environments when windows are open along the majority of building facades. Additional review of specific locations is provided in the following sections.

It will be necessary to provide habitable rooms with acoustically rated ventilators along the building elevations most exposed to traffic noise. Occupants will have the options to open the windows if they so wish, however, doing so will increase the internal noise level. This approach to mitigation is acknowledged in ProPG, as reproduced below:

“2.22 Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents “

Note 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded

2.34 Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to

design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “whole dwelling ventilation” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.”

It is therefore acceptable to provide building facades with appropriate sound insulation, with windows closed and vents open, that result in a good internal acoustic environment.

Impact of noise control measures on fire, health and safety etc

The proposed noise control measures do not have a significant impact on fire or other health and safety issues.

Assess Viability of Alternative Solutions

The major noise sources incident on the site are road traffic. Road traffic is mitigated by the distance from the road edge to the building, screening by existing/proposed structures, off and on-site buildings and orientation of windows. All the measures listed above aid in the control of noise intrusion to the living areas and bedrooms across the majority of the development.

Assess External Amenity Area Noise

ProPG advises the following in relation to external noise levels in amenity areas:

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 $L_{Aeq,16hr}$.

An assessment of noise within external amenity areas is addressed in the relevant section of this document.

GAD Summary

It is considered that the principles of Good Acoustic Design have been applied to the development.

6.2.2.2 Element 2: Internal Noise Level Guidelines

Internal Noise Criteria

ProPG recommends internal noise targets as derived from BS 8233. These internal noise level targets are presented in Table 3.

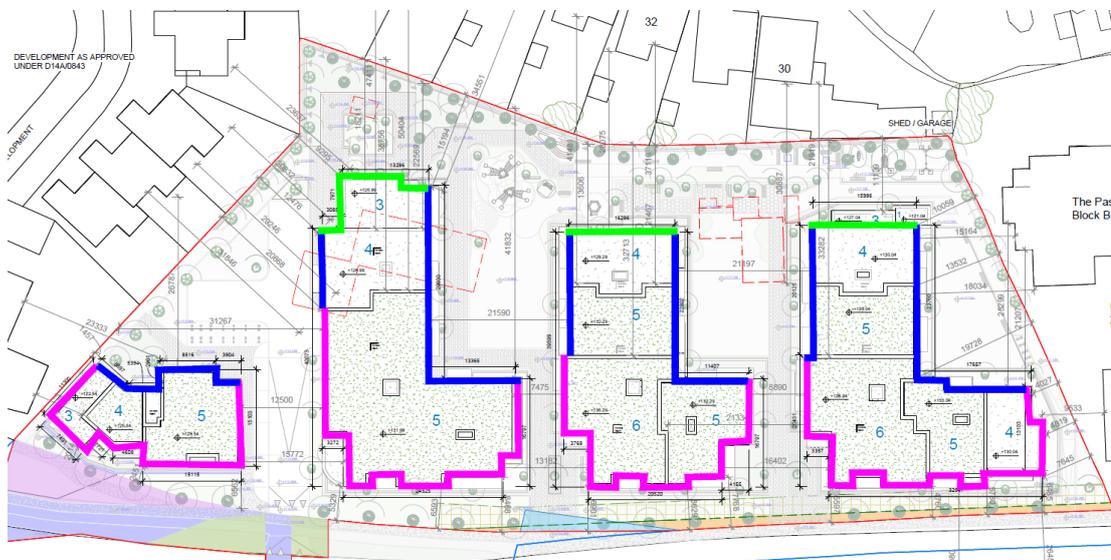
ProPG acknowledges that there can be some flexibility given in cases where the development is necessary or desirable, and that a relaxation by up to 5dB of the internal L_{Aeq} values can still provide reasonable internal conditions.

Assessed External Noise Levels

Noise surveys and calculations have been conducted across the site in order to establish the range and magnitude of noise levels at various positions on-site. Table 11 presents the free-field noise levels used for assessment purposes.

Table 11: Projected Traffic Noise Levels at Development Facades

Development Zone (Ref. Figure 9)	Period	Assessment Level (dB $L_{Aeq,T}$)
Zone A (Magenta)	Daytime (07:00 to 23:00)	65
Zone B (Blue)		60
Zone C (Green)		55
Zone A (Magenta)	Night-time (23:00 to 07:00)	57
Zone B (Blue)		50
Zone C (Green)		45



Proposed Façade Acoustic Specification

The methodology to estimate internal noise level within a building is outlined in Annex G of BS 8233: 2014 and is derived from BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound*. The methodology calculates internal noise levels based on a reference external noise level (i.e. octave band frequency data as measured in baseline noise surveys) and proposed façade constructions. The standard takes into account the following site-specific characteristics:

- External noise level;
- Area and type of each façade element (i.e. window, wall, etc.);
- Shape of the façade, and;
- Characteristics of the receiving room (i.e. room volume, reverberation time etc.)

This method has been used to determine the required sound insulation performance for the various building façade elements.

Glazing

Facades shall be provided with glazing that achieves the following minimum sound insulation performance.

Table 12: Glazing Acoustic Specification (Ref. Figure 9)

Specification	Sound Reduction Performance Requirements (dB) in Octave Frequency Bands (Hz)						Typical Overall dB R _w
	125	250	500	1k	2k	4k	
Type A (Magenta)	27	28	36	45	53	59	41
Type B (Blue)	25	22	33	40	43	44	36
Type C (Green)	24	20	25	35	38	35	31

The acoustic specification Type A and B can be achieved using acoustic double-glazed unit comprising laminated glass incorporating slightly thicker glazed panes than standard double glazing.

For Glazing Type C, this can be achieved using a standard double-glazed configuration incorporating laminated glass.

The overall R_w values outlined above are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values.

The acoustic performance specifications are minimum requirements which apply to the overall glazing system. The 'glazing system' is understood to include any and all of the component parts that form part of the glazed element of the façade, i.e. glass, frames, seals, openable elements etc.

The window supplier shall provide laboratory tests confirming the sound insulation performance, (to British Standard 2750 Part 3:1980 and British Standard 5821, or British Standard EN ISO 140 Part 3 1995 and British Standard EN ISO 717, 1997).

Wall / Roof Constructions

Masonry wall and roof constructions with plasterboard linings typically offer sound insulation performance much greater than that offered by the glazed elements.

The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 55 dB R_w for these constructions. The performance of non-glazed elements of the façade will be confirmed as part of the detailed design phase.

Acoustic Attenuation to Ventilation Systems

Acoustic attenuation to ventilation systems shall therefore be provided to the following rooms:

Table 13: Specification for Acoustic Ventilators to Dwellings (Ref. Figure 9)

Specification	Room Type	Required Overall dB $D_{n,e,w}$
Zone A (Magenta)	Living Room, Dining Rooms and Bedrooms	40
Zone B (Blue)	Living Room	36
Zone C (Green)	-	Not required

The ventilation supplier shall provide evidence, consisting of calculations and/or laboratory tests confirming the acoustic performance of ventilation systems.

6.2.2.3 Element 3: External Amenity Area Noise Assessment

It is a ProPG requirement, as part of the acoustic design statement, to assess noise levels within external amenity spaces. ProPG refers to guidance contained in BS 8233 (2014) for this element of the assessment, the relevant extract of BS 8233 (2014) states:

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

BS 8233 also comments that:

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses.

However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

In addition, ProPG, Element 3(v) states the following in relation to external amenity areas:

“Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or;*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or;*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or;*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquility) 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.*

With consideration of the various open amenity spaces / gardens proposed as part of the development, the following comments are provided:

Apartment Balconies

There are a number of balconies proposed as part of the development that will have noise levels exceeding the ideal 50 – 55 dB $L_{Aeq,T}$ range. These are primarily those associated with apartments that face the R117 Sandyford Road. The occupants of these apartments will have 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”* (i.e. the Communal Amenity Spaces discussed below), thus the impact of these noisier balconies is partially offset, in accordance with ProPG Guidelines.

Communal Amenity Space

There are ground floor communal amenity areas proposed as part of the development to the east (refer Figure 10) i.e. at locations on site that are set back and well shielded from the R117 Sandford Road.

Figure 10: Site Plan indicating Communal Amenity Areas



The expected noise levels in the communal amenity areas are within the recommended range of noise levels as outlined in ProPG Guidance i.e. noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,T}$. As such we consider that the intent of ProPG has been achieved with regard to noise in external amenity areas.

6.2.2.4 Element 4: Assessment of Other Relevant Issues

ProPG defines a number of other issues that should be considered and may prove pertinent to the assessment:

- 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
- 4(v) acoustic design v wider planning objectives

Each of the above considerations are discussed below.

Compliance with Relevant National and Local Policy

Table 14 provides a comparison of the measured (corrected) site noise levels, when compared to the *Desirable Low* and *Undesirable High* Sound levels as presented in the DCC NAP.

Table 14: Review of Measured Noise Levels vs. NAP Desirable Low and Undesirable High Sound levels

Period	Expected Noise Level On Site	NAP <i>Desirable Low</i> Sound Level	NAP <i>Undesirable High</i> Sound Level	Comments
Daytime	55 - 65 dB $L_{Aeq,16hr}$ (L_{day})	< 55 dB(A) L_{day}	> 70 dB(A) L_{day}	Noise levels fall generally between <i>Desirable Low</i> and <i>Undesirable High</i> Category
Night-time	45 - 57 dB $L_{Aeq,8hr}$ (L_{night})	< 50 dB(A) L_{night}	> 55 dB(A) L_{night}	

The measured noise levels therefore fall generally between *Desirable Low* and *Undesirable High* sound level categories, indicating that the impact of environmental noise sources on the proposed development will not be significant. Where noise levels are approaching the *Undesirable High* sound level categories, noise mitigation measures have been designed and incorporated into the development to control noise ingress, in line with the requirements of ProPG. This report has therefore been prepared in compliance with the requirements of local policy.

Magnitude and extent of compliance with ProPG

The following conclusions are made in relation to the magnitude and extent of compliance with ProPG:

- All dwellings have been designed to achieve the good internal noise levels, as specified within ProPG, when windows are closed.
- Dwellings that are screened by the development buildings can achieve good to reasonable internal noise levels with windows partially open.
- The remainder of dwellings can achieve good internal noise levels with windows closed and acoustic ventilators open.
- There is an external amenity space available for use by residents that has been assessed and is determined to be within the ProPG guidance for noise levels in external amenity areas.

It is therefore concluded that the proposed development is in compliance with the requirements of ProPG.

Likely occupants of the development

The development consists of apartments and is designed for the purpose of residential accommodation. The criteria adopted as part of this assessment are based on those recommended for permanent dwellings and are therefore considered robust and appropriate for the occupants.

Acoustic design v unintended adverse consequences

There have not been any unintended adverse consequences identified resulting from the acoustic design and control measures.

Acoustic design v wider planning objectives

Acoustic design has been considered in the context of wider planning objectives, particularly the National Planning Framework 2040. (NPF) The NPF is taken into consideration in the production



of local planning policy/guidelines and plans. In following existing local / national guidelines and policies, including the *dlrcoco County Development Plan 2022-2028*, it is considered that the acoustic design is compliant with wider planning objectives.

7 CONCLUSIONS

RSK Ireland Limited (RSK) was instructed by Thornton O'Connor Town Planning to conduct a noise impact assessment and Acoustic Design Statement (ADS) in respect of a proposed 137 no. unit residential development at Karuna & Glenina, Sandyford.

The aim of this study is to assess the potential impacts to nearby receptors and to provide recommendations, where necessary, to the risk of nuisance arising from construction and operational phase noise and/or vibration emissions.

Baseline monitoring has found pre-existing noise levels are typical of a suburban location in the vicinity of a busy regional road. Local and distant traffic were the primary contributors to the noise environment on site. Baseline noise measurement data has been corrected to account for the impacts relating to Covid-19 restrictions.

An assessment of the potential construction phase noise impacts has been conducted, following the procedures as outlined in BS 5228-1:2009+A1:2014. At the majority of locations, and for the majority of phases, calculated noise levels are within construction noise significance thresholds. At locations closest to the site boundary, potential significant construction noise effects are predicted, this is primarily due to the short distance between the works area and these neighbouring dwellings. The adoption and implementation of the noise control measures outlined in the relevant sections of this document is expected to reduce impacts to an acceptable level.

In the developments operational phase, criteria have been set for new building services plant items in accordance with the methodologies outlined in BS 4142:2014+A1:2019. It has been concluded that the likely noise impact of the developments in its operational phase is not significant.

This report also considers the potential inward impact of road traffic on the proposed development. Assessment methodologies use guidance from *The Professional Guidance on Planning & Noise* (ProPG), May 2017. The two primary stages of the ProPG assessment are the "Stage 1" initial noise risk assessment of the proposed site and "Stage 2" detailed appraisal of the proposed development and preparation of an Acoustic Design Statement.

The site noise survey has also been used to assess the sites noise risk categories, as per the ProPG "Stage 1" assessment. The ProPG noise risk categories are as follows:

Daytime: **Medium**

Night-time: **Medium**

Recommendation to mitigate noise emissions, as specified in the "Stage 2" Acoustic Design Statement, include the following:

- Provision of glazing with minimum sound insulation properties as outlined in this document.
- Provision of acoustic attenuation to ventilation systems for dwellings exposed to the highest levels of traffic noise.

In summary, it is considered that the site is suitable for residential development subject to the provision of the noise control recommendations as outlined in this report.

APPENDIX A

SERVICE CONSTRAINTS

RSK ENVIRONMENT LIMITED SERVICE CONSTRAINTS

1. This report (the "Services") was compiled and carried out by RSK Ireland Limited (RSK) for Thornton O'Connor Town Planning Ltd. (Ltd. (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be** well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.