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Acoustic Report

Phase 1, Adamstown Boulevard Development

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1 Introduction

Quintain Developments Ireland Ltd has engaged iAcoustics to provide an Acoustic Design Statement in response to an RFI relating to the 'Boulevard Phase 1' development in Adamstown, Co Dublin. This report has been prepared in accordance with relevant standards and guidance relating to residential acoustic design. This report presents recent noise monitoring details and illustrative noise maps showing the predicted noise levels at each dwelling across the site due to transportation sources.

1.1 Full Development Description

Comprising Phase 1 of the Adamstown Boulevard Development Area and consists of 38,768.21sq.m. of residential development to be constructed in a mix of housing and apartment units, with 423 residential units proposed in total (of which 166 units are subject to the application for outline permission); The housing units for which permission is being sought are on a site of 9.22Ha shall comprise 75 two bedroom units, 113 three bedroom units and 69 four bedroom units, ranging from 2 to 3 storeys in height; Outline permission is sought on a site of 0.54Ha for the apartment block, which shall range from 5 to 9 storeys in height and comprises 11 studio units, 76 one bedroom units and 79 two bedroom units; All residential units are provided with private open space, in the form of private rear gardens or balconies; The proposed development includes approximately 0.95 Ha of public open space in the form of a linear open space located on the east of the site stretching between Adamstown Way and Station Road and a pocket park located in the north-west of the site. 488 car parking spaces are proposed in total. 433 of these are allocated to the housing element of the development, and 55 are allocated to the apartments. A total of 52 visitor spaces are provided across the site; A total of 6 disabled spaces and 6 EV spaces are proposed. 40 secure bicycle parking spaces are provided in 4 locations throughout the site. 3 ESB Substations are also provided; Vehicular access to serve the development is provided from the existing Adamstown Avenue and Adamstown Way from the west and north, Station Road to the south and Stream Road, which bisects the Boulevard Development Area. A new bus turning circle, along with bus lay-bys are proposed on the south of the site on Station Road; The development includes the provision of ancillary site development works, boundary treatments and landscape works; This development amends aspects at the interface between the proposed development and the development at The Crossings currently under construction and permitted under Reg. Ref. SDZ20A/0017 (as amended bySDZ21A/0021) on lands bounded generally to the north by Adamstown Way and the Aderrig Development Area, currently under development subject to planning permissions Reg. Ref.SDZ20A/0017 (as amended by SDZ21A/0021) and Reg. Ref. SDZ21A/0014; to the east by currently undeveloped lands within the Adamstown Station Development Area as well as the railway overpass and its approach road known locally as 'the farmer's bridge'; to the south by the existing railway line and to the west by undeveloped agricultural lands; This application is being made in accordance with the Adamstown Planning Scheme 2014, as amended, and relates to a proposed development within the Adamstown Strategic Development Zone Planning Scheme Area, as defined by Statutory Instrument No. 272 of 2001.

1.2 RFI

Extract from SDCC RFI Dated 30th June 2022:

Item no.2:

The Environmental Health Department request the application to submit a Traffic Noise Impact Assessment to include:

1. *An acoustic assessment must be undertaken by a suitably qualified acoustic consultant describing and assessing the potential noise impact of the nearby railway line on the proposed development. The investigation must include, but not be necessarily limited to, the following:*
    a) *The identification and cumulative assessment of all sources of traffic noise on the proposed development.*
    b) *An assessment of the existing background (LA90,15min) and ambient (LAeq,15min) acoustic environment at the receiver locations representative of the time periods that any noise impacts may occur.*
    c) *Distances between the proposed development and the nearest noise sources (i.e. traffic noise) and the predicted level of noise (LAeq, 15min) from these noise sources when assessed at the boundary of the proposed development.*
    d) *A statement outlining recommended acoustic control measures that should be incorporated into the design and construction of the proposed houses and/or site to ensure the use will not create adverse noise impacts on the occupiers. This should include parameters for walls, glazing, doors and ventilation for the proposed development.*

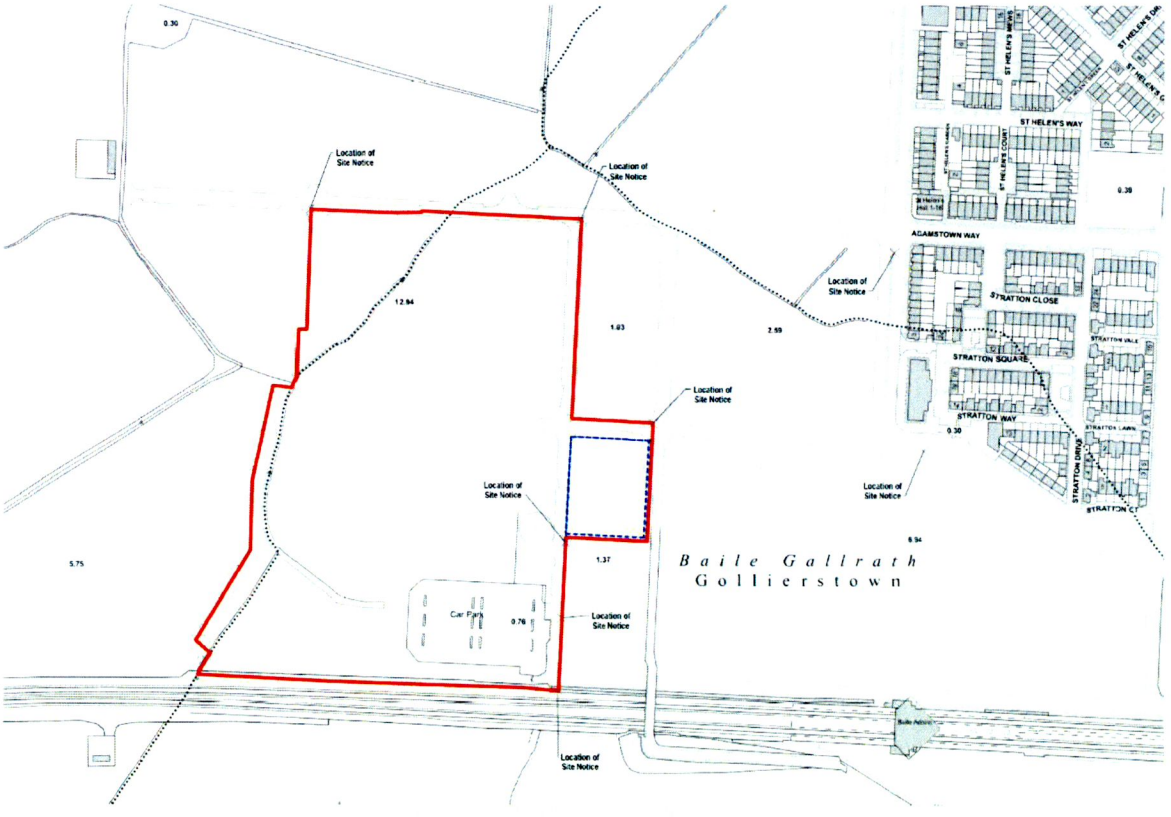

Table 1-1 Site location, extract from 1238-MDO-ZZ-XX-DR-A-01002

Figure 1-2 Extract from 'Proposed Site Plan' drawing. Red line denotes the application area.

1.3 Primary Noise Sources

Road traffic and rail noise will be the two dominant noise sources impacting the development. The railway line runs east-to-west along the southern boundary of the subject site. The route services at Adamstown station include the InterCity service between Dublin (Heuston) and Cork and the Dublin (Grand Canal Dock) and Portlaoise service. In Figure 3-1 below, we refer to the Strategic Noise Maps showing the railway noise levels at the development location. Levels range from 55-64dB L_{den} and 45-54dB L_{night}. No information is available for roads.

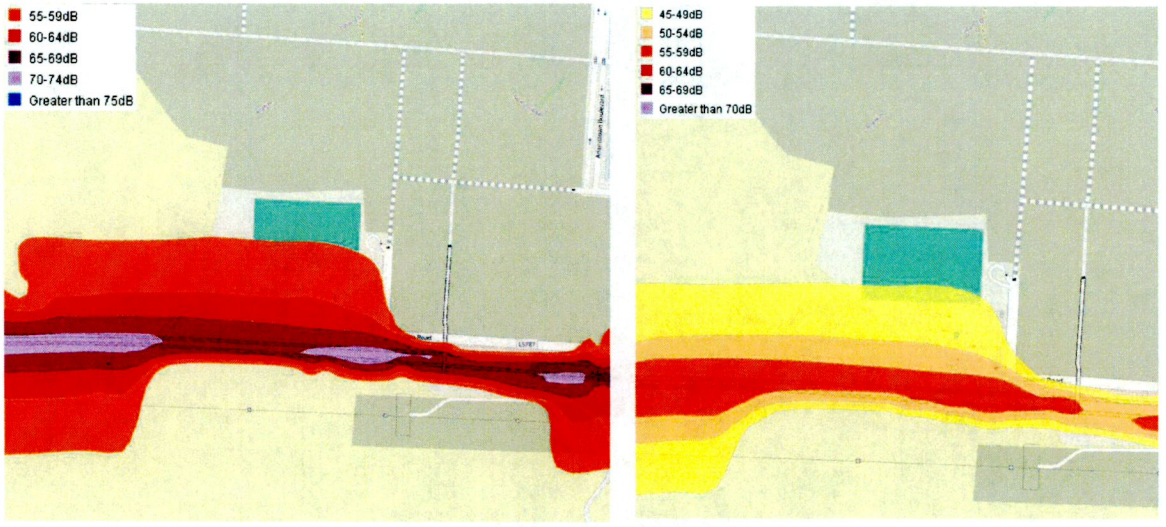

Figure 1-3 This is a polygon dataset of the strategic noise mapping of rail, which were identified as those exceeding the flow threshold of 30,000 vehicle passages per year, in the form of noise contours for the L_{den} (day, evening, night) period in the left image and L_{night} in the right image. The dB value represents the average decibel value during the time period.

2 Relevant Standards & Guidance

2.1 World Health Organisation (WHO) Guidelines

Environmental noise is a threat to public health, having negative impacts on human health and well-being. To support the efforts of the Member States in protecting the population´s health from the harmful levels of noise, WHO issued *Guidelines for community noise* in 1999, which includes guideline values for community noise in various settings based on the scientific evidence available.

I. For 'outdoor living areas', a daytime limit of $L_{Aeq,16hr}$ 55dB to safeguard against the likelihood of 'serious annoyance'. A second daytime limit of $L_{Aeq,16hr}$ 50dB is also given as a 'moderate annoyance' threshold.
II. For 'internal living areas', a level of $\leq L_{Aeq,16hr}$ 35dB is desirable to maintain reasonable speech intelligibility indoors and prevent moderate annoyance during day and evening times.
III. A nighttime threshold value of $L_{Aeq,8hr}$ 30dB should not be exceeded *indoors* in the interest of preventing adverse effects of sleep. It follows that an internal level of $L_{Aeq,T}$ 30dB is equivalent to a façade level of $L_{Aeq,T}$ 45dB for continuous, steady noise (assuming a partially open window provides 15 dB's of reduction).
IV. When the background noise is low, single noise events exceeding 45dB L_{AFmax} inside bedrooms at nighttime should be limited.

In 2009, the WHO European Regional Office published the 'Night Noise Guidelines for Europe'. It presents new evidence on the health damage of nighttime sound exposure and recommended threshold values. An $L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons and where policymakers choose to adopt a stepwise approach. These guidelines are applicable to the Member States of the European Region, and may be considered as an extension to, as well as an update of, the previous WHO Guidelines for community noise (1999).

It should be noted that the WHO guideline values are neither standards nor legally binding criteria. The WHO guideline values are evidence-based public health-oriented recommendations to serve as the basis for a policy-making process. Nonetheless, the WHO guide values are normally taken on board as part of good design practice and will often be applied as an acoustic design criterion for residential projects, depending on the context.

2.2 BS 8233:2014 guidance on sound insulation and noise reduction for buildings

This British Standard provides guidance for the control of noise in buildings, which includes guidance on hotels and rooms for long-term residential purposes. The Standard defines upper limits for internal ambient noise levels in habitable areas of a home; these values are outlined in Table 3.1. We consider that the guideline values defined in Table 3.1 should be applied to this project as a *design target*. BS 8233:2014 adds that where development is considered necessary or desirable, "*the internal target levels may be relaxed by up to 5dB and reasonable internal conditions be achieved*".

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	$L_{Aeq,16hr}$ 35dB	-
Dining	Dining Room	$L_{Aeq,16hr}$ 40dB	-
Sleeping	Bedroom	$L_{Aeq,16hr}$ 35dB	$L_{Aeq,8hr}$ 30dB

Table 2-1 BS 8233:2014 guidance on internal ambient noise levels in dwellings

BS 8233:2014 adds that where development is considered necessary or desirable, "*the internal target levels may be relaxed by up to 5dB and reasonable internal conditions be achieved*". This relaxation is also noted in the World Health Organisations' *Guidelines for Community Noise* (1999).

2.3 South Dublin County Council (SDCC) Noise Action Plan 2018-2023

The key objective of the South Dublin County Council (SDCC) Noise Action Plan 2018-2023 is to avoid, prevent and reduce, where necessary, on a prioritised basis, the harmful effects, including annoyance, arising from long-term exposure to environmental noise from road traffic and rail. This will be achieved by taking a strategic approach to managing environmental noise and undertaking a balanced approach in the context of sustainable development.

SDCC set out the following target values for *desirable low* and *undesirable high* sound levels in the Noise Action Plan 2018-2023:

Desirable Low Sound levels:	Undesirable High Sound levels:
< 50 dB(A) L_{night}	> 55 dB(A) L_{night}
< 55 dB(A) L_{night}	> 70 dB(A) L_{day}

The noise environment at the development locations will be discussed later in the report in the context of the above for *desirable low* and *undesirable high* sound levels.

2.4 Project Ireland 2040: National Planning Framework (2018)

The National Planning Framework (2018) lists noise management as one of its Environment and Sustainability Goals for creating a clean environment for a healthy society. The Framework lists National Policy Objective 65 as follows,

> *"Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans."*

In addressing these issues, the National Planning Framework will support:

- **Noise Management and Action Planning**

Measures to avoid, mitigate, and minimise or promote the pro-active management of noise, where it is likely to have significant adverse impacts on health and quality of life, through strategic noise mapping, noise action plans and suitable planning conditions.

- **Noise, Amenity and Privacy**

This includes but is not limited to, good acoustic design in new developments, in particular residential development, through a variety of measures such as setbacks and separation between noise sources and receptors, good acoustic design of buildings, building orientation, layout, building materials and noise barriers and buffer zones between various uses and thoroughfares.

- **Quiet Areas**

The further enjoyment of natural resources, such as our green spaces, through the preservation of low sound levels or a reduction in undesirably high sound levels, is particularly important for providing respite from high levels of urban noise. As part of noise action plans, an extra value placed on these areas, in terms of environmental quality and the consequential positive impact on quality of life and health, due to low sound levels and the absence of noise, can assist in achieving this.

2.5 ProPG Planning & Noise (2017)

The Professional Guidance on Planning & Noise (ProPG) was developed to provide acoustic practitioners with guidance on a recommended approach to the management of noise within the planning system in the UK. ProPG has been widely adopted in Ireland in the absence of an Irish equivalent.

This ProPG encourages a systematic, proportionate, risk-based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower-risk sites and assists proper consideration of noise issues where the acoustic environment is challenging. The two sequential stages of the overall approach are:

I. Stage 1 – an initial noise risk assessment of the proposed development site; and
II. Stage 2 – a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

I. Element 1 – demonstrating a "Good Acoustic Design Process";

II. Element 2 – observing internal "Noise Level Guidelines";
III. Element 3 – undertaking an "External Amenity Area Noise Assessment";
IV. Element 4 – consideration of "Other Relevant Issues".

The approach is underpinned by preparing and delivering an "Acoustic Design Statement" (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk. Following the ProPG approach will lead to the choice of one of four possible recommendations from the noise practitioner to the decision maker:

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").

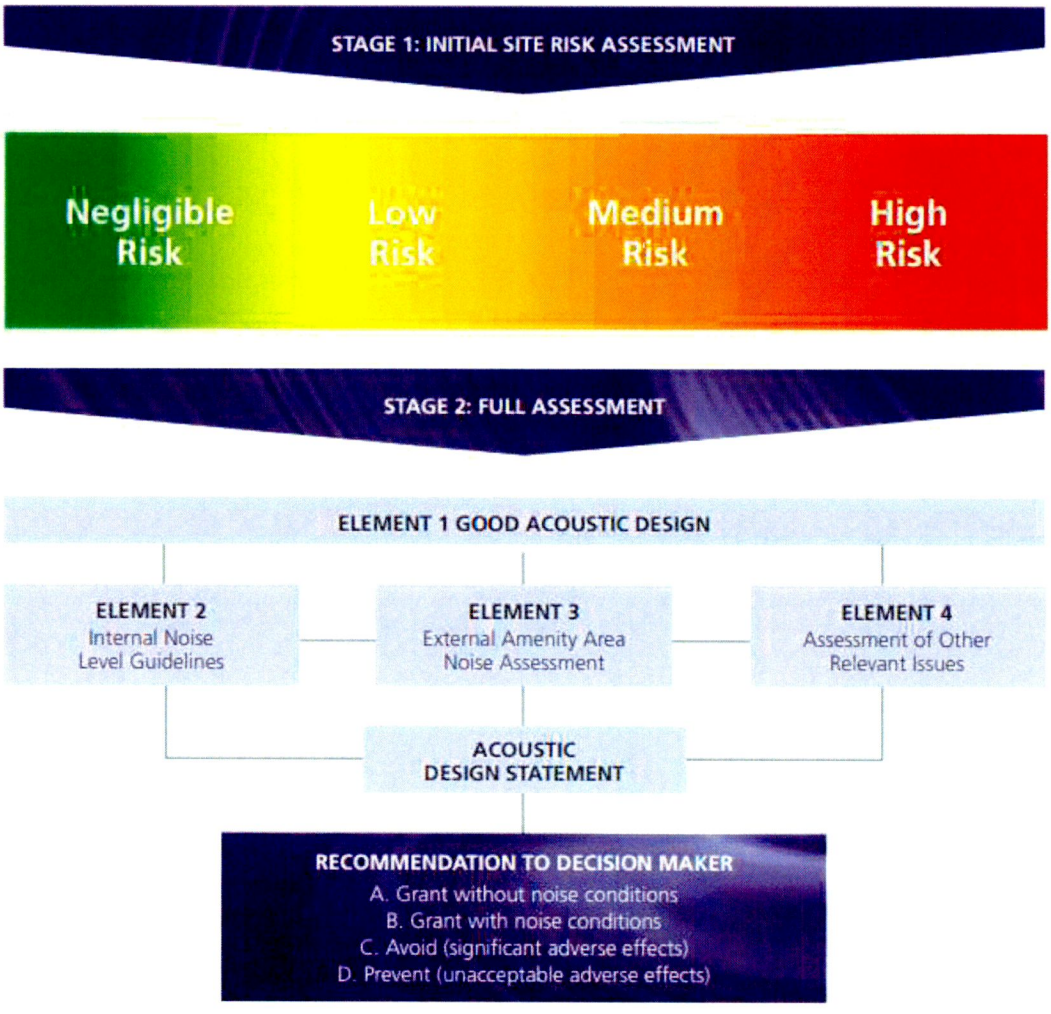

Table 2-2 – Summary of ProPG procedure

3 Baseline Noise Measurements

3.1 Overview

Noise monitoring was carried out in the vicinity of the development site between 2nd – 4th April. Due to site constraints, measurements were obtained at a nearby representative location on the currently undeveloped site shown in Figure 3-1. The monitoring location was placed at an equivalent distance from the railway line as the nearest dwellings in the Boulevard development.

The following measurement standards were referenced:

- ISO 1996-1:2016 Acoustics — Description, measurement, and assessment of environmental noise — Part 1: Basic quantities and assessment procedures.
- ISO 1996-2:2017 Acoustics — Description, measurement, and assessment of environmental noise — Part 2: Determination of sound pressure levels.

Table 3-1 Noise Monitoring Location

3.2 Measurement Equipment

The complete sound measuring system deployed conforms to BS EN 61672-1, Class 1. Sound calibrators deployed for use conform to BS EN 60942, Class 1. The microphone was fitted with an all-weather protection kit (NTI WP30) to minimise interference.

Type	Make & Model	Serial No.	Next Calibration
Sound Level Meter	*NTI XL2-TA*	*a2a-12398-EO*	*Mar-2023*
Microphone	*NTI MA220*	*6337*	*Mar-2023*
Calibrator	*Castle GA607*	*044447*	*Oct-2023*

Table 3-1 Noise Monitoring equipment. Calibration certificates are available on request.

3.3 Assessment Parameters

The selected assessment parameters are as follows: L_{Aeq} $L_{AF10\%}$ $L_{AF90\%}$ L_{AFmax}

Ambient sound level, L_{Aeq}

Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval.

Statistical Parameters $L_{AF10\%}$ & $L_{AF90\%}$

These are statistical parameters that describe the sound level that is exceeded for 10% or 90% of the measurement interval. The $L_{AF10\%}$ is a useful descriptor of road traffic noise as it correlates well with the disturbance people feel when close to busy roads as well as more rural situations. $L_{AF90\%}$ has been widely adopted to quantify background noise levels. $L_{AF10\%}$ provides a good indication of noise levels during traffic pass-bys, while $L_{AF90\%}$ may describe the noise levels in-between pass-bys.

L_{AFmax}

The maximum Sound Level with 'A' Frequency weighting and Fast Time weighting during the measurement period.

3.4 Results

Assessment Parameter:	Calculated levels
L_{den}	58 dB(A)
L_{day}	56 dB(A)
$L_{evening}$	56 dB(A)
L_{night}	43 dB(A)

Table 3-2 Calculated L_{den} L_{night} & $L_{Aeq,16hr}$ parameters

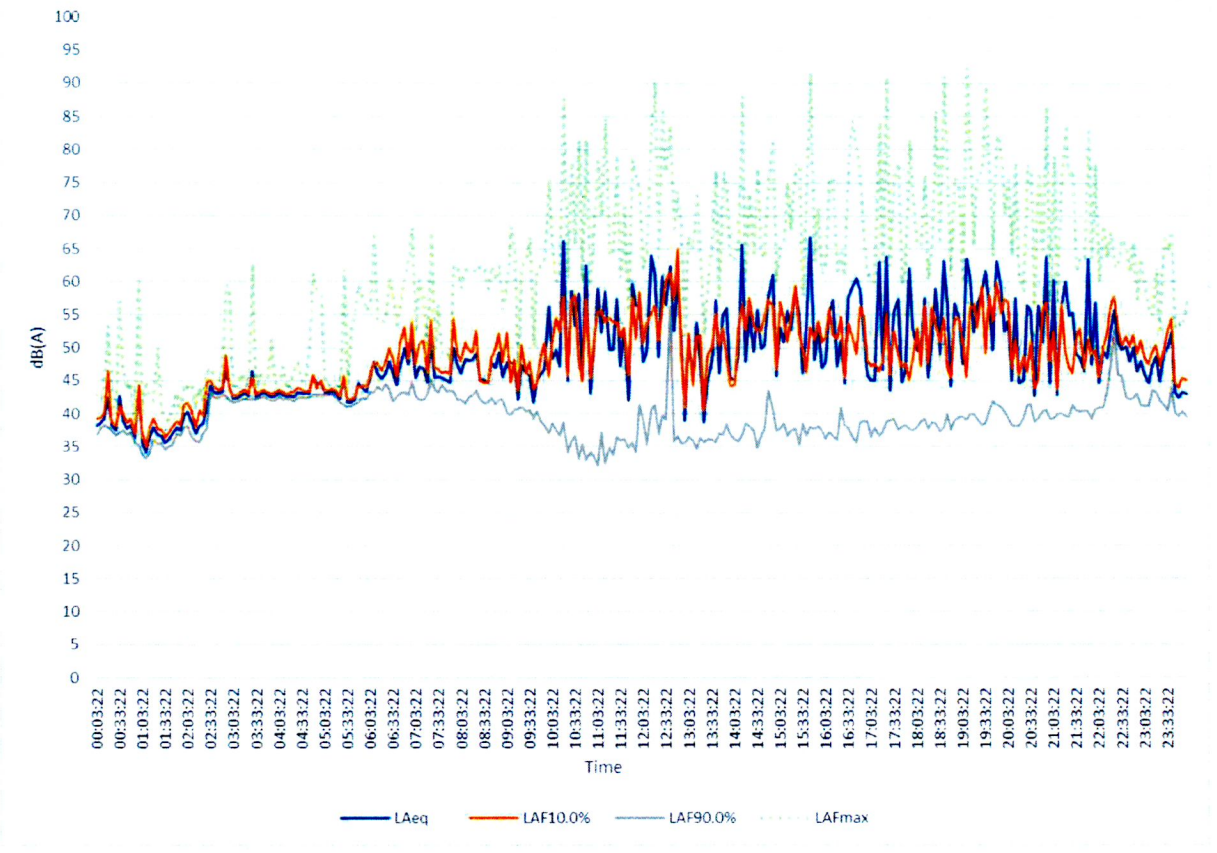

Figure 3-1 Graph showing the change in sound pressure level over a 24hr period, recorded on the 3rd April 2022 at Monitoring Location 2. Each point on the graph represents the continuous equivalent sound pressure level measured over 5-minute intervals.

4 Assessment

4.1 Noise Mapping

iAcoustics have undertaken desktop modelling using the CadnaA software package. Road and rail noise modelling was calculated in accordance with the CRTN [1] and CRN [2] methods, respectively. Road traffic data is provided in the Atkins Report. Input data from railway movements are unknown, however, predicted railway noise impacts are demonstrated on the EPA maps: https://gis.epa.ie/EPAMaps/. iAcoustics have also calibrated the noise maps

Noise levels are presented as a horizontal grid at a specified height. We have given the predicted noise levels at 2m, & 4m heights The *façade levels* (receiver assumed as 1m from the façade) are also presented at specific points along the façade.

Figure Reference:	Map:
4-1	$L_{day}/L_{Aeq,16hr}$, Grid Height: 2m
4-2	L_{night}, Grid Height: 2m
4-3	$L_{day}/L_{Aeq,16hr}$, Grid Height: 4m
4-4	L_{night}, Grid Height: 4m

[1] *Calculation of Road Traffic Noise. Department of Transport (UK). 1988.*
[2] *Calculation of Rail Noise. Department of Transport (UK). 1995.*

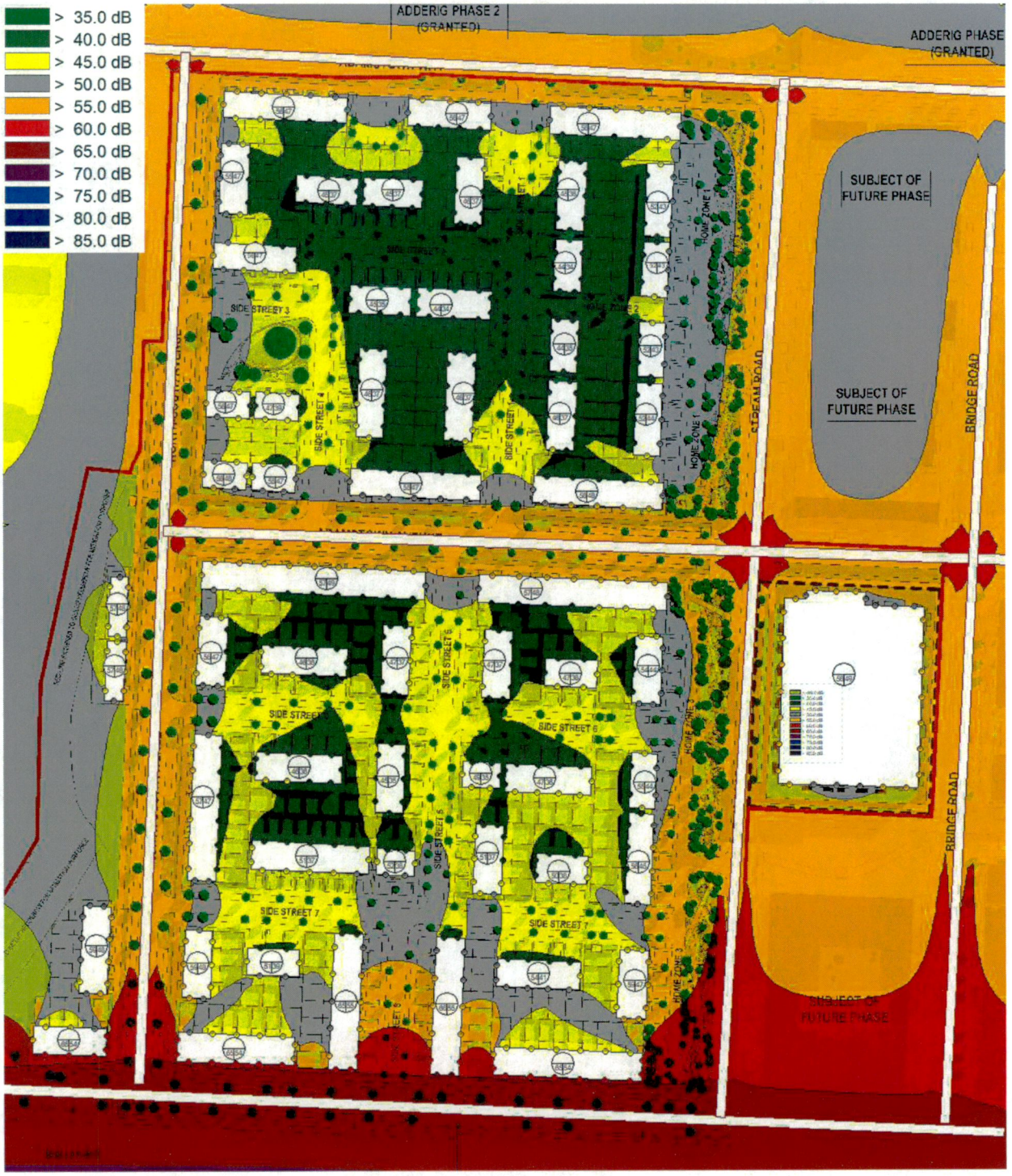

Table 4-1 $L_{day}/L_{Aeq,16hr}$, Grid Height: 2m

Table 4-2 L_{night}, Grid Height: 2m

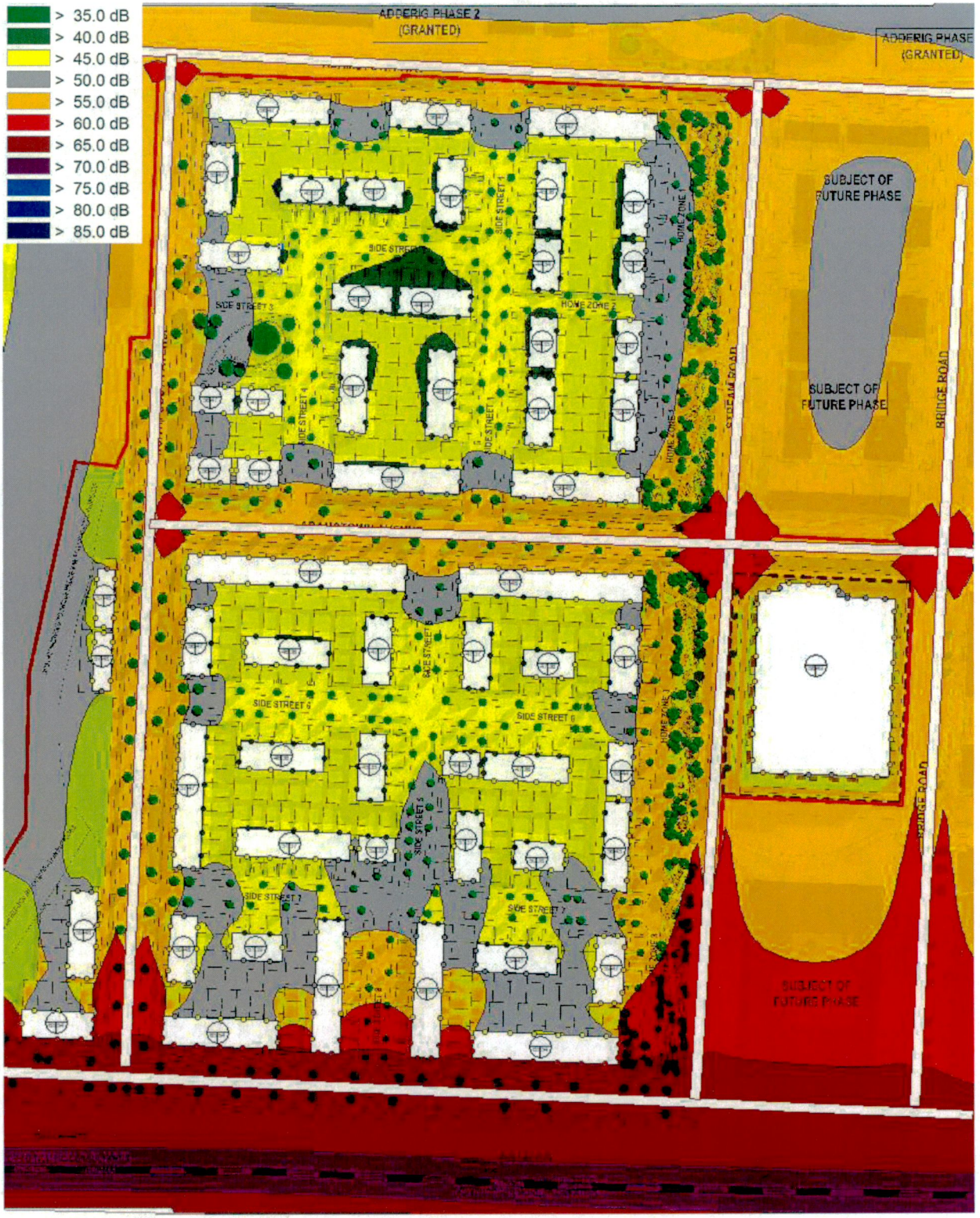

Table 4-3 $L_{day}/L_{Aeq,16hr}$, Grid Height: 4m

Table 4-4 L_{night}, Grid Height: 4m

4.2 Indoor L_{AFMax} Levels from Train Passings

L_{AFMax} 45dB should not be exceed more than 10 times during a typical nighttime period according to the W.H.O guidance. Road traffic and rail movements will be the most likely sources of single noise events. Typical noise levels during road and rail movements have been measured on-site. It has been found that rail passings generate the most significant noise levels. Table 4-1 below is a calculation of noise break-in from free-field noise levels at the location of the façade in accordance with the calculation procedure described in BS 8233:2014. The source input level is taken to the peak noise spectra of the 'loudest' train recorded during the entire measurement survey. The measurement position was at a similar distance from the railway line as the nearest dwellings proposed on Station Road.

Calculation	*Single-figure*	SPL L_{Zeq}				
		125Hz	250Hz	500Hz	1kHz	2kHz
Train Passing L_{AFMax}	76 dB(A)	71	70	70	73	70
Predicted indoor level L_{AFMax}	**40 dB(A)**	48	44	39	31	26
Criteria:	< 45 dB(A)					

Calculation Assumptions:

The receiver is a typical bedroom (13m^2) in a dwelling facing the railway line. The facade's width and height are 3.4m x 2.8m, respectively. The window area is approx. 4m2. The bedroom has an assumed reverberation time of 0.4s. The SRI of the glazing and background ventilation element is assumed as follows:

Element	125Hz	250Hz	500Hz	1kHz	2kHz
Glazing - 6mm/16mm Argon-filled cavity/8.8mm *Pilkington Optiphon Laminated**	25	27	38	48	47
Background 'Trickle' vent Model: SFXSA, Dne,w 44dB	37	37	36	47	49

*Table 4-5 Measured event level for a train passing when measured at the façade of Block E. *This glazing make-up is indicative and there are multiple glazing configurations which can achieve similar or better performances.*

Taking the loudest measured train event of 76 dB(A) L_{AFMax}, an indoor level of 40 dB(A) L_{AFMax} is predicted inside a bedroom of a south-facing dwelling on Station Road, which is 5dB lower than the 45 dB(A) L_{AFMax} threshold for singe events.

5 ProPG Assessment

5.1 Stage 1 – Initial Noise Risk Assessment

Figure 3-1 below summarises the *Stage 1 Initial Site Noise Risk Assessment* from Pro PG. The figure illustrates how an initial noise risk assessment is linked with an increased risk of adverse noise and broadly associated with indicative noise levels derived from current guidance and experience. The indicative noise levels are intended to provide a sense of the noise challenge at a potential residential development site and should be interpreted flexibly regarding the locality, the project and the broader context. In the final column, the initial noise risk assessment is aligned with pre-planning application guidance that highlights the increasing importance of good acoustic design as the noise risk increases. Based on the predicted noise levels across the subject site, the site is deemed **'medium-low'** risk according to the ProPG Stage 1 risk assessment.

NOISE RISK ASSESSMENT	POTENTIAL EFFECT WITHOUT NOISE MITIGATION	PRE-PLANNING APPLICATION ADVICE
Indicative Daytime Noise Levels $L_{Aeq,16hr}$ / Indicative Night-time Noise Levels $L_{Aeq,8hr}$		
High	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.
70 dB / 60 dB		As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
Medium		
65 dB / 55 dB		
60 dB / 50 dB		At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
Low		
55 dB / 45 dB		
50 dB / 40 dB		
Negligible	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

Table 5-1 Stage 1 Initial Site Noise Risk Assessment from ProPG

The outcome of the ProPG Stage 1 noise risk assessment at a proposed residential development site is not the basis for the eventual recommendation to the decision-maker. A site considered to be high risk will be

recognised as presenting more acoustic challenges than a site considered as low risk, with increasing risk indicating the increasing importance of good acoustic design.

5.2 Stage 2 – Four Key Elements of Acoustic Design

5.2.1 Element 1 – Good Acoustic Design Process

This element seeks to deliver Good acoustic design and should provide an integrated solution whereby the optimum acoustic outcome is achieved without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements. ProPG provides the following checklist:

1.	Check the feasibility of relocating or reducing noise levels from relevant sources.

Road traffic noise and rail is the dominant noise source impacting the development site. It is not possible to relocate or reduce these noise source. However, it is expected that improvements in technology should reduce noise emissions from transportation sources in the future. Such improvement may include, but not limited to, better tyre/road design, increase in the Electric Vehicle (EV's) fleet, and electrification of the railway line.

2.	Consider options for planning the site or building layout.

There is limited scope to alter the building layout, given the size and shape of the site. In our opinion, the best practice would be to improve the sound insulation of the building façade (including glazed elements). This is dealt with in a later section.

3.	Consider the orientation of the proposed building(s).

Measures taken to reorientate the facades of buildings will subsequently place the other façades in view of the noise sources having an overall neutral impact. Therefore, this has not been considered.

4.	Select construction types and methods for meeting building performance requirements.

The external façade of the building will be constructed as a twin leaf block cavity with internal plaster lining. This build-up will typically provide airborne sound insulation performances exceeding R_w 65dB, which will provide sufficient levels of airborne sound insulation. The weakest elements of the façade will be the glazing and any background ventilation elements.

5.	Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.

The need to close windows to achieve reasonable acoustic conditions has no impact on the minimum ventilation requirements for dwellings. MVHR units will provide whole-house ventilation to dwellings.

The use of laminated glass for acoustic purposes offers excellent noise reduction without compromising light transmittance or impact performance. The use of laminate glazing is not cost-prohibitive.

6.	Assess the viability of alternative solutions.

	The dominant noise source (road traffic & rail noise) is beyond the control of the designers.
7.	Assess external amenity area noise.
	Discussed further in section 5.2.3.

5.2.2 Element 2 - Indoor Ambient Noise Levels

Indoor ambient noise levels (IANL's) are assessed under two scenarios: windows opened and closed. Dwellings will be naturally ventilated with background 'trickle' vents fitted within the window frame to achieve the minimum ventilation requirements. Purge ventilation may be relied on to improve thermal comfort or for the rapid dilution of outdoors and pollutants. It shall be assumed that the guideline acoustic values do not apply during periods of purge ventilation. The *Acoustics Ventilation & Overheating Residential Design Guide (2020)* provides the following guidance on conflicting requirements:

> *"It is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition. The basis for this is that the overheating condition occurs for only part of the time. During this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. In other words, occupants may, at their own discretion, be more willing to accept higher short-term noise levels to achieve better thermal comfort. The importance of control is relevant to daytime exposure, but not to nighttime exposure where the consideration is sleep disturbance. It is important to note that there is no specific research available to support this view regarding human response to combined exposure to heat and noise. However, the notion that control over one's environment moderates the response to exposure is well established in the field of thermal comfort, and underpins the adaptive thermal comfort model."*

The solid elements of the building façade will be constructed as cavity blocks with an internal plaster lining. This build-up can provide high levels of sound insulation performance, even in high-noise environments. The acoustic performance of the façade is dictated by weaker elements such as glazing and the window frame. In section 6, we propose an acoustic specification for glazing throughout the development to achieve reasonable indoor noise levels when windows are closed and comply with the relevant guide values.

5.2.3 Element 3 - External Amenity Spaces

Current guidance recommends that the external noise level in gardens, patios and balconies should not exceed 50 dB $L_{Aeq,16hr}$ with an upper guideline value of 55 dB $L_{Aeq,16hr}$. These guide values are taken from the W.H.O document *Guidelines for Community Noise (1999)*; these guide values are also cited in BS 8233:2014 and ProPG (2017).

The noise maps presented in Chapter 4 demonstrate that much of the development site will not exceed the lower threshold 50 dB $L_{Aeq,16hr}$ from transportation sources. Much of the gardens are shielded behind the

houses and not in direct line-of-sight of nearby roads or railway. Of all privately-owned rear gardens (dwellings), only 2no. gardens of 257no. in total are showing levels which may exceed 55 dB $L_{Aeq,16hr}$ due to the proximity to the railway line; this equates to 0.8% of houses. A recommendation is provided in Chapter 6 to minimise the adverse impact for the two affected gardens.

5.2.4 Element 4 – Assessment of Other Relevant Issues

Currently, Ireland does not have any national or local policies specific to the acoustic design of residential dwellings. Part-E of the Building Regulations 2014 aims to provide "reasonable sound insulation between dwellings", but it does not address external noise entering a dwelling and therefore is beyond the scope of this report.

This ADS has been prepared in accordance with ProPG (2017) where relevant noise mitigation measures have been proposed to minimise the harmful effects of noise on future inhabitants, considering both internal and external noise.

The acoustic mitigation measures for this development **do not** have any unintended adverse consequences for the building or the nearby environment and may affect the attractiveness of the living environment for the occupants. Examples include sealed up balconies that result in a lack of connection with the external environment, roadside barriers that remove views or prevent crossing roads, sealed facades that affect personal control over the internal environment

5.3 Recommendation to Decision Maker

As described in section 2.5, following the ProPG approach will lead to the choice of one of four possible recommendations from the noise practitioner to the decision-maker:

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").

iAcoustics considers that,

A. Planning consent may be granted without any need for noise conditions;

Where the ProPG Stage 2 guidance has been followed and where the submitted development proposal is supported by an ADS that adequately demonstrates good acoustic design, then it should be possible for the noise practitioner to recommend that planning consent may be granted without the need for additional noise conditions.

5.4 Outward/Operational-Phase Impacts

During the operational phase of the development, there is a very low potential for adverse noise impacts to the surrounding environment. Typical noise sources for the residential aspect of this development will include vehicular movements, children playing etc. However, it is expected that these noise sources would not be above and beyond those noises which form part of any urban environment.

6 Recommendations

6.1 Glazing

To protect residents from rail and road traffic noise impacts, the following *minimum* performance levels should be achieved. We propose 2no. glazing types, with a more onerous glazing specification required for facades that are more exposed to noise. The proposed performance levels have been deemed suitable following the calculation procedure described in BS 8233:2014 *guidance on sound insulation and noise reduction for buildings*.

Octave Band, Hz:	125	250	500	1000	2000	4000	R_w	$R_w + C_{tr}$
Glazing Type 1 (façade levels between L_{day} 60-65 dB):	25	27	38	48	47	55	41	35
Example buildup:	6mm/16mm Argon-filled cavity/8.8mm *Pilkington Optiphon Laminated*							
Glazing Type 2 (façade levels between L_{day} 55-60 dB):	24	24	32	37	37	44	35	32
Example buildup:	10mm / 6-16mm cavity / 6mm							

Table 6-1 Table showing the minimum acoustic performance requirements for glazing throughout the development. The values are quoted in terms of the Sound Reduction Index (SRI) in dB from 125Hz – 4kHz. Example buildups are provided. However, it should be noted that there are other glazing configurations which will achieve similar performance values (i.e. triple glazed windows).

Glazing Type 1 is recommended for bedrooms, kitchen and living rooms in the following locations:

House No.	Façade
173	South & East
174	South
175	South
176	South
177	South
178	South
179	South
180	South
181	South
182	South & West
183	All
184	All
185	All
186	All
198	All
199	All

200	All
201	All
202	South & East
203	South
204	South
205	South
206	South
207	South
208	South
209	South & West
253	South & East
254	South
255	South
256	South
257	South & West

Table 6-2 Proposed locations of enhanced acoustic glazing build-ups

6.2 Ventilation Elements

The window units will be fitted with permanent background ventilators or 'trickle vents'. The acoustic specification for these ventilation elements is as follows:

I. For windows with Glazing Type 1, provide a trickle vent that achieves a weighted element normalised level difference of $D_{n,e,w}$ 44 dB when the vent is open.

II. For windows with Glazing Type 2, provide a trickle vent that achieves a weighted element normalised level difference of $D_{n,e,w}$ 35 dB when the vent is open.

6.3 Garden Walls

To reduce noise exposure in private gardens due to train passings, we recommend a 2.4m solid block wall in the below locations.

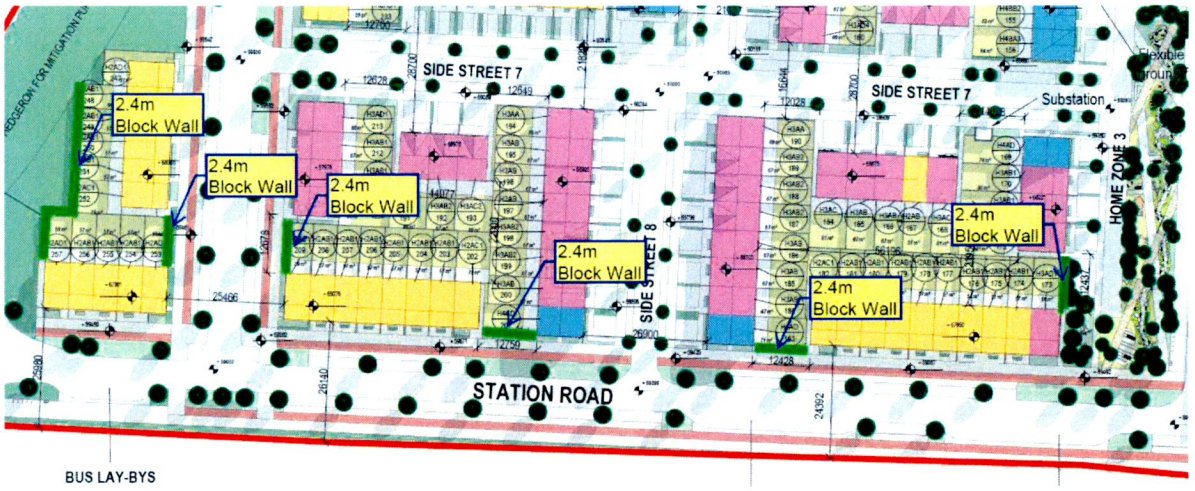

Figure 6-1 Location of recommended block wall (noise barrier) to rear gardens near the railway line

7 Conclusions

I. Road and rail noise will be the dominant noise source impacting the development location. The south-facing facades of dwellings along Station Road will experience the highest noise impacts in the region of 60-65 dB L_{den} and 50-55 dB L_{night}. These levels are considered a worst-case scenario; however, they do not exceed the SDCC thresholds for *undesirable high sound levels* 70 dB L_{den} and 55 dB L_{night}. Dwellings situated further north will be shielded from railway noise and experience relatively low noise levels during the day and at night.

II. A defined noise mitigation strategy has been developed with respect to those dwellings which will be worst affected by noise with a view to ensuring that residents will not be exposed to excessive levels of transportation noise.

III. **Indoor noise levels:** In line with the relevant standard and guidance, a nighttime threshold value of L_{night} 30dB indoors has been targeted for the development. All dwellings are predicted to achieve indoor levels below this threshold when windows are closed; an enhanced glazing build-up has been recommended for dwellings facing the railway line.

IV. **Noise level in outdoor amenity spaces:** Noise maps show that much of the development site will not exceed the lower threshold 50dB $L_{Aeq,16hr}$ from transportation sources; this value is suggested by the W.H.O. to prevent 'moderate annoyance' in outdoor amenity areas, with an upper threshold of 55dB $L_{Aeq,16hr}$ as a guide to prevent 'serious annoyance'. 0.8% (2 out of 257) of rear gardens were shown to potentially exceed 55dB $L_{Aeq,16hr.}$ However, mitigation can be enacted in the form of a 2.2m block wall to reduce the noise impact for these two dwellings.

V. **Outward noise impacts:** The development is not expected to impact surrounding noise-sensitive locations adversely. Residential development, by its nature, does not produce significant amounts of noise. Noise from the mechanical plant will be controlled through the imposition of noise limits at nearby noise-sensitive locations, and all mechanical plants shall be selected and designed to meet this criterion