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Noise Impact Assessment

New Residential and Creche Scheme of 137 no. Residential Units at Glencarrig, Hazelhatch Road, Celbridge, Co Kildare.

Reference Number: LRD202201

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09/08/2022	1	Draft
23/08/2022	2	For planning

Glossary of Terms

A-weighting	A frequency-dependent correction that is applied to a measured or calculated sound of moderate intensity to mimic the varying sensitivity of the ear to sound for different frequencies.
Ambient Sound	The all-encompassing sound at a given location, comprised of many sound sources near and far.
Break-in/out	Noise transmission into a building from outside, or noise transmission for a building to the outside.
C_{tr}	A correction term applied against the sound insulation single-number values (R_w & $D_{nT,w}$). Its is commonly used to account for low frequency urban traffic noise.
Free-field level	The sound pressure level measured away from any reflecting surfaces.
$L_{A10,T}$	The A-weighted sound pressure level exceeded for 10% of the measurement time. Used to assess traffic noise.
$L_{A90,T}$	The A-weighted sound pressure level exceeded for 90% of the measurement time. Used as an indicator for the relative 'quietness' of a given location.
$L_{Aeq,T}$	Defined in ISO 1996-1:2016 as A-weighted, equivalent continuous sound pressure level during a stated time interval, expressed in decibels (dB), at a given point in space.
$L_{AF,max}$	Maximum time-weighted and A-weighted sound pressure level with a FAST time constant (125ms) within a stated time interval t.
L_{day}	Equivalent continuous sound pressure level when the reference time interval is the day, defined in ISO 1996-1:2016.
L_{den}	Day-evening-night-weighted sound pressure level as defined in section 3.6.4 of ISO 1996-1:2016.
L_{night}	Equivalent continuous sound pressure level when the reference time interval is the night, defined in ISO 1996-1:2016.
Reverberation	Reverberation is the persistence of sound after the sound is produced, caused by multiple reflections from surfaces.
Reverberation Time (RT_{60})	The time, in seconds, required for the sound pressure level to decrease by 60 dB after the sound source has stopped. RT_{30} & RT_{20} may also be used.
R_w dB	The weighted sound reduction index. This is a laboratory measure of the sound insulating proterties of a material or structure.

1 Introduction

Garyaron Homes LTD has engaged iAcoustics to prepare an Acoustic Design Statement for a proposed mixed-use development in Johnstown, Naas, Co Kildare. The proposed development is a new residential and creche scheme comprising 137 no. units in a mixture of houses and apartments ranging from 2-5 storeys in height. The site is situated off the Hazelhatch Road and approximately 1km from Hazelhatch/Celbridge railway station. The LRD Opinion by Kildare County Council dated 11th July 2022 states the following in relation to noise:

> *The site is located near Public Roads and the Railway Line, and the applicant is requested to submit an Acoustic Design Statement by a suitably qualified acoustic specialist to ensure the proposed development, including external areas will not be exposed to noise levels more than the Kildare County Third Noise Action Plan Lden threshold of 70 dB (A) and Lnight threshold of 57 dB (A). (Mitigation measures are to be included as deemed required).*
>
> a. *A noise monitoring survey conducted midweek during school-term that is to contain a full set of noise monitoring results. These results are to include the Time Run Duration, LAeqT (1 hour), LAeqT (15min), LAFmax, LAF10, LAF90, calculated Lden noise levels and measured Lnight noise levels.*
> b. *Calculated Lden and measured Lnight values at the fa<;ades of the proposed development at levels not less than 1.5 metres above each of the respective floor level. The useability of balconies (If applicable) are to be subject of this assessment.*
> c. *The predicted internal noise levels to be in accordance with the recommended indoor ambient noise levels as prescribed under the British Standards BS 8233:2014. This is also to have an assessment regarding opening windows at night (in summer months) and the impact on internal ambient noise levels. This assessment shall have consideration to the number of LAFmax events from 11 pm to 7.00 am having regard to potential sleep disturbance.*
> d. *Concluding statement regarding the compliance with the Kildare County Council Third Noise Action Plan 2019- 2023 and the British Standards BS 8233:2014.*

Best practice guidance has been followed in developing an Acoustic Design Statement (ADS) to ensure that future residents are protected from adverse noise impacts both indoors and in outdoor amenity areas.

Drawings and other design information are presented in this report for informative purposes to assist our discussion of acoustical matters. This report should be read in conjunction with all relevant design information submitted as part of the application.

Figure 1-1 Proposed site layout. Ref: HZL-JFA-SP-00-DR-A-P1003

1.1 Site Description

The subject site is located off the R405 'Hazelhatch road' and Local Road L5062. The site is bound to the north and west by existing residential development. Adjacent undeveloped lands, currently in use for agricultural purposes, bounds the site to the south. Vehicular access to the site will be from L5062, with the road widened and improved from the junction of the R405 to accommodate the increased traffic flow.

2 Assessment Criteria, Relevant Standards & Guidance

2.1 Kildare County Council Noise Action Plan 2019 - 2023

The objectives of the Noise Action Plan are to avoid, prevent and reduce on a prioritised basis, where necessary, the harmful effects due to long-term exposure to environmental noise. The Noise Action Plan proposes noise levels thresholds of 70 dB(A) L_{den}, and 57 dB(A) L_{night} for both "Major Roads" and "Major Railways" set in accordance with the Environmental Protection Agency (EPA) "Guidance Note for Noise Action Planning, July 2009". These limits are arbitrary at present as there is no existing legislation that limits environmental noise to a particular value.

2.2 World Health Organisation (WHO) *Guidelines for Community Noise* 1999

The WHO drafted the Guidelines for Community Noise (1999) as a response to the need for action on community noise. The document is widely referenced throughout the industry as a benchmark in assessing acoustics for residential developments.

- 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.
- 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.
- 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).
- When the background noise is low, single noise events exceeding 45dB L_{AFmax} inside bedrooms at nighttime should be limited.

It should be noted that the WHO guideline values are not intended as noise limits. The WHO guideline values are evidence-based public health-oriented recommendations to serve as the basis for a policy-making process.

2.3 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 a 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).

2.4 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").

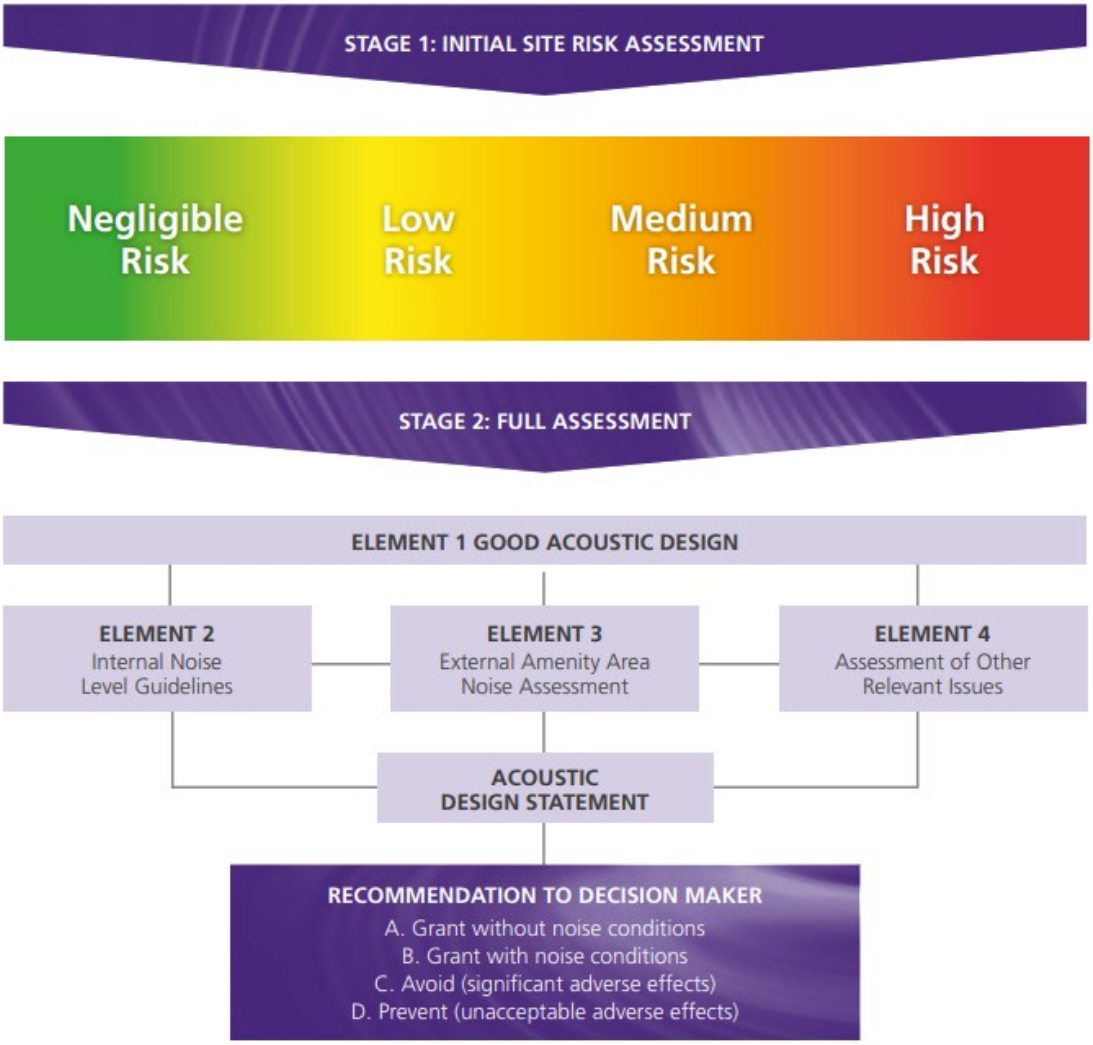

Figure 2-1 – Summary of ProPG procedure

3 Baseline Noise Survey

3.1 Baseline Noise Levels: Definition & Function

Baseline noise refers to the noise environment in an area prior to the construction and/or operation of a proposed development. Baseline noise levels serve several purposes in the assessment process:

a. They provide context for the noise levels predicted to arise from the proposed development against which they may be appraised;
b. They may be required as a formal part of the noise assessment process;
c. They may demonstrate that the noise environment is already unsatisfactory.

The baseline noise levels assumed for assessment must be the expected levels at the relevant time for the phase of the proposed development being considered. This may be at some future date either because the development will not be operational for several years or because its noise emissions will change during its operating life. Baseline noise levels may be determined by direct measurement, prediction, or a combination of these methods.

In many cases, the year in which the study is carried out will be relevant, and these baseline noise levels can normally be assumed as the baseline levels during the *Opening Year* (2024). We have no reason to believe that the noise environment at the development location will change significantly over the next five years. Furthermore, the dominant source will be road traffic noise from Hazelhatch road; any potential increase in noise level will likely be associated with increased traffic flows. Predictive methods can easily determine potential increases in baseline noise levels in the future (i.e. year of opening, 15th year) resulting from increased traffic flows.

3.2 Survey Methodology

iAcoustics carried out an unattended 24-hour noise survey at the development site between the 4th and 5th of August 2022. A microphone was placed on a tripod at the height of 3m from the ground, and there were no nearby reflective surfaces. The monitoring location was chosen as the approximate location of the façade nearest to the dominant noise source, which was identified as Hazelhatch Road.

Figure 3-1 Ariel view of the subject site showing the location of noise monitoring marked with a red dot

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.

3.3 Measurement Equipment & Weather Conditions

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-06306-EO*	*Mar-2023*
Microphone	*NTI MA220*	*8285*	*Mar-2023*
Calibrator	*Castle GA607*	*044447*	*Oct-2023*

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

Weather conditions were calm and dry throughout the survey. Temperatures ranged from 9°C - 20 °C with broken cloud. A north-westerly wind was present with average speeds of 16km/h (4.4 m/s), which is below the 5 m/s threshold suggested in ISO 1996.

3.4 Assessment Parameters

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.

4 Results

4.1 Measured Sound Pressure Levels (SPL's)

Figure 4-1 is a summary of the noise level readings over the entire measurement period. Appendix A presents the results in tabular format.

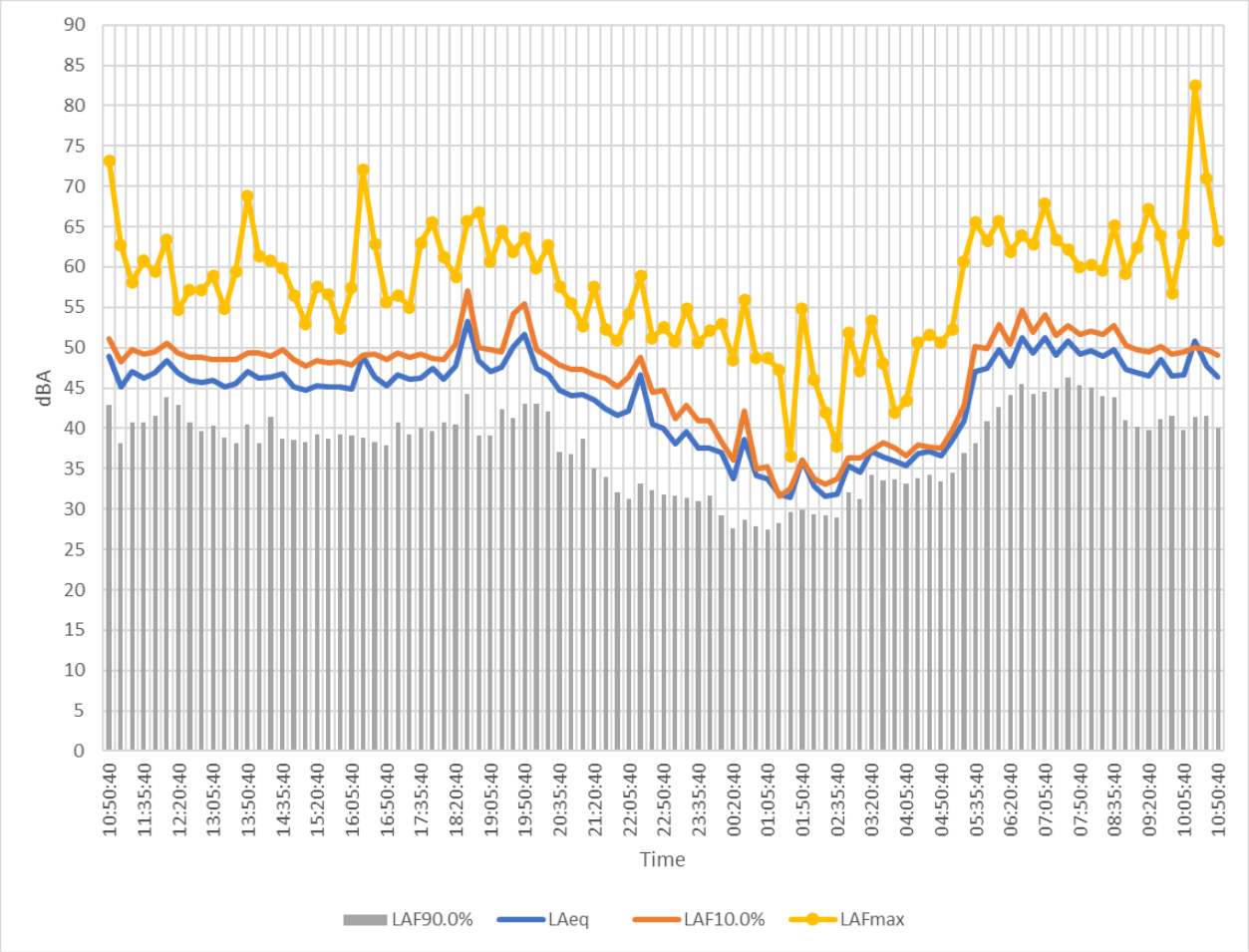

Figure 4-1 Graph showing the plotted LAeq, LA10, LA90 and LAFMax parameters over the measurement period

4.2 Calculated Parameters

Parameter:	Values
L_{den}	51 dB
L_{day} / $L_{Aeq,16hr}$	48 dB
$L_{evening}$	46 dB
L_{night} / $L_{Aeq,8hr}$	44 dB

Table 4-1 Calculated L_{den} L_{night} $L_{evening}$ & $L_{Aeq,16hr}$ parameters

4.3 Observations

An iAcoustics practitioner partially attended the survey for a 30-minute period 10:50am – 11:20am on the 4th August 2022. The dominant noise source is road traffic noise made up of distant road noise and local road noise along Hazelhatch Road. Other audible sounds included birdsong and general neighbourhood noise. Train noise was just audible above the background noise at the monitoring location but was insignificant.

5 Noise Mapping

5.1 EPA Strategic Noise Maps

Environmental noise from major infrastructure, including roads, railways and airports, is governed by the EU's Environmental Noise Directive (END) 2002/49/EC, which requires the Member States to prepare and publish, every 5 years, strategic noise maps. A strategic noise map is a graphical representation of the predicted noise levels in a particular area and from road, rail and air sources with different colours representing different noise levels, accessible via: [*https://gis.epa.ie/EPAMaps/*].

Only *rail noise* data for rail is available for the development site, which is indicated below in figures 5-1 and 5-2. Based on a review of the strategic noise maps, the development site is well outside the catchment area of the noise contours and will not pose a risk of adverse impact on the development site. The railway line is approximately 1km from the development site; in our experience, rail noise is not ordinarily audible at this distance.

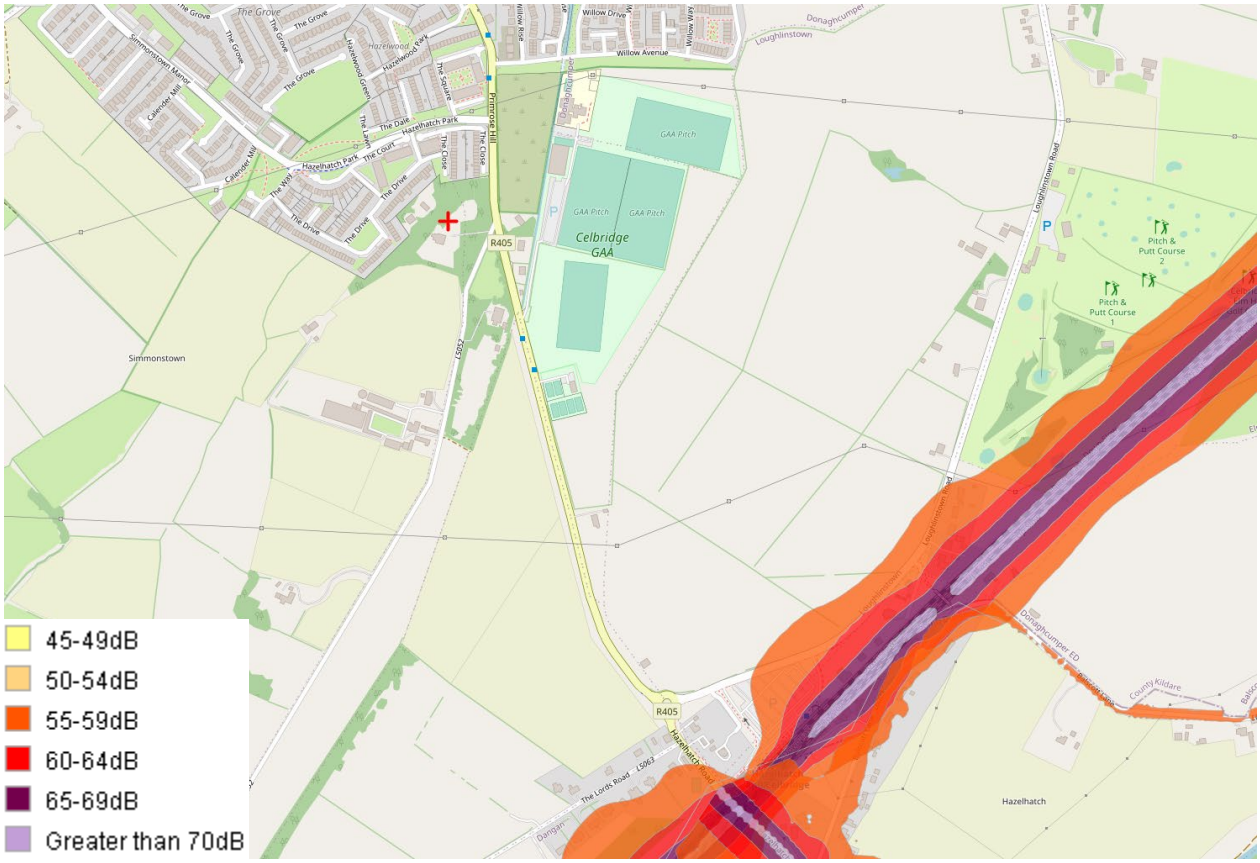

Figure 5-1 Strategic noise mapping of rail. The dB value represents the average decibel value during the Lden time.

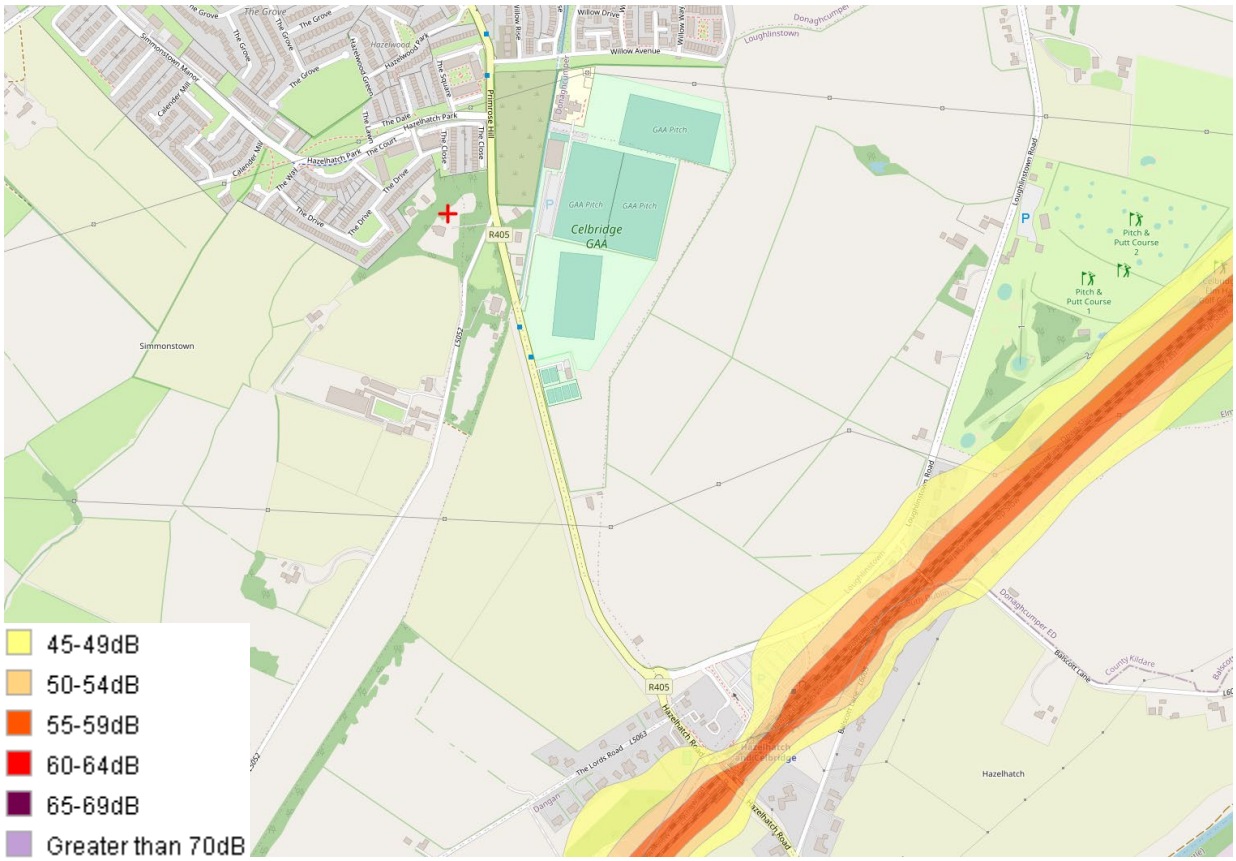

Figure 5-2 strategic noise mapping of rail. The dB value represents the average decibel value during the L_{night} time.

5.2 Site Specific Noise Mapping

For illustrative purposes, iAcoustics have developed site-specific noise maps accounting for the layout and orientation of dwellings across the site. Noise maps were developed in CadnaA[1] and have been calibrated against the baseline noise levels captured in the noise survey. The function of site-specific noise maps is to

a) Present the façade noise levels across all dwellings.
b) Show the external noise levels in gardens and external play areas.

[1] *CadnaA (Computer Aided Noise Abatement) is the leading software for the calculation, presentation, assessment and prediction of environmental noise.*

Figure 5-3 Lden noise map. Grid height: 2m.

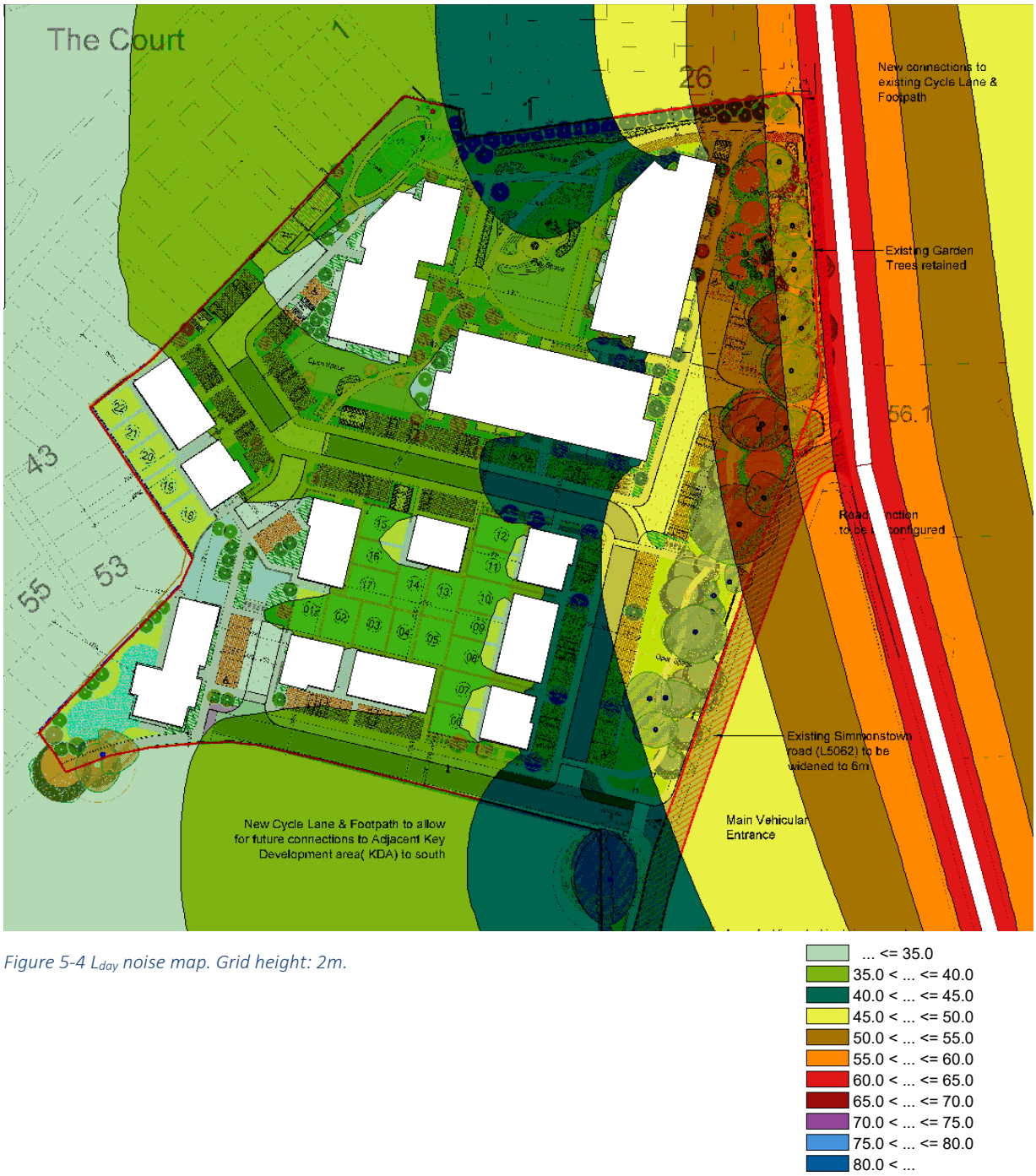

Figure 5-4 L_{day} noise map. Grid height: 2m.

Figure 5-5 L_{night} noise map. Grid height: 2m

6 Assessment

6.1 Indoor Noise Levels

Specific guidance with respect to Indoor Ambient Noise Levels (IANL's) in dwellings is outlined in Section 2. The general aim should be to reduce the noise level inside the bedrooms to 35dB $L_{Aeq,16hr}$ during the day and 30dB $L_{Aeq,8hr}$ at night. The IANL for any given dwelling can be predicted from external free-field sound levels at the façade following the 'outdoor-to-indoor' calculation procedure in BS 8233:2014.

Sections 6.1.1 & 6.1.2 examine a likely worst-case scenario which is assumed as the dwelling, or group of dwellings, predicted with the highest noise exposure levels. For this development, the east façade of the apartment block nearest Hazlehatch Road has been chosen as a representative worst-case situation.

6.1.1 Continuous Noise

Annex G of BS 8233:2014 provides a simplified calculation of indoor noise levels by subtracting the R_w values of the façade from the free-field outdoor level. The airborne sound insulation of a façade is determined by the weakest element of the façade, which is assumed to be the glazing and any background ventilation. Insulating glass units have an airborne sound insulating performance of approximately 33 dB R_w. An assessment of indoor noise levels (assumed windows are closed) is outlined below.

Assessment Period	Criteria	*Outdoor Level	Glazing insulation	Resulting indoor level
Daytime	≤ 35dB $L_{Aeq,16hr}$	48 dB $L_{Aeq,16hr}$	33 dB R_w	15dB $L_{Aeq,16hr}$
Nighttime	≤ 30dB $L_{Aeq,8hr}$	44 dB $L_{Aeq,8hr}$	33 dB R_w	11dB $L_{Aeq,8hr}$

*Table 6-1 Assessment of indoor noise levels with closed windows. *Levels based on site measurements.*

The assessment indicates that the resulting indoor levels will be well within the criteria for day and nighttime levels inside dwellings when windows are closed. If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB according to BS 8233:2014. The assessment of indoor levels with *partially opened windows* is repeated below.

Assessment Period	Criteria	*Outdoor Level	Façade sound reduction	Resulting indoor level
Daytime	≤ 35dB $L_{Aeq,16hr}$	48 dB $L_{Aeq,16hr}$	15 dB	33dB $L_{Aeq,16hr}$
Nighttime	≤ 30dB $L_{Aeq,8hr}$	44 dB $L_{Aeq,8hr}$	15 dB	29dB $L_{Aeq,8hr}$

*Table 6-2 Assessment of indoor noise levels with partially opened windows. *Levels based on site measurements.*

The repeated assessment for partially opened windows indicates that acceptable acoustic conditions will be achieved inside dwellings during the day and night. It should be noted that dwellings located further west on the development site will experience lower noise levels and benefit from shielding from other buildings.

6.1.2 Single-Noise Events

Single noise events exceeding 45dB L_{AFmax} inside bedrooms at nighttime (2300hrs – 0700hrs) should be limited. The passing of a vehicle or train can be referred to as a single-noise event. Figure 6-1 below is a graph showing the plotted L_{AFmax} levels at the monitoring location between 2300hrs and 0700hrs.

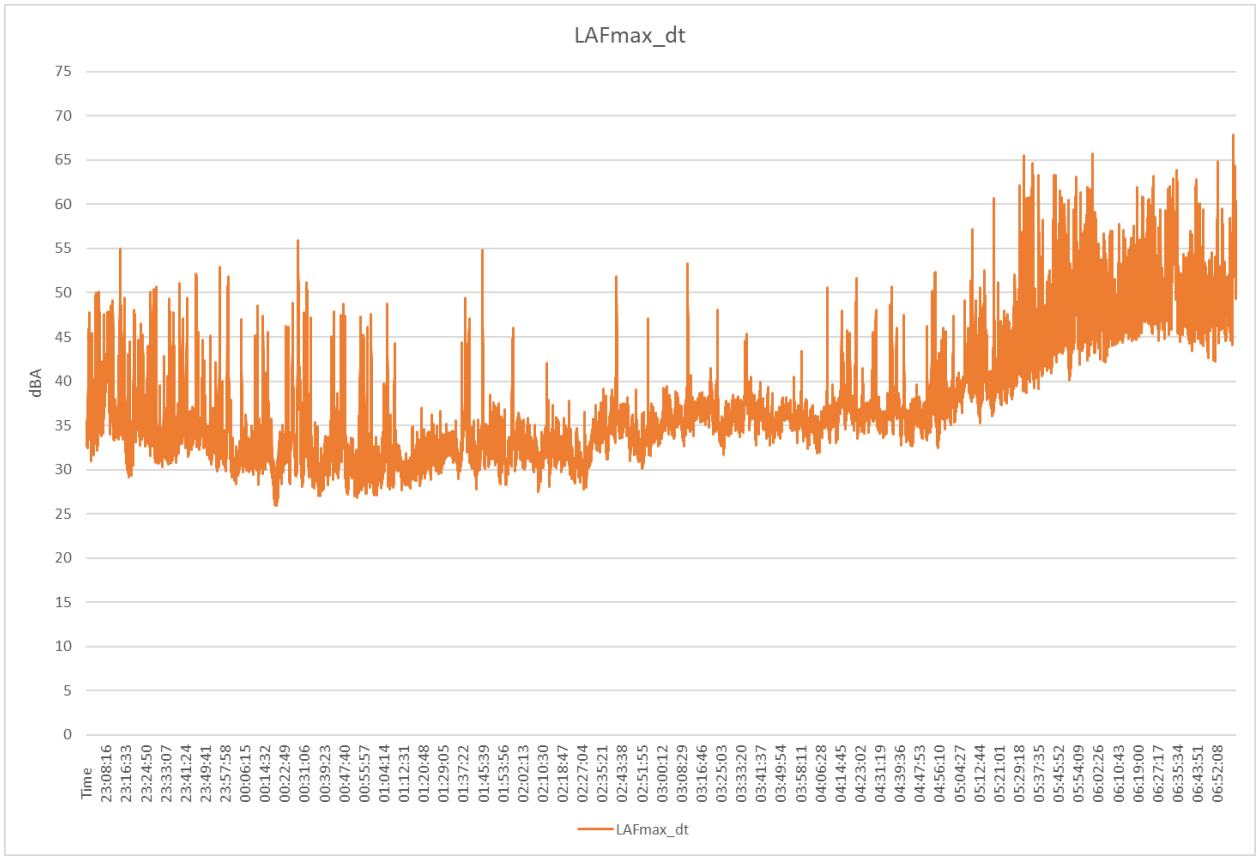

Figure 6-1 Change in baseline L_{AFMax} levels between 2300hrs and 0700hrs

Based on a typical insulating glass unit rated R_w 33dB, 45dB L_{AFmax} will not be exceeded inside a bedroom in the worst affected dwelling. To achieve no more than 45dB $L_{AFmax,inside}$ when windows are partially opened, the outdoor level at the window should not exceed 60dB $L_{AFmax,outside}$ based on a 15dB reduction. Figure 6-1 demonstrates that in a worst-case situation, the baseline $L_{AFmax,outside}$ did not exceed 60dB for the vast majority of the night period.

6.2 Outdoor Noise Levels

For external areas that are used for amenity space, such as gardens, balconies and communal areas, the external noise level should not exceed 50 dB $L_{Aeq,16hr}$ with an upper threshold of 55 dB $L_{Aeq,16hr}$. The 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 site-specific noise maps presented in Chapter 5 demonstrate that much of the development site will not exceed the lower threshold 50 dB $L_{Aeq,16hr}$ from transportation sources. Therefore, no mitigation is required. All residents of the development will have access to one or both of the following:

- A relatively quiet private garden, roof garden or open balcony.
- A relatively quiet external amenity space for use by residents as part of the amenity of their dwellings (i.e an external green area, play area)

6.3 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 the environment at the development location.

Mechanical noise sources associated with a creche facility might include kitchen/toilet extract fans and external condensers for A/C units. In our experience, there is typically a very low risk of adverse noise impact from this type of commercial operation. The proposed mechanical plant details are unknown to iAcoustcis at the time of writing. Alternatively, it is appropriate at this stage to apply plant noise limits as follows:

Period	Noise Emission Limit Value
Daytime (07:00 to 19:00hrs)	55 dB $L_{Ar,T}$
Evening (19:00 to 23:00hrs)	50 dB $L_{Ar,T}$
Night-time (23:00 to 07:00hrs)	45 dB $L_{Aeq,T}$ & no tonality
Note: $L_{Ar,T}$ is the rating level as defined in BS 4142:2014.	

Table 6-3 NG4 noise emission limit values

The plant noise criteria are based on the limit values provided in the Environmental Protection Agency document - *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016*. These limits values are widely used in the imposition of planning conditions by local authorities. At the design stage for this development, a detailed desktop assessment must be carried out by a suitably qualified acoustician to ensure that any proposed plant does not exceed the criteria.

6.4 Anticipating Future Changes in Noise Levels

iAcoustics have reviewed the transportation report by NRB Consulting. Overall, increases during AM peak hour and PM peak hour will be 5% or less as a worst-case impact. Increases of this magnitude will have a negligible impact from a noise-generating perspective.

Calculations of the relevant growth factors are included in Table 3.4 of the NRB report. below (based on tabulated 'Central Growth' for County Kildare).

From year	To year	Growth rate	Likley change is baseline noise levels
2022	2024	1.039	< 0.1dB
2024	2039	1.204	< 0.5dB

Table 3.4: Traffic Growth Rates, TII Travel Demand Projections Unit 5.3

6.5 ProPG 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. 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. Based on the predicted noise levels across the subject site, the site is deemed 'low' risk according to the ProPG Stage 1 risk assessment.

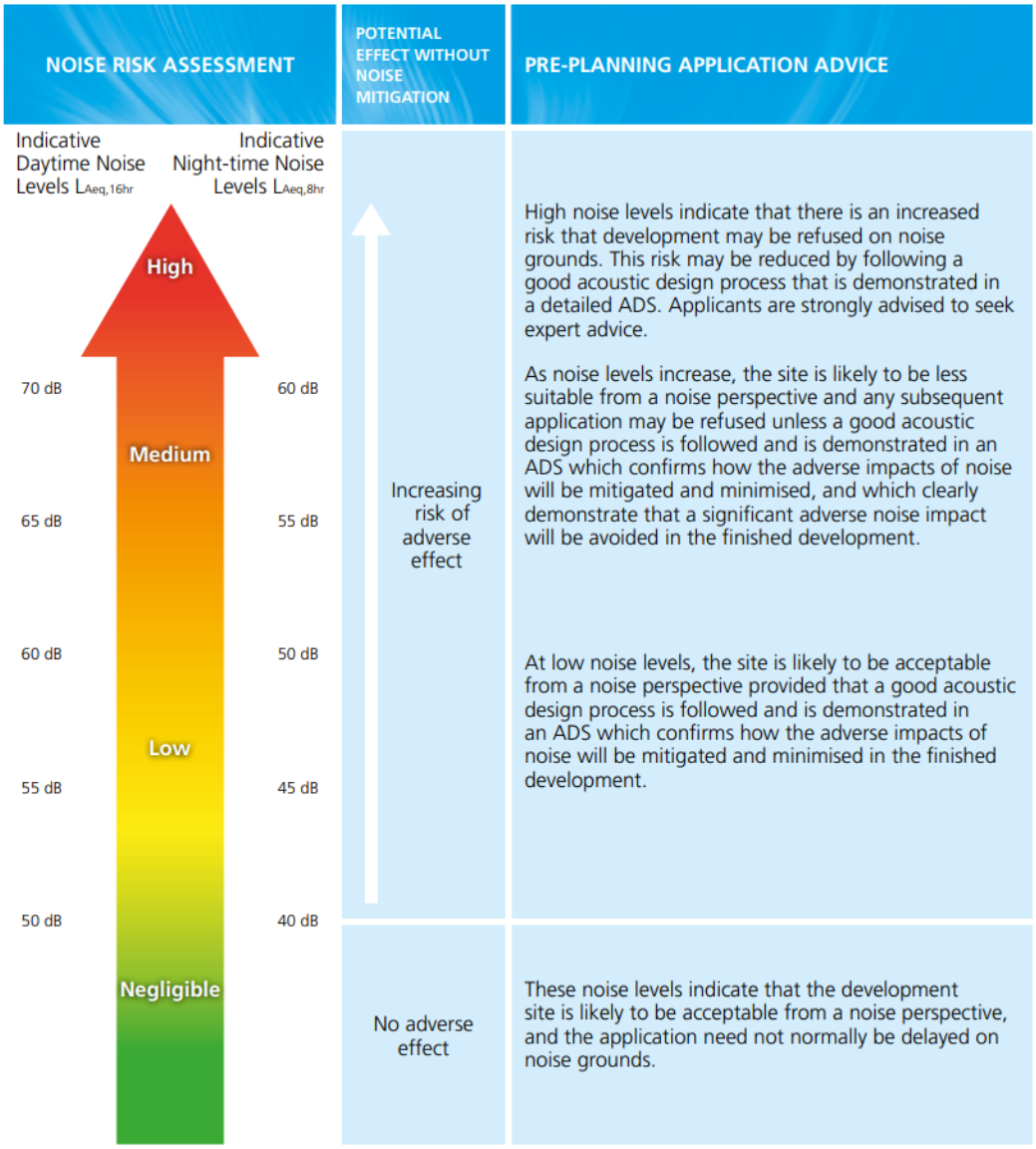

Figure 6-2 Stage 1 Initial Site Noise Risk Assessment from ProPG

6.6 Assessment of Alternatives

I. **Feasibility of relocating or reducing noise levels from relevant sources:** Road traffic noise is the dominant noise source impacting the development site. It is not possible to relocate or reduce this noise source.

II. **Site layout & orientation with respect to noise sources:** There is limited scope to alter the building layout, given the size and shape of the site. Situating the residential building further 'back' into the site away from the main road is not likely to reduce the noise impacting the façade. We do not consider it necessary to alter the layout or orientation of buildings on the site.

7 Recommendations

Our assessment indicates that the development site will not be exposed to noise levels giving rise to significant adverse impacts or other adverse impacts. Therefore, there is no requirement for mitigating noise measures. To maximise the acoustic quality of the finished development, general guidance is provided with respect to acoustics and ventilation.

7.1 Acoustics & Ventilation

Indoor environmental quality (IEQ) is dependent on air quality, thermal comfort and acoustic comfort. These factors are interdependent, and provisions for ventilation and overheating mitigation may include façade openings that permit external noise ingress. iAcoustics recommends that all dwellings be provided with *either* MVHR ventilation or background (trickle) vents with sound attenuating characteristics to minimise the need to open windows. Background vents, where specified, weighted element normalised level difference of $D_{n,e,w}$ 35 dB when the vent is open.

8 Conclusion

This Noise Impact Assessment (NIA) has been prepared for a proposed residential and creche development in Hazelhatch, Co Kildare. A noise survey has been undertaken at the subject site to quantify the existing noise environment. iAcoustics have evaluated the measured noise levels against the relevant standards and guidance to ensure an appropriate quality of life and residential amenity indoors and outdoors for residential development.

Baseline noise levels at the site are significantly below the Kildare County *Third Noise Action Plan* L_{den} threshold of 70 dB(A) and L_{night} threshold of 57 dB(A). We do not anticipate any significant increases in baseline levels in the future.

All dwellings are expected to comply with the relevant indoor ambient noise level criteria.

The noise levels for external amenity spaces (communal gardens, patios etc.) at the subject site are predicted to comply with the 50 & 55 dB $L_{Aeq,16hr}$ guide values proposed by the W.H.O.

The development is not expected to adversely impact surrounding noise-sensitive locations. Residential development will not produce significant amounts of noise above and beyond the pre-existing ambient noise levels at the development location. Noise from the commercial aspect of the development (i.e. creche) 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.

No noise mitigation measures have been recommended for the development on the basis of low-risk factors.

Appendix A – Tabular Data

Start Date [YYYY-MM-DD]	Time [hh:mm:ss]	Stop Date [YYYY-MM-DD]	Time [hh:mm:ss]	LAeq [dB]	LAF10.0% [dB]	LAF90.0% [dB]	LAFmax [dB]
03/08/2022	10:35:40	03/08/2022	10:50:40	48.9	51.1	42.9	73.2
03/08/2022	10:50:40	03/08/2022	11:05:40	45.1	48.3	38.1	62.7
03/08/2022	11:05:40	03/08/2022	11:20:40	47	49.7	40.8	58.1
03/08/2022	11:20:40	03/08/2022	11:35:40	46.2	49.2	40.7	60.8
03/08/2022	11:35:40	03/08/2022	11:50:40	46.9	49.5	41.5	59.4
03/08/2022	11:50:40	03/08/2022	12:05:40	48.4	50.6	43.9	63.4
03/08/2022	12:05:40	03/08/2022	12:20:40	46.9	49.4	42.9	54.7
03/08/2022	12:20:40	03/08/2022	12:35:40	46	48.8	40.7	57.2
03/08/2022	12:35:40	03/08/2022	12:50:40	45.7	48.8	39.6	57.1
03/08/2022	12:50:40	03/08/2022	13:05:40	45.9	48.6	40.3	58.9
03/08/2022	13:05:40	03/08/2022	13:20:40	45.1	48.5	38.9	54.8
03/08/2022	13:20:40	03/08/2022	13:35:40	45.5	48.5	38.2	59.5
03/08/2022	13:35:40	03/08/2022	13:50:40	47.1	49.4	40.5	68.8
03/08/2022	13:50:40	03/08/2022	14:05:40	46.2	49.3	38.2	61.3
03/08/2022	14:05:40	03/08/2022	14:20:40	46.3	48.9	41.4	60.8
03/08/2022	14:20:40	03/08/2022	14:35:40	46.8	49.8	38.7	59.9
03/08/2022	14:35:40	03/08/2022	14:50:40	45.1	48.5	38.6	56.5
03/08/2022	14:50:40	03/08/2022	15:05:40	44.7	47.7	38.3	53
03/08/2022	15:05:40	03/08/2022	15:20:40	45.3	48.4	39.3	57.6
03/08/2022	15:20:40	03/08/2022	15:35:40	45.2	48.1	38.7	56.6
03/08/2022	15:35:40	03/08/2022	15:50:40	45.2	48.3	39.2	52.4
03/08/2022	15:50:40	03/08/2022	16:05:40	44.9	47.8	39.1	57.4
03/08/2022	16:05:40	03/08/2022	16:20:40	49	49.1	38.8	72
03/08/2022	16:20:40	03/08/2022	16:35:40	46.3	49.2	38.3	62.9
03/08/2022	16:35:40	03/08/2022	16:50:40	45.3	48.5	37.9	55.7
03/08/2022	16:50:40	03/08/2022	17:05:40	46.7	49.4	40.7	56.5
03/08/2022	17:05:40	03/08/2022	17:20:40	46.1	48.8	39.3	55
03/08/2022	17:20:40	03/08/2022	17:35:40	46.2	49.2	40.1	63
03/08/2022	17:35:40	03/08/2022	17:50:40	47.4	48.7	39.7	65.5
03/08/2022	17:50:40	03/08/2022	18:05:40	46.1	48.5	40.8	61.2
03/08/2022	18:05:40	03/08/2022	18:20:40	47.7	50.4	40.5	58.8
03/08/2022	18:20:40	03/08/2022	18:35:40	53.3	57.1	44.2	65.7
03/08/2022	18:35:40	03/08/2022	18:50:40	48.4	50	39.1	66.8
03/08/2022	18:50:40	03/08/2022	19:05:40	47	49.8	39.1	60.6
03/08/2022	19:05:40	03/08/2022	19:20:40	47.6	49.5	42.4	64.4
03/08/2022	19:20:40	03/08/2022	19:35:40	50.2	54.2	41.3	61.9
03/08/2022	19:35:40	03/08/2022	19:50:40	51.7	55.5	43.1	63.6
03/08/2022	19:50:40	03/08/2022	20:05:40	47.4	49.7	43	59.9
03/08/2022	20:05:40	03/08/2022	20:20:40	46.6	48.8	42.1	62.7
03/08/2022	20:20:40	03/08/2022	20:35:40	44.7	47.9	37.1	57.6
03/08/2022	20:35:40	03/08/2022	20:50:40	44.1	47.3	36.8	55.5

03/08/2022	20:50:40	03/08/2022	21:05:40	44.2	47.3	38.7	52.7
03/08/2022	21:05:40	03/08/2022	21:20:40	43.5	46.7	35	57.5
03/08/2022	21:20:40	03/08/2022	21:35:40	42.4	46.2	33.9	52.2
03/08/2022	21:35:40	03/08/2022	21:50:40	41.6	45.2	32	50.9
03/08/2022	21:50:40	03/08/2022	22:05:40	42.1	46.4	31.3	54.2
03/08/2022	22:05:40	03/08/2022	22:20:40	46.6	48.8	33.2	58.9
03/08/2022	22:20:40	03/08/2022	22:35:40	40.6	44.5	32.4	51.2
03/08/2022	22:35:40	03/08/2022	22:50:40	40	44.8	31.8	52.5
03/08/2022	22:50:40	03/08/2022	23:05:40	38.1	41.2	31.6	50.8
03/08/2022	23:05:40	03/08/2022	23:20:40	39.6	42.8	31.4	54.9
03/08/2022	23:20:40	03/08/2022	23:35:40	37.5	41	31	50.7
03/08/2022	23:35:40	03/08/2022	23:50:40	37.5	40.9	31.7	52.1
03/08/2022	23:50:40	04/08/2022	00:05:40	37	38.4	29.2	52.9
04/08/2022	00:05:40	04/08/2022	00:20:40	33.8	36.1	27.6	48.5
04/08/2022	00:20:40	04/08/2022	00:35:40	38.7	42.2	28.7	55.9
04/08/2022	00:35:40	04/08/2022	00:50:40	34.2	35	27.8	48.7
04/08/2022	00:50:40	04/08/2022	01:05:40	33.8	35.2	27.4	48.7
04/08/2022	01:05:40	04/08/2022	01:20:40	31.8	31.6	28.2	47.3
04/08/2022	01:20:40	04/08/2022	01:35:40	31.4	32.6	29.6	36.6
04/08/2022	01:35:40	04/08/2022	01:50:40	36	36.1	29.9	54.8
04/08/2022	01:50:40	04/08/2022	02:05:40	32.8	33.8	29.4	46
04/08/2022	02:05:40	04/08/2022	02:20:40	31.6	33.1	29.2	42
04/08/2022	02:20:40	04/08/2022	02:35:40	31.8	33.8	29	37.8
04/08/2022	02:35:40	04/08/2022	02:50:40	35.4	36.3	32.1	51.8
04/08/2022	02:50:40	04/08/2022	03:05:40	34.6	36.3	31.3	47.1
04/08/2022	03:05:40	04/08/2022	03:20:40	37.1	37.3	34.2	53.3
04/08/2022	03:20:40	04/08/2022	03:35:40	36.4	38.2	33.6	48.1
04/08/2022	03:35:40	04/08/2022	03:50:40	35.9	37.6	33.7	41.9
04/08/2022	03:50:40	04/08/2022	04:05:40	35.4	36.6	33.2	43.4
04/08/2022	04:05:40	04/08/2022	04:20:40	36.9	38	33.8	50.6
04/08/2022	04:20:40	04/08/2022	04:35:40	37.1	37.7	34.2	51.6
04/08/2022	04:35:40	04/08/2022	04:50:40	36.6	37.5	33.4	50.7
04/08/2022	04:50:40	04/08/2022	05:05:40	38.5	39.7	34.5	52.3
04/08/2022	05:05:40	04/08/2022	05:20:40	40.9	42.9	37	60.7
04/08/2022	05:20:40	04/08/2022	05:35:40	47.1	50.2	38.2	65.5
04/08/2022	05:35:40	04/08/2022	05:50:40	47.4	49.9	40.9	63.3
04/08/2022	05:50:40	04/08/2022	06:05:40	49.7	52.9	42.7	65.7
04/08/2022	06:05:40	04/08/2022	06:20:40	47.7	50.4	44.1	61.9
04/08/2022	06:20:40	04/08/2022	06:35:40	51.3	54.6	45.5	63.9
04/08/2022	06:35:40	04/08/2022	06:50:40	49.3	51.9	44.2	62.8
04/08/2022	06:50:40	04/08/2022	07:05:40	51.3	54.1	44.6	67.8
04/08/2022	07:05:40	04/08/2022	07:20:40	49.1	51.5	45	63.4
04/08/2022	07:20:40	04/08/2022	07:35:40	50.8	52.8	46.3	62.1
04/08/2022	07:35:40	04/08/2022	07:50:40	49.2	51.6	45.4	60
04/08/2022	07:50:40	04/08/2022	08:05:40	49.6	52	45.1	60.2
04/08/2022	08:05:40	04/08/2022	08:20:40	49	51.6	44	59.6

04/08/2022	08:20:40	04/08/2022	08:35:40	49.8	52.7	43.8	65.1
04/08/2022	08:35:40	04/08/2022	08:50:40	47.3	50.3	41	59.2
04/08/2022	08:50:40	04/08/2022	09:05:40	46.9	49.7	40.2	62.4
04/08/2022	09:05:40	04/08/2022	09:20:40	46.5	49.5	39.8	67.2
04/08/2022	09:20:40	04/08/2022	09:35:40	48.5	50.1	41.1	63.9
04/08/2022	09:35:40	04/08/2022	09:50:40	46.5	49.2	41.5	56.8
04/08/2022	09:50:40	04/08/2022	10:05:40	46.7	49.5	39.8	64
04/08/2022	10:05:40	04/08/2022	10:20:40	50.8	50	41.4	82.5
04/08/2022	10:20:40	04/08/2022	10:35:40	47.7	49.8	41.5	71
04/08/2022	10:35:40	04/08/2022	10:50:40	46.4	49.1	40.1	63.2
04/08/2022	10:50:40	04/08/2022	11:04:17	47.4	48.8	40.7	66.7