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PROPOSED DEVELOPMENT AT HOLLYSTOWN SITES 2 AND 3 & KILMARTIN LOCAL CENTRE SHD DUBLIN 15

AIRCRAFT & ROAD NOISE IMPACT ASSESSMENT

Technical Report Prepared For

Glenveagh Homes

Technical Report Prepared By

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Our Reference

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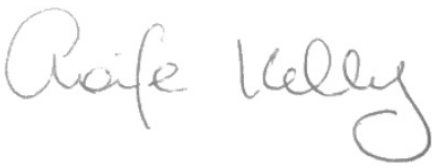
Signature		
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EXECUTIVE SUMMARY

AWN Consulting Ltd. has been commissioned to undertake a study in relation to potential inward noise impacts due to local road traffic and aircraft noise from flights to and from Dublin Airport on a proposed residential development at Hollystown (Site 2 /3 and Kilmartin Local Centre), Dublin 15.

An initial site noise risk assessment has been carried out for the proposed development of residential units on the sites located at Hollystown, Dublin 15. The sites are located within a section of the Dublin Airport Zone B and Zone C. The sites have been classified as having a low to medium noise risk using guidance contained in ProPG: Planning & Noise. This was determined through a review of noise maps available for the proposed development site. This review also took into account the future noise environment due to the operation of the North Runway at Dublin Airport. The discussion presented in Section 3.2 of this report is deemed to be a comprehensive review of all available information with regard to the potential future noise impacts from Dublin Airports operations.

For development buildings, which lie within Dublin Airport Noise Zone B and Zone C, it will be necessary to provide enhanced acoustic glazing and vents to ensure that when windows are closed that the internal noise environment is good. The noise level internally with the windows open will be higher than ideal, however, inhabitants will have the option to close the window to reduce the noise level internally while maintaining ventilation.

CONTENTS

1.0 INTRODUCTION

Planning Permission is being sought for development of residential units, childcare & community facilities and associated amenity areas at a site at Hollystown (Sites 2 and 3) and the Kilmartin Local Centre, Dublin 15. AWN Consulting Ltd. has been commissioned by Brady Shipman Martin to undertake a study in relation to potential inward noise impacts on the site.

This report has been prepared to address the potential noise impact due to aircraft movements on the proposed development with reference to best practice guidance contained in the *Dublin Agglomeration Environmental Noise Action Plan December 2018 – November 2023 Volume 3 – Fingal County Council Public Consultation Document* (NAP).

The site is located at Hollystown, Dublin 15. The site is located approximately 8km west of Dublin Airport.

Appendix A presents a glossary of acoustic terminology that is used throughout this report.

2.0 DESIGN GUIDANCE

2.1 Fingal Development Plan Policy on Aircraft Noise

The members of Fingal County Council resolved to adopt Variation No. 1 of the Fingal Development Plan 2017-2023 at a Council meeting on 9 December 2019. Variation No. 1 outlines revised Noise Zones and policy objectives in relation to aircraft noise from Dublin Airport.

Four noise zones (Zone A to D) are now indicated representing potential site exposure to aircraft exposure. The council will actively resist residential development within Zone A, and resist in Zone B and C pending independent acoustic advice and mitigation measures. Certain specific residential developments located in Zone D may be required to demonstrate that aircraft noise intrusion has been considered in the design.

Table 1 below outlines the objectives to be adhered to by applicants for developments in each zone.

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

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
	≥ 55 dB L_{night}	*Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment **must** be undertaken in order to demonstrate good acoustic design has been followed.* *Appropriate well-designed noise insulation measures **must** be incorporated into the development in order to meet relevant internal noise guidelines.* *An external amenity area noise assessment **must** be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants **must** seek expert advice.*
A	≥ 63 dB $L_{Aeq, 16hr}$ and/or ≥ 55 dB L_{night}	**To resist new provision for residential development and other noise sensitive uses.** *All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.*
Notes: • 'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: *Planning & Noise – New Residential Development*, May 2017; • Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*		

Table 1 Aircraft Noise Zones

2.2 Noise Action Plan for Dublin Airport 2019 – 2023

The Noise Action Plan for Dublin Airport (2019 – 2023) was published by Fingal County Council on 19 December 2019. The plan outlines the following objective in relation to aircraft noise:

> *"to avoid, prevent and reduce, where necessary, on a prioritised basis the effects due to long term exposure to aircraft noise, including health and quality of life through implementation of the International Civil Aviation Organisation's 'Balanced Approach' to the management of aircraft noise as set out under EU Regulation 598/2014"*

Whilst the plan outlines a range of measures to achieve this objective, the document is focussed primarily on the outward impact of the airport and aircraft noise and consider planning only in the context of outward impact such as the encroachment of airport activities on existing uses.

Discussion on the consideration of the inward noise impacts on residential amenity is considered in more detail in the Dublin Agglomeration Noise Action Plan 2019 – 2023.

2.3 Dublin Agglomeration Noise Action Plan 2019 – 2023

The Dublin Agglomeration NAP states the following with respect to assessing the noise impact on new residential development:

> *"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 in the interim, that Action Planning Authorities should examine planning policy guidance notes, such as ProPG (2017). Such guidance notes have been produced with a view to providing practitioners with guidance on a recommended approach to the management of noise within the planning system."*

In addition, the following is provided:

> *"In advance of any national guidance relating to noise in the planning process, the following actions relating to planning and development will be considered for implementation:*
>
> *a) To integrate Noise Action Plans into the County Development Plans.*
> *b) To develop guidelines relating to Noise and Planning for FCC. These guidelines should outline the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise. They should introduce the concept of a risk based approach to assessment of noise exposure, and for Good Acoustic Design to be encouraged as part of all new residential developments in FCC.*
> *c) To require developers to produce a noise impact assessment and mitigation plans, where necessary, for any new development where the Planning Authority considers that any new development will impact negatively on pre-existing environmental noise levels within their Council area.*
> *d) To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances in accordance with Department of the Environment, Community and Local Government planning guidelines such as the Urban Design Manual. e.g. the position, direction and height of new buildings, along with their function, their distance from roads, and the position of noise barriers and buffer zones with low sensitivity to noise,*
> *e) To ensure that new housing areas and in particular brown field developments will be planned from the outset in a way that ensures that at least the central area is quiet. This could mean designating the centre of new areas as pedestrian and cycling zones with future developments to provide road design layouts to achieve low speed areas where appropriate.*
> *f) To incorporate street design in new developments, which recognise that residential streets have multi-function uses (e.g. movement, recreation) for pedestrians, cyclists and vehicles, in that priority order. The noise maps will be used to identify and classify the priority areas and streets. In the design of streets, cognisance should be given to the Irish Manual for Roads and Streets 2013.*
> *g) To require sound proofing for all windows, in all new residential developments, where noise maps have indicated undesirable high*

noise levels. This may also lead to a requirement to install ducted ventilation.

h) To advise during pre-planning meetings regarding site specific design, the orientation of sensitive rooms and balconies away from noise, designing the layout and internal arrangement in apartments to ensure that similar rooms in individual units are located above each other or adjoin each other and that halls are used as buffer zones between sensitive rooms and staircases."

In accordance with this NAP policy, the following Acoustic Design Statement (ADS) has been prepared to comply with the requirements of this policy.

2.4 ProPG: Planning & Noise

The Professional Practice Guidance on Planning & Noise (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a UK or Irish government document, since its publication it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The 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.

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 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 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").

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS).

A summary of the ProPG approach is illustrated in Figure 1.

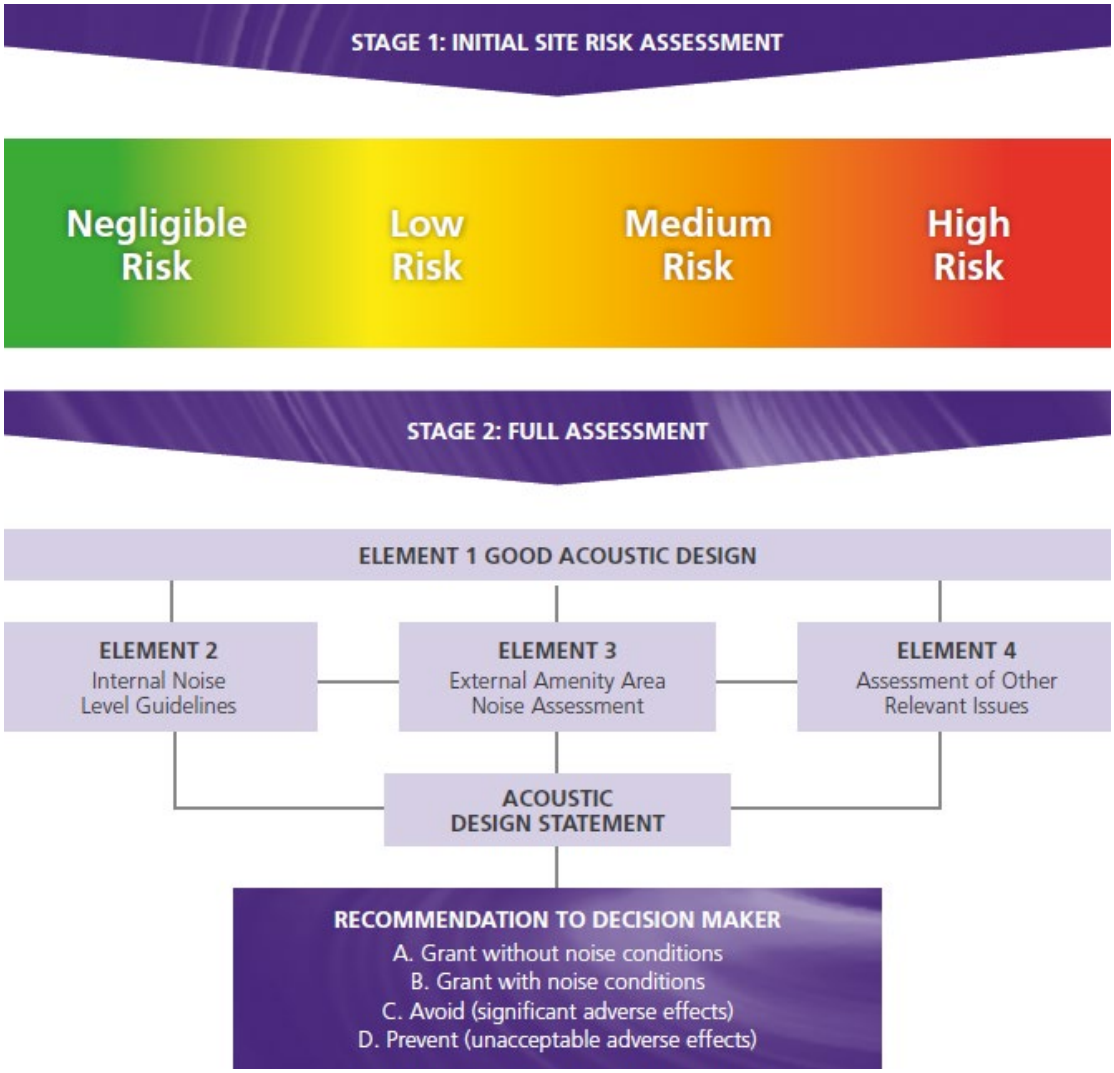

Figure 1 ProPG Approach (Source: ProPG)

2.5 WHO Environmental Noise Guidelines for Europe

The World Health Organisation (WHO) have published in October 2018 *Environmental Noise Guidelines for the European Region*. The objective of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise from transportation, wind farm and leisure sources of noise. The guidelines present recommendations for each noise source type in terms of L_{den} and L_{night} levels above which there is risk of adverse health risks.

However, it should be noted that the WHO guideline values referred to here are recommended to serve as the basis for a policy-making process to allow evidence-based public health orientated recommendations. They are not intended to be noise limits and the WHO document states the following regarding the implementation of the guidelines,

> *"The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or*

legislation, additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organizations. WHO will work with Member States and support the implementation process through its regional and country offices."

It is therefore not intended to refer to the WHO guidelines in an absolute sense as part of this assessment and it will be a decision for national and local policy makers to adopt the WHO guidelines and propose noise limits for use.

2.6 Internal Noise (BS 8233)

There are no statutory guidelines or specific local guidelines relating to appropriate internal noise levels in dwellings. In this instance, reference is made to BS 8233: 2014: *Guidance on sound insulation and noise reduction for buildings.*

BS 8233 sets out recommended internal noise levels for several different building types from external noise sources such as traffic. The guidance is primarily for use by designers and hence BS 8233 may be used as the basis for an appropriate schedule of noise control measures. The recommended indoor ambient noise levels for residential dwellings are set out in Table 2.

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

Table 2 Indoor Ambient Noise Levels for Dwellings from BS8233: 2014

BS 8233 also provides some guidance on individual noise events, it states:

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{AFmax}, depending on the character and number of events per night. Sporadic noise events could require separate values."

Typically, a 45 dB L_{AFmax} criterion is applied to individual noise events within bedrooms at night. This criterion is generally considered a noise level that should not typically be exceeded.

2.7 External Noise (BS 8233 Amenity Areas)

BS 8233 also provides desirable noise levels for external amenity areas such as gardens, patios and balconies. It states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 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."

3.0 STAGE 1 – NOISE RISK ASSESSMENT

3.1 Methodology

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 4 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.

It should be noted 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.

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."*

In this instance it is proposed to use the noise maps produced by Fingal County Council and daa as part of the noise mapping requirements under the European Noise Directive (END). These maps present the noise levels incident across the site over the course of an annual average, in addition the noise contour produced by daa for the future operation of Dublin Airport including the North Runway will be used to characterise the future noise environment.

ProPG states the following with respect to the initial risk assessment,

> *"The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. In other words, the risk assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds."*

In this instance the site topography and surrounding buildings are not expected to change significantly during construction.

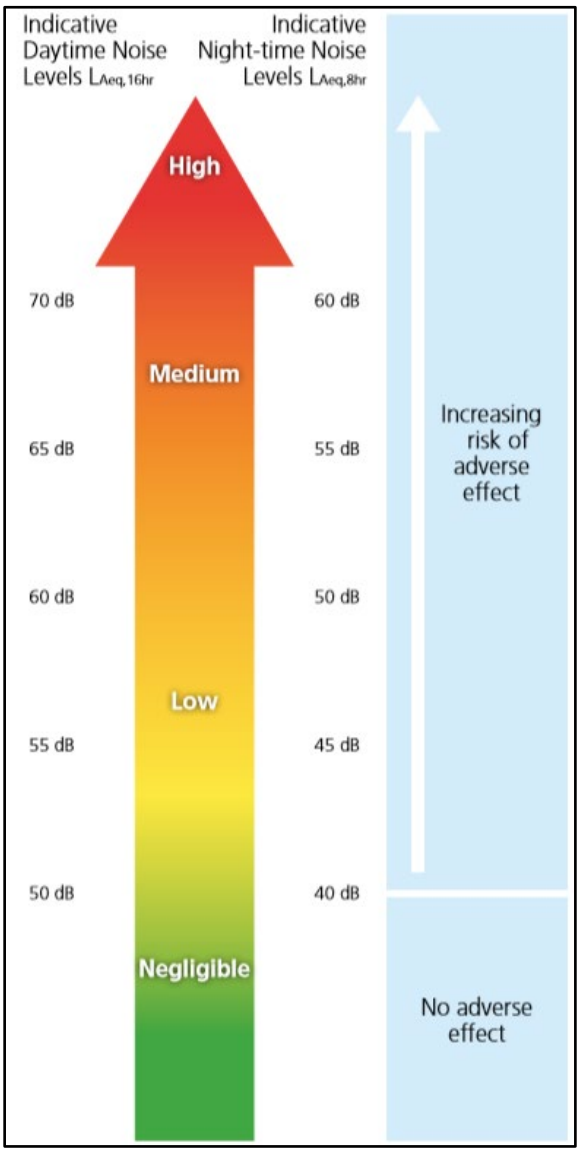

Figure 2 ProPG Stage 1 - Initial Noise Risk Assessment

3.2 Baseline Noise Environment

3.2.1 Site Area Description

The proposed development comprises of 25.29 ha in a predominantly greenfield site**.** The site is located west of the R121 and the north of the existing Tyrrelstown Local Centre.

Receptors

The Site 2/3 section of the site is bounded to the north by open space on the former Hollystown Golf Course, to the east by Hollywoodrath residential estate, to the south by the Bellingsmore residential estate and a secondary school, and by open space to the west and southwest. The Kilmartin Local Centre section of the site is bound to the north by the Bellingsmore residential estate, to the east by the R121, to the south by Tyrrelstown Local Centre, which comprises a mix of retail and commercial units with office and residential above, and to the west by primary schools and residential developments.

The existing noise and vibration environment across the development sites and in the vicinity of the nearest existing noise sensitive locations is dominated by air traffic as it lies beneath a Dublin Airport flight path and is also influenced by R121 road traffic.

At Site 2/3, the nearest existing residential NSLs are those located at Bellingsmore residential estate to the south, Hollywoodrath residential estate to the east and Redwood residential estate to the north. The nearest school NSLs to Site 2/3 are those located at the Le Chéile secondary school to the south.

At Site 2/3, the nearest permitted / proposed residential NSLs are those located in a permitted residential estate to the southeast of the site boundary at the Hollywoodrath Road (R121) (FW21A/0042).

At Kilmartin Local Centre, the nearest existing residential NSLs are those located at Bellingsmore residential estate to the north, Bellgree residential estate to the west and residential apartments located above Tyrellstown Local Centre to the south. The nearest childcare / school NSLs to the Kilmartin Local Centre are located at Tyrellstown Educate Together national school to the northwest and Tyrellstown Montessori to the southwest. The closest religious building is Blanchardstown Methodist Church to the southwest.

At Kilmartin Local Centre, commercial NSLs include Carlton Hotel Blanchardstown and Lidl, which are located beyond the northeast and south site boundaries, respectively.

3.2.2 Desk Based Study of Published Data

EPA Noise Maps

The following noise maps have been referred to when assessing the baseline noise environment:

- Round 3 Noise Maps for Roads – Dublin Agglomeration, and;
- Round 3 Noise Maps for Airports – Dublin Airport.

The above noise maps are provided for the overall day evening night period in terms of L_{den} and for the night-time period in terms of L_{night}.

All data has been taken from the EPA Mapping website http://gis.epa.ie.

Figures 3 to 6 present the predicted noise levels across the development site for road and air traffic in terms of L_{den} and L_{night}.

Figure 3 L_{den} Road Traffic Noise Levels

Figure 4 L_{night} Road Traffic Noise Levels

Figure 5 L_{den} Aircraft Noise Levels

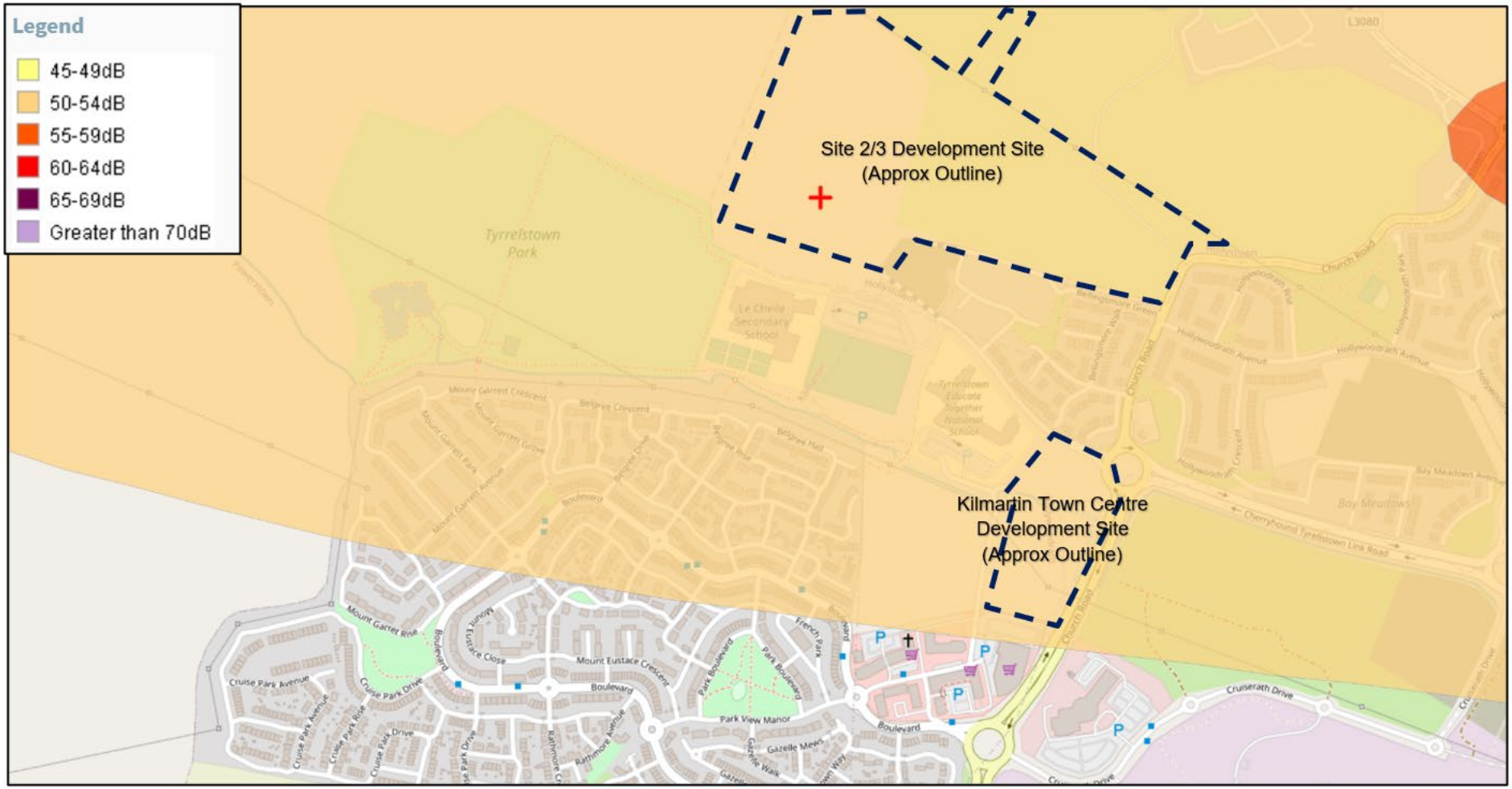

Figure 6 L_{night} Aircraft Noise Levels

Table 3 summarises the current noise levels across the site for each source type.

Site 2/3 section of proposed development site			
Noise Source	L_{den}, dB	L_{night}, dB	L_{day}, dB Note A
Road Traffic	<55 - 64	<50 - 59	54 - 62
Air Traffic	60 - 64	50 - 54	60 - 64
Total	61 – 67	52 – 60	61 - 66
Kilmartin Town Centre section of proposed development site			
Noise Source	L_{den}, dB	L_{night}, dB	L_{day}, dB Note A
Road Traffic	55 - 69	<50 - 59	56 - 67
Air Traffic	55 - 64	50 - 54	53 - 64
Total	58 – 70	52 – 60	58 - 69

Table 3 Noise Levels at Development Site

Note A L_{day} has been estimated by assuming day and evening noise levels are equal

3.2.3 Future Noise Environment

The major change to the local infrastructure that is likely to alter the noise environment is the development of the North Runway at Dublin Airport. Under the permitted operation of the North Runway there will be no night-time use of the new runway and night-time use of the existing runway will be severely constrained.

To address this Fingal have produced noise zone maps for the area surrounding the airport. These maps present noise contours as follows,

- Zone A – ≥ 63 dB $L_{Aeq,16hr}$ and/or ≥ 55 dB $_{Lnight}$;
- Zone B – ≥ 54 dB $L_{Aeq,16hr}$ and < 63 dB $L_{Aeq,16hr}$ and ≥ 55 dB L_{night};
- Zone C – ≥ 54 dB $L_{Aeq,16hr}$ and < 63 dB $L_{Aeq,16hr}$ and ≥ 48dB L_{night} and < 55 dB L_{night}; and,
- Zone D – ≥ 50 dB $L_{Aeq,16hr}$ and < 54dB $L_{Aeq,16hr}$ and ≥ 40dB L_{night} and < 48dB L_{night}

Figure 7 presents the current development site in the context of these zones. Note that road traffic noise is not expected to change significantly into the future.

Note that road traffic noise is not expected to change significantly into the future.

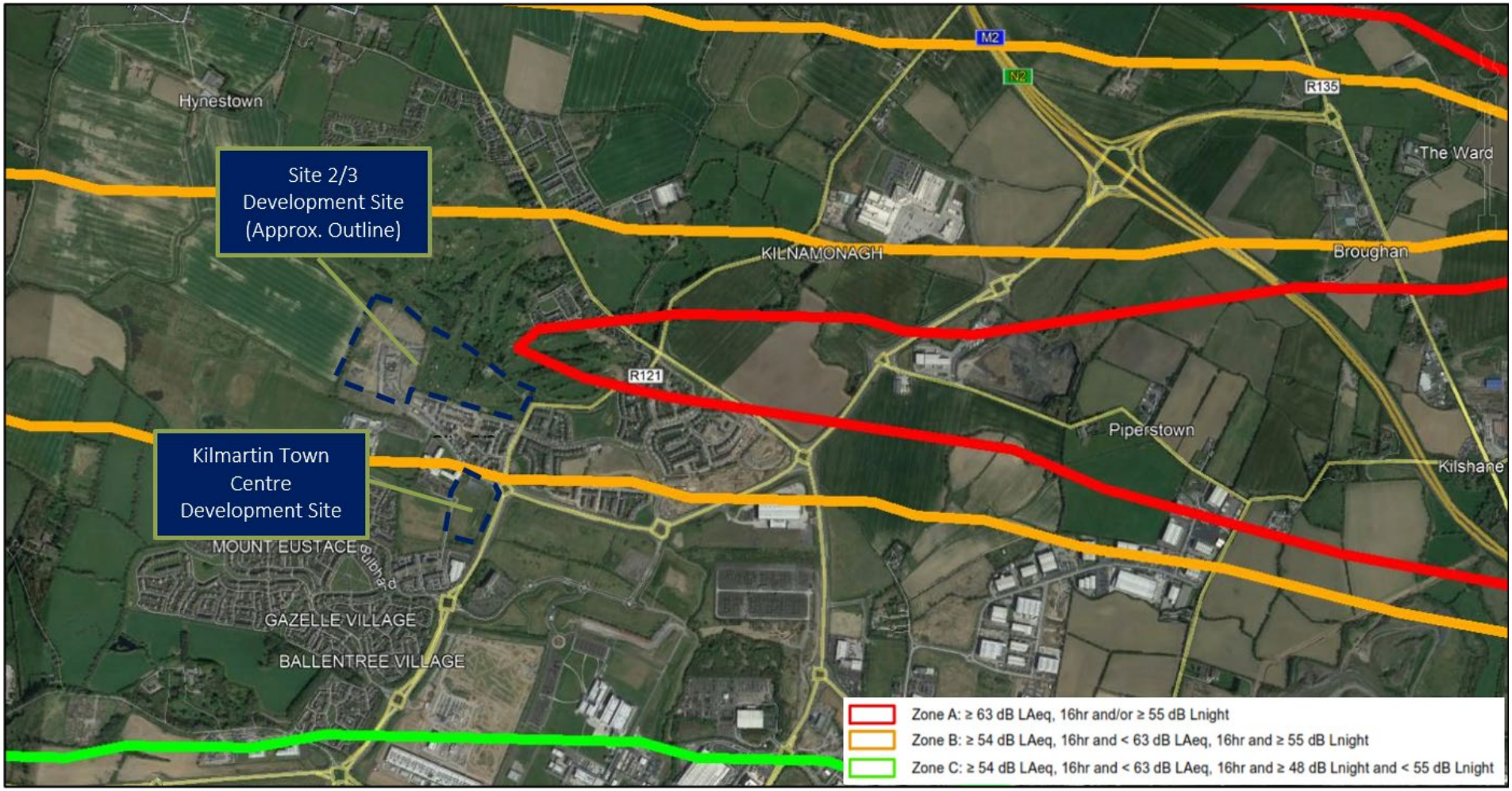

Figure 7 Future Daytime Aircraft Noise Zones (source: Fingal County Council)
Note The blue shaded area approximately indicates the location of the proposed residential buildings which all fall within Zone B. The Kilmartin Town Centre lands are located within Zone C.

Table 4 summarises the future noise levels across the site for each source type.

Site 2/3 section of proposed development site		
Noise Source	L_{day}, dB	L_{night}, dB
Road Traffic	54 - 62	<50 - 59
Air Traffic	<63	55
Total	62 - 65	56 - 61
Kilmartin Town Centre section of proposed development site		
Noise Source	L_{day}, dB	L_{night}, dB
Road Traffic	56 - 67	<50 - 59
Air Traffic	<63	<55
Total	62 - 68	54 - 60

Table 4 Noise Levels at Development Site

3.2.4 Baseline Noise Survey

In March 2021, AWN was commissioned to undertake baseline noise monitoring at the site of the proposed development. The baseline noise monitoring was undertaken during Covid-19 pandemic restrictions where non-essential travel was still somewhat restricted. To quantify any potential reductions in baseline noise levels due to the pandemic, a review of historical noise monitoring data from the site in July 2018 was also carried out.

Combined, the 2018 and 2021 noise surveys, along with the desk based study of published data, quantify the existing and future varying noise environment across the proposed development site, namely: -

- The future noise environment giving consideration to future airport noise levels across the site for the inward noise assessment, i.e. worst case scenario as noise levels will be higher than those measured in the noise surveys; and
- The measured noise surveys to identify the noise environment at the nearest NSLs for the outward noise assessment, i.e. worst case scenario as the noise levels will be lower than those influenced by the future development of the airport, e.g. lower construction noise thresholds set for NSLs.

All surveys were conducted in general accordance with ISO 1996-2: 2017: *Acoustics – Description and measurement and assessment of environmental noise. Part 2 – Determination of sound pressure levels.* The specific details will be set out in the following sections.

Measurement Parameters

The noise survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The 'A' suffix denotes the fact that the sound levels have been 'A-weighted' in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

Historical Unattended Environmental Noise Survey (July 2018)

The location of the proposed development site is such that the noise climate is dominated by air traffic as it lies beneath a Dublin Airport flight path. One unattended noise survey was undertaken in order to obtain long term measurements.

Survey Locations

The measurement location was selected on the proposed site as shown in Figure 8.

Location U1 is located centrally on site to capture the noise from overhead aircraft movements.

Figure 8 Installation photographs for location U1

Personnel and Monitoring Equipment

Alistair MacLaurin (AWN) performed the measurements during the survey period. Measurements were performed using a Rion NL-52 Sound Level Meter. Unattended noise measurements were conducted between 11:00 hrs on 12th July 2018 and 16:00 hrs on 17th July 2018.

Results

The weather during the survey period was generally dry and calm and was not considered to have had a detrimental effect on the noise measurements. Table 5 presents a summary the unattended noise levels for both day and night periods measured at location U1.

Start Time	Period	Octave Band Centre Frequency (Hz)						Overall $L_{Aeq,T}$ dB
		125	250	500	1k	2k	4k	
12/07/2018 11:40:00	Day*	64	62	60	56	52	42	61
12/07/2018 23:00:00	Night	58	57	55	51	48	41	56
13/07/2018 07:00:00	Day	64	62	60	56	51	39	61
13/07/2018 23:00:00	Night	57	55	54	50	45	36	55
14/07/2018 07:00:00	Day	63	61	59	55	50	39	60
14/07/2018 23:00:00	Night	56	55	53	49	45	36	54
15/07/2018 07:00:00	Day	64	62	60	56	52	42	61
15/07/2018 23:00:00	Night	58	56	54	50	45	35	55
16/07/2018 07:00:00	Day	64	62	60	56	51	40	61
16/07/2018 23:00:00	Night	57	55	53	49	45	33	55
17/07/2018 07:00:00	Day[1]*	65	62	61	57	52	39	62
Worst Case Day		64	62	60	56	52	42	61
Worst Case Night		58	57	55	51	48	41	56

Table 5 Summary of unattended noise measurements at U1

The L_{AFmax} values were measured at 10 minute intervals over the duration of the unattended monitoring survey. Figure 9 presents the distribution of the magnitude of L_{AFmax} events during the night period.

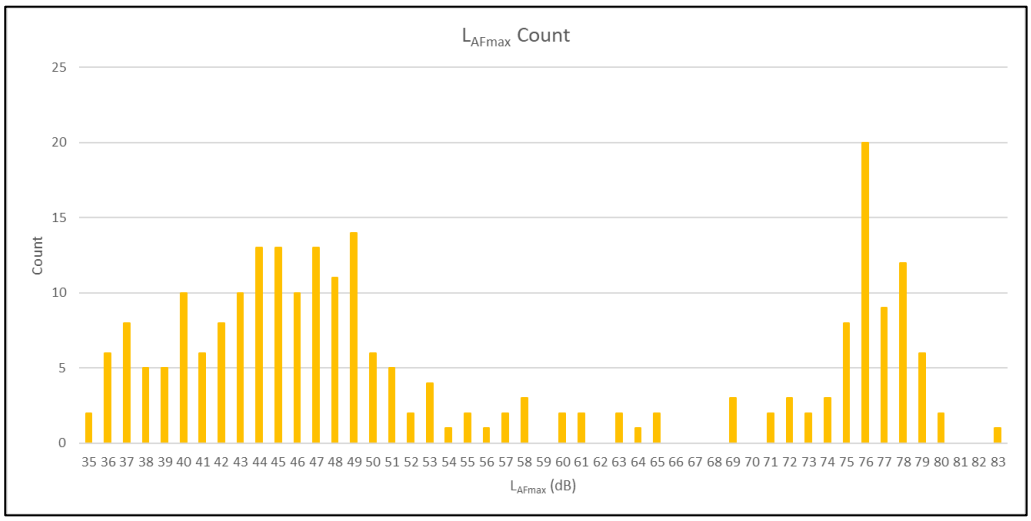

Figure 9 Number of L_{AFmax} events at each decibel level measured during the night period

[1] The noise measurements for the day periods of 12th and 17th July have been excluded from assessment as only partial days were captured.

Table 6 presents the L_{AFmax} noise level assumed for the purpose of this assessment. Spectral data has been derived from an arithmetic averaging of the frequency content measured at the most frequent magnitude of 76 dB L_{AFmax} the averaged spectral data has then been re-adjusted to the assessment value of 77 dB L_{AFmax}.

Overall dB L_{AFmax}	Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
77	78	77	76	71	69	58

Table 6 Night-time L_{AFmax} Noise Level

Attended Environmental Noise Survey (March 2021)

In March 2021, three attended monitoring locations (A1 to A3) were undertaken in the close vicinity of the proposed development site, representative of the existing noise environment at the closest NSLs.

Survey Locations

Measurement locations were selected on the proposed site as shown in Figure 10.

Location A1 Attended monitoring approximately 25 m northeast of the eastern boundary of the Site 2/3 section of the site. In line with residential façades of nearest existing NSLs in Hollywoodrath estate.

Location A2 Attended monitoring approximately 35 m northwest of the eastern boundary of the Kilmartin section of the site, with direct line of sight to R121.

Location A3 Attended monitoring approximately 20 m southwest of the western boundary of the sit

Figure 10 Indicating attended noise survey locations (© Google Earth)

Personnel and Monitoring Equipment

Donogh Casey (AWN) performed the measurements during the survey period. Measurements were performed using a Brüel and Kjaer Type 2250 Sound Level Meter. Sample periods were 15 minutes. Before and after the survey, the measurement instruments were check calibrated using a Brüel & Kjaer 4231 Sound Level Calibrator. Attended daytime noise measurements were conducted between 11:00 to 16:46 hrs on 2nd March 2021 and night-time noise measurements were conducted between 23:00 hrs on 23rd to 01:14 hrs on 24th March 2021.

Results

The weather during the survey periods were generally dry and calm and was not considered to have had a detrimental effect on the noise measurements.

Survey Position A1

The survey results for Location A1 are presented in Table 7. During the day time period, road traffic noise from R121 Hollywoodrath Road and the surrounding roads were the dominant noise source at this location, with intermittent aircraft flyovers. At night-time, road traffic noise continued as the dominant noise source, with intermittent local road traffic pass-by and dogs barking in the distance.

Date	Period	Measurement Period	Measured Noise Levels, dB re $2x10^{-5}$ Pa		
			L_{Aeq}	L_{AFMax}	L_{AF90}
2 March 2021	Day	11:00 – 11:15	54	70	43
		14:11 – 14:26	60	79	42
		16:41 – 16:56	55	71	42
23 March 2021	Night	23:00 – 23:15	50	71	36
24 March 2021		00:19 – 00:34	51	68	36

Table 7 Measured noise levels at Location A1

Daytime noise levels were in the range of 54 to 60 dB $L_{Aeq,15min}$ and in the range of 42 to 43 dB $L_{A90,15min}$ during the measurement periods. Night-time noise levels were in the range of 50 to 51 dB $L_{Aeq,15min}$ and in the order of 36 dB $L_{A90,15min}$ during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

Survey Position A2

The survey results for Location A2 are presented in Table 8. During the day time period, road traffic noise from R121 was the dominant noise source at this location, with intermittent aircraft flyovers and local road traffic. At night-time, road traffic noise continued as the dominant noise source, with intermittent local road traffic pass-by.

Date	Period	Measurement Period	Measured Noise Levels, dB re $2x10^{-5}$ Pa		
			L_{Aeq}	L_{AFMax}	L_{AF90}
2 March 2021	Day	12:02 – 12:17	52	61	47
		13:48 – 14:03	57	73	51
		15:50 – 16:05	53	67	49
23 March 2021	Night	23:40 – 23:55	44	67	39
24 March 2021		00:59 – 00:14	42	56	38

Table 8 Measured noise levels at Location A2

Daytime noise levels were in the range of 52 to 57 dB $L_{Aeq,15min}$ and in the range of 47 to 51 dB $L_{A90,15min}$ during the measurement periods. Night-time noise levels were in the range of 42 to 44 dB $L_{Aeq,15min}$ and in the range of 38 to 39 dB $L_{A90,15min}$ during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

Survey Position A3

The survey results for Location A3 are presented in Table 9. During the day time period, road traffic noise from local roads leading to the Tyrellstown retail area was the dominant noise source at this location, with intermittent aircraft flyovers and distant road traffic noise from the R121. At night-time, plant noise from the commercial units and an ESB pylon to the south were the dominant noise sources, with distant road traffic also audible during the measurement periods.

Date	Period	Measurement Period	Measured Noise Levels, dB re $2x10^{-5}$ Pa		
			L_{Aeq}	L_{AFMax}	L_{AF90}
2 March 2021	Day	11:21 - 11:36	50	66	47
		13:27 – 13:42	62	81	48
		16:10 – 16:25	56	68	51
23 March 2021	Night	23:21 – 23:36	42	53	40
24 March 2021		00:40 – 00:55	40	50	38

Table 9 Measured noise levels at Location A3

Daytime noise levels were in the range of 52 to 62 dB $L_{Aeq,15min}$ and in the range of 47 to 51 dB $L_{A90,15min}$ during the measurement periods. Night-time noise levels were in the range of 40 to 42 dB $L_{Aeq,15min}$ and in the range of 38 to 40 dB $L_{A90,15min}$ during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

Summary of 2021 Baseline Noise Monitoring Results for the Outward Noise Assessment

As a worst case assessment, the attended noise monitoring results from March 2021 will be used to inform the outward impact assessment. At those NSLs external to the Site 2/3 section of the site boundary, the results presented from Location A1 will be used to identify the suitable construction noise thresholds. At those NSLs to the north and east of the Kilmartin Local Centre section of the site boundary, the results presented from Location A2 will be used to identify the suitable construction noise thresholds. At those NSLs to the south and west of the Kilmartin Local Centre section of the site boundary, the results presented from Location A3 will be used to identify the suitable construction noise thresholds.

The night-time L_{A90} values presented for Locations A1 to A3 will be used to inform the plant noise assessment at the closest residential NSLs to the proposed development site boundary.

Summary of 2018 Baseline Noise Monitoring Results and Desk Based Study of Future Noise Levels for the Inward Noise Assessment

From the measurements and calculations undertaken in 2018 at U1, and giving consideration to the future aircraft noise zones in the area; it is concluded that, for the proposed development Site 2/3 section of the site, the noise climate will be between

62 to 65 dB $L_{Aeq,16hr,}$ daytime and 56 to 61 dB $L_{Aeq,8hr}$ night-time. At the Kilmartin Local Centre, the noise climate will be between 62 to 68 dB $L_{Aeq,16hr,}$ daytime and 54 to 60 dB $L_{Aeq,8hr}$ night-time. L_{AFmax} noise levels have been assessed as typically 77 dB L_{AFmax}. The noise levels applicable to the assessment of inward noise impact for this site are defined in Table 10 and Table 11.

Period	Parameter	Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
Day	62 dB $L_{Aeq, 16 hr}$	65	63	61	57	53	43
	65 dB $L_{Aeq, 16 hr}$	68	66	64	60	56	46
Night	56 dB $L_{Aeq, 8 hr}$	57	56	54	50	47	40
	61 dB $L_{Aeq, 8 hr}$	62	61	59	55	52	45
	77 dB L_{AFmax}	78	77	76	71	69	58

Table 10 Noise levels applicable to Site 2/3 section of the proposed development site

Period	Parameter	Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
Day	62 dB $L_{Aeq, 16 hr}$	65	63	61	57	53	43
	65 dB $L_{Aeq, 16 hr}$	68	66	64	60	56	46
	68 dB $L_{Aeq, 16 hr}$	71	69	67	63	59	49
Night	54 dB $L_{Aeq, 8 hr}$	55	54	52	48	45	38
	57 dB $L_{Aeq, 8 hr}$	58	57	55	51	48	41
	60 dB $L_{Aeq, 8 hr}$	61	60	58	54	51	44
	77 dB L_{AFmax}	78	77	76	71	69	58

Table 11 Noise levels applicable to Kilmartin Local Centre of the proposed development site

3.3 Noise Risk Assessment Conclusion

Giving consideration to the noise levels presented in the previous sections, the initial site noise risk assessment has concluded that the level of risk across the site is low to medium. Note that this risk classification is valid for both the existing situation, i.e. without the North Runway at Dublin Airport, and the future environment with the North Runway. Furthermore, it is important to note that the Medium risk classification would apply to sections of the sites in the absence of any activity at Dublin Airport due to the road traffic noise levels. This is not unusual and only the quietest sites away from the road network would find the risk profile to be low.

ProPG states the following with respect to medium risks:

Low Risk — *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."*

Medium Risk — *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.*

Given the above it can be concluded that the development site may be categorised as *Low* to *Medium Risk* and as such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development. It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used,

> *"2.12 It is important that **the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker**. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitable designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

4.0 STAGE 2 – FULL ACOUSTIC ASSESSMENT

4.1 Element 1 – Good Acoustic Design Process

4.1.1 ProPG Guidance

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life of occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or "*gold plating"* of all new development but that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- 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; and,
- Assess external amenity area noise.

In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

4.1.2 Application of GAD Process to Proposed Application

Relocation or Reduction of Noise from Source

The main noise sources are located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

Planning, Layout and Orientation

The Site 2/3 section of the site lies completely within Noise Zone B of the airport, while the Kilmartin Local Centre section of the site lies completely within Noise Zone C of the airport Given that one of the main sources of noise is from aircraft passing overhead there will be no benefit realised from changing the internal layout or orientation of the proposed dwellings. It also should be noted that the noise from road traffic alone would require some aspect of acoustic design input to ensure adequate mitigation from road traffic noise.

Select Construction Types for meeting Building Regulations

Masonry constructions will be used in constructing the external walls of the development. This construction type offers high levels of sound insulation performance. However, as is typically the case the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade in terms of sound insulation performance. Consideration will therefore be given to the provision of upgraded glazing and acoustic

ventilators. Note that it will not be possible to achieve the desirable internal acoustic environments with windows open during night-time hours. Instead the proposal here will be to provide dwelling units with glazed elements and ventilators that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good. Inhabitants will be able to open the windows if they wish, however, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following (note emphasis has been added in bold):

> "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 very important to note that it is impractical to achieve the good internal noise levels with windows open across the vast majority of development sites in close proximity to major infrastructure such as roads or airports. Such sites would need to be classified as having a negligible risk in accordance with the ProPG noise risk assessment approach. For this reason, there are no guidance documents either at a local level or an international level that AWN is aware of which would support the approach of achieving the ideal internal noise levels only in the open window scenario. It is therefore considered entirely correct and justifiable to provide building facades with a moderate degree of sound insulation such that with windows closed but vents opened a good internal acoustic environment is achieved.

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

The good acoustic design measures do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

The major noise sources incident on the site are air traffic over head and road traffic from the local roads. Given that air traffic overhead is a significant noise source it is not considered practicable to provide alternative noise mitigation measures such as noise barriers to the site boundary with the road network.

Assess External Amenity Area Noise

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

> *"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 $L_{Aeq,16hr}$."*

Worst case external noise levels at the site during the daytime, with the North Runway in operation, have been calculated to be less than 64dB $L_{Aeq,16hr}$. The following extract from BS 8233 on amenity areas is reiterated:

> *"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."*

For the Site 2/3 section of the site , it is noted that whilst external amenity areas located in Zone B would be above the desirable level of 55 dB $L_{Aeq,16hr}$ it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source. Notwithstanding this, efforts have been made to provide private external space to each dwelling to the rear of the houses and a large external amenity area is located serving the proposed units.

For the Kilmartin Local Centre section of the site, it is not possible to reduce the noise level across external spaces (i.e. balconies), due to aircraft noise, incident from above, being the dominant noise source.

Summary

The principles of Good Acoustic Design have been applied to the development in so far as possible. In terms of viable alternatives to acoustic treatment of façade elements, currently it is not considered likely that there will be further options for mitigation outside of proprietary acoustic glazing and ventilation. This is considered entirely correct and justifiable and the façade enhancement will ensure good acoustic levels internally.

4.2 Element 2 – Internal Noise Guidelines

4.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*. The recommended indoor ambient noise levels are set out in Table 12 and are based on annual average data, they omit occasional events where higher intermittent noisy events may occur, such as New Year's Eve.

Activity	Location	(07:00 to 23:00hrs)	(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 $L_{Amax,T}$*

Table 12 ProPG Internal Noise Levels

*Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

In addition to these absolute internal noise levels ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

4.2.2 Discussion on Open/Closed Windows

In the first instance, it is important to note the typical level of sound reduction offered by a partially open window falls in the region of 10 to 15 dB[2].

Considering the design goals outlined in Table 12 and a sound reduction across an open window of 15 dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good (i.e. at or below the internal noise levels) or reasonable internal noise levels (i.e. 5 dB above the internal noise levels) have been summarised in Table 13.

Level Desired	Day 07:00 to 23:00hrs	Night 23:00 to 07:00hrs
Good (i.e. at or below the internal noise levels)	50 – 55dB $L_{Aeq,16hour}$	45dB $L_{Aeq,8hour}$
Reasonable (i.e. 5 dB above the internal noise levels)	55 – 60dB $L_{Aeq,16hour}$	50dB $L_{Aeq,8hour}$

Table 13 External Noise Levels Required to Achieve Internal Noise Levels

In this instance the external noise levels are such that it will not be possible to achieve the desired internal noise levels during night-time with windows open and therefore appropriate acoustic specifications to windows and passive vents will be provided to ensure the rooms are adequately ventilated and achieve the good internal noise levels detailed here.

[2] Section 2.33 of ProPG, additional information can be found in the DEFRA NANR116: *'Open/Closed Window Research' Sound Insulation Through Ventilated Domestic Windows'*

4.2.3 Proposed Façade Treatment

The British Standard 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* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principals outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G[3] of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades. This approach corrects the noise levels to account for the frequency content of aircraft noise which has been determined by AWN from numerous noise surveys in the vicinity of Dublin Airport.

Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance the facades will be provided with glazing that, when closed, achieve the minimum sound insulation performance as set out in Table 7.

Glazing Specification	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1k	2k	4k	
Double Glazing	26	28	36	40	40	40	38

Table 14 Sound Insulation Performance Requirements for Glazing, SRI (dB)

The performance specifications detailed in Table 14 are minimum requirements which apply to the overall glazing system. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

Wall Construction

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50 dB R_w for this construction.

[3] The methodology contained within Annex G of BS8233 is based on the assumption that the source is a line source (such as a road) and that the building facades are simple, i.e. do not have balconies. These assumptions are considered valid for the purposes of this assessment and have been adopted.

Ventilation

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detail design stage. Options which will be considered to achieve compliance with background ventilation requirements will be adjustable hit and miss acoustic ventilators or trickle vents built into the façade or window frames respectively or mechanical ventilation. For the Site 2/3 section of the site it is recommended that any through wall vents are specified to achieve a sound insulation performance of 41dB $D_{n,e,w}$.

For the Kilmartin Local Centre section of the site, it is recommended that the wall vents are specified to achieve a sound insulation performance of 46 dB $D_{n,e,w}$[4]. This specification can be achieved by a range of proprietary vents in either through frame trickle vent or through wall vents.

Roof

There is the potential for the roof structure to allow the passage of sound into the rooms. For the Site 2/3 section of the site the roof constructions that have been considered for the calculations are:

- Attic roof: Tile/slate Attic cavity insulation layer with 12.5mm plasterboard.

The plasterboard should have a surface mass of 8kg/m^2 or greater and there should be a layer of mineral / glassfibre quilt / slab in the void between the joists of at least 100mm thickness (which will normally be greater than this for thermal reasons) with a density of 10 to 30kg/m^3. Any penetrations through the ceiling boards must be as small as possible and made good by fully filling with plaster or with an acoustic sealant.

For the Kilmartin Local Centre section of the site, the roof construction is 100 mm structural screed on 200 mm deep reinforced concrete slab with 150mm insulation, which has been assumed to offer a sound reduction index no greater than 60 dB R_w.

4.2.5 Internal Noise Levels

Taking into account the external façade levels and the specified building envelope the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time periods.

4.2.6 Overheating

Another issue arising is the impact of intrusive noise when the windows are temporarily opened during periods of overheating. Section 2.36 of ProPG provides the following guidance in respect of overheating:

> *"In addition to providing purge ventilation, open windows can also be used to mitigate overheating. Therefore, should the LPA accept a scheme is to be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. In this case a more detailed assessment of the potential impact on occupants should be provided in the ADS. It should be noted that overheating issues will vary across the country and any specific*

[4] It has been assumed that 1 no. vent would be required per room.

design solutions will need to be developed alongside advice from energy consultants."

As is the case in the vast majority of residential dwellings, overheating will be controlled by opening windows as required. ProPG does not specify any internal noise targets to be achieved during the overheating scenario and neither do other guidance documents. In the absence of guidance, the Association of Noise Consultants (ANC) in the UK have produced a draft document entitled *Acoustics Ventilation and Overheating Residential Design Guide – February 2018.* While this is a draft document, it is considered appropriate for use in the absence of other guidance.

A two-level assessment procedure is recommended by the ANC guide, depending on the risk of potential impact. Table 15 presents the Risk Categories presented within the ANC guide for the overheating conditions.

External free-field noise level[5]		Risk Category[6]
Daytime, dB $L_{Aeq,T}$[7]	Night-time, dB $L_{Aeq,8hr}$[8]	
≤52 dB	≤47 dB	Low
>52 dB and ≤62 dB	>47 dB and ≤55 dB	Medium
>62 dB	>55 dB	High

Table 15 Façade noise levels on worst-affected façades

Figure 11 presents a flow chart of the process to assess the adverse effect of noise during the overheating condition. In this instance the façade levels previously presented have been used to categorise the risk level across the façades of the proposed development.

Given the external noise levels, all façades are categorised as low to medium risk. In all instances, the overheating condition will be controlled by opening windows. This is the only practical option and will be required during the hottest days of the year. Given that the façade levels range from 58 dB $L_{Aeq,8hr\ at}$ night to 63 dB $L_{Aeq,16hr}$ during the day, and an open window offers a noise reduction of up to 15 dB, the expected internal noise level at the worst-affected façades during the overheating condition is in the range of 43 dB $L_{Aeq,8hr}$ at night and 48 dB $L_{Aeq,16hr}$ during the day.

Following the ANC guide, these internal noise levels would be considered to represent a medium risk of an adverse impact on speech communication during the daytime and a low risk of sleep disturbance at night. Noise levels of this level are likely to be considered suitable if they occur for limited periods.

5 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, such as those described in a DEFRA 2014 study.

6 The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels.

7 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

8 Regular individual noise events should also be considered. Refer to Appendix A of ProPG for further guidance.

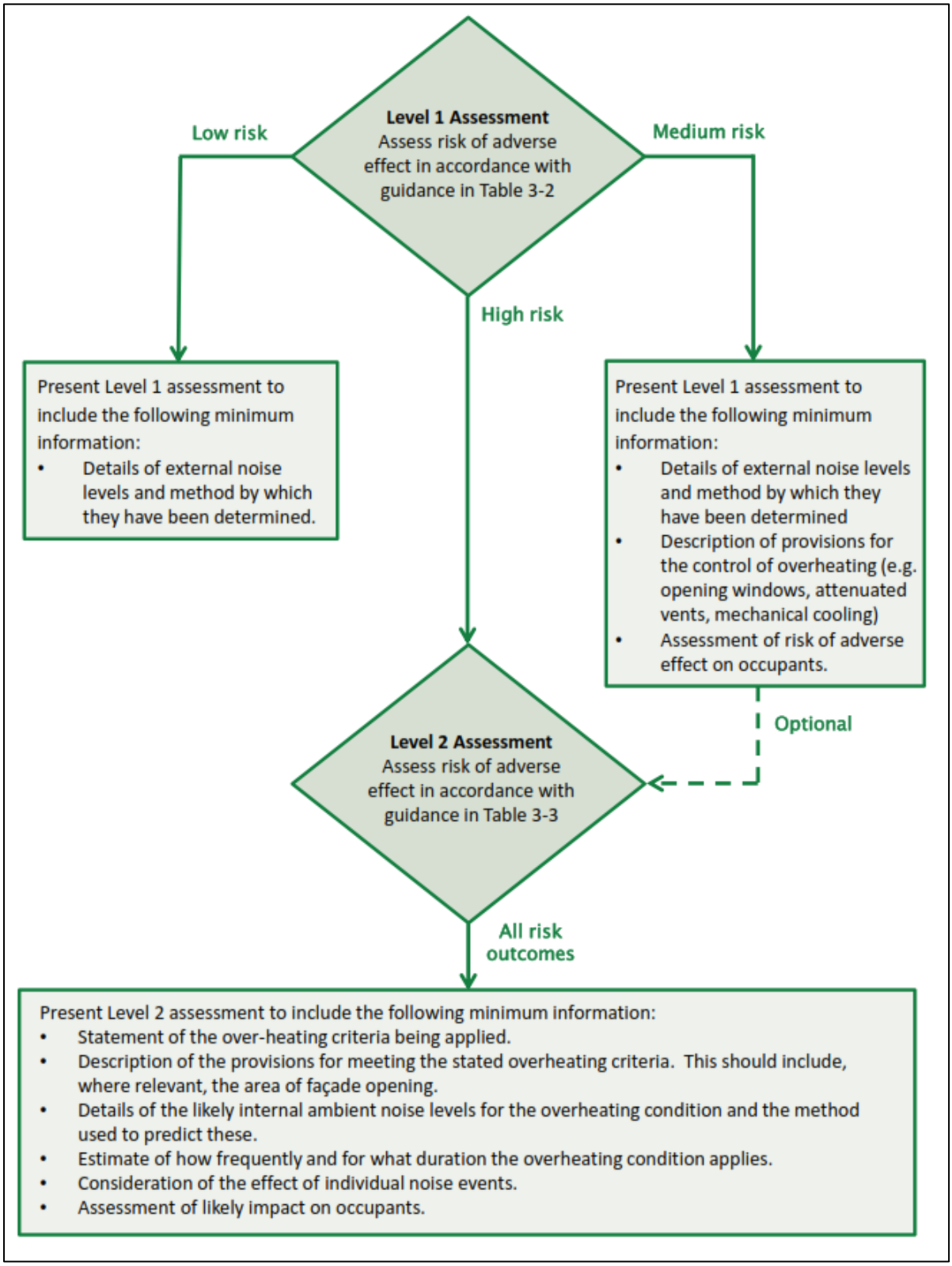

Figure 11 Two-stage assessment of overheating condition

4.3 Element 3 – External Amenity Area Noise Assessment

As previously discussed, external amenity areas are not expected to achieve the recommended 55 dB $L_{Aeq,16hr}$ noise level recommended in ProPG. However, it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source. Nonetheless, where possible, the location of private gardens in Site 2/3 and public spaces in the Kilmartin Local Centre sections of the site have building layouts designed to provide screening from the R121 road traffic noise sources in the vicinity of the site.

4.4 Element 4 – Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that *may* prove pertinent to the assessment, these are defined in the document as:

- 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 is discussed in turn.

4.4.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally, the Adopted Variation No 1 to Fingal Development Plan 2017 – 2023 contains Objective DA07 relating to development within the Airport Noise Zones. This objective states:

> *"Objective DA07*
>
> *Strictly control inappropriate development and require noise insulation where appropriate in accordance with Table 7.2[9] above within Noise Zone B and Noise Zone C and where necessary in Assessment Zone D, and actively resist new provision for residential development and other noise sensitive uses within Noise Zone A, as shown on the Development Plan maps, while recognising the housing needs of established families farming in the zone. To accept that time based operational restrictions on usage of a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone.".*

Furthermore, the Fingal Noise Action Plan recommends that the guidance contained within ProPG should be used in assessing the noise impact on new residential developments being introduced to existing noise sources.

This Acoustic Design Statement has been prepared in compliance with the requirements of ProPG and therefore complies with the requirements of local policy.

[9] Table 1 of this report.

4.4.2 Magnitude and Extent of Compliance with ProPG

As discussed within this report the following conclusions have been drawn with regards to the extent of compliance with ProPG:

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG. The units require closed windows and open vents to achieve this level;
- External amenity areas have been assessed and calculated to comply with the recommended criterion set out in ProPG, and;
- An assessment of the potential for adverse noise impacts during the overheating condition has also been included and it has concluded that there is a medium to high risk of an adverse impact which is considered acceptable if the overheating condition occurs for a limited period.

Based on the preceding it is concluded that the proposed development is in full compliance with the requirements of ProPG.

4.4.3 Likely Occupants of the Development

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 likely occupants.

4.4.4 Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

4.4.5 Acoustic Design v Wider Planning Objectives

With reference to the Adopted Variation No 1 to Fingal Development Plan 2017 – 2023, the proposed development site is within Zone B for Site 2/3 section of the site and Zone C for the Kilmartin Local Centre section of the site. In particular, the acoustic design of the site has taken cognisance of Objective DA07 and ensured that all dwelling units are located on the area of the site that is outside Zone A. Figure 7 illustrates the relative positions of the proposed dwellings and the airport noise zones.

Furthermore, this report has demonstrated the noise insulation measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

5.0 COMMENT ON DMS31

It is noted that ABP requested the following:

9. A Noise Impact Assessment of the proposed development, specifically with regard to location of the site within Noise Zone B associated with the airport and compliance with Objective DMS31 of the Fingal County Development Plan 2017

Objective DMS31 of the *Fingal County Development Plan 2017* states the following:

> *Require that sound transmission levels in semi-detached, terraced, apartments and duplex units comply as a minimum with the 2014 Building Regulations Technical Guidance Document Part E or any updated standards and evidence will need to be provided by a qualified sound engineer that these levels have been met.*

The *2014 Building Regulations Technical Guidance Document Part E* deal with minimum levels or airborne noise transfer across walls and airborne and impact noise transfer across floors in residential settings. It also outlined guidance in relation to reverberation control in common areas of apartment buildings. These measures will be considered as part of the detailed design of the scheme. The evidence of compliance that is called for in DMS31 will be provided to relevant building control authority in the form of pre completion testing that is a requirement of *2014 Building Regulations Technical Guidance Document Part E* and will be completed in order that relevant ancillary certification can be issued for the scheme. *2014 Building Regulations Technical Guidance Document Part E* document does not outline any requirements in relation to intrusive noise.

6.0 CONCLUSION

An initial site noise risk assessment has been carried out for the proposed development of commercial and residential units on sites located at Hollystown, Dublin 15. The Site 2/3 section of the development site are located within a section of the Dublin Airport Zone B and the Kilmartin Local Centre is within Zone C. The site has been classified as having a low to medium noise risk using guidance contained in ProPG: *Planning & Noise.* This was determined through a review of noise maps available for the proposed development site. This review also took into account the future noise environment due to the operation of the North Runway at Dublin Airport. The discussion presented in Section 3.2 of this report is deemed to be a comprehensive review of all available information with regard to the potential future noise impacts from Dublin Airports operations.

Further discussion is presented in terms of the likely noise impact of both the external and internal areas of the proposed development. It will be necessary to provide enhanced acoustic glazing and vents to ensure that when windows are closed that the internal noise environment is good. The noise level internally with the windows open will be higher than ideal, however, inhabitants will have the option to close the window to reduce the noise level internally with acoustic attenuated passive ventilation.

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

Ambient noise — The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

Background noise — The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

dB — Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).

dB(A) — An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

$D_{n,e,w}$ — Weighted element-normalized level difference. This is the value of sound insulation performance of a ventilator measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature for acoustic ventilators typically presents sound insulation data in terms of the $D_{n,e,w}$ parameter.

Hertz (Hz) — The unit of sound frequency in cycles per second.

$L_{Aeq,T}$ — This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} — The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{AF90} — Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; 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 estimate a background level. Measured using the "Fast" time weighting.

L_{AF10} — Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.

L_{AFmax}	is the instantaneous fast time weighted maximum sound level measured during the sample period.
Octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
R_w	Weighted Sound Reduction Index – This is the value of the sound insulation performance of a partition or element measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature typically presents sound insulation data in terms of the R_w parameter.