NOISE & VIBRATION IMPACT ASSESSMENT FOR PLANNING

PROPOSED DEVELOPMENT AT MOUNTGORRY, SWORDS

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Technical Report Prepared For

Bartra Propco 23

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EXECUTIVE SUMMARY

AWN Consulting has been commissioned to carry out a study in relation to the potential noise and vibration impacts associated with the proposed Large Scale Residential Development (LRD) at the lands at Mountgorry, Swords, Dublin 18.

A baseline noise survey has been undertaken at the development site to determine the existing environment at the site.

Outward noise impact assessments have been undertaken for both construction and operational phases of the proposed development.

Construction noise thresholds have been selected and noise predictions have been undertaken. Noise predictions indicate that the construction noise levels will be below the construction noise threshold. Best practice control measures will be employed on site to control noise emissions outside of the site through the use of site hoarding, localised screening, scheduling of works, maintenance of plant items etc. to control noise emissions during this phase. Vibration impacts during the construction phase are not likely to be significant.

Once the various best practice control measures during the construction phase are implemented on site, the overall noise and vibration impact during this phase will not be overly intrusive to cause a significant impact.

Once operational, noise emissions will be limited to noise associated with traffic coming to and from the development and plant items serving the development. The additional vehicular traffic generated by residents of the proposed development has been assessed as having no impact on the surrounding environment. Regarding plant noise, suitable noise thresholds have been assigned based on the measured background noise levels on the site. Plant items serving the proposed development will be designed such that the cumulative noise emissions will achieve the noise criteria set out in the report.

An inward noise impact assessment has been undertaken. Mitigation measures for inward noise, specifically enhanced ventilation and glazing specification have been outlined. Good internal noise levels can be achieved with the proposed façade treatments.

CONTENTS

1.0 INTRODUCTION

Bartra Propco 23 Limited intend to apply for permission for development of a Large-scale Residential Development (LRD) at this site fronting the Swords to Malahide Road (R106), Mountgorry, Swords, Co. Dublin.

The proposed development will principally provide 123 No. residential units (55 No. one bed apartments and 68 No. two bed apartments) in a courtyard block arrangement ranging in height from part 4 No. to part 5 No. storeys. The development also includes ancillary residential amenities, 24 No. car parking spaces, vehicular and pedestrian access points, a connection to the parcel of existing public open space west of the site and public and communal open spaces.

AWN Consulting has been commissioned to carry out an assessment in relation to the potential outward noise and vibration impact of the proposed development, and also the inward noise impact on the development itself.

Figure 1 presents the outline of the proposed development site and the surrounding area.

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

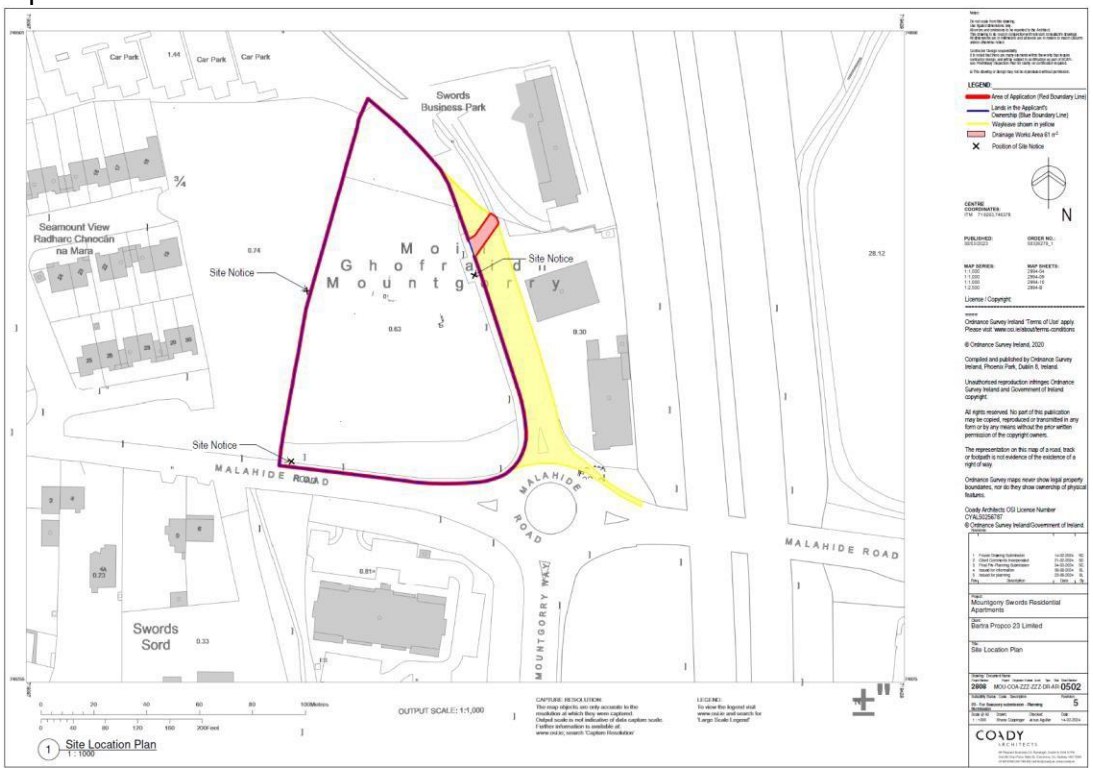

Figure 1 Location of proposed development

2.0 DESIGN CRITERIA

2.1 Construction Phase Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local Authorities typically control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

2.1.1 British Standard BS 5228 – 1: 2009+A1:2014

British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise (hereinafter referred to as BS 5228-1:2009+A1:2014) is referenced here for the purposes of setting appropriate construction noise limits for the development. This is the most widely accepted standard for this purpose in Ireland. This document sets out a method whereby construction noise thresholds are determined based on ambient noise level.

Potential noise impacts during the construction stage of a project are often assessed in accordance with BS 5228-1:2009+A1:2014. Various mechanisms are presented as examples of determining if an impact is occurring, these are discussed in the following paragraphs.

ABC Method

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities, depending on context.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings and weekends D	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

Table 1 Example Threshold of Significant Effect at Dwellings.

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

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. If the construction noise exceeds

the appropriate category value, then a significant effect is deemed to occur.

The closest residential neighbouring noise sensitive properties are west and south of the development site including a number of dwellings, located west of the proposed site.

It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors, may result in an excessively onerous thresholds being set.

Fixed Limits

When considering non-residential receptors, reference is made to BS 5228-1:2009+A1:2014, which gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states: -

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

Paragraph E.2 goes on to state: -

"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: -
70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;
75 decibels (dBA) in urban areas near main roads in heavy industrial areas".

It is proposed to apply the 75 dBA criterion to commercial receptors located approximately 20m to the East of the subject site.

2.1.2 Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above the following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development:

- Monday to Friday 07:00 to 18:00hrs: 65 dB(A)
- Saturdays: 08:00 to 13:00hrs: 65 dB(A)

2.1.3 Determination of Significance

In order to assist with interpretation of the significance of construction noise levels, Table 2 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of the Design Manual for Roads and Bridges (DMRB) *LA 111 Noise and Vibration Revision 2 2020* document.

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA Significance Ratings
Negligible	Below or equal to baseline noise level	Not Significant
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate

Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant
Major	Above CNT +5 to +15 dB	Significant to Very Significant
	Above CNT +15 dB	Significant to Profound

Table 2 Construction Noise Significance Ratings

The adapted DMRB guidance outlined will be used to assess the predicted construction noise levels at NSLs and comment on the likely impacts during the construction stages.

2.2 Construction Phase – Traffic Noise

In order to assist with the interpretation of impacts relating to construction traffic noise, Table 3 includes guidance as to the likely magnitude of impact associated with changes in traffic noise levels along an existing road. This is taken from Table 3.17 of the DMRB *LA 111 Noise and Vibration (2020)*,

Magnitude of Impact	Increase in Traffic Noise Level (dB)
Negligible	Less than 1.0
Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

Table 3 Likely Effect Associated with Change in Traffic Noise Level – Construction Phase

In accordance with the DMRB *LA 111 Noise and Vibration* (2020), construction noise and construction traffic noise impacts results in a potential initial significant effect where it is determined that a major or moderate magnitude of change will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights;
- A total number of days exceeding 40 in any six consecutive months.

2.3 Construction Phase - Vibration

2.3.1 Building Damage

With respect to vibration, British Standard BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Vibration* recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 4 are recommended.

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

Table 4 Recommended Vibration Criteria During Construction Phase

Expected vibration levels from the construction works will be discussed further in Section 4.4.

2.3.2 Human Perception

Humans are sensitive to vibration stimuli, and perception of vibration at high magnitudes may cause concern to building occupants. BS 5228 – 2 notes that vibration typically becomes perceptible at around 0.15mm/s to 0.3mm/s and may become disturbing or annoying at higher magnitudes. During surface construction works associated with breaking of ground, piling, and excavation, depending on the methodologies involved have the potential to be perceptible to building occupants and have the potential to cause significant effects.

Higher levels of vibration are however typically tolerated for single events or events of temporary duration, particularly during construction projects and when the origin of vibration is known. For example, piling can typically be tolerated at vibration levels up to 2.5mm/s during the daytime and the evening if those affected are aware of the time-frame and origin of the vibration, and if they have been informed about the limit values relating to the structural integrity of neighbouring properties. Table 15-14 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS 5228 – 2 and reference to the Association of Noise Consultants (ANC) Measurement and Assessment of Groundborne Noise and Vibration (ANC, 2020).

Table 5 summarises the range of vibration values and the associated potential effects on humans within buildings.

Vibration Level, PPV	Human Response (BS 5228 – 2)	Significance Rating (EPA 2022)
Less than 0.14	Not perceptible	Imperceptible to Not significant
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.	Not significant to Slight
0.3mm/s	Vibration is unlikely to be perceptible in even the most sensitive situations for most vibration frequencies associated with construction	Slight to Moderate
1mm/s	Increasing likelihood of complaints in residential environments but can be tolerated at the lower end of the scale if prior warning and explanation has been given to residents	Moderate to Significant
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	Very Significant

Table 5 Guidance on Effects of Human Response to PPV Magnitudes

Further consideration of where an effect is significant is undertaken using professional judgement based on the duration of and frequency of the effect, as well as the time of the day.

2.4 Operational Phase – Noise

During the operational phase of the proposed development the primary sources of noise are expected to be mechanical plant items serving the apartments and traffic along the surrounding road network.

2.4.1 Mechanical Services Plant

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment is BS 4142 Methods for rating and assessing industrial and commercial sound (2014). This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in "background" noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

- "Specific sound level, $L_{Aeq,\ Tr}$" is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference to manufacturers information for specific plant items.
- "Rating level" $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;
- "Background noise level" is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the L_{A90} parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS4142: 2014 is outlined as follows:

1. determine the specific noise level;
2. determine the rating level as appropriate;
3. determine the background noise level, and;
4. subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10 dB or more is likely to be an indication of a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise impacts are typically considered to be neutral.

2.4.2 Noise due to Additional Traffic Serving the Development

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 6 is taken from DMRB *LA 111 Noise and Vibration* (2020) which relate to the long term magnitude of change.

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact
10+	Over a doubling of loudness	Major
5 – 9.9	Up to a doubling of loudness	Moderate
3 – 4.9	Perceptible	Minor
0.1 – 2.9	Imperceptible	Negligible
0	None	No Change

Table 6 Significance in Change of Noise Level

The guidance outlined in Table 6 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term impacts during the operational phase.

2.5 Operational Phase – Vibration

The proposed development is residential in nature, there are no sources of vibration associated with the operational phase. Operational criteria relating to vibration are not required in this instance.

2.6 Inward Noise – 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 government document, since its adoption 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
    - Element 4 - Other Relevant Issues

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 2 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.

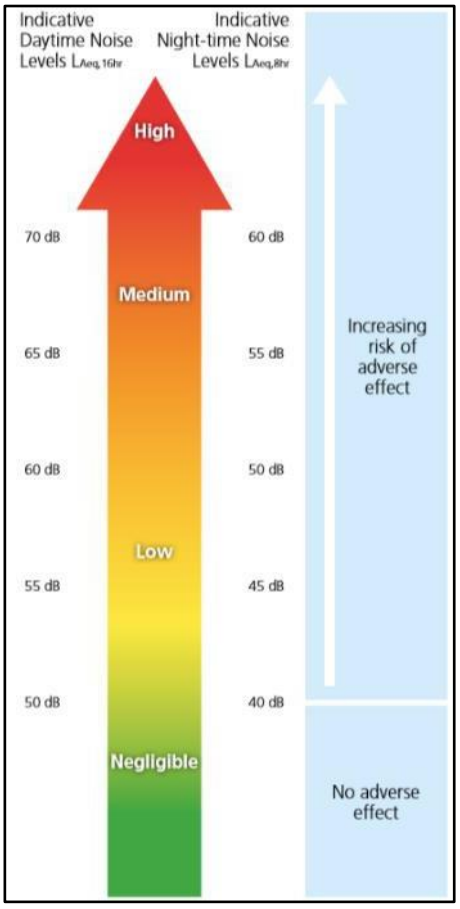

Figure 2 ProPG Stage 1 - Initial Noise Risk Assessment

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.

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 6 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

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 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 6 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.

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

3.0 BASELINE NOISE SURVEY

Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site.

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise.* Specific details are set out below.

3.1 Methodology

Baseline Noise Survey

A baseline noise survey was undertaken within and adjacent to the site to characterise the prevailing noise environment. The surveys were conducted in general accordance with ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (ISO 2017).

Survey Locations

Three attended survey positions were surveyed in and surrounding the proposed development site to characterise the baseline noise environment. The survey locations are described below and illustrated in Figure 3.

AN1 Attended survey position located at the southern boundary of the site set back at location of closest residential units to the R106 road.

AN2 Attended survey position located at the eastern boundary of the site set back at location of closest residential units to the adjacent road, opposite the Applegreen service station.

AN3 Attended survey position located at the northern boundary of the site.

AN4 Attended survey position located to the north west of the site, outside the site boundary at the nearest residential area setback from the R106.

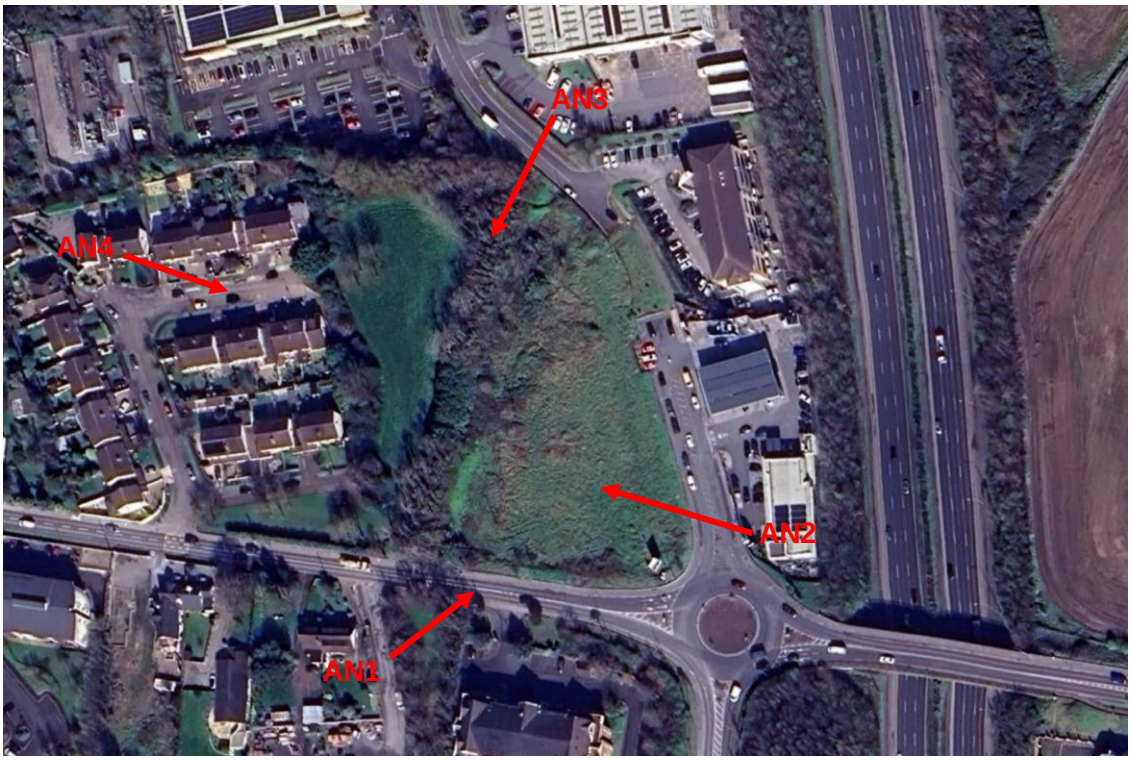

Figure 3: Baseline Noise Survey Positions and Red Line Boundary

Survey Periods

Attended noise surveys at AN1 to AN4 were carried out on 23 April 2024. Noise levels were measured on a cyclic basis at each measurement location for 15-minute periods.

The weather during the survey period was dry and bright with wind <5m/s.

Instrumentation and Parameters

The attended surveys were undertaken using Bruel & Kjær 2250 Type 1 Sound Level Meter (Serial number 2818091).

The instrument was calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator (Serial number 2022651) at the start and end of the field work. All equipment in laboratory calibrated every two years.

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

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

The "A" suffix for the noise parameters 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 x 10-5 Pa.

Survey Results

Location AN1

The attended survey results for Location AN1 within the site are summarised in Table 7.

Date	Time	dB L_{Aeq}	dB L_{A90}	dB L_{AFmax}
23 April 2024	11:06 – 11:21	60	57	70
	12:37 – 12:52	59	56	72
	14:06 – 14:21	58	54	68

Table 7 AN1 survey results

At Location AN1, ambient noise levels noise levels were measured in the range of 58 to 60 dB $L_{Aeq,15\ mins}$ and background levels were in the range of 54 to 57 dB $L_{A90,15mins}$ with maximum values in the range of 68 to 72 dB L_{AFmax} recorded also.

The noise environment at this location was dominated by road traffic to the south along the R106 with distant traffic noise from the M1. Also contributing was birdsong, landscaping works, service station carwash operating, dogs barking and foliage rustle.

Location AN2

The attended survey results for Location AN2 inside the site are summarised in Table 8.

Date	Time	dB L_{Aeq}	dB L_{A90}	dB L_{AFmax}
23 April 2024	11:24 – 11:39	58	56	68
	12:55 – 13:10	58	56	65
	14:23 – 14:38	58	55	65

Table 8 AN2 survey results

At Location AN2, an ambient noise level of 58 dB $L_{Aeq,15\ mins}$ and background levels were in the range of 55 to 56 dB, $L_{A90,15mins}$ with maximum values in the range of 65 to 68 dB L_{AFmax} recorded also.

The noise environment at this location was dominated by local road traffic to the south and service station related traffic as well as distant traffic from the M1. Also audible were, landscaping works, service station carwash operating, pedestrian conversation, birdsong and foliage rustle

Location AN3

The attended survey results for Location AN3 inside the site are summarised in Table 9 overleaf.

Date	Time	dB L_{Aeq}	dB L_{A90}	dB L_{AFmax}
23 April 2024	11:42 – 11:57	55	53	70
	12:55 – 13:10	55	52	65
	14:23 – 14:37	53	51	62

Table 9 AN3 survey results

At Location AN3, an ambient noise level of 55 dB $L_{Aeq,15\ mins}$ and background levels were in the range of 51 to 53 dB, $L_{A90,15mins}$ with maximum values in the range of 62 to 70 dB L_{AFmax} recorded also.

The noise environment at this location was dominated by local traffic within the

industrial estate, service station traffic and local and distant road traffic from the R106 and the M1. Also contributing to the noise build up was fabrication works from within the industrial estate, tonal reversing beacons, pedestrian conversation, birdsong and foliage rustle.

Location AN4

The attended survey results for Location AN4 to the northwest of the site outside the site boundary and adjacent to the nearest residential area are summarised in Table 10

Date	Time	dB L_{Aeq}	dB L_{A90}	dB L_{AFmax}
23 April 2024	11:42 – 11:57	53	50	67
	13:16 – 13:31	54	51	72
	14:40 – 14:55	52	50	59

Table 10 AN4 survey results

Ambient noise levels were measured in the range of 52 to 54 dB $L_{Aeq,15\ mins}$ and background levels were in the range of 50 to 51 dB, $L_{A90,15mins}$ with maximum values recorded in the range of 59 to 72 dB $L_{AFmax.}$

The noise environment at this location was contributed to by distant road traffic, works within the industrial estate, tonal reversing beacons, residential traffic within the housing estate, birdsong and foliage rustle.

3.2 Noise Survey Summary

The baseline noise levels measured across the proposed development site are typical of a Urban noise landscape. Noise levels measured were dictated by road traffic noise from the M1, local traffic, rustling vegetation, birdsong, occasional passing vehicles on the local roads and activities in the local industrial estate and petrol station.

3.3 Review of Fingal Development Plan Aircraft Noise Zones

The Fingal Development Plan 2023 - 2029 outlines Noise Zones and policy objectives in relation to aircraft noise from Dublin Airport. Four noise zones (Zone A to D) are indicated representing potential site exposure to aircraft exposure..

Objective DMSO105 sets out the following relating to development within the Airport Noise Zones:

"Strictly control inappropriate development and require noise insulation where appropriate in accordance with Table 14.16 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."

The proposed site is located in Dublin Airport Noise Zone D (≥ 50 and < 54 dB $L_{Aeq,\ 16hr}$ and ≥ 40 and < 48 dB L_{night}) which in accordance with the Fingal Development Plan, the following restrictions apply:

"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 nonresidential 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."

3.4 Review of EPA Noise Mapping

A desktop review of publicly available data has been undertaken to characterise the baseline noise environment. Reference has been made to the most recent Round 4 noise maps published by the Environmental Protection Agency (EPA) (https://gis.epa.ie/EPAMaps/) for aircraft and road traffic noise within the Dublin Agglomeration. The published noise maps are provided for the overall day-evening-night period in terms of L_{den} and the 8-hour night-time period, L_{night}, defined as follows:

L_{den} is the 24hour noise rating level determined by the averaging of the L_{day} with the $L_{evening}$ (plus a 5dB penalty) and the L_{night} (plus a 10dB penalty). L_{den} is calculated using the following formula:

$$L_{\text{den}} = 10log\ (\frac{1}{24})\ (12 * (10^{\frac{Lday}{10}}) + 4 * (10^{\frac{Levening+5}{10}}) + 8 * (10^{\frac{Lnight+10}{10}}))$$

Where:

L_{day} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the day periods of a year. The 12hr daytime period is between 07:00 to 19:00hrs.

$L_{evening}$ is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The 4hr evening period is between 19:00 to 23:00hrs.

L_{night} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The 8hr night-time period is between 23:00 to 07:00hrs.

Road Traffic Noise

Figure 4 presents the road traffic noise levels across the site in terms of the L_{den} parameter and sourced from the EPA Round 4 noise maps.

The southern and eastern portion of the proposed development site is located within the 60 to 65 L_{den} noise contours, reducing to within the 55 to 60dB L_{den} further north west into the proposed development site. The area closest to the R106 is in the 65 - 70 L_{den} noise contours.

Figure 1 Existing L_{den} Road Traffic Noise Level (Source: http://gis.epa.ie accessed August 2024)

Figure 5 presents the night-time road traffic noise levels across the site in terms of the L_{night} parameter and sourced from the EPA noise maps.

The southern and eastern portion of the proposed development site is located within the 55 to 60 L_{night} noise contours, reducing to within the 50 to 55dB L_{night} further north west into the proposed development site. The area closest to the R106 is in the 60 to 65 L_{night} noise contours.

Figure 5 Existing L_{night} Road Traffic Noise Level (Source: http://gis.epa.ie accessed August 2024)

Cumulative Noise Levels

The contribution of road and aircraft noise across the study area has been combined using the noise mapping information discussed in 3.4 and aircraft noise zones in Section 3.3. The results of the noise maps are presented in terms of the L_{den} and L_{night} parameters. Whilst the maps do not display the L_{day} parameter, an estimation of daytime noise levels has been determined by subtracting 2dB from the L_{den} values. This is based on the recommended approach set out in the *Brink 2018 - Conversion_between_noise_exposure_indicators*, document[1]. Table 11 presents the resultant cumulative noise level from road and air traffic. The values are summed Logarithmically to obtain a combined dB value.

Noise Source	Majority of Proposed Site			Road Edge		
	L_{den}	L_{day}	L_{night}	L_{den}	L_{day}	L_{night}
Aircraft (Zone D)	n/a	50 – 54	40 – 48	n/a	50 – 54	40 – 48
Road	55 – 65	53 – 63	55 – 65	65 - 70	63 - 68	60 - 65
Cumulative	55 – 65	55 – 64	55 – 65	65 - 70	63 - 68	60 - 65

Table 11 Cumulative Existing Noise Levels Across Study Area

Review of the noise maps indicates that existing noise levels across the study area are dominated by road traffic noise, with aircraft noise to a lower extent.

The measured baseline noise levels at AN1 and AN2 are at the lower end of the mapped contour noise levels during the daytime period.

4.0 CONSTRUCTION PHASE

4.1 Construction Phase Overview

A variety of items of plant will be in use for the purposes of site clearance/groundworks, and construction. There will be vehicular movements to and from the site that will make use of existing public roads and access via R106. Due to the nature of these activities, there is potential for the generation of elevated levels of noise. These are assessed in the following sections.

During the construction phase, there will be a number of HGV's moving to/from site during different phases of work. Excavators and dump trucks will be in use for site clearance and building foundations. Following this standard construction tools and methods will be employed for general construction and landscaping.

Test holes have been undertaken which indicate that it is not likely bedrock will be encountered. No piling or rock breaking are anticipated to be required

Review of aerial imagery and baseline noise surveys have identified the nearest NSLs are houses at Seamount View to the western site boundary, commercial buildings located to the north and east of the proposed site and residences at R106 to the south of the site respectively.

[1] Brink et al: "Conversion between noise exposure indicators Leq_{24h}, L_{Day}, $L_{Evening}$, L_{Night}, L_{dn} and L_{den}: Principles and practical guidance" 2018

4.2 Construction Noise

The closest NSLs to areas where significant works are to take place are located at distances of between 10 and 60m from the site boundaries. The closest NSLs are described below:

NSL1 Houses to the west of the site boundary, some 50m from areas of major works.

NSL2 Commercial buildings to the north of the site boundary some 65m from areas of major works.

NSL3 Commercial buildings to the east of the site boundary, some 20m from areas of major works.

NSL4 Residential buildings to the south of the site boundary some 50m from areas of major works.

The nearest noise sensitive locations are illustrated in Figure 5.

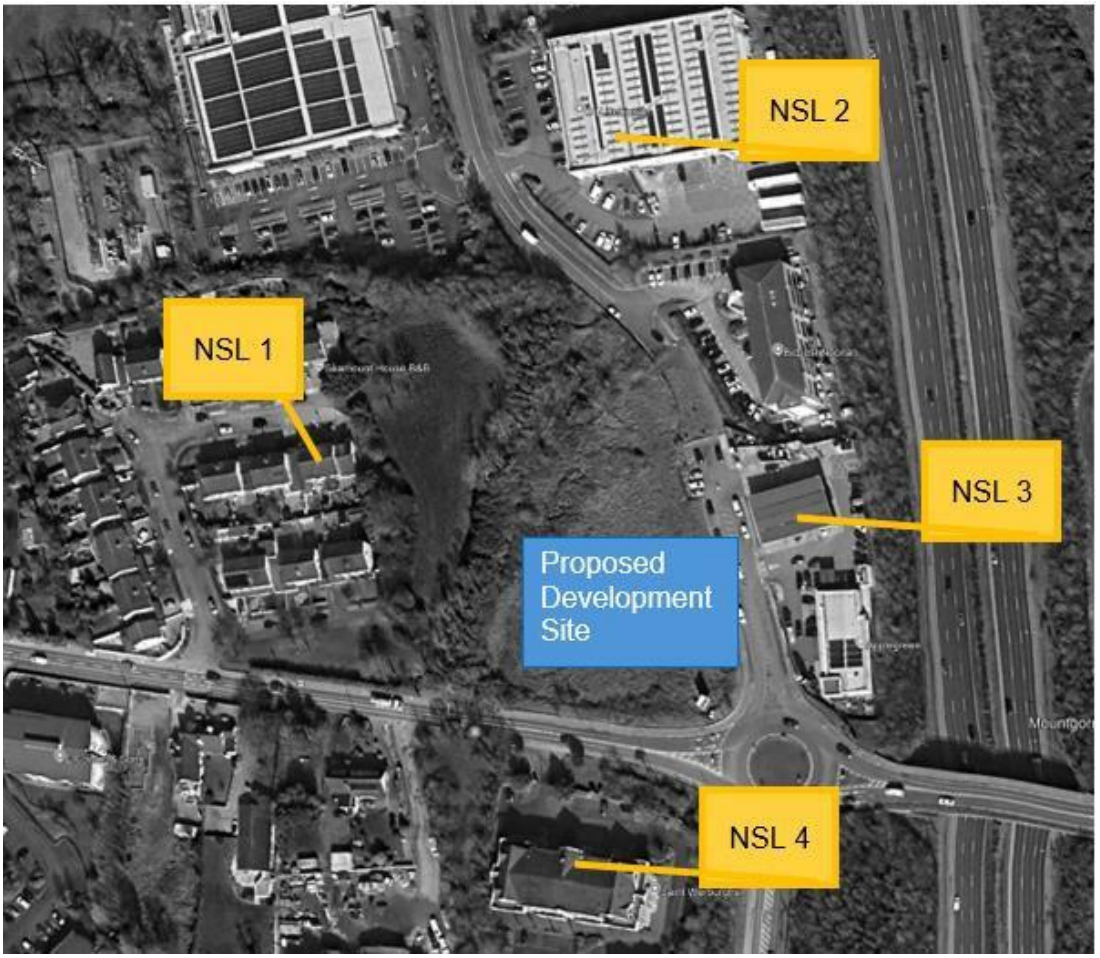

Figure 5 Indication of Sensitive Receptor Locations to Site Boundary (Source: Google Earth, August 2024)

Given that works during the construction phase will be transient in nature and will involve the use of several different plant items at any one time, it is difficult at this stage of the assessment to state accurately what items of plant will be in use and what levels of noise will be experienced during construction works. In order to assess the range of potential noise levels associated with the construction phase, therefore, indicative

noise prediction calculations have been prepared in relation to construction activities.

The calculations have been undertaken in line with guidance set out in British Standard BS 5228 (2009 +A1 2014): *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.* Table 12 outlines typical plant items for the main phases of work provided by the design team. The plant items relate to the construction and landscaping of the proposed houses along the site boundaries which are the closest construction activities to NSLs outside of the site.

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Construction Noise Level at 10m Distance (dB $L_{Aeq,1hr}$)
Site Clearance/ Groundworks	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Tracked Mobile Crane (C4.50)	71
	Diesel Generator (C4.76)	61
Foundations	Tracked excavator (C2.21)	78
	Dump Truck (C4.2)	75
	Cement mixer truck (C4.18)	71
General Construction	Compressor (D7.08)	70
	Telescopic Handler (D4.54)	79
	Hand Held Circular Saw (D4.72)	79
	Diesel Generator (D4.76)	61
	Internal Fit out	70
Landscaping and Road Paving	Asphalt Paver & Tipping Lorry (D5.30)	75
	Electric Water Pump (D5.40)	68
	Vibratory Roller (D5.20)	75

Table 12 Typical Noise Levels associated with Construction Plant Items (BS5228-1)

The predicted construction noise associated with each of the expected construction activities is presented below for various distances.

Guidance on the approximate attenuation achieved by standard construction hoarding surrounding construction sites is also provided in BS 5228-1. It states that when the top of the plant is just visible to the receiver over the noise barrier, an approximate attenuation of 5 dB can be assumed, while a 10 dB attenuation can be assumed when the noise screen completely hides the sources from the receiver.

In this scenario it is assumed that partial vision to the site is possible from the nearby receptors. Table 13 presents the potential noise levels calculated at various distances representative of the closest NSLs. The calculated levels are the combined construction plant items in operation during each of the phases noted above and assuming a conservative attenuation provided by the site hoarding of 5 dB.

Location	Construction Phase (dB $L_{Aeq,12hr}$)			
	Site Clearance/ Groundworks	Foundations	General Construction	Landscaping
20 m	64	65	65	63
50 m	54	55	55	53
60 m	50	51	51	49

Table 13 Potential Construction Noise Levels at Varying Distances

At the closest NSL (NSL3) located approximately 20 m from the closest area of works, noise levels are calculated in the range of 63 to 65 dB $L_{Aeq,12hr}$ during the different phases of works. The calculated noise levels for the work phases are within the daytime construction noise threshold of 65 dB $L_{Aeq,12hr}$ at this distance and in accordance with Table 2 the effect of impact is not significant and short term. There is potential for a slight exceedance of the construction noise threshold during the foundations and general construction works, depending on the combination of plant items in operation at any one time. Due to the transient nature of the dominant sources, this impact is not considered significant in the overall context of the construction phase.

For NSL's at greater distances from the apartment buildings construction noise levels will be further reduced.

In order to minimise the impact of construction activity, good practice mitigation measures are detailed in Section 4.5.

4.3 Construction Vibration

There is no piling or rock breaking proposed for the construction phase of the proposed development site.

Considering the low vibration levels at very close distances to excavations, vibration levels at the nearest off-site buildings will be orders of magnitude below those associated with cosmetic or structural damage buildings (Refer to Table 4). Due to the distances involved and magnitudes detailed above, vibration levels will also be below those likely to be perceptible to occupants of buildings adjacent to the site (Refer to Table 5).

4.4 Construction Traffic Noise

It is intended that R106 will be the primary construction access route to the development for Construction Traffic.

A traffic noise assessment has been undertaken to determine whether the increase in traffic along both access roads.

During the construction phase a total of 12 HGVs are forecast to access the site per day (resulting in a total of 24 vehicle movements over the full day). Up to 40 light vehicles for staff and other small deliveries are expected per day (resulting in a total of 80 vehicle movements).

In order to increase the noise level associated with traffic to any significant degree, there would have to be an increase in traffic volumes of 25%, due to then number of vehicles required during the construction phase it is unlikely that an increase of 25% traffic volume will occur.

The effect of impact will be short term, not significant. No further mitigation measures would therefore be required.

4.5 Construction Mitigation Measures

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2. Whist construction noise and vibration impacts are expected to vary during the

construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

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

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

4.5.1 Selection of Quiet Plant

The potential for any item of plant to generate noise should be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

4.5.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control “at source”. This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.
Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures should be considered:

- The lifting of bulky items, dropping and loading of materials will be restricted to normal working hours.
- Mobile plant should be switched off when not in use and not left idling.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

4.5.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The use of a standard 2.4 site hoarding will be included around all noise sensitive

boundaries. It is also understood that the existing perimeter walls and fences will remain during the construction process and provide a degree of screening.
In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

4.5.4 Liaison with the Public

A designated environmental liaison officer should be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

4.5.5 Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. While excavation or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

4.5.6 Monitoring

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

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

5.0 OPERATIONAL PHASE

5.1 Plant Noise

The prevailing baseline noise levels have been reviewed so as to set an appropriate noise criteria.

Daytime measured noise levels in the vicinity of the site were in the range 50 to 57 dB L_{A90}. Therefore, with consideration of the criteria set out in Section 2.4, plant noise levels during the daytime should be designed so as not to exceed **50 dB L_{A90}** at nearby noise sensitive locations.

With respect to night-time plant noise levels, reference has been made to available EPA noise maps[1] in order to estimate an appropriate noise level for the contribution of proposed plant items.

Night-time noise levels for the area surrounding the site are limited and noise levels are estimated to be < 50 to 65 dB L_{night}. With reference to measured daytime noise levels it is considered appropriate that plant noise levels during the night-time should be designed so as not to exceed **45 dB L_{A90}** at nearby noise sensitive locations.

Taking into account the recommendation from BS 4142 that if the plant noise level does not exceed the background sound level it is an indication of a low impact, it is recommended in this instance that noise emissions from all plant installed on the development site (considered cumulatively) do not exceed the following background noise levels:

- Daytime (07:00 – 23:00hrs) – 45 dB $L_{A90,1hr}$
- Night-time (23:00 – 07:00hrs) – 45 dB $L_{A90,15min}$

It is understood that various external plant items are proposed for the development. These items of plant have the potential to emit noise to the environment and consequently an exercise should be undertaken at detailed design stage to ensure that the finalised items of plant do not exceed the proposed noise thresholds. Noise mitigation measures may be required to meet the thresholds, as an indication these measures could include attenuators and acoustic barriers or louvres around the plant area.

5.2 Additional Traffic on Surrounding Roads

The proposed number of car parking spaces within the development is 24 no. This limited number of spaces corresponds to a level of trip generation that falls below the threshold for a Traffic Impact Assessment. Similarly for noise, the small number of potential vehicle movements in comparison to the existing level of traffic on R106, is expected to generate insignificant level of additional noise.

In order to increase the noise level associated with traffic to any significant degree, there would have to be an increase in traffic volumes of 25%. Due to the limited number of parking spaces associated with the development, it is unlikely that there will be 25% increase in traffic volume.

The predictions indicate that the subjective reaction to the change in noise levels will be inaudible and the associated impact will be no change.

5.3 ProPG Inward Noise Impact - Noise Risk Assessment

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 medium to high noise risk.

ProPG states the following with respect to medium to high risk sites:

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.

High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

Given the above it can be concluded that the development site may be categorised as *Medium to High 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 or high-risk 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.

6.0 STAGE 2 – FULL ACOUSTIC ASSESSMENT

6.1 Element 1 – Good Acoustic Design Process

6.1.1 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.

6.1.2 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

Consideration has been given to the location of both the buildings and external amenity areas. In the first instance, a primary consideration was to ensure that buildings are located as far as possible from the busy roads and existing industry where possible. Where this cannot be accommodated additional façade noise attenuation measures will be incorporated into the design.

The orientation of the site is such that the buildings themselves screen many of the common external amenity areas associated with the development.

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. 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

"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 that have been implemented on site do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

The major noise sources incident on the site are road and air traffic. Road traffic noise from the M1 and R106 is mitigated by the distance from the road edge to the building. However, aircraft noise cannot be mitigated using a boundary noise barrier. Furthermore due to the proximity to the R106, setting up an effective noise barrier would risk causing a significant obstruction of the view from inside a number of apartments. For these reasons it was not considered practicable to provide noise screens to the boundary.

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 $L_{Aeq,16hr}$."

Reference to the noise contours detailed in Section 3.4 indicates that daytime noise levels in the majority of southern and eastern external amenity areas are predicted to range between 53 - 58 dB $L_{Aeq,16hr}$ due to road traffic noise. It is noted that this is above the desirable level of 55 dB $L_{Aeq,16hr}$, however, it is predicted that barrier attenuation provided by the apartments themselves will attenuate ambient noise levels in screened areas such as the north and west of the site and courtyard external areas by at least 10 dB. As such it can be said that amenity areas in the range of 50 – 55 dB $L_{Aeq,16hr}$ and below this level will be available to all residents.

Summary

Considering the constraints of the site, in so far as possible and without limiting the

extent of the development area, the principles of Good Acoustic Design have been applied to the development.

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.

6.2 Element 2 – Internal Noise Guidelines

6.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 *Sound Insulation and Noise Reduction for Buildings* (2014). The recommended indoor ambient noise levels are set out in Table 14 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

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 14 ProPG Internal Noise Levels (From BS 8233)

*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.

6.2.2 Proposed Façade Treatment

Predicted noise levels on several facades are above a level whereby internal noise levels are achieved with standard double glazing and therefore mitigation in the form of enhanced glazing and ventilators will be required. The facades where mitigation is required are outlined in Figure 6.

Figure 6 Facades requiring enhanced glazing and ventilation

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[2] 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.

[2] 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.

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 15.

Glazing Specification	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1k	2k	4k	
	26	30	33	42	39	32	38
	16	20	23	32	29	22	28

Table 15 Sound Insulation Performance Requirements for Glazing, SRI (dB)

It is important to note that the acoustic performance specifications detailed herein 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 56 dB R_w for this construction.

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 demand control ventilation and trickle vents built into the façade or window frames respectively. In this instance the facades will be provided with ventilation that, when closed, achieve the minimum sound insulation performance as set out in Table 16. This specification can be achieved by a range of proprietary vents in either through frame trickle vent or through wall vents.

Ventilation Specification	Octave Band Centre Frequency (Hz)						D_{new}
	125	250	500	1k	2k	4k	
	28	32	40	44	39	32	41
	18	22	30	34	29	22	31

Table 16 Sound Insulation Performance Requirements for Ventilation, SRI (dB)

6.2.3 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.

6.3 Element 3 – External Amenity Area Noise Assessment

As noted previously, reference to the noise contours detailed in Section 3.2 indicates that daytime noise levels in the south and west external balconies and amenity areas

are predicted to reach 55 - 64 dB $L_{Aeq,16hr}$ due to road traffic noise. It is noted that this is above the desirable level of 55 dB $L_{Aeq,16hr}$. ProPG states the following, with regard to private amenity areas exceeding the desirable levels of 50 - 55 dB $L_{Aeq,16hr}$:

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

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations."*

A central courtyard where desirable external noise levels are predicted to be achieved has been incorporated into the design of the development. External amenity areas to the north and west of the proposed development will benefit from screening provided from the buildings themselves and will provide additional amenity areas which are predicted to achieve desirable noise levels.

6.4 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 below.

6.4.1 Compliance with Relevant National and Local Policy

There are no national policy documents relating to the acoustic design of residential dwellings. Locally the Fingal Development Plan 2023 – 2029 contains Objective DA011 relating to development within the Outer Noise Zone. This objective states:

"Objective DA011

Strictly control inappropriate development and require noise insulation where appropriate in accordance with Table 8.1 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 the runways are not unreasonable to minimise 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.

6.4.2 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:

- The development building has been designed to achieve the good internal noise levels specified within ProPG. The rooms require closed windows and open vents to achieve this level;
- External amenity areas have been assessed and while the noise levels externally are above the recommended criterion set out in ProPG, no reasonable mitigation from aircraft noise is possible.

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

6.4.3 Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

7.0 CONCLUSION

Planning Permission is being sought for a proposed LRD at the lands at Mountgorry, Swords, Dublin 18.

A baseline noise survey has been undertaken at the development site to determine the existing environment.

The potential impact during the short-term construction phase has been assessed. Construction noise thresholds have been selected and noise predictions have been undertaken. The predictions indicate that whilst there are a small number of commercial and residential properties in proximity to the site boundary, the nature of the construction activities for the majority of the construction phase will involve construction techniques which can operate within the construction noise thresholds. Best practice control measures will be employed on site to control noise emissions outside of the site through the use of site hoarding, localised screening, scheduling of works, maintenance of plant items etc. Vibration impacts during the construction phase are not significant.

Once operational, it is expected that noise emissions will be limited to noise associated with traffic coming to and from the development and plant items serving to the development. With reference to the minimal number of parking spaces provided for in

the scheme, traffic associated with the development is not significant, a negligible effect of impact and associated increases in noise levels are expected to be imperceptible to perceptible. Regarding plant noise, suitable noise thresholds have been assigned based on the measured noise levels on the site. During detailed design stage plant and noise mitigation options should be selected so that the noise emissions at nearby sensitive receptors do not exceed the recommended thresholds.

Once the various best practice control measures during the construction phase are implemented on site, the overall noise and vibration impact during this phase will not be overly intrusive to cause a significant impact.

An inward noise impact assessment has been undertaken. With the inclusion of enhanced glazing and ventilation, good internal noise levels can be achieved in all residences.

There are no significant impacts associated with the operational phase.

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.

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.

PPV Peak Particle Velocity (PPV) is defined as the instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position and is measured in mm/s.