12 AIR (NOISE & VIBRATION)

12.1 INTRODUCTION

This document has been prepared by AWN Consulting Ltd. (AWN) to assess the potential noise, and vibration impacts of the proposed "Phase 1F" residential development at Portmarnock, Co. Dublin (the Proposed Development) in the context of current relevant standards and guidance.

This assessment has been prepared by Miguel Cartuyvels (Acoustic Consultant) holds a BEng (Hons) in Industrial Engineering and is a member (TechIOA) of the Institute of Acoustics. Miguel previously worked in the construction industry and has worked in the field of acoustics since 2021, where he has contributed to numerous projects related to environmental surveying, noise modelling, and impact assessment for various sectors, including wind energy, industrial, commercial, and residential.

The assessment has been reviewed by Alistair Maclaurin, Senior Acoustic Consultant at AWN, who holds a BSc in Creative Music and Sound Technology and a Diploma in Acoustics and Noise Control. He is a member of the Institute of Acoustics. Alistair has worked in the field of acoustics since 2012. He has been the lead noise consultant across various sites on major infrastructure projects such as Crossrail and Thames Tideway Tunnel, specialising in construction noise assessment and control. Additionally, he has undertaken various other environmental noise assessments for infrastructure developments and planning reports across the UK and Ireland.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the Proposed Development site (the Site) and an assessment of the potential noise and vibration impact associated with the Proposed Development, during both the short-term construction phase and the permanent operational phase, on its surrounding environment. The assessment of direct, indirect and cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the Proposed Development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

12.2 ASSESSMENT METHODOLOGY

The assessment of impacts has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out within the relevant sections of this chapter. In addition to specific guidance documents for the assessment of noise and vibration impacts which are discussed further in the relevant sections, the following guidelines were considered and consulted for the purposes of this chapter: -

- EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports May 2022.
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports Draft August 2017.
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).

The study has been undertaken using the following methodology: -

- An environmental noise survey has been undertaken in the vicinity of the Proposed Development site in order to characterise the existing baseline noise environment.
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the Proposed Development.
- Predictive calculations have been performed during the construction phase of the project at the nearest sensitive locations to the development site.

- Predictive calculations have been performed to assess the potential impacts associated with the operational of the development at the most sensitive locations surrounding the development site.
- A schedule of mitigation measures has been proposed to reduce, the identified potential outward significant impacts relating to noise and vibration from the proposed development.

12.3 RECEIVING ENVIRONMENT

12.3.1 Noise Sensitive Locations

A number of noise sensitive locations have been considered in relation to the Proposed Development as illustrated in Figure 12.1 and described in Table 12-1. The locations have been selected as the closest sensitive residential receptors to the development, hence they are the most at risk of being impacted by any outward noise or vibration.

Ref	Description
N1	Monument View Properties (residential) including Phase 1E under construction
N2	Dwelling on R123
N3	Dwellings on the R106 (Coast Rd)
N4	Dwelling on R123
N5	Dwellings on Station Rd

Table 12-1 Noise Assessment Locations.

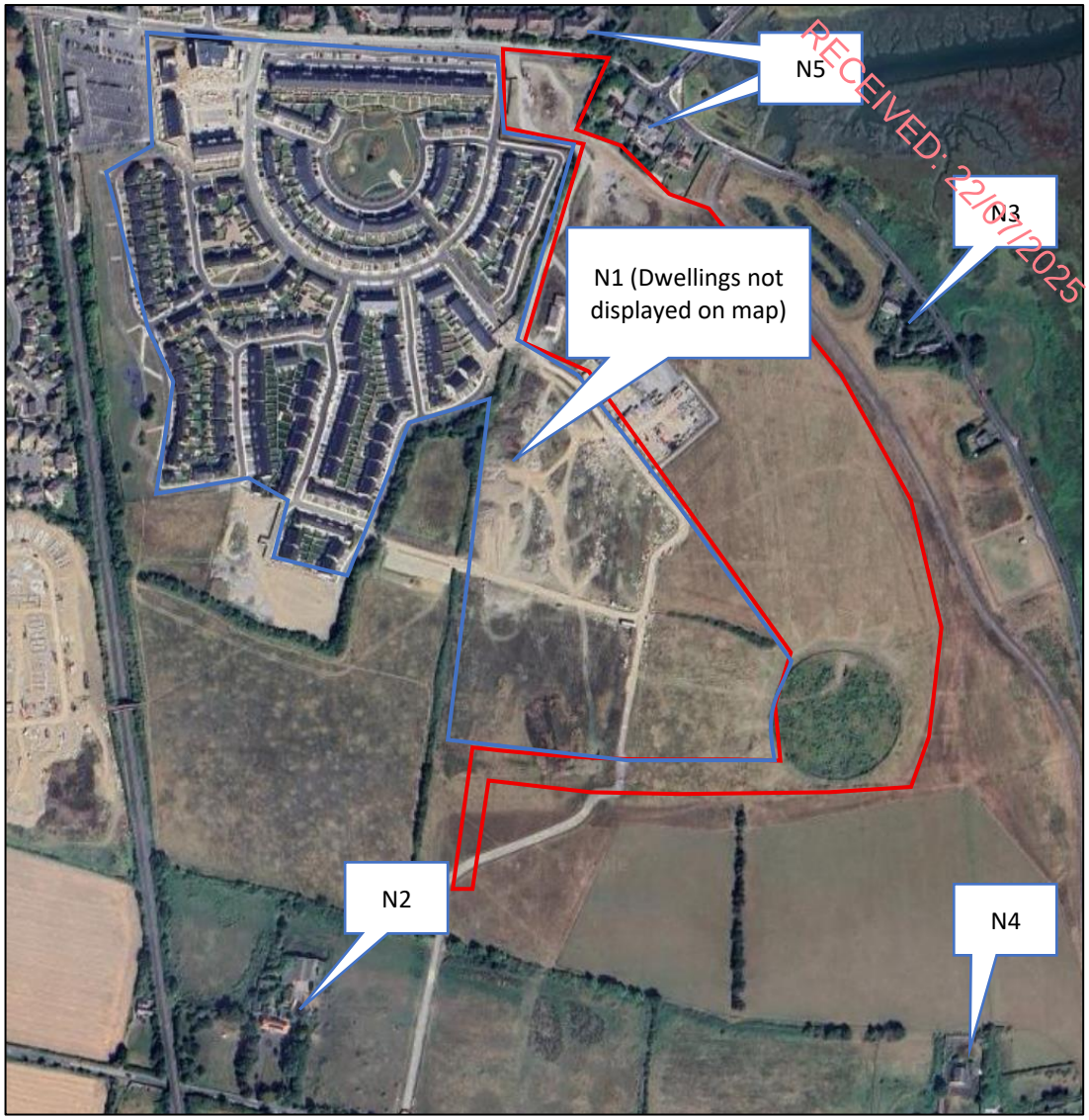

Figure 12.1 Noise Sensitive Receptor Locations

12.3.2 Noise Survey

An environmental noise survey has been conducted at the site to assess the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

12.3.2.1 Survey Location

The following survey location was selected as presented in Figure 12.2. This location was selected to capture noise levels experienced across the site for the purposes of the inward impact assessment.

UN1 – Located in the centre of the site in order to measure the overall noise environment of the proposed site.

Figure 12.2 Noise Survey Location

12.3.2.2 Survey Periods

The attended noise survey was carried out on 17th and 19th June 2025. Short measurements were undertaken to capture the noise impact of flyovers as it was determined they are the main contributor within the site.

The weather during the survey period was dry with cloud coverage. Wind speeds were noted to be low; they were not considered to have had a detrimental effect on the noise measurements.

Unattended noise measurements were carried out between 17th June 2025 and 19th June 2025.

12.3.2.3 Personnel and Instrumentation

AWN installed and collected the noise monitoring equipment. The following instrumentation was used in conducting the noise and surveys:

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Larson Davis LxTI	0006260	20 Feb 2025

Table 12-2 Instrumentation Details.

12.3.2.4 Noise 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 which samples over a 125 ms period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

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 chapter are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

12.3.2.5 Survey Results

Attended Noise Measurements

Short, attended measurements were taken at UN1 to obtain samples of maximum sound levels across the site from the main contributor, in this instance, the aircraft flyovers, to be compared with the unattended measurements.

The survey results for the attended monitoring are given in Table 12-3

Location	Start Time	Duration	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			Comment
			L_{Aeq}	L_{AFmax}	L_{A90}	
UN1	15:08:36	25 seconds	67.9	75.1	60.3	Landing
	15:14:06	33 seconds	66.4	75.8	56.4	Landing
	15:16:37	46 seconds	64.4	73.4	54.1	Landing
	15:18:18	45 seconds	66.7	76.7	55.4	Landing
	10:48:00	31 seconds	65.8	72.7	58.0	Take-off

Table 12-3 Attended Noise Survey Results.

The noise environment was dominated by aircraft movements overhead. It's noted that construction also contributed to overall noise levels. In addition to these dominating factors there was birdsong, foliage rustling and traffic noted in the quieter periods.

Unattended Noise Measurements

The results of the unattended monitoring survey at Location UN1 are summarised for daytime periods in Table **12-4** and for night-time periods in Table **12-5**.

Monitoring Period / Range		Measured Noise Levels (dB re. 2x10-5 Pa)	
		L_{Aeq}	L_{A90}
17/06/2025	Highest	63	51
	Lowest	45	35
	Average	**61**	**41**
18/06/2025	Highest	66	54
	Lowest	41	36
	Average	**62**	**46**
19/06/2025	Highest	70	54
	Lowest	58	45
	Average	**63**	**49**

Table 12-4 Summary of Daytime Unattended noise measurements at UN1.

Monitoring Period / Range		Measured Noise Levels (dB re. 2x10-5 Pa)	
		L_{Aeq}	L_{A90}
17/06/2025	Highest	62	41
	Lowest	26	24
	Average	**57**	**31**
18/06/2025	Highest	59	43
	Lowest	35	27
	Average	**51**	**31**

Table 12-5 Summary of Night-time Unattended noise measurements at UN1.

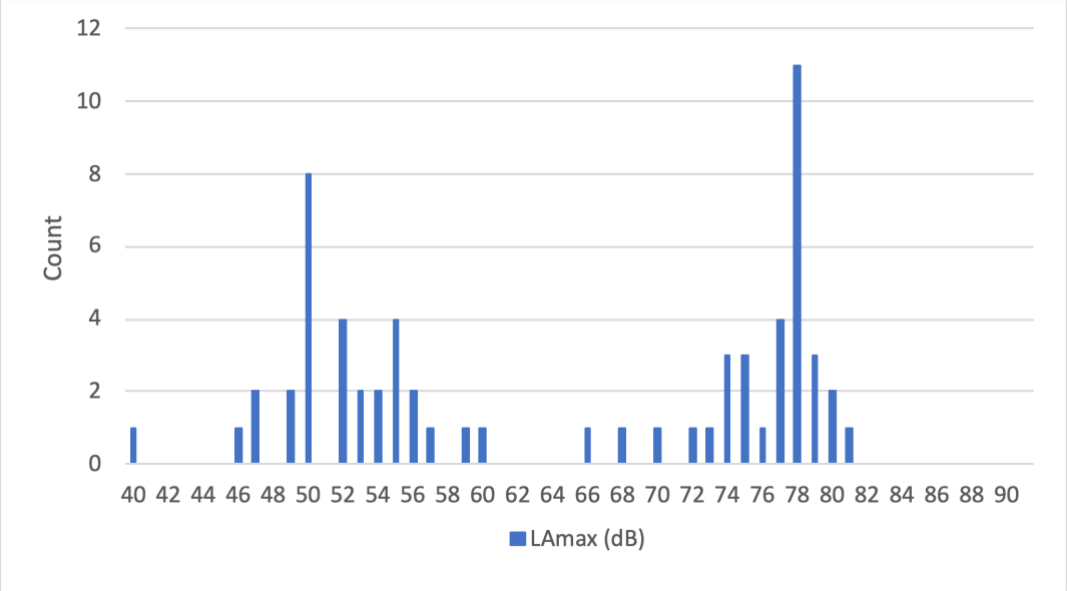

Figure 12.3 Number of Maximum Events at Each Decibel Level – Night.

During daytime periods, average noise levels were in the range 61 to 63 dB L_{Aeq} and 41 to 49 dB L_{A90}. During night-time periods, average noise levels were in the range 51 to 57 dB L_{Aeq} and 31 dB L_{A90}.

L_{Aeq} and L_{AFMax} values were measured at 15-minute intervals over the duration of the survey. Figure 12.3 present the number of measured L_{Aeq} and L_{AFMax} events for each decibel level during the day and night periods. It is noted from Figure 12.3 the noise level of 78 dB L_{Amax} is not normally exceeded.

12.4 LEGISTLATION AND GUIDANCE

12.4.1 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.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of an NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. A threshold noise value

is applied to each category. Exceedances (construction noise only) of the threshold value, at the facade of a sensitive receptor during construction, indicates a potential significant noise impact associated with the construction activities. The threshold values recommended by BS5228-1 are set out in Table 12-6.

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

Table 12-6 Example Threshold of Significant Effect at Dwellings.

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

For the appropriate period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5dB. Based on review of existing noise levels obtained from the noise survey, relevant BS5228-1 threshold values at the various assessment locations are presented in the Table 12-7.

Period	Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB)	Baseline Noise Category
Daytime (07:00 – 19:00) and Saturdays(07:00 – 13:00)	65	A
Evening(19:00 to 23:00hrs)	55	A
Night time (23:00 to 07:00hrs)	45	A

Table 12-7 Rounded Baseline Noise Levels and Associated Categories.

See Section 12.16for the assessment in relation to this development. If the construction noise level exceeds the appropriate category value, then a potential significant effect is deemed to occur.

Guidance on the degree of significance is presented the UK document Design Manual for Roads and Bridges (2020) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2. The approach is as follows:

- To determine the threshold value for construction noise according to the method from BS5228 described above.
- To compare the predicted construction noise level with the existing noise levels and the threshold value according to the criteria in the table below.

Potentially this procedure is to be followed separately for each noise-sensitive location, however in this instance as the existing noise levels at all survey locations correspond to Category A according to table above, all noise-sensitive locations are considered together.

Similarly, for this Proposed Development the vast majority of construction works will take place within the 'Daytime' period, i.e. 07:00 – 19:00 on Mondays to Fridays and 07:00 – 13:00 on Saturdays.

The magnitude of the construction noise impact according the DMRB is mapped to the EPA significance terms as detailed in Table 12-8:

Construction Noise Level	Magnitude of Impact (DMRB)	EPA Significance of Effect
Below or equal Baseline Noise Level	Negligible	Not Significant
Above Baseline and below or equal to threshold	Minor	Slight – Moderate
Above threshold and below or equal to threshold + 5dB	Moderate	Moderate – Significant
Above threshold + 5dB	Major	Significant – Very Significant

Table 12-8 Description of Construction Noise Impacts based on DMRB.

It should be noted that this assessment method is only valid for residential properties. The threshold for construction noise has been determined as:

65dB $L_{Aeq,1hr}$ at any residential noise sensitive location

12.4.1.1 Linear Construction Activities

Due to the linear progressive nature of the construction works associated with the pump connection route, a fixed noise limit is proposed. This is deemed appropriate in that noise from associated construction activities is variable and typically occurs for a short period of time only and is at its highest when closest to the NSL. As the works progress, construction noise levels at the NSL will reduce due to the works taking place at greater distances, resulting overall in shorter periods of exposure to noise impacts.

In relation to an appropriate fixed noise limit value, BS 5228-1 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".

The Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) document Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, 2004) proposes daytime period (Monday to Friday 0700 – 1900 hrs) construction noise limits of 70 dB $L_{Aeq,1hr}$.

Considering the above guidance, a construction noise limit of 70 dB $L_{Aeq,1hr}$ is proposed for linear construction activities (i.e. access road and, cabling and grid connection route). Noise levels above 70 dB $L_{Aeq,1hr}$ would indicate a significant impact depending on the duration and frequency of occurrence.

12.4.1.2 Consideration of Duration When Assessing Effects

Section 3.19 of LA 111, DMRB states that construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or,
- A total number of days exceeding 40 in any 6 consecutive months.

12.4.2 Construction Phase - Vibration

12.4.2.1 Building Damage Criteria

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings from a building damage perspective is contained in the following documents: -

- British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- British Standard BS 5228-2: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Vibration.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 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 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5288-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The TII document Guidelines for the Treatment of Noise and Vibration in National Road Schemes also contains information on the permissible construction vibration levels as follows:

Allowable Vibration (in Terms of Peak Particle) at the Velocity Closest Part of Sensitive Property to the Source of Vibration, at a Frequency of		
Less than 10 Hz	**10 to 50 Hz**	**50 to 100 Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

Table 12-9 Allowable Vibration during Construction Phase.

12.4.2.2 Human Response Criteria

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 0.15 mm/s to 0.3 mm/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 2.5 mm/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 12-10 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).

Criteria	Impact Magnitude	Significance Rating
≥10 mm/s PPV	Very High	Very Significant

≥1 mm/s PPV	High	Moderate to Significant
≥0.3 mm/s PPV	Medium	Slight to Moderate
≥0.14 mm/s PPV	Low	Not significant to Slight
Less than 0.14 mm/s PPV	Very Low	Imperceptible to Not significant

Table 12-10 Human Response to Vibration Significance Ratings

Notes from BS5228-2:

A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.

C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472 (BS1 2008), and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

12.4.3 Operational Phase - Additional Traffic on Surrounding Roads

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 12-11, taken from Design Manual for Roads and Bridges (DMRB), LA 111 Noise and vibration Revision 2 (UK Highways Agency et al, 2020) offers guidance as to the likely degree of impact associated with any long-term change in traffic noise level.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact	EPA Significance of Effect
0.0 – 0.9	Inaudible	Negligible	Imperceptible
0.9 – 2.9	Barely Perceptible		Not significant
3 – 4.9	Perceptible	Minor	Slight, Moderate
5 – 9.9	Up to a doubling of loudness	Moderate	Significant
10+	Doubling of loudness and above	Major	Very significant

Table 12-11 Significance in Change of Noise Level.

The guidance outlined in Table 12-11 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.

12.4.4 Operational Phase – Building Services Noise

The standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment and that often applied by local authorities 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 $L_{Ar,T}$	Is the specific noise level plus adjustments for the character features of the sound (if any).
Background noise level	Is the sound 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 LA90 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.
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 +10dB or more is a likely to be an indication of a significant adverse impact. A difference of around +5dB is likely to be an indication of a significant 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.

Note that for receptors that are a part of the Proposed Development it is more appropriate to set thresholds based on internal noise guidelines contained within British Standard BS 8233 (BSI 2014c). The logic being that there will be no change in noise levels for the future receptors and, hence, impacts cannot be assessed as a change. Absolute noise levels are based on those defined within BS8233 and presented below.

Activity	Location	Daytime (07:00 to 23:00hrs)	Night (23:00 to 07:00hrs)	Derived External Levels
Resting	Living room	35 dB $L_{Aeq, 16hr}$	-	50 dB $L_{Aeq, 16hr}$
Dining	Dining room	40 dB $L_{Aeq, 16hr}$	-	55 dB $L_{Aeq, 16hr}$
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hr}$	30 dB $L_{Aeq, 8hr}$	50 dB $L_{Aeq, 16hr}$ 45 dB $L_{Aeq, 8hr}$ at night

Table 12-12 Guidance on Indoor Ambient Noise Levels for Dwellings,

The derived external levels are based on the approximate attenuation provided by a partially open window of 15 dB, as advised in BS 8233 (BSI 2014c), and represent the appropriate noise level at the external façade of the building.

12.4.5 Operational Phase – Inward Noise Impact

12.4.5.1 Fingal Development Plan 2023 - 2029

Objective DA011 of the Fingal Development Plan 2023 – 2029 is relevant to the Proposed Development. Four noise zones (Zone A to D) are now indicated representing potential site exposure

to aircraft noise. The council will actively resist residential development within Zone A, and resist in Zone B and C pending independent acoustic advise 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. The objective states the following:

> *"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 a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone."*

Table 8.1 of the Development Plan is reproduced in Table 12-13 which outlines the objectives to be adhered to by applicants for developments in each zone. The Proposed Development is situated in Zone B and, hence, a noise assessment is required to demonstrate good acoustic design has been followed.

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 dB and < 54 dB LAeq, 16hr and ≥ 40 dB and < 48 dB Lnight	**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 LAeq, 16hr and ≥ 48 dB and < 55 dB Lnight	**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 ≥ 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 noise insulation is incorporated within the development.** *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 LAeq, 16hr and/or ≥ 55 dB Lnight	**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 12-13 Aircraft Noise Zones.

12.4.5.2 Dublin Agglomeration Noise Action Plan 2024 - 2028

The Dublin Agglomeration Noise Action Plan 2024 – 2028, addresses the requirements of the European Noise Directive 2002/49/EC for local authorities for managing environmental noise. The Noise Action Plan (NAP) states the following regarding planning guidance: "The appropriate use of the planning system can be used to help avoid, or minimise, the adverse impacts of noise without placing unreasonable restrictions on development".

The action plan outlines guidance to minimise the impact in relation to noise on new developments. ProPG Planning and Noise: Professional Practice Guidance on Planning and Noise, and BS 8233: Guidance on Sound Insulation and Noise Reduction for Buildings, are recommended as guidance to

be employed in areas where people are being brought to noise in the form of existing transportation noise.

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

12.4.5.3 ProPG: Planning & Noise

The Professional 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 it's 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.
    - **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").

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 12.4.

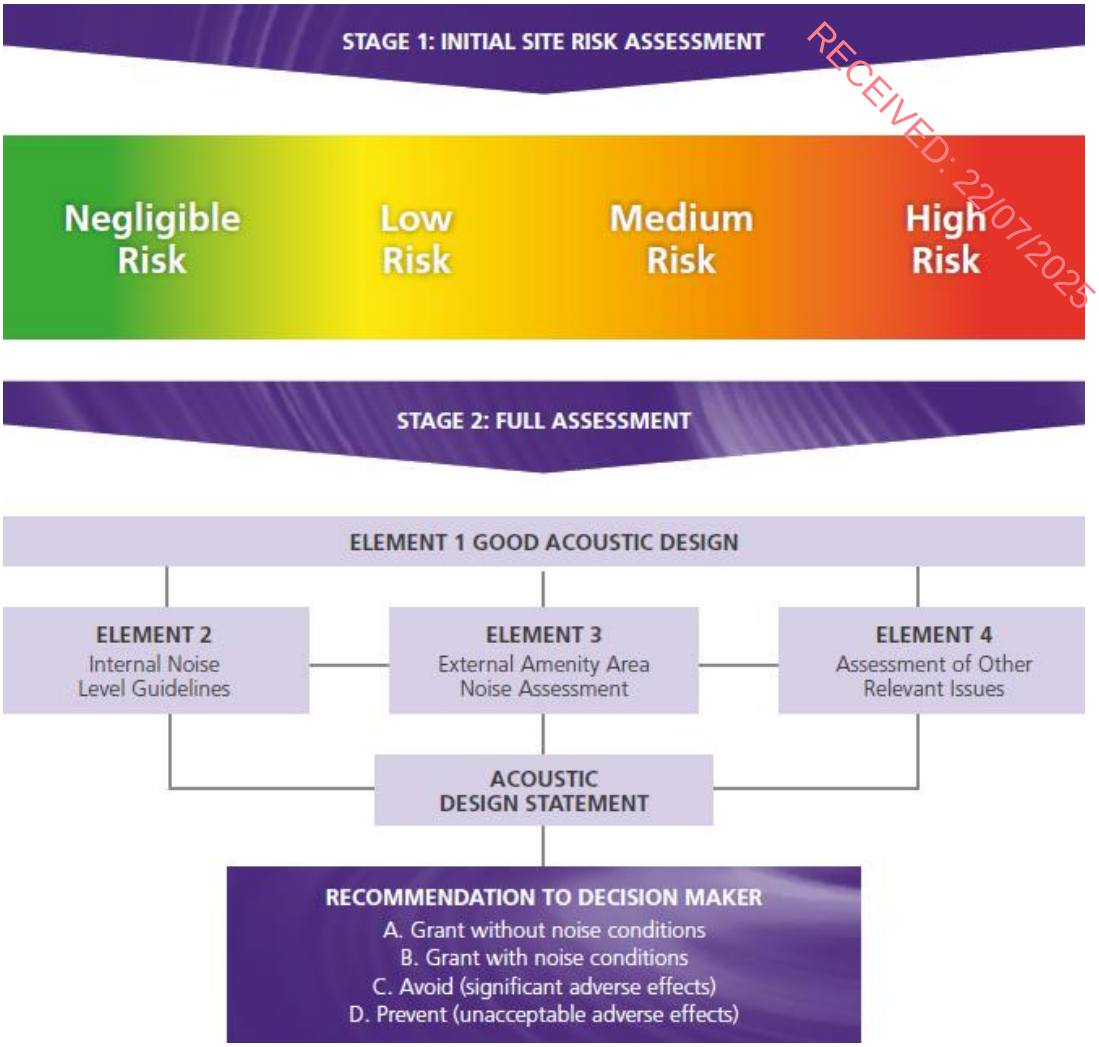

Figure 12.4 ProPG Approach (Source: ProPG).

12.4.5.4 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.

12.5 CHARATERISTICS OF THE PROPOSED DEVELOPMENT

The Proposed Development subject of this Large-scale Residential Development (LRD) planning application will generally comprise: -

- 296 no. residential units consisting of 42 no. duplex / apartments and 254 no. houses ranging in heights between 1.5 and 3 storeys.
- Public open space including a pocket pack and linear space along 'Monument View'.
- Installation of temporary underground pipe to be used until Irish Water Station is operational.
- All associated and ancillary site development, infrastructural, landscaping and boundary treatment works.

A full project description is provided in Chapter 3: Description of Proposed Development.

12.6 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

12.6.1 Construction Stage Noise

It is predicted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

12.6.1.1 General construction

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00hrs on Saturdays. Occasional weekday evening works may also be required; however evening activities will be significantly reduced in order to manage any associated noise impacts in an appropriate manner and more stringent construction noise criteria will be applicable during any evening works that may be required. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Due to the nature of daytime activities undertaken on a construction site there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

As the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, it is possible to predict typical noise levels using calculation guidance set out in Annex F of BS 5228-1. Table 12-14 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

For the purposes of the assessment, we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this chapter.

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance, (dB LAeq,1hr)
1 – Site Preparation	Wheeled Loader Lorry (C2 28)	74
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78

2 – Foundations	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (C3 19)	75
	Poker Vibrator (C4 33)	78
3 – General Construction	Mobile Telescopic Crane C4.39	77
	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
4 – Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

Table 12-14 Typical Noise Levels associated with Construction Plant Items (BS5228-1)

Table 12-15 sets out a range of construction noise levels relating to different construction activity at the various noise assessment locations. The calculations assume that the construction site is to be surrounded by a 2.4m high solid hoarding and that an 'on-time' of 66% applies to construction plant.

Ref.	Predicted Ranges of Construction Noise Levels for Various Phases dB $L_{Aeq,1hr}$			
	Site Preparation	Foundations	General Construction	Landscaping
N1	42 – 74	42 - 75	43 - 76	41 - 73
N2	31 – 37	31 - 37	32 - 38	30 - 36
N3	39 – 59	39 - 59	40 - 60	38 - 58
N4	30 – 40	30 - 40	31 - 41	29 - 39
N5	34 – 67	34 - 67	41 - 70	39 - 68

Table 12-15 Review of Potential Daytime Construction Noise Levels.

The indicative construction noise prediction values are within the criterion of 65 dB $L_{Aeq,1hr}$ for receptor locations N2 to N4, however, at times when works are undertaken closest to N1 and N5 they are in excess of the criterion. Consequently, management of construction noise will need to be applied on a proactive day to day basis. Note that there are no construction activities that would be expected to give rise to noise construction levels that would be considered out of the ordinary or in exceedance of the levels outlined in Table 12-8 on an on-going basis.

Based on the above a description of impacts is presented in Table 12-16:

Ref.	Predicted Construction Noise Impacts for Various Phases dB $L_{Aeq,1hr}$			
	Site Preparation	Foundations	General Construction	Landscaping
N1	Not Significant to Significant	Not Significant to Significant	Not Significant to Significant	Not Significant to Significant
N2	Not Significant	Not Significant	Not Significant	Not Significant
N3	Not Significant	Not Significant	Not Significant	Not Significant
N4	Not Significant	Not Significant	Not Significant	Not Significant

Ref.	Predicted Construction Noise Impacts for Various Phases dB $L_{Aeq,1hr}$			
	Site Preparation	Foundations	General Construction	Landscaping
N5	Not Significant to Significant	Not Significant to Significant	Not Significant to Significant	Not Significant to Significant

Table 12-16 Review of Potential Daytime Construction Noise Impacts.

12.6.1.2 Pump connection

The proposed pump expansion and connection to the main register will require underground works for the installation of the pipes. The full description of the pipe route is outlined in Chapter 3 (Description of the Proposed Development) of this EIAR. Review of the pipe layout has identified that the nearest NSL is part of the same masterplan development (South of Phase 1E, currently under construction) and approximately 20 m from the pipeline route. The next nearest receptor is located to the west of the proposed pump route at approximately 100 m (N2).

Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB LAeq,12hr)	Calculated Construction Noise Level dB LAeq,T at distance from works (m)		
		20 m	100 m	200 m
HGV Movement (C.2.30)	79	61	53	47
Tracked Excavator (C.4.64)	77	59	51	45
Excavator Mounted Rock Breaker (C9.12)	85	67	59	53
General Construction (Various)	84	66	58	52
Concrete Mixer Truck and Concrete Pump (C.4.27)	75	57	49	43
Dumper Truck (C.4.4)	76	58	50	44
Mobile Telescopic Crane (C.4.39)	77	59	51	45
Dewatering Pumps (D.7.70)	80	62	54	48
JCB (D.8.13)	82	64	56	50

Vibrating Rollers (D.8.29)	77	59	51	45
Total Construction Noise	**--**	**73**	**65**	**59**

Table 12-17 Review of Potential Daytime Construction Noise Impacts at different distances.

Table 12-17 outlines the typical construction noise levels associated with the proposed works for this element of the construction. Calculations have assumed an on-time of 66% for each item of plant i.e., that the item is operational for 8 hours over a 12-hour assessment period. A noise barrier has been included in the assessment when the distance between the construction works and the receivers were less than 50 m.

Note the plant items and activities are indicative and based on conservative assumption to be representative of a reasonable worst case.

The construction activities for the pump connections will vary and will not be continuous in nature. The noise levels are not expected to exceed the threshold over a significant period, as the works are linear. This duration is below the threshold that would trigger a significant effect according to the guidance outlined in Section 12.4.1.2. Therefore, a significant effect is not expected at any NSL from the proposed grid connection works, and specific mitigation measures are not required.

12.6.2 Construction Stage Vibration

Expected vibration levels during piling assuming augured or bored piles have been determined through reference to published empirical data. The British Standard BS 5228 – Part 2: Vibration, publishes the measured magnitude of vibration of rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Given the above values it can be concluded that vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in Table 12-9 to avoid any cosmetic damage to buildings. Vibration levels are also expected to be below a level that would cause disturbance to building occupants, although for the closest receptors vibration may be perceptible. The impacts are predicted to be temporary, negative and slight.

12.6.3 Operational Stage – Outward Impact

The main potential noise outward noise impact to the surrounding will be from additional vehicles on the surrounding road network and building services and mechanical plant serving the development.

Potential impacts from each of these sources are discussed below.

12.6.3.1 Additional Vehicular Traffic on Surrounding Roads

During the operational phase of the Proposed Development, there will be an increase in vehicular traffic associated with the site and other planned developments on surrounding roads.

The predicted change in noise levels due to an increase in road traffic has been calculated for each of these roads. Projected traffic data used for the purpose of this assessment includes committed and

planned developments in the vicinity of the project site as listed in Chapter 14: Material Assets (Transportation) of this EIAR.

In terms of the additional traffic on local roads that will be generated as a result of this development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to this development will not result in a significant noise impact. The resultant noise impact is neutral, imperceptible and long-term.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads surrounding the Proposed Development site with and without development using the Annual Average Daily Traffic (AADT) data. Note that the traffic data used to inform the calculations include future traffic flows for Site E and F, hence, this is a cumulative assessment.

The impact from the increase in traffic from the Proposed Development has been assessed for the design year of 2044 where the highest change was noted relative to the Do Nothing scenario along the sections of road detailed in Table 12-18.

Road Link	Traffic AADT Increase %	Noise level (dB L_{A10}) Increase between Do Nothing and Do Something based on AADT Traffic Data, Year 2044
Station Road	3.9%	+ 0.17
Coast Road	0.8%	+ 0.04
Moyne Road	4.1%	+ 0.18
Drumnigh Road	1.1%	+ 0.05

Table 12-18 Predicted Change in Noise Level associated with Vehicular Traffic

The predicted increase in traffic flows associated with the development in the design year of 2044 will result in an increase in noise levels of less than 1dB along all roads receiving traffic from the Proposed Development, which will have a negligible effect. The effect is therefore *neutral, imperceptible and long-term.* It's noted that the traffic figures consider a cumulative scenario, changes of noise levels with the development alone will be lower than those calculated.

12.6.3.2 Building Services Plant

Once operational, there will be building services plant items required to serve the residential aspect of the Proposed Development. These will typically be limited to heating and cooling plant, pumps and extraction units, depending on the building design and user requirements. In this instance, only heating systems will be installed and will run during both day, evening and night time periods.

For this development, heating will be provided exclusively by Air Source Heat Pumps (ASHPs). Logic Air units rated at 5kW and 8kW have been selected for this purpose. According to the manufacturer's datasheet, these units have sound power levels of 52 dBA and 55 dBA respectively.

Based on the baseline noise data the following criteria is proposed for plant noise:

- Dwellings within the development itself: 45 dB $L_{Aeq,15min}$
- Existing dwellings external to the development: 33 dB $L_{Aeq,15min}$

These criteria have been set taking account of guidance from BS4142 and BS8233. For dwellings internal to the development where a change in noise level will not occur, the criteria has been set to achieve the internal guidance night time noise levels in BS8233 so that the guidance levels will be met when occupants have their windows open. For existing dwellings located off site the criteria have

been set so that plant noise will not be greater than background noise levels as per BS4142 guidance which indicates this will be a neutral impact.

Noise prediction calculations for the operation of the heat pumps and impact at several distances have been undertaken in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation (2024)*. Assuming that the minimum distance from any heat pump to the nearest window is 5 meters, the predicted noise level for any given noise sensitive receiver will be 33 dB or lower and therefore will be below the criteria set out above.

The resultant effects are considered *negative, not significant and long-term*.

12.6.4 Operational Stage – Inward Impact (ProPG Assesssment)

12.6.4.1 ProPG Initial Risk Assessment

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 12.5 presents the basis of the initial noise risk assessment and 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 measurements undertaken on site in combination with the Dublin Airport noise contours produced as part of the Fingal Development Plan.

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 there are no buildings to be demolished, and the site topography is not expected to change significantly during construction.

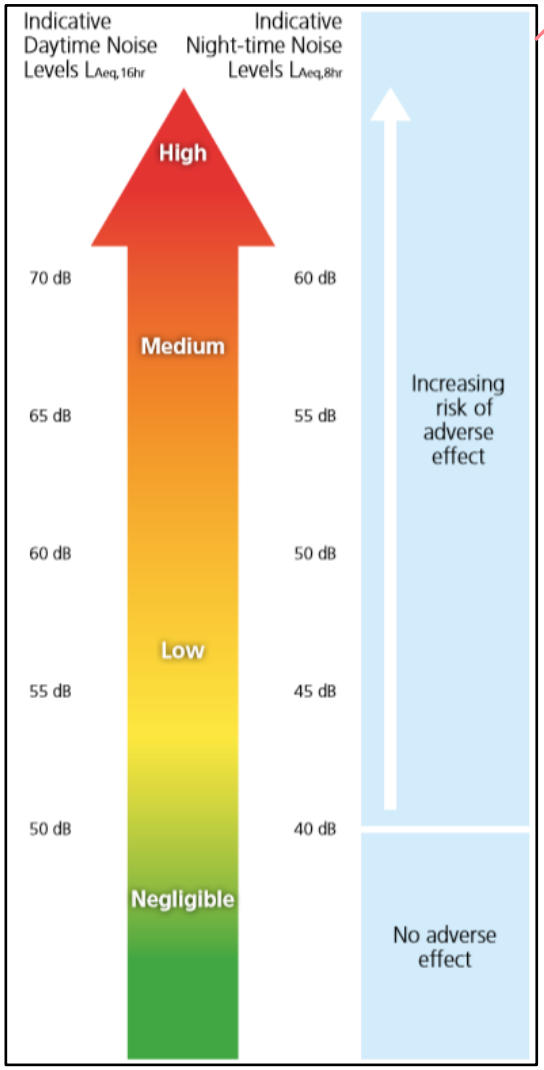

Figure 12.5 ProPG Stage 1 – Initial Noise Risk Assessment.

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 Low to Medium Noise Risk. ProPG states the following with respect to various levels of risk: -

Negligible Risk *These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.*

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 and based on the average measured values measured on site 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. Appropriate mitigation measures are set out in section 12.6 of this chapter.

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 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.

12.6.4.2 ProPG Acoustic Design Statement

Element 1 – Good Acoustic Design Process

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.

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 (e.g. noise from aircraft) and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

Planning, Layout and Orientation

The site lies completely within the Noise Zone B for Dublin Airport and as such it is not possible to reduce the aircraft noise through layout design. The assessment in this chapter is appropriate for sites of this nature in Noise Zone B.

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 where required. For units where it will not be possible to achieve the desirable internal acoustic environments with windows open, 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 that have been implemented on site, e.g. using suitable glazing and vents to be cost neutral and do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

The site lies within Dublin Airport Noise Zone B. Due to the height at which aircraft noise would be incident to the dwellings and external amenity areas, an acoustic barrier or similar would be ineffective and is not proposed anywhere on the site.

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

External noise levels across the site during the daytime, with the North Runway in operation, are expected fall in the region of 62 dB $L_{Aeq,16hr}$.

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.

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.

Element 2 – Internal Noise Guidelines

Internal Noise Criteria

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 12-19 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur, such as New Year's Eve.

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.

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	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$*

Table 12-19 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.

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.

Considering the design goals outlined in Table 12-19 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 12-20.

Level Desired	Day	Night

	07:00 to 23:00hrs	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 12-20 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 good internal noise levels with windows open for properties located within Zone B 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.

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.
- Characteristics of the receiving room.

The principles outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G 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 12-21.

Octave Band Centre Frequency (Hz)						R_w
125	250	500	1k	2k	4k	
26	28	38	46	44	56	40

Table 12-21 Sound Insulation Performance Requirements for Glazing, SRI (dB)

The acoustic specification listed in Table 12-21 can be achieved using a double-glazed unit with slightly thicker than standard glass. This performance could also be achieved using a suitably specified triple glazing window.

It is important to note that the acoustic performance specifications detailed herein are 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 Rw for this construction.

Ventilation

Acoustic ventilation systems will be required. Calculations indicate that the following ventilation specification will achieve the internal noise guidelines.

Table 12-22 presents the acoustic specification for the vents:

Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
125	**250**	**500**	**1k**	**2k**	**4k**	
31	33	42	43	39	44	42

Table 12-22 Sound Insulation Performance Requirements for Ventilation, SRI

Roof

There is the potential for the roof structure to allow the passage of sound into the rooms. In order to control potential sound transmission via this route the ceiling / roof construction will need to provide a sound reduction in excess of that required for the windows. A suitable sound reduction performance would be provided by a standard tiled or slated roof with a single 12.5mm layer plasterboard ceiling and heat insulation layer above the ceiling.

Any penetrations through the ceiling constructions must be as small as possible and made good by fully filling with plaster or with an acoustic sealant.

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.

The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. There are a number of combinations of glazing and ventilation systems that may also meet the internal noise requirements. Consequently, these may be subject to change as the project progresses.

Element 3 – External Amenity Area Noise Assessment

As previously discussed, external amenity areas are not expected to achieve the recommended 55dB $L_{Aeq,16hr}$ 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. ProPG states *"These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited",* given the area is zoned for residential development it is considered that the external amenity noise levels are sufficient.

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.

Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally, objective DA011 of the Fingal Development Plan 2023 – 2029 is relevant to the Proposed Development. The objective states the following:

> *"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 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.

Magnitude and Extent of Compliance with ProPG

As discussed within this chapter 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 while the noise levels externally will not comply with the recommended criterion set out in ProPG. It should be noted that given the dominant source of noise is overhead aircraft it is not possible to mitigate external amenity areas. However, as the development is considered desirable – the land is zoned for residential development – then the criteria can be relaxed to a value of the order of the current daytime noise levels; and

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.

Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project due to the acoustic mitigation specified.

Acoustic Design v Wider Planning Objectives

With reference to the Fingal Development Plan 2013 – 2029, the Proposed Development site is within Zone B. This assessment has demonstrated the noise insulation measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

12.6.5 Do-Nothing Impact

In the absence of the Proposed Development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged resulting in a neutral impact in the long-term.

12.6.6 Cumulative

12.6.6.1 Construction Stage

If construction of the Proposed Development were to concur with that of other phases, there is potential for cumulative construction noise impacts. As noted in Section 12.6.1, significant construction noise levels are only expected when works are being carried out at short distances from a given noise-sensitive location. However, due to the site layout it is not likely that there will be simultaneous construction activity from other Proposed Developments at such distances from noise-sensitive locations.

12.6.6.2 Operational Stage

In respect of cumulative impact, assessment of the impact of additional vehicular traffic on surrounding roads presented in above takes into account both traffic flows due to the Proposed Development and flows generated by other phases of the Portmarnock Framework Plan, namely the 'entire development' as it is described in Chapter 14: Material Assets Traffic and Transport.

12.7 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

In order to ameliorate the likely significant noise impacts, a schedule of noise control measures has been formulated for both construction and operational phases.

12.7.1 Proposed Development

12.7.1.1 Construction Stage

With regard to construction activities, best practice operational and 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.

BS5228 includes guidance on several aspects of construction site practices, including, but not limited to: -

- Selection of quiet plant.
- Control of noise sources.
- Screening (boundary, and or localised plant screening).
- Hours of work.
- Liaison with the public.
- Monitoring.

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 monitoring.

Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should 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.

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

BS5228 makes a number of recommendations in relation to "*use and siting of equipment*". These are all directly relevant and hence are reproduced below. These recommendations will be adopted on site.

> *"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.*
>
> *Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.*
>
> *Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.*
>
> *Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.**
>
> *Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."*

Other forms of noise control at source relevant to the development works are set out below: -

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.

- 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/ breakers and will be moved around site as necessary.
- All items of plant should 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.

Screening

Typically 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 effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

Screening may be a useful form of noise control when works are taking place at basement and ground level to screen noise levels at ground floor adjacent buildings.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as aggregate can provide a degree of noise screening if placed between the source and the receiver. The use of localised mobile (mobile hoarding screens and / or acoustic quilts) to items of plant with the potential to generate high levels of noise are an effective noise control measure. These options should be considered when percussive works are taking place in close proximity to the nearest sensitive perimeter buildings.

Liaison with the Public

A designated noise liaison should be appointed to site during construction works. All noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, prior to particularly noisy construction activity, e.g. demolition, breaking, piling, etc., the liaison officer should inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Hours of Work

Construction works will be undertaken within the times below, taken from the Section 6 of the Draft Construction Management Plan: -

- Monday to Friday 07:00 to 19:00hrs
- Saturday 07:00 to 14:00hrs
- Sunday and Public Holidays No noisy work on site.

12.7.1.2 Operational Stage

Building Services Plant

Predicted plant noise emissions as outlined in section 12.4.4 show that criteria set out in Section 12.20 are not exceeded and therefore no specific mitigation measures are required.

Additional Traffic on Surrounding Roads

During the operational phase of the Proposed Development, noise mitigation measures with respect to the (outward) impact of traffic from the development are not deemed necessary as there is no significant impact calculated.

Inward Impact

At detailed design stage, glazing and vent specifications fulfilling the requirements in Section 12.23 will ensure suitable internal noise levels. The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses.

12.7.2 Cumulative

12.7.2.1 Construction Stage

As per Section 12.7.1.1.

12.7.2.2 Operational Stage

As per Section 12.7.1.2.

12.8 RESIDUAL IMPACT OF THE PROPOSED DEVELOPMENT

This section summarises the likely noise impact associated with the Proposed Development, taking into account the mitigation measures.

12.8.1 Proposed Development

12.8.1.1 Construction Stage

During the Construction Phase of the project there will be a short-term noise impact on nearby noise sensitive properties from site activities and the close proximity of adjacent buildings. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration are kept to minimised. At location N1 a negative, slight to significant and temporary effect is likely depending, with the most significant effects occurring when works take place at the closest boundary to the receptor.

All other identified noise sensitive locations at greater distances from the Proposed Development will experience a negative, slight and short-term effect.

12.8.1.2 Operational Stage

Additional Traffic on Surrounding Roads

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, the overall effect from noise contribution of increased traffic is considered to be of neutral, imperceptible and long-term effect to nearby noise sensitive locations.

Building Services Plant

With the installation of Logic Air heat pumps (or an equivalent heat pump) for building services noise as described in Section 12.4.4 the range of potential noise levels is not expected to add significantly to the existing noise environment. The resultant noise effect from this source once plant is considered will be of negative, not significant, long-term impact.

12.8.1.3 Worst Case Impact

Impact on nearby noise sensitive properties from site activities and the close proximity of adjacent buildings if all items of plant assessed will be in operational simultaneously. However, this is unlikely to occur in practicality and would only be momentary to brief in occurrence.

12.8.2 Cumulative

Given that a cumulative assessment of operations has been considered, impact remain the same as those identified above.

12.8.2.1 Construction Stage

As per Section 12.8.1.1

12.8.2.2 Operational Stage

As per Section 12.8.1.2

12.8.2.3 Worst Case Impact

As per Section 12.8.1.3

12.9 MONITORING

12.9.1 Proposed Development

12.9.1.1 Construction Stage

During the construction phase consideration may be given to noise and vibration monitoring at the nearest sensitive locations, where high level of noise and or vibration are expected.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: "Acoustics – Description, Measurement and Assessment of Environmental Noise" and be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

Vibration monitoring should be conducted in accordance with BS 7385-1 (1990) *Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* or BS 6841 (1987) *Guide to Measurement and Evaluation of Human Exposure to Whole-Body Mechanical Vibration and Repeated Shock*. With regard to construction activities, best practice operational and 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.

12.9.1.2 Operational Stage

No monitoring is required.

12.10 REINSTATEMENT

Not Applicable.

12.11 DIFFICULTIES ENCOUNTERED

There were no difficulties encountered in the preparation of this EIAR chapter.