11.0 NOISE AND VIBRATION

11.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) describes the assessment undertaken of the potential noise and vibration impact from the proposed Profile Park substation and grid connection project on local residential amenity and commercial properties. Electrical power will be exported from the power plant's main transformers through the proposed Baldonnell 110kV substation to the existing Barnakyle 110kV substation, which is operated by EirGrid and owned by ESB. The associated grid connection works will consist of underground cabling. A full description of the proposed project is provided in Chapter 3 – *Description of the Proposed Development.*

Some 16 no. noise assessment locations (see Table 11.9) have been identified that are representative of the nearest residential, commercial and amenity locations. The nearest occupied residential noise sensitive locations (NSL) are located some 400 m to the south of the site (i.e., R001) and some 450 m to the north east (i.e. R014). The closest amenity to the development is Grangecaslte Golf Course (i.e., R015) which is located to the east of the development lands.

Noise and vibration impact assessments for the nearest NSLs have been prepared for the construction and operational phase of the proposed development. To inform this assessment baseline noise levels have been measured in the vicinity of a number of NSLs surrounding the proposed development. Noise predictions to the nearest NSLs have been prepared for both the construction and operational phases.

Other developments in the area (operational or permitted) with the potential for cumulative impacts were identified and included in this assessment. Further details on all the developments considered for cumulative impacts are provided in Chapter 6 of this EIAR (Planning Policy).

For a glossary of terms used in this chapter please refer to Appendix 11-1.

11.1.1 Statement of Authority

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd:

Damian Kelly (Technical Director) holds a B.Sc. from DCU and a M.Sc. from QUB. He has some 25 years' experience as an acoustic consultant and is a Member of the Institute of Acoustics. He has extensive knowledge in the field of noise modelling and prediction, having developed many of the largest and most complex examples of proprietary noise models prepared in Ireland to date. He has extensive modelling experience in relation to wind farm, industrial and road infrastructure projects. He is a sitting member of the committee of the Irish Branch of the Institute of Acoustics.

11.1.2 Fundamentals of Acoustics

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. To take account of the enormous range of pressure levels that can be detected by the ear, it is widely accepted that sound levels are measured and expressed using a decibel scale i.e., a

logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels (SPL) is from 0 dB (for the threshold of hearing) to 120 dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10 dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. The 'A-weighting' system defined in the international standard, BS ISO 226:2003 *Acoustics. Normal Equal-loudness Level Contours* has been found to provide the best correlations with human response to perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 11-1.

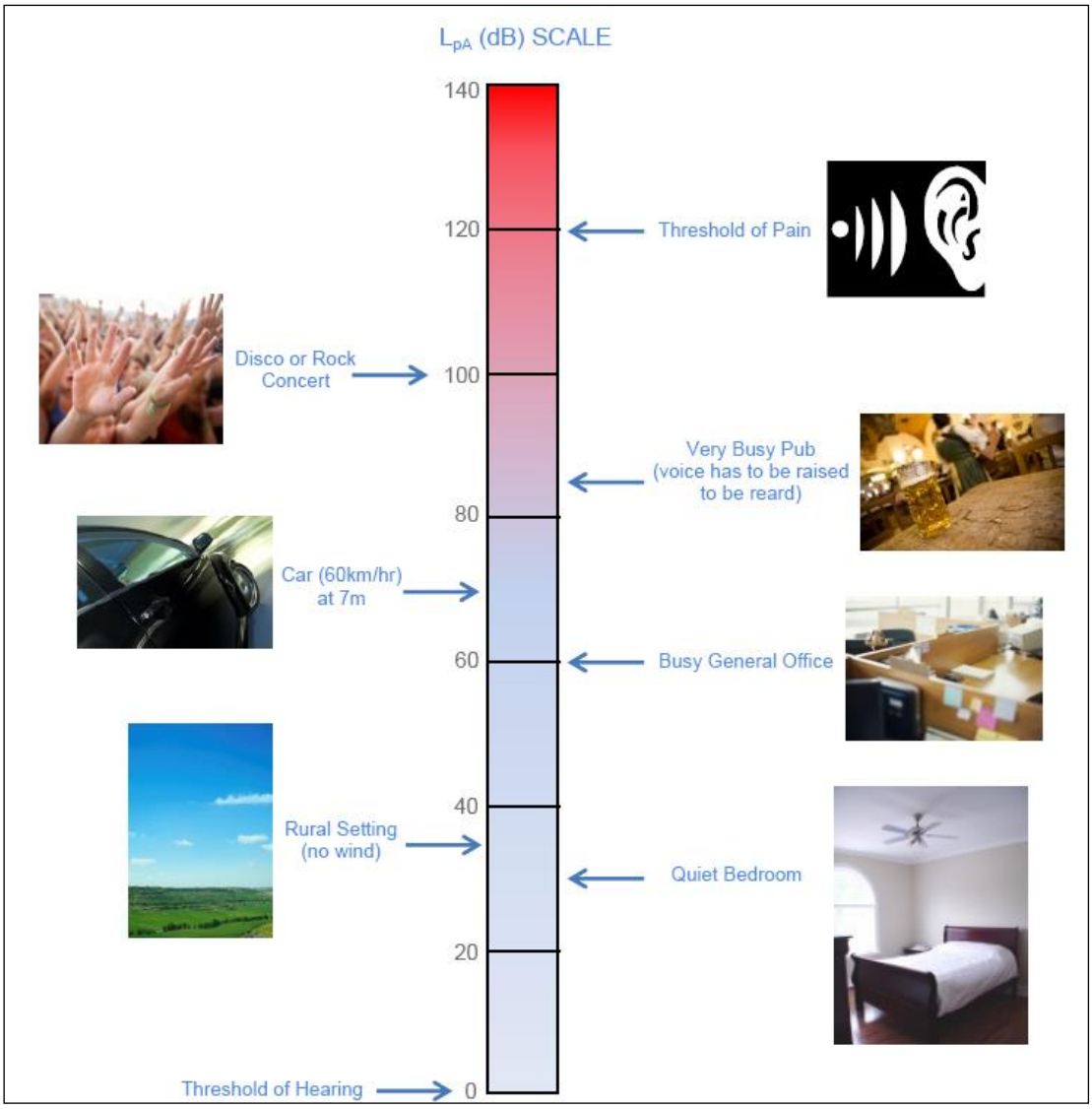

Figure 11-1: dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016))

11.2 METHODOLOGY

The assessment of impacts for the proposed development have been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in Section 11.2.3. In addition to these specific guidance documents, the following guidelines were considered and consulted for the purposes of this chapter:

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

The assessment methodology undertaken for this assessment is summarised as follows:

- Review of the most applicable standards and guidelines to set acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- Characterise the receiving environment through baseline noise surveys at various NSLs surrounding the proposed development;
- Undertake predictive calculations to assess the potential impacts associated with the construction phase of the proposed development at NSLs;
- Undertake predictive calculations to assess the potential impacts associated with the operational phase of the proposed development at NSLs;
- Specify mitigation measures to reduce, where necessary, the identified potential outward impacts relating to noise and vibration from the proposed development; and,
- Describe the significance of the residual noise and vibration effects associated with the proposed development.

11.2.1 Guidance Documents and Assessment Criteria

The following sections review best practice guidance that is commonly adopted in relation to developments such as the one under consideration here.

11.2.1.1 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 normally control construction activities by imposing limits on the hours of operation and may 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 depicted in Table 11-1.

Table 11-1: Example Threshold Potential Significant Effect at Dwellings

Assessment category and threshold value period (T)	Threshold value, in $L_{Aeq,T}$ 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 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75

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.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate period (e.g., daytime) the ambient noise level is determined and rounded to the nearest 5 dB. Based on review of baseline noise monitoring to hand the relevant BS5228-1 threshold values at the various assessment locations are discussed in the relevant section of this report.

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, and;
- to compare the predicted construction noise level with the existing noise levels and the threshold value according to the criteria in the Table 11.2 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 11-1 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 11.2:

Table 11-2: Description of the magnitude of impacts. Adapted from DMRB Table 3.16

Predicted Construction Noise Level is	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

Taking the above into account, it is considered that the 70 dB $L_{Aeq,1hr}$ is a suitable criterion for daytime construction noise at residential and amenity noise-sensitive locations and 75 dB $L_{Aeq,1hr}$ at commercial locations.

11.2.1.2 Construction Phase Vibration

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. With respect to this development, the range of relevant criteria used for building protection is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

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

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 a 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 particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

The Transport Infrastructure Ireland (TII) publication *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII, 2014)* also contains information on the permissible construction vibration levels during the construction phase as shown in Table 11-3.

Table 11-3: Allowable Vibration at Sensitive Properties (TII, 2014)

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 10 Hz	10 to 50 Hz	50 to 100 Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Following review of the guidance documents set out above, the values in Table 11-3 are considered appropriate for this assessment as they provide more stringent vibration criteria.

11.2.1.3 Additional Vehicular Activity on Public 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.

For the assessment of potential noise impacts from construction related traffic along public roads and haul routes it is proposed to adopt guidance from *Design Manual for Roads and Bridges* (DMRB), Highways England, Transport Scotland, The Welsh Government and The Department of Infrastructure 2020.

Table 11-4, taken from Section 13.17 of DMRB presents guidance as to the likely impact associated with any change in the background noise level ($L_{Aeq,T}$) at a noise sensitive receiver as a result of construction traffic.

Section 3.19 of 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;
- A total number of days exceeding 40 in any 6 consecutive months.

Table 11-4: Likely Impacts Associated with Change in Traffic Noise Level (Source: Table 3.17, DMRB, 2020).

Change in Sound Level (dB L_{A10})	Magnitude of Impact
<1.0	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5+	Major

The guidance outlined in Table 11-4 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely short-term impacts during the construction phase.

11.2.1.4 Operational Phase Noise

The relevant local authority, South Dublin County Council (SDCC), does not have any standard noise conditions listed in the *Dublin Agglomeration Environmental Noise Action Plan December 2018 – November 2023 – Volume 4: South Dublin County Council*. Therefore, consideration has been given to the following best practice and national guidance and a review of planning conditions recently applied to similar developments in the area.

11.2.1.4.1 EPA – NG4

In order to establish whether the noise sensitive locations in the vicinity of the site would be considered 'low background noise' areas as defined in the Environmental Protection Agency (EPA) publication Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 2016) guidance, the noise levels measured during the environmental noise survey need to satisfy the following criteria:

- Arithmetic Average of L_{A90} During Daytime Period ≤40 dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Evening Period ≤35 dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Night-time Period ≤30 dB L_{A90}.

Determining Appropriate Noise Criteria

Table 11-5 outlines the noise emission limit criteria detailed in the NG4 document.

Table 11-5: NG4 Approach for Determining Appropriate Noise Criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00hrs)	Night Noise Criterion, dB $L_{Aeq,T}$ (23:00 to 07:00hrs)
Areas of Low Background Noise	45 dB	40 dB	35 dB
All Other Areas	55 dB	50 dB	45 dB

Based on a review of the noise data to hand in the vicinity of the development site, the noise sensitive locations in the vicinity of the site are not defined as areas of low background noise as per the NG4 guidance, As the proposed development will operate on a 24-hour basis, the potential impact during night-time periods governs this assessment. Therefore, a night-time criterion 45 dB $L_{Aeq,T}$ would be applied to normal operations of the site.

Note that if the proposed development were designed to this level, plant noise would be a clearly audible source of noise at number of noise sensitive locations in close proximity of the development. It would be expected that such levels would give rise to complaints at nearby noise sensitive locations.

Note the following statements from NG4:

> *"Where there may be a question as to the bona fides of the complaint or any residual dispute following an initial investigation, an objective assessment should be undertaken in accordance with the guidance set out in BS 4142: 2014: Methods for rating and assessing industrial and commercial sound.*
>
> *In situations where there are reasonable grounds for annoyance and/or licence limits are exceeded, prompt remedial action should be taken by the licensee and BAT should be used to resolve the problem and to minimise the noise impact."*

Therefore, while a site may be compliant with the EPA limits the above would infer that a BS 4142 assessment may still confirm the validity of a complaint. Therefore, consideration should also be given to this guidance.

11.2.1.4.2 BS 4142:2014

BS 4142:2014+A1:2019: *Methods for rating and assessing industrial and commercial sound* is the industry standard method for analysing building services plant sound emissions to residential receptors. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. It should also be noted that the EPA NG4 document indicates that this assessment methodology should be used in the assessment of complaints associated with a site's operations. Whilst the current site will be licenced, based on the NG4 extracts referenced above in relation to complaints, the guidance contained in BS 4142 needs to be given due regard.

For an appropriate BS 4142 assessment it is necessary to compare the measured external background sound level (i.e., the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T}$) of the various plant items, when operational. Where sound emissions are found to be tonal, impulsive, intermittent or to have other sound characteristics that are readily distinctive against the residual acoustic environment, BS 4142 advises that penalties be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal sound characteristics outlined in BS 4142 recommends the application of a 2dB penalty for a tone which is just perceptible at the receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible. In relation to intermittency, BS 4142 recommends that If the intermittency is readily readily distinguishable against the residual acoustic environment, a penalty of 3 dB can be applied. The following definitions as discussed in BS 4142 as summarised below:

"ambient sound level, $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at any given time, usually from many sources near and far, at the assessment location over a given time interval, T.
"residual sound level, $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level of the residual sound (i.e., ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound) at the assessment location over a given time interval, T.
"specific sound level, $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr.
"rating level, $L_{Ar,T}$"	specific sound level plus any adjustment for the characteristic features of the sound.
"background sound level, $L_{A90,T}$"	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

In order to establish an initial estimate of impact, BS 4142 states the following:

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following.

a. *Typically, the greater this difference, the greater the magnitude of the impact.*

b. *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*

c. *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*

d. *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The assessment methodology described above (i.e., comparison of rated sound level to background sound level) is quoted in BS 4142 as representing a methodology to '*obtain an initial estimate*' of impact. It is important to note that BS 4142 also comments that '*Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration*'. BS 4142 provides a list of potential pertinent factors that can influence the '*initial estimate*'. The plant noise assessment conducted in the following sections has been carried out with consideration of the guidance contained in BS 4142 as summarised above.

Based on the noise monitoring summarised in Section 11.3, and considering the guidance contained in BS 4142 it would be considered that a suitable noise criterion for a development of this nature at residential locations would be the order of 37 to 39 dB(A). This would also need to consider any rating corrections that would be appropriate in relation to BS 4142.

11.2.1.4.3 Commercial Properties

A number of commercial / industrial properties are located in the vicinity of the site. In terms of noise missions from the site it is considered that an appropriate noise criterion at these locations is 55 dB $L_{Aeq,15min}$.

11.2.1.4.4 Golf Couse Boundary

The adjacent golf course would be considered noise-sensitive and it is recommended that noise limits associated with the operations of the Proposed Development would not exceed 55 dB $L_{Aeq,15min}$ along the common boundary between the two sites in order to protect the recreational amenity of the facility.

11.2.1.5 Assessment of Significance

The '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014) have been referenced in order to categorise the potential effect of changes in the ambient noise levels during the operational phases of the proposed development.

The guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which effect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration and level etc.) assigning a subjective response must take account of these factors.

The scale adopted in this assessment is shown in Table 11.6 below and is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2022) is also presented.

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

It is considered that the criteria specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of operational noise.

Table 11-6: Operational Noise Impact Scale

Noise Level Change dB(A)	Subjective Response	Impact Guidelines for Noise Impact Assessment Significance (Institute of Acoustics)	Impact Guidelines on the Information to be contained in EIA Report's (EPA)
0	No change	None	Imperceptible
0.1 – 2.9	Barely perceptible	Minor	Not Significant
3.0 – 4.9	Noticeable	Moderate	Slight, Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial	Significant
10.0 or more	More than a doubling or halving of loudness	Major	Very Significant, Profound

11.2.1.6 Recommended Criteria

Following review of relevant guidance, the following noise criteria are proposed for the development:

Day to Day Operation (Residential) – 37 to 39 dB $L_{Aeq,15min}$

Day to Day Operation (Commercial) – 55 dB $L_{Aeq,15min}$

Day to Day Operation (Grange castle Golf Couse Boundary) – 55 dB $L_{Aeq,15min}$

Note plant noise emissions are to be designed such that they are not tonal and do not have impulsive characteristics at the nearest noise sensitive locations.

11.2.1.7 Operational Phase Vibration

It should be noted that the day-to-day operation of the Proposed Development will not give rise to any significant levels of vibration off site and therefore the associated impact is not significant.

11.2.1.8 Decommissioning Phase

In relation to the decommissioning phase, the criteria and limits outlined in the Construction Phase of the Proposed Project would be applicable as similar tools and equipment will be used.

11.2.2 EPA Description of Effects

The significance of effects of the proposed development shall be described in accordance with the EPA guidance document Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022. Details of the methodology for describing the significance of the effects are provided in Chapter 1 (Introduction).

The effects associated with the proposed development are described in the relevant sections of this chapter with respect to the EPA guidance and description of effects as set out in Chapter 1 (Introduction).

11.2.3 Assessment Methodology

The following guidance documents have been referenced to inform the assessment methodology; further details are presented where relevant in the various sections of this chapter.

11.2.3.1 Background Noise Survey

Baseline noise monitoring has been completed at a number of representative locations in the vicinity of the development and is reviewed here to inform a preliminary discussion of the existing noise environment.

11.2.3.1.1 Choice of Measurement Locations

Figure 11-2: Noise Monitoring Locations illustrates the approximate location of the noise monitoring locations being considered here.

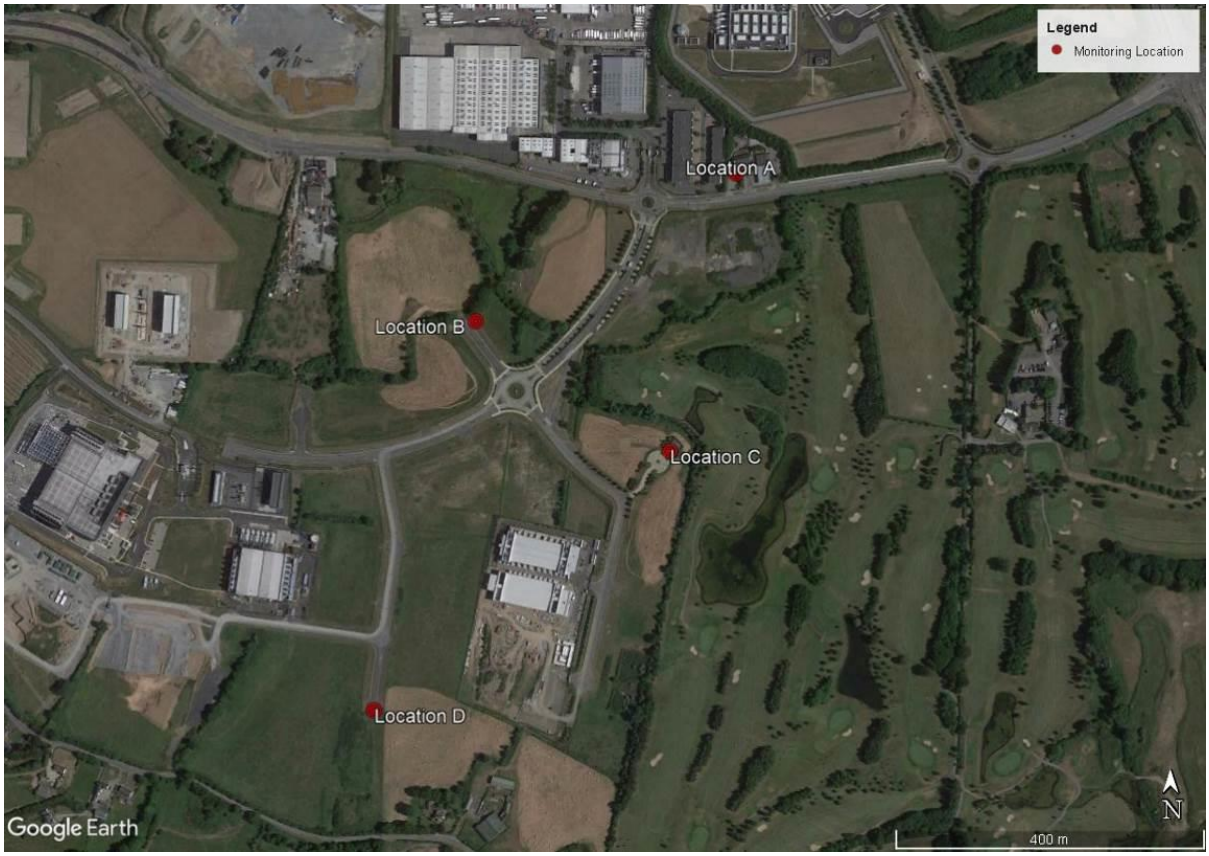

Figure 11-2: Noise Monitoring Locations

Location A Located to the north of the site in the vicinity of a number of dormer bungalows (R14) that are considered to be the closed noise sensitive residences to the north.

Location B Located to the north west of the site in the vicinity of R09.

Location C Located to the east of the site in the vicinity of the boundary with the Grangecastle golf course. This location would be considered to be representative of noise levels that would be experienced on the golf course itself.

Location D Located to the south of the site. The location would be considered to be representative of noise levels at Location R01 and background noise levels at properties along the Baldonnel Road (i.e. R02 to R05).

11.2.3.1.2 Measurement Periods

Noise measurements were conducted during typical day, evening and night-time periods. The night survey represents the time of night that provides a measure of existing background noise levels during a period where people are attempting to go to sleep or are sleeping. Due to the fact that the units in question here will operate on a 24-hour basis their potential impact during night-time periods is the critical issue. The survey was conducted during the following periods:

Surveys were completed during the following periods:

- Daytime 10:30 hrs to 14:25 hrs on 2 March 2021;
- Evening 21:34 hrs to 22:47 hrs on 2 March 2021, and;
- Night 22:53 hrs on 2 March 2021 to 01:21 hrs on 3 March 2021.

Weather conditions were dry and calm during all periods with temperatures of the order of 10°C during the daytime period, 5°C during the evening and 3°C during the night.

11.2.3.1.3 Instrumentation

A Brüel & Kjær Type 2250 Sound Level Meter (S/N 2818091) was used for all survey periods. Before, after and during each survey period, the measurement instrument was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

11.2.3.1.4 Measurement Procedure

Measurements were conducted at the locations noted above. Sample periods for the noise measurements were typically 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis if required. Survey personnel noted the primary noise sources contributing to noise build-up.

11.2.3.2 Construction Noise Calculations

A variety of items of plant will be in use for the purposes of site preparation, construction and site works. There will be vehicular movements to and from the site that will make use of existing roads. There is the potential for generation of significant levels of noise from these activities.

Due to the nature of construction activities it is difficult to calculate the actual magnitude of emissions to the local environment in the absence of a detailed construction programme. The standard best practice approach is to predict typical noise levels at the nearest sensitive receptor using guidance set out in BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*. Construction noise predictions have been carried out using guidance set out in British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.

The methodology adopted for the assessment of construction noise is to analyse the various elements of the construction phase in isolation. For each element, the typical construction noise sources are assessed along with typical sound pressure levels and spectra from BS 5228 at various distances from these works.

11.2.3.3 Operational Noise Calculations

There will be no noise emissions from the operation of the proposed underground grid connection during the day to day operation of the Proposed Development. Consequently, there is no requirement to assess any noise emissions associated with this aspect of the Proposed Development.

In terms of the proposed substation element of the Proposed Development a computer-based prediction model has been prepared to quantify the potential noise level associated with the operational phase of this aspect of the Proposed Development on the receiving environment.

This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

11.2.3.4 DGMR iNoise V2020 Enterprise

The selected software, DGMR *iNoise Enterprise*, calculates noise levels in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation*, (ISO, 1996).

iNoise is a proprietary noise calculation package for computing noise levels and propagation of noise sources. iNoise calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated considering a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_WA);
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400 m).

11.2.3.5 Input Data and Assumptions

Buildings and information available for the site has been inputted into iNoise noise modelling software that implements *ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors: General method of calculation*. The proposal in question considers the construction of a 6 no. gas turbine hall on the site as detailed in Chapter 2 of this EIAR (Description of the proposed development).

11.2.3.6 Noise Source Data

The noise modelling completed indicates the following limits in relation to various items of plant associated with the overall site development. Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant/building in order that the plant noise emission levels are achieved on site and relevant criteria are not exceeded at noise sensitive locations.

Table 11-7presents the noise data assumed for the significant noise sources associated with the Proposed Development. Data has been supplied by Tobin Engineering unless otherwise stated.

Table 11-7: Summary of Noise Data for EIAR Noise Model

Item	Octave Band Sound Power Level dB L_w								dB	dB (A)
	63	125	250	500	1000	2000	4000	8000		
Transformer	79	81	82	81	77	71	79	68	88	84

The following extract from the "*EirGrid Evidence Based Environmental Studies Study 8: Noise – Literature review and evidence based field study on the noise effects of high voltage transmission development*" (May 2016) states the following in relation to noise impacts associated with 110KvA transformer installations:

> *"The survey on the 110kV substation at Dunfirth indicated that measured noise levels (LAeq) were less than 40dB(A) at 5m from each of the boundaries of the substation. This is below the WHO night-time free-field threshold limit of 42dB for preventing effects on sleep and well below the WHO daytime threshold limits for serious and moderate annoyance in outdoor living areas (i.e. 55dB and 50dB respectively). Spectral analysis of the data recorded at this site demonstrated that there were no distinct tonal elements to the recorded noise level. To avoid any noise impacts from 110kV substations at sensitive receptors, it is recommended that a minimum distance of 5m is maintained between 110kV substations and the land boundary of any noise sensitive property."*

Assuming the proposed substation installation has comparable noise emissions to the 110kV unit discussed above and considering the distance between the 110kV substation and the nearest off site locations (i.e. >220m) noise from this installation is not predicted to be an issue off site. The modelling presented here has been calibrated such that predicted levels are no greater than 45 dB(A) at 5m from each of the boundaries of the substation transformer.

11.2.3.6.1 Modelling Calculation Parameters

Prediction calculations for turbine noise have been conducted in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation*, 1996.

In terms of calculation a ground attenuation factor (general method) of 0.8 and no metrological correction were assumed for all calculations. The atmospheric attenuation outlined in Table 11-8 were used for all calculations.

Table 11-8: Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (°C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.93	3.66	9.66	32.77	116.88

Additional information relating to the noise model inputs and calculation settings is provided in Appendix 11-2.

11.2.3.7 Additional Information

The following noise sensitive locations have been considered as part of this assessment.

Figure 11-3: Noise Assessment Locations

Table 11-9: Assessment Locations

NSL Ref.	Description
R01	Two-storey residence to the south of the site on the north side of the Baldonnel Road. This location would be representative of residential accommodation associated with Baldonnel aerodrome on the opposite side of the road.
R02	A number of private residences located to the south west of the site along the southern side of the Baldonnel Road.
R03	
R04	
R05	
R06	Commercial property to the north east of the site.
R07	
R08	Derelict residence located to the north east of the site off the Nangor Road. It is assumed that this property will be demolished in due course and is not considered a noise sensitive residence in terms of this review.
R09	Residence located to the north east of the site. It is assumed that this property will be demolished in due course and is not considered a noise sensitive residence in terms of this review.
R10	Commercial buildings including office space located to the north on the opposite side of the Nagor Road.
R11	
R12	
R13	
R14	A row of dormer bungalows located to the north on the opposite side of the Nangor road beside a service station.
R15	Location representative of the Grangecastle Golf Course.
R16	Façade on nearest commercial building to the south of the proposed development.

11.3 EXISTING ENVIRONMENT

This section documents the typical background noise levels measured in the vicinity of the noise sensitive locations in closest proximity to the proposed development site. Table 11-10 presents the measured noise levels at Locations A, B, C and D.

Table 11-10: Noise Monitoring Results

Location	Period	Time	Sound Pressure Level (dB)	
			$L_{Aeq,15min}$	$L_{AF90,15min}$
A	Day	10:31 – 10:46	64	55
		11:52 – 12:07	63	50
		13:06 – 13:21	63	51
		Average	63	52
	Evening	21:34 – 21:49	58	42
	Night	22:55 – 23:10	59	41
		00:12 – 00:27	52	37
		Average	57	39
B	Day	10:53 – 11:08	54	52
		12:10 – 12:25	52	48
		13:49 – 14:04	51	47
		Average	52	49
	Evening	21:56 – 22:09	45	42
	Night	23:15 – 23:30	44	41
		00:31 – 00:46	42	40
		Average	43	40
C	Day	11:14 – 11:29	49	46
		12:29 – 12:44	48	45
		13:31 – 13:46	51	45
		Average	50	45
	Evening	22:14 – 22:29	42	40
	Night	23:32 – 23:47	42	39
		00:48 – 01:03	40	37
		Average	41	38
D	Day	11:32 – 11:47	46	45
		12:47 – 13:03	45	43
		14:07 – 14:23	45	42
		Average	45	43
	Evening	22:32 – 22:47	40	38
	Night	23:50 – 00:05	40	37
		01:06 – 01:21	40	37
		Average	40	37

Note 1 Average L_{Aeq} are logarithmic averages, Average L_{A90} values are arithmetic averages.

11.4 POTENTIAL EFFECTS

11.4.1 Do Nothing Effects

If the development is not progressed the existing noise environment will remain largely unchanged. Traffic noise is currently a significant noise source in the vicinity of road networks in the area. In the absence of the proposed development increases in traffic volumes on the local road network would be expected over time and would likely result in slight increases in the overall ambient and background noise levels in the area.

11.4.2 Potential Effects – Construction Phase

Construction noise prediction calculations have been conducted using the methodology outlined in Section 11.2.3.2. The noise levels referred to in this section are indicative only and are intended to demonstrate that it will be possible for the contractor to comply with current best practice guidance. The predicted "worst case" levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will be lower than these levels for most of the time at most properties in the vicinity of the proposed development.

11.4.2.1 General Construction

11.4.2.1.1 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.

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 of this nature, 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. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to site works however, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings as a result of vibration.

Due to the fact that 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 guidance set out in BS 5228-1. Table 11.11 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 report.

Table 11-11: Typical Construction Noise Emission Levels

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance (dB $L_{Aeq,1hr}$)
1 – Site Preparation	Pneumatic Breaker (C5.6)	95
	Rock Breaker (C9.12)	85
	Wheeled Loader Lorry (C2 28)	74
	Tracked Semi-Mobile Crusher (C9.14)	90
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
2 – Foundations	Large Rotary Bored Piling Rig – Cast In-Situ (C3.14)	83
	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (C3 19)	75
	Poker Vibrator (C4 33)	78
3 – Steel Erection	Tower Crane (C4.48)	76
	Sarens SCG 120 Crane	86
	Articulated lorry (C11.10)	77
4 – General Construction	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
	Dozer (C2.13)	78
5 - Landscaping	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

A number of representative noise sensitive locations have been considered in relation to the proposed development as illustrated in Figure 11.4.

Table 11.12 presents the predicted construction noise levels in the vicinity of the site. Calculations have assumed an on time 66% for each item of plant i.e. 8-hours over a 12 hours assessment period.

Table 11-12: Review of Potential Daytime Construction Noise Levels

Ref.	Baseline Noise Level dB $L_{Aeq,1hr}$	BS5228-1 Threshold dB $L_{Aeq,1hr}$	Predicted Construction Noise Level for Various Phases (dB $L_{Aeq,1hr}$)				
			Site Preparation	Foundations	Steel Erection	General Construction	Landscaping
R01	45	65	51	41	46	37	28
R02	60	65	47	41	42	39	34
R03	60	65	47	41	42	38	33
R04	60	65	46	40	41	38	33
R05	60	65	42	36	39	35	29
R06 [1]	52	70	53	46	47	43	38
R07 [1]	63	70	41	35	37	32	26
R08	63	70	53	47	47	43	38
R09	52	65	60	53	52	49	44
R10 [1]	63	70	53	47	47	44	39
R11 [1]	63	70	54	47	47	45	40
R12 [1]	63	70	53	47	47	44	39
R13 [1]	63	70	52	46	46	43	38
R14	63	70	51	45	46	43	37
R15	50	65	63	55	54	51	47
R16	50	65	45	38	39	35	31

Note 1 Commercial Property, therefore Threshold of 70 dB $L_{Aeq,1hr}$ applies.

Table 11-12 details the baseline noise level measured at the nearest survey noise monitoring location or based on expected ambient noise levels in the vicinity of the location based on proximity to an existing noise source (e.g. road). If the predicted construction noise level is below this value the associated impact is deemed to be 'Not Significant'.

Where the predicted construction noise level is above the baseline noise level but below the stated BS5228-1 threshold value the associated impact is deemed be between 'Slight' and 'Moderate'. If a predicted noise level is below or equal to the BS5228-1 threshold value, the impact is deemed to be 'Not Significant'. Where the predicted construction noise level is 5 dB or mode higher than the BS5228-1 threshold value the impact is assumed to be 'Moderate' to 'Significant'.

Note, where a non-residential assessment location is being considered a threshold value of 70 dB $L_{Aeq,1hr}$ has been adopted.

Based on the above rationale, and the predicted noise levels presented the assigned impacts are summarised as follows:

Table 11-13: Review of Potential Daytime Construction Noise Impact

Ref.	Predicted Construction Noise Impacts for Various Phases				
	Site Preparation	Foundations	Steel Erection	General Construction	Landscaping
R01	Slight	Not Significant	Slight	Not Significant	Not Significant
R02	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R03	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R04	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R05	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R06	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R07	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R08	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R09	Slight	Slight	Not Significant	Not Significant	Not Significant
R10	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R11	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R12	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R13	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R14	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
R15	Slight	Slight	Slight	Slight	Not Significant
R16	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

In the majority of cases, the construction noise impact is Not Significant; in a small number of cases, a Slight impact is predicted.

11.4.2.1.2 Vibration

Due to the distance of the proposed works from sensitive locations significant vibration effects are not expected.

11.4.2.1.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with this aspect of the construction phase are described below.

Quality	*Significance*	*Duration*
Negative	Slight	Short-term

The above effects should be considered in terms that the effect is variable and that this assessment considers the locations of the greatest potential impact.

11.4.2.2 Construction Traffic

This section has been prepared in order to review potential noise impacts associated with construction traffic on the local road network. Chapter 15 of this EIAR presents an assessment

of traffic and transportation and reference has been made to this chapter to inform the following discussion.

In terms of the additional construction traffic on local roads that will be generated as a result of the proposed development the following comment is presented: Considering that in order to increase traffic noise levels by 1 dB 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 the construction phase associated with the development, as outlined in the relevant sections of Chapter 15 will not result in a significant noise impact.

11.4.2.2.1 Vibration

Construction vehicle movements are not expected as a significant source of vibration along the existing road networks.

11.4.2.2.2 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations are described below.

Quality	*Significance*	*Duration*
Negative	Not Significant	Short-term

11.4.3 Potential Effects – Operational Phase

11.4.3.1 Assessment of Transformer Noise

Table 11-14 presents the predicted noise at all assessment locations considering the impact of the Proposed Development.

Table 11-14: Predicted Noise Levels

Ref.	Sound Pressure (dB) per Octave Band Centre Freq (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
R01	13	8	8	6	6	--	--	--	9
R02	13	9	9	7	1	--	--	--	7
R03	13	9	9	7	1	--	--	--	7
R04	12	9	8	6	--	--	--	--	6
R05	9	6	5	3	--	--	--	--	3
R06	21	16	17	18	14	5	4	--	18
R07	14	9	7	4	--	--	--	--	4
R08	20	15	15	17	13	4	3	--	18
R09	22	19	19	21	17	9	12	--	22
R10	18	14	14	16	11	3	1	--	16
R11	17	13	13	16	11	2	--	--	16
R12	13	8	9	11	6	--	--	--	11
R13	12	5	4	2	--	--	--	--	2
R14	11	4	3	--	--	--	--	--	1

Ref.	Sound Pressure (dB) per Octave Band Centre Freq (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
R15	15	10	8	4	--	--	--	--	6
R16	8	3	3	4	--	--	--	--	6

A noise contour for day to day operation of the proposed development has been presented in Appendix 11-3. Table 11-15 compares the predicted noise at all assessment locations against the adopted criteria.

Table 11-15: Review of Overall Noise Levels

Ref.	Predicted Noise Level dB(A)	Criterion dB $L_{Aeq,15min}$	Excess (dB)
R01	9	37	--
R02	7	37	--
R03	7	37	--
R04	6	37	--
R05	3	37	--
R06	18	55	--
R07	4	55	--
R08	18	55	--
R09	22	55	--
R10	16	55	--
R11	16	55	--
R12	11	55	--
R13	2	55	--
R14	1	39	--
R15	6	55	--
R16	6	55	--

The updated predicted noise levels satisfy the relevant noise criteria adopted in this assessment.

Table 11-16, 11-17 and 11-18 present the predicted changes in noise level associated with the development at the nearest residential noise sensitive locations to the site.

Table 11-16: Review of Predicted Changes in Existing Noise Levels – Day

Ref.	Daytime (07:00 – 19:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB)	EPA Glossary of Impacts
R01	9	43	43	0	Not Significant
R02	7	52	52	0	Not Significant
R03	7	52	52	0	Not Significant
R04	6	52	52	0	Not Significant
R05	3	52	52	0	Not Significant
R14	1	52	52	0	Not Significant

Table 11-17: Review of Predicted Changes in Existing Noise Levels – Evening

Ref.	Evening (19:00 – 23:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB)	EPA Glossary of Impacts
R01	9	38	38	0	Not Significant
R02	7	42	42	0	Not Significant
R03	7	42	42	0	Not Significant
R04	6	42	42	0	Not Significant
R05	3	42	42	0	Not Significant
R14	1	42	42	0	Not Significant

Table 11-18: Review of Predicted Changes in Existing Noise Levels – Night

Ref.	Night (23:00 – 07:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB)	EPA Glossary of Impacts
R01	9	37	37	0	Not Significant
R02	7	39	39	0	Not Significant
R03	7	39	39	0	Not Significant
R04	6	39	39	0	Not Significant
R05	3	39	39	0	Not Significant
R14	1	39	39	0	Not Significant

Review of the predicted increases in noise level at the nearest residential noise sensitive locations conclude that the associated impact is 'Not Significant' at all locations for daytime, evening and night time periods.

Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with operation of the Proposed Development is described below.

Quality	*Significance*	*Duration*
Negative	Not Significant	Long-term

There are no expected sources of vibration associated with the operational phase of the proposed development. In relation to vibration the associated effect is summarised as follows:

Quality	*Significance*	*Duration*
Negative	Imperceptible	Long-term

11.4.3.2 Additional Road Traffic

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 1 dB 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.

Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with operation of the additional road traffic is described below.

Quality	*Significance*	*Duration*
Negative	Imperceptible	Long-term

11.4.3.3 Decommissioning Phase

In relation to the decommissioning phase, similar overall noise levels as those calculated for the construction phase would be expected, as similar tools and equipment will be used and a similar noise and vibration impact as outlined previously would be applicate in this instance.

11.4.3.4 Cumulative Impacts

The environmental noise survey takes account of noise emissions from existing developments including nearby data centres. It was noted that the existing ambient noise levels in the area were dominated primarily by road traffic on the surrounding road network.

The noise criteria proposed for Proposed Development plant items has been derived with consideration of existing site noise emissions levels to ensure that cumulative noise emissions do not exceed the relevant noise criteria.

The potential cumulative noise emissions from the proposed development, the approved Gas Fired Peaking Power Plant (i.e. Profile Park), DUB69 and Cyrus One Data Centre and Microsoft have been considered. Reference is made Chapter 10 of the Profile Park EIAR, to Section 10 of the Cyrus One EIAR, Section 10 of the DUB69 EIAR and Section 8.0 of the Microsoft DUB14/15 EIAR which present noise predictions to nearby shared residential receptors.

The closest shared receptors to the two neighbouring sites are the receivers R02 and R14. Table 11-19 presents the predicted cumulative noise levels to these two receivers and highlights the predicted increase in noise level .

Table 11-19: Assessment of Cumulative Noise

Ref.	Noise Level (dB $L_{Aeq,T}$)					Cumulative dB(A)	Change in Noise Level (dB)
	Proposed Development	Profile Park	Cyrus One	DUB69	Existing (Night)		
R02 [A]	7	35	12	31	37	40	+3
R14 [B]	1	38	12	30	39	42	+3

Note A NSL R8 in DUB69 assessment R7 (extrapolated) in Cyrus One assessment.
Note B NSL R14 (extrapolated) in DUB69 assessment R7 (extrapolated) in Cyrus One assessment.

Review of the predicted noise levels associated with the Proposed Development are so low they are not considered significant and there is no potential for any cumulative impacts.

11.5 MITIGATION MEASURES

The assessment of potential impact has demonstrated that the proposed development is expected to comply with the identified criteria for both the construction, operational and decommissioning phases. However, to ameliorate any noise and vibration effects, a schedule of noise control measures has been formulated for both construction/decommissioning and operational phases.

11.5.1 Construction and Decommissioning Phases

The comments in this section relate primarily to the construction phase, but are apply equally to the decommissioning phase:

Regarding construction/decommissioning activities, reference shall be made to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*, which offers detailed guidance on the control of noise and vibration from construction activities. It is proposed that various practices be adopted during construction as required, including the following:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration; and
- keeping the surface of the site access roads even to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed. These include:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints, and;
- regular maintenance and servicing of plant items.

11.5.1.1 Noise

The contract documents shall specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures when deemed necessary to comply with the recommendations of BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise.* The following list of measures will be considered, where necessary, to ensure compliance with the relevant construction noise criteria:

- No plant used on site will be permitted to cause an on-going public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 11-1 using methods outlined in BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.
- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs weekdays and between 9:00hrs and 13:00hrs on Saturdays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local Planning Authority.

11.5.1.2 Vibration

Vibration associated with construction activities will be limited to the values set out in Table 11-3. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage.

Site investigations have indicated that no piling activities are anticipated. Therefore, no mitigation measures are proposed.

On review of the likely vibration levels associated with construction activities, it is concluded that the construction of the proposed development is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to buildings.

In the unlikely event of vibration levels giving rise to human discomfort, in order to minimise such impacts, the following measures shall be implemented during the construction period:

- A clear communication programme will be established to inform closest building occupants in advance of any potential intrusive works which may give rise to vibration

levels likely to exceed perceptible levels. The nature and duration of the works will be clearly set out in all communication circulars.
- Alternative less intensive working methods and/or plant items shall be employed, where feasible.
- Appropriate vibration isolation shall be applied to plant, where feasible.
- Cut off trenches to isolate the vibration transmission path shall be installed where required.
- Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values.

11.5.2 Operational Phase

Noise from external plant will be minimised by the following measures:
- Purchasing low noise generating equipment, and;
- Incorporating appropriately specified in line attenuators for stacks and exhausts where necessary.

With due consideration as part of the detailed design process, this approach will result in the site operating well within the constraints of the best practice guidance noise limits that have been adopted as part of this detailed assessment.

11.5.3 Decommissioning Phase

The mitigation measures that will be considered in relation to any decommissioning of the site are the same as those proposed for the construction phase of the development, i.e. as per Section 11.5.1.

11.5.4 Monitoring

11.5.4.1 Construction Phase

Noise and vibration monitoring is proposed in accordance with the guidance contained in *British Standard BS5528* during the construction phase.

11.5.4.2 Operational Phase

As part of the EPA IED license that will be applicable to the site annual noise monitoring will be required to ensure noise emissions comply with relevant criteria.

11.6 RESIDUAL EFFECTS

This section summarises the likely residual noise and vibration effects associated with the proposed development following the implementation of mitigation measures.

11.6.1 Construction / Decommissioning Phases

During the construction phase of the project there will be some effect on nearby noise sensitive properties due to noise emissions from site traffic and other construction activities. However, given the distances between the main construction works and nearby noise sensitive properties and the fact that the construction phase of the development is temporary in nature, it is expected that the various noise sources will not be excessively intrusive. Furthermore, the

application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration effect is kept to a minimum.

With respect to the EPA's criteria for description of effects, in terms of these construction activities, the potential worst-case associated effects at the nearest noise sensitive locations associated with the various elements of the construction phase are described below.

The effects below should be considered in terms that the effect is variable and that this assessment considers the locations of the greatest potential impact.

11.6.1.1 General Construction

Noise Assessment

Quality	*Significance*	*Duration*
Negative	Slight	Short-term

Vibration Assessment

Quality	*Significance*	*Duration*
Negative	Not Significant	Short-term

11.6.1.2 Construction Traffic

The predicted residual construction traffic effects during the construction phase are summarised as follows:

Noise Assessment

Quality	*Significance*	*Duration*
Negative	Not Significant	Short-term

Vibration Assessment

Quality	*Significance*	*Duration*
Negative	Not Significant	Momentary

11.6.2 Operational Phase

11.6.2.1 Day to Day Noise

The predicted residual operational noise effects are summarised as follows at the closest noise sensitive locations to the site:

Quality	*Significance*	*Duration*
Negative	Not Significant	Long-term

In terms of vibration, the effect of the operational site is as follows:

Quality	*Significance*	*Duration*
Negative	Not Significant	Long-term

11.6.3 Cumulative Effects

Cumulative assessment has been considered here with due consideration of the proposed development in combination with any existing permitted and developments in the wider study area as noted in Section 11.4.3.1. It has been predicted that the cumulative effects are Not Significant during daytime and evening periods and Slight during night time periods.

11.7 CONCLUSION

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction and the long-term operational phase.

The assessment of construction noise and vibration and has been conducted in accordance best practice guidance contained in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration*. Subject to good working practice as recommended in the EIAR, noise associated with the construction phase is not expected to exceed the recommended limit values. The associated noise and vibration are not expected to cause any significant effects.

Based on detailed information on the site layout, plant noise emission levels, noise levels have been predicted at NSLs. The predicted operational noise levels will be within best practice noise limits; therefore, it is not considered that a significant effect is associated with the development.

No significant vibration effects are associated with the operation of the site.

11.8 REFERENCES

- EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIA Reports) (2022) and draft revised Guidelines on information to be contained in Environmental Impact Statements; and Advice Notes for preparing EIS (2015).
- Draft '*Guidelines for Noise Impact Assessment*' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party.
- *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.
- Transport Infrastructure Ireland (TII) publication *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (2014).*
- 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 4142:2014: *Methods for rating and assessing industrial and commercial sound.*
- BS 8233:2014: *Guidance on sound insulation and noise reduction for buildings.*
- Environmental Protection Agencies *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (January 2016).
- ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*
- British Standard *BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).*
- ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*
- *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.
- BS EN 1793-1:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 1: Intrinsic characteristics of sound absorption*
- BS EN 1793-2:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 2: Intrinsic characteristics of airborne sound insulation.*
- BS EN 1794-1:2003: *Road traffic noise reducing devices. Non-acoustic performance. Mechanical performance and stability requirements*
- BS EN 1794-2:2003: *Road traffic noise reducing devices. Non-acoustic performance. General safety and environmental requirements.*