10.0 NOISE & VIBRATION

10.1 INTRODUCTION

As detailed in Chapter 1 (Introduction), this EIA Report has been prepared to accompany an application for the construction and operation for of new volatile organic compound (VOC) abatement system, a supporting utilities workshop and associated ancillary services at the existing TILGC site in Grange Castle, Co. Dublin.

The nearest residential noise sensitive locations are private houses to the north of the TILGC site in general and to the west of the site along Adamstown Road where a number of houses are located. The site itself is bounded by other industrial/commercial sites.

A detailed description of the Proposed Development and a site layout is presented in Chapter 2 (Description of Development).

10.2 METHODOLOGY

10.2.1 Proposed Approach

The following methodology has been adopted for this assessment:

- review appropriate guidance, typical local authority planning conditions, etc. in order to identify appropriate noise criteria for the site operations;
- carry out noise monitoring at the site to identify existing levels of noise in the vicinity of the development;
- development of a detailed 3D noise model to consider the noise emissions from the new plant items in the Proposed Development; and
- comment on predicted levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 10.1 of this document presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some basic fundamentals of acoustics.

10.2.2 Fundamentals of Acoustics

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

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. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of 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 is 0dB (for the threshold of hearing) to 120dB (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 10dB 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 3dB.

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. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPL's 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 10.1.

The 'A' subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.

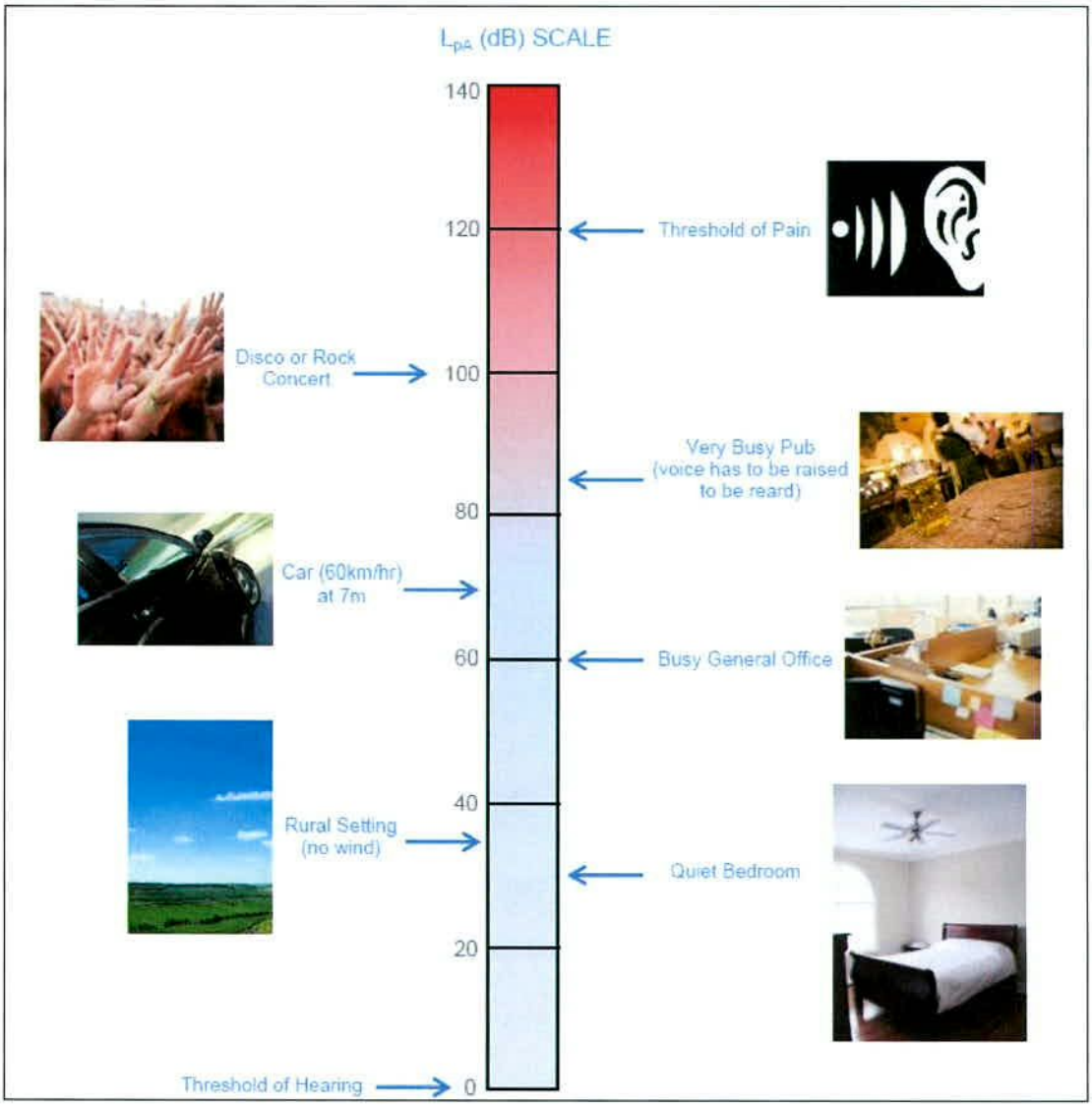

Figure 10.1 *dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016))*

10.2.3 Significance of Impacts

The quality, magnitude and duration of potential noise and vibration impacts are defined and assessed in accordance with the criteria provided in the *Guidelines on Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022) this criteria is duplicated in Chapter 1, Table 1.2.

These guidelines do not quantify the impacts in decibel terms, therefore further reference has been made to the draft '*Guidelines for Noise Impact Assessment*' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party.

10.2.4 Construction Phase Guidance

Criteria for Rating Noise Impacts

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 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*.

Relevant Noise Criteria 'ABC' Method

The approach adopted in BS5228 – 1 calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

BS5228 – 1 sets out guidance on permissible noise levels relative to the existing noise environment. Table 10.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

Table 10.1 *Example Threshold of Significant Effect at Dwellings*

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

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 periods (i.e. daytime, evening and night-time) the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out as part of this assessment would indicate that the categories detailed in Table 10.2 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

Table 10.2 *Rounded Baseline Noise Levels and Associated Categories*

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

See Section 10.5.1 for the construction noise assessment in relation to this site.

This assessment process determines if a significant construction noise impact is likely.

In exceptional circumstances there may be a requirement that certain construction works are carried out during night-time periods. In these instances, the relevant evening (60dB L_{Aeq1hr}) and night time (50dB $L_{Aeq,1hr}$) will apply.

Fixed Limits

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

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

Paragraph E.2 goes on to state: -

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

Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 9.3), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development: -

- For residential NSLs it is considered appropriate to adopt 65 - 75 dB(A) CNT depending on existing noise level. Given the baseline monitoring carried out, it would indicate that Category A and C values are appropriate using the ABC method;
- For non-residential NSLs it is considered appropriate to adopt the 70 dB(A) CNT, given the urban environment in which the community centre resides, in line with BS 5228-1:2009+A1:2014 Annex E2.

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 10.2 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of DMRB: Noise and Vibration and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

Table 10.3 *Construction Noise Significance Ratings*

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIA Report Significance Effects	Determination
Period	Baseline Noise Category	Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB)	Depending on CNT, duration & baseline noise level
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	A	65	
Evening (19:00 to 23:00hrs)	A	55	
Night time (23:00 to 07:00hrs)	A	45	

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

Criteria for Rating Vibration Impacts

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings; and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings::

- British Standard BS 5228-2 (BSI 2014); and
- British Standard BS 7385-2 (BSI 1993)

Table 10.4 *Transient vibration guide values for cosmetic damage*

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Values referred to are at the base of the building.

Note 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Furthermore, BS 5228-2 and BS 7385-2 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 10.4 and major structural damage can occur at vibration magnitudes greater than four times those in Table 10.4.

BS 5228-2 also provides guidance relating to the human response to vibration. Guidance is again provided in terms of PPV in mm/s since this parameter is routinely measured when monitoring the structural effects of vibration. The potential human response at different vibration levels, as set out in BS 5228-2, is summarised in Table 10.5.

Table 10.5 *Transient vibration guide values for cosmetic damage*

Vibration level Note A) B) C) (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

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 6472-1 or -2, 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.

10.2.5 Operational Phase – Noise Guidance

Definitions

"*equivalent 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, T_r.

"*rating level, $L_{Ar,T}$*" specific sound level plus any adjustment for the characteristic features of the sound.

Current EPA Licence

TILGC operates under an EPA IE Licence Registration No. P0963-02 which specifies the following noise level limits at noise-sensitive locations:

- Daytime: 55 dB $L_{Ar,30\ min}$;
- Evening time: 50 dB $L_{Ar,\ 30\ min}$; and
- Night-time: 45 dB $L_{Aeq,30\ min}$

Note that in respect of Night-time periods, the licence states that "*There shall be no clearly audible tonal or impulsive component in the noise emission from the activity at any noise-sensitive location*", and as such the L_{Aeq} parameter is used for night-time limits rather than the rating noise level $L_{Ar,T}$.

As the facility operates during daytime, evening and night-time periods, the focus of the environmental noise assessment is the comparison of the predicted noise levels with the night-time criterion of 45 dB(A), which is more onerous than daytime and evening periods.

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 10.6 below and is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the EPA EIA Report Guidelines 2022 is also presented.

Table 10.6 *Noise Impact Scale – Operational Noise Sources*

Noise Level Change dB(A)	Subjective Response	Long Term Impact Classification (IEMA, 2014)	Impact Guidelines on the Information to be contained in EIA Report's (EPA)
≥ 0	No change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible		Not Significant
≥ 3 and < 5	Noticeable	Minor	Slight - Moderate
≥ 5 and < 10	Up to a doubling or halving of loudness	Moderate	Moderate - Significant
≥10	More than a doubling or halving of loudness	Major	Significant - Profound

The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in

environmental noise that is perceptible to the human ear. A 10dB(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 ratings 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.

10.2.6 Operational Phase – Vibration Guidance

Criteria for Rating Vibration Impacts

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

10.2.7 Forecasting Methods

Construction noise calculations have been conducted generally in accordance with BS 5228: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise.*

Prediction calculations for operational building services noise, car park activity and vehicle movements on site have been conducted generally in accordance with ISO 9613 (1996): *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the UK's Department of Transport in 1988.

10.3 RECEIVING ENVIRONMENT

Examination of the area surrounding the site show that there are a number of private dwelling houses or noise-sensitive receptors (NSRs) in the vicinity, as shown in Figure 10.2 below.

Figure 10.2 *Nearest noise-sensitive receptors. (Background Imagery: © Google Earth)*

10.3.1 Noise Survey for IED Licence

Although the current IED Licence does not require noise monitoring, as part of the annual environmental report (AER), the applicant had a noise survey carried out at reference locations on an annual basis. The most recent Annual Noise Survey (November 2021) is included in Appendix 10.2. The noise measurement locations used are shown in Figure 10.3.

Figure 10.3 *Noise survey locations in AER. (Background Imagery: © Google Earth)*

Table 10.7 *Summary of Measured Noise Levels in AER 2021*

Location	Period	Measured Noise Level Range (dB re. $2x10^{-5}$ Pa)[1]	
		L_{Aeq}	L_{A90}
NML-1	Daytime	56 - 63	51 - 56
	Evening	51 - 58	48 - 51
	Night-time	52 - 55	48 - 52
NML-2	Daytime	60 - 62	59 - 60
	Evening	59 - 61	58 - 59
	Night-time	60	59 - 60

Note 1: The given range represents the majority of results – outlier readings are not included.

It is important to note that these locations are not at nearest noise-sensitive locations rather at boundary locations. Noise levels are significantly affected by construction activity and by mechanical plant on other sites. Further discussion is presented in the Annual Noise Report.

10.3.2 Environmental Noise Survey

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

The noise measurement locations were selected to represent the noise environment at the NSLs surrounding the Proposed Development.

The monitoring locations are discussed below and shown in Figure 10.4:

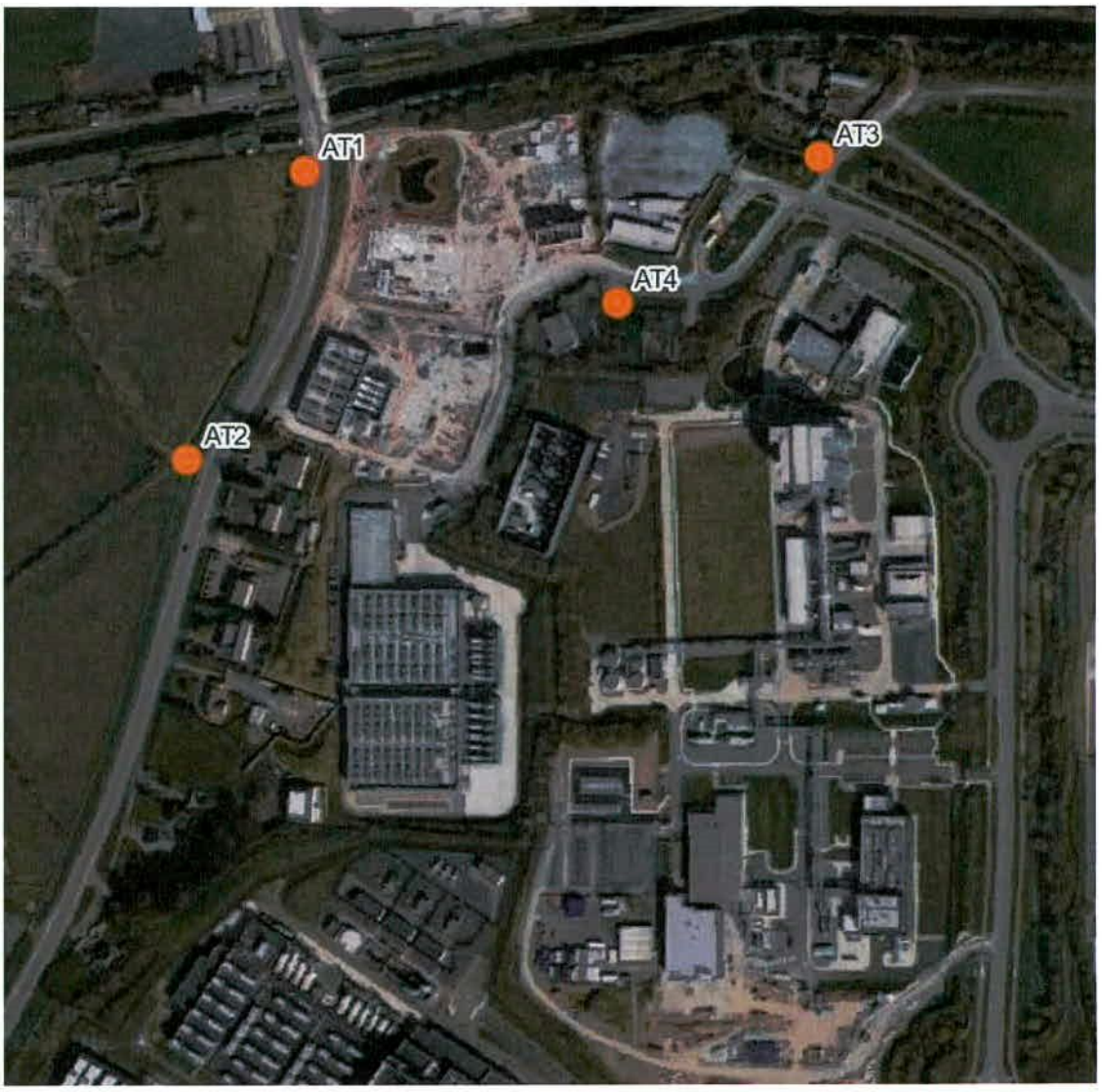

Figure 10.4 *Noise survey locations in Baseline Noise Survey. (Background Imagery: © Google Earth)*

Location AT1 Attended measurement location to capture the noise level near a set of houses to the northwest of the industrial area.

Location AT2 Attended measurement location to capture the noise level near a set of houses to the west of the industrial area.

Location AT3 Attended measurement location to capture the noise level near a set of houses to the north of the industrial area.

Location AT4 Attended measurement location to capture the noise level at the northern boundary of TILGC lands.

10.3.3 Survey Details

Attended measurements were carried out during the following periods:

- Daytime: 13:40 hrs to 17:40 on 13 June 2022;
- Evening time: 19:00 to 20:50 on 13 June 2022;
- Night-time: 23:18 hrs on 13 June to 02:42 on 14 June 2022.

The weather during the survey periods was mainly dry with varying cloud cover. Wind speeds were generally moderate; however they were not considered to have had a detrimental effect on the noise measurements.

10.3.4 Personnel and Instrumentation

AWN Consulting installed, configured and collected the noise monitoring equipment.

The noise measurements were performed using a Rion NL52 Sound Level Meter. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

Table 10.8 *Instrumentation Details*

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Bruel & Kjaer 2250	186669	May 2022

10.3.5 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_{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 for the noise parameters denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

10.3.6 Methodology

Measurement equipment was configured to record noise levels over consecutive 15-minture intervals. The equipment was check-calibrated using a sound level meter calibrator at the time of installation and again at collection. Survey personnel noted the primary noise sources contributing to noise build-up during site visits.

10.3.7 Survey Results

The survey results summarised in Table 10.9 below. The periods are defined as follows:

Table 10.9 *Summary of Attended Results - Daytime*

Location	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
		$L_{Aeq,15min}$	L_{A90}
AT1	13:40	68	56
	15:53	69	58
	17:50	70	55
AT2	14:45	66	51
	16:42	68	54
	18:44	66	47
AT3	15:08	61	52
	17:06	54	50
AT4	15:28	61	52
	17:25	52	50

At AT1, noise levels were in the range 68 to 70 dB $L_{Aeq,15min}$ and 55 to 55 dB $L_{A90,15min}$. Noise from road traffic was the dominant source at this location. Noise from the various sites also audible.

At AT3, noise levels were in the range 66 to 68 dB $L_{Aeq,15min}$ and 47 to 54 dB $L_{A90,15min}$. Similarly, noise from road traffic was the dominant source at this location. Noise from the various sites also audible.

At AT4, noise levels were in the range 54 to 61 dB $L_{Aeq,15min}$ and 50 to 52 dB $L_{A90,15min}$. Plant noise and road traffic, and reversing alarms in the distance were audible noise sources.

At AT5, noise levels were in the range 51 to 62 dB $L_{Aeq,15min}$ and 50 to 52 dB $L_{A90,15min}$. Similarly, Plant noise and road traffic, and reversing alarms in the distance were audible noise sources.

The survey results for the evening time attended monitoring are given in Table 10.10.

Table 10.10 *Summary of Attended Results – Evening*

Location	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
		$L_{Aeq,15min}$	L_{A90}
AT1	19:03	70	53
AT2	19:50	62	47
AT3	20:16	52	50
AT4	20:35	52	50

During the evening periods, the noise levels at the noise survey locations ranged from 52 to 70 dB L_{Aeq} at and 47 to 53 dB L_{A90}. Although reduced, traffic noise remained dominant, though plant noise was also audible.

The survey results for the night-time attended monitoring are given in Table 10.11.

Table 10.11 *Summary of Attended Results – Night-time*

Location	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
		$L_{Aeq,15min}$	L_{A90}
AT1	23:18	61	41
	01:15	61	40
AT2	23:00	56	41
	00:57	58	40
AT3	00:09	53	52
	02:09	52	51
AT4	00:27	50	49
	02:27	50	49

During the night-time time periods, the noise levels at the noise survey locations ranged from 50 to 61 dB L_{Aeq} and 40 to 52 dB L_{A90}. Plant noise from various sites was clearly audible at all locations.

10.4 CHARACTERISTICS OF THE DEVELOPMENT

The Proposed Development will comprise the construction and operation of the proposed new volatile organic compound (VOC) abatement system, supporting utilities workshop and associated ancillary services.

When considering a development of this nature, the potential noise and vibration impact on the surroundings must be considered for each of two distinct stages:

- construction phase, and;
- operational phase.

As stated, the construction phase will involve excavation, general site preparation over the development site and the erection of new buildings/structures. Comment will also be presented in relation to construction traffic on local roads in terms of noise and vibration.

The primary sources of outward noise in the operational context are deemed long-term and will involve a set of plant items in the new VOC abatement system.

10.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

10.5.1 Construction Phase

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.

Thresholds for significant noise from construction can be determined by referring to Table 10.1 and the baseline ambient noise levels, as outlined in the assessment criteria section. The daytime significance threshold for construction noise at the site is set at 65 dB $L_{Aeq,T}$. A night-time threshold is not included as construction work will not take place at night.

BS 5228-1 contains noise level data for various construction machinery. The noise levels relating to site clearance, ground excavation and loading lorries (dozers, tracked excavators and wheeled loaders) reach a maximum of 81 dB $L_{Aeq,T}$ at a distance of 10 m. For this assessment, a worst-case scenario is assumed of 3 no. such items with a sound pressure level (SPL) of 81 dB at 10 m operating simultaneously along the closest works boundary. This would result in a total noise level of 86 dB at 10 m and an equivalent combined sound power level of 114 dB L_{WA}. This worst-case scenario is the typical assumption made for developments of this size, on the basis that it is unlikely that more than 3 no. items of such plant/equipment would be operating simultaneously in such close proximity to each other.

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

This scenario can be assumed in this case due to the proximity of the NSLs, i.e. a barrier height will be chosen so as to completely hide the source. Table 10.12 shows the potential noise levels calculated at various distances based on the assumed sound power level and attenuation provided by a barrier of 5 dB.

Table 10.12 *Potential construction noise levels at varying distances*

Description of Noise Source	Sound Power Level (dB Lw(A))	Calculated noise levels at varying distances (dB LAeq,T)				
		50 m	75 m	100 m	125 m	150 m
3 no. items each with SPL of 81 dB at 10 m operating simultaneously.	114	65	61	59	57	55

The calculated noise levels in Table 10.5 show that there is potential for the maximum permissible daytime noise level to be exceeded at distances up to 50 m from the works. However, as discussed above, the closest NSL to the works are at distances of the order of 75 m. This indicates that additional construction noise effects are negative, not significant and short-term.

10.5.2 Operational Phase

The primary sources of outward noise in the operational context are deemed long-term and will involve plant noise from the various VOC abatement system components. The

environmental noise impact of the development has been assessed using a 3D noise model of the site created using proprietary environmental noise modelling software, which calculates noise levels from the development at noise-sensitive locations.

Noise Model

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed building. This section discusses the methodology behind the noise modelling process.

DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise, calculates noise levels in accordance with ISO 9613: *Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation*, 1996.

iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account 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 400m).

Brief Description of ISO9613-2: 1996

ISO9613-2:1996 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT(DW)}$, for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT(DW)}$ from any point source at any receiver location is given by:

$$L_{fT(DW)} = L_W + D_c - A \qquad \text{Eqn. A}$$

Where:

$L_{fT(DW)}$ is an octave band centre frequency component of $L_{AT(DW)}$ in dB relative to $2x10^{-5}$ Pa;

L_W is the octave band sound power of the point source;

D_c is the directivity correction for the point source;

A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 10.13 below:

Table 10.12 *Estimated Accuracy for Broadband Noise of $L_{AT(DW)}$*

Height, h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

* h is the mean height of the source and receiver.
† d is the mean distance between the source and receiver.
N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings forwarded by DPS.

Local Area The location of noise sensitive locations has been obtained from a combination of site drawings provided by DPS and others obtained from Ordinance Survey Ireland (OSI).

Contours Due to the lack of contour information off the proposed site a flat ground model has been assumed for this study.

Noise Source Sound Power Levels

Table 10.14 presents the noise sound power levels used in the preparation of noise model. Sound power levels for each item of outdoor plant have been provided by TILGC. Sound spectra, where not provided in the data, have been derived from a standard acoustic text or from similar projects.

The noise modelling competed is based on the following assumed data in relation to various items of plant associated with the overall site development. It is also assumed noise from any plant associated with the development is neither tonal nor impulsive in nature.

Table 10.14 L_{wA} levels Utilised in Noise Model

Source	L_{wA} - Octave Band Centre Frequency								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Hot Oil Air Blast Cooler	78	74	74	75	73	70	68	65	83
Recirc Pump CT Coolant Circulation Pump	74	75	77	77	80	77	73	67	85
Recirculation Pump (Thermal Fluid Oil Pump)	68	69	71	71	74	71	67	61	79
TO Pumps (Quench and Caustic Scr Liq Pump)	74	75	77	77	80	77	73	67	85
Liquor circuit Air Blast Cooler	42	59	72	85	90	90	85	75	94
Generator	65	66	66	66	64	62	59	54	73
Quench and Caustic Scrubber ID Fan	51	63	71	80	74	69	61	48	82

Noise Model Results

The results of the noise model are presented in Table 10.15. Noise levels are compared to the night-time criterion as discussed in Section 10.2.5.

The above predicted levels are based on a situation where the receiver is downwind of all noise sources. For the purposes of the assessment against the adopted criteria this is a robust worst-case assumption.

Table 10.15 *Predicted Plant Noise Levels for Various Scenarios*

Ref.	Predicted Noise Level, dB $L_{Aeq,15min}$	Adopted Criterion dB $L_{Aeq,15min}$	Excess (dB)
R01	26	45	--
R02	26	45	--
R03	35	45	--
R04	35	45	--
R05	37	45	--
R16	27	45	--
R17	28	45	--
R18	29	45	--
R19	35	45	--
R20	35	45	--
R21	36	45	--
R21a	36	45	--
R22	27	45	--
R23	23	45	--
R24	27	45	--
R25	28	45	--
R26	29	45	--

The total noise levels from the new plant items specifically is well below the noise criterion of 45dB $L_{Aeq,T}$ for night-time periods, and therefore also in compliance with during daytime and evening time periods..

The potential increases in the total noise levels at noise-sensitive locations are reviewed in the next section.

Review of Increases in Noise Level

Table 10.10, 10.11 and 10.12 presents the predicted changes in noise level associated with the development at the nearest noise sensitive locations to the site. Background noise levels have been selected based on the information presented in Sections 10.3.1 and 10.3.2.

Table 10.13 *Review of Predicted Changes in Existing Noise Levels – Day*

Loc.	Daytime Periods				
	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	26	47	47	0	Imperceptible
R02	26	47	47	0	Imperceptible
R03	34	50	50	0	Imperceptible
R04	34	50	50	0	Imperceptible
R05	36	50	50	0	Imperceptible
R16	27	47	47	0	Imperceptible
R17	28	47	47	0	Imperceptible
R18	29	47	47	0	Imperceptible
R19	34	47	47	0	Imperceptible
R20	34	47	47	0	Imperceptible
R21	36	47	47	0	Imperceptible
R21a	36	47	47	0	Imperceptible
R22	27	47	47	0	Imperceptible
R23	23	47	47	0	Imperceptible
R24	27	47	47	0	Imperceptible
R25	28	47	47	0	Imperceptible
R26	28	47	47	0	Imperceptible

Review of the predicted increases in daytime noise level at the nearest noise sensitive locations conclude that the associated impact is *'Imperceptible'*.

Table 10.14 *Review of Predicted Changes in Existing Noise Levels – Evening*

Loc.	Evening Periods				
	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	26	47	47	0	Imperceptible
R02	26	47	47	0	Imperceptible
R03	34	50	50	0	Imperceptible
R04	34	50	50	0	Imperceptible
R05	36	50	50	0	Imperceptible
R16	27	47	47	0	Imperceptible
R17	28	47	47	0	Imperceptible
R18	29	47	47	0	Imperceptible
R19	34	47	47	0	Imperceptible
R20	34	47	47	0	Imperceptible
R21	36	47	47	0	Imperceptible
R21a	36	47	47	0	Imperceptible
R22	27	47	47	0	Imperceptible
R23	23	47	47	0	Imperceptible
R24	27	47	47	0	Imperceptible
R25	28	47	47	0	Imperceptible
R26	28	47	47	0	Imperceptible

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is *'Imperceptible'* at all locations.

Table 10.15 *Review of Predicted Changes in Existing Noise Levels – Night*

Loc.	Night-Time Periods				
	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	26	40	40	0	Imperceptible
R02	26	40	40	0	Imperceptible
R03	34	49	49	0	Imperceptible
R04	34	49	49	0	Imperceptible
R05	36	49	49	0	Imperceptible
R16	27	40	40	0	Imperceptible
R17	28	40	40	0	Imperceptible
R18	29	40	40	0	Imperceptible
R19	34	40	41	+1	Not Significant
R20	34	40	41	+1	Not Significant
R21	36	40	42	+2	Not Significant
R21a	36	40	42	+2	Not Significant
R22	27	40	40	0	Imperceptible
R23	23	40	40	0	Imperceptible
R24	27	40	40	0	Imperceptible
R25	28	40	40	0	Imperceptible
R26	28	40	40	0	Imperceptible

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*Imperceptible*' or '*Not Significant*' all locations.

In essence the existing soundscapes that are encountered at the nearest noise sensitive locations are predicted to remain unchanged in terms of ambient noise levels with the development of the thermal oxidiser facility introducing a low level of plant noise which will increase the background noise environment.

In terms of noise associated with day-to-day activities the associated effect is stated to be as follows; ***negative, not significant, and long-term***

Additional Vehicular Traffic on Public Roads

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***.

Vibration

There is no source of vibration associated with the day-to-day operation of the development that will give rise to impacts at nearby sensitive locations. In terms of these the operational phase of the development the associated effect is stated to be: ***neutral, imperceptible,*** and ***long-term.***

10.6 REMEDIAL AND MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impact, a schedule of noise control measures has been formulated for both construction and operational phases associated with the Proposed Development.

10.6.1 Construction Phase

With regard to construction activities, reference has been made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the Proposed Development. As an example, the following measures will be implemented on site:

- 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;
- monitoring levels of noise and/or vibration during critical periods and at critical sensitive locations; and
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed, such as:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of barriers as necessary around items such as generators or high duty compressors;
- situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

During construction of the Proposed Development vibration from construction activities to off-site residences be limited to the values set out in Table 10.3. 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. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

10.6.2 Operational Phase

Building Services Noise / Emergency Site Operation

Noise from external plant will be minimised by the following measures:

- Selecting 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.

Additional Vehicular Traffic on Public Roads

The noise impact assessment outlined previously has demonstrated that mitigation measures are not required.

10.7 PREDICTED IMPACTS OF THE DEVELOPMENT

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

10.7.1 Construction Phase

During the construction phase of the Proposed Development there will be some impact on nearby noise sensitive properties due to noise emissions from construction site works. The application of noise and vibration limits and hours of operation (i.e. as per Table 10.3 and 10.4 in Section 10.2.4), along with implementation of appropriate noise and vibration control measures (as summarised in Section 10.6.1), will ensure that noise and vibration impact is kept to a minimum. Also, it is reiterated that any construction noise impacts will be ***moderate, negative*** and ***short-term*** in nature. Also, it is considered that as the Proposed Development progresses from initial ground works that construction noise impacts will reduce from moderate to ***not significant.***

10.7.2 Operational Phase

Building Services Noise / Emergency Site Operation

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is ***negative***, ***not significant*** and ***long-term***.

Additional Vehicular Traffic on Public Roads

Any change in noise levels associated with vehicles at road junctions in the vicinity of the Proposed Development is expected to be ***imperceptible.*** The resultant noise impact is ***neutral, imperceptible*** and ***long-term.***

10.8 CUMULATIVE IMPACTS

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

The cumulative impact of the Proposed Development with any/all relevant other planned or permitted developments (as outlined in Chapter 3) are discussed in Sections 10.9 below for construction and operational phases.

10.9 RESIDUAL IMPACTS

The construction noise assessment has shown that in accordance with the 'significance' thresholds presented in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise* there is not a significant impact at residential locations, subject to the implementation of the mitigation measures outlined in Section 10.6.1.

The robust analysis of potential operational phase plant has shown that in accordance with the scale in the EPA EIA Report Guidelines 2022 there will be a ***not significant, negative, long-term*** impact at the closest residences identified on Figure 10.3. Ambient noise levels are, and will continue to be, dictated by road traffic noise in the area while a low level of plant noise is expected to be audible during lulls in other sources (e.g. distant traffic noise).

The operational noise assessment of vehicle movements associated with the site has shown that in accordance with the scale in the *Guidelines on Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022) there will be an ***imperceptible, neutral, long-term*** impact off site noise sensitive locations considering existing traffic volumes on the local road network.

10.10 REFERENCES

1. EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIA Reports) (2022)
2. IEMA Guidelines for Environmental Noise Impact Assessment, 2014.
3. *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise.*
4. Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* .2004.
5. British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.*
6. British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration.*
7. BS 4142:2014+A1 2019: *Methods for rating and assessing industrial and commercial sound.*
8. BS 8233:2014: *Guidance on sound insulation and noise reduction for buildings.*
9. Environmental Protection Agencies *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (January 2016).
10. ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*
11. ISO 9613 (1996): *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*
12. *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

APPENDIX 10.1

GLOSSARY OF ACOUSTIC TERMINOLOGY

ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
broadband	Sounds that contain energy distributed across a wide range of frequencies.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).
dB L_{pA}	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
impulsive noise	A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).
$L_{Ar,T}$	The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the

	intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.
L_{AT}(DW)	equivalent continuous downwind sound pressure level.
L_{fT}(DW)	equivalent continuous downwind octave-band sound pressure level.
L_{day}	L_{day} is the average noise level during the day time period of 07:00hrs to 19:00hrs
L_{night}	L_{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.
low frequency noise	LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.
noise	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.
noise sensitive location	NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
rating level	See $L_{Ar,T}$.
sound power level	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m^2 where: $$Lw = 10Log\frac{P}{P_0}\ \text{dB}$$ Where: p is the rms value of sound power in pascals; and P_0 is 1 pW.
sound pressure level	The sound pressure level at a point is defined as: $$Lp = 20Log\frac{P}{P_0}\ \text{dB}$$
specific noise level	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure

	level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq, T}$)'.
tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.
$^1/_3$ octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each

APPENDIX 10.2

ANNUAL NOISE SURVEY REPORT (NOVEMBER 2021)

(overleaf)

Annual Environmental Noise Report

Takeda Ireland Ltd (Grange Castle)

Dublin 22

Rev: 1.5

Prepared by:

Diarmuid Keaney, ICAN Acoustics.

Date: Thursday 17 February 2022

Signature:

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Executive Summary

ICAN Acoustics have been engaged by Ms Aoife Murray, EHS Department at Takeda Ireland Ltd, Grange Castle Business Park, Nangor Road, Dublin 22, to carry out an annual noise survey at the facility. As part of our noise survey work, all noise measurements were carried out in accordance with the guidance in ISO 1996-Part 1, Acoustics-Description, measurements and Assessment of environmental noise.

It is evident that the noise climate, within the vicinity of the nearest noise-sensitive residential receptor, to the North of Takeda Ireland Ltd (Grange Castle) is dominated by noise from an adjacent external facility to the West of the site not related to Takeda Ireland. Noise from this external facility emanates from gas-powered electrical generator sets at the measurement position (Location A) for the daytime, evening and night periods.

At the time of our survey on the 16th and 17th of November 2021, a notable quantity of construction noise was present due to a large construction project (not related to Takeda Ireland Limited). This construction work was located to the northwest of the Takeda Ireland Ltd (Grange Castle) site. Construction noise was ever-present during the daytime, with some construction noise present in the evening and night periods that influenced measurements at NML-1 and with some moderate influence on the noise measurements at NML-2.

In the absence of road traffic noise and construction noise, the resulting noise contribution from this external data centre facility is such that it dominates the noise climate at Takeda Ireland Ltd (Grange Castle) at NML-1. NML-1 is a boundary location to the nearest noise-sensitive residential receptor to the North of the site. In essence, in the absence of extraneous noise, the noise climate remains dominated by a facility external to the Takeda facility (Grange Castle).

Table of Contents

1 Introduction

1.1 Project Brief

ICAN Acoustics have been engaged by Ms Aoife Murray, EHS Department at Takeda Ireland Ltd, Castle Business Park, Nangor Road, Dublin 22, to carry out an annual environmental noise survey at the facility. The noise work was carried out on the 16th and 17th of November 2021 following the guidance in ISO 1996-Part 1, Acoustics-Description, measurements and environmental noise assessment. Calibrated Type 1/Class 1 noise measurement instrumentation was used throughout, and calibration certification is included in the appendices of this report. Figure 1 below shows an approximation of the perimeter of the Takeda site and the nearest noise-sensitive receptor located to the North of the site (Eircode K78 RW26).

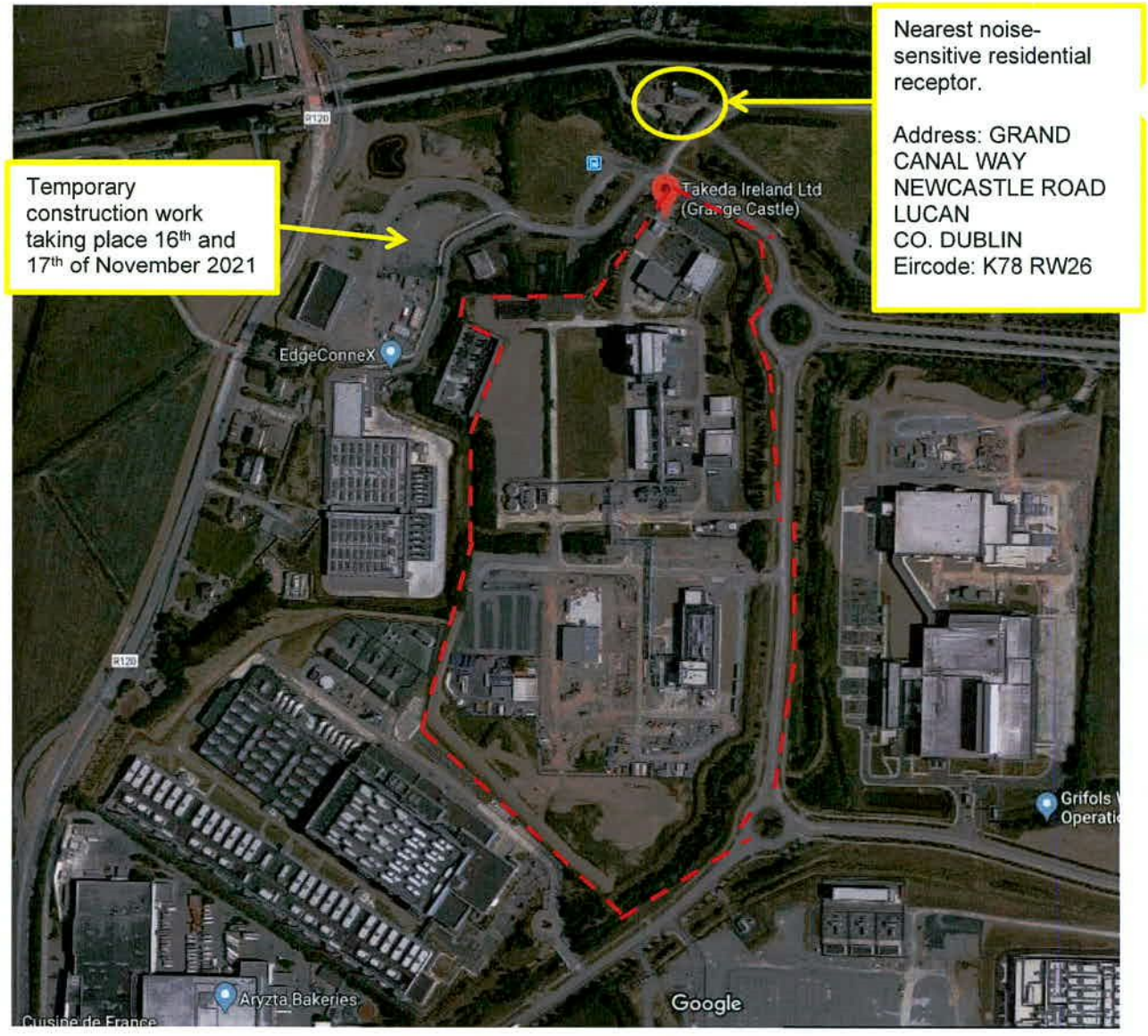

Figure 1: Shows the Takeda site arrangement, the sites approximate perimeter and the nearest noise-sensitive receptor to the North of the facility.

It is worth noting that the Takeda Ireland Ltd (Grange Castle) facility has commercial units on its Western, Southern and Eastern boundaries. Therefore, the only residential receptor within the immediate vicinity of the facility is located to the North of the facility, as shown in Figure 1 above. The purpose of EPA limiting levels is to protect the residential amenity within the area and vicinities of EPA licensed sites, and for this reason, the only residential location being considered in the annual environmental noise report is within the vicinity of the northern site boundary.

1.2 About the author of this report

Diarmuid Keaney works as a noise and vibration consultant for ICAN Acoustics which originally commenced trading in 1998. ICAN Acoustics has a wide variety of clients ranging from state authorities, national power companies to industrial and private clients. Diarmuid holds a Master's of Science in Applied acoustics awarded by Derby University, a Diploma in Acoustics in Noise Control and a BE Honours Degree from the National University of Ireland. Diarmuid was awarded a distinction on completing his M.Sc. in Applied Acoustics and was graded an (A-) for his independent study project. He is a full member of the UK's Institute of Acoustics, the Acoustical Society of America and the Institute of Sound and Communication Engineers. Diarmuid is currently a serving member on the Irish Branch of the Institute of Acoustics since 2010. Diarmuid Keaney of ICAN Acoustics has carried out all measurement work and reporting.

2 Measurement Equipment

Measurements in this report were conducted using two logging sound level meters and a field calibration unit. The instrument details have been provided below, with calibration certification provided in Appendix B.

2.1 NTi Audio XL2 Sound Level Meter (SLM4)

Sound Level Meter, NTi Audio, Serial No: A2A-19921-E0
Calibration Certificate Dated: 29th October 2021 (2-year calibration)
Type 1 instrument.
Calibration certification has been provided in Appendix B of this report.

2.2 NTi Audio XL2 Sound Level Meter (SLM1)

Sound Level Meter, NTi Audio, Serial No: A2A-10976-E0
Calibration Certificate Dated: 20th of October 2021 (2-year calibration)
Type 1 instrument.
Calibration certification has been provided in Appendix B of this report.

2.3 Field Calibration (Instrument CAL-A)

Using the Type 4231 Sound Level Calibrator, which produces a sound level of 93.8dB re.2x10-5 Pa, at a frequency of 1 kHz. The instrumentation used was calibrated before and after use of each measurement with a recorded maximum deviation of –0.02dB
Calibrator, Bruel & Kjaer Type: 4231 with Serial No 2499109
Date of Calibration: 19th October 2021 (annual calibration)
Calibration certification has been provided in Appendix B of this report

Instrument calibration was carried at the beginning of all measurements and repeated after measurements had ceased. The noted deviation did not exceed 0.2dB at any point, typically due to battery ageing.

3 EPA Licensing Conditions

It is a requirement of the Irish Environmental Protection Agency (EPA) to ensure that relevant licensed activities do not result in a significant impact on the residential environment with regard to noise. IPPC and Waste Licenses typically contain a number of conditions in relation to noise, including separate daytime, evening and nighttime noise limits, monitoring/reporting protocols and site-specific noise monitoring locations. It is the responsibility of each licensee to ensure that the site is compliant with these conditions and does not have a detrimental effect on the local noise climate. The terminology for all metrics used has been provided in Appendix A.

For the Takeda Ireland Ltd (Grange Castle) site, EPA License Registration Number P0963-02 sets out specific noise limiting levels that are attached to the site. Therefore, noise monitoring was undertaken as per Condition 6.13 Noise of IPPC License Number P0963-02, as shown in Figure 2 below.

6.13 **Noise**

The licensee shall carry out a noise survey of the site operations as required by the Agency. The survey programme shall be undertaken in accordance with the methodology specified in the 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Agency.

Figure 2: Noise Condition 6.13 from IPPC License Number P0963-02

Noise monitoring was undertaken on the 16th and 17th of November 2021 to verify compliance or otherwise with the noise emission limits as outlined in Schedule B4: Noise Emissions of IPPC License Register Number P0963-02. Noise monitoring was undertaken, and reporting was carried out following the guidelines as set out in the Guidance Note for Noise (NG4).

Environmental Protection Agency *Licence Reg. No. P0693-02*

B.4 Noise Emissions

Daytime dB $L_{A1,T}$ (30 minutes)	Evening time dB $L_{A1,T}$ (30 minutes)	Night-time dB $L_{Aeq,T}$ (30 minutes)
55	50	45 Note 1

Note 1: There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise-sensitive location.

Figure 3: Noise Emission limits specified in P0963-02, Schedule B4.

4 Noise Sensitive Receptors

4.1 The Nearest Noise Sensitive Receptor to Takeda

It should be noted that there are other commercial enterprises located on the Western, Eastern and Southern boundaries of Takeda Ireland Ltd (Grange Castle), as shown in Figure 4 below. Therefore, Table 1 has been provided to allow each entity to be identified and correlated with the reference locations shown in Figure 4 below, denoted as Location A, B, C, D, E, F and G.

It would appear that the only noise-sensitive location within the immediate vicinity of Takeda Ireland Ltd (Grange Castle) is a residential single storey dwelling on the northern side of the facility (Eircode K78 RW26). No measurements were carried out at this residential location on private lands; however, noise measurements were carried out at NML1 on the Northern side of Takeda Ireland Ltd (Grange Castle) to determine the likely industrial noise level in the area and the likely noise climate at this residential location.

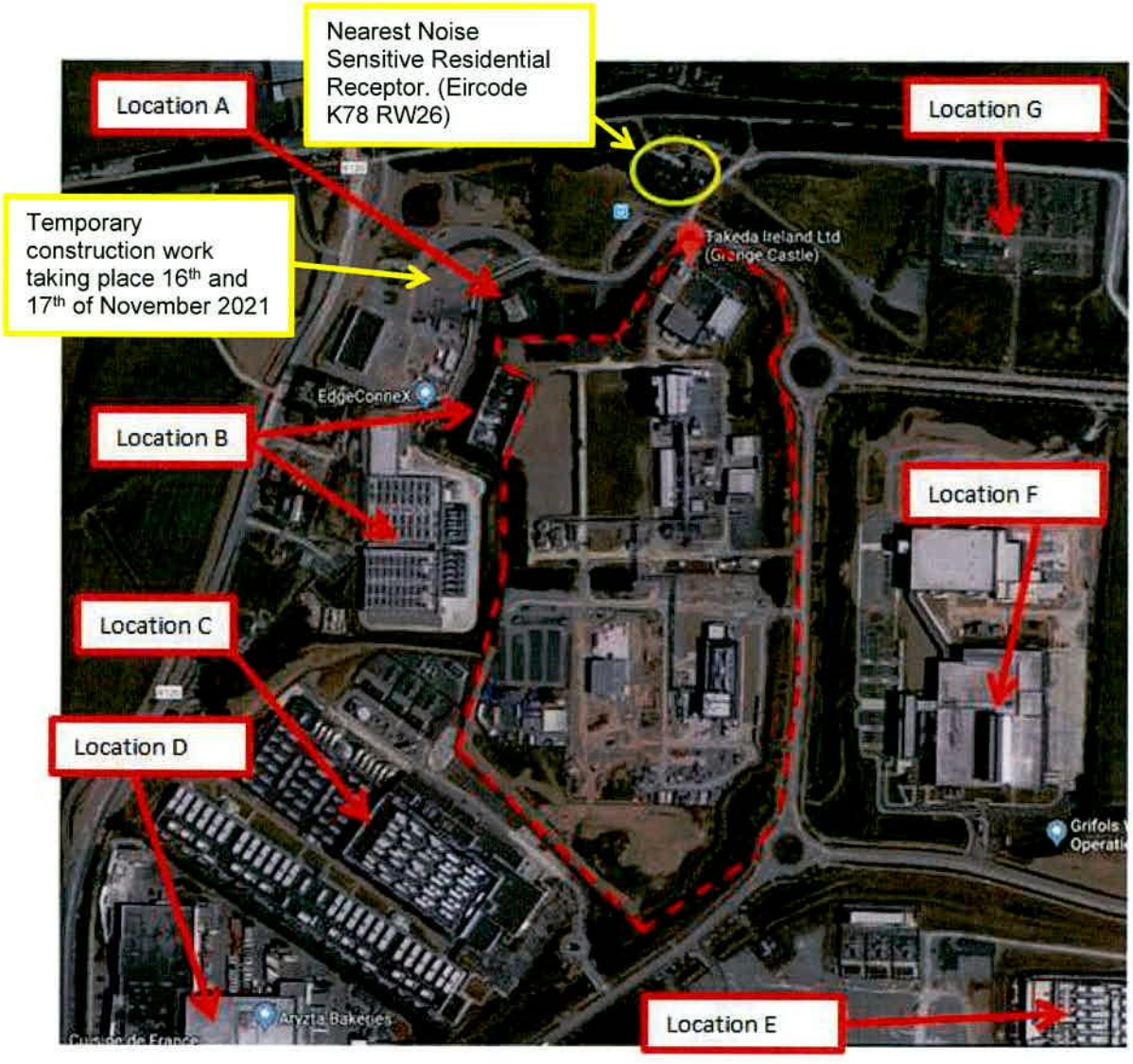

Figure 4: Site layout showing commercial entities to the West, South and East of the Takeda Ireland Ltd

Locn.	Item	Comments/Notes
A	South Dublin County Council pumping station.	Noise generated by water pumps and ventilation. Plant noise audible within the boundary of the site.
B	EdgeConneX	Data Centre, powered by gas-powered engines running generators. Dominant noise source within the area. This survey included the noted movement of construction vehicles with reversing alarms within the vicinity of the facility.
C	Data Centre	Not known and not identified on local maps, Google Earth or with signage on the site, perhaps for security purposes.
D	Artzta Bakeries/Cuisine de France	Noise from plant and vehicle movements.
E	Data Centre	Not known and not identified on local maps or Google Earth.
F	Grifols Healthcare	
G	Power Substation	Typically transformer noise and corona noise.

Table 1: Commercial entities located on the Western, Southern and Eastern boundaries of Takeda Ireland Ltd (Grange Castle).

5 Measurement Results

5.1 Noise Monitoring Locations

Noise monitoring was conducted on the site's Northern boundary at NML-1 and NML-2. The purpose of measuring the noise climate at NML-2 was to verify the noise contribution and frequency spectra from the Data Centre nearby.

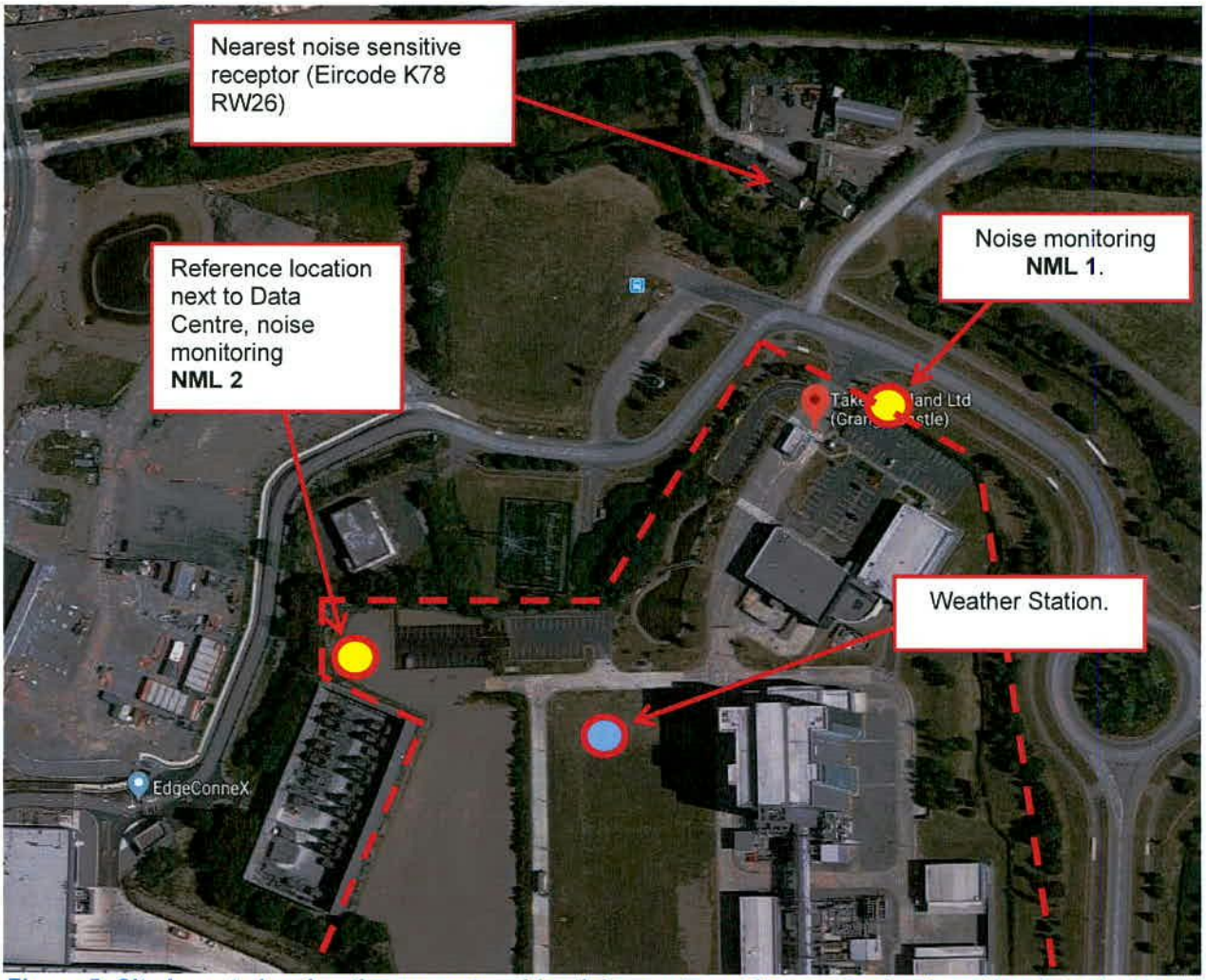

Figure 5: Site layout showing the nearest residential receptor, noise monitoring Location A to the North of the site and Location B on the Western Boundary.

5.2 Noise Monitoring Location 1 (NML-1)

This measurement location was monitored continuously and was subjectively witnessed throughout the measurement process at various times throughout our survey. In the absence of construction noise and local road traffic, industrial noise was noted to emanate from gas-powered generation sets from the adjacent site on the West of the Takeda facility. On the 16th and 17th of November 2021, we recorded a substantial quantity of construction noise from what we understand to be a new data centre being constructed to the northwest of the site. As well as construction noise, a considerable quantity of road traffic passed this location, which was witnessed during the daytime and evening period. Traffic noise levels fall significantly at night. Traffic noise sources included cars, buses and HGVs, which pass on the access road to the North of the site. Additionally, there was a notable quantity of birdsong during the measurements throughout the observation periods. Other noise sources included aircraft events, most likely related to the Casement/Baldonnell military aerodrome, which is located circa 2.5km South of the Takeda facility with a second aerodrome (Weston Airport) circa 3.4km to the northwest of the Takeda facility. During lulls, the construction noise and road traffic, noise from the gas-powered generation sets on the western side of the Takeda facility, remained dominant.

5.2.1 Daytime Noise Survey Results at NML-1

Figure 6 below shows measurements carried out at NML-1 during daytime hours from circa 17:00hrs to 19:00hrs observed over 30minute intervals. It is important to note that measurements at this location were noticeably affected by construction noise, road traffic noise, and a contribution from gas-powered generation sets in use at a Data Centre nearby.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-16 17:00:00	00:04:06	54.6	68.3	57.3	51.4
30'	2021-11-16 17:30:00	00:30:00	53.9	68.8	55.8	51.2
30'	2021-11-16 18:00:00	00:30:00	54.4	68.1	57.0	50.6
30'	2021-11-16 18:30:00	00:30:00	55.3	71.3	58.8	50.9

Figure 6: Daytime Noise Survey at NML-1 on the boundary closest to the nearest noise-sensitive receptor on the Northern side of the Takeda facility.

Figure 7 below shows daytime noise measurements carried out at NML-1 from 07:00hrs to 16:00hrs observed over 30minute intervals. It is important to note that measurements at this location were noticeably affected by construction noise, road traffic noise, and a contribution from gas-powered generation sets in use at a Data Centre nearby.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-17 07:00:00	00:30:00	56.7	71.9	59.9	52.8
30'	2021-11-17 07:30:00	00:30:00	56.7	73.4	59.1	53.0
30'	2021-11-17 08:00:00	00:30:00	58.4	74.5	60.4	55.7
30'	2021-11-17 08:30:00	00:30:00	59.9	76.3	63.5	52.8
30'	2021-11-17 09:00:00	00:30:00	60.2	82.2	61.1	53.1
30'	2021-11-17 09:30:00	00:30:00	60.4	75.9	63.3	54.0
30'	2021-11-17 10:00:00	00:30:00	57.7	73.0	60.2	52.5
30'	2021-11-17 10:30:00	00:30:00	59.1	84.8	60.8	51.3
30'	2021-11-17 11:00:00	00:30:00	58.7	75.2	61.2	52.0
30'	2021-11-17 11:30:00	00:30:00	60.3	76.4	62.9	51.8
30'	2021-11-17 12:00:00	00:30:00	59.6	78.3	62.6	51.9
30'	2021-11-17 12:30:00	00:30:00	59.0	76.5	61.1	52.1
30'	2021-11-17 13:00:00	00:30:00	57.1	76.7	58.9	51.3
30'	2021-11-17 13:30:00	00:30:00	56.8	80.6	56.9	50.6
30'	2021-11-17 14:00:00	00:30:00	60.9	73.6	65.1	51.4
30'	2021-11-17 14:30:00	00:30:00	62.4	80.3	65.7	58.9
30'	2021-11-17 15:00:00	00:30:00	57.9	75.0	60.8	52.4
30'	2021-11-17 15:30:00	00:30:00	59.3	74.8	62.2	53.1
30'	2021-11-17 16:00:00	00:30:00	55.8	73.2	58.3	51.0

Figure 7: Daytime Noise Survey at NML-1on the boundary closest to the nearest noise-sensitive receptor on the Northern side of the Takeda facility.

5.2.2 Evening Noise Survey Results at NML-1

Figure 8 below shows evening noise measurements carried out at NML-1 from 19:00hrs to 23:00hrs observed over 30minute intervals. It is important to note that measurements at this location were noticeably affected by construction noise, road traffic noise, and a contribution from gas-powered generation sets in use at a Data Centre nearby.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-16 19:00:00	00:30:00	58.2	78.3	62.5	50.5
30'	2021-11-16 19:30:00	00:30:00	58.1	75.3	61.6	51.3
30'	2021-11-16 20:00:00	00:30:00	54.0	74.7	55.8	50.7
30'	2021-11-16 20:30:00	00:30:00	52.7	64.6	54.8	50.7
30'	2021-11-16 21:00:00	00:30:00	52.7	67.8	54.5	50.4
30'	2021-11-16 21:30:00	00:30:00	51.3	65.2	52.3	49.6
30'	2021-11-16 22:00:00	00:30:00	51.1	64.5	52.4	49.4
30'	2021-11-16 22:30:00	00:30:00	51.0	66.3	51.7	49.1

Figure 8: Evening Noise Survey at NML-1 on the boundary closest to the nearest noise-sensitive receptor on the Northern side of the Takeda facility.

5.2.1 Night Survey Results

In previous noise measurements, it was found that the noise climate at this location from 23:00hrs was dominated by noise from the data centre nearby. However, during this survey period, a substantial amount of construction noise took place in the area. This included passing construction traffic and noise events at night, which dominated the measurements NML1 at times. Analysis of the spectra for the night period showed ever-present elevated low-frequency bands at 100Hz and 125Hz. This low-frequency noise is likely to be a combination of the gas-powered data centre sounds and low-frequency noise from construction site generators and equipment. For example, it was noted that there was a notable level of construction work taking place between 01:36hrs and 02:33hrs. Other sources at night included occasional birdsong as well as the dawn chorus. Whilst road traffic noise had fallen considerably during the nighttime survey, residual steady-state noise from gas-powered generator sets in the area was ever-present.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-16 23:00:00	00:30:00	52.4	74.9	54.2	49.3
30'	2021-11-16 23:30:00	00:30:00	51.7	67.5	54.1	49.1
30'	2021-11-17 00:00:00	00:30:00	52.0	71.5	53.5	49.1
30'	2021-11-17 00:30:00	00:30:00	58.3	81.8	60.6	49.8
30'	2021-11-17 01:00:00	00:30:00	52.4	69.4	55.2	49.1
30'	2021-11-17 01:30:00	00:30:00	54.3	65.1	56.8	49.5
30'	2021-11-17 02:00:00	00:30:00	55.0	72.5	57.2	52.0
30'	2021-11-17 02:30:00	00:30:00	52.3	75.3	54.1	48.6
30'	2021-11-17 03:00:00	00:30:00	51.3	69.6	53.5	48.6
30'	2021-11-17 03:30:00	00:30:00	50.8	65.0	52.9	48.7
30'	2021-11-17 04:00:00	00:30:00	67.7	95.9	53.2	48.8
30'	2021-11-17 04:30:00	00:30:00	52.6	79.2	51.3	49.0
30'	2021-11-17 05:00:00	00:30:00	52.7	79.7	51.7	49.3
30'	2021-11-17 05:30:00	00:30:00	52.2	69.9	54.0	49.9
30'	2021-11-17 06:00:00	00:30:00	55.1	77.4	57.6	51.1
30'	2021-11-17 06:30:00	00:30:00	57.3	71.0	60.7	53.0

Figure 9: Night Noise Survey at NML-1 on the boundary closest to the nearest noise-sensitive receptor on the Northern side of the Takeda facility.

Tonal Assessment at night.

During the nighttime noise survey, after 23:00hrs, it was noted that there were some construction noise events and some steady-state construction noise present at NML1. One notable construction noise activity took place from 01:36hrs to 02:33hrs. However, other noise sources at night included a bird song, which was intermittent and random, except during the dawn chorus, which took place from 06:18hrs to circa 08:30hrs.

When distant traffic noise had fallen, and when there was no construction noise, between circa 03:00hrs to 04:00hrs, noise emanating from the data centre nearby remained dominant. Using the objective methods described in ISO1996-Part 2 (1/3 octave method) and the objective method described in BS4142:2014 (1/3 octave method), the noise measured during this survey was not found to be tonal at this location. However, there are raised bands at 100Hz and 125Hz, typical of low-frequency noise associated with biogas generation and possible diesel-powered lighting or generation associated with the construction site in the area.

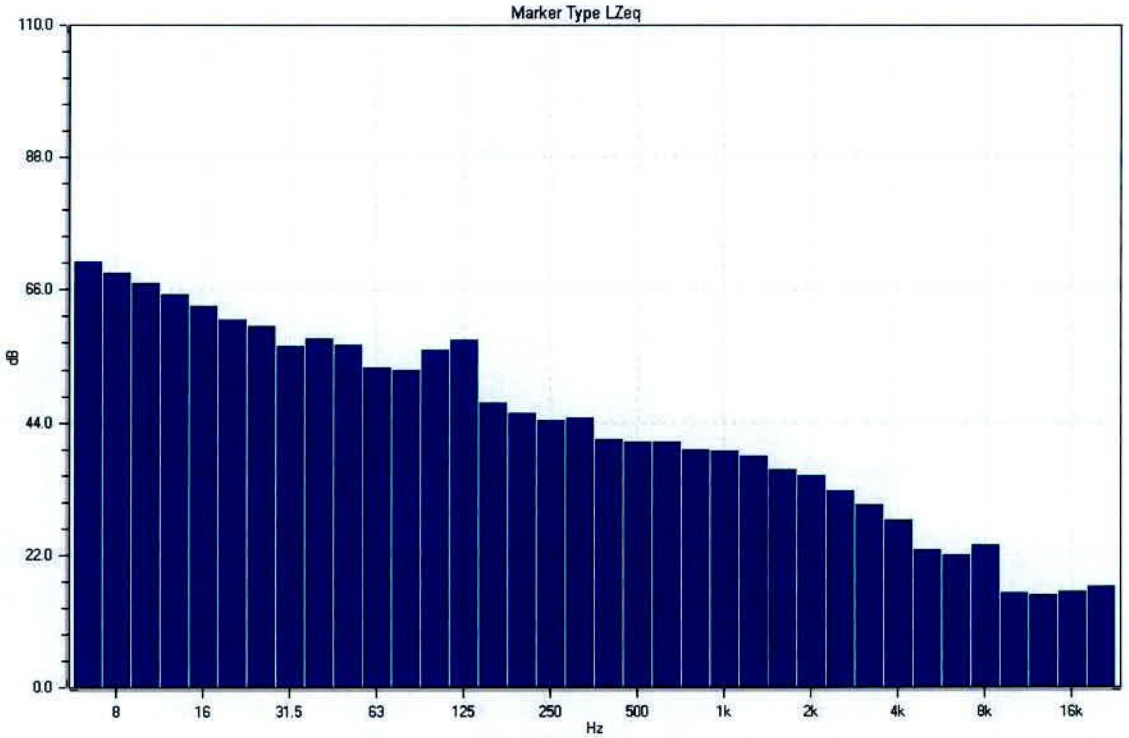

Figure 10: Measured from 04:15hrs to 04:50hrs and when assessed using ISO 1996-Part2 and BS4142:2014, the noise was not found to be tonal.

5.3 Noise Monitoring Location 2 (NML-2)

At this location on the Western Boundary, the noise was monitored near one Data Centre on the site's Western side. The noise climate at this location is dominated by noise from the gas-powered generator sets nearby. This location has been used in the past essentially to verify the presence of one of the noise contributors in the general area not related to the Takeda facility.

Daytime at NML-2

However, the dominant ever-present noise was that of the gas-powered generation sets from an adjacent site to the West of the Takeda facility. No noise was audible from the plant at Takeda at this time.

Time	Locn.	File	Description
12:59hrs to 14:30hrs	MP-NS-02	17-SLM-001	Noise climate dominated by the data centre nearby. It is understood that the generator sets are gas-powered; however, this has not been verified. There were several elevated bands centred around 125Hz, but there was no evidence of tonality at this location. There was also a noise contribution from the SDCC pumping station nearby. The data centre noise dominates the noise climate, and no noise from Takeda was audible at this location. At 13:35hrs, a notable aircraft event was relatively low, associated with Baldonnell or Weston Airport nearby. Additionally, there were some construction noise events nearby, but the data centre remained dominant.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-17 12:30:00	00:01:54	60.0	64.5	60.7	59.3
30'	2021-11-17 13:00:00	00:30:00	60.2	68.7	61.1	59.1
30'	2021-11-17 13:30:00	00:30:00	60.6	80.0	60.8	59.1
30'	2021-11-17 14:00:00	00:30:00	59.8	68.5	60.5	58.9
30'	2021-11-17 14:30:00	00:00:34	61.5	66.2	63.4	59.9

Figure 11: Daytime measurements at NML-2

Time	Locn.	File	Description
18:28hrs to 19:00hrs	MP-NS-02	16-SLM-000	Noise climate dominated by the data centre nearby. It is understood that the generator sets are gas-powered; however, this has not been verified. There were many raised bands centred around 125Hz, but there was no evidence of tonality at this location. There was also some moderate noise contribution from the SDCC pumping station nearby. The data centre noise dominates the noise climate, and no noise from Takeda was audible at this location. Additionally, there were some construction noise events nearby, but the data centre remained dominant.

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-16 18:00:00	00:01:32	58.9	62.1	59.8	57.8
30'	2021-11-16 18:30:00	00:30:00	58.9	69.7	59.5	58.2

Figure 12: Daytime measurements at NML-2.

Evening at NML-2

Time	Locn.	File	Description
19:00hrs to 20:03hrs	NML-2	16-SLM-000	Noise climate dominated by the centre nearby. There was a notable quantify of construction noise event in this measurement which sounded like percussive chipping or rock breaking from 19:30hrs to 19:55hrs. Between 19:55hrs and 20:03hrs, the noise climate was dominated by steady-state noise from the data centre adjacent to this measurement location, with a steady-state noise level in the order of 58~59dB(A).

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
30'	2021-11-16 19:00:00	00:30:00	59.0	71.6	59.6	58.3
30'	2021-11-16 19:30:00	00:30:00	61.1	70.9	63.0	58.5
30'	2021-11-16 20:00:00	00:03:04	59.4	63.3	60.0	58.6

Figure 13: Evening measurements at NML-2

Night at NML-2

Time	Locn.	File	Description
00:23hrs to 01:09hrs.	NML-2	17-SLM-000	Noise climate dominated by the centre nearby. Ambient noise levels had fallen considerably, including construction noise and the data centre's noise remained dominant. The noise climate remains low frequency dominant at this location, centred around 125Hz; however, it was not found to be tonal with a steady-state noise level in the order of 59dB(A).

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	L 90.0 % [dB]
30'	2021-11-17 00:00:00	00:07:06	60.0	63.1	58.2	59.4
30'	2021-11-17 00:30:00	00:30:00	60.1	65.8	57.6	59.5
30'	2021-11-17 01:00:00	00:09:39	60.2	62.8	57.5	59.4

Figure 14: Night measurements at NML-2

6 Discussion: Dominant Sources External to Takeda

Noise monitoring was conducted primarily on the Northern boundary of the site. However, the gas-powered generators in use at an adjacent facility were also occasionally audible at monitoring location NML-1 in the absence of construction noise and local traffic noise throughout the monitoring period. Therefore, we can definitively say that independent of Takeda Ireland Ltd, temporary construction noise and permanent noise emanating from an adjoining site influenced the measured noise level at NML-1. However, with local and distant traffic noise at a minimum during night periods, levels from the data centre generator sets (and possibly night power at the nearby construction site) were found to be 49dB, LA90 at NML-1. In addition, daytime, evening and even nighttime steady-state noise levels at NML-1 on occasion were notably affected by noise from construction activities nearby, too, so levels have been stated in Figure 15 below. However, these noise levels are not levels attributable to Takeda Ireland Ltd, but instead to nearby construction activities and data centres operating in the area.

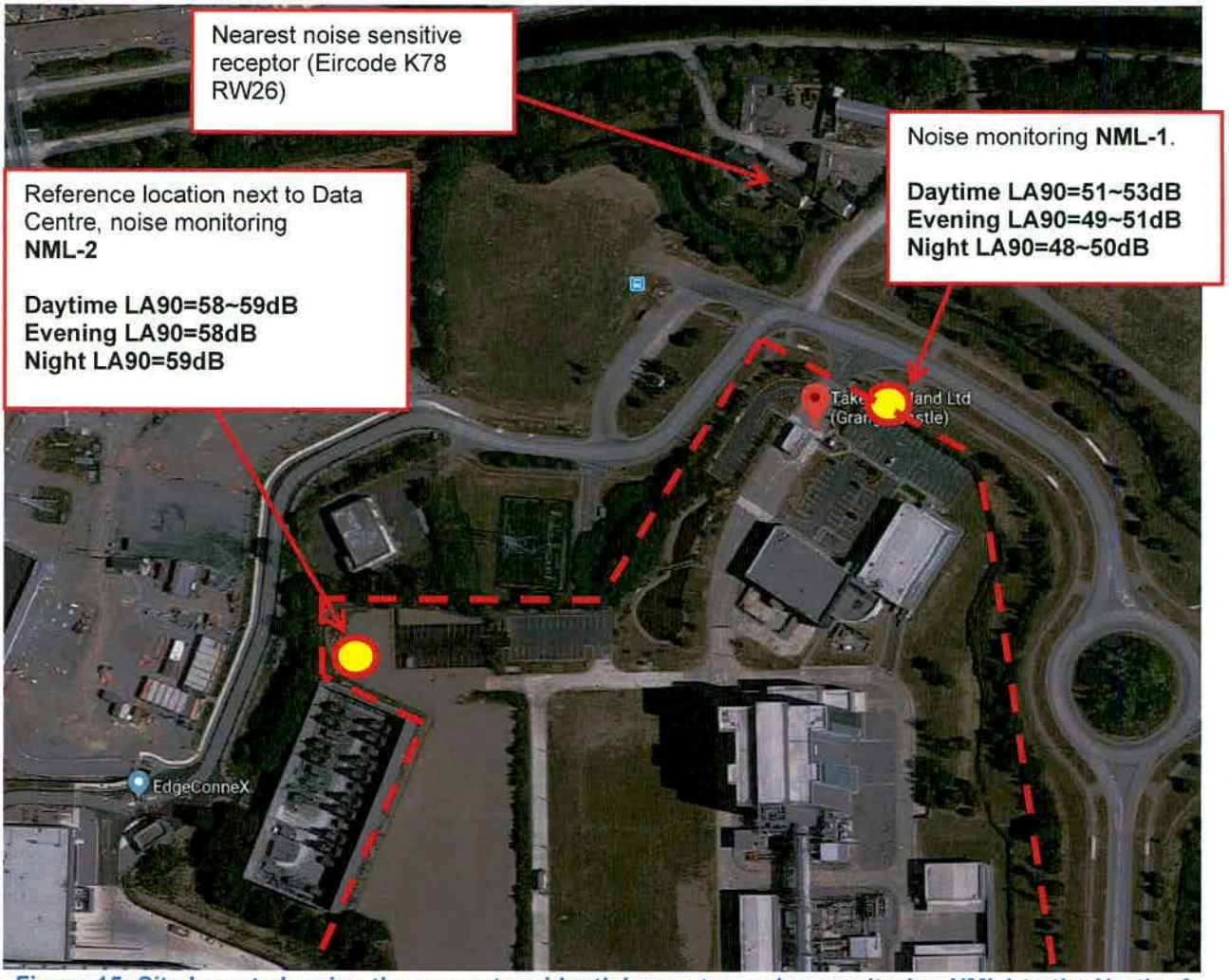

Figure 15: Site layout showing the nearest residential receptor, noise monitoring NML1 to the North of the site and NML2 on the Western Boundary.

In addition to the noise present at NML1 from the gas-powered generator sets (at an adjacent site to the West), it would appear that the raised bands at 100Hz and 120Hz at NML1 are not tonal when assessed using BS4142:2014 and ISO1996-Part 2 guidance. The presence of the elevated band at 100Hz and 120Hz has been noted for the Daytime, Evening and Night period at Location NML1, in the absence of birdsong, road traffic or variable and intermittent construction noise, as shown in Figure 16 below. In the absence of extraneous noise, the character of the noise at Location NML1 is similar to that which was witnessed at Location NML2, and the 1/3 octave data show a close correlation.

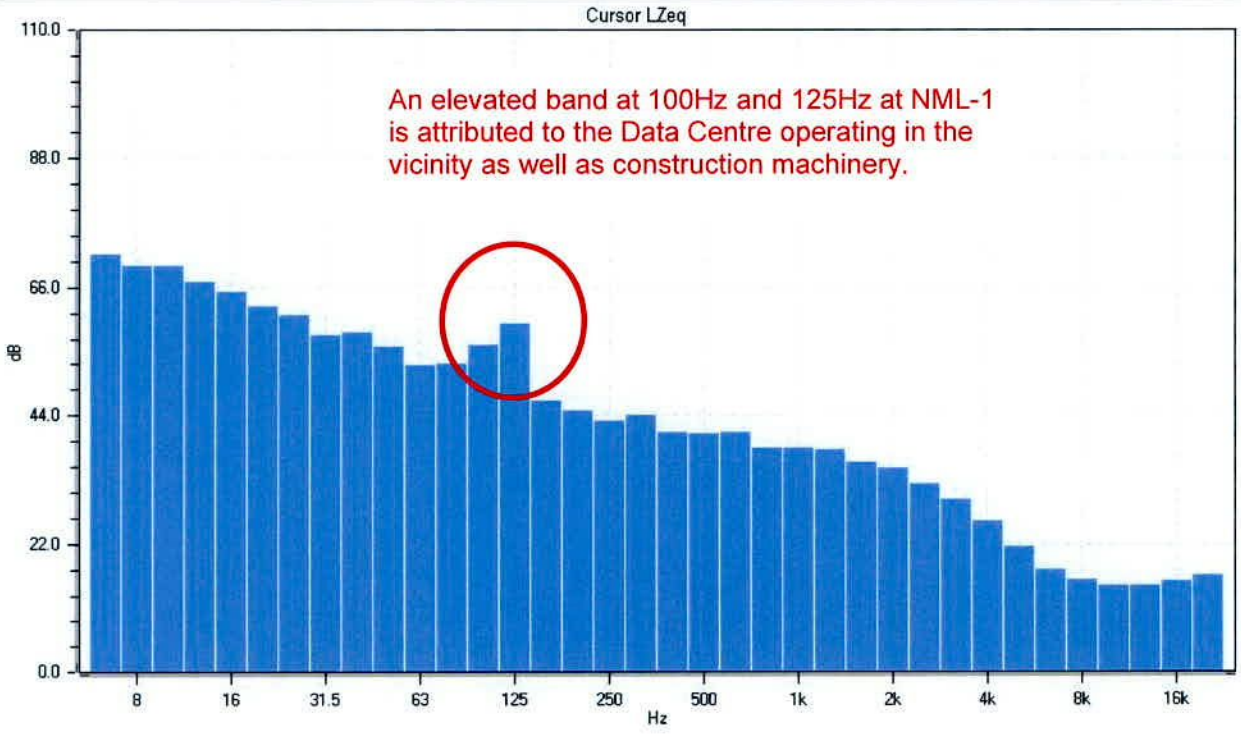

Figure 16: Spectra at NML1 showing an elevated band at 125Hz noted at Location NML1 at night at 03:27hrs (not related to the Takeda facility).

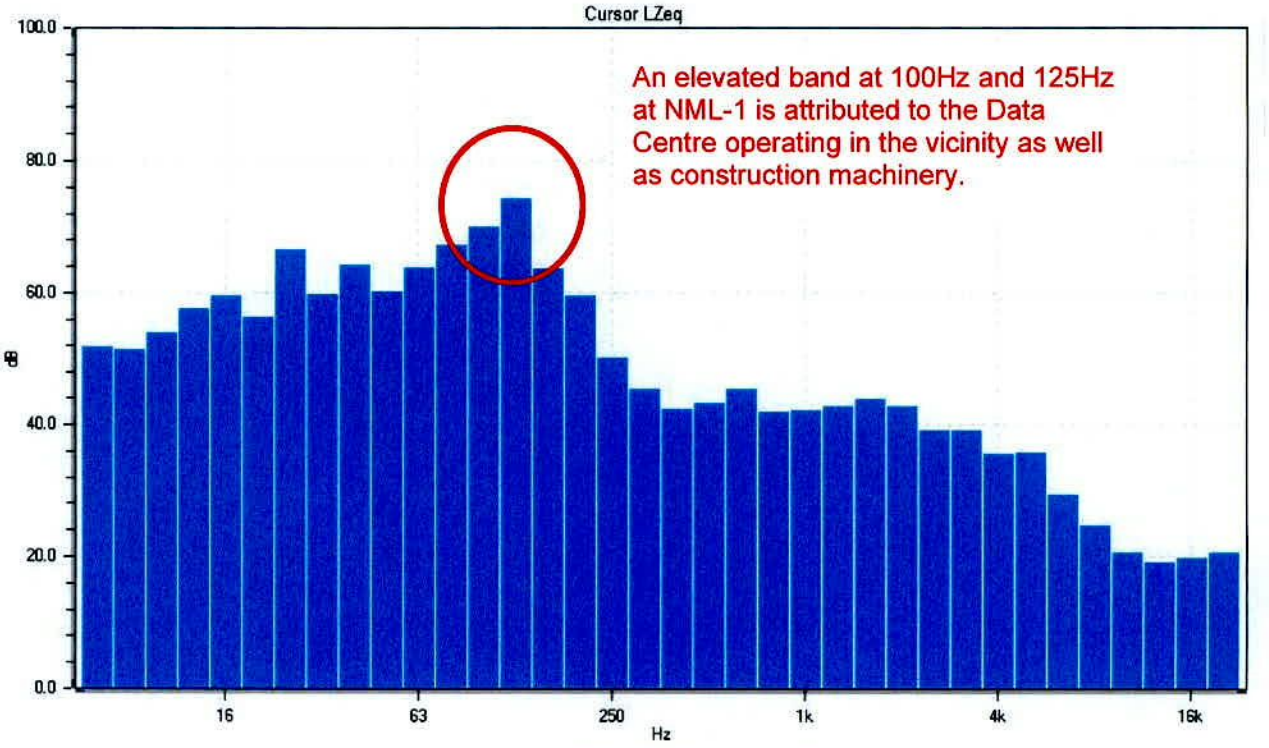

Figure 17: Spectra at NML2 showing an elevated band at 125Hz noted at Location NML1 at night at 00:44hrs (not related to the Takeda facility).

7 Conclusions

Having carried out a comprehensive and detailed noise survey at Takeda Ireland Ltd, Castle Business Park, Nangor Road, Dublin 22, on the 16th and 17th of November 2021, during the daytime, evening and night period, we find that:

- Takeda Ireland Ltd (Grange Castle) is well-positioned in that there is only a single noise-sensitive residential property on the northern side of the facility. This means that the other boundaries are ideally shared with other commercial entities rather than residential, making for a good arrangement regarding the potential of site noise emissions impacting on residential.
- Noise emissions from the Takeda Ireland Ltd (Grange Castle) are NOT shown to exceed the daytime, evening limiting levels at NML1, which is within the vicinity of the nearest noise-sensitive receptor to the North of the site. It is also important to note that measurements included extraneous noise from nearby operational data centres and noise from construction on the dates of our survey. Additionally, Takeda Ireland Ltd (Grange Castle) is ONLY responsible for noise that Takeda Ireland makes, and that noise present did not relate to Takeda Ireland. Therefore, it was clear that even in the absence of local traffic and construction noise, the noise present was not attributable to Takeda Ireland Ltd.
- The noise climate at Location NML1 is dominated by noise from gas-powered electrical generation to the West of the site and construction noise during the daytime, evening and night, which is external, separate and independent to Takeda Ireland Ltd.
- It has been found that the dominant source of noise in the vicinity was from gas-powered electrical generation in use at data centres in the area in the absence of construction noise. While this noise from data centres external to Takeda Ireland Ltd (Grange Castle) was found to be tonal in 2019 at NML1, it was not found to be tonal in 2020 or 2021. Therefore, tonality was assessed at NML1 using the objective methods stipulated in ISO 1996-Part 2 (1/3 octave method) for the daytime, evening and night periods.

Measurements show that the general area remains saturated by noise from an adjacent facility which is highly influential on the measured level NML 1 and NML 2 at the Takeda Ireland Ltd (Grange Castle) site. It would appear that the only way of determining the contribution of noise from the Takeda Ireland Ltd (Grange Castle) site would be to shut down the neighbouring gas-powered generator sets operating at data centres in the area. The gas-powered generator units appear to run continuously, and we understand that they provide power to a nearby data centre. It is not known if the power arrangements are temporary or permanent. At the same time, they continue to dominate the noise climate in the area. Construction noise present during our survey on the 16th and 17th of November 2021, external to Takeda Ireland Ltd, also presented further difficulties in quantifying noise emissions from Takeda Ireland Ltd (Grange Castle). There is NO evidence to suggest that Takeda Ireland Ltd (Grange Castle) are in excess of their EPA stipulated limiting levels. Measurements clearly show that the noise can be attributed to a separate data warehouse facility to the West of the Takeda site and relatively temporary construction noise. Even in the absence of construction noise, it was found that gas-powered generators at an adjacent site prevent the measurement of the noise contribution from Takeda at that location. Our subjective observations during noise monitoring at both NML1 and NML2 indicated that the Takeda plant did not make an appreciable contribution to the noise climate in that locality and remained inaudible during witnessed measuements.

8 Appendix A: Terminology

Decibel (dB): A decibel is a unit of level, which denotes the ratio between two quantities that are proportional to the power; the number of decibels corresponding to the ratio of two powers is ten times the logarithm to the base 10 of this ratio.

dB(A): A-weighted sound pressure level (SPL) approximately equivalent to the human ear frequency response to noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear frequency response of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Equivalent Continuous (A) Weighted Sound Level [L_{AeqT}]:

This can be regarded as a notional level, which would, in the course of the measuring period (T), cause the same (A) weighted sound energy to be received as that due to the actual sound over the actual measuring period.

LA90 is the "A weighted" noise levels that are exceeded for 90% of each sample period. This is term used to measure the background noise level in an area.

Hertz (Hz): The unit of frequency equivalent to one cycle per second.

Sound pressure level (SPL) or sound level Lp is a logarithmic measure of the root-mean-square sound pressure of a sound relative to a reference value (at the threshold of hearing). It is measured in decibel (dB).

9 Appendix B: Instrument Calibration Certification

9.1 Logging Type Approved Measurement Instrument SLM4 (S/N A2A-19921-E0)

NTi AUDIO

Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **XL2 Audio and Acoustic Analyzer**
- Serial Number: **A2A-19921-E0**

- Certificate Issued: **29 October 2021**
- Certificate Number: **44498-A2A-19921-E0**
- Results: **PASSED**
  (for detailed report see next page)

Tested by: M. Frick

Signature:

Stamp: NTi Audio AG
Im alten Riet 102
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www.nti-audio.com

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10 Appendix C: Local Weather Data (16/17th October 2021)

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
16/11/2021	17:20	18.7	0	N	762.2	0
16/11/2021	17:30	18.1	0	N	762.1	0
16/11/2021	17:40	13.8	2.2	SSW	762.2	0
16/11/2021	17:50	12.1	2.7	SW	762.4	0
16/11/2021	18:00	11.9	2.2	SW	762.4	0
16/11/2021	18:10	11.8	2.2	SSW	762.5	0
16/11/2021	18:20	11.9	1.8	SSW	762.5	0
16/11/2021	18:30	11.9	1.3	SW	762.7	0
16/11/2021	18:40	11.9	1.3	WNW	762.8	0
16/11/2021	18:50	11.6	2.2	WNW	762.7	0
16/11/2021	19:00	11.2	2.2	WNW	762.8	0
16/11/2021	19:10	11	2.2	WNW	762.9	0
16/11/2021	19:20	10.8	2.2	WNW	763	0
16/11/2021	19:30	10.7	2.2	WNW	763	0
16/11/2021	19:40	10.6	2.2	WNW	763.1	0
16/11/2021	19:50	10.4	1.8	WNW	763.1	0
16/11/2021	20:00	10.6	1.3	W	763.2	0
16/11/2021	20:10	10.6	1.3	WNW	763.3	0
16/11/2021	20:20	10.4	1.3	WNW	763.4	0
16/11/2021	20:30	10.3	0.9	WSW	763.4	0
16/11/2021	20:40	10.2	0.4	WNW	763.5	0
16/11/2021	20:50	10.2	0.9	SSW	763.4	0
16/11/2021	21:00	10.2	0.9	S	763.4	0
16/11/2021	21:10	10.2	0.9	W	763.5	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
16/11/2021	21:20	10.2	0.9	W	763.6	0
16/11/2021	21:30	10.1	0.9	SSW	763.7	0
16/11/2021	21:40	9.8	0.9	SW	763.8	0
16/11/2021	21:50	9.7	1.8	SSW	763.8	0
16/11/2021	22:00	9.7	2.2	SW	764	0
16/11/2021	22:10	9.8	2.7	SW	764.2	0
16/11/2021	22:20	9.8	2.2	SW	764.1	0
16/11/2021	22:30	9.6	2.7	SW	764	0
16/11/2021	22:40	9.7	2.7	SW	763.9	0
16/11/2021	22:50	9.7	2.7	SW	763.8	0
16/11/2021	23:00	9.8	2.7	SW	763.8	0
16/11/2021	23:10	9.7	2.7	SW	764	0
16/11/2021	23:20	9.6	2.2	SW	764.1	0
16/11/2021	23:30	9.4	2.2	SW	764.1	0
16/11/2021	23:40	9.3	2.7	SW	764.1	0
16/11/2021	23:50	9.1	2.2	SSW	764.2	0
17/11/2021	00:00	9.1	2.7	SW	764.3	0
17/11/2021	00:10	9	2.7	SW	764.3	0
17/11/2021	00:20	8.9	2.7	SW	764.2	0
17/11/2021	00:30	8.8	2.7	SW	764.3	0
17/11/2021	00:40	8.7	2.7	SSW	764.4	0
17/11/2021	00:50	8.7	2.7	SW	764.5	0
17/11/2021	01:00	8.8	2.2	SSW	764.6	0
17/11/2021	01:10	8.7	2.7	SW	764.7	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
17/11/2021	01:20	8.7	2.7	SW	764.7	0
17/11/2021	01:30	8.7	2.7	SW	764.6	0
17/11/2021	01:40	8.6	2.7	SW	764.7	0
17/11/2021	01:50	8.4	2.2	SW	764.7	0
17/11/2021	02:00	8.5	2.7	SW	764.8	0
17/11/2021	02:10	8.6	2.7	SW	764.8	0
17/11/2021	02:20	8.6	2.2	SSW	764.8	0
17/11/2021	02:30	8.6	2.2	SSW	764.7	0
17/11/2021	02:40	8.6	2.7	SSW	764.8	0
17/11/2021	02:50	8.7	2.7	SSW	764.9	0
17/11/2021	03:00	8.7	2.2	SSW	765	0
17/11/2021	03:10	8.6	2.2	SSW	765	0
17/11/2021	03:20	8.5	2.2	SSW	765	0
17/11/2021	03:30	8.6	2.2	SW	765.1	0
17/11/2021	03:40	8.7	2.2	SSW	765.2	0
17/11/2021	03:50	8.9	2.7	SW	765.1	0
17/11/2021	04:00	8.7	1.8	SSW	765.1	0
17/11/2021	04:10	8.7	2.2	SSW	765.2	0
17/11/2021	04:20	8.7	2.7	SW	765.2	0
17/11/2021	04:30	8.7	2.7	SW	765.3	0
17/11/2021	04:40	8.8	3.1	SW	765.3	0
17/11/2021	04:50	8.9	3.1	SW	765.5	0
17/11/2021	05:00	8.7	3.1	SW	765.5	0
17/11/2021	05:10	8.6	2.2	SW	765.6	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
17/11/2021	05:20	8.6	2.2	SW	765.7	0
17/11/2021	05:30	8.8	2.7	SSW	765.7	0
17/11/2021	05:40	9	2.7	SSW	765.7	0
17/11/2021	05:50	9.2	2.7	SW	765.6	0
17/11/2021	06:00	9.2	2.7	SW	765.7	0
17/11/2021	06:10	9.2	2.7	SW	765.7	0
17/11/2021	06:20	9.1	2.7	SW	765.7	0
17/11/2021	06:30	9.2	3.1	SW	765.7	0
17/11/2021	06:40	9.1	2.7	SW	765.9	0
17/11/2021	06:50	9.2	3.1	SW	766	0
17/11/2021	07:00	9.2	3.1	SW	766.1	0
17/11/2021	07:10	9.3	2.2	SSW	766.2	0
17/11/2021	07:20	9.3	2.2	SW	766.3	0
17/11/2021	07:30	9.2	1.8	SSW	766.3	0
17/11/2021	07:40	9.1	2.2	SSW	766.3	0
17/11/2021	07:50	9	2.7	SSW	766.3	0
17/11/2021	08:00	9.1	2.7	S	766.4	0
17/11/2021	08:10	9.1	3.1	S	766.5	0
17/11/2021	08:20	9.3	2.7	S	766.8	0
17/11/2021	08:30	9.4	2.7	S	766.8	0
17/11/2021	08:40	9.4	2.7	S	766.9	0
17/11/2021	08:50	9.6	2.7	SSW	766.9	0
17/11/2021	09:00	9.8	3.1	SW	767	0
17/11/2021	09:10	9.9	2.7	SSW	766.9	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
17/11/2021	09:20	9.8	2.7	SSW	766.7	0
17/11/2021	09:30	10.1	2.7	SSW	766.8	0
17/11/2021	09:40	10.2	2.7	SSW	766.9	0
17/11/2021	09:50	10.1	3.1	S	767	0
17/11/2021	10:00	10.2	2.7	SSW	767.1	0
17/11/2021	10:10	10.4	2.2	SW	766.9	0
17/11/2021	10:20	10.7	2.7	SW	767	0
17/11/2021	10:30	10.7	2.7	SW	767.1	0
17/11/2021	10:40	10.8	3.1	SW	767.2	0
17/11/2021	10:50	10.8	2.7	SW	767.1	0
17/11/2021	11:00	11.1	3.1	SW	767.2	0
17/11/2021	11:10	11.2	2.7	SW	767.3	0
17/11/2021	11:20	11.1	3.1	SW	767.3	0
17/11/2021	11:30	11.4	2.7	SW	767.4	0
17/11/2021	11:40	11.7	2.7	SSW	767.3	0
17/11/2021	11:50	11.8	2.7	SSW	767.2	0
17/11/2021	12:00	11.8	3.1	SW	767.2	0
17/11/2021	12:10	11.8	2.7	SW	767.1	0
17/11/2021	12:20	11.8	3.1	SW	767.3	0
17/11/2021	12:30	12	2.7	SW	767.3	0
17/11/2021	12:40	12	3.1	SW	767.2	0
17/11/2021	12:50	12.2	3.1	SW	767.2	0
17/11/2021	13:00	12.2	2.7	SW	767.2	0
17/11/2021	13:10	12.1	3.1	SW	767.2	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
17/11/2021	13:20	12.3	2.2	SW	767.3	0
17/11/2021	13:30	12.2	2.2	SW	767.2	0
17/11/2021	13:40	12.2	2.2	SW	767.1	0
17/11/2021	13:50	12.1	1.8	SW	767	0
17/11/2021	14:00	12.1	2.7	SW	767.1	0
17/11/2021	14:10	12	2.7	SW	767	0
17/11/2021	14:20	12.1	3.1	SW	767	0
17/11/2021	14:30	12.1	2.2	SSW	767.1	0
17/11/2021	14:40	12	2.2	SW	767.3	0
17/11/2021	14:50	12	2.7	SW	767.3	0
17/11/2021	15:00	11.8	2.7	SW	767.2	0
17/11/2021	15:10	11.5	2.2	S	767.1	0
17/11/2021	15:20	11.4	2.7	S	767	0
17/11/2021	15:30	11.4	2.2	S	767.2	0
17/11/2021	15:40	11.3	2.7	S	767.1	0
17/11/2021	15:50	11.2	2.7	S	767.1	0
17/11/2021	16:00	11.1	2.7	S	767.1	0
17/11/2021	16:10	11.1	2.7	S	767.2	0
17/11/2021	16:20	11.1	2.7	SSW	767.2	0
17/11/2021	16:30	10.9	3.1	S	767.1	0
17/11/2021	16:40	10.8	2.7	SSW	767.1	0
17/11/2021	16:50	10.9	2.7	SSW	767.3	0
17/11/2021	17:00	10.8	3.1	SSW	767.3	0
17/11/2021	17:10	10.7	3.6	SSW	767.3	0

Date	Time	Temp Out	Wind Speed	Wind Dir	Bar	Rain
17/11/2021	17:20	10.7	3.6	SSW	767.2	0
17/11/2021	17:30	10.6	3.6	S	767.1	0
17/11/2021	17:40	10.6	3.6	S	767.2	0

11.0 LANSCAPE AND VISUAL IMPACT

11.1 INTRODUCTION

The following chapter has been prepared to describe the landscape context of the Proposed Development and assesses the predicted landscape and visual impacts of the Proposed Development on the receiving environment.

Landscape Impact Assessment (LIA) relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

Visual Impact Assessment (VIA) relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; Visual Obstruction (blocking of a view, be it full, partial or intermittent) or; Visual Intrusion (interruption of a view without blocking).

This Landscape and Visual Impact Assessment (LVIA) uses methodology as prescribed in the following guidance documents:

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022) and the Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2015) ;
- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment (2013).

11.2 METHODOLOGY

Production of this LVIA involved:

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the South Dublin County Development Plans as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the Proposed Development;
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;
- Assessment of the significance of the landscape impact of the development as a function of landscape sensitivity weighed against the magnitude of the landscape impact
- Assessment of the significance of the visual impact of the development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints (included as Appendix 11.1); and

- Incorporation of mitigation measures to reduce potential impacts and estimation of residual impacts once mitigation has become established.

11.2.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from a Proposed Development, the following criteria are considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria set out in **Table 11.1.**

Table 11.1 *Landscape Value and Sensitivity*

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the Proposed Development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the Proposed Development Site boundary that may have an effect on the landscape character of the area. **Table 11.2** refers.

Table 11.2 *Magnitude of Landscape Impacts*

Magnitude of Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in **Figure 11.1.**

	Sensitivity of Receptor				
Scale/Magnitude	*Very High*	*High*	*Medium*	*Low*	*Negligible*
Very High	Profound	Profound-substantial	Substantial	Moderate	Minor
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Figure 11.1 Impact significance graph

Note: Judgements deemed 'substantial' and above are considered to be 'significant impacts' in EIA terms.

11.2.2 Visual Impact Assessment Criteria

As with the landscape impact, the visual impact of the Proposed Development will be assessed as a function of sensitivity versus magnitude. In this instance, the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

11.2.3 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below and used in Table 11.5 below to establish visual receptor sensitivity at each VRP:

1. **Susceptibility of Receptors** - In accordance with the Institute of Environmental Management and Assessment ("IEMA") Guidelines for Landscape and Visual Assessment (3rd edition 2013) visual receptors most susceptible to changes in views and visual amenity are:
    - "*Residents at home;*
    - *People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;*
    - *Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;*
    - *Communities where views contribute to the landscape setting enjoyed by residents in the area; and*
    - *Travellers on road, rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened*".

    Visual receptors that are less susceptible to changes in views and visual amenity include;
    - "*People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and*
    - *People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life*".

2. **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;

3. **Views from within highly sensitive landscape areas**. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;

4. **Primary views from dwellings**. A Proposed Development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;

5. **Intensity of use, popularity**. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;

6. **Connection with the landscape**. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;

7. **Provision of elevated panoramic views**. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;

8. **Sense of remoteness and/or tranquillity.** Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;

9. **Degree of perceived naturalness**. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;

10. **Presence of striking or noteworthy features.** A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;

11. **Historical, cultural and / or spiritual significance.** Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;

12. **Rarity or uniqueness of the view**. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;

13. **Integrity of the landscape character**. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;

14. **Sense of place**. This considers whether there is special sense of wholeness and harmony at the viewing location; and

15. **Sense of awe**. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. No relative importance is inferred by the order of listing. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

11.2.4 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the proposal and its effect on visual amenity.

Visual presence is a somewhat quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects, aside from scale in relation to distance. Some of these aspects include the extent and complexity of the view, as well as the degree of existing contextual movement experienced. The backdrop against which the development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista and is often, though not always, expressed as one of the following terms:

- Minimal;
- Sub-dominant;
- Co-dominant;
- Dominant;

- Highly dominant.

The magnitude of visual impacts is classified in **Table 11.3**.

Table 11.3 *Magnitude of Visual Impact*

Criteria	Description
Very High	The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene
High	The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene
Medium	The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene

11.2.5 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA definitions of significance as used earlier in respect of landscape impacts (**Figure 11.1** refers).

11.2.6 Quality of Effects

In addition to assessing the significance of landscape/townscape effects and visual effects, EPA Guidance for EIAs requires that the quality of the effects is also determined. This could be negative/adverse, neutral, or positive/beneficial.

Whereas the introduction of new built elements into countryside areas more often results in negative landscape and visual effects, in urban and peri-urban settings, development proposals are often replacing one built feature with another, developing 'brownfield' sites or represent consistency with land use zoning objectives. The consequence for the townscape character and visual amenity is often beneficial or may be a combination of positive effects and negative effects for different receptors. In the context of this assessment, the judgment of the quality of the effects is made in combination with the significance judgement for both landscape/townscape impacts and visual impacts e.g. Moderate / Positive or Moderate / Negative.

11.3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Proposed Development will consist of:

- A Volatile Organic Compound (VOC) Abatement system comprising of a Thermal Oxidiser (TO), associated plant equipment and scrubbers positioned on a bunded concrete plinth
- A single storey utilities workshop
- A new pipe rack with the addition of a second-tier extension to the existing pipe rack

- Contractor's compound
- Modifications to the existing internal access road
- Permanent pedestrian crossing to the existing internal access road
- New access road and footpaths to perimeter of proposed development
- Modifications to the existing site lighting, signage, surface water, foul and process wastewater drainage, hard and soft landscaping

The Proposed Development is described in detail in Chapter 2 (Description of the Proposed Development).

11.3.1 Extent of Study Area

It is anticipated that the Proposed Development will be difficult to discern and not likely to give rise to significant landscape/townscape or visual impacts beyond 2km. As a result, a 2km study area is to be used in this instance with a focus on those receptors within 1km of the site.

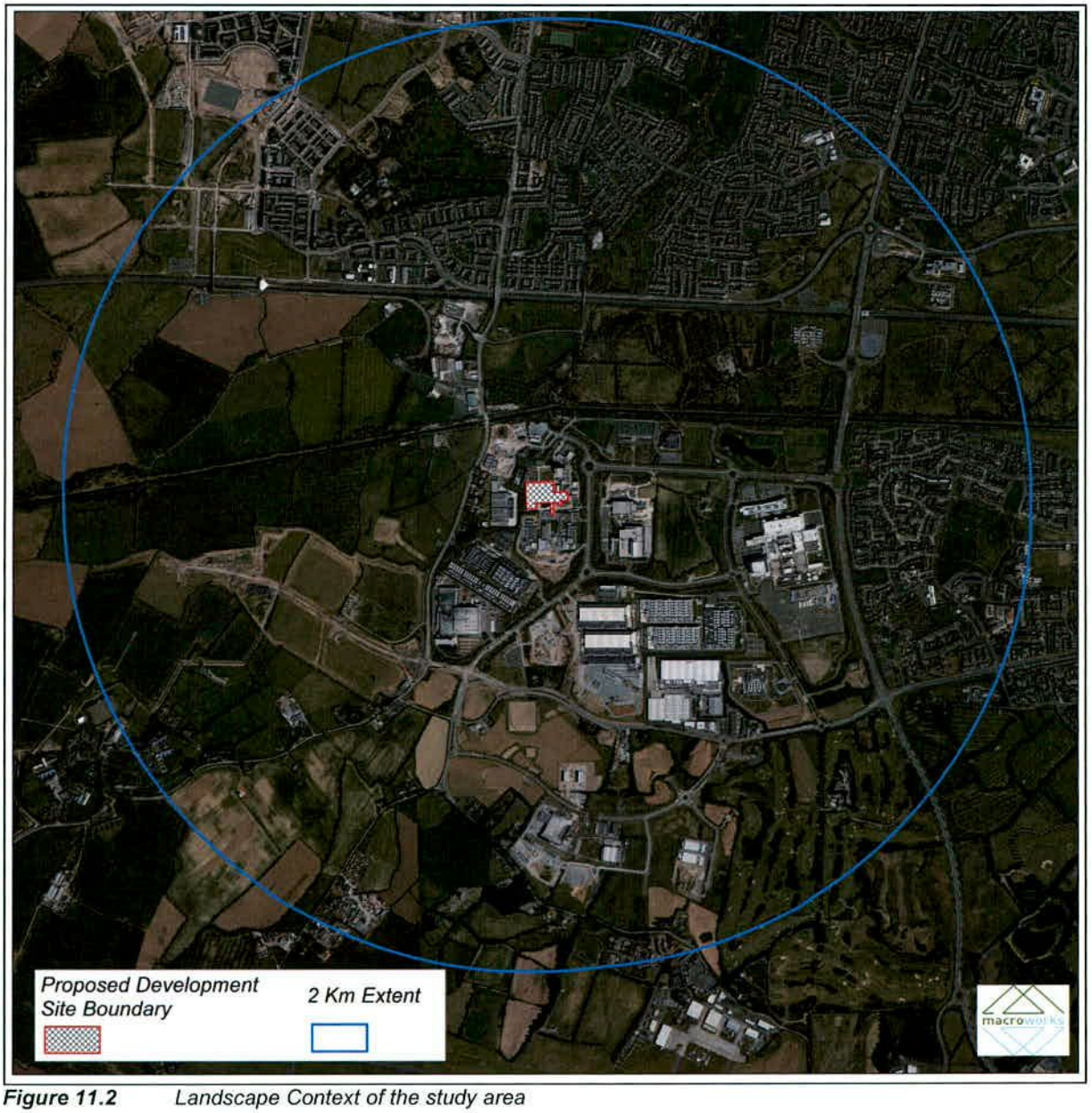

Figure 11.2 *Landscape Context of the study area*

11.4 LANDSCAPE AND VISUAL POLICY CONTEXT AND DESIGNATIONS

11.4.1 South Dublin County Development Plan 2016-2022

The application site is situated within land designated as "Employment and Enterprise" by the CDP's Land Use Zoning Map no. 4 (Figure 11.3).

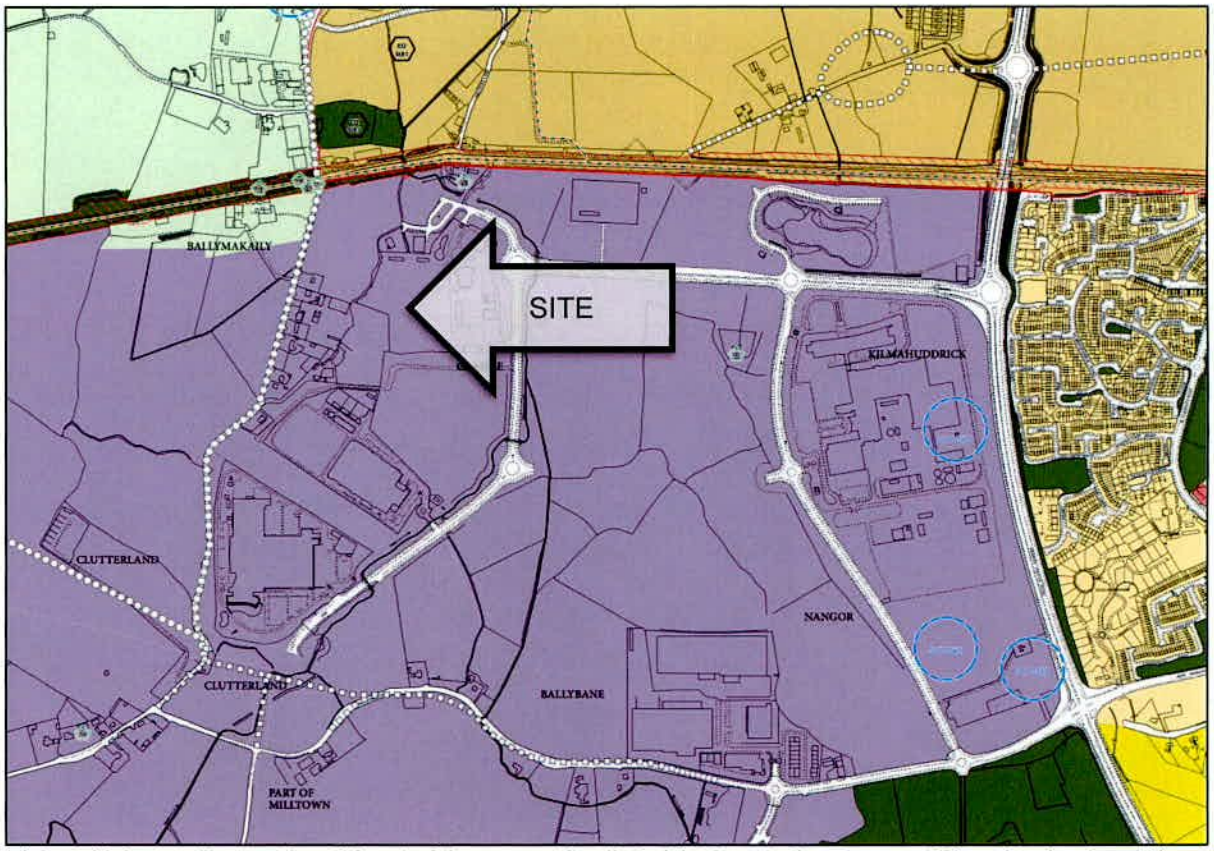

Figure 11.3 *Excerpt from Map 4 of the current South Dublin County Development Plan showing Land Use Zoning in relation to the Proposed Development*

The objective of 'Enterprise and Employment" (EE) Zoning is to provide for enterprise and employment related uses; specifically:

> *"Enterprise and Employment (EE) zoned lands will accommodate low to medium intensity enterprise and employment uses. Enterprise and Employment zoned lands to the west of the County in the vicinity of the Grange Castle and Citywest economic clusters have the capacity to attract high tech manufacturing and associated strategic investments, due to the availability of large sites that are supported by high quality infrastructure and services."*

Land Use Classes identified as 'Permitted in Principle' within EE zones include, Public Services, which is further defined as:

> "*A building or part thereof or land used for the provision of public services. Public services include all service installations necessarily required by electricity, gas, telephone, radio, telecommunications, television, drainage and other statutory undertakers, it includes: public lavatories, public*

telephone boxes, bus shelters, bring centres, green waste and composting facilities."

Section 11.2.5 of the CDP states:

"Enterprise and employment areas are characterised by a structure that is distinctly different to those of other urban areas. Most industrial estates are characterised by large functional buildings that are set back from the street, extensive areas of hard surfacing and security fences. A number of industrial estates, and in particular newer business parks, incorporate extensive areas of open space to create a more attractive parkland-like setting.

According to Table 11.18 of the CDP, the key principles within Enterprise and Employment Zones entail the three broader categories of 'Access & Movement,' 'Open Space and Landscape" and 'Built Form and Corporate Identity.' The criteria of these categories are as follows:

Access and Movement:

- Major links to and through a site are provided as identified within a local plan, Masterplan and/or as determined by a site analysis process;
- The street network is easy to navigate and a clear a hierarchy is applied, identifying the function of each street;
- Individual streets are designed in accordance with the requirements of the Design Manual for Urban Roads and Streets;
- Large areas of parking (in particular staff parking) are located to the rear of buildings and screened from the street. Smaller areas of parking can be located to the front of buildings provided they are well designed (including areas of planting) and do not result in excessive setbacks from the street;
- The design and layout of new business parks should promote walking, cycling and the use of public transport, including adequate provision of cycle and pedestrian linkages.

Open Space and Landscape:

- Creation of an open space network with a hierarchy of spaces suited to a variety of functions and activities;
- Development within business parks maintain and promote a parkland-like setting with high quality landscaping;
- Important nature features of the site such as trees, hedgerows and watercourses are retained, integrated within the landscape plan and reinforced with the planting of native species;
- Natural buffer zones and defensive planting are used to define private space and the use of fencing to the front of buildings minimised. Where fences interface with the public domain they should be of a high quality and incorporate elements of landscaping (for screening).

Built Form and Corporate Identity:

- Building heights respond to the surrounding context with transitions provided where necessary and reinforce the urban structure with taller buildings located along key movement corridors, gateways and nodes;

- Individual buildings should be of contemporary architectural design and finish (including use of colour). Various treatments should be employed to reduce the bulk, massing and scale of larger buildings;
- The layout and design of buildings maximise frontages onto the public realm and enclose private external spaces (such as service yards and car parks) and storage areas behind them;
- Signage should be simple in design and designed to integrate with architectural feature and/or the landscape setting (see also Section 11.2.8 Advertising, Corporate Identification and Public Information Signs).

Section 9.2.0 of the CDP pertains to landscape.

Heritage, Conservation and Landscapes (HCL) Policy 7 Landscapes:
"It is the policy of the Council to preserve and enhance the character of the County's landscapes particularly areas that have been deemed to have a medium to high Landscape Value or medium to high Landscape Sensitivity and to ensure that landscape considerations are an important factor in the management of development."

HCL7 Objective 1:
"To protect and enhance the landscape character of the County by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the landscape, taking full cognisance of the Landscape Character Assessment of South Dublin County (2015)."

HCL7 Objective 2:
"To ensure that development is assessed against Landscape Character, Landscape Values and Landscape Sensitivity as identified in the Landscape Character Assessment for South Dublin County (2015) in accordance with Government guidance on Landscape Character Assessment and the National Landscape Strategy."

According to the South County Dublin Landscape Character Assessment, the study area is located within the 'Urban' Landscape Character Area. The key characteristics of this Landscape Character Area are:

- Built – up urban area with extensive housing estates and industrial/commercial parks;
- Settlements of Rathfarnham, Templeogue and Clondalkin with important historical legacy and remnants;
- Major traffic corridors with M50 traversing north-south through the area, and LUAS line travelling north from Tallaght, parallel to the M50, to city centre;
- Corridors of natural and semi natural vegetation, notably along the River Dodder (a linear park) and the Camac River;
- Grass open spaces in gardens, industrial parks, golf courses, school playing fields, and miscellaneous spaces in housing areas;
- Street trees planting;
- Recreational facilities – public parks and golf courses – provide amenities and ecological resources.

Landscape Values for this landscape character area entail:

- Public parks with recreational and ecological resources;
- Dodder River Valley;
- 19th Century industrial heritage;
- Views out to Dublin Mountains and agricultural hinterland.

In terms of 'Forces for Change,' these entail:

- West boundary is set against agricultural and mountain hinterlands. Untidy urban developments can adversely impact on the character of the hinterlands;
- Urban developments can impact on open views to the hinterlands;
- On-going urban infrastructure developments notably road improvements generate increasing volumes of traffic and detract from opportunities to create or maintain tranquil settings;
- New infill or other built developments can be insensitive to remnant historical or vernacular features.

11.4.2 Views of Recognised Scenic Value

Views of recognised scenic value are primarily indicated within the current and draft development plans in the context of scenic views/routes designations, but they might also be indicated on touring maps, guide books, road side rest stops or on post cards that represent the area.

A number of 'prospects to be preserved' are identified on in Table 9.2 of the current county development plan. None of these are located within the study area.

11.5 RECIEVING ENVIRONMENT

11.5.1 Landscape Baseline

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the Proposed Development will be assessed. A description of the landscape context of the proposed application site and wider study area is provided below under the headings of landform and drainage, vegetation and land use, centres of population and houses, transport routes and public amenities and facilities. Although this description forms part of the landscape baseline, many of the landscape elements identified also relate to visual receptors i.e. places and transport routes from which viewers can potentially see the Proposed Development.

11.5.2 Landscape Context

The Proposed Development is located in Grange Castle Business Park in an area of relatively flat terrain. On a broad scale, the terrain slopes gently in a northerly direction towards the River Liffey some 3km north of the site at its nearest point and is one of the most notable natural watercourses in relation to the site. The Grand Canal is situated c. 300m north of the site and is one of the most notable landscape features in relation to the site. In terms of land use, the site and its surrounds are heavily influenced by large scale commercial and industrial facilities. The TILGC site is one of several large-scale manufacturing plants located within Grange Castle Business Park, with many other large scale industrial units currently under construction. South and east of the site are typified by industrial and commercial land uses, whilst to the west of the site, the typical land use is that of pastoral farmland bound by mixed hedgerow vegetation. To the north, the Grand Canal corridor is a notable linear land use and is bound by dense areas of mature vegetation. Immediately north of the Grand Canal corridor is a small area of pastoral farmland encompassing South Dublin County Council Park's Depot, whilst north of this again, the land-use transitions to more typical urban land use such as large residential housing estates and small linear urban parks.

Figure 11.4 *Large scale existing and under construction industrial units that typify the study area.*

The nearest residential receptors to the Proposed Development are located immediately west of the site along the R120 regional road, whilst a small farmstead is located to the north of the site on the southern side of the Grand Canal corridor. The majority of residential receptors within the study area are located to the north and east of the site and form part of the wider Dublin area. Some isolated residential dwellings and farmsteads are also located throughout the southern and western extents of the study area, where agricultural farmlands are the primary land use.

Figure 11.5 *Nearest residential dwellings to the site (located on the R120 regional road west of site)*

In terms of recreation, the study area encompasses a number of local parks, some of which are located within Grange Castle Business Park itself. The most notable recreation feature is the Grand Canal Way National Waymarked Trail. The Grand Canal Way is a 124km trail and commences at Lucan Bridge, c. 300m north of the site. A cycleway and walking trail also follows the corridor of the Grand Canal east from Lucan Bridge and connects back to Dublin City Centre. Grange Castle Golf Club, an 18-hole championship golf course, is located in the southwest quadrant of the study area and is some 1.5km from the site at its nearest point. The most notable heritage feature in relation to the site is the ruins of Grange Castle, which is located some 600m east of the site. The castle remains are located in a small public park that's contains a looped walking trail encircling the castle remnants.

Figure 11.6 *Land use mix of the immediate study area.*

11.5.3 Identification of Viewshed Reference Points as a Basis for Assessment

Viewshed Reference Points (VRP's) are the locations used to study the visual impacts of a proposal in detail. It is not warranted to include each and every location that provides a view of a development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the Proposed Development. Instead, the selected viewpoints are intended to reflect a range of different receptor types, distances and angles. The visual impact of a Proposed Development is assessed by Macro Works using up to 6 no. categories of receptor type as listed below:

- Key Views (from features of national or international importance);
- Designated Scenic Routes and Views;
- Local Community views;
- Centres of Population;
- Major Routes; and
- Amenity and heritage features.

VRP's might be relevant to more than one category and this makes them even more valid for inclusion in the assessment. The receptors that are intended to be represented by a particular VRP are listed at the beginning of each viewpoint appraisal. The Viewshed Reference Points selected in this instance are set out in the **Table 11.4** and **Figure 11.7** below.

Table 11.4 *Outline Description of Selected Viewshed Reference Points (VRPs)*

VRP No.	*Location*	*Direction of view*
VP1	R120 overbridge of the Grand Canal (12th Lock Bridge)	SE
VP2	Grange Castle Business Park north of site	S
VP3	R120 Adamstown Road west of site	E
VP4	Grange Castle Business Park east of site	W
VP5	Grange Castle Business Park southeast of site	NW

Figure 11.7 *Viewpoint location map*

11.6 MITIGATION MEASURES

The main mitigation by avoidance in this instance is the siting of the Proposed Development in a landscape zoning that can facilitate such a development type where it is surrounded by commercial and industrial developments of a similar scale and nature. The Proposed Development will be entirely located within the boundary of the existing TILGC lands, and thus effects solely relate to the intensification of an existing land use. Aside from the proposed stack, many of the proposed constructed elements on site will not rise c. 7m above the surrounding existing ground levels. Thus, much of the existing vegetation and built infrastructure within the site will heavily screen the majority of the Proposed Development from surrounding receptors.

In terms of vegetation removal, c. 38m of existing hedgerow are to be removed to facilitate the proposed service road. It is proposed to plant a new section of hedgerow to the east of the Utilities workshop, whilst some 40 linear meters of compensatory planting consisting of native hedgerow species prevalent in the surrounding landscape (*Crataegus monogyna, Prunus spinosa, Corylus avellana, Lonicera periclymenum and Salix alba*) will be planted to the north of the new access road set among a bed of native grasses and ferns.

11.7 IMPACT ASSESSMENT

11.7.1 Landscape Impact Assessment

11.7.1.1 Landscape Value and Sensitivity

Landscape value and sensitivity are considered in relation to a number of factors highlighted in the Guidelines for Landscape and Visual Impact Assessment 2013, which are set out below and discussed relative to the proposal site and wider study area.

The study area constitutes a highly modified setting influenced by large-scale commercial and industrial developments. The site itself is heavily influenced by the exiting TILGC manufacturing facility, which comprises highly anthropogenic features such as a wastewater treatment plant, stacks, industrial-scale sheds and a 37m tall production building. Similar developments of an identical and more extensive scale are also located throughout the study area in Grange Castle Business Park. Whilst the current land use in the western half of the site is that of pastoral farmland, the permitted and partially constructed Grange Castle West Business Park will occupy much of this part of the study area in the future.

Several large scale suburban residential estates are located in the wider eastern and northern half of the study area, whilst the Peamount hospital campus is located on the southwestern periphery of the study area. Despite the industrial landscape character of the central study area, there are some heritage and recreational landscape values associated with the landscape in the surrounds of the site. The Grand Canal Way occurs less than 500m to the north of the site, whilst Grange Castle Golf Course is also located in the southeast quadrant of the study area. Furthermore, the remnants of Grange Castle, a 16th Century medieval tower house, are located in a small landscaped park in the centre of Grange Castle Business Park.

In terms of landscape policy and designations, the Proposed Development is located within the 'Urban; landscape character area and is located in the zoning 'Employment

and Enterprise', further reinforcing the robust nature of the site and its surrounding context.

Overall, it is considered that this is a highly anthropogenic landscape context that is influenced by numerous utilitarian land uses and features. While some areas of local amenity are located throughout the study area, the site and its immediate surroundings are not highly susceptible to development and are currently characterised by large-scale industrial and commercial development. On balance of these factors and in accordance with the criteria outlined in **Table 11.1**, the landscape sensitivity to this form of development is deemed to be **Low**.

11.7.1.2 Magnitude of Landscape Effects

Construction Stage

The Proposed Development comprises the construction of a new Thermal Oxidiser (TO), a single storey utilities workshop, an extension to the existing pipe rack, access tracks, associated services and utilities. There will be a minor degree of excavation works required to facilitate the foundations of the Proposed Development and the proposed temporary contractor's compound, whilst a c. 38m section of existing internal hedgerow and the partial removal of one C Category tree group will be removed to facilitate the propsoed works. Construction stage activities are likely to include:

- HGVs transporting materials to and from the site;
- Movement of heavy earth-moving machinery;
- Temporary storage of excavated materials and construction materials on-site;
- Gradual emergence of the Proposed Development, and associated works;
- Security hoarding and site lighting.

The physical impact on the landscape will be permanent and not readily reversible. However, the site of the Proposed Development is already heavily modified and characterised by existing industry.

Construction stage impacts on the landscape are considered to be 'temporary to short term' as the construction and commissioning stage is estimated to take c. 12 months to complete, while the contractor's compound will continue to be used for a further 12 months for existing site activities.

On the basis of the reasons outlined above, the Proposed Development represent the intensification of an existing land use and is a relatively modest sized piece of infrastructure contained within the existing extensive TILGC site. Much of the construction work will also be heavily screened by the existing buildings on-site and the dense mature vegetation and similar sized developments surrounding the site. Thus, the magnitude of construction stage landscape effects is deemed to be **Low** within the immediate surrounds of the site, however, this quickly reduces to **Low-negligible** and **negligible** in the wider surrounds of the study area where visibility of construction activity is likely to be very limited and contained within an existing large scale business park. In combination with the Low landscape sensitivity designation outlined above, the significance of construction stage impacts is deemed to be **slight-imperceptible** within the immediate surrounds of the site, however this quickly reduces to **imperceptible** within the wider study area where construction activities will not be discernible. The quality of the construction stage effects will be **Negative**.

Operational Stage

In relation to the landscape character of the site and its immediate vicinity, the Proposed Development is located entirely within the boundary of the existing TILGC site within the established Grange Castle Business Park. The Proposed Development will principally occupy a small area in the centre of the TILGC site where the proposed VOC abatement system will rise to a maximum height of 12m (76.10m AOD), whilst the propsoed utilities workshop will rise to a maximum height of 5.72m (69.80m AOD). The Proposed Development will result in an increase in the intensity of built development within the site, however, the Proposed Development will be barely discernible from even the immediate surrounds of the TILGC facility. Thus, the Proposed Development will have no major impact on the character of the study area, which is predominately characterised by numerous other large scale industrial and commercial developments and other highly anthropogenic features.

Some c. 40m of hedgerow is proposed within the site to compensate for the hedgerow loss. This planting will be native and pollinator friendly and will strengthen the green infrastructure links throughout the site and wider study area.

On balance of the factors discussed above, it is considered that the magnitude of landscape impact within the immediate context is **low-negligible** and of a **neutral** quality.

With reference to the significance graph (**Figure 11.1** refers) above, the **low-negligible** landscape sensitivity judgement attributed to the study area, coupled with a **Low** magnitude of operational stage landscape impact is considered to result in an overall significance of no greater than **slight-imperceptible / neutral**.

11.7.2 Visual Impact Assessment

11.7.2.1 Sensitivity of Visual Receptors

Table 11.5 *Analysis of Visual Receptor Sensitivity at Viewshed Reference Points*

Scale of value for each criterion

Strong association	Moderate association	Mild association	Negligible association

Values associated with the view	VP1	VP2	VP3	VP4	VP5
Susceptibility of viewers to changes in views					
Recognised scenic value of the view					
Views from within highly sensitive landscape areas					
Primary views from residences					
Intensity of use, popularity (number of viewers)					
Viewer connection with the landscape					
Provision of vast, elevated panoramic views					
Sense of remoteness / tranquillity at the viewing location					
Degree of perceived naturalness					
Presence of striking or noteworthy features					
Sense of Historical, cultural and / or spiritual significance					
Rarity or uniqueness of the view					
Integrity of the landscape character within the view					
Sense of place at the viewing location					
Sense of awe					
Overall sensitivity assessment	**M**	**L**	**ML**	**L**	**L**

N = Negligible; **L** = low sensitivity; **ML** = medium-low sensitivity **M** = medium sensitivity; **HM** = High-medium sensitivity; **H** = high sensitivity; **VH** = very high sensitivity

11.7.2.2 Magnitude of Visual Effects

The assessment of visual impacts at each of the selected viewpoints is aided by wireframe photomontages of the Proposed Development (included as Appendix 11.1). In this instance, wireframe photomontages were produced as the Proposed Development represents a relatively simple form.

Wireframe montages* are a depiction of the scheme within the view utilising a rendered three-dimensional block model of the development, which has been geo-referenced to allow accurate placement and scale. For each viewpoint, the following images have been produced:

1. Existing view;
2. Outline view (yellow outline showing the extent of the development).

**As the Proposed Development is almost entirely screened from view, in this instance, outline views were only required.*

Viewshed Reference Point		Direction of View
VP1	R120 overbridge of the Grand Canal (12th Lock Bridge)	SE

Representative of:
- Amenity and heritage feature
- Major route
- Local community views

Receptor Sensitivity **Medium**

Existing View This is a view from the R120 overbridge of the Grand Canal immediately northwest of Grange Castle Business Park. The view is oriented to the southeast towards several large industrial-sized warehouse buildings. The partially glazed TILGC production building rises from the business park further in the distance, whilst the rolling Dublin Mountains backdrop the view in the distant background.

Visual impact of Proposed Development The propsoed development will be entirely screened from here by the large industrial buildings in the near foreground. Thus, the magnitude of visual impact is **Negligible** by default.

Summary Based on the assessment criteria and matrices outlined at Section 1.1.3 the significance of residual visual impact is summarised below.

Significance / Quality

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Medium	Negligible	**Imperceptible**

Viewshed Reference Point		Direction of View
VP2	Grange Castle Business Park north of site	S

Representative of:
- Local community views

Receptor Sensitivity
Low

Existing View
This is a view from within Grange Castle Business Park, immediately adjacent to the entrance of the TILGC facility.

Visual impact of Proposed Development
The Proposed Development will be entirely screened by the mature vegetation located to the west of the main entrance to the TILGC facility. Thus, the magnitude of visual impact is **Negligible** by default.

Summary
Based on the assessment criteria and matrices outlined at Section 1.1.3 the significance of residual visual impact is summarised below.

Significance / Quality

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Negligible	**Imperceptible**

Viewshed Reference Point		Direction of View
VP3	R120 Adamstown Road west of site	E

Representative of:
- Major route
- Local community views

Receptor Sensitivity
Medium-low

Existing View
The depicted view is oriented east along the regional road corridor and is partially contained at a near distance by a linear cluster of residential dwellings and their surrounding vegetation. The TILGC production building rises beyond the near residential dwellings in the background of the view.

Visual impact of Proposed Development
The Proposed Development will be entirely screened from here by a combination of existing vegetation and an industrial warehouse immediately beyond near dwellings. Whilst there is potential for glimpses of the stack to be afforded along this section of the regional road, it will be viewed in the context of the existing extensive industrial and commercial developments and will have little impact on the visual amenity of this scene. Therefore, on balance of the reasons outlined above, the magnitude of visual impact is deemed **Negligible**.

Summary
Based on the assessment criteria and matrices outlined at Section 1.1.3 the significance of residual visual impact is summarised below.

Significance / Quality	Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
	Medium-low	Negligible	**Imperceptible**

Viewshed Reference Point		Direction of View
VP4	Grange Castle Business Park east of site	W

Representative of:
- Local community views

Receptor Sensitivity **Low**

Existing View This is a view from within Grange Castle Business Park immediately east of the TILGC site. The depicted view is oriented towards the extensive industrial facility, which is partially screened by a grassed berm and a corridor of mature trees.

Visual impact of Proposed Development The Proposed Development will be almost entirely screened by the existing buildings and pipe racks along the eastern boundary of the TILGC site. Partial glimpses of the tip of the proposed stack have the potential to be glimpsed from here amongst the existing pipe racks. Nonetheless, even if noticed from here, the stack represents only a very minor intensification of industrial development and will have no impact on the visual amenity of this highly anthropogenic scene. As a result, the magnitude of visual impact is deemed **Negligible**.

Summary Based on the assessment criteria and matrices outlined at Section 1.1.3 the significance of residual visual impact is summarised below.

Significance / Quality	Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
	Low	Negligible	**Imperceptible**

Viewshed Reference Point		Direction of View
VP5	Grange Castle Business Park southeast of site	NW

Representative of:
- Local community views

Receptor Sensitivity **Low**

Existing View This is a view from within Grange Castle Business Park immediately southeast of the TILGC site. The view is oriented northwest towards the existing TILGC facility, which comprises large scale industrial buildings and features. A grassed berm and mature trees line the access road in

	the near foreground and screen the smaller built elements within the TILGC site.
Visual impact of Proposed Development	The Proposed Development will be entirely screened from here, and thus, the magnitude of visual impact is Negligible by default.
Summary	Based on the assessment criteria and matrices outlined at Section 1.1.3 the significance of residual visual impact is summarised below.

Significance / Quality

Visual Receptor Sensitivity	Visual Impact Magnitude	Significance of Visual Impact
Low	Negligible	**Imperceptible**

11.8 SUMMARY OF EFFECTS

In terms of landscape impacts, the Proposed Development will have a direct physical impact on the site's land cover, but only to a relatively minor extent as the Proposed Development is entirely contained within the existing extensive TILGC site. As the Proposed Development represents the intensification of an existing land use, it has limited potential to substantially alter the character of the local and broader landscape, which is principally influenced by other large scale industrial and commercial developments. This is a robust landscape context that can accommodate large-scale industrial developments, which is reinforced by the sites land use zoning for 'Employment and Enterprise'. Overall, this is a relatively modest-sized development that is appropriately sited, and consequently, the impact on landscape character (post-construction) will be of ***Slight-imperceptible significance*** and a ***Neutral*** quality.

Visual impacts were assessed at 5 no. viewpoint locations throughout the 2km study area, representing a range of viewing angles, distances, and contexts. The sensitivity of visual receptors ranged from Low to Medium, with the medium sensitivity representing the Grand Canal corridor immediately north of the site. Low sensitivity receptors are typically representative of views from within Grange Castle Business Park and are already heavily influenced by existing large-scale industrial developments. In most cases, the Proposed Development will be entirely screened by a combination of the surrounding existing built development and mature vegetation in the surrounds of the site. Even where glimpsed, the Proposed Development will have little to no impact on the visual amenity of the study area as it represents such a minor intensification of built development in this already highly modified and anthropogenic landscape context.

Based on the landscape and visual impact judgements provided throughout this LVIA, the Proposed Development is not considered to give rise to any significant landscape and visual impacts.

APPENDIX 11.1

LVIA PHOTOMONTAGES
Prepared by Macro Works