7. Air Quality

7.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the likely direct and indirect significant effects on air quality associated with the Construction, Operational and Decommissioning Phases of the Data Centre Development DC3 (referred to as the Proposed Development) in accordance with the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

During the Construction Phase, the potential air quality effects associated with the Proposed Development have been assessed. This included construction activities such as earthworks and construction traffic movements.

During the Operational Phase, the potential air quality effects associated with onsite emissions have been assessed.

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental effects, where practicable. In addition, feedback received from consultation undertaken throughout the alternatives assessment and design development process have been considered, where appropriate.

The aim of the Proposed Development when in operation is to offer expanded compute capacity to GIL's customers and products. The Proposed Development is described in detail in Chapter 4 (Description of the Proposed Development) and Chapter 5 (Construction) provides a description of the construction and demolition activities.

Refer to Appendix 1.1 for the competency of the author of this Chapter.

7.2 Assessment Methodology

7.2.1 Introduction

This Chapter has been prepared in accordance with the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022). Potential effects have been described with regard to Table 3.4 of the EIAR guidelines.

Emissions from the existing GIL Campus DC1 and DC2 developments are regulated by the EPA under Industrial Emissions licence P1189-01. This licence will be required to be reviewed by the EPA to accommodate the Proposed Development.

7.2.2 Legislation and Guidance

The statutory ambient air quality standards in Ireland are outlined in Ambient Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022) (hereafter referred to as the Air Quality Regulations), which incorporate the ambient air quality limits set out in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (hereafter referred to as the CAFE Directive), for a range of air pollutants.

In addition to the specific statutory air quality standards, the assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of ambient air quality effects from infrastructural projects. These are summarised below:

- Air Dispersion Modelling from Industrial Installations Guidance Note (AG4), (EPA, 2020);
- Air Quality Assessment of Proposed National Roads - Standard PE-ENV-01107 (TII, 2022);
- Institute of Air Quality Management (IAQM) Guidance (IAQM, 2024);

- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (hereafter referred to as LA 105 Air Quality Guidance) (UKHA, 2019);
- World Health Organization (WHO) Global Air Quality Guidelines (WHO, 2021); and
- Clean Air Strategy (DoECC, 2023).

7.2.2.1 Air Quality Regulations

In December 2022, the Air Quality Regulations came into force and transposed EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe into Irish law. The purpose of the Air Quality Regulations is to:

- Establish limit values and alert thresholds for concentrations of certain pollutants;
- Provide for the assessment of certain pollutants using methods and criteria common to other European member states;
- Ensure that adequate information on certain pollutant concentrations is obtained and made publicly available; and
- Provide for the maintenance and improvement of ambient air quality where necessary.

The limit values established under the Air Quality Regulations relevant to the assessment of human health for the pollutants of concern are included in Table 7.1.

Table 7.1: Limit values in the air quality regulations for the protection of human health. Source: GoI, 2022.

Pollutant	Averaging Period	Limit Value (µg/m³)	Basis of Application of Limit Value
NO_2	1-Hour	200	⩽18 exceedances p.a. (99.79 %ile)
	Calendar Year	40	Annual Mean
PM_{10} (Particulate Matter)	24-hours	50	⩽ 35 exceedances p.a. (90%ile)
	Calendar year	40	Annual mean
$PM_{2.5}$ (Particulate Matter)	Calendar year	25	Annual mean
SO_2 (Sulphur Dioxide)	1-Hour	350	⩽24 exceedances p.a. (99%ile)
	Daily	125	⩽3 exceedances p.a. (90.41 %ile)

In April 2023, the Government of Ireland published the new National Clean Air Strategy, a strategic policy framework to reduce air pollution (DoECC, 2023). The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines (WHO, 2021) Interim Target IT3 by 2026, IT4 targets by 2030 and the final targets by 2040 (shown in Table 7.2). The strategy acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2*" (DoECC, 2023). Ireland will revise its air quality legislation in line with the proposed EU revisions to the CAFE Directive, which will set interim 2030 air quality standards and align the EU more closely with the WHO targets.

Table 7.2: WHO air quality guidelines levels. Source: WHO, 2021.

Pollutant	Averaging Time		Interim Targets (µg/m^3)			Final Target
		IT1	IT2	IT3	IT4	AQG Level
NO_2	24-hour limit for protection of human health	120	50	-	-	25
	Annual limit for protection of human health	40	30	20	-	10
PM (as PM_{10})	24-hour limit for protection of human health	150	100	75	50	45
	Annual limit for protection of human health	70	50	30	20	15
PM (as $PM_{2.5}$)	24-hour limit for protection of human health	75	50	37.5	25	15
	Annual limit for protection of human health	35	25	15	10	5
SO_2	24-hour limit for protection of human health (99th percentile)	125	50	-	-	40

However, as the EU statutory limit values have not been updated since the release of the new WHO guidelines, the appropriate compliance limit values for the assessment of air quality impacts of the Proposed Development are those outlined in the Air Quality Regulations, which incorporate the cleaner air for Europe (CAFE) Directive (EC, 2008). Therefore, the assessment considers compliance with the EU statutory limits only.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines, at European or national level, regarding the maximum dust deposition levels, that may be generated during construction activities. However, Verein Deutscher Ingenieure (VDI) German Technical Instructions on Air Quality Control - TA-Luft standard for dust deposition (VDI, 2002) (non-hazardous dust) provides a guideline for the rate of dust deposition of 350 mg/m^2/day averaged over one year. The EPA concurs that this guideline may be applied, although the EPA typically applies the guideline limit as a 30-day average (EPA Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals), 2006).

This guidance value is applied to monitor dust effects from the Construction Phase of the Proposed Development.

The level of potential effect is based on the significance criteria provided in TII guidance, refer to Table 7.3.

Table 7.3: Potential effect descriptors. Source: TII, 2022.

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQSV)			
	1	2-5	6-10	>10
75% or less of AQSV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQSV	Neutral	Slight	Moderate	Moderate
95- 102% of AQSV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQSV	Moderate	Moderate	Substantial	Substantial
110% or more of AQSV	Moderate	Substantial	Substantial	Substantial

7.2.2.2 National Air Emission Targets

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (hereafter referred to as the National Emissions Reduction Directive) was published in December 2016. The National Emissions Reduction Directive applied the limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (hereafter referred to as the National Emission Ceiling (NEC) Directive) until 2020 and established new national emission reduction commitments for various pollutants.

The pollutants relevant to this assessment are NO_x and $PM_{2.5}$. In relation to Ireland, the 2020 to 2029 emission targets are 65kt for NOx (49% reduction on 2005 levels) and 10kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 7.4.

Table 7.4: National air emission targets. Source: Ireland's air pollutant emissions, 2020 to 2030.

Pollutant	2020 to 2029 Reduction Commitments (kilotonnes) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kilotonnes) (and % Reduction Compared to 2005 Levels)
NOx	66.8	40.6
	-49%	-69%
$PM_{2.5}$	15.6	11.2
	-18%	-41%

7.2.2.3 Ecological Limits

The nearest Natura 2000 site, Rye Water Valley SAC is located 5.8km from the Proposed Development. This is located outside of the zone of influence of the Proposed Development and not considered further, refer to Chapter 11 (Biodiversity). The Grand Canal pNHA is located approximately 1.69km north of the site of the Proposed Development and is considered in the assessment.

The Air Quality Regulations outline an annual critical level for NO_X for the protection of vegetation and natural ecosystems in general. The CAFE Directive defines 'Critical Levels' as:

"a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans" (EC, 2008).

The United Nations Economic Commission for Europe (UNECE) Critical Loads for Nitrogen where a *"Critical Load*" is defined by the UNECE as:

"a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE 2015).

No critical loads are available for pNHAs in Ireland. In its absence, the critical loads for Rye Water Valley SAC are applied. These were obtained from the Air Pollution Information System (APIS) website (Centre for Ecology and Hydrology, (APIS, 2023), refer to Table 7.5.

Table 7.5: Critical loads / levels at sensitive designated habitats. Source: APIS, 2023.

	Nitrogen deposition critical load (kgN/ha/yr)	NO_x Critical level (µg/m^3)	SO_2 Critical level (µg/m^3)
Maximum	10	30	20
Minimum	5	30	20

In order to calculate the nitrogen deposition, firstly the NO_2 / NO_X concentrations are determined through modelling including the background concentration. In accordance with AG4 the method considers the maximum annual average ground level concentration in the ecologically sensitive area (EPA, 2020). The concentration is then converted into a deposition flux using a deposition specific velocity (m/s) outlined below:

- Grassland and similar habitats deposition velocity: NO_2 = 0.0015 m/s; and
- Forest and similar habitats deposition velocity: NO_2 = 0.003 m/s.

The worst-case NO_2 concentration is converted into a dry deposition flux using the following equation.

Dry deposition flux (µg m^{-2} s^{-1}) = Ground-level process contribution (µg/m^3) x Deposition velocity (m/s)

A conversion factor of 95.9 is then applied to convert the dry deposition flux units from µg m^{-2} s^{-1} of NO_2 (as Nitrogen) to kg ha^{-1} $year^{-1}$.

Background N deposition rates are obtained from www.apis.ac.uk (APIS, 2023). The total N deposition is then be compared to the critical load for the site and the increase considered in accordance with the significance criteria provided in Table 7.6.

Table 7.6: Significance of effect at sensitive designated habitats. Source: TII, 2022.

Description of Results	Significance
Total N deposition are more than 1% of the critical load.	Discuss further with biodiversity practitioners (see below).
The total N deposition are less than 1% of the critical load.	Not Significant.

7.2.3 Assessments of Effects Methodology

7.2.3.1 Construction Phase Activities

For the Construction Phase activities assessment, the focus is on air quality sensitive receptors adjacent to the proposed works that are susceptible to potential dust effects. As such, the greatest potential effect on air quality during the Construction Phase is from construction dust emissions, PM_{10} / $PM_{2.5}$ emissions and the potential for nuisance dust.

The construction effects have been assessed using the qualitative approach described in the IAQM guidance (IAQM, 2024). The guidance applies to the assessment of dust from construction and demolition activities. However, no demolition activities are required during the Construction Phase of the Proposed Development, as such dust emission from demolition activities will not be further assessed.

An 'impact' is described as a change in pollutants concentrations or dust deposition, while an 'effect' is described as the consequence of an impact. The main effects that may arise during construction of the Proposed Development are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes;
- Elevated PM_{10} concentrations as a result of dust generating activities on site; and
- An increase in NO_2 and PM_{10} concentrations due to exhaust emissions from non-road mobile machinery (NRMM) and vehicles accessing the site.

The IAQM guidance considers the potential for dust emissions from dust-generating activities, such as earthworks, construction of new structures and track-out. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while track-out is the transport of dust and dirt from the Proposed Development site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the Proposed Development site with dusty materials, which may then spill onto the road, or when they travel over muddy ground on the Proposed Development site and then transfer dust and dirt onto the road network (IAQM, 2024).

For each of these dust-generating activities, the guidance considers three separate effects: annoyance due to dust soiling; harm to ecological receptors; and the risk of health effects due to a significant increase in PM_{10} exposure. The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM_{10} exposure (IAQM, 2024).

The methodology takes into account the scale to which the above effects are likely to be generated (classed as small, medium or large), along with the levels of background PM_{10} concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. This is then taken into consideration when deriving the overall risk for the Proposed Development site. Suitable mitigation measures are also proposed to reduce the risk of the site. Figure 7.1 outlines the steps to be undertaken, as per the IAQM guidance (IAQM, 2024).

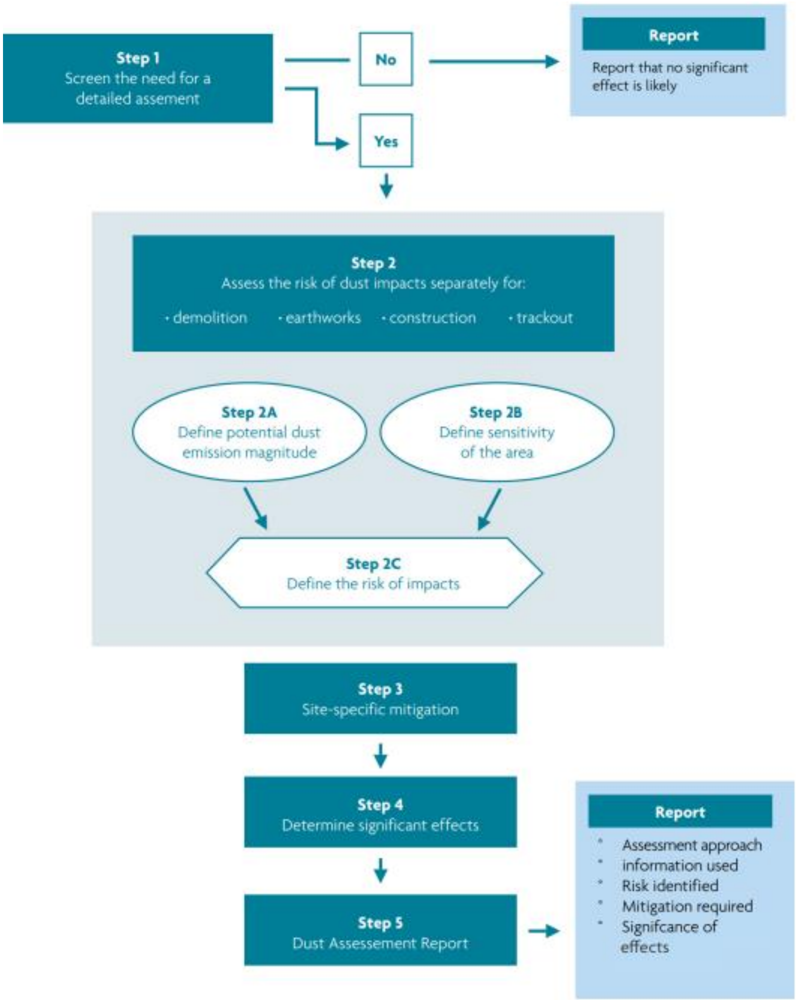

Figure 7.1: Steps to undertaking dust assessment. Source: IAQM, 2024.

Step 1 Screen Need for Assessment

The first step is the initial screening to determine whether a detailed assessment is required. According to the IAQM guidance published in 2024, an assessment is normally required where there is:

- a *'human receptor'* within:
  - 250 m of the boundary of the site; and/or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).
- an *'ecological receptor'* within:
  - 50 m of the boundary of the site; and/or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).

There are sensitive human receptors located within 250 m of the site boundary so therefore an assessment of the air quality effects is required. No ecological sensitive receptors are located within 50 m of the Proposed Development site boundary or within 250 m of the Proposed Development site entrance so are not considered further.

Step 2 Assess the Risk of Potential Dust Effects

This step is split into three sections as follows:

- A - Define the potential dust emission magnitude;

- B - Define the sensitivity of the area; and
- C - Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (Step 2A) based on the criteria shown in Table 7.7.

Table 7.7: Categorisation of dust emission magnitude. Source: IAQM, 2024.

Dust Emission Magnitude		
Small	**Medium**	**Large**
Demolition		
Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months.	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12 m above ground level.	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level.
Earthworks		
total site area <18,000m^2 soil type with large grain size (e.g., sand) <5 heavy earth moving vehicles active at any one time formation of bunds <3m in height.	total site area 18,000m^2 - 110,000m^2 moderately dusty soil type (e.g., silt) 5 – 10 heavy earth moving vehicles active at any one time formation of bunds 3 - 6m in height.	total site area >110,000 m^2 potentially dusty soil type (e.g., clay, which will be prone to suspension when dry due to small particle size) >10 heavy earth moving vehicles active at any one time formation of bunds >6m in height.
Construction		
total building volume <12,000 m^3 construction material with low potential for dust release (e.g., metal cladding or timber).	total building volume 12,000 - 75,000m^3 potentially dusty construction material (e.g., concrete) on-site concrete batching.	total building volume >75,000m^3 on-site concrete batching, Sandblasting.
Trackout (transport of dust and dirt from the construction/demolition site onto the public road network)		
<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.	20 – 50 HDV (>3.5t) outward movements in any one day moderately dusty surface material (e.g., high clay content) unpaved road length 50 – 100m.	>50 HDV (>3.5t) outward movements in any one day potentially dusty surface material (e.g., high clay content) unpaved road length >100m.

The sensitivity of the surrounding area is determined (Step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors (IAQM, 2024).

Sensitivities of People to Dust Soiling Effects (IAQM, 2024)

High sensitivity receptor – surrounding land where:

- Users can reasonably expect enjoyment of a high level of amenity; or
- The appearance, aesthetics or value of their property would be diminished by soiling; and/or
- The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
  - Indicative examples include dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.

Medium sensitivity receptor – surrounding land where:

- Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; and/or

- The appearance, aesthetics or value of their property could be diminished by soiling; and/or
- The people would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.
  - Indicative examples include parks and places of work.

Low sensitivity receptor – surrounding land where:

- The enjoyment of amenity would not reasonably be expected; and/or
- Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; and/or
- There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
  - Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

Sensitivities of People to the Health Effects of PM_{10}

High sensitivity receptor:

- Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).
  - Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

Medium sensitivity receptor:

- Locations where the people exposed are kw, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).
  - Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

Low sensitivity receptor:

- Locations where human exposure is transient.
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

Table 7.8 and Table 7.9 show the criteria for defining the sensitivity of the area to soiling and health effects respectively.

Table 7.8: Sensitivity of the area to dust soiling effects on people and property. Source: IAQM, 2024.

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		< 20	< 50	< 100	< 250
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1- 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

Table 7.9: Sensitivity of the area to human health effects. Source: IAQM, 2024.

Background PM_{10} concentrations (annual mean)	Number of receptors	Distance from the source (m)			
		< 20	< 50	< 100	< 250
High receptor sensitivity					
> 32µg/m³	> 100	High	High	High	Medium
	10 – 100			Medium	Low
	< 10		Medium	Low	
28 – 32µg/m³	> 100	High	High	Medium	Low
	10 – 100		Medium	Low	
	< 10				
24 – 28µg/m³	> 100	High	Medium	Low	Low
	10 – 100				
	< 10	Medium	Low		
< 24µg/m³	> 100	Medium	Low	Low	Low
	10 – 100	Low			
	< 10				
Medium receptor sensitivity					
> 32µg/m³	> 10	High	Medium	Low	Low
	1 – 10	Medium	Low		
28 – 32µg/m³	> 10	Medium	Low	Low	Low
	1 – 10				
24 – 28µg/m³	> 10	Low	Low	Low	Low
	1 – 10				
< 24 µg/m³	> 10	Low	Low	Low	Low
	1 – 10				
Low receptor sensitivity					
< 24µg/m³	> 1	Low	Low	Low	Low

The overall risk of the potential effects for each activity is then determined (Step 2C) prior to the application of any mitigation measures and an overall risk for the site is derived, refer to Table 7.10.

Table 7.10: Risk of dust impacts. Source: IAQM, 2024.

Sensitivity of area	Dust Emission Magnitude		
	Large	Medium	Small
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk

Sensitivity of area	Dust Emission Magnitude		
	Large	Medium	Small
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

In order to determine the level of dust mitigation required during the Construction Phase, the potential dust emission magnitude for each dust generating activity needs to be taken into account, along with the already established sensitivity of the area.

7.2.3.2 Operational Phase Activities

Dispersion Modelling Methodology

General

The air dispersion modelling study has been carried out using the internationally approved Breeze AERMOD computer package to predict the potential effect of emissions on ambient air quality. The assessment considers one worst-case generator operating continuously (testing) plus the remaining generators operating in emergency mode. Currently, in accordance with IE Licence P1189-01, the Applicant is permitted to operate its generators in emergency mode for 150 hours per annum, this is assumed for the existing situation. However, for the proposed situation, a limitation of 100 hours per annum is assumed to minimise total emissions from site.

Two approaches are applied for the assessment of the emergency scenario:

- USEPA Methodology**:** The scenario modelled includes emissions from the emergency operation of the generators factored down by the maximum number of operational hours per year (as described in EPA AG4 Volume 2 Appendix 7; for emergency or intermittent operations, an average hourly emission rate should be used rather than the maximum hourly rate). The assessment involved modelling the standby diesel generators based on 150 hours of back-up operation per year in addition to scheduled testing as per IE Licence for the existing and 100 hours in the proposed scenario. The cumulative effect of the neighbouring proposed and operational data storage facilities as well as Licenced Emissions points are also considered.
- UKEA Methodology**:** Statistical approach for modelling emergency generators and determines the number of hours for which the generators can operate without exceeding the ambient air quality standards at the 95th%ile confidence level. For modelling purposes, all emergency generators are assumed to run simultaneously for every hour of the year at the actual maximum hourly emission rate for NO_x, and results are predicted for every hour of the year at the worst-case sensitive receptor.

Building Wake Effect

The length, width and height of buildings in the vicinity of the sources were taken into account in modelling. Building data for the current situation and for the Proposed Development was inputted. Site buildings are imported graphically into AERMOD using AutoCAD drawing files and drawn using the polygon buildings feature, with elevation and heights included.

AERMOD includes a software utility called BPIP to calculate direction-specific building downwash factors using the relative positions and dimensions of sources and neighbouring buildings.

Figure 7.2 shows the main buildings included in the AERMOD model as well as adjacent buildings.

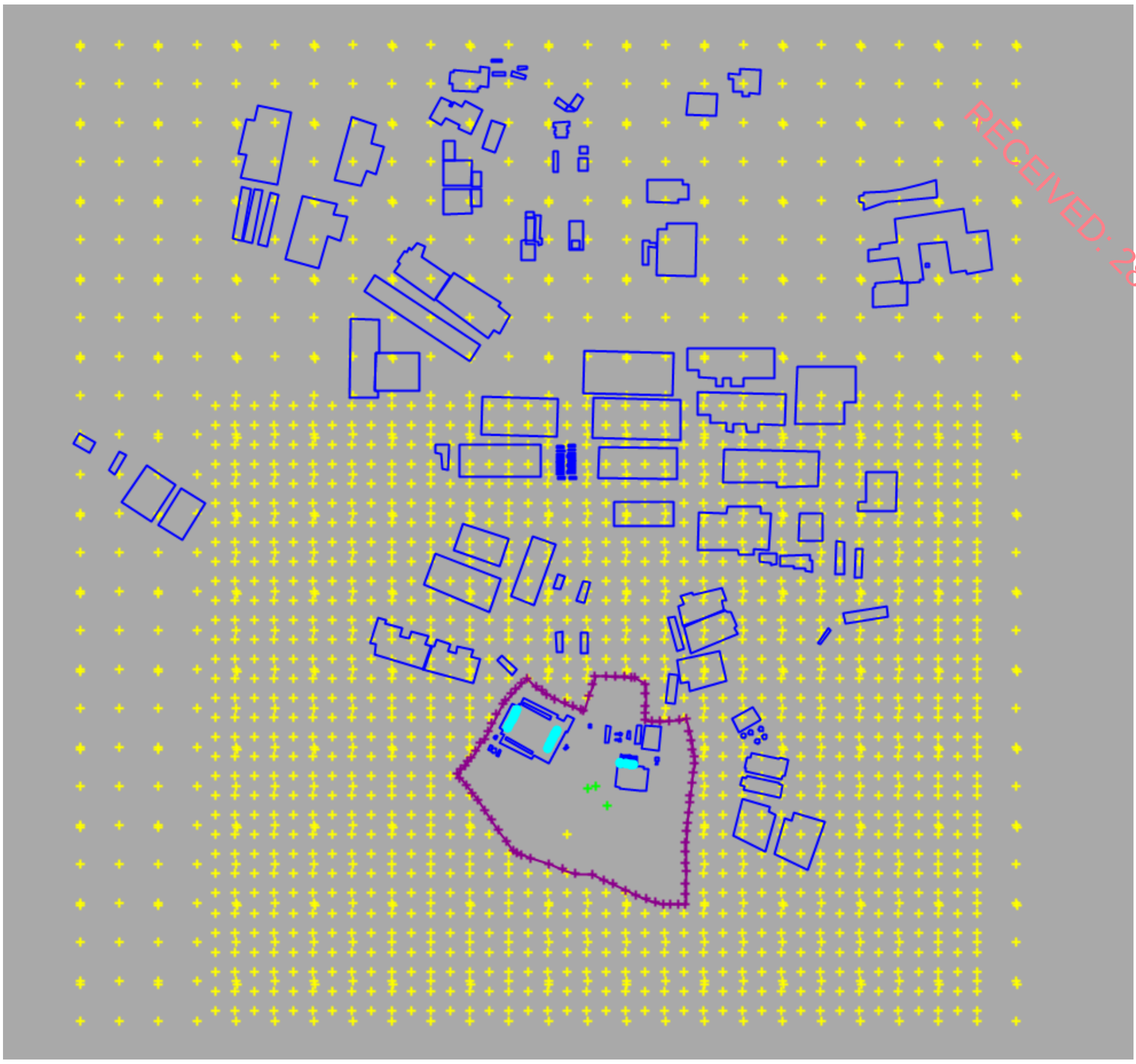

Figure 7.2: Model layout. Source: AERMOD.

Receptor locations

For this modelling situation, two nested cartesian receptor grids were used: the first extends 2.5 x 2.4 km at 100 m spacings with a second 2 x 1.55 km at 50m spacings.

Ground level concentrations are predicted at each receptor location. These receptors do not represent individual residences but would be representative of potential 'worst-case' receptors. On-site receptors were excluded from the model.

The closest sensitive ecological receptor is the Grand Canal pNHA located approximately 1.6 km north of the Proposed Development site boundary. Receptor points are included at this location to assess potential effects at the Proposed Development site.

Terrain elevations were obtained from Ordnance Survey Ireland. In accordance with AG4, terrain data was converted from DTM to DEM. This DEM data file was used to generate terrain elevations at each receptor point.

Meteorological data

Meteorological data from 2017 to 2021 recorded by the Met Éireann station at Casement Aerodrome (located immediately to the south of the Proposed Development) was used. This data was used to generate surface and profile files, using the ADMS meteorological pre-processer. Refer to Figure 7.3 for the annual wind-roses from Met Eireann.

A surface roughness of 1m was assumed. The predominant land usage in the vicinity of the Proposed Development is grassland and urban.

The meteorological data includes hourly values of wind speed, wind direction, atmospheric stability, ambient temperature and mixing heights.

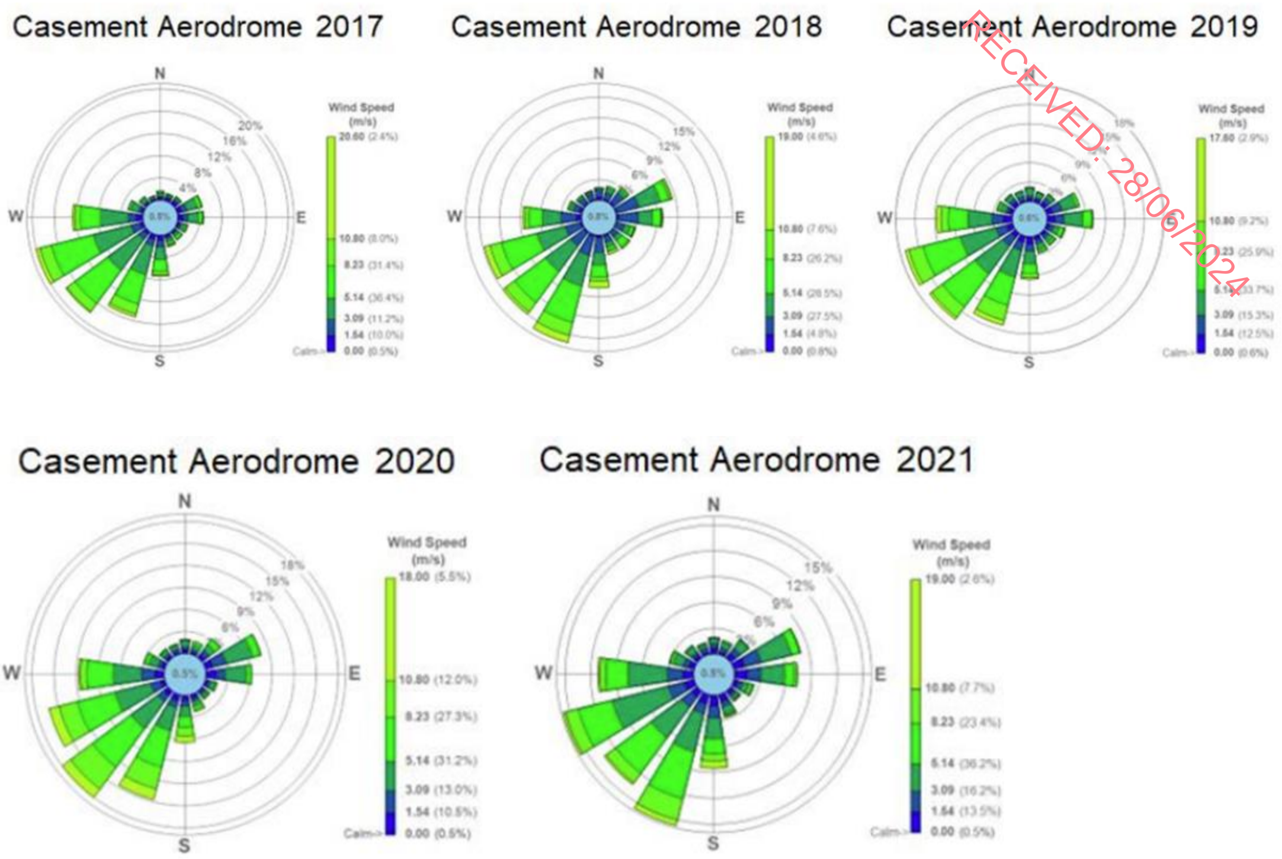

Figure 7.3: Casement Aerodrome wind-roses from 2017 to 2021. Source: Met Eireann, 2022.

Five years of meteorological data is analysed by the model to determine the worst-case effects at all receptors points.

Emission sources

Emission data is provided in Table 7.11 for both the existing GIL Campus and the Proposed Development generators. As discussed, the rates for existing and proposed scenarios vary due to the changes in operational hours.

Table 7.11: Generator source emission data. Source: Breeze AERMOD.

Building		DC1	DC2	DC3
No. of Diesel Generators		7	17	45
Stack Height (m)		17	25	15
Stack Internal Diameter (m)		0.6	0.7	0.6
Exit Gas Temperature (K)		758.15	684.15	695.15
Max Vol Flow Rate (m^3/s)		6.32	9.27	9.57
NO_x	NO_x (mg/Nm^3) @ 5% O_2	3,498	2,820	2,830
	NO_x (mg/Nm^3) correct to 15% O_2	1,298	1,046	1,050
	Emission Rate (testing) (g/s)	4.9	6.4	6.6
	Emission Rate (emergency, existing) (g/s)	0.08	0.11	0.11
	Emission Rate (emergency, proposed) (g/s)	0.06	0.07	0.08

Building		DC1	DC2	DC3
PM_{10}	PM_{10} (mg/Nm^3) @ 5% O_2	10	10	10
	PM_{10} (mg/Nm^3) correct to	3.7	3.7	3.7
	15% O_2			
	Emission Rate (testing) (g/s)	0.01	0.02	0.02
	Emission Rate (emergency, existing) (g/s)	0.0002	0.0004	0.0004
	Emission Rate (emergency, proposed) (g/s)	0.0002	0.0003	0.0003
$PM_{2.5}$	$PM_{2.5}$ (mg/Nm^3) @ 5% O_2	10	10	10
	$PM_{2.5}$ (mg/Nm^3) correct to	3.7	3.7	3.7
	15% O_2			
	Emission Rate (testing) (g/s)	0.01	0.02	0.02
	Emission Rate (emergency, existing) (g/s)	0.0002	0.0004	0.0004
	Emission Rate (emergency, proposed) (g/s)	0.0002	0.0003	0.0003
SO_2	SO_2 (mg/Nm^3) @ 5% O_2	10	10	10
	SO_2 (mg/Nm^3) correct to	3.7	3.7	3.7
	15% O_2			
	Emission Rate (testing) (g/s)	0.01	0.02	0.02
	Emission Rate (emergency, existing) (g/s)	0.0002	0.0004	0.0004
	Emission Rate (emergency, proposed) (g/s)	0.0002	0.0003	0.0003

7.2.3.3 Construction / Operational Phase Traffic

The assessment of traffic emissions has been carried out using the methodology outlined in the TII Standard (TII, 2022).

The TII REM provides a spatial and temporal estimate of CO_2 equivalent emissions and the pollutant concentrations resulting from vehicular use on the National Roads Network. The REM integrates:

- Traffic information from the TII National Transport Model which provides validated estimates of the volumes of light and heavy vehicles, and the speed at which they travel, on the National Roads Network;
- A Fleet Mix database developed by researchers in the Energy Policy and Modelling Group at University College Cork (UCC) for cars based on economic projections, and for other light and heavy vehicles by AECOM. The Fleet Mix database is underpinned by the Central Statistics Office’s goods vehicles registration data (both heavy and light goods vehicles);
- Emission Rate Database derived from the European Environment Agency’s (EEA) COPERT Emissions Tool - the EU industry standard vehicle emissions calculator – published in the EMEP/EEA air pollutant emission inventory guidebook. These data were adjusted further using data published in the UK by DEFRA; and
- An Ambient Air Quality Model module, which calculates pollutants (NO_X, NO_2, PM_{10} and $PM_{2.5}$) released from each individual road link, using predictions of atmospheric pollutants concentration and dispersion, scaled up to an annual average concentration. TII’s REM calculates road transport emissions integrating traffic volumes/speeds for light and heavy vehicles on the Irish National Roads Network with Irish fleet composition information.

The projected stock models for non-goods vehicles (i.e. cars) are extrapolated from the UCC stock model for:

- Business as Usual (BaU) scenario; i.e. excluding strategic policy interventions for reduction of CO_2, etc, and based on existing trends in vehicle purchasing and turnover of vehicles out of the vehicle fleet;

- Climate Action Plan (CAP) based on achieving increases in EVs including 151,000 passenger car EV and PHEVs by 2025 and 840,000 passenger car electric vehicle (EV) and plug-in hybrid (PH) EVs by 2030; and
- An intermediate case calculated by AECOM using linear extrapolation to a central value between BaU and CAP for each vehicle sub-classification.

For the purposes of the calculations, an intermediate case was used in the assessment.

Based upon traffic data, areas for assessment can be screened against the following criteria. The screening criteria are based on the changes between the DS traffic (i.e., with construction/operation) compared to the existing traffic volumes:

- Road alignment will change by 5 m or more;
- Annual average daily traffic (AADT) flows will change by 1,000 or more;
- Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more;
- Daily average speed change by 10 kph or more; and
- Peak hour speed will change by 20 kph or more.

If the criteria are not met, then a quantitative assessment of traffic can be scoped out and the effects are considered to be Not Significant. If the criteria are met, a local air quality assessment is required.

The air quality assessment utilises the traffic data provided in Chapter 6 (Traffic and Transport) to assess the likely significant effects of Construction and Operational Phase traffic changes on air quality.

7.3 Baseline Environment

The Environmental Protection Agency (EPA) Air Quality in Ireland Reports describes the air quality zoning adopted in Ireland as follows:

- Zone A (Dublin conurbation);
- Zone B (Cork conurbation);
- Zone C (24 Cities and towns); and
- Zone D (Rural Ireland: areas not in Zones A, B and C).

The Proposed Development site falls within Zone A. Background pollutant levels from 2022, 2021 and 2020 air quality monitoring of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 are listed for Zone A, as provided by the EPA, and are presented in Table 7.12.

A desk study of the EPA air quality monitoring programmes has been undertaken. Concentrations of each pollutant recorded in Zone A are averaged to represent typical background levels. Average concentrations were obtained from all stations where 90% data capture was achieved. This is in accordance with Directive 2008/50/EC which specifies that any site used for assessment purposes must comply with 90% data capture.

The most recent annual report on air quality, Air Quality in Ireland 2022 (EPA, 2023) details the range and scope of monitoring undertaken throughout Ireland.

The continuous monitoring data from EPA monitoring stations in Zone A is outlined in Table 7.12 which presents a three-year maximum of background pollutant concentration values for NO_2, $PM_{10,}$ $PM_{2.5}$ and SO_2.

Table 7.12: Maximum three-year background pollutant concentrations based on a minimum 90% data capture. Source: EPA, 2023.

Pollutant	Year	Location							Average
		Rathmines	Ballyfermot	Swords	Ringsend	Dun Laoghaire	Pheonix Park	Winetavern Street	
NO_2	2022	14.2	12.7	12.3	-	-	-	-	13.1
	2021	14.4	13.2	11.4	-	-	-	-	13.0
	2020	13.0	12.0	11.0	-	-	-	-	12.0
NO_x	2022	21.8	19.0	17.8	-	-	-	-	19.5
	2021	20.1	17.7	15.4	-	-	-	-	17.7
	2020	21.4	17.1	15.5	-	-	-	-	18.0
SO_2	2022	1.8	-	-	2.9	-	-	-	2.4
	2021	1.1	-	-	-	-	-	-	1.1
	2020	1.4	-	-	2.1	-	-	-	1.8
PM_{10}	2022	14.7	12.6	-	-	12.3	10.9	13.6	12.8
	2021	12.4	11.8	-	-	11.3	9.6	12.4	11.5
	2020	11.0	12.0	-	-	12.0	-	13.0	12.0
$PM_{2.5}$	2022	7.5	7.5	-	-	7.8	6.3	-	7.3
	2021	-	7.8	-	-	7.5	-	-	7.7
	2020	8.0	8.0	-	-	8.0	-	-	8.0

The averaged background concentrations are well within the air quality standards for all pollutants in Zone A as shown in Table 7.13. Maximum concentrations are used in the model as background.

Table 7.13: Annual mean background pollutant concentrations for Zone A. Source: EPA, 2023.

Year	Annual Average NO_2 (µg/m³)	Annual Average NO_x (µg/m³)	Annual Average PM_{10} (µg/m³)	Annual Average $PM_{2.5}$ (µg/m³)	Annual Average SO_2 (µg/m³)
Limit	40	30	40	25	20
2022	13.1	19.5	12.8	7.3	2.4
2021	13.0	17.7	11.5	7.7	1.1
2020	12.0	18.0	12.0	8.0	1.8
Maximum	13.1	19.5	12.8	8.0	2.4

7.4 Potential Effects

7.4.1 Do-Nothing Scenario

In the scenario where the Proposed Development did not proceed, none of the construction, operational or decommissioning effects set out in this Chapter would occur, potentially resulting in an overall Neutral effect.

7.4.2 Potential Construction Phase Effects

There is potential for direct and indirect effects to arise during the Construction Phase. Direct effects are likely due to Construction Phase activities. Indirect effects relate to the potential offsite effects associated with construction traffic accessing the site for deliveries, removals and staff.

7.4.2.1 Direct Effects

Dust emissions are likely to arise from the following activities:

- Site clearance;
- Utility diversions;
- Foundation construction;
- Site excavation;
- Use of generators;
- Stockpiling of excavated materials;
- Handling of construction materials; and
- Construction traffic movements.

Dust Emission Magnitude

The IAQM guidance (2024) was used to assess the potential air quality effects on sensitive receptors during the Construction Phase.

Following the methodology outlined in Section 7.2.3, each dust generating activity has been assigned a dust emission magnitude as shown in Table 7.14.

As there is no existing structure to be demolished, the demolition activity is omitted.

Table 7.14: Dust emission magnitude for construction activities. Source: IAQM, 2024.

Activity	Dust emission magnitude	Reasoning
Earthworks	Large	Total site area >110,000 m^2
Construction	Large	Total building volume > 75,000 m^3, on site concrete batching
Track-out	Large	>50 HDV (>3.5t) outward movements in any one day

Sensitivity of the Area

The receptor sensitivity of the Proposed Development study area to dust soiling effects has been assigned as medium, due to the presence of dwellings and a creche with a medium sensitivity for health effects, refer to Section 7.2.3.1. The sensitivity of the area to dust effects (based on Table 7.8) is considered medium due to the number of sensitive receptors within proximity to the source of dust. The sensitivity of the area to human health effects (based on Table 7.9) is considered low due to the low background concentration of PM_{10}.

The overall sensitivity has been summarised as shown in Table 7.15.

Table 7.15: Outcome of defining sensitivity of area. Source: IAQM, 2024.

Potential effect	Sensitivity of Surrounding Area		
	Earthworks	Construction	Trackout
Dust effects	Medium	Medium	Medium
Human Health	Low	Low	Low

Risk of Effects

Taking into consideration the dust emission magnitude and the sensitivity of the area, the risk of dust effects is presented in Table 7.16 based on the approach outlined in Table 7.11.

Table 7.16: Risk of dust effects to define mitigation. Source: IAQM, 2024.

Potential Effect	Risk		
	Earthworks	Construction	Track-out
Dust Soiling	Medium	Medium	Medium
Human Health	Low	Low	Low

The impact risk is assigned a risk, as shown in Table 7.16 prior to the implementation of mitigation measures. On this basis, the direct effect on air quality during the Construction Phase has the potential to be Negative, Significant, and Short-Term in proximity to the works. The duration of the works is expected to be 27 months.

7.4.2.2 Indirect Effects

The predicted change in NO_2 and PM_{10} concentrations, due to the likely changes in Construction Phase AADT between the existing and proposed scenarios are presented in Table 7.17 for the nearest sensitive receptor to each affected road link. Six road links are projected to result in an increase of HGV of greater than 200 (AADT) requiring detailed assessment, refer to Section 7.2.3.3. Refer to Chapter 6 for further details on the traffic and transport data.

Table 7.17: Predicted change in pollutant concentrations – Construction Phase 2025. Source: Breeze AERMOD.

Pollutant and limit	Link	Receptor ID	Total Predicted annual concentrations (µg/m³) at nearest receptor (background + predicted for existing situation)	Total Predicted DS annual concentrations (µg/m³) at nearest receptor (background + predicted for proposed situation)	% Change in concentration relative to Air Quality Standard Value (AQSV)	% proposed situation Concentration relative to AQSV (< 75%)	Rating of Effects
NO_2 (40 µg/m³)	Profile Park (S)	R1	13.2	13.2	0.1	33.0	Neutral
	R134 New Nangor Road (E)	R2	15.2	15.4	0.5	38.5	Neutral
	R136 Grange Castle Road (S)	R3	15.9	16.0	0.1	40.0	Neutral
	R136 Grange Castle Road (S)	R4	15.7	15.8	0.1	39.5	Neutral
	R136 Grange Castle Road (S)	R5	15.8	15.9	0.2	39.6	Neutral
	R136 Grange Castle Road (S)	R6	15.7	15.8	0.1	39.4	Neutral
PM_{10} (40 µg/m³)	Profile Park (S)	R1	12.8	12.9	0.1	32.2	Neutral
	R134 New Nangor Road (E)	R2	14.7	15.0	0.7	37.4	Neutral

Pollutant and limit	Link	Receptor ID	Total Predicted annual concentrations (µg/m³) at nearest receptor (background + predicted for existing situation)	Total Predicted DS annual concentrations (µg/m³) at nearest receptor (background + predicted for proposed situation)	% Change in concentration relative to Air Quality Standard Value (AQSV)	% proposed situation Concentration relative to AQSV (< 75%)	Rating of Effects
	R136 Grange Castle Road (S)	R3	15.4	15.5	0.3	38.7	Neutral
	R136 Grange Castle Road (S)	R4	15.2	15.3	0.3	38.2	Neutral
	R136 Grange Castle Road (S)	R5	15.2	15.3	0.3	38.4	Neutral
	R136 Grange Castle Road (S)	R6	15.1	15.3	0.3	38.1	Neutral
$PM_{2.5}$ (25 µg/m³)	Profile Park (S)	R1	8.0	8.0	0.1	32.2	Neutral
	R134 New Nangor Road (E)	R2	9.1	9.2	0.6	36.8	Neutral
	R136 Grange Castle Road (S)	R3	9.4	9.5	0.3	38.0	Neutral
	R136 Grange Castle Road (S)	R4	9.3	9.4	0.2	37.5	Neutral
	R136 Grange Castle Road (S)	R5	9.4	9.4	0.2	37.6	Neutral
	R136 Grange Castle Road (S)	R6	9.3	9.4	0.2	37.4	Neutral

Predicted concentrations are in compliance with air quality standards. Based on the significance criteria outlined in Table 7.3, a Neutral and Short-Term effect is predicted to occur due to Construction Phase traffic.

Figure 7.4: Construction Phase affects roads and human receptors (2025). Source: Google Earth Pro.

7.4.3 Potential Operational Phase Effects

7.4.3.1 Site Emissions – Human Assessment of Effects

Air dispersion modelling was undertaken to assess the potential effects of air emissions resulting from the operation (i.e. emergency and testing) of backup generators. The emissions from the existing and new generators were simulated including, DC1 (7 no. back-up generators), DC2 (17 no. back-up generators) and the Proposed Development, DC3, (45 no. back-up generators) to evaluate compliance with ambient air quality standards.

An assessment of the existing situation (i.e. DC1 and DC2) is based on 150 hours of emergency operation per year, in addition to one generator being tested continuously. Refer to Table 7.18 for modelling results.

Table 7.18: Existing scenario (150 hour emergency generator operation).

Emergency + Testing Scenario - 150 hour emergency operation							
Pollutant	**Averaging Period**	**Background ($\mu g/m^3$)**	**Other Sources ($\mu g/m^3$)1**	**DC1, 2 ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**% of AQS**	**Air Quality Standard ($\mu g/m^3$)**
NO2	1hr (99.79 %ile)	26.2	-	93.56	119.76	59.88	200
	Annual average	13.1	3.5	23.30	39.90	99.75	40
PM10	24 Hour (90 %ile)	12.8	-	0.62	13.42	26.83	50
	Annual	12.8	-	0.32	13.12	32.81	40
PM2.52	Annual	8	-	0.20	8.20	32.81	25

[1] Determined from the air dispersion modelling assessment completed for application for IE licence P1189-01 090151b280853aab.pdf (epa.ie)

[2] Based on a ratio of $PM_{10}/PM_{2.5}$ as per monitoring data

Emergency + Testing Scenario - 150 hour emergency operation							
SO2	1hr (99 %ile)	4.8	-	1.33	6.13	1.75	350
	24 Hour (90.41 %ile)	2.4	-	0.62	3.02	2.41	125

As outlined in Table 7.18, the existing scenario reaches 99.75% of the AQS for annual average NO_2. All parameters are in compliance with limit values.

An assessment of the proposed situation (i.e. all generators) is based on 100 hours of emergency operation per year, in addition to one generator being tested continuously. Refer to Table 7.19 for modelling results.

Table 7.19: Proposed scenario (100 hour emergency generator operation). Source: Breeze AERMOD.

Emergency + Testing Scenario - 100 hour Operational							
Pollutant	**Averaging Period**	**Background (µg/m³)**	**Other Sources (µg/m³)** [3]	**DC1, DC2, DC3 (µg/m³)**	**Total (µg/m³)**	**% of AQS**	**Air Quality Standard (µg/m³)**
NO_2	1hr (99.79 %ile)	26.2	-	89.02	115.22	57.61	200
	Annual average	13.1	3.5	22.31	38.91	97.28	40
PM_{10}	24 Hour (90 %ile)	12.8	-	0.60	13.40	26.81	50
	Annual	12.8	-	0.32	13.12	32.80	40
$PM_{2.5}$	Annual	8	-	0.20	8.20	32.80	25
SO_2	1hr (99 %ile)	4.8	-	1.29	6.09	1.74	350
	24 Hour (90.41 %ile)	2.4	-	0.61	3.01	2.41	125

As outlined in Table 7.19, the proposed scenario reaches 97.28% of the AQS for annual average NO_2. All parameters are in compliance with limit values. Refer to Figure 7.5, Figure 7.6, Figure 7.7, Figure 7.8, Figure 7.9 and Figure 7.10 for the isopleths showing the highest ground level concentrations of 1-hour NO_2, annual NO_2,, 24-hour PM_{10}, annual PM_{10}, 1-hour SO_2 and 24-hour SO_2 respectively. All isopleths exclude ground level concentrations.

Table 7.20 a comparison of the existing and proposed scenarios. A reduction in ground level concentrations is predicted to occur for NO_2 and PM_{10}, with SO_2 concentrations remaining unchanged. The reason for the reduction is due to the proposed decrease in emergency operation of the generators from 150 hours per annum to 100 hours per annum across the full GIL Campus. A rating of neutral to moderate positive permanent effects in EIA terms is predicted based on the impact descriptors outlined in Table 7.3.

Table 7.20: Comparison of existing and proposed scenarios. Source: Breeze AERMOD.

Pollutant	Averaging Period	Air Quality Standard (µg/m³)	Existing total concentration (µg/m³)	Proposed total concentration (µg/m³)	% change relative to AQS	Rating of Effects
NO_2	1hr (99.79 %ile)	200	119.76	115.22	-2.27	Moderate Positive
	Annual average	40	39.90	38.91	-2.48	Moderate Positive
PM_{10}	24 Hour (90 %ile)	50	13.42	13.40	-0.04	Slight Positive
	Annual	40	13.12	13.12	0	Neutral

[3] Determined from the air dispersion modelling assessment completed for application for IE licence P1189-01 090151b280853aab.pdf (epa.ie)

Pollutant	Averaging Period	Air Quality Standard (µg/m^3)	Existing total concentration (µg/m^3)	Proposed total concentration (µg/m^3)	% change relative to AQS	Rating of Effects
$PM_{2.5}$	Annual	25	8.2	8.2	0	Neutral
SO_2	1hr (99 %ile)	350	6.13	6.09	-0.01	Slight Positive
	Daily (90.41 %ile)	125	3.02	3.01	-0.00008	Slight Positive

Figure 7.5: Isopleth of 1-hour ground level concentration for NO_2 (µg/m^3) excluding the background concentration. Source: Breeze 3D Analyst.

Figure 7.6: Isopleth of annual ground level concentration for NO_2 (µg/m^3) excluding the background concentration. Source: Breeze 3D Analyst.

Figure 7.7: Isopleth of 24-hour ground level concentration for PM_{10} ($\mu g/m^3$) excluding the background concentration. Source: Breeze 3D Analyst.

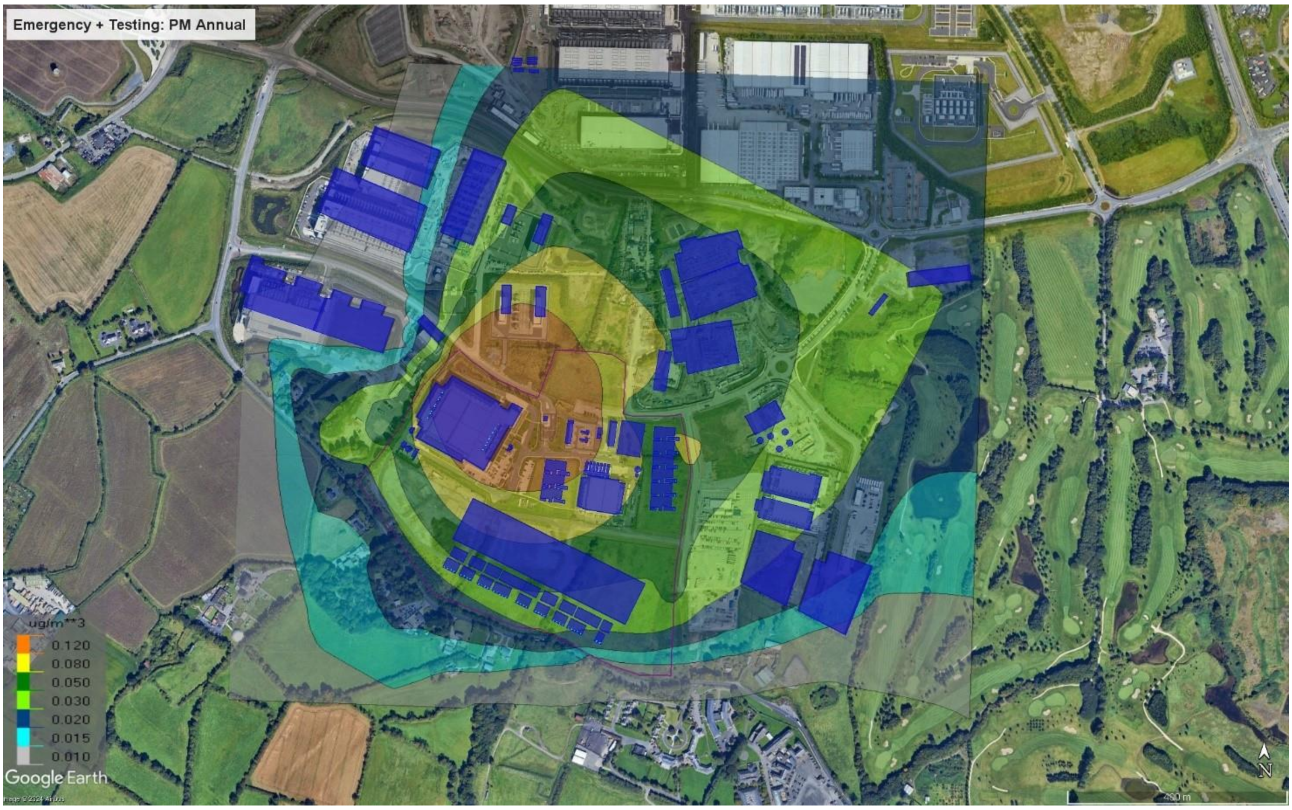

Figure 7.8: Isopleth of annual ground level concentration for PM_{10} ($\mu g/m^3$) excluding the background concentration. Source: Breeze 3D Analyst.

Figure 7.9: Isopleth of 1-hour ground level concentration for SO_2 (µg/m^3) excluding the background concentration. Source: Breeze 3D Analyst.

Figure 7.10: Isopleth of 24-hour ground level concentration for SO_2 (µg/m^3) excluding the background concentration. Source: Breeze 3D Analyst.

7.4.3.2 Site Emissions - Statistical Analysis – UK Environment Agency Methodology

Emissions from the standby diesel generators were assessed using the UK Environment Agency methodology. The methodology, based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value assuming a hypergeometric distribution, has been undertaken at the worst-case residential receptor. The hypergeometric distribution of 19 and more hours per year was computed and the probability of an exceedance determined as outlined in Table 7.21. The results have been compared to the 98th percentile confidence level to indicate if an exceedance is likely at various operational hours for the facility. The results indicate that the facility can operate for a maximum of 911 hours in any given year without the likelihood of an exceedance of the ambient air quality standard (at a 98th percentile confidence level).

Table 7.21: Hypergeometric statistical results at worst-case residential receptor – NO_2. Source: Breeze AERMOD.

Pollutant / Meteorological Year	Hours of Operation (Hours) (98th%ile) Allowed Prior to Exceedance of Limit Value	UK Guidance – Probability Value = 0.02 (98th%ile)
NO_2 (2016)	1,393	0.2
NO_2 (2017)	911	
NO_2 (2018)	1,480	
NO_2 (2019)	1,200	
NO_2 (2020)	1,419	

As it is proposed to limit the emergency operation of the generators to 100 hours per annum, no Adverse Significant effects on air quality in EIA terms are predicted based on the UK Environment Agency statistical approach.

7.4.3.3 Site Emissions – Potential Ecological Effects

The assessment of the potential effect of the Proposed Development on pollutants relating to the protection of vegetation (NO_x and SO_2) is outlined in Table 7.22 at the Grand Canal pNHA.

Table 7.22: Results of modelling of NOx, NO_2 and SO_2 at the grand canal pNHA. Source: Breeze AERMOD.

Pollutant	Averaging Period	Background (µg/m³)	Other Sources (µg/m³)	DC1, DC2, DC3 (µg/m³)	Total (µg/m³)	% of AQS	Air Quality Standard (µg/m³)
NO_x	Annual	19.5	-	1.1	20.6	68.6	30
NO_2	Annual	13.1	3.5	0.7	17.3	43.4	40
SO_2	Annual	2.4	-	0.004	2.4	12.0	20

Air quality standards for the protection of vegetation are complied with at the nearest ecologically sensitive site.

Nitrogen deposition is calculated based on the methodology outlined in Section 7.2.3.2.

Using the methodology outlined in the AG4 the worst-case NO_2 concentration outlined in Table 7.20 is first converted into a dry deposition flux using the equation below.

Dry deposition flux (µg m^{-2} s^{-1}) = Ground-level process contribution (µg/m^3) x Deposition velocity (m/s)

Deposition velocities for various pollutants are specified in AG4 with the recommended value for NO_2 being 0.0015 m/s. A conversion factor of 95.9 is multiplied by the dry deposition flux to convert the units from µg m^{-2} s^{-1} of NO_2 (as Nitrogen) to kg ha^{-1} $year^{-1}$ (EPA, 2020).

Calculation:

$$\text{Dry Deposition Flux } (\mu g\ m^{-2}\ s^{-1}) = 17.3\ \mu g/m^3 \times 0.0015\ m/s$$

$$\text{Dry Deposition Flux } (\mu g\ m^{-2}\ s^{-1}) = 0.026\ \mu g\ m^{-2}\ s^{-1}$$

$$NO_2 \text{ dry deposition flux } (kg\ ha^{-1}\ year^{-1}) = 0.026 \times 95.9$$

$$NO_2 \text{ dry deposition flux } (kg\ ha^{-1}\ year^{-1}) = 2.49\ kg\ ha^{-1}\ year^{-1} \text{ as Nitrogen (N)}$$

The predicted nitrogen dry deposition is predicted to be 2.49 kg ha^{-1} $year^{-1}$ as Nitrogen (N). This is in compliance with the minimum nitrogen deposition critical load of 5 kg ha^{-1} $year^{-1}$, refer to Table 7.5.

7.4.3.4 Operational Phase Traffic

No road links are projected to exceed the criteria for assessment as described in Section 7.2.3.3 so no detailed assessment is required.

7.4.4 Potential Decommissioning Phase Effects

During the Decommissioning Phase of the Proposed Development, the potential effects of the Proposed Development on air quality are likely to be similar to those arising during the Construction Phase, refer to Section 7.4.2.

7.5 Mitigation and Monitoring

7.5.1 Construction Phase

The following mitigation measures will be implemented for the Construction Phase of the Proposed Development, in order to reduce the dust risk associated with construction, earthworks and track-out, in accordance with IAQM guidance (IAQM, 2024). Refer to the Construction Environmental Management Plan (CEMP) in Appendix 5.1 for further details.

7.5.1.1 Measures Specific to All Sites

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager; and
- Display the head or regional office contact information.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.

Monitoring

- Carry out regular site inspections of cleanliness, record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;

- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles; and
- Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- No bonfires and burning of waste materials.

7.5.1.2 Measures Specific to Construction

The following measures are specific to construction:

- Ensure sand and other aggregates are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

7.5.1.3 Measures Specific to Trackout

The following measures are specific to trackout:

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site logbook;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable); and
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.

Dust deposition monitoring will be conducted at locations to the south and west of the Proposed Development where works are occurring within 250m. Monitoring will be carried out using the Bergerhoff method, i.e. analysis of dust collecting jars left on-site (German Standard VDI 2119, 1972). Results will be compared to the TA Luft guidelines (VDI, 2002). At least one month of dust deposition monitoring will be carried out in advance of the commencement of works to determine a baseline. In the event that guideline limits are exceeded, a review of mitigation measures will be carried out.

7.5.2 Operational Phase

As the Proposed Development will result in a reduction in ground level concentrations, no mitigation measures are required during the Operational Phase. The reduction in emergency operational hours will be implemented and committed to under a revised IE licence for the full GIL Campus, resulting in a Positive and Long-Term effect when compared to the existing situation.

GIL will be required to continue to monitor emissions from the generators in accordance with the requirement of a revised IE licence.

In addition, GIL will continue to carry out ambient air quality monitoring of NO_2 in accordance with IE licence requirements.

7.5.3 Decommissioning Phase

During the Decommissioning Phase of the Proposed Development, the mitigation and monitoring measures employed to mitigate the potential effects of the Proposed Development on air quality are likely to be similar to those used during the Construction Phase, refer to Section 7.5.1.

7.6 Residual Effects

7.6.1 Construction Phase

Following the implementation of mitigation measures outlined in Section 7.5.1, no Adverse Significant effects on air quality are likely to arise offsite. Dust deposition monitoring will be carried out to ensure the effectiveness of mitigation.

7.6.2 Operational Phase

During the Operational Phase of the Proposed Development, the GIL will be required to comply with the requirements of its revised IE licence. This revised licence will be issued by the EPA to reflect the changes arising from the Proposed Development. No Adverse Significant effects on air quality are likely to arise.

7.6.3 Decommissioning Phase

During the Decommissioning Phase of the Proposed Development, the likely residual effects of the Proposed Development on air quality are likely to be similar to those arising as a result of the Construction Phase, refer to Section 7.6.1. As outlined in Section 5.7, decommissioning activities will need to be undertaken in accordance with the requirements of the IE licence.

7.7 References

Air Pollution Information System (APIS) (2023) *Site Relevant Critical Loads and Source Attribution – Centre for Ecology and Hydrology*

Department of the Environment, Climate and Communications (DoECC) (2023) *Clean Air Strategy*.

EC (2008) *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe – CAFÉ Directive.*

EPA (2006) *Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals*)

EPA (2020) *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)*.

EPA (2022) *Guidelines on the information to be contained in Environmental Impact Statements*.

EPA (2023) *Air Quality in Ireland 2022*.

Government of Ireland (GoI) (2022) *Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022).*

Institute of Air Quality Management (IAQM) (2024) *Guidance on the assessment of dust from demolition and construction.*

Met Eireann (2022) *Meteorological data (2017-2021) at Casement Aerodrome.*

TII (2022) *Air Quality Assessment of Proposed National Roads - Standard PE-ENV-01107*.

UK Highways Agency (UKHA) (2019) *Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality*.

United Nations Economic Commission for Europe (UNECE) (2015) *Chapter 1 of Manual on methofologies and criteria for modelling and mapping critical loads and levels and air pollution effects, risks and trends*

Verein Deutscher Ingenieure (VDI) (1972) *German Standard VDI 2119 Blatt 2:1972-06*

Verein Deutscher Ingenieure (VDI) (2002) *German Technical Instructions on Air Quality Control - TA-Luft standard for dust deposition*.

World Health Organization (WHO) (2021) *Global Air Quality Guidelines – Particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*.

8. Climate

8.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the likely direct and indirect significant effects on Climate associated with the Construction, Operational and Decommissioning Phases of the Data Centre Development DC3 (referred to as the "Proposed Development") in accordance with the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

During the Construction Phase, the potential climate effects associated with the Proposed Development have been assessed. This included the assessment of embodied carbon associated with the materials likely to be used during the Construction Phase.

During the Operational Phase, the potential climate effects associated with the use of emergency generators and energy to power the Proposed Development have been assessed.

Consideration is also given to the vulnerability of the Proposed Development to climate change.

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental effects, where practicable. In addition, feedback received from consultation undertaken throughout the alternatives assessment and design development process have been considered, where appropriate.

The aim of the Proposed Development when in operation is to offer expanded compute capacity to GIL's customers and products. The Proposed Development is described in detail in Chapter 4 (Description of the Proposed Development) and Chapter 5 (Construction) provides a description of the construction and demolition activities.

Refer to Appendix 1.1 for the competency of the author of this Chapter.

8.2 Methodology

8.2.1 Introduction

The following section identifies the regulations, legislation and/or guidelines available and based on the foregoing the adopted methodology in the preparation of this Chapter.

8.2.2 Regulations, Legislation and/or Guidelines

8.2.2.1 Introduction

Transport Infrastructure Ireland (TII) Climate Assessment of Proposed National Roads – Standard (PE-ENV-01105) (2022) has been applied in the assessment of potential climatic effects. This is the only Irish guidance relating to climate assessment of effects of infrastructural projects. It is informed by UK guidance such as IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Estimating their Significance, the EU Commission technical guidance on climate proofing infrastructure projects and BSI PAS 2080 Carbon Management in Infrastructure and is therefore considered relevant in the context of the Proposed Development.

The climate assessment identifies, describes and assesses the likely significant effects on the environment. This captures the construction, operation and decommissioning phases. This Chapter assesses the potential effects of the project on climate (i.e. through its GHG emissions) and the project's vulnerability to climate.

EU greenhouse gas emission reduction targets and reduction obligations for Ireland are split into two broad categories. The first category covers the large energy and power (i.e., energy intensive) industry which have their emissions controlled under the EU Emissions Trading Scheme (ETS).

The second category deals with the non-Emissions Trading Scheme (non-ETS) sectors such as agriculture, transport, residential, commercial, waste, and non-energy intensive industry.

GIL is permitted to undertake activities resulting in emissions of CO_2 eq from emergency generators at its GIL Campus site (No IE-GHG170-10431) under the ETS. The permit also contains requirements that must be met in respect of such emissions, including monitoring and reporting requirements. This permit places an obligation on GIL to surrender allowances to the Agency equal to the annual reportable emissions of CO_2 eq from the installation in each calendar year, no later than four months after the end of each such year. GIL is required to revise this permit to account for the provision of the proposed new generators on their GIL Campus site.

8.2.2.2 International

The Paris Agreement (UNFCCC, 2015), which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C (degrees Celsius) above pre-industrial levels with efforts to limit this rise to 1.5°C. Nationally Determined Contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs comprise the efforts and actions by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each country to prepare the NDCs that it intends to achieve, updating and enhancing the NDCs every 5 years to enable a global stocktake which will assess the collective progress toward the meeting of the purpose of the Agreement. Countries are required to implement mitigation measures, with the aim of achieving the objectives of such contributions. Each of the EU Member States submit their own NDCs, which contribute to the overall EU NDC.

The European Green Deal, published by the European Commission in December 2019, provides an action plan which aims for the EU to be climate neutral by 2050. The EU Green Deal highlights that further decarbonisation of the energy sector is critical to reach climate objectives in 2030 and 2050. The European Green Deal will increase the GHG emissions reduction 2030 target to at least 55% in comparison to 1990 levels. Targets for renewable energy and energy efficiency are also likely to be increased.

On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in greenhouse gas emissions by 2030. The package of proposals is known as the 'Fit for 55' package. The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU ETS, Effort Sharing Regulation, transport and land use legislation, setting out in real terms the ways in which the Commission intends to reach EU climate targets under the European Green Deal.

The overall volume of greenhouse gases that can be emitted by power plants, industry factories and aviation sector covered by the EU Emissions Trading System (EU ETS) is limited by a 'cap' on the number of emission allowances. Within the cap, companies receive or buy emission allowances, which they can trade as needed. The cap decreases every year, ensuring that total emissions fall. This was established into European law by Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community.

The European Climate Law (EC, 2021) enshrines in law the EU's objective of becoming climate neutral by 2050, and the intermediate target of reducing net greenhouse gas (GHG) emissions by at least 55% by 2030. In 2023, the Commission issued a new Effort Sharing Regulation, requiring Ireland to reduce non-ETS carbon emissions by 42% relative to 2005 levels (EC, 2023a).

In February 2024, the European Commission presented its assessment for a 2040 climate target for the EU. The Commission recommended reducing the EU's net greenhouse gas emissions by 90% by 2040 relative to 1990. The 2040 climate target reaffirms the EU's determination to tackle climate change and to ensure the EU reaches climate neutrality by 2050 (EC, 2024).

The 2021 EU Strategy on Adaptation to Climate Change sets out the pathway to prepare for the unavoidable impacts of climate change. The aim is that "*by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts…*" (EC, 2023b).

Adaptation refers to measures that can reduce the negative effect of climate change by, for example, ensuring a project is resilient to future increases in storm frequency and rainfall levels.

8.2.2.3 National

In 2015, the Climate Action and Low Carbon Development Act (Climate Act) was enacted by the Houses of the Oireachtas. The purpose of the Climate Act was to enable Ireland "*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050"* (GoI, 2021). This is referred to in the Climate Act as the *"national transition objective*" (GoI, 2021). The Climate Act allows for the submission of an adaptation framework for Ireland referred to as the 'National Adaptation Framework', which is required to be submitted to Government for approval every five years.

The Climate Action and Low Carbon Development (Amendment) Act (2021 Climate Act) was enacted into national law in July 2021. The 2021 Climate Act commits Ireland, in law, to move to a climate resilient and climate neutral economy by 2050 in alignment with the European Green Deal, and includes the following elements:

- Establishes 2050 emissions target;
- Introduces a system of successive 5-year, economy-wide carbon budgets. The first two carbon budgets covering the periods 2021-2025 and 2026-2030 were announced by the Climate Change Advisory Council in 2021 (with a provisional budget from 2031). Once adopted by the Oireachtas, the carbon budgets will be used to prepare sectoral emissions ceilings for relevant sectors of the economy;
- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets;
- Introduces a requirement to annually revise the Climate Action Plan and prepare a National Long Term Climate Action Strategy at least every decade; and
- Introduces a requirement for all Local Authorities to prepare individual Climate Action Plans which will include both mitigation and adaptation measures.

Section 15 of the Climate Act sets out the duty of a body, with respect to climate, stating that the relevant body (South Dublin County Council in this case) must, *in so far as practicable, perform its functions in a manner consistent with:*

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.

The Government published the first Climate Action Plan in June 2019. The Climate Action Plan 2024 (CAP 2023) is the third annual update to Ireland's Climate Action Plan 2019. The Plan *"builds upon last year's Plan by refining and updating the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings"* (DoECC, 2024). A key policy of CAP24 is to *"ensure that 15% of electricity demand is met by renewable sources contracted under Corporate Purchase Power Agreements (PPAs)"* (DoECC, 2024). In addition, the Plan commits to achieving *"up to 0.8 TWh of district heating installed capacity across both the residential and commercial building stock by 2025, and up to 2.7 TWh by 2030"* (DoECC, 2024).

A key target in CAP24 is to reach 50% renewable energy share for electricity in 2025 and 80% by 2030 relative to 2005 levels.

The first carbon budget programme proposed by the Climate Change Advisory Council was approved by Government and adopted by both Houses of the Oireachtas in April 2022. The CAP 2023 then implemented the carbon budgets and sectoral emissions ceilings for the non-ETS sectors.

The carbon budgets comprise of three successive 5-year budgets. The total emissions allowed under each budget is set out below in Table 8.1 as well as the average annual reduction for each 5-year period.

Table 8.1: 2021 – 2035 carbon budgets. Source: DoECC, 2024.

Period	Mt CO_2eq	Emission Reduction Target
2021 - 2025	295	Reduction in emissions of 4.8% per annum for the first budget period.
2026 - 2030	200	Reduction in emissions of 8.3% per annum for the second budget period.
2031 - 2035	151	Reduction in emissions of 3.5% per annum for the third provisional budget.

The Sectoral Emission Ceilings for each Sector, published in July 2022, is shown in Table 8.2. It should be noted that 5.25 MtCO_2eq of annual emissions reductions are currently unallocated on an economy-wide basis for the second carbon budget period (2026-2030). These will be allocated following a mid-term review and identification of additional abatement measures. It is noted that the electricity sector is required to reduce emissions by 75% by 2030 relative to 2018 emissions.

Table 8.2: Sectoral emission ceilings. Source: DoECC, 2022.

Sector	Reduction Required (%)	2018 Emissions (Mt CO_2eq)	2030 Emission Ceiling (Mt CO_2eq)
Electricity	75	10.5	3
Transport	50	12	6
Buildings (Commercial and Public)	45	2	1
Buildings (Residential)	40	7	4
Industry	35	7	4
Agriculture	25	23	17.25
Other[1]	50	2	1

The legal basis for implementing the EU ETS in Ireland for stationary installations is set out in the European Communities (Greenhouse Gas Emissions Trading) Regulations 2012 (SI 490 of 2012) as amended (EC, 2012).

Ireland's second statutory National Adaptation Framework (NAF) was published on 5th of June 2024. This latest NAF replaces the first iteration of the framework published in 2018, which was reviewed in 2022 in line with the five year requirement of the Climate Act.

The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

8.2.2.4 Local

The South Dublin County Council (SDCC) Climate Action Plan 2024-2029 is centred around actions that collectively address the four key targets of the plan:

- 50% improvement in the Council's energy efficiency by 2030;

[1] = F-gases, Petroleum Refining and Waste.

- 51% reduction in the Council's greenhouse gas (GHG) emissions by 2030;
- To make Dublin a climate resilient region, by reducing the effects of future climate change-related events; and
- To actively engage and inform our communities on climate action.

In the SDCC Climate Plan, one of its strategic priorities is noted as follows:

Significant electricity consumers, such as data centres and other large industrial sites, should maximise on-site renewable generation and ensure any remaining demand is supplied through renewable Power Purchase Agreements (preferably those which match hourly site demand), which finance renewable electricity projects within Ireland or its territorial waters.

8.2.3 Study Area

The study area for potential climatic effects due to the Proposed Development differs from other aspects of the EIAR as emissions are compared to sectorial (e.g., transport) GHG emissions and Irish GHG emission targets. As a result, the potential effects on climate are based on the national implications of changes in carbon emissions due to the Proposed Development, considering Ireland's climate commitments and carbon budget. Therefore, the Proposed Development study area encompasses the Republic of Ireland.

8.2.4 Assessment of Effects Methodology

8.2.4.1 Construction Phase

The assessment of carbon emissions has been carried out to determine the likely GHG emissions (CO_2eq) predicted due to the Construction Phase of the Proposed Development. The construction materials are manufactured using carbon intensive practices, which results in embodied carbon associated with the materials. The results of this assessment have been compared with the EPA's projected GHG emissions for Ireland's total projected emissions for 2025 (assumed worst case construction year). The assessment considers the material manufacture, the transport of construction materials to site, the excavated materials and transportation and disposal of excavated materials, as applicable.

The TII Carbon Assessment Tool (Version 0.7.5) (hereafter referred to as the TII Carbon Tool) (TII 2022c) has been used to calculate the embodied carbon of materials, which incorporates the energy needed in the mining or processing of the raw material and its manufacture, in terms of CO_2eq. The TII Carbon Tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013).

For a small number of materials not covered by the TII Carbon Tool, the National Highways Carbon Tool (Version 2.6) and the ICE Database (Version 3) have been used to estimate carbon emissions due to construction activities in terms of CO_2eq.

The carbon emissions are calculated by multiplying the emission factor by the estimated quantity of the material that will be used over the Construction Phase. Estimations of relevant transport distances have been included in the calculations for the transportation of materials to and from the Proposed Development site.

The assessment includes the excavation stage, assessment of the embodied carbon associated with key materials used in the Construction Phase, and the emissions associated with the transportation of materials to and from the construction site.

The assumptions were made in the assessment of embodied carbon likely to be generated during the Construction Phase:

- The climate assessment reflects availability of data at the current stage of the project;
- Embodied carbon from equipment to be used in data centre operations is not assessed as its contribution would be minor relative to proposed buildings;
- Transport distance of an average of 50km is assumed for all materials being imported to and exported from the site. It is assumed that transportation will be via 30t HGVs, as standard; and

- Construction plant fuel use, land clearance activities, water usage and personnel travel are captured through the consideration of 'construction stage carbon' in the TII carbon tool.

Table 8.3 below outlines the data and assumptions which informed the assessment of Construction Phase embodied carbon emissions.

Table 8.3: Data and assumptions informing the Construction Phase embodied carbon assessment

Project Element	Embodied Carbon Contribution – Emission Factor (tCO_2e/tonne)	Source	Quantity of Material (tonnes)	Comment / Assumptions
Excavations				
Topsoil reused	0	TII	85,000	Assumed that materials for reuse on site will emit 0 tCO_2e. This material will go offsite for a period and be brought back to site later. Assumed 50km additional transport, HGV Average - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Made ground reused	0	National Highways	100,000	Assumed that materials for reuse on site will emit 0 tCO_2e. This material will go offsite for a period and be brought back to site later. Assumed 50km additional transport, HGV Average - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Dublin Boulder Clay	0.0012	National Highways	285,000	This material is not expected to be reused on site. Assumed carbon factor of 0.0012 tCO_2e/tonne - Clay exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.07 $kgCO_2e$/km (TII). Average road load 30t - no need to calculate round trip.
Rock (Lucan Formation)	0.0014	TII	100,000	Some of this material may be reused on site as fill for limited embankments. Assumed carbon factor of 2.85 $kgCO_2e/m^3$ - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.07$kgCO_2e$/km (TII). Average road load 30t to calculate round trip.
Stockpiles – reusable portion (50%)	0	National Highways	12,500	This material may be reused on site. Assumed carbon factor of 0 tCO_2e/tonne due to material being reused. Assumed 50km additional transport, HGV Average - 1.07 $kgCO_2e$/km (TII). Average road load 30t to calculate round trip.
Stockpiles – for disposal (50%)	0.001	National Highways	12,500	This material will not be suitable for reuse. Assumed carbon factor of 0.0012 tCO_2e/tonne due to material being disposed of. Assumed 50km transport offsite, HGV Average - 1.07 $kgCO_2e$/km (TII). Average road load 30t - no need to calculate round trip.
Construction Material Imports				
Aluminium	5.25	National Highways	1.05	Assumed carbon factor of 5.25 tCO_2e/tonne. Assumed 50km additional transport for import to site in HGV - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Ceramics	0.7	ICE	2	Assumed carbon factor of 0.7 $kgCO_2e$ per kg. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.
Fibreglass	8.1	National Highways	483.6	Assumed carbon factor of 8.1 tCO_2e/tonne. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.

Project Element	Embodied Carbon Contribution – Emission Factor (tCO_2e/tonne)	Source	Quantity of Material (tonnes)	Comment / Assumptions
Glass	1.63	ICE	362.9	Assumed carbon factor of 1.63 kg CO_2e per kg. Assumed 50km additional transport for import to site in HGV - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Gypsum	0.13	ICE	53.7	Assumed carbon factor of 0.13 $kgCO_2e$ per kg. Assumed 50km additional transport for import to site in HGV - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Inert	0.18	TII	0.43	Assumed carbon factor of 0.175 $kgCO_2e$ per kg. Assumed 50km additional transport for import to site in HGV - 1.073 $kgCO_2e$/km (TII). Average road load 30t.
Plastic	3.1	National Highways	781	Assumed carbon factor of 336$kgCO_2e$ per m. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.
Ready-mixed concrete	0.107	TII	94,281	Assumed carbon factor of 255$kgCO_2e$ per m^3. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.
Steel	0.6	TII	25,847	Assumed carbon factor of 603$kgCO_2e$ per tonne. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.
Stone wool	1.28	ICE	148	Assumed carbon factor of 1.28 kg CO_2e/kg. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.
Wood	0.26	TII	74.9	Assumed carbon factor of 0.26 $kgCO_2e$ per kg. Assumed 50km additional transport for import to site in HGV - 1.07 $kgCO_2e$/km (TII). Average road load 30t.

8.2.4.2 Operational Phase

No significant CO_2eq emissions are likely to arise due to traffic accessing the Proposed Development site during the Operational Phase, refer to Chapter 6 (Traffic and Transport) for further information.

Potential Operational Phase CO_2eq emissions relate to the testing and emergency use of stand-by generators (direct) as well as the use of energy to operate the Proposed Development (indirect).

The assessment of direct emissions is based on the following:

- 45 stand-by generators proposed;
- Operational hours for testing and maintenance as outlined in Schedule A of Licence P1189-01;
- Fuel burn rate of 685l/hr based on generator specification; and
- Carbon intensity of diesel of 2.68kg CO_2eq/L[2].

[2] Conversion Factors | SEAI Statistics | SEAI

Indirect CO_2eq emissions will arise due to the power demand to allow the Proposed Development can operate. The assessment of indirect emissions is based on the following:

- Expected maximum power demand of 883GWh, based on the following assumptions:
  - 100% IT load demand for every hour of the year.
  - The mechanical/ancillary loads are annualised, i.e. at lower temperature conditions the load is lower.
- Emission factor of 254.8 gCO_2/kWh for electricity in 2023[3].

8.2.4.3 Construction and Operational Phase Significance Criteria

Potential CO_2eq emissions arising from the Proposed Development are assessed relative to TII criteria, refer to Table 8.4.

Table 8.4: Climate significance criteria. Source: TII, 2022.

Effects	Significance Level	Description
Significant Adverse	Major Adverse	The Proposed Development's GHG impacts are not mitigated; The Proposed Development has not complied with do-minimum standards set through regulation, nor provide reductions required by local or national policies; and No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate Adverse	The project's GHG impacts are partially mitigated; The Proposed Development has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and Falls short of full contribution to Ireland's trajectory towards net zero.
Not Significant	Minor Adverse	The Proposed Development's GHG impacts are mitigated through 'good practice' measures; The Proposed Development has complied with existing and emerging policy requirements; and Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	The Proposed Development's GHG impacts are mitigated beyond design standards; The Proposed Development has gone well beyond existing and emerging policy requirements; and Well, 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	The Proposed Development's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration; The Proposed Development has gone well beyond existing and emerging policy requirements; and Well, 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

8.2.4.4 Vulnerability of the Proposed Development to Climate Change

The Operational Phase assessment also involves determining the vulnerability of the Proposed Development to climate change. This involves an analysis of the sensitivity and exposure of the Proposed Development to climate hazards which together provide a measure of vulnerability.

The TII Standard outlines an approach for undertaking a risk assessment where there is a potentially significant effect on the Proposed Development receptors due to climate change.

---

[3] Conversion Factors | SEAI Statistics | SEAI

The risk assessment assesses the likelihood and consequence of the effect occurring to each receptor, leading to the evaluation of the significance of the potential effect.

Likelihood refers to how likely the identified climate hazards are to occur during the lifetime of the Proposed Development. Consequence refers to the severity or magnitude of the effect associated with the climate risk, should it eventuate.

The likelihood and consequence of each effect is combined in the form of a matrix to identify the significance of each effect as outlined in Table 8.5.

Table 8.5: Vulnerability significance matrix.

Likelihood	Magnitude of Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	Not Significant	Not Significant	Not significant	Significant	Significant
Unlikely	Not Significant	Not Significant	Not significant	Significant	Significant
Moderate	Not Significant	Not Significant	Significant	Significant	Significant
Likely	Not Significant	Significant	Significant	Significant	Significant
Almost certain	Significant	Significant	Significant	Significant	Significant

Legend			
Low	Medium	High	Extreme

8.3 Baseline Environment

8.3.1 Climate Baseline for the Purposes of the Assessment of Climate Change Vulnerability

The Irish Climate Futures: Data for Decision Making report, published by the EPA, states that it is expected that weather extremes will become more likely and more frequent with future climate change (Murphy et al., 2019).

The Status of Ireland's Climate 2020 report, published by the EPA, includes a number of recent climate observations for Ireland. The report states that the annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons. This compares with a global average temperature estimated to be 1.1°C above pre-industrial levels. The report indicates that the sea level around Ireland has risen by approximately 2–3 mm per year since the early 1990s. In addition, annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990 (Camaro et al., 2020).

Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns.

According to the EPA, climate change is expected to lead to the following adverse effects (EPA, n.d.):

- Sea level rise;
- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;
- Water shortages in summer in the east;
- Adverse impacts on water quality;
- Changes in distribution of plant and animal species; and
- Effects on fisheries sensitive to changes in temperature.

The region where the Proposed Development will be located has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed.

A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Darwin in February 2014, Storm Emma in March 2018, Storm Ophelia in October 2018 and Arwen and Barra in 2021. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding.

European State of the Climate 2023 report provides details on climate change in Ireland. It states *that 2023, was the warmest year on record for the second year running since records began in 1900. It was also one of the wettest years on record (since 1941) which saw numerous flooding episodes across the country, especially during the second half of the year*3

TRANSLATE, published by Met Éireann (2023) provides the first standardised and bias-corrected national climate projections for Ireland to aid climate risk decision making across multiple sectors (for example, transport, energy, water), by providing information on how Ireland's climate could change as global temperatures increase to 1.5˚C ,2˚C, 2.5˚C, 3˚C or 4˚C (Met Eireann, 2023).

A Flood Risk Assessment (FRA) was prepared for the Proposed Development (Appendix 12.1). Refer to Chapter 12 (Water) for the results of the FRA. The FRA has assessed risks of flooding to the development from fluvial, tidal, pluvial and groundwater flood sources factoring in climate change. The FRA concluded that the risks relating to flooding can be managed and mitigated to acceptable levels and therefore comply with DoEHLG / OPW and South Dublin County Council planning guidance.

8.3.2 Baseline Greenhouse Gas Emissions

As outlined in Section 8.2.3, the study area for the climate assessment encompasses the Republic of Ireland and therefore national level projections represent the baseline environment. Baseline greenhouse gas emissions are derived for future years (to account for construction and operational years) from published EPA CO_2eq projections.

In May 2024, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2023-2050, which includes total projected emissions and a breakdown of projected emissions per sector under the "With Existing Measures (WEM)" and "With Additional Measures (WAM)" scenarios.

The projections show that implemented policies and measures in the WEM scenario can only deliver an 11% reduction in greenhouse gas emissions by 2030 compared to the 2018 level. The WAM scenario, including policies and measures from the 2024 Climate Action Plan, is projected to deliver a 29% emissions reduction over the same period. Both projected scenarios indicate that even with implementation of all climate plans and policies Ireland will not meet the 51% emissions reduction target by 2030.

Table 8.6 presents the EPA National Total emission projections for 2025 (assumed worst case construction year) and 2027 (opening year). 2025 is assumed as the worst-case construction year as the majority of construction emissions occur within the first year of construction.

Table 8.6: Projected emissions for the non ETS sector total emissions. Source: EPA, 2024.

Projections	Year	National Total (Mt CO_2eq)
Projections (with existing measures)	2025	56.5
	2027	54.9
Projections (with additional measures)	2025	54.7
	2027	50.7

Ireland contributes to the achievement of EU-wide 2030 targets through obligations under the Renewable Energy and Energy Efficiency Directives, with a requirement to achieve 50% renewable electricity by 2025 and 80% renewable energy by 2030.

According to CAP24, in 2022, renewable generation accounted for 38.6% of electricity, an increase from 35% in 2021. Electricity emissions decreased by 2% in 2022 which is attributable to an increase in renewable generation, coupled with reductions in coal, fuel oil, and peat use for electricity generation.

Following a decrease of 8.9% in natural gas use in 2021, there was an increase of 12.6% year-on-year in 2022.
Ireland's electricity emissions in the first half of 2023 were 16.7% lower than for the same period in 2022. In the first half of 2023, renewables accounted for 43% of electricity generated, an increase of 0.9 percentage points on the first half of the previous year.

The ETS is currently in Phase 4 (2021-2030) under which emissions in the ETS sectors must be cut by 62% by 2030, compared to 2005. In order to reach this reduction, there will be a one-off reduction to the EU-wide quantity of allowances of 90 Mt CO_2eq in 2024 and 27 Mt CO_2eq in 2026 in combination with an annual reduction of allowances by 4.3% from 2024-2027 and 4.4% from 2028-2030. The free allowances to industries in the ETS will be phased out as follows: 2026: 2.5%, 2027: 5%, 2028: 10%, 2029: 22.5%, 2030: 48.5%, 2031: 61%, 2032: 73.5%, 2033: 86%, 2034: 100%.

8.4 Potential Effects

8.4.1 Introduction

The Proposed Development has the potential to generate carbon emissions during the Construction, Operation and Decommissioning Phases.

8.4.2 Do-Nothing Scenario

In the scenario where the Proposed Development did not proceed, none of the construction, operational or decommissioning effects set out in this Chapter would occur, potentially resulting in an overall Neutral effect.

8.4.3 Construction Phase

The assessment commences with the assessment of the embodied carbon associated with key materials used in the construction of the Proposed Development, the emissions associated with excavation of the construction site, and emissions from the transportation of excavation and construction materials to and from the site.

8.4.3.1 Construction Embodied Carbon Impacts

Detailed project information including excavation materials and quantities (such as the type and volume of waste generated, and volumes of material for reuse) and construction material quantities (e.g., volume of materials) was obtained. The Proposed Development is expected to have a Construction Phase of 27 months approximately and an operational lifespan of 35-40 years for the purposes of the maintenance embodied carbon. The predicted GHG emissions can be averaged over the full Construction Phase to give the predicted annual emissions to allow for direct comparison with annual emissions and targets.

The breakdown of the activities between the different phases of the Proposed Development has been assessed. As shown in Table 8.7, the assessment indicates that the key phases of GHG generation is the embodied carbon of the construction materials, which accounts for 83% of all carbon emissions. Generation of excavated materials and transportation of materials and wastes account for the remaining embodied carbon emissions.

Table 8.7: Construction & maintenance stage greenhouse gas emissions.

Project Element	Embodied Emissions (tCO2e)	Transportation emissions (tCO2e)	Total Emissions (tCO2e)	Percentage of Total (%)
Excavations				
Topsoil and subsoil reused (94% total)	0.0	873.9	873.9	2
Topsoil and subsoil for disposal (6% total)	0.0	27.9	402.2	1
Dublin Boulder Clay reused (94% total)	342.0	554.4	554.4	2

Project Element	Embodied Emissions (tCO2e)	Transportation emissions (tCO2e)	Total Emissions (tCO2e)	Percentage of Total (%)
Dublin Boulder Clay for disposal (6% total)	142.4	17.7	29.6	0
Rock reused (94% total)	0.0	223.0	223.0	1
Rock for disposal (6% total)	15.0	7.1	12.8	0
Construction Material Imports				
Aluminium	5.5	0.1	5.5	0
Ceramics	1.4	0.1	1.5	0
Fibreglass	3,917	0.9	3918	11
Glass	591	0.7	592.1	2
Gypsum	7.0	0.1	7.1	0
Inert	0.1	0.1	0.1	0
Plastic	2,455	1.4	2456.7	7
Ready-mixed concrete	10,041	169	10,209	29
Steel	15,595	46.2	15,641	45
Stone wool	189	0.3	189.6	1
Wood	19.7	0.2	19.9	0
Construction Waste (Major Quantities Only)				
Bricks	0.021	0.1	0.1	0
Concrete	0.207	0.8	1.0	0
Inert	0.321	0.6	1.0	0
Timber	4.140	0.3	4.4	0
Total			**35,143**	**100%**

In the absence of mitigation, potential effects on climate are predicted to be Adverse, Moderate and Short-Term in EIA terms due to embodied carbon generated during the Construction Phase.

8.4.3.2 Construction Traffic – CO_2eq Emissions

As noted in Section 8.2.4.1, there is the potential for construction related road traffic effects, these relate to additional vehicles on the road as a result of the Proposed Development. Construction Phase traffic effects will fluctuate depending on the works progressing, however, for the purposes of the construction assessment traffic volumes are assumed to occur for the full construction period as a conservative approach and therefore are likely to overpredict emissions. In addition, these emissions are partly double counted in the Construction Phase assessment as transport of materials is included within the embodied carbon assessment, refer to Section 8.4.3.2 which include the transportation of materials. The transport emissions due to workers accessing the site is not included in the embodied carbon assessment but in the construction traffic calculations.

Construction Phase mass CO_2eq emissions for affected road links included in Table 7.17 in Chapter 7 (Air Quality) have been summed and provided in Table 8.8 for the existing and proposed (with construction of the Proposed Development) scenarios. The results show that the Construction Phase traffic emissions modelled using the REM tool assessment for the Proposed Development are predicted amount to 362 tonnes of CO_2 annually over the construction period of 27 months.

The construction traffic GHG emissions associated with the Construction Phase of the Proposed Development is predicted to be Adverse, Moderate and Short-Term in nature in the absence of mitigation.

Table 8.8: Predicted change in CO_2eq emissions due to construction traffic in 2025 relative to Ireland's climate commitments.

Predicted Existing Scenario Annual Emissions (Tonnes/yr)	Predicted Proposed Scenario Annual Emissions (Tonnes/yr)	Change DM to DS (Tonnes/yr)	% Change DM to DS	% Change in Mass Emissions Relative to the 2030 Reduction Commitment
7,397	7,759	362	4.89	0.006

8.4.4 Operational Phase

8.4.4.1 Direct Effects

Potential emissions of CO_2eq from the GIL Campus is regulated by the EPA under the ETS. The existing greenhouse gas permit was granted in May 2013. Under the permit, GIL must, by 30 April in each year, surrender to the EPA allowances equal to the annual reportable emissions in the preceding calendar year. The existing permit applies to 26 combustion sources, S1-S26 which includes two fire pump engines and 24 emergency back-up generators. Based on the 45 generators to be used on DC3, an estimate of projected CO_2eq emissions is presented in Table 8.9 based on the methodology outlined in Section 8.2.4 with a comparison relative to Ireland's 2027 national projections with additional measures (refer to Section 8.3.2).

Table 8.9: Predicted direct CO_2eq emissions.

Predicted Direct Annual CO_2eq Emissions from DC3 (tonnes/yr)	Projected National Annual CO_2eq Emissions in 2027 (tonnes/yr)	% Change Relative to Ireland's Projections
1,737	50,719,000	0.003

In the absence of mitigation, indirect effects on climate are predicted to be Adverse, Minor and Permanent in EIA terms during the Operational Phase in the absence of mitigation based on the criteria provided in Table 8.4.

8.4.4.2 Indirect Effects

The Proposed Development will be powered through an existing connection as agreed with Eirgrid. CO_2eq emissions will arise indirectly due to energy generated by the national grid to power the Proposed Development site. Based on the information provided in Section 8.2.4, predicted maximum annual indirect emissions are provided in Table 8.10 in the absence of mitigation.

Table 8.10: Predicted maximum indirect CO_2eq emissions.

Predicted Maximum Indirect Annual CO_2eq Emissions from DC3 (tonnes/yr)	Projected National Annual CO_2eq Emissions in 2027 (tonnes/yr)	% Change Relative to Ireland's Projections
224,250	50,719,000	0.44

In the absence of mitigation, the Proposed Development is predicted to result in Adverse, Moderate effects in EIA terms during the Operational Phase in the absence of mitigation based on the criteria provided in Table 8.10. The duration of the effects on climate is considered to be Short-Term, as, in accordance with CAP24, 80% of the electricity grid will be renewable by 2030 (DoECC, 2024) thereby significantly reducing carbon emissions.

8.4.4.3 Climate Change Vulnerability

Climate adaptation seeks to ensure adequate resilience of major projects to the potential adverse effects of climate change, such as increased flooding or droughts. Mitigation, on the other hand, seeks to reduce the emissions of GHGs by implementing low-carbon energy options.

A risk assessment has been conducted for potentially significant effects on the Proposed Development associated with climate change.

The risk assessment considered the likelihood and consequence of potential effects occurring and then provided an evaluation of the significance of the effect using the framework set out in Section 8.2.4.4.

The flood risk assessment appended to Chapter 12 (Water) concludes that the sources of flood risk identified in the Proposed Development study area can be managed to acceptable levels in accordance with relevant guidance.

EPA research (High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach EPA, 2020) shows an overall reduction of approximately 10% in the numbers of storms affecting Ireland and suggest an eastward extension of the more severe windstorms over Ireland and the UK from the middle of the century. However, the research notes that this should be taken with some caution as extreme storms are rare events.

In addition, the research indicated a likely reduction in windspeed by the mid-century. In addition, a summer reduction in 10m wind speed range is expected from 0.3% to 3.4% for the RCP4.5 (medium global emission) scenario and from 2% to 5.4% for the RCP8.5 (high global emission) scenario.

The significance conclusion (Refer to Table 8.5) indicates that the potential effect is Not Significant and therefore the significance of the potential effects is at an acceptable level in accordance with TII Standard leading to a finding of a Not Significant effect in EIA terms.

8.4.5 Decommissioning Phase

In the absence of mitigation, the potential climate effects are predicted to be Minor Adverse and Short-Term in during the Decommissioning Phase.

8.5 Mitigation and Monitoring Measures

8.5.1 Construction Phase

This section outlines the proposed Construction Phase mitigation measures for climate.

A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the Construction Phase of the Proposed Development. These mitigation measures include:

- The substitution of concrete containing Portland cement with concrete containing 25% ground granulated blast furnace slag (GGBS). This measure will lead to an estimated saving of c.2,200 tonnes of CO_{2eq} during the Construction Phase;
- Opportunities for materials reuse will be incorporated within the extent of the Proposed Development including the use of reclaimed asphalt and recycled aggregate. This measure will lead to an estimated saving of 5,300 tonnes of CO_{2eq};
- Opportunities for the use of recycled steel, up to a minimum of 50%, will be incorporated within the extent of the Proposed Development construction. This measure will lead to an estimated saving of 1,335 tonnes of CO_{2eq};
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport;
- The combined measures, including the incorporation of GGBS, recycled and reused material, and recycled steel, will lead to an estimated saving of 8,885 tonnes of CO_{2eq};
- The Construction Traffic Management Plan (CTMP) will have the effect of reducing emissions from Construction Phase traffic, refer to the CEMP in Appendix 5.1; and
- All Field Integration & Assembly (FIA) products will be prefabricated and manufactured offsite before being shipped to site. This innovative solution limits construction waste, reduces the embodied carbon of the products and improves the construction efficiency.

8.5.2 Operational Phase

8.5.2.1 Climate Change Vulnerability

As no Significant Adverse effects are likely due to the vulnerability of the Proposed Development to climate change and as the design already includes for climate change no further, additional mitigation measures are required.

8.5.2.2 Direct CO_2eq Emissions

As outlined in Section 8.2.1, CO_2eq emissions from the existing GIL Campus is regulated by the EPA under a greenhouse gas permit. This permit limits the carbon emissions from the GIL Campus due to the use of emergency generators for the purposes of testing and emergency use. This will need to be updated to account for the new combustion sources as part of the Proposed Development. Under the requirements of the ETS, GIL will be required to report annually to the EPA on CO_2eq emissions and reduce emissions and/or pay for CO_2eq allowances (100% of CO_2eq emissions by 2034).

It should be noted that GIL is currently limited by the EPA under IE Licence P1189-01 on the use of its generators both in the testing and emergency mode. As part of this planning application, GIL is committing to reducing the use of its generators in emergency mode from 150 hours per annum to 100 hours per annum. This will have the effect of mitigating emissions further.

In addition, energy efficiency is a key focus of GIL facilities and energy use is continuously monitored and reviewed. Existing energy use for DC1 and DC2 is managed through the Energy Management System (EnMS) which is implemented at the site since 2013 and is accredited to the ISO 50001 Standard. The EnMS includes regular cross-functional management reviews and is subject to both internal and external audits. All Google Data Centres are designed with high efficiency standards to use as little energy as possible through minimizing power loss and removing unnecessary parts. The servers are also designed as energy-proportional systems e.g. they use minimal energy when they're idle and waiting for a task.

Under licence P1189-01 which applies to DC1 and DC2, the following conditions apply to carbon emissions and energy usage that must be implemented on site:

- *Effects on climate due to release of CO_2 emissions will be mitigated through the limitations on the generators, which includes an operating hour restriction, conditions relating to energy efficiency and alternative energy sources, and through the requirement to participate in the EU Emissions Trading System (ETS).*
- *The licensee shall prepare, maintain and implement a Schedule of Environmental Objectives and Targets. The schedule shall, as a minimum, provide for a review of all operations and processes, as referred to in the conditions of this licence, including an evaluation of practicable options for:*
  - *(i) energy and resource efficiency;*
  - *(ii) increasing the use of solar power, sustainable biofuels and other renewable energy options on site;*
- *The licensee shall carry out an audit of energy use and the energy efficiency of the site with one year of the date of grant of this licence. The audit shall be carried out in accordance with the guidance published by the Agency, "Guidance Note on Energy Efficiency Auditing" and have regard to any other relevant published guidance. The audit shall be repeated at intervals as required by the Agency. The audit shall identify all practicable opportunities for:*
  - *Energy use reduction and efficiency; and*
  - *The use of alternate energy sources as a means of decreasing or offsetting the use of fossil energy.*
- *The recommendations of the audit shall be incorporated into the Schedule of Environmental Objectives and Targets under Condition 2 above.*
- *Alternative Energy Sources: The licensee shall carry out a feasibility study of opportunities to increase the use of solar power, sustainable biofuels and other renewable energy options including energy storage.*

The licensee shall submit a report within six months of the date of grant of the licence on the study under Condition 7.2.1 with recommendations for approval by the Agency on the options to decrease or offset the use (both directly and indirectly) of fossil fuelled energy.

It is expected that a similar condition will be implemented under a revised IE licence regulating the full campus. Refer to Appendix 8.1 for the feasibility report submitted to the EPA under the requirements of its existing licence.

8.5.2.3 Indirect CO_2eq Emissions

In Ireland, GIL has signed a 14 year Power Purchase Agreement (PPA) (with the possibility to extend by five years) with Power Capital Renewable Energy for 58 megawatts (MW) of new-to-the grid capacity from the Tullabeg Solar Farm through an existing grid connection. This agreement has allowed the development of a new renewable energy project which was granted planning in 2022 is currently under construction. It will add new renewable energy to the grid that GIL's offices and data centres run on, contributing to the decarbonisation of Ireland's electricity system and of their operations.

GIL's current projections indicate that, once operational, this PPA will help its offices and data centres in Ireland to reach 60% carbon-free energy in 2025 when measured on an hourly basis. At present, GIL matches 100% of its electricity consumption of global operations with purchases of renewable energy on an annual basis. GIL will continue to apply that approach to mitigate carbon emissions generated during the Operational Phase of the development, in accordance with CAP24.

The Proposed Development includes measures to facilitate district heating where excess heat is produced, in accordance with CAP24 and the SDCC CAP. This system has the potential to deliver heat for both space heating and water heating needs to nearby buildings through a network of insulated underground pipelines. This system will be realised once suitable offtakers are available.

In addition, it is proposed to provide photovoltaic (PV) panels on the roof of the FSA building. This is expected to generate 20% of the energy need associated with that occupied building through the use of renewable power.

Other site specific measures include:

- Variable Speed Drive (VSD) technology where appropriate to ensure that electrical drives operate efficiency over their demand range;
- Minimise water use through low flow sensor activated taps and other sanitary ware systems; and
- The water supply to toilets includes solenoids so that when the room is unoccupied the water supply gets shut off; thus minimising water wastage.

GIL is certified under the Climate Neutral Data Centre Pact standard (as verified by Bureau Veritas). This standard is verified under the following headings:

- Energy efficiency;
- Clean energy;
- Water conservation;
- Circular economy; and
- Circular energy systems.

The standard is valid until 30 June 2027, refer to Appendix 1.2.

At DC3, GIL will align with the EU Climate Neutral Data Centre Pact energy efficiency and water use targets and set themselves targets to achieve zero carbon electricity use at all hours. System operators will work with large energy users to facilitate accurate hourly emissions reporting, grid carbon-intensity transparency, and allow data centre to optimise computing loads to maximise use of renewables and minimise carbon emissions (as per Action 99 of Climate Action Plan 2021).

The DC3 design aligns with the CNDCP principles and targets:

- **Energy Efficiency:** The design improves upon the annualised Power Usage Effectiveness (PUE) target of 1.3 that the CNDCP sets out.
- **Water Conservation:** The design is based on air chillers and minimal water consumption is expected.
- **Renewable Energy:** GIL demonstrates a strong commitment to sustainability by using 100% renewable energy across all its global operations, including in Ireland. This goal was achieved in 2017 and has been maintained ever since. GIL continues to buy renewable energy as they grow.

In its 2023 Environmental Report (2023 Environmental Report (gstatic.com)), Google describes its target to achieve net-zero emissions across all operations and value chain by 2030. The Report outlines the work undertaken with suppliers that are committed to sustainability, and partners with them to develop decarbonisation roadmaps and build essential data infrastructure to accurately quantify emissions and reductions across the value chain. Google engages with suppliers—including hardware manufacturing and indirect services suppliers—to help reduce their energy consumption and GHG emissions, as stated in the 'Supplier Code of Conduct', which all suppliers are required to sign. Google assesses suppliers' practices to report, manage, and reduce their emissions and incorporate this into the supplier scorecard.

In 2022, Google engaged with suppliers directly to drive improved data and accounting, including increased completeness and accuracy for their Scope 1, 2, and 3 emissions.

As outlined in Section 8.2.2.3, significant additional reductions in CO_2eq emissions are expected to arise by 2030 due to the decarbonisation of the electricity grid through the growth of renewable energy provision. This will further mitigate the potential indirect effects on climate.

GIL is permitted to undertake activities resulting in emissions of CO_2eq from generators at its GIL Campus site (No IE-GHG170-10431). Under this permit, GIL is required to report to the EPA on an annual basis on its GHG emissions. This permit will be extended to the full GIL Campus, prior to the commencement of operations.

8.5.3 Decommissioning Phase

As no Adverse Significant effects are likely to arise during the Decommissioning Phase of the Proposed Development, no mitigation measures are required.

8.6 Residual Effects

This section considers the likely residual effects of the Proposed Development. Construction, Operational and Decommissioning on climate.

8.6.1 Construction Phase

8.6.1.1 Climate Change Vulnerability

No Adverse Significant effects are likely due to the vulnerability of the Proposed Development to climate change.

8.6.1.2 Construction Activities and Materials

Following the implementation of mitigation measures outlined in Section 8.5.1 and considering the significance criteria outlined in Table 8.4, the Proposed Development is expected to have an Adverse, Minor, Short-Term effect in EIA terms on carbon and climate.

8.6.2 Operational Phase

8.6.2.1 Direct

Emissions arising during the Operational Phase of the Proposed Development will be limited by operational hours of the generators under the conditions of the IE licence.

Prior to the commencement of operations, GIL will be required to update its GHG permit in accordance with EPA requirements.

Following the implementation of mitigation measures outlined in Section 8.5.2 and considering the significance criteria outlined in Table 8.4, the Proposed Development is expected to have a Direct Adverse, Minor, Permanent effect in EIA terms on carbon and climate during its Operational Phase.

8.6.2.2 Indirect Emissions

Following the implementation of mitigation measures outlined in Section 8.5.2.3 and considering the significance criteria outlined in Table 8.4, the Proposed Development is expected to have an Indirect Adverse, Minor, Short-Term effect in EIA terms on carbon and climate during its Operational Phase. The longer-term effects are considered Not Significant due to the ongoing transition to grid decarbonisation.

8.6.3 Decommissioning Phase

The Proposed Development is expected to have an Adverse, Minor, Short-Term effect in EIA terms on carbon and climate during the Decommissioning Phase. As outlined in Section 5.7, decommissioning activities will need to be undertaken in accordance with the requirements of the IE licence.

8.7 References

Camaro, G. et al (2020). *Climate Status Report for Ireland.* [online] EPA.

Civil Engineering Standard Method of Measurement (CESSM) (2013) *Carbon and Price Book database*.

Department of the Environment, Climate and Communications (DoECC) (2022) Sectoral Emission Ceilings for Each Sector.

Department of the Environment, Climate and Communications (DoECC) (2024) *Climate Action Plan 2024.*

European Commission (EC) (2003) *Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.*

European Commission (EC) (2019) *European Green Deal.*

European Commission (EC) (2021) *Fit For 55 - Climate and Energy Framework 2021-2030.*

European Commission (EC) (2021) *Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law').*

European Commission (EC) (2023) *European Parliament Revised Effort Sharing Regulation.*

European Commission (EC) (2023) *EU Strategy on Adaptation to Climate Change.*

European Commission (EC) (2024) *EU Climate Target For 2040 – Q1 2024.*

European Commission (EC) (2023) *European State of the Climate 2023*

EPA (2020) High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach

Environmental Protection Agency (EPA) (2022*). Guidelines on the information to be contained in Environmental Impact Assessment Reports*

EPA (2023*) Ireland's Greenhouse Gas Emissions Projections 2022-2040.*

EPA (n.d.) *What Impact Will Climate Change Have on Ireland?*

Government of Ireland (GoI) (2012) *European Communities (Greenhouse Gas Emissions Trading) Regulations 2012 (SI 490 of 2012).*

Government of Ireland (GoI) (2021) *Climate Action and Low Carbon Development (Amendment) Act 2021.*

Murphy, C. et al. (2019). *Irish Climate Futures: Data for Decision Making (2014-CCRP-MS-16) EPA Research Report.* [online] EPA.

Met Éireann (2023) *TRANSLATE*.

South Dublin County Council (SDCC) (2023) *South Dublin County Council Climate Action Plan 2024-2029.*

Transport Infrastructure Ireland (TII) (2022*) Climate Assessment of Proposed National Roads – Standard: PE-ENV-01105*.

United Nations Framework Convention on Climate Change (UNFCCC) (2015) *The Paris Agreement*

9. Noise & Vibration

9.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the likely direct and indirect significant effects on noise and vibration effects associated with the Construction, Operational and Decommissioning Phases of the Data Centre Development DC3 (referred to as the Proposed Development) in accordance with the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

During the Construction Phase, the potential noise and vibration effects associated with the Proposed Development have been assessed. This included construction activities such as site preparation works, earthworks and external works.

During the Operational Phase, the potential noise and vibration effects associated building services noise and the operation of generators have been assessed.

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental effects, where practicable. In addition, feedback received from consultation undertaken throughout the alternatives assessment and design development process has been considered, where appropriate.

The aim of the Proposed Development when in operation is to offer expanded compute capacity to GIL's customers and products. The Proposed Development is described in detail in Chapter 4 (Description of the Proposed Development) and Chapter 5 (Construction) provides a description of the construction and demolition activities.

Refer to Appendix 1.1 for details of the author of this Chapter.

9.2 Assessment Methodology

9.2.1 Guidance and legislation

This chapter has been prepared with reference to the following legislation and guidance documents:

- Environmental Impact Assessment (EIA) Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2024 amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment; and
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

Reference has also been made to the following documents, which are specific to noise and vibration:

- Environmental Protection Agencies Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (EPA, 2016);
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 - Noise (BSI, 2014a);
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2 - Vibration (BSI, 2014b);
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (BSI, 1993);
- BS 6472: Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz) (BSI, 1992);
- ISO 9613: Acoustics - Attenuation of sound during propagation outdoors - Part 2. Engineering method for prediction of sound pressure levels outdoors. (BSI, 2024);

- BS 4142: 2014+A1 :2019: Methods for Rating and Assessing Industrial and Commercial Sound (BSI, 2019);
- Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2, Highways England (UKHA, 2020);
- The UK Department of Transport Calculation of Road Traffic Noise (hereafter referred to as CRTN) (UK Department of Transport, 1998);
- ISO 1996-2:2017 Acoustics - Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels (ISO, 2017);
- Transport Infrastructure Ireland Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII, 2014); and
- IEMA Guidelines for Environmental Noise Impact Assessment (IEMA, 2014).

The following methodology has been adopted for this assessment:

- Review appropriate guidance and the current Industrial Emissions Licence (IEL) (P1189-01) in order to identify appropriate noise criteria for the site operations;
- Carry out noise monitoring at a number of locations in the vicinity of nearest sensitive properties to identify existing noise levels;
- Develop a detailed 3D noise model to assess the impact of the Proposed Development; and
- Outline and comment on predicted levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 9.1 of this EIAR presents a glossary of the acoustic terminology used throughout this document.

9.2.2 Relevant Limits, and Significance Criteria

9.2.2.1 Construction Phase – Noise

There are no published statutory noise limits applicable to construction sites in Ireland. The construction noise assessment therefore makes reference to BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 - Noise (BSI, 2014a). This is considered an appropriate method to assess construction noise prior to the appointment of Contractors and confirmation of work method and plant/equipment to be used.

BS5228-1:2009+A1:2014 provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for different situations such as ground type and distances form source to receptor. Annex E of BS5228-1 provides example criteria for the assessment of construction noise effects, presented in Table 9.1. These criteria have been used to assess the potential significant effects from construction noise.

Table 9.1: Example threshold of significant effect at dwellings.

Assessment Category and Threshold Value Period	Threshold Value, $L_{Aeq,T}$ dB		
	Category A[1]	Category B[2]	Category C[3]
Day time (07:00 – 19:00 on weekdays, 07:00 – 13:00 on Saturdays)	65	70	75
Evening time (19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays, and 07:00 – 23:00 on Sundays)	55	60	65
Night-time (23:00 – 07:00 on all days)	45	50	55

[1] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dBA) are less than these values
[2] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dBA) are the same as Category A values
[3] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dBA) are higher than Category A values

Based on the measured baseline levels (presented in Section 9.3), the construction noise threshold values are calculated and presented in Table 9.2.

Table 9.2: Construction Noise Thresholds (CNT) based on measured baseline noise levels

Period	Measured Noise Level $dBL_{Aeq,T}$	Baseline Noise Category	Construction Noise Threshold (CNT) Value $L_{Aeq,1hr}$ (dB)
Day	62 – 68	B	70
Evening	56 – 58	B	60
Night	42 – 60	B	50

Construction work is only expected during day time periods, therefore only the day time CNT is applicable.

The assessment of likely significant effects is carried out by firstly quantifying the magnitude of noise potential effects, determined by the predicted noise levels arising from the Proposed Development and any exceedances of these over the defined CNTs, then by considering the likely duration of these potential effects.

Where an exceedance of the CNT, as outlined in Table 9.2**,** is predicted, the likely potential effect associated with the noise increase is rated in accordance with Table 9.3.

Table 9.3: Likely potential effect associated with the exceedance of construction noise criteria.

Extent of Potential Noise Effect (Exceedance of construction noise level above CNT)	Potential Noise Effect Magnitude	EPA 2022 Guidelines Magnitude of Effect	Determination of a Likely Significant Effect
Less than 0 dBA	No Change	No Change	No Significant effect
0 – 3 dBA	No Significant change/ imperceptible	Neutral to Slight effect	
3 – 5 dBA	Slight increase	Slight to Moderate effect	Likely Significant effect dependent on effect duration (see further details below)
6 – 10 dBA	Moderate increase	Moderate to Significant effect	
More than 10 dBA	Substantial increase	Very Significant effect	

Table 9.4 outlines the duration and frequency of potential effects, based on EPA 2022 Guidelines. This terminology is used when describing effects, with most construction effects assessed as being temporary.

Table 9.4: Duration and frequency of effects. Source: EPA, 2022.

Effect Type	Duration
Momentary effect	Effects lasting from seconds to minutes
Brief effect	Effects lasting less than a day
Temporary effect	Effects lasting less than a year
Short-term effect	Effects lasting one to seven years
Medium-term effect	Effects lasting seven to fifteen years
Long-term effect	Effects lasting fifteen to sixty years
Permanent effect	Effects lasting over sixty years

Additionally, in line with advice provided in the DMRB (UKHA, 2020), potential construction noise effects constitute a likely Significant effect where it is determined that a moderate or worse magnitude of effect is likely to occur for a duration exceeding:

- Ten or more days or nights in any 15 consecutive days or nights; or

- A total number of days exceeding 40 in any six consecutive months.

Potential noise effects of durations of less than these are not considered as likely Significant effects.

9.2.2.2 Construction Phase Traffic Noise

Road traffic noise levels have been calculated according to CRTN (UK Department of Transport, 1988), which gives methods to calculate traffic noise based on the 18-hour Average Annual Daily Traffic (AADT).

The magnitude of the potential noise effect due to changes in road traffic noise levels during the Construction Phase is assessed against criteria outlined in the Design Manual for Roads and Bridges (DMRB): LA111 Noise and vibration (UKHA, 2020). DMRB contains advice and information on transport-related noise and vibration, and the criteria set out in Table 9.5 are used here in lieu of detailed Irish guidance.

Table 9.5: Construction traffic noise significance criteria.

Increase in Noise Level due to Traffic, dBA	Magnitude of Effect	EPA 2022 Guidelines Magnitude of Effects
Less than 1.0	Very low	Imperceptible
Greater than or equal to 1.0 and less than 3.0	Low	Not Significant to Slight
Greater than or equal to 3.0 and less than 5.0	Medium	Moderate
Greater than or equal to 5.0	High	Significant

Based on the construction programme in Chapter 5 (Construction), it is assumed that all construction traffic effects will be short-term (i.e., lasting less than seven years).

The basis of these criteria is that changes in noise levels of 1 dBA or less are imperceptible, and changes of 3 dBA are perceptible to the average human ear for comparable noise sources outside of a controlled laboratory environment. Consequently, the onset of a negative effect is set at a change in traffic noise of +1 dBA and the onset of a Negative Significant effect is set at +3 dBA (UKHA, 2020).

Construction road traffic noise has been assessed by considering the change in traffic due to construction activities between the following scenarios:

- Scenario 1 – Future year baseline. This represents the scenario without additional construction traffic in the construction year predicted to have the highest volume of traffic (and therefore the largest change in noise level associated with construction traffic); and
- Scenario 2 – Future year baseline plus construction traffic associated with the Proposed Development.

Comparison of the calculated traffic noise for Scenario 1 and Scenario 2 allows the potential effect due to changes in road traffic noise because of the construction of the Proposed Development to be derived.

9.2.2.3 Construction Phase – Vibration

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 the Proposed 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.

Cosmetic or Structural Damage to Buildings

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

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

BS 5228-2 and BS 7385-2 define thresholds as summarised in Table 9.6 for cosmetic damage to light framed buildings.

Table 9.6: Transient vibration guide for cosmetic damage for light framed buildings[4,5].

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

Furthermore, BS 5228-2 and BS 7385-2 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 9.6 and major structural damage can occur at vibration magnitudes greater than four times those in Table 9.6.

These guidelines will be adopted as limits for cosmetic and structural damage to buildings arising from vibration during the Construction Phase of the Proposed Development.

Human Response to Vibration

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 9.7.

Table 9.7: Guidance on human response to vibration levels

Vibration Level Note (mm/s) [6,7,8]	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.

9.2.2.4 Operational Phase – Noise

An application will be made to the EPA to review the current IEL (P1189-01) to include the Proposed Development. An updated licence will need to be issued by the EPA prior to the commencement of operation. GIL will be required to comply with the requirements of the revised licence, and until such time as a revised IEL is issued, to comply with the requirements of the existing licence.

Schedule B.4 of the current IEL outlines the noise limits at nearby noise sensitive locations for the Proposed Development site. These are presented in Table 9.8. The noise limits of the revised IEL are expected to be the same as the existing IEL, as both will follow the EPA's NG4 guidance for licenced sites, which stipulates the noise limits as presented in Table 9.8.

---

[4] Note 1: Values referred to are at the base of the building.
[5] Note 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.
[6] The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
[7] A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.
[8] 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.

Table 9.8: Noise limits from industrial emissions licence P1189-01.

Daytime dB $L_{Ar,T}$ (30 minutes)	Evening-time dB $L_{Ar,T}$ (30 minutes)	Night-time dB $L_{Aeq,T}$ (15 minutes) [9]
55	50	45

The BS4142 assessment methodology has been used to provide context to the assessment of operational noise. A key aspect of the BS4142 assessment method is a comparison between the background noise level in the vicinity of receptor locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

- Background noise level, LA90,T – defined in BS4142 as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting 'F' (i.e., fast) and quoted to the nearest whole number of decibels';
- Specific noise level – LAeq,Tr – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and
- Rating level – LAr,Tr – the specific sound level plus any adjustment made for the characteristic features of the noise.

The rating level and background noise level are compared and the difference between them assessed using the following guidance from BS4142:

a. *"Typically, the greater the difference, the greater the magnitude of impact.*
b. *The difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c. *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
d. *The lower the rating level is to the measured background noise level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact, depending on the context."*

The guidance on the magnitude of potential effects above has been used to provide context to the assessment of potential operational noise effects and is summarised in Table 9.9.

Table 9.9: Significance ratings of operational noise based on BS4142 guidance

Difference Between Background Noise Level and Rating Level, dBA	Potential Noise Effect Magnitude	EPA 2022 Guidelines Magnitude of Potential Effects	Determination of Likely Significant Effect
⩽ 0	Not Significant	No change	No Significant effect
0 – 2	Not Significant	Imperceptible	
3 – 5	Slight potential effect	Slight to Moderate	Likely Significant effect dependent on potential effect duration
6 – 10	Adverse potential effect	Moderate to Significant	
≥ 10	Significant Adverse potential effect	Very Significant to Profound	

Emergency Operation

In order to provide continuity of service, 45 stand-by generators are integral to the continued uninterrupted operation of the Proposed Development. These generators will only operate in a situation where there is a failure in the electricity supply from the national grid and will be tested routinely.

[9] During night-time hours, there shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise-sensitive location.

Routine testing will be conducted during regular weekday daytime periods only. Section 4.4.1 of the EPA NG4 guidance contains the following comments in relation to emergency plant items:

"In some instances, ...sites will have certain items of emergency equipment (e.g. standby generators) that will only operate in urgent situations (e.g. grid power failure). Depending upon the context, it may be deemed permissible for such items of equipment to give rise to exceedances in the noise criteria/limits during limited testing and emergency operation only. If such equipment is in regular use for any purposes other than intermittent testing, it is subject to the standard limit values for the site".

9.2.2.5 Operational Phase – Vibration

Guidance as to an acceptable magnitude of vibration during the Operational Phase of the Proposed Development is taken from BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz). The Standard contains recommendations that continuous vibration in residential buildings should not exceed 0.3 mm/s PPV by daytime and 0.2 mm/s by night-time.

9.2.3 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.

Operational noise calculations have been undertaken in SoundPLAN (a 3D noise modelling software) that implements ISO 9613 (2024): Acoustics — Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors.

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 Department of Transport in 1988.

9.3 Receiving Environment

A series of noise surveys have been undertaken to determine the existing noise environment.

9.3.1 Survey Locations

Figure 9.1 illustrates the noise monitoring locations in the vicinity of the Proposed Development site.

Figure 9.1: Noise monitoring locations. Source: Google Earth Pro.

The noise monitoring locations are described below:

- Noise Monitoring Location 1 (NM1): Attended measurement location to capture the noise level at the nearby noise sensitive receptors to the south-east of Baldonnel Road; and
- Noise Monitoring Location 2 (NM2): Attended measurement location to capture the noise level at nearby noise sensitive receptors to the north-west of Baldonnel Road.

9.3.2 Survey Periods

Attended measurements were carried out during the following periods:

- Daytime: 11:00 hrs to 16:00 hrs on 12 December 2023;
- Evening time: 21:00 hrs to 22:00 hrs on 12 December 2023; and
- Night-time: 23:00 hrs to 01:00 hrs on 12 December 2023.

The weather during the survey periods was dry with 90% cloud cover with wind speeds of between 2 – 5 m/s.

9.3.3 Personnel and Instrumentation

Arup acousticians carried out the noise surveys. Table 9.10 outlines the instrumentation used in conducting the noise surveys:

Table 9.10: Instrumentation details.

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Brüel & Kjær 2250	2602664	09/11/2021
½" polarised microphone	Brüel & Kjær 4189	2600946	09/11/2021
Sound pressure level calibrator	Brüel & Kjær 4231	3011816	09/03/2023

Note: Sound level meter was calibrated in January 2024 and adjusted by 0.2 dB. This is within the tolerance of ±1.1 dB for Class 1 sound level meters.

9.3.4 Noise Measurement Parameters

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

- LAeq: 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;
- LA90: is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise;
- LAFmax: is the maximum sound pressure level with 'A' Frequency weighting and fast time weighting during the measurement period; and
- LA10: is the sound pressure level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic 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.

9.3.5 Survey Results

The survey results for the daytime attended monitoring are given in Table 9.11.

Table 9.11: Summary of measured noise levels – daytime.

Location	Start Time and Duration of Survey	L_{Aeq} (dB)	L_{A10} (dB)	L_{A90} (dB)	$L_{AF\ max}$ (dB)
NML 1	13:57 (1 x 30 min)	63	68	40	81
	14:37 (1 x 30 min)	68	69	44	96
	15:13 (1 x 30 min)	64	69	43	82
NML 2	11:27 (1 x 30 min)	62	64	41	83
	11:58 (1 x 30 min)	64	66	42	86
	12:29 (1 x 30 min)	65	68	45	87

The dominant noise source was road traffic noise from Baldonnel Road. Other noise sources included distant traffic from the N7 and the R120, airplanes overhead, reverse beeping of machinery from Profile Park, distant tree felling, dogs barking, a distant train horn, bird song, and wind in trees.

The survey results for the evening time attended monitoring results are given in Table 9.12.

Table 9.12: Summary of measured noise levels – evening.

Location	Start Time and Duration of Survey	L_{Aeq} (dB)	L_{A10} (dB)	L_{A90} (dB)	$L_{AF\ max}$ (dB)
NML 1	22:08 (1 x 30 min)	58	53	42	84
NML 2	21:27 (1 x 30 min)	56	46	42	81

The dominant noise source was road traffic noise from Baldonnel Road. Other noise sources included distant traffic from the N7 and the R120, airplanes overhead, dogs barking in the distance, lapping of a stream, bird song, and wind in trees.

The survey results for the night-time attended monitoring results are given in Table 9.13.

Table 9.13: Summary of measured noise levels – night-time.

Location	Start Time and Duration of Survey	L_{Aeq} (dB)	L_{A10} (dB)	L_{A90} (dB)	$L_{AF\ max}$ (dB)
NML 1	23:54 (1 x 15 min)	42	43	41	56
	00:10 (1 x 15 min)	55	43	40	80
	00:27 (1 x 15 min)	57	44	41	83
NML 2	23:00 (1 x 15 min)	60	45	40	86
	23:16 (1 x 15 min)	54	44	41	77
	23:32 (1 x 15 min)	54	51	40	78

The dominant noise source was road traffic noise from Baldonnel Road. Other noise sources included distant traffic from the N7 and the R120, airplanes overhead, low level industrial noise, dogs barking in the distance, lapping of a stream, council workers laying cones on the road and wind in trees.

9.3.6 Study Area

The nearest noise sensitive receptors (NSRs) to the Proposed Development are presented in Figure 9.2.

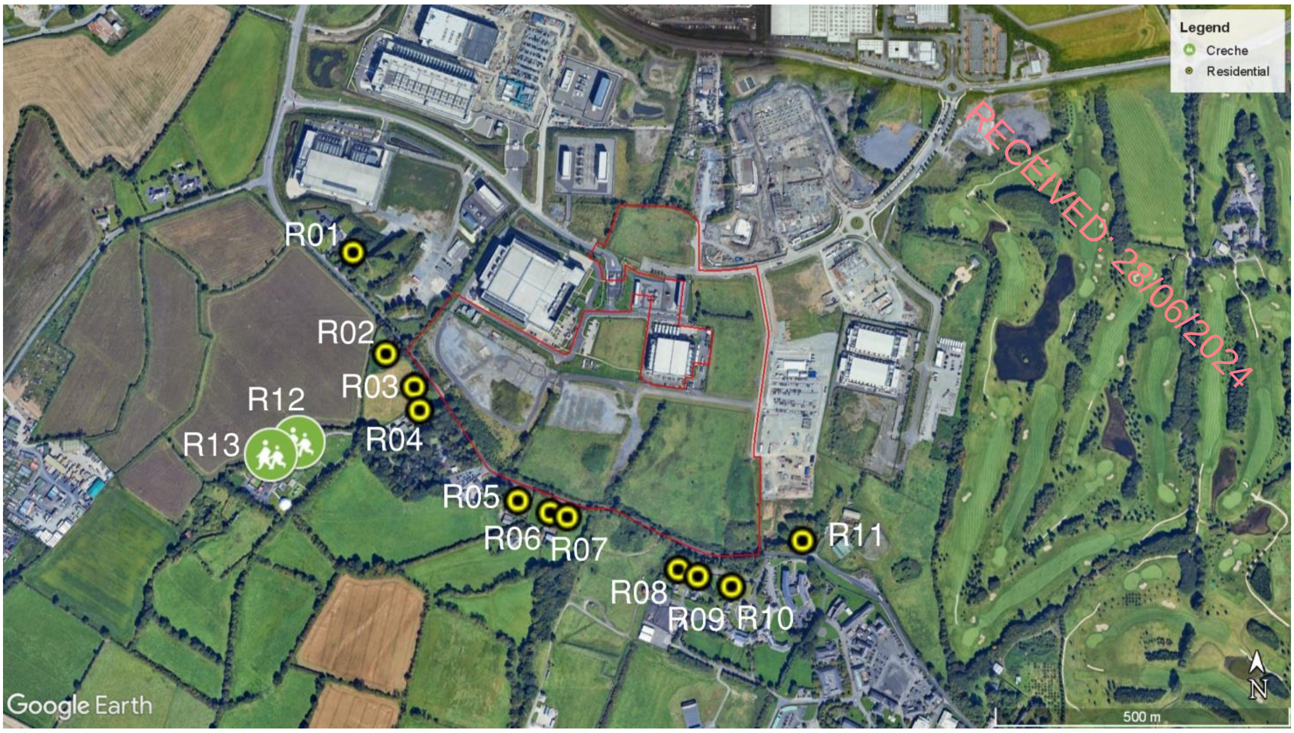

Figure 9.2: Noise sensitive receptors. Source: Google Earth Pro.

Table 9.14 presents the NSRs and their respective distances to the Proposed Development site boundary.

Table 9.14: NSR distances to red line boundary. Source: Google Earth Pro.

Receptor Number	Receptor Type	Distance to Red Line Boundary, m
R01	Residential	185
R02	Residential	30
R03	Residential	25
R04	Residential	40
R05	Residential	30
R06	Residential	30
R07	Residential	25
R08	Residential	40
R09	Residential	40
R10	Residential	50
R11	Residential	75
R12	Educational	250
R13	Educational	290

9.4 Characteristics of the Proposed Development

A description of the Proposed Development is provided in Chapter 4 (Description of the Proposed Development) and Chapter 5 (Construction) provides a description of the construction and demolition activities.

The potential effects of noise and vibration on the surroundings from the Proposed Development are considered for two stages:

- Construction Phase – involving noise and vibration generating activities and potential noise from construction-related traffic; and

- Operational Phase – involving noise from building services, generator testing, and emergency site operations. There are no vibration-generating activities in the Operational Phase.

9.5 Potential Effects

9.5.1 Construction Phase

9.5.1.1 Construction Noise

The largest potential noise effect of the Proposed Development will occur due to plant operating on site and HGV movement to, from and around the site. The Construction Phase can be classed as Short-Term (approximately 27 months in duration).

Construction noise thresholds are presented in Table 9.2. The daytime construction noise threshold for the site is set at 70 dB $L_{Aeq,T}$. A night-time threshold is not included as construction work is not expected to take place at night.

BS 5228-1 contains noise level data for various construction machinery. The noise levels relating to site preparation, building the substructure and superstructure, internal works and external works have been calculated on a receptor by receptor basis and the predictions are presented in Table 9.15.

The highest noise levels will be generated during activities involving earthworks, including the substructure preparation works, site preparation works, and external works of the data centre facility. It is not possible at this stage to predict the exact equipment that will be used by the Contractor(s). The approach taken in this assessment is to make reasonable assumptions about likely plant and their associated 'on-times' (the percentage of the time that they are active) in order to present a reasonable assessment of likely significant effects.

The following Construction Phase activities have been considered:

- Site preparation works;
- Substructure (preparation works including earthworks);
- Substructure (concrete pouring);
- Superstructure;
- Internal works / fit out;
- External works (preparation works including earthworks); and
- External works (concrete pouring).

The calculations assume that all plant items are operating simultaneously, with percentage 'on times' and sound power levels as detailed in Appendix 9.2. This information is based on data provided in Chapter 5 (Construction).

Standard construction hours will be from 07:00 – 19:00, Monday to Friday, and 08:00 – 14:00 on Saturdays with no working on Sundays or Bank Holidays. A description of the programme and phasing are described in Chapter 5 (Construction).

Predicted unmitigated construction noise levels are presented in Table 9.15. These predicted levels have assumed a reasonable scenario of all plant in the construction activity operating simultaneously.

Table 9.15: Potential unmitigated construction noise levels at sensitive receptors.

Activity	Total Sound Power Level dB(A)	Calculated Noise Levels at Each NSR (dB $L_{Aeq,T}$)												
		R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
Site preparation works	121	67	79	78	74	81	81	77	75	74	71	67	65	63
Substructure (preparation)	124	64	69	72	74	76	73	72	78	77	74	70	66	64
Substructure (pouring)	112	52	57	61	62	65	62	60	67	65	62	59	54	53
Superstructure	121	62	67	70	71	70	69	68	71	70	69	68	63	62
Internal works / fit out	107	48	53	56	46	56	55	54	57	56	55	54	49	47
External works (preparation)	122	60	63	65	66	77	79	79	77	76	73	70	61	60
External works (pouring)	119	57	60	62	63	74	76	75	74	73	70	67	58	57

The NSRs listed are as presented in Figure 9.2.

Table 9.16: Predicted effects from unmitigated construction noise at each receptor.

Activity	Significance Rating (as per Table 9.3)				
	No change	Negative, Neutral to Slight	Negative, Slight to Moderate	Negative, Moderate to Significant	Negative, Significant to Very Significant
Site preparation works	R01, R11 – R13	R10	R04, R08, R09	R02, R03, R07	R05, R06
Substructure (preparation)	R01, R02, R12, R13	R03, R07, R11	R04, R06, R10	R05, R08, R09	None
Substructure (pouring)	R01 – R13	None	None	None	None
Superstructure	R01, R02, R06, R07, R10 – R13	R03 – R05, R08, R09	None	None	None
Internal works / fit out	R01 – R13	None	None	None	None
External works (preparation)	R01 – R04, R12, R13	R11	R10	R05 – R09	None
External Works (pouring)	R01 – R04, R11 – R13	R10	R05, R07 – R09	R06	None

The unmitigated construction noise levels are compared with the CNT in Table 9.2 to determine the potential effects as outlined in Table 9.3. This indicates that unmitigated construction noise effects are predicted to range from Negative, Not Significant and Short-Term, to Negative, Significant to Very Significant and Short-term.

9.5.1.2 Construction Traffic

Predicted annual average daily traffic (AADT) flows are presented in Chapter 6 (Traffic and Transport). These values are used to calculate the change in traffic noise along the surrounding roads due to traffic associated with the proposed construction works.

The predicted changes in traffic noise levels are presented in Table 9.17. The road links referred to are detailed in Chapter 6 (Traffic and Transport).

The traffic noise assessment considers the change in noise level for the road section presented in Table 9.17 and not a specific NSRs along the road section.

Table 9.17: Predicted change in noise levels due to construction traffic with and without Proposed Development

Junction Number	Road	Without Construction		With Construction		Change in Noise Level (dBA)	Significance Rating
		Total AADT	% Heavy Vehicles	Total AADT	% Heavy Vehicles		
1	R120 Adamstown Road (N)	12,052	10%	12,052	10%	0	Imperceptible
1	R134 New Nangor Road (E)	14,083	8%	14,083	8%	0	Imperceptible
1	R120 Adamstown Road (S)	9,048	6%	9,048	6%	0	Imperceptible
1	Grange Castle Access Road (W)	26	0%	26	0%	0	Imperceptible
2	Grange Castle Business Park (N)	4,271	9%	4,271	9%	0	Imperceptible

Junction Number	Road	Without Construction		With Construction		Change in Noise Level (dBA)	Significance Rating
		Total AADT	% Heavy Vehicles	Total AADT	% Heavy Vehicles		
2	R134 New Nangor Road (E)	11,267	9%	11,267	9%	0	Imperceptible
2	L2001 Realigned Baldonnel Road (S)	8,807	10%	8,807	10%	0	Imperceptible
2	R134 New Nangor Road (W)	14,083	8%	14,083	8%	0	Imperceptible
3	Kilcarbery Park (N)	2,980	18%	2,980	18%	0	Imperceptible
3	R134 New Nangor Road (E)	13,943	10%	15,097	13%	+ 1	Not Significant to Slight Negative
3	Profile Park (S)	2,398	9%	3,552	20%	+ 4	Moderate, Negative
3	R134 New Nangor Road (W)	11,387	10%	11,387	10%	0	Imperceptible
4	R136 Grange Castle Road (N)	22,041	5%	22,041	5%	0	Imperceptible
4	R134 New Nangor Road (E)	17,988	7%	17,988	7%	0	Imperceptible
4	R136 Grange Castle Road (S)	33,483	7%	34,637	9%	+ 1	Not Significant to Slight
4	R134 New Nangor Road (W)	17,605	9%	18,759	11%	+ 1	Not Significant to Slight
5	L2001 Baldonnel Road (N)	8,762	10%	8,762	10%	0	Imperceptible
5	Conchobar Murray Avenue (E)	1,340	7%	1,340	7%	0	Imperceptible
5	L2001 Baldonnel Road (S)	8,406	10%	8,406	10%	0	Imperceptible

For receptors adjacent to affected roads, the additional noise from construction traffic over and above the existing traffic noise is predicted to be minimal in most cases, with no significant effects adverse predicted.

A Negative, Not Significant to Slight, Short-Term effect is predicted to occur at receptors located in proximity to three roads. One road (Profile Park (S)) is predicted to experience a direct Negative, Moderate, Short-Term effect however there are no sensitive receptors within 500 m of this road.

9.5.1.3 Construction Vibration

There is the potential for vibration effects to occur during the Construction Phase, particularly in association with excavation activities, which will be undertaken during site preparation and substructure construction. The method of excavation is not yet agreed, however, the scenario most likely to produce perceptible vibration at nearby sensitive receptors is excavation of rock, so this is considered here.

The level of vibration at nearby sensitive receptors that is likely to result from excavation activities through hard rock is less than 0.1 mm/s PPV, based on measured levels from previous construction projects (corrected for distance to excavation works in this case).

BS5228-2 notes that complaints are likely to occur where vibration levels are greater than 1.0 mm/s PPV at residential receptors. It is possible that vibration generated by construction activities may be perceptible to nearby sensitive receptors, however, there is a low likelihood of complaints.

Given the low level of predicted vibration, no likely Significant Effects are predicted.

9.5.2 Operational Phase

The primary sources of outward noise from the Proposed Development during the Operational Phase will involve:

- Building services noise; and
- Generator noise, either from routine testing or emergency site operations.

A brief overview of the calculation process is presented below. Full details of the noise modelling, including source sound power levels, can be found in Appendix 9.2.

9.5.2.1 SoundPLANnoise 9.0

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, SoundPLANnoise 9.0, calculates noise levels in accordance with ISO 9613: Acoustics — Attenuation of sound during propagation outdoors, Part 2: General method of calculation (ISO, 2024).

SoundPLANnoise 9.0 is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. 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 (LWA);
- The distance between the source and receptor;
- 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 receptor;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these can have significant effects on noise levels at distances greater than approximately 400m).

9.5.2.2 Input Data and Assumptions

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

Site Layout	The Proposed Development site layout has been obtained from the design drawings.
Local Area	The location of noise sensitive locations has been obtained from Google Maps, site visits and from Ordinance Survey Ireland (OSI).
Heights	The heights of buildings on the Proposed Development site have been obtained from design drawings. Off-site buildings (NSRs and other buildings) have been assumed to be 12 m high with the exception of single storey buildings where a default height of 6 m has been assumed.
Contours	In this instance the contours for the Proposed Development site and surrounding area were obtained from LiDAR data obtained from Ordnance Survey Ireland to account for any screening by undulations in the lands.

The final critical aspect of the noise model development is the inclusion of the various plant noise sources, as discussed below.

9.5.2.3 Source Sound Power Data

A 3D render of the overview of the noise model is presented in Figure 9.3.

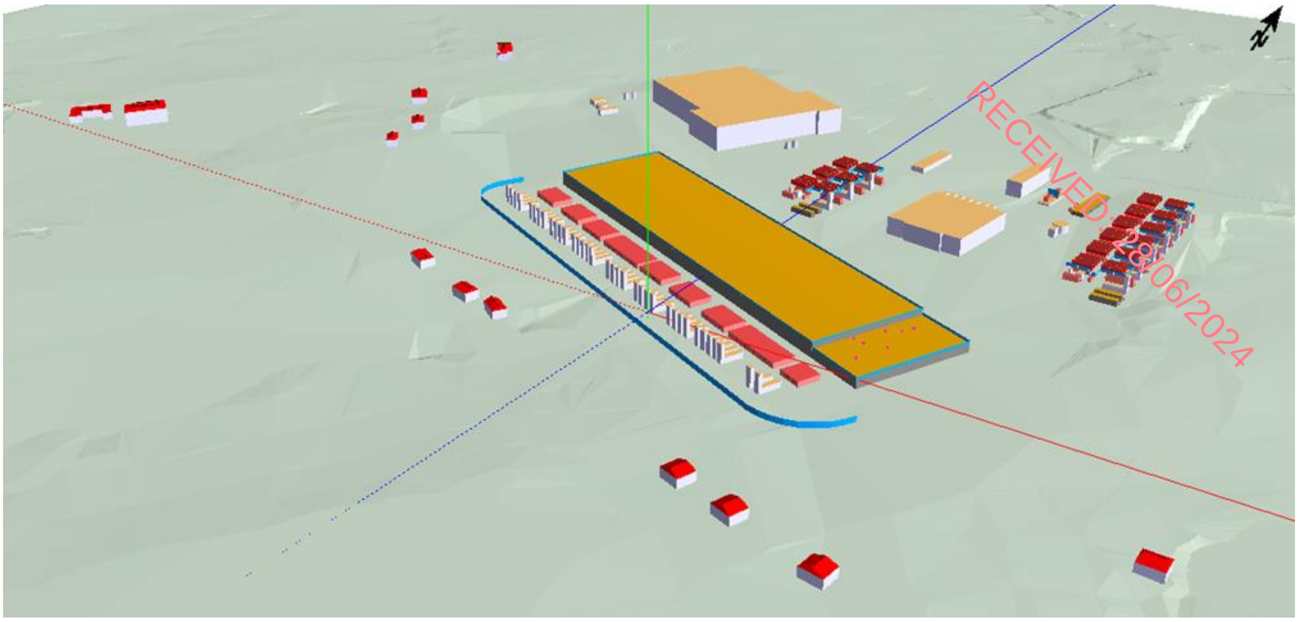

Figure 9.3: Image of the acoustic model – Proposed Development site overview.

The following noise sources have been modelled:

- The mechanical yards, which includes noise sources such as air cooling plant, and generators;
- The data centre hall and associated buildings, which includes noise sources such as rooftop air cooling plant;
- The High Voltage (HV) compound, which includes noise sources such as transformers and electrical buildings; and
- The electrical yard, which includes noise sources such as emergency generators.

Full details of the noise assessment and sound power sources can be found in Appendix 9.2.

9.5.2.4 Mitigation Measures included in Modelling

To reduce operational noise from the Proposed Development, various mitigation measures have been included in the noise model. These are described in detail in Appendix 9.3.3, and are summarised as follows:

- Acoustic louvres have been modelled around the air cooled chiller's compressors and heat exchangers in the mechanical yard at gantry-level, which reduces noise from the air cooled chiller's compressors and heat exchangers to nearby NSRs;
- Discharge attenuators have been modelled on top of each air cooled chiller fan in the mechanical yard, which reduces noise from the air cooled chiller fan to the environment;
- Night-time conditions such as reduction of operational units and implementation of quiet modes have been applied to Facility Support Area (FSA) rooftop plant, which reduces operational noise between 23:00 and 07:00; and
- The following night time operational conditions have been assumed, which reduce operational noise produced by the equipment between 23:00 and 07:00:
  - FSA Rooftop Unit (RTU) fan speed is set to a lower maximum operational speed during the night time period;
  - Making use of the manufacturer's *Quiet Mode* on air handling unit condensers where available;
  - Reducing the number of operational air handling units on the data centre hall during the night time period.

9.5.2.5 Modelling Scenarios

Three scenarios have been developed to consider the potential noise effect of the proposed operations. These are outlined in Table 9.18.

Table 9.18: Modelled operating scenarios.

Scenario Description	Frequency of Occurrence	Operating Conditions	Note
Scenario 1: **Normal operation**	Continuous, over day, evening and night-time periods	• All day-to-day plant running continuously. • Plant running at design duty during the daytime and evening, but with set-back conditions where appropriate during the night to reduce noise levels at source. • No generators running. • Redundancy of plant items incorporated.	Representative of the typical, day-to-day, noise levels from the site.
Scenario 2: **Maintenance**	Monthly	• 60 minutes of run-time at 100% load, per generator. • A maximum of 1 generator runs simultaneously, testing 4 generators per day, during normal business hours only (9am-6pm).	Representative of generator testing. Includes full operational noise as per Scenario 1.
Scenario 3: **Full site blackout**	In an emergency only	• All generators running for the duration of the emergency, at 100% load.	Representative of the unlikely event that full emergency operation would occur. Includes full operational noise as per Scenario 1.

Scenario 1 is representative of normal operation.

Scenario 2 represents occasional testing of emergency generators. Only generators at DC3 have been considered in this assessment as they are closest to NSRs and will therefore represent the highest noise level for generator testing at the NSRs considered. Only potential daytime effects are considered as testing will not take place during evening or nighttime.

Scenario 3 is representative of the emergency situation when an issue with supply from the national grid has occurred. Full operation of all emergency generators will be required to keep the data centres in operation in this case. This scenario predicts the noise level when all 69 no. generators are in operation along with all plant from DC1, DC2 and DC3 running continuously only omitting HV compound plant. It should be noted that such an event is extremely unlikely.

Scenario 1

The predicted noise levels are presented and compared to the relevant noise criteria for Scenario 1 for the day, evening, and night time periods in Table 9.19 to Table 9.21.

Table 9.19: Summary of predicted plant noise levels and comparison with noise limits – Scenario 1 (daytime).

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Rating Sound Level From DC3 dB $L_{Ar,Tr}$	Full GIL Campus Predicted Noise Levels dB $L_{Ar,Tr}$	IEL Noise Limit dB $L_{Ar,\,30\,minutes}$ (Day)	Compliant with IEL?
Scenario 1: Normal Operation (Daytime)	R01	38	38	41	55	Yes
	R02	38	43	45		
	R03	38	44	45		
	R04	38	42	44		
	R05	36	41	42		
	R06	36	41	42		
	R07	36	42	43		
	R08	35	46	46		
	R09	35	45	46		
	R10	35	45	45		
	R11	35	45	45		
	R12	38	38	41		
	R13	38	35	40		

Predicted noise levels comply with the day time noise criterion of 55 dB $L_{Aeq,T}$, as outlined in the IE licence, at all locations for Scenario 1.

Table 9.20: Summary of predicted plant noise levels and comparison with noise limits – Scenario 1 (evening time).

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Rating Sound Level From DC3 dB $L_{Ar,Tr}$	Full GIL Campus Predicted Noise Levels dB $L_{Ar,Tr}$	IEL Noise Limit dB $L_{Ar,\,30\,minutes}$ (Evening)	Compliant with IEL?
Scenario 1: Normal Operation (Evening)	R01	38	38	41	50	Yes
	R02	38	43	45		
	R03	38	44	45		
	R04	38	42	44		
	R05	36	41	42		
	R06	36	41	42		
	R07	36	42	43		
	R08	35	46	46		
	R09	35	45	46		
	R10	35	45	45		
	R11	35	45	45		
	R12	38	38	41		
	R13	38	35	40		

Predicted noise levels comply with the evening noise criterion of 50dB $L_{Aeq,T}$ outlined in the IEL at all locations for Scenario 1.

Table 9.21: Summary of predicted plant noise levels and comparison with noise limits – Scenario 1 (night-time).

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Specific Sound Level From DC3 dB $L_{Aeq,T}$	Full GIL Campus Predicted Noise Levels dB $L_{Aeq,T}$	IEL Noise Limit dB $L_{Aeq, 15 minutes}$ (Night-time)	Compliant with IEL?
Scenario 1: Normal operation (Night-time)	R01	38	33	40	45	Yes
	R02	38	40	43		
	R03	38	41	43		
	R04	38	39	42		
	R05	36	38	41		
	R06	36	39	41		
	R07	36	39	41		
	R08	35	43	44		
	R09	35	43	44		
	R10	35	43	44		
	R11	35	42	43		
	R12	38	35	40		
	R13	38	30	39		

Predicted noise levels comply at all locations with the night time noise criterion of 45dB $L_{Aeq,T}$ as outlined in the IEL for Scenario 1.

Scenario 2

The predicted noise levels are presented and compared to the relevant noise criteria for Scenario 2 in Table 9.22.

Table 9.22: Summary of predicted plant noise levels and comparison with noise limits – Scenario 2.

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Rating Sound Level From DC3 dB $L_{Ar,Tr}$	Cumulative, Full GIL Campus Noise Levels dB $L_{Ar,Tr}$	IEL Noise Limit dB $L_{Ar, 30 minutes}$ (Daytime)	Compliant with IEL?
Scenario 2: Maintenance	R01	38	40	42	55	Yes
	R02	38	45	45		
	R03	38	45	46		
	R04	38	45	46		
	R05	36	48	48		
	R06	36	48	49		
	R07	36	49	49		
	R08	35	49	49		
	R09	35	48	48		
	R10	35	47	47		

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Rating Sound Level From DC3 dB $L_{Ar,Tr}$	Cumulative, Full GIL Campus Noise Levels dB $L_{Ar,Tr}$	IEL Noise Limit dB $L_{Ar, 30\ minutes}$ (Daytime)	Compliant with IEL?
	R11	35	46	46		
	R12	38	40	42		
	R13	38	38	41		

The predicted noise levels comply at all locations with the relevant daytime noise criterion of 55 dB $L_{Aeq,T}$ as outlined in the IEL.

Scenario 3

The predicted noise levels are presented and compared to the relevant noise criteria for Scenario 3 in Table 9.23.

Table 9.23: Summary of predicted plant noise levels and comparison with noise limits – Scenario 3.

Scenario	NSR	Specific Sound Level From DC1 and DC2 dB $L_{Aeq,T}$	Predicted Rating Sound Level From DC3 dB $L_{Ar,Tr}$	Full GIL Campus Predicted Noise Levels dB $L_{Ar,Tr}$	IEL Noise Limit	Compliant with IEL?
Scenario 3: Full site blackout	R01	56	48	56	Limit not applicable during emergency use of generators, on the assumption that this scenario is deemed a permissible exceedance as per EPA NG4 Guidelines.	N/A
	R02	56	51	57		
	R03	56	52	57		
	R04	56	53	58		
	R05	50	60	60		
	R06	50	59	60		
	R07	50	59	60		
	R08	47	56	56		
	R09	47	54	55		
	R10	47	53	54		
	R11	47	52	53		
	R12	56	48	56		
	R13	56	47	56		

In line with EPA NG4 guidance, no noise limit is set for Scenario 3. Review of the predicted noise levels shows that the expected noise at NSRs is between 47 and 60 dB $L_{Ar,T}$. This scenario is unlikely to occur.

Conclusion

The results show that during normal operation and the maintenance of generators, predicted noise levels comply with the IEL noise limits during the day, evening, and night at the surrounding NSRs.

No corrections for acoustic character have been assumed for predicted rating sound levels. It has been assumed that all plant on site will be adequately maintained such that no tonal element is perceived. On-going assessment for tonal noise is stipulated as part of the monitoring requirements under the IEL. If any tonal element is measured, then the equipment generating the tonal noise must be identified and maintained so that the tonal element is no longer present on re-measuring.

9.5.2.6 *Significance of Predicted Noise Levels*

Table 9.24 presents the predicted changes in noise level due to the Proposed Development at NSRs for the night-time period, as this is the most sensitive time period for noise. The changes are assessed against significance criteria as outlined in Table 9.9 for Scenario 1 (Normal Operation).

Table 9.24: Predicted changes in noise levels.

Location	Scenario 1 – Typical Operation Night Time			
	Predicted Rating Noise Level, $dBL_{Aeq,T}$,	Average Measured Background Level dB L_{A90}	Change in Noise Level (dBA)	Potential Effect
R01	40	41	0	No change
R02	43	41	+2	Imperceptible
R03	43	41	+2	Imperceptible
R04	42	41	+1	Imperceptible
R05	41	41	0	No change
R06	41	41	0	No change
R07	41	41	0	No change
R08	44	41	+3	Negative, Slight to Moderate
R09	44	41	+3	Negative, Slight to Moderate
R10	44	41	+3	Negative, Slight to Moderate
R11	43	41	+2	Imperceptible
R12	40	41	0	No change
R13	39	41	0	No change

All noise levels are predicted to comply with the IEL limit, however, an increase of between 1 and 3 dBA is predicted above existing average night time noise levels at seven receptors, which would constitute a Negative, Slight to Moderate, Long-Term effect on overall noise levels at these receptors.

9.5.3 Decommissioning Phase

It is envisaged that the Proposed Development will have a lifespan of 35 – 40 years or more. Regular maintenance and upgrading of the data centre facility over time will enable it to continue to meet future demands. Upon closure, which is unforeseen at this time, it is anticipated that the facility will be suitable for re-use, as would any other industrial site. All bespoke plant and equipment that would be surplus to requirements for a standard industrial site would be decommissioned, removed, and recycled/disposed of as appropriate to guidelines and regulations at the time.

The potential effects from the Decommissioning Phase will be similar to those from the Superstructure and Internal Works/Fit-out stages of the Construction Phase – i.e., No Change to Negative, Neutral to Slight for the unmitigated scenario.

9.6 Mitigation and Monitoring Measures

9.6.1 Construction Phase

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

Due to the proximity of the NSRs, a barrier height will be chosen to completely hide the source, and a 10 dBA reduction in noise levels is predicted at NSRs. All noise barriers shall be constructed of solid material that is free from holes or gaps (including to ground level) to achieve the stated noise reduction.

BS5228 Parts 1 and 2 offer detailed guidance on the control of noise and vibration from demolition and construction activities. Specific examples of such mitigation measures include:

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- Establishing channels of communication between the contractor/developer, Local Authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration; and
- All site access roads will be kept even to mitigate the potential for vibration from lorries.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- 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; and
- 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.

It is proposed that during any rock breaking or similar vibration-generating works, vibration from construction activities to off-site residences be limited to the values set out in Table 9.6 through monitoring of vibration at the Proposed Development site boundary or at noise-sensitive locations. It should be noted that these limits in Table 9.6 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%, as stated in BS5228.

9.6.1.1 Noise and Vibration Monitoring

Monitoring of noise and vibration levels at the construction site boundary will be undertaken near working areas to identify where work procedures may need to be modified. In the event of a valid complaint, a noise monitoring protocol will be submitted to the relevant local authority prior to commencement of any noise monitoring. The protocol will include details of:

- A description of the complaint;
- Construction activities taking place at the time of the complaint;
- Noise monitoring methodology and results; and
- Any actions taken.

9.6.2 Operational Phase

9.6.2.1 Operational Phase Mitigation

Mitigation measures for the Operational Phase of the Proposed Development are included in the noise modelling presented above. The mitigation measures are in the form of acoustic louvres, attenuators, and reduced fan speeds during the night time period that all reduce noise from equipment at the Proposed Development, and therefore reduce predicted noise levels at nearby NSRs.

A summary of the mitigation measures is presented in Section 9.5.2.4, with details presented in Appendix 9.3.

9.6.2.2 *Operational Phase Monitoring*

Schedule C.4 of the IEL outlines the required noise monitoring. This is presented in Table 9.25.

Table 9.25: Noise monitoring requirements from Industrial Emissions Licence P1189-01.

Period	Minimum Survey Duration
Daytime	A minimum of 3 sampling periods at each noise monitoring location.[10]
Evening-time	A minimum of 1 sampling periods at each noise monitoring location.
Night-time[11]	A minimum of 2 sampling periods at each noise monitoring location.

9.6.3 Decommissioning Phase

Mitigation measures for the Decommissioning Phase will be similar to those proposed for the Construction Phase, i.e., a solid noise barrier free from holes or gaps, which is expected to reduce noise levels at noise sensitive receptors.

9.7 Residual Effects

9.7.1 Construction Phase

A summary of the residual effects of construction noise on residential receptors for each of the construction stages considered is presented in Table 9.26 to Table 9.32.

For the construction stage, a noise barrier has been modelled that is expected to reduce the predicted noise level at nearby NSRs by 10 dBA. This is the basis of the reduction in noise levels at the "post mitigation" stage presented below. Details of the noise barrier can be found in Section 9.6.1.

Table 9.26: Summary of residual effects at receptors from construction noise from Proposed Development site preparation works.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	67	No Significant effect	57	No Significant effect
R02	79	Moderate to Significant, Negative	69	No Significant effect
R03	78	Moderate to Significant, Negative	68	No Significant effect
R04	74	Slight to Moderate, Negative	64	No Significant effect
R05	81	Very Significant, Negative	71	Negative, Neutral to Slight
R06	81	Very Significant, Negative	71	Negative, Neutral to Slight
R07	77	Moderate to Significant, Negative	67	No Significant effect
R08	75	Slight to Moderate, Negative	65	No Significant effect
R09	74	Slight to Moderate, Negative	64	No Significant effect
R10	71	Neutral to Slight, Negative	61	No Significant effect
R11	67	No Significant effect, Negative	57	No Significant effect
R12	65	No Significant effect, Negative	55	No Significant effect
R13	63	No Significant effect, Negative	53	No Significant effect

[10] Sampling period is to be the time period T stated as per Schedule B.4 Noise Emissions, of this licence. This applies to day, evening and night-time periods

[11] Night-time measurements should be made between 2300hrs and 0400hrs, Sunday to Thursday, with 2300hrs being the preferred start time.

Table 9.27: Summary of residual effects at receptors from construction noise from preparation works for the substructure.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	64	No Significant effect	54	No Significant effect
R02	69	No Significant effect	59	No Significant effect
R03	72	Neutral to Slight, Negative	62	No Significant effect
R04	74	Slight to Moderate, Negative	64	No Significant effect
R05	76	Moderate to Significant, Negative	66	No Significant effect
R06	73	Slight to Moderate, Negative	63	No Significant effect
R07	72	Neutral to Slight, Negative	62	No Significant effect
R08	78	Moderate to Significant, Negative	68	No Significant effect
R09	77	Moderate to Significant, Negative	67	No Significant effect
R10	74	Slight to Moderate, Negative	64	No Significant effect
R11	70	Neutral to Slight, Negative	60	No Significant effect
R12	66	No Significant effect	56	No Significant effect
R13	64	No Significant effect	54	No Significant effect

Table 9.28: Summary of residual effects at receptors from construction noise from concrete pouring works for the substructure.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	52	No Significant effect	42	No Significant effect
R02	57	No Significant effect	47	No Significant effect
R03	61	No Significant effect	51	No Significant effect
R04	62	No Significant effect	52	No Significant effect
R05	65	No Significant effect	55	No Significant effect
R06	62	No Significant effect	52	No Significant effect
R07	60	No Significant effect	50	No Significant effect
R08	67	No Significant effect	57	No Significant effect
R09	65	No Significant effect	55	No Significant effect
R10	62	No Significant effect	52	No Significant effect
R11	59	No Significant effect	49	No Significant effect
R12	54	No Significant effect	44	No Significant effect
R13	53	No Significant effect	43	No Significant effect

Table 9.29: Summary of residual effects at receptors from construction noise from superstructure works.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	62	No Significant effect	52	No Significant effect
R02	67	No Significant effect	57	No Significant effect
R03	70	Neutral to Slight, Negative	60	No Significant effect
R04	71	Neutral to Slight, Negative	61	No Significant effect
R05	70	Neutral to Slight, Negative	60	No Significant effect
R06	69	No Significant effect	59	No Significant effect
R07	68	No Significant effect	58	No Significant effect
R08	71	Neutral to Slight, Negative	61	No Significant effect
R09	70	Neutral to Slight, Negative	60	No Significant effect
R10	69	No Significant effect	59	No Significant effect
R11	68	No Significant effect	58	No Significant effect
R12	63	No Significant effect	53	No Significant effect
R13	62	No Significant effect	52	No Significant effect

Table 9.30: Summary of residual effects at receptors from construction noise from internal works/fitout.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	48	No Significant effect	38	No Significant effect
R02	53	No Significant effect	43	No Significant effect
R03	56	No Significant effect	46	No Significant effect
R04	46	No Significant effect	36	No Significant effect
R05	56	No Significant effect	46	No Significant effect
R06	55	No Significant effect	45	No Significant effect
R07	54	No Significant effect	44	No Significant effect
R08	57	No Significant effect	47	No Significant effect
R09	56	No Significant effect	46	No Significant effect
R10	55	No Significant effect	45	No Significant effect
R11	54	No Significant effect	44	No Significant effect
R12	49	No Significant effect	39	No Significant effect
R13	47	No Significant effect	37	No Significant effect

Table 9.31: Summary of residual effects at receptors from construction noise from preparation for external works.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	60	No Significant effect	50	No Significant effect
R02	63	No Significant effect	53	No Significant effect
R03	65	No Significant effect	55	No Significant effect
R04	66	No Significant effect	56	No Significant effect
R05	77	Moderate to Significant, Negative	67	No Significant effect
R06	79	Moderate to Significant, Negative	69	No Significant effect
R07	79	Moderate to Significant, Negative	69	No Significant effect
R08	77	Moderate to Significant, Negative	67	No Significant effect
R09	76	Moderate to Significant, Negative	66	No Significant effect
R10	73	Slight to Moderate, Negative	63	No Significant effect
R11	70	Neutral to Slight, Negative	60	No Significant effect
R12	61	No Significant effect	51	No Significant effect
R13	60	No Significant effect	50	No Significant effect

Table 9.32: Summary of residual effects at receptors from construction noise from concrete pouring for external works.

Receptor	Predicted Noise Level (Pre-mitigation), L_{Aeq}, dB	Potential Effect (Pre-mitigation)	Predicted Noise Level (Post-mitigation), L_{Aeq}, dB	Potential Effect (Post-mitigation)
R01	57	No Significant effect	47	No Significant effect
R02	60	No Significant effect	50	No Significant effect
R03	62	No Significant effect	52	No Significant effect
R04	63	No Significant effect	53	No Significant effect
R05	74	Slight to Moderate, Negative	64	No Significant effect
R06	76	Moderate to Significant, Negative	66	No Significant effect
R07	75	Slight to Moderate, Negative, Negative	65	No Significant effect
R08	74	Slight to Moderate	64	No Significant effect
R09	73	Slight to Moderate, Negative	63	No Significant effect
R10	70	Neutral to Slight, Negative	60	No Significant effect
R11	67	No Significant effect	57	No Significant effect
R12	58	No Significant effect	48	No Significant effect
R13	57	No Significant effect	47	No Significant effect

Review of the predicted effects at NSRs due to construction noise show that, with mitigation, no significant effect is expected for the majority of receptors for all phases. At R05 and R06, during the site preparation works, a Negative, Neutral to Slight, Short-Term effect is predicted.

Vibration levels from construction activities are predicted to be less than 0.1 mm/s at nearby NSRs, which is below the "just perceptible" limit (as presented in Table 9.7) for human response to vibration of 0.14 mm/s, and below the limit of cosmetic damage to light-framed buildings (presented in Table 9.6) of 15 mm/s or 20 mm/s (depending on the frequency of the vibration). Due to the low level of predicted vibration levels, no likely significant effects are predicted for construction vibration to nearby sensitive receptors.

9.7.2 Operational Phase

A summary of the residual effects on noise sensitive receptors is presented in Table 9.33 to Table 9.37for Scenario 1 (day, evening, and night time), Scenario 2, and Scenario 3 respectively.

In the Operational Phase, the potential effects pre- and post-mitigation are the same, as all mitigation measures have been included in Operational Phase modelling. Mitigation measures include acoustic louvres, attenuators, and reduced fan speeds during the night time period, which reduce noise levels from the equipment at the Proposed Development and therefore reduce the predicted noise levels at nearby NSRs.

Potential significant negative effects are based on the change in noise levels at NSRs, as presented in Table 9.9.

Table 9.33: Summary of residual effects from the Operational Phase noise – Scenario 1 – day time.

Receptor	Predicted Full GIL Campus Noise Level, dBL_{ArT}	Measured Background Noise Level, dBL_{A90}	Excess of Predicted Noise Level Over Measured Background Level, dBA	Exceedance of Predicted Noise Level over IEL Limit, dBA	Potential Effect (Pre and Post Mitigation)
R01	41	43	0	0	No Change
R02	45	43	2	0	Imperceptible
R03	45	43	2	0	Imperceptible
R04	44	43	1	0	Imperceptible
R05	42	43	0	0	No Change
R06	42	43	0	0	No Change
R07	43	43	0	0	No Change
R08	46	43	3	0	Negative, Slight to Moderate
R09	46	43	3	0	Negative, Slight to Moderate
R10	45	43	2	0	Imperceptible
R11	45	43	2	0	Imperceptible
R12	41	43	0	0	No Change
R13	40	43	0	0	No Change

For Scenario 1 (daytime), no change is predicted at 6 NSRs, an Imperceptible, Long-Term Effect is predicted at 5 NSRs, and a Negative, Slight to Moderate, Long-Term Effect is predicted at 2 NSRs. It should be noted that predicted noise levels at all NSRs comply with the IEL noise limits.

Table 9.34: Summary of residual effects from the Operational Phase noise – Scenario 1 – evening time.

Receptor	Predicted Full GIL Campus Noise Level, dBL_{ArT}	Measured Background Noise Level, dBL_{A90}	Excess of Predicted Noise Level Over Measured Background Level, dBA	Exceedance of Predicted Noise Level over IEL Limit, dBA	Potential Effect (Pre and post mitigation)
R01	41	42	0	0	No Change
R02	45	42	3	0	Negative, Slight to Moderate
R03	45	42	3	0	Negative, Slight to Moderate
R04	44	42	2	0	Imperceptible
R05	42	42	0	0	No Change
R06	42	42	0	0	No Change
R07	43	42	1	0	Imperceptible
R08	46	42	4	0	Negative, Slight to Moderate
R09	46	42	4	0	Negative, Slight to Moderate
R10	45	42	3	0	Negative, Slight to Moderate
R11	45	42	3	0	Negative, Slight to Moderate
R12	41	42	0	0	No Change
R13	40	42	0	0	No Change

For Scenario 1 (evening time), no change is predicted at 5 NSRs, an Imperceptible, Long-Term Effect is predicted at 2 NSRs, and a Negative, Slight to Moderate, Long-Term Effect is predicted at 6 NSRs. It should be noted that predicted noise levels at all NSRs comply with the IEL noise limits.

Table 9.35: Summary of residual effects from the Operational Phase noise – Scenario 1 – night time.

Receptor	Predicted Full GIL Campus Noise Level, dBL_{ArT}	Measured Background Noise Level, dBL_{A90}	Excess of Predicted Noise Level Over Measured Background Level, dBA	Exceedance of Predicted Noise Level over IEL Limit, dBA	Potential Effect (Pre and Post Mitigation)
R01	40	41	0	0	No Change
R02	43	41	2	0	Imperceptible,
R03	43	41	2	0	Imperceptible,
R04	42	41	1	0	Imperceptible
R05	41	41	0	0	No Change
R06	41	41	0	0	No Change
R07	41	41	0	0	No Change
R08	44	41	3	0	Negative, Slight to Moderate
R09	44	41	3	0	Negative, Slight to Moderate
R10	44	41	3	0	Negative, Slight to Moderate
R11	43	41	2	0	Imperceptible
R12	40	41	0	0	No Change
R13	39	41	0	0	No Change

For Scenario 1 (night time), no change is predicted at 6 NSRs, an Imperceptible, Long-Term Effect is predicted at 4 NSRs, and a Negative, Slight to Moderate, Long-Term Effect is predicted at 3 NSRs. It should be noted that predicted noise levels at all NSRs comply with the IEL noise limits.

Table 9.36: Summary of residual effects from the Operational Phase noise – Scenario 2.

Receptor	Predicted Full GIL Campus Noise Level, dBL_{ArT}	Measured Background Noise Level, dBL_{A90}	Excess of Predicted Noise Level Over Measured Background Level, dBA	Exceedance of Predicted Noise Level over IEL Limit, dBA	Potential Effect (Pre and Post Mitigation)
R01	42	43	0	0	No Change
R02	45	43	2	0	Imperceptible
R03	46	43	3	0	Negative, Slight to Moderate
R04	46	43	3	0	Negative, Slight to Moderate
R05	48	43	5	0	Negative, Slight to Moderate
R06	49	43	6	0	Negative, Moderate to Significant
R07	49	43	6	0	Negative, Moderate to Significant
R08	49	43	6	0	Negative, Moderate to Significant
R09	48	43	5	0	Negative, Slight to Moderate
R10	47	43	4	0	Negative, Slight to Moderate
R11	46	43	3	0	Negative, Slight to Moderate
R12	42	43	0	0	No Change
R13	41	43	0	0	No Change

For Scenario 2 (maintenance), no change is predicted at 3 NSRs, an Imperceptible, Long-Term Effect is predicted at 1 NSR, a Negative, Slight to Moderate, Long-Term Effect is predicted at 6 NSRs, and a Negative, Moderate to Significant, Long-Term Effect is predicted at 3 NSRs. It should be noted that predicted noise levels at all NSRs comply with the IEL noise limits.

Note that the maximum noise level associated with Scenario 2 is only expected for 60 minutes once a month during the testing of each of the 45 generators. The maximum noise level at any one NSR will only occur when the generator that is closest to the NSR is being tested. During the remainder of the generator testing period (when the other generators are being tested), noise levels at that specific NSR will be less than the maximum.

Table 9.37: Summary of residual effects from the Operational Phase noise – emergency scenario.

Receptor	Predicted Full GIL Campus Noise Level, dBL_{ArT}	Measured Background Noise Level, dBL_{A90}	Excess of Predicted Noise Level Over Measured Background Level, dBA	Exceedance of Predicted Noise Level over IEL Limit, dBA	Potential Effect (Pre and Post Mitigation)
R01	56	43	13	N/A	Negative, Very Significant
R02	57	43	14	N/A	Negative, Very Significant
R03	57	43	14	N/A	Negative, Very Significant
R04	58	43	15	N/A	Negative, Very Significant
R05	60	43	17	N/A	Negative, Very Significant
R06	60	43	17	N/A	Negative, Very Significant
R07	60	43	17	N/A	Negative, Very Significant
R08	56	43	13	N/A	Negative, Very Significant
R09	55	43	12	N/A	Negative, Very Significant
R10	54	43	11	N/A	Negative, Very Significant
R11	53	43	10	N/A	Negative, Moderate to Significant
R12	56	43	13	N/A	Negative, Very Significant
R13	56	43	13	N/A	Negative, Very Significant

For Scenario 3 (full site blackout), a Negative, Moderate to Significant, Temporary effect is predicted for 1 NSR, and a Negative, Very Significant, Temporary effect is predicted for 12 NSRs.

Scenario 3 is unlikely to occur as it will only happen in the case that there is a loss of power to the Proposed Development. In the rare event that it does occur, it is only expected to last for a few hours and will thus constitute a brief effect, and not be a Significant Effect based on duration.

9.7.3 Decommissioning Phase

The residual effects for the Decommissioning Phase of the Proposed Development are anticipated to be similar to those for the Superstructure and Internal Works/Fit-out stages Construction Phase, i.e., No Significant Effect for the mitigated scenario. As outlined in Section 5.7, decommissioning activities will need to be undertaken in accordance with the requirements of the IE licence.

9.8 References

British Standards Institution (BSI) (1992) *BS 6472: Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).*

British Standards Institution (BSI) (1993) *BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*

British Standards Institution (BSI) (2014) *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 – Noise*.

British Standards Institution (BSI) (2014) *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2 – Vibration.*

British Standards Institution (2019) *BS 4142: 2014+A1 :2019: Methods for Rating and Assessing Industrial and Commercial Sound.*

EPA (2003) *Advice Notes on Current Practice - In the Preparation Of Environmental Impact Statements.*

EPA (2016) *Environmental Protection Agencies Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).*

EPA (2022) *Guidelines on the Information to be contained in Environmental Impact Assessment Reports.*

IEMA (2014) *Guidelines for Environmental Noise Impact Assessment.*

International Organization for Standardization (ISO) (2017) *ISO 1996-2:2017 Acoustics - Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels.*

International Organization for Standardization (ISO) (2024) *ISO 9613: Acoustics - Attenuation of sound during propagation outdoors - Part 2. Engineering method for prediction of sound pressure levels outdoors.*

South Dublin County Council (SDCC) (2018) *South Dublin County Council Noise Action Plan 2018-2023.*

Transport Infrastructure Ireland (TII) (2014) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*

UK Department of Transport (1998) *The UK Department of Transport Calculation of Road Traffic Noise.*

UK Highways Agency (UKHA) (2020) *Design Manual for Roads and Bridges - LA 111 Sustainability & Environmental Appraisal - Noise and Vibration Rev 2.*