8. HYDROLOGY (WATER)

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by AWN Consulting and assesses and evaluates the potential for significant impacts on the surrounding hydrological environment associated with the principal and facilitation works of the proposed project.

This assessment considers the following:

A. The 'principal' works subject to the development consent being sought from Kildare County Council, i.e. the proposed development; and

B. 'Facilitation works' required to support the development which do not form part of the development consent being sought from Kildare County Council. The facilitation works include a mix of works that will be required to be undertaken for or on behalf of statutory undertakers such as Gas Networks Ireland and EirGrid.

The principal works include the proposed expansion of the existing innovation campus and all those works included within the redline boundary and described on the statutory notices accompanying the application. The facilitation works are those known works that are expected to be required to facilitate the proposed development over the life of the permission being sought.

In assessing likely impacts, account is taken of both the importance of the existing hydrological attributes and the predicted scale and duration of the likely impacts.

8.1.1 PROJECT PERSONNEL

Teri Hayes (BSc MSc PGeol EurGeol) is a Director and Senior Hydrogeologist with AWN Consulting with over 25 years of experience in water resource management, environmental assessment and environmental licensing. Teri is a former President of The International Association of Hydrogeologists (IAH, Irish Group) and is a professional member of the Institute of Geologists of Ireland (IGI) and European Federation of Geologists (EurGeol). She has qualified as a competent person for contaminated land assessment as required by the IGI and EPA. Her project experience includes contributions to a wide range of complex Environmental Impact Statements, planning applications and environmental reports for Industry Infrastructure and residential developments. Teri's specialist area of expertise is water resource management, eco-hydrogeology, hydrological assessment and environmental impact assessment. Teri will be assisted by the water and environment section at AWN which includes a team of experienced hydrogeologists and environmental scientists.

Conor McGrath is a Senior Environmental Consultant at AWN, with over 12 years' experience working in the geology and environmental science fields. Conor is a Chartered Environmentalist (CEnv) and is a professional member of the Institute of Geologists of Ireland (PGeo) and European Federation of Geologists (EurGeol). Conor has experience with a wide range of projects including site investigations, contaminated land, project management, environmental compliance and licencing, environmental remediation programmes and environmental impact assessments. Conor has extensive experience in managing development projects, stakeholder engagement, leading teams, change management, operational transformation, corporate compliance, and governance programmes.

Alan Wilson is an Environmental Consultant with AWN Consulting. Alan holds a BSc Honours in Environmental Management in Agriculture/Environmental and Geographical Sciences, working on projects involving EIA Reports, Flood Risk Assessments, Soil and Water Baseline Reports, Environmental Site Investigations and carrying out soil and groundwater monitoring on contaminated lands and a range of other developments. Alan has over 2 years' experience as an Environmental Consultant including roles in Ecology and Forestry related work.

8.2 Project Description (Principal Works)

The Davy Platform ICAV, on behalf of the Liffey Sub-Fund, intend to apply for permission for development of an integrated campus Masterplan proposal including 2 no. Deep Tech Buildings, 4~~5~~ no. Data Centres, an Energy Centre, new campus entrance incl. signalised intersection, a new public road, internal roads & pathways, a new pedestrian/cycle overpass of the M4 Motorway and supporting infrastructure with an overall area of c. 72~~3~~.29~~6~~ ha inclusive of 1.83 ha of lands within the ownership of KCC. The proposal will also include the demolition of existing buildings no's 7, 8 & 9.

The site will include the provision for 4 No. Data Centres and a total of 80no. generators . The fuel for the generators will be stored in individual, double-skinned storage tanks. Each tank has the capacity to store 15.5 m*3* of diesel; therefore, a total of 1,240 m*3* across all Data Centres (or 1066 tonnes at a density of 0.86 tonnes / m*3*). The energy centre will have its own HVO bulk storage of c.3440 tonnes.

There will be an increase in overall hardstand as a result of the proposed development of c. 171,641.88 m^2. The existing site has a total hardstanding of c. 86,029.00 m^2. The proposed development will have a total hardstanding of c. 257, 670.88 m^2.

The proposed development will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes. The runoff will discharge from the proposed bioretention and attenuation systems before out falling to the existing pond system and existing monitoring regime on-site resulting in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding will be reduced and the overall discharged runoff will have an improved water quality due to the proposed SuDS upgrades. The SuDs features have been designed to provide sufficient capacity to contain and convey all surface water runoff associated with the 1 in 100-year event plus an additional allowance of 30% for climate change and 10% urban creep. This is as per Kildare County Council Water Services Department draft guidance on Drainage and SuDS Strategy.

Attenuation measures include bio retention areas, attenuation ponds, swales, filter drains, permeable paving and hydrocarbon interceptors. Proposed discharge rates for the Proposed Development and the overall landholding are addressed in CSEA's *Engineering Services Report Drainage and Water Services* submitted with the planning application.

8.2.1 Facilitation Works

The facilitation works required to support the development are works which do not form part of the development consent being sought from Kildare County Council. The facilitation works include a mix of works that will be required to be undertaken for or on behalf of statutory undertakers such as Gas Networks Ireland and EirGrid. The facilitation works will be subject to future consents as required by GNI and EirGrid but are included the project for the purpose of the EIAR.

GNI Gas Upgrades

The GNI upgrades will be delivered through a local upgrade of the gas network over a length of approximately 1.5km through predominantly residential areas. The route of the upgrades will be along Ryevale Lawns along Station Road, Old Hill and Celbridge Road for a distance of approximately 1.5km up to the entrance of Barnhall Meadows. The pipe will run under the existing road pavement. At the entrance to Barnhall Meadows, the pipe will run underground through the Barnhall Meadows lands (adjacent to the existing haul road) and will then cross the M4 Motorway through Horizontal Directional Drilling and enter the Kildare Innovation Campus then connecting to the proposed Gas Skid.

EirGrid Uprating

Upon completion of Phase 1 of the KIC Masterplan, including the development of the proposed replacement 110kV Substation, uprating of existing overhead lines from the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad will be required to facilitate commencement of Phase 3 of the KIC Masterplan. The uprating will be carried out to existing lines along established wayleaves primarily traversing agricultural lands. Due to the nature of the proposed EirGrid works being minimal and comprising only minor line and structural replacement, they have been scoped out of this assessment as the interaction between land, soils, geology and hydrogeology with the proposed works is negligible.

A detailed description of the project is outlined in Chapter 2 of this EIAR.

8.3 Methodology

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this chapter:

- Environmental Protection Agency (EPA), Advice Notes for Preparing Environmental Impact Statements Draft (September 2015)
- Environmental Protection Agency (EPA) 2022, Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
- Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report, European Union 2017
- Department of Housing, Planning and Local Government (DoHPLG), Guidelines for Planning Authorities and An Bord Pleanála on Carrying Out Environmental Impact Assessment (August 2018); and,
- Transport Infrastructure Ireland (TII) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes', by the Transport Infrastructure Ireland (2009).

This assessment was considered in the context of the available baseline information, potential impacts, consultations with statutory bodies and other parties, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Latest EPA Maps & Envision water quality monitoring data for watercourses in the area (these data can be accessed at https://gis.epa.ie/EPAMaps/ & catchments.ie);
- National River Basin Management Plan 2018-2021;
- DRAFT National River Basin Management Plan 2022-2027;
- Eastern River Basin District (ERBD) Management Plan;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG)
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie);
- Relevant Eastern Catchment Flood Risk Assessment and Management (CFRAM) Flood Reports;
- Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites (Eastern Regional Fisheries Board (ERFB);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' (Inland Fisheries Ireland, 2016);
- Annual Environmental Report 2020 prepared for D0004-02, Lower Liffey Valley Regional Sewer Scheme in Kildare;
- Kildare County Development Plan 2023-2029; and
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001).

8.3.1 Baseline Scenario/Receiving Environment Analysis Methodology

The EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) state that:

"It is important to demonstrate that correct methodologies and experts have been used. It is also important that the methodology used in establishing the baseline scenario is documented to permit replicable future monitoring so that the later results can be properly compared (where required). Standard recognised methods should be applied where available and appropriate."

This Chapter evaluates the effects, if any, which the project will have on hydrology as defined in the Environmental Protection Agency (EPA) '*Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (EPA, 2022) as well as in line with Article 94 and Schedule 6 of the Planning and Development Regulations 2001 (as amended) and Article 5 and Annex IV of the EIA Directive (2011/92/EU, as amended).

The Draft EPA document entitled '*Advice Notes for Preparing Environmental Impact Statements'* (EPA, 2015) is also followed in this hydrological assessment and classification of environmental effects. Due consideration is also given to the document entitled '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*' by the Transport Infrastructure Ireland (TII) formerly National Roads Authority (NRA) (TII, 2009) is referenced where the methodology for assessment of impact is appropriate.

The baseline/future receiving environment analysis for this Chapter has been undertaken in accordance with the EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) and all other documents outlined above.

8.3.2 Impact Assessment Methodology

This chapter evaluates the effects, if any, which the project will have on hydrology as defined in the Environmental Protection Agency (EPA) 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2022). The Draft EPA document entitled 'Advice Notes for Preparing Environmental Impact Statements' (EPA, 2015) is also followed in this hydrological assessment and classification of environmental effects. In addition, the document entitled 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the Transport Infrastructure Ireland (TII, 2009, previously NRA) is referenced where the methodology for assessment of impact is appropriate.

The rating of potential environmental effects on the hydrological environment is based on the standard EIAR impact predictions table included in Chapter 1 which takes account of the quality, significance, duration and type of effect characteristic identified (in accordance with impact assessment criteria provided in the EPA Guidelines (2022) publication) set out in Chapter 1 Table 1.2.

The TII criteria for rating the magnitude and significance of impacts and the importance of hydrological attributes at the site during the EIA stage are also relevant in assessing the impact and are presented in Tables 1-3 in Appendix 8.1.

The analysis of the predicted impacts of the proposed development hydrology during 'do-nothing' scenario and construction and operation are presented in this Chapter. The assessment considered hydrological features identified within the project site and the surrounding vicinity in accordance with the methodology outlined above and below, to determine the significance of the impacts. Where likely significant impacts are highlighted, mitigation and monitoring are proposed, and any residual impacts are assessed.

The impact assessment for this chapter has been undertaken in accordance with the *EPA Guidelines on the Preparation of an EIAR* (EPA, May 2022) and all other documents outlined above.

The *European Commission Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions*, 1999, breaks down appropriate methodologies, involved in the assessment of impacts, into <u>'scoping and identification'</u> methods and <u>'assessment and evaluation'</u> methods.

8.3.3 Scoping and Identification Methods

The EPA Guidelines, 2022 state that:

> *"each* [environmental] *factor is typically explored by examining a series of headings and/or topics relevant to that factor"* and *"The relevant topics for any given EIAR should be established during scoping".*

The methods employed for scoping and identification of the relevant environmental topics for this Chapter have been:

1. Expert Opinion stemming from the baseline/future receiving environment analysis
2. Review of Strategic Environmental Assessment prepared for the Kildare County Development Plan 2023-2029 (including a review of the Development Plan itself).
3. Geospatial Analysis (cumulative impacts only – used to identify planning permissions/applications within a 5 km radius)
4. Other relevant documentation consulted as part of this assessment included the following site specific sources:

   - Clifton Scannell Emerson Associates Limited, Consulting Engineers – Site Specific Flood Risk Assessment Kildare Innovation Campus. Project No. 21_048. February 24th 2023;
   - Clifton Scannell Emerson Associates Limited, Consulting Engineers – Surface Water Management Strategy Report. Project No. 21_048. November 11th 2022;
   - Clifton Scannell Emerson Associates Limited, Consulting Engineers – Construction Environmental Management Plan Kildare Innovation Campus. Project No. 21_048. 24th February 2023;
   - Clifton Scannell Emerson Associates Limited, Consulting Engineers – Engineering Services Report Drainage and Water Services. Project No. 21-_048. 24th February 2023;
   - LBC Preliminary Site Assessment Report. Project No. 0523254. September 2020;
   - Assimilative Capacity Study – Liffey Science and Technology Business Park. ARUP, May 2023;
   - RSK Ireland Limited (RSK) Preliminary Environmental Site Assessment Report. Project No. 602128-R01(00). March 2018; and
   - Various design site plans and drawings.

8.3.4 Assessment and Evaluation Methods

Assessment and evaluation methods quantify and predict the magnitude and significance of impacts.

The methods employed for assessment and evaluation of the environmental topics for this Chapter have been:

1. The rating of potential environmental effects on the hydrological environment is based on the standard EIAR impact predictions table included in Chapter 1 which takes account of the quality, significance, duration and type of effect characteristic identified (in accordance with impact assessment criteria provided in the EPA Guidelines (2022) publication) set out in Chapter 1 Table 1.2; and
2. The TII criteria for rating the magnitude and significance of impacts and the importance of hydrological attributes at the site during the EIA stage are also relevant in assessing the impact and are presented in Tables 1-3 in Appendix 8.1.

8.3.5 Forecasting Issues or Difficulties Encountered

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

8.4 Receiving Environment

The receiving environment is discussed in terms of hydrology, flood risk and water quality. The principal site, Kildare Innovation Campus (KIC), is located in north east Kildare, in the administrative district of Kildare County Council. The site is an existing underdeveloped business campus, zoned for 'Industry and Warehousing' in *the Leixlip Local Area Plan 2020-2023 (extended to 2026).* Leixlip town is located 4km to the north and Dublin city centre is located approximately 21km to the east.

8.4.1 Principal Works

The site is principally bounded by: the M4 Motorway to the north; Cellbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west. The River Liffey flows in a north-easterly direction on the opposing side of Celbridge Road to the east of the site where the Liffey Reservoir is also located. To the immediate west and east of the site agricultural lands are located - refer to Figure 8.1 below.

The site has an overall area of c. 72.23 ha. The planning application site covers the majority of the existing business campus, with a 5.7-hectare parcel of land known as the DB Schenker (DBS) site being excluded as it has recently been developed in accordance with a separate planning permission (KCC Reg. Ref:. 20-873). The planning application site also includes a portion of Celbridge Road along the eastern boundary of the site which will cater for a new access to the campus.

8.4.2 Facilitation Works

The facilitation works include a mix of works that will be required to be undertaken for or on behalf of statutory undertakers such as Gas Networks Ireland and EirGrid.

<u>GNI Upgrades</u>

The GNI upgrades will be delivered through a local upgrade of the gas network over a length of approximately 1.5km through predominantly residential areas. The route of the upgrades will be along Ryevale Lawns along Station Road, Old Hill and Celbridge Road for a distance of approximately 1.5km up to the entrance of Barnhall Meadows running underground through the Barnhall Meadows lands (adjacent to the existing haul road) before crossing the M4 Motorway through Horizontal Directional Drilling and enter the Kildare Innovation Campus then connecting to the proposed Gas Skid.

<u>EirGrid Uprating</u>

Upon completion of Phase 1 of the KIC Masterplan, including the development of the proposed replacement 110kV Substation, uprating of existing overhead lines from the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad will be required to facilitate commencement of Phase 3 of the KIC Masterplan. The uprating will be carried out to existing lines along established wayleaves primarily traversing agricultural lands.

Due to the nature of the proposed EirGrid works being minimal and comprising only minor line and structural replacement, they have been scoped out of this assessment as the interaction between land, soils, geology and hydrogeology with the proposed works is negligible.

The surrounding environment for both the principal and facilitation works can be described as a mix of agricultural and residential. The site location map for the proposed development is presented in presented in Figure 8.1 below.

A detailed description of the project is outlined in Chapter 2 of this EIAR.

Figure 8.1 Site Location and Surrounding Land Use (Google Earth Pro, 2023)

8.4.1 Hydrology (Surface Water)

The topography on-site is generally flat and has an elevation of 51.0 m above Ordnance Datum (mAOD). The topography of the site slopes gently down towards the south east, which is consistent with the surrounding area. The site is located within the Liffey and Dublin Bay catchment, which encompasses an area of approximately 1,616 km^2. The River Liffey extends from the mountains of Kippure and Tonduff in County Wicklow to the sea at Dublin Bay with major tributaries including the River Dodder, The River Poddle and River Camac. The main channel covers approximately 120 km and numerous tributaries enter along its course. The proposed development site is within the sub-catchment Liffey_SC_080 (Catchment ID: 09).

There is an existing Reservoir (Leixlip Reservoir) east of the principal works site which forms part of the River Liffey. The site discharges its surface water runoff directly into the Leixlip Reservoir via an outfall pipe following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, upstream of the existing retention ponds near the existing site entrance off the Celbridge Road (Refer to CSEA Drawing No. DR-C-2100). The Kilmacredock_Upper watercourse is mapped on the EPA as flowing in a south-easterly direction through the site. This watercourse has already been diverted beneath the site via a

1.5m culvert and outfalls into the Leixlip Reservoir east of the Celbridge Road. The proposed development does not discharge into the Kilmacredock_Upper. It is proposed to redesign the culvert as part of the proposed scheme. The proposed design of the culvert will ensure that there is no reduction in the hydraulic capacity of the culvert and no resultant increase in flood risk. The maximum allowable discharge rate for the site is 149.75 l/s (12,938.4m3/day). Leixlip WWTP has a maximum capacity of 33,745m3/day. Therefore Leixlip WWTP has sufficient capacity for the proposed development site - refer to Figure 8.2 below and CSEA's *Engineering Services Report Drainage and Water Services* submitted with the planning application.

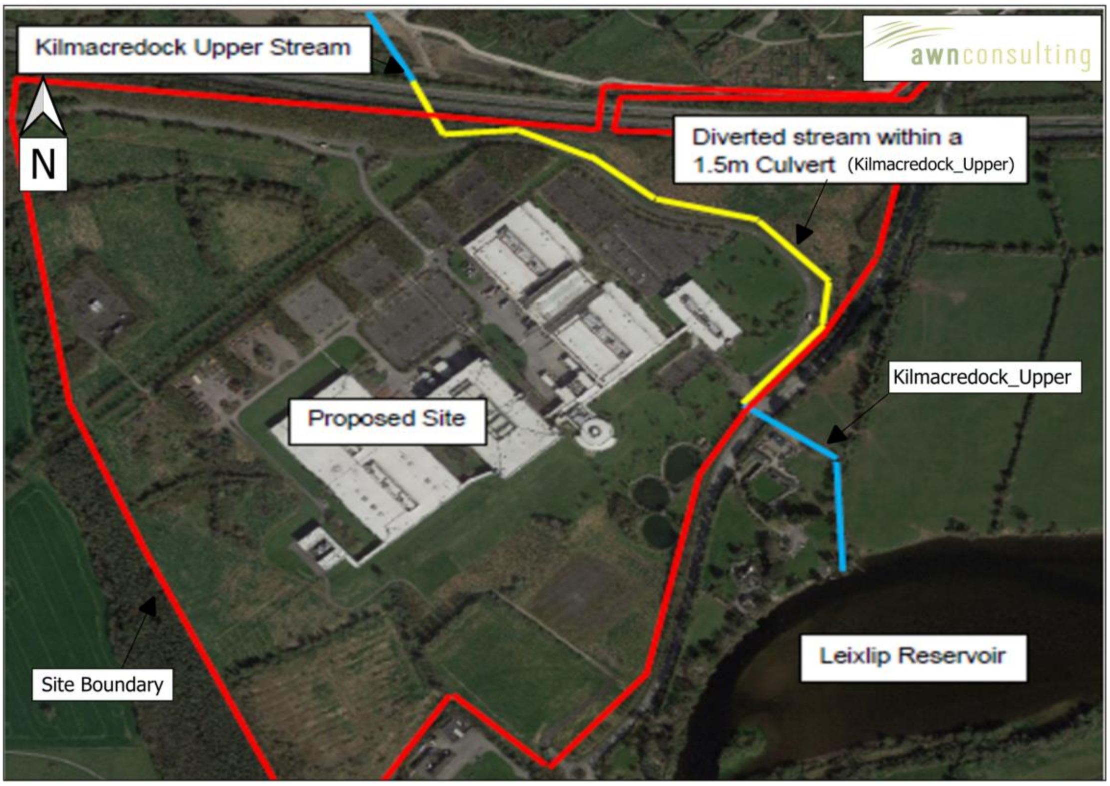

Figure 8.2 Local Hydrological Environment (CSEA – SSFRA, 2023)

The most significant drainage system in the vicinity is the River Liffey which flows adjacent to the site's south-eastern boundary in a west to north east direction on the opposite side of Celbridge Road – refer to Figure 8.3 below.

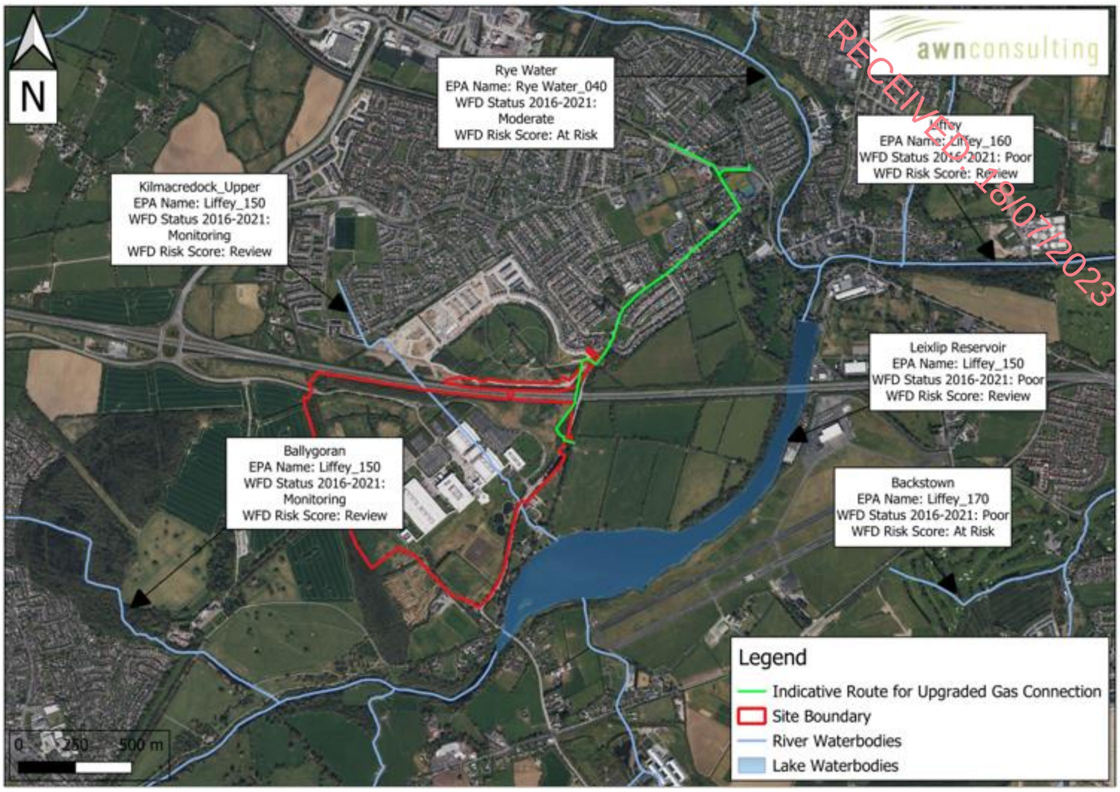

Figure 8.3 Regional Hydrological Environment (EPA, 2023)

8.4.2 Surface Water Quality

The Proposed Development (principal and facilitation works) is located within the former ERBD (now the Irish River Basin District), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD). It is situated in Hydrometric Area No. 09 of the Irish River Network. It is located within the sub-catchment Liffey_SC_080 (Catchment ID: 09).

The aim of the WFD is *'Good Water Status'* for all European waters to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both *'Good Ecological Status'* and *'Good Chemical Status'.*

Water bodies identified as being '*At Risk'* of not achieving their environmental objectives need to have targeted measures implemented to achieve objectives outline in River Basin Management Plans.

During the development of this third RBMP, a prioritisation exercise was undertaken by the local authorities, the EPA and other stakeholders to identify those water bodies that require immediate action within this plan cycle to 2021. During the catchment characterisation, the EPA identified those water bodies either *'At Risk'* of not achieving their objectives or *'Under Review'*. The outcome of this prioritisation process was the selection of 190 Areas for Action across the 5 Local Authority regions. Within these 190 areas, a total of 726 water bodies were selected for initial actions during this RBMP cycle. There are 832 water bodies identified as being '*At Risk'* of not achieving their environmental objectives under this Plan that have not been included in the Areas for Action. For most of these water bodies, targeted actions will be undertaken in the third cycle RBMP from 2022-2027. The draft 3rd cycle RBMP has been reviewed in the context of ensuring mitigation measures comply with current and expected future measures required to be implemented for protection of water body status within the context of the Proposed Project.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014) and amended in 2017 (S.I. No. 464/2017);
- European Communities Environmental Objectives (Surface Waters); Regulations, 2009 (S.I. No. 272 of 2009) & 2015 (S.I. No. 386 of 2015);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) & 2016 (S.I. No. 366 of 2016);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010);
- European Communities (Good Agricultural Practice For Protection of Waters) Regulations 2022 (S.I. No. 113 of 2022);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011); and
- European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018).

Figure 8.4 below presents the EPA national monitoring stations in the context of the proposed developemnt and other regional hydrological features.

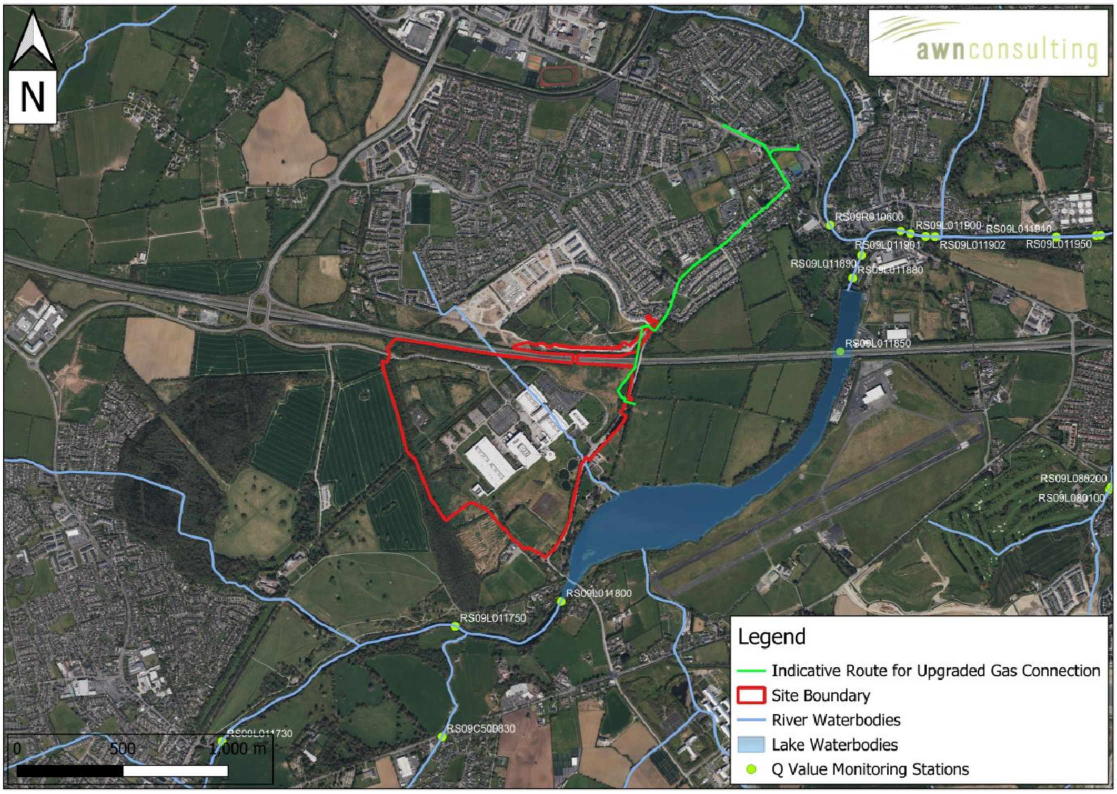

Figure 8.4 National Monitoring Stations (EPA, 2023)

Surface water quality is monitored periodically by the EPA at various regional locations along principal and other smaller watercourses. The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse. The biological indicators range from Q5 - Q1. Level Q5 denotes a watercourse with good water quality and high community diversity, whereas Level Q1 denotes very low community diversity and bad water quality.

With reference to the site setting, the nearest EPA Q value monitoring station is situated along the River Liffey c. 1.4 km north-east of the principal works site and c. 400m to the east of the facilitation works site. The EPA Q value monitoring station (Station Name: Leixlip Br (RHS) – Station Code: RS09L011900) obtained a Q4 – Good Status in 2022.

In accordance with the WFD, each river catchment was assessed by the EPA and a water management plan detailing the programme of measures was put in place for each. Currently, the EPA classifies the WFD Ecological Status for the Liffey_150 and Rye Water_040 waterbodies as having a '*Poor*' status (2016-2021) with the current WFD River Waterbody risk score being under '*Review*' for the Liffey_150 and '*At Risk*' for the Ryewater_040. According to the EPA Map viewer, the Leixlip Reservoir also received a '*Poor*' status (2016-2021) and the WFD Lake Waterbodies Risk score is currently under '*Review*'. Figure 8.5 below presents the WFD river waterbody risk map.

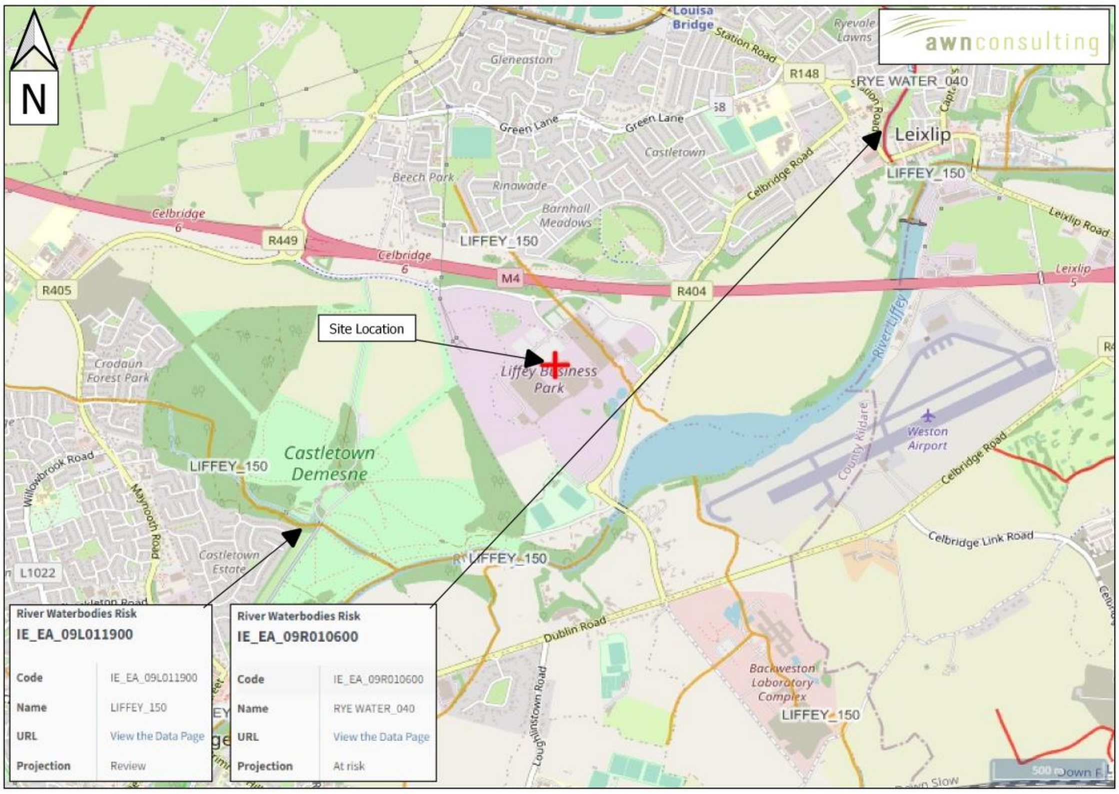

Figure 8.5 WFD River Waterbody Risk Score – Principal site location indicated with a + (EPA, 2023)

The main pressures identified on the Liffey_150 are associated with urban run-off. The poor status is likely attributable to diffuse urban sources (Source: Catchments.ie).

The main pressures identified on the Rye Water_040 are associated with urban run-off, domestic waste water and agriculture. This poor status is likely attributable to a combination of poor ecological, biological and invertebrate status and/or potential as well as diffuse urban sources (Source: Catchments.ie).

The main pressures identified on the Leixlip Reservoir are associated with anthropogenic pressures. This poor status is likely attributable to a combination of nutrient, organic and sediment pollution (Source: Catchments.ie).

8.4.3 Flood Risk Assessment

The potential risk of flooding on the site was also assessed. A Site-Specific Flood Risk Assessment was completed and is included as Appendix 8.3 (CSEA SSFRA, 2023). The assessment identified no flood hazards for the Proposed Development (principal and facilitation works). The Proposed Development (principal and facilitation works) resides within Flood Zone C and is not at risk of flooding from a 1% or 0.1% Annual Exceedance Probability (AEP) event. The flood zonation confirms that the site is suitable for this type of industrial development.

The principal and facilitation works site has no recorded historical flood events as noted in the OPW's flood maps – refer to Figure 8.6 below.

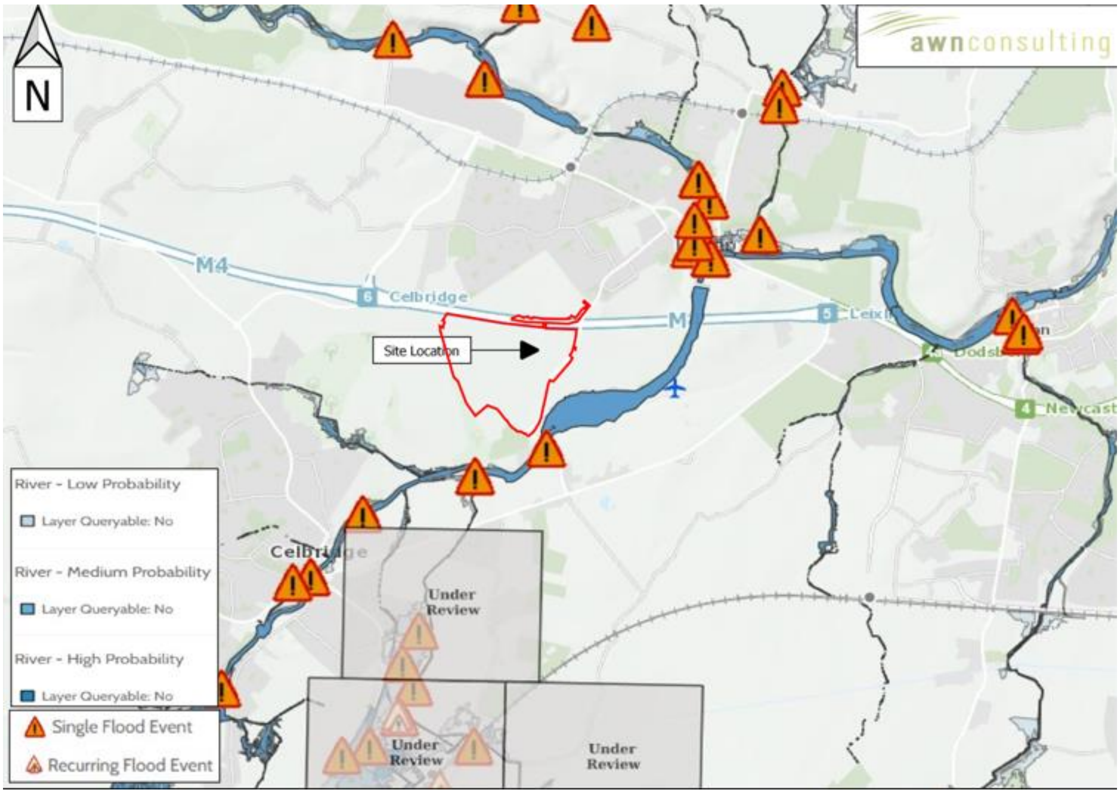

Figure 8.6 CFRAM River Flood Extents & Probability – Indicative Principal Site Boundary *only* (OPW, 2023)

The Kildare County Development Plan 2023-2029 (adopted January 28th 2023) has indicated that the subject lands are located outside the 0.1% AEP Zone.

- Predicted flood mapping for pluvial/tidal & fluvial flood events will not affect the subject lands.
- Following the flood risk assessment stages, it was determined that the site is within Flood Zone C as defined by the Guidelines and based on the CFRAMS mapping. Therefore, the development on the subject site is appropriate for the site's flood zone category and a justification test as outlined in the Guidelines is not required.

- A regularly maintained drainage system will ensure that the network remains effective and in good working order should a large pluvial storm occur.
- The likelihood of onsite flooding from the hydrogeological ground conditions are deemed to be minor and within acceptable levels.

Therefore, this development is in compliance with Kildare County Development Plan 2023-2029 objectives and the Planning System and Flood Risk Management Guidelines 2009 for Planning Authorities (or any updated guidelines).

8.4.4 Existing Surface Water Drainage Network

Existing storm water runoff from the existing building surface areas discharges to the existing retention pond system. This includes roof run-off, runoff from carparking, associated access roadways and general yard areas which all discharge through petrol/ oil separators prior to the retention pond system. Two existing surface water retention ponds are located on the western site boundary. An additional fire water retention pond is also located there. Additional bunded storage is provided in the surrounding landscaped area in the event of an overflow occurring. The normal capacity of the retention ponds is 5000m3, with and additional 25,000m3 being able to be accommodated in the bunded overflow area. The discharge to the outfall is controlled to ensure an appropriate volume of water is retained at all times. These ponds serve the existing site as attenuation during extreme storm events as well as to provide the firefighting network with water when required. The site ultimately discharges its surface water runoff directly via an outfall pipe to the Leixlip Reservoir (Refer to CSEA Drawing No. DR-C-2100), following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, upstream of the existing Retention Ponds near the existing site entrance off the Celbridge Road.

The site is also connected to the local municipal sewerage network where wastewater streams drain by gravity to the Kildare County Council sewer and is treated within the municipal wastewater treatment plant in Leixlip.

8.4.5 Proposed Surface Water Drainage Network

The proposed drainage plan for the principal works site incorporates a SuDS Strategy which complies with the requirements of Sections 15.8 of Kildare County Council (KCC) Development Plan 2017-2023. There are four separate surface water drainage networks in the proposed development drainage plan which flow to separate surface water attenuation basins from which attenuated flows are discharged, via carrier drains, to the existing attenuation ponds within the site. The site is divided up into five catchment areas. These areas are defined by the topographical characteristics of the site and the proposed finish levels of the development. Each catchment collects the surface runoff and attenuates it within a pond up to the 1:100 year event. A flow control device will be installed within each catchment to slowly releases the water into the existing ponds. The portion of the site on the north side of the M4 will drain into small swales and landscaping. No attenuation or piped infrastructure will be required in this area.

The surface water runoff from the proposed development will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes. The runoff will discharge from the proposed bioretention and attenuation systems before outfalling to the existing pond system and existing monitoring regime on-site. The existing outfall from the existing ponds to the Leixlip Reservoir is to be retained. The following SuDS drainage elements are proposed:

Source Control Measures

- Swales;
- Tree Pits;
- Rainwater Harvesting;
- Permeable Paving;
- Green Roofs; and
- Filter Drains.

Site Control Measures

- Ponds; and
- Permeable paving with stone-fill storage.

Refer to CSEA's *Engineering Services Report Drainage and Water Services* for further information regarding proposed site drainage, proposed source and site control measures and proposed pollution prevention measures.

Due to the increase in hardstanding area (c. 171,641.88 m^2) for the principal works site, which are going to replace existing brownfield lands, the attenuation system has been designed to provide sufficient capacity to contain and convey all surface water runoff associated with the 1 in 100-year event plus an additional allowance of 30% for climate change and 10% urban creep. This is as per Kildare County Council Water Services Department draft guidance on Drainage and SuDS Strategy.

As a result of the SuDS drainage, the proposed development will result in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding will be reduced and the overall discharged runoff will have an improved water quality.

8.4.6 Existing Foul Water Drainage Network

The existing foul/wastewater inflows were pumped to the public sewerage system at the northeast corner of the site. Two pumping stations are located on the site with 200mm diameter pumping mains with provision included for future development.

Site watermain inflow record information indicates that outflow to the public sewerage network was likely to be up to 965m^3 per day during HP's previous operation at the site. Peak (3 x DWF) 34 l/s during 2009/ 2010. Peak DWF for the proposed development has been calculated at 2.52 l/s. The existing catering facility drainage system included a large capacity grease separator (estimated to cater for 1800 meals each day).

The existing foul pumping stations with the 200mm dia. pump rising mains shall be retained and upgraded where necessary to accommodate the new developments on the site. Upgrading shall include consideration of the pumps and automated pumping controls upgrade/updating/replacement etc. The station operation data signals etc shall be connected to the new location for the campus facilities management building etc. Underground 24-hour storage tanks shall be provided at each of the existing stations. The route of the existing pumping mains from the stations shall be realigned to facilitate the new development, as shown on CSEA Drawing No's . 21_048-CSE-ZZ-ZZ-DR-C-2200, 21_048-CSE-ZZ-ZZ-DR-C-2210 - 1_048-CSE-ZZ-ZZ-DR-C-2218 in support of the planning application to foul water drainage.

There are no new requirements for new foul connections outside of the overall landholding. The wastewater discharged from the site will ultimately discharge to the Waste Water Treatment Plant at Leixlip. There are no proposed process water emissions.

According to the Annual Environmental Report 2020 prepared for D0004-02, Lower Liffey Valley Regional Sewer Scheme in Kildare the peak hydraulic capacity of Leixlip WWTP is 65,405 m^3/day and the current hydraulic loading is 50,837m^3/day. Therefore Leixlip WWTP has sufficient capacity to accommodate the peak foul water outflow from the existing outflow to the public drainage network (c. 965m^3/day).

Further detail in relation to wastewater emissions is presented in CSEA's *Engineering Services Report Drainage and Water Services.*

8.4.7 Proposed Foul Water Drainage Network

A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the Pre-Connection Enquiry is awaited. It is anticipated that no upgrades to the surrounding infrastructure is required. It is proposed to outfall the foul drainage from the site to the existing 450mmø foul sewer in the Celbridge Road to the east of the development site. The proposed foul water drainage network has been designed in accordance with the requirements of Appendix B of the Uisce Éireann Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03).

The proposed foul water drainage network collects domestic foul water flows from the administration block of the proposed Data Storage Facilities, the Deep Technology Buildings, Energy Centre and the 110kV substation and has been designed in accordance with the requirements of Appendix B of the Uisce Éireann Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03).

8.4.7 Water Supply

A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the proposed development (principal works site). A response to the Pre-Connection Enquiry is awaited. Any upgrade works to the surrounding area will be identified within the Confirmation of Feasibility. There is an existing 150mmø water main located in the site which spurs from Celbridge Road.

It is proposed to connect a 150mmø watermain to this existing line within the Celbridge Road where connections will be provided from the 150mmø incoming water supply main to the admin area of the data centre buildings, the water treatment plant room, the sprinkler storage tanks, the substation, and the Deep Technology Buildings. The water main will also serve the proposed buildings, water treatment plant, sprinkler tanks, deep tech buildings and proposed substation. A separate fire hydrant main will be provided to serve the fire hydrants which will be feed from the sprinkler tanks.

The domestic water supply peak daily demand for the proposed development has been estimated as follows:

- Population = 2080;
- Consumption = 45 litres per person per day + 30 litres per meal are added for Deep Technology buildings which are equipped with canteens;
- Daily Demand = 1.74 l/s;
- Average Day/Peak Week Demand = 1.25 x 1.74 = 2.18 litres/sec; and
- Peak Demand = 5.0 x 2.18 litres/sec = 10.9 litres/sec.

Each of the C1, C2 and C3 Data Centres have an annual expected potable water demand of 1643.8m3 with the B Data Centre having an annual expected potable water demand of 1166.1m3. These annual demands only be required during the peak summer periods.

- Total Annual Demand = 1643.8m^3 x 3 + 1166.1m^3 = 6097.5m3

The Data Centres will require an annual water demand of 6097.5m^3 resulting from the peak summer months only. This water will be stored on-site such that no water is required from Uisce Éireann during the peak summer months. In order to facilitate the tanks, the development will be required to fill up these tanks during the colder/winter periods at a very slow rate. It is proposed to fill up these tanks over a two-week period during the colder/winter periods in an attempt to reduce the water demand of Uisce Éireann network during the summer months.

- Peak Demand = 6097.5m3 x 1000 / [(2 weeks x 14 days) x 24 x 60 x 60] = 2.52 l/s

Further detail in relation to wastewater and water emissions is presented in CSEA's *Engineering Services Report Drainage and Water Services.*

8.4.8 Conservation Areas

According to the NPWS (2022) on-line database there are no special protected areas (SPA's), special areas of conservation (SAC's), National Heritage Areas (NHA's) or Proposed Natural Heritage Areas (pNHA's) within the boundary or immediate vicinity of the subject site. The European listed sites located in closest proximity are as follows:

- The Royal Canal (Site Code: 002103) pNHA - circa. 1.3km north of the site;
- Liffey Valley (Site Code: 000128) pNHA – circa. 1.6km north-east of the site; and
- Roy Water Valley/Carton SAC (Site Code: 001398) – circa. 1.4km north of the site.

The proposed development (principal and facilitation works) has no hydrological connection with the Rye Water Valley/Carton SAC as the Rye Water is upstream of the River Liffey. However, the principal works site has an indirect hydrological connection with Liffey Valley pNHA through the local drainage network and the River Liffey. Potential adverse effects on these European sites from the proposed development are highly unlikely given the distance of removal and integrated mitigation measures in place through standard SuDS measures on site – refer to Figure 8.7 below for the locations of the European sites mentioned above in the context of the site.

The proposed development (principal and facilitation works) will have a neutral imperceptible effect on water quality and flow of designated sites within the zone of impact of the development site. A full assessment of the ecology has been undertaken and is included in Chapter 6 of the EIAR.

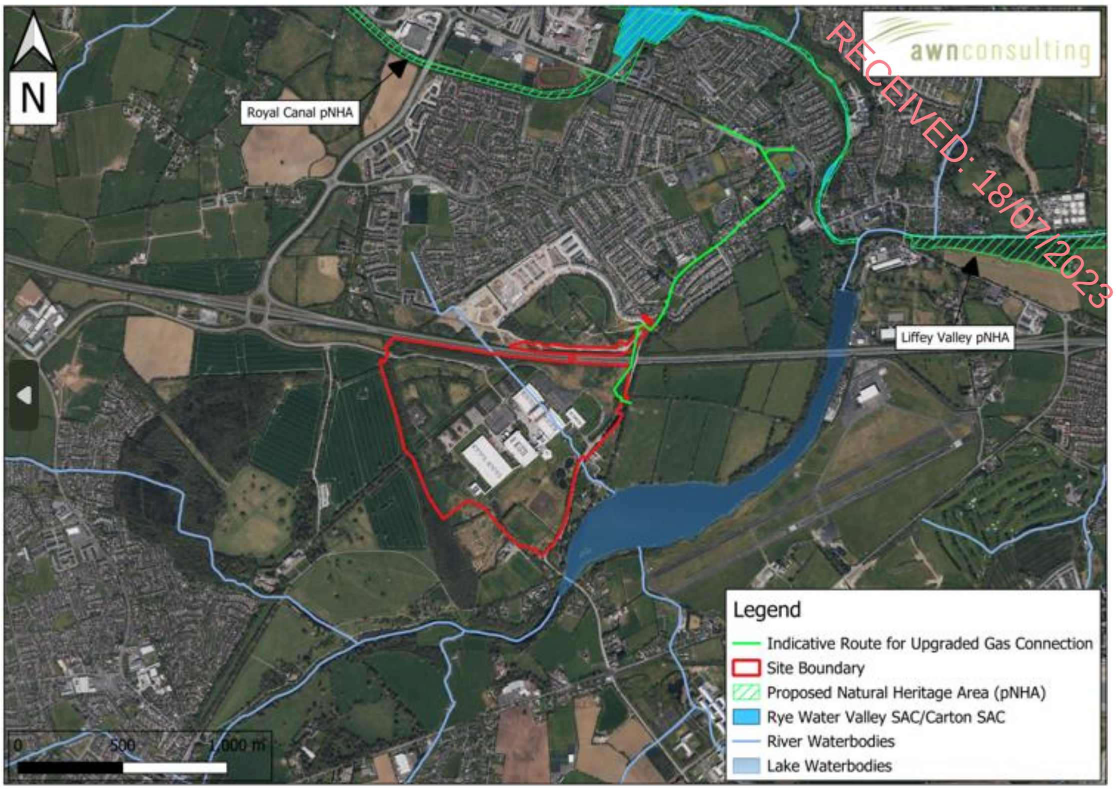

Figure 8.7 Areas of Conservation (GSI, 2023)

8.4.9 Rating of site importance of the hydrological features

In accordance with the 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the TII (2009) the environmental significance of the nearest receiving environment (River Liffey) has been considered as having **Medium Importance** or value on a local scale.

8.4.10 Likely Future Receiving Environment

The EIA Directive requires the following to be described relating to the future receiving environment (the 'Do Nothing' scenario):

> *"an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge".*

It is likely that the land use will change over time even if this development does not go ahead. The associated impact of any such development will be similar to the proposed development for the underlying hydroogical regime.

In the event of a 'Do Nothing' scenario, the subject site would remain in operation as an existing ICT campus.

8.5 Likely Impacts of the Project

The potential impacts in relation to hydrology during the construction and operational phases are outlined below and the assessment of effects defined based on the description of effects as set out in the EIA Report Guidelines (2022) (Table 1.2 Chapter 1) and the TII criteria detailed in Appendix 8.1.

8.5.1 Construction Phase

During the construction phase of the proposed development (principal and facilitation works) the potential impacts in relation to hydrology (in the absence of mitigation) are assessed in the following sections.

Increased Run-off and Sediment Loading

Surface water run-off from site preparation, levelling and excavations during the construction phase may contain increased silt levels or become polluted from construction activities. Run-off containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from excavations, exposed ground, stockpiles, and access roads.

During the construction phase at the principal works site in particular, there is potential for a slight increase in run-off due to the introduction of impermeable surfaces, increase in hardstanding (171,641.88 m^2) and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface run-off. The potential impact of this is a possible increase in surface water run-off and sediment loading which could potentially impact local drainage. In particular through the excavation works required to facilitate the local extension upgrades of the gas transmission network over a length of approximately 7km from the R136 roundabout at Lucan.

Excavation for foundations, services, and landscaping

The proposed development (principal and facilitation works) will require site preparation, excavations and levelling for foundations, the installation of services and landscaping. The GNI upgrades will be delivered through a local upgrade of the gas network over a length of approximately 1.5km Ryevale Lawns along Station Road, Old Hill and Celbridge Road for a distance of approximately 1.5km up to the entrance of Barnhall Meadows. The pipe will run under the existing road pavement. At the entrance to Barnhall Meadows, the pipe will run underground through the Barnhall Meadows lands (adjacent to the existing haul road) and will then cross the M4 Motorway through Horizontal Directional Drilling and enter the Kildare Innovation Campus then connecting to the proposed Gas Skid.

Some removal of perched rainwater from the excavation may be required. Volumes will be quite low, and all pumped water will be subject to onsite settlement before release to the Leixlip Reservoir.

Contamination of Local Water Courses

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Localised spillage or leakage of fuels (and oils) stored on site for construction.
- Spillage or leakage of fuels (and oils) from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.

- Alkaline run-off due to use of concrete and cement.

Machinery activities on site during the construction phase may result in contamination of runoff/surface water. Potential impacts could arise from accidental spillage of fuels, oils, paints etc. which could impact surface water if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses. However, implementation of the mitigation measures detailed in Sections 8.6.1 will ensure that this does not occur.

Summary of the Construction Phase Impacts

A summary of construction phase impacts for the Proposed Development (with and without mitigation) following EPA (2022) EIA guidelines is provided below.

The magnitude of the impact for the construction phase without mitigation and design measures is ***Temporary*** in duration with ***Slight*** effect rating to the hydrological environment present.

However, with the implementation of design and mitigation measures for the Proposed Development site the impact of the construction phase is ***short-term*** in duration with an ***Imperceptible*** effect rating.

8.5.2 Operational Phase

The following risks have been considered in relation to the operational phase of the development:

Surface Water

There is a direct connection to the Leixlip Reservoir east of the proposed development (principal works site) which falls part of the River Liffey. The principal works site discharges its surface water runoff directly into the Leixlip Reservoir following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, upstream of the existing retention ponds near the existing site entrance off the Celbridge Road. The Kilmacredock_Upper watercourse is mapped on the EPA as flowing in a south-easterly direction through the site. This waterocourse has been diverted beneath the site via a 1.5m culvert and outfalls into the Leixlip Reservoir east of the Celbridge Road. The existing and proposed development does not discharge to the Kilmacredock_Upper waterocurse. The SuDs features have been designed to accommodate surface water drainage from the proposed development. Attenuation measures include bio retention areas, attenuation ponds, swales, filter drains, permeable paving and hydrocarbon interceptors. Proposed discharge rates for the Proposed Development and the overall landholding are addressed in CSEA's *Engineering Services Report Drainage and Water Services.*.

Wastewater

The existing foul/wastewater inflows were pumped to the public sewerage system at the northeast corner of the site. Two pumping stations are located on the site with 200mm dia. pumping mains with provision included for future development. The existing foul pumping stations with the 200mm dia. pump rising mains shall be retained and upgraded where necessary to accommodate the new developments on the site. Upgrading shall include consideration of the pumps and automated pumping controls upgrade/updating/replacement etc. Underground 24-hour storage tanks shall be provided at each of the existing stations.

The route of the existing pumping mains from the stations shall be realigned to facilitate the new development, as shown on CSEA Drawing No's . 21_048-CSE-ZZ-ZZ-DR-C-2200, 21_048-CSE-ZZ-ZZ-DR-C-2210 - 1_048-CSE-ZZ-ZZ-DR-C-2218 submitted as part of the planning application.

A new, additional pumping facility shall be provided to service areas of development outside the catchments of the existing stations. There are no new requirements for new foul connections outside of the overall landholding. The wastewater discharged from the site will ultimately discharge to the Waste Water Treatment Plant at Leixlip. There are no proposed process water emissions. The proposed foul network will be designed in accordance with the Uisce Éireann Code of Practice for Wastewater.

It is not proposed to discharge any trade effluent to the foul sewer.

Refer to CSEA's *Engineering Services Report Drainage and Water Services.* for further design information.

A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the Pre-Connection Enquiry is awaited. Any upgrade works to the surrounding area will be identified within the Confirmation of Feasibility.

Refer to CSEA's *Engineering Services Report Drainage and Water Services* for further information.

<u>Fuel and Other Accidental Spills</u>

There is a potential for leaks and spillages from the proposed fuel oil generators to occur on site. In addition to this there is a potential for leaks and spillages from vehicles along access roads, loading bays and in parking areas. Any accidental emissions of oil, petrol or diesel could cause contamination if the emissions enter the water environment unmitigated.

In the event of a fire at the facility, firewater will also need to be contained or it may contaminate receiving waters.

The fuel for the generators will be stored in individual, double-skinned storage tanks. Each tank has the capacity to store 15.5 m^3 of diesel; Each tank has the capacity to store 15.5 m*3* of diesel; therefore, a total of 1,240 m*3* across all Data Centres (or 1066 tonnes at a density of 0.86 tonnes / m*3*). The energy centre will have its own HVO bulk storage of c.3440 tonnes.

As there is full containment for bulk fuel oil, use of interceptors as part of the SuDS approach, additional dilution within the attenuation ponds and no direct pathway to surface water from this site there is no likely potential impact on offsite watercourses.

<u>Increase in Hardstanding</u>

In relation to the principal works site, there will be an increase in overall hardstand as a result of the proposed development of c. 171,641.88 m^2. The existing site has a total hardstanding of c. 86029.00 m^2. The proposed development will have a total hardstanding of c. 257, 670.88 m^2. This may increase the run-off rates from the proposed development site into receiving surface waterbodies (Leixlip Reservoir, River Liffey). However, the proposed development will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes. Attenuation measures include bio retention areas, attenuation ponds, swales, filter drains, permeable paving and hydrocarbon interceptors. This will have a net positive result on the downstream surrounding areas as the potential for flooding will be reduced and the overall discharged runoff will have an improved water quality due to the proposed SuDS upgrades.

Proposed discharge rates for the Proposed Development and the overall landholding are addressed in CSEA's *Engineering Services Report Drainage and Water Services.*

Summary of the Operational Phase Impacts

A summary of operational phase impacts for the Proposed Development (with and without mitigation) following EPA (2022) EIA guidelines is provided below.

In the absence of mitigation measures, the operational phase of the proposed development will likely have a **Neutral**, **Long-Term** and **Slight** impact.

With the implementation of the appropriate mitigation measures outlined in Section 8.6.2, the operational phase of the proposed development will likely be ***Long-Term, Neutral*** in terms of quality and ***Not Significant.***

8.6 Mitigation Measures and Monitoring of Impacts

The design of the Proposed Development (principal and facilitation works) has taken account of the potential impacts of the development and the risks to the water environment specific to the areas where construction is taking place as described in Section 8.5 above.

The proposed development (Principal works site) has a direct hydrological connection with Leixlip Reservoir via the surface water drainage network and an indirect connection to the River Liffey and Liffey Valley pNHA. Caution will be taken to mitigate the potential effects on the local water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

8.6.1 Construction Phase

Construction Environnemental Management Plan (CEMP)

A Construction Environmental Management Plan (CSEA, 2023) has been prepared for planning which details project-specific construction methodologies. A sample CEMP for the GNI works has also been provided (Appendix 6.1) A project-specific CEMP will be prepared and maintained by the appointed contractors during the construction phase of the proposed project. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the CEMP. At a minimum, the manual will be formulated to the standard best international practice including, but not limited, to:

- CIRIA, (2001), *Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532)* Construction Industry Research and Information Association;
- CIRIA (2002) *Control of water pollution from construction sites: guidance for consultants and contractors (SPI56)* Construction Industry Research and Information Association;
- CIRIA (2005), *Environmental Good Practice on Site* (C650); Construction Industry Research and Information Association;
- BPGCS005, *Oil Storage Guidelines*;
- CIRIA 697 (2007), *The SUDS Manual*; and

To ensure the CEMP remains fit for purpose, it will be regarded as a live document. The appointed contractor will be responsible for updating the CEMP, as required; e.g. to reflect the publication of relevant new or revised guidelines and / or new statutory requirements. The full schedule of environmental commitments (i.e. all mitigation measures set out in the CEMP, Environmental Impact Assessment Report and submitted as part of the planning application, as well as any applicable conditions of development consent) will be included in the CEMP by the appointed contractor.

Culvert Design

As per the CSEA CEMP the proposed redesign of the culvert will ensure that there is no reduction in the hydraulic capacity of the culvert and no resultant increase in flood risk. The new culvert will be built as part of the phase 1 development. The new culvert route will be constructed prior to the decommissioning of the existing culvert. This will ensure minimal operational disturbance of the existing infrastructure. The contractor will begin the works by initially excavating the proposed route for the new culvert. The proposed culvert will then be fully constructed except for the tie-in locations to the existing culvert. Once the proposed culvert is constructed, cleaned, and inspected the tie-in locations to the existing culvert will be completed. This will ensure minimal operational disturbance to the existing infrastructure. Once the existing water course has been diverted through the new route, the existing culvert will be removed.

The proposed diverted culvert will be c.360m in length, located c.90 south-west of the existing culvert. The work will be achieved over 8 weeks. As per the AA Screening Report findings, no significant effects whether arising from the project itself or in combination with any other plan or project, are likely to occur to the Natura 2000 sites largely due to the significant distance of the project from the identified sites. Notwithstanding this, best practice environmental controls will be put in place as per the balance of the site to ensure no damage to the immediate aquatic receiving environment. Run-off from the site or any area of exposed soils should be channelled and intercepted and discharged to silt traps with over-flows directed to land rather than the existing culvert. A maintenance schedule and operation procedure should be implemented by the Contractor for the silt and pollution control measures during the construction of the diverted culvert.

Surface Water Run-off

Run-off water containing silt will be contained on site via settlement tanks and treated to ensure adequate silt removal. Silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, silt sacks and settlement ponds).

Should any discharge of construction water be required during the construction phase, the discharge will be treated using sediment traps as required.

The temporary storage of soil will be carefully managed. Stockpiles will be tightly compacted to reduce runoff and graded to aid in runoff collection. This will prevent any potential negative impact on the storm water drainage and the material will be stored away from any surface water drains. Movement of material will be minimised to reduce the degradation of soil structure and generation of dust. Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise the potential for water ingress into excavations.

Weather conditions will be considered when planning construction activities to minimise the risk of run-off from the site through the excavation works required to facilitate the local extension upgrades of the gas transmission. The suitable distance of topsoil piles from surface water drains will also be maintained.

Fuel and Chemical Handling

The following mitigation measures will be taken at the construction stage in order to prevent any spillages of fuels and prevent any resulting impacts to the surface water system;

- Designation of a bunded refuelling areas on the site;
- Provision of spill kit facilities across the site;
- Where mobile fuel bowsers are used the following measures will be taken:
  - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
  - The pump or valve will be fitted with a lock and will be secured when not in use;
  - All bowsers to carry a spill kit and operatives must have spill response training; and
  - Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

In the case of drummed fuel or other potentially polluting substances which may be used during construction the following measures will be adopted:

- Secure storage of all containers that contain potential polluting substances in a dedicated internally bunded chemical storage cabinet unit or inside concrete bunded areas. The containment measures planned will minimise the risk of release of solid/ liquid material spillages to the water environment. Containment measures will include storage of fuels on site in bunded containers or compartments. The design of all bunds will conform to standard bunding specifications - BS EN 1992-3:2006, *Design of Concrete Structures – Part 3: Liquid retaining and containment measures*;
- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site, they should be done so secured and on spill pallets; and
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be required and completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters or contaminated storm water to the underlying subsoil. Wash-down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

<u>Accidental Releases</u>

Emergency response procedures will be outlined in the site CEMP and are set out in the CEMP included with the application. All personnel working on the site will be suitably trained in the implementation of the procedures.

<u>Soil Removal and Compaction</u>

Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment. The material will be stored away from any open surface water drains (see Surface Water Run-off section above). Movement of material will be minimised to reduce degradation of soil structure and generation of dust. No soil storage will occur within 30 m of any of the open surface water features including the existing retention ponds. Given the size of the site where sufficient working areas are available within the site boundaries this is achievable. All soil storage and removal practices during the construction phase will be in accordance with Inland Fisheries Ireland guidelines (Guidelines on protection of fisheries during construction works in and adjacent to waters, 2016).

Site investigations carried out at the site by IGSL in December 2019 found no residual contamination on site. Nonetheless, all excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of potential contaminants to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be segregated and appropriately disposed of by a suitably permitted/licensed waste disposal contractor.

8.6.2 Operational Phase

<u>Environmental Procedures</u>

The Operator of the proposed data centre buildings implements an Environmental Management System at each of its facilities. Prior to operation of the Proposed Development, a comprehensive set of operational procedures will be established (based on those used at other similar facilities) which will include site-specific mitigation measures and emergency response measures as outlined below, similar procedures will be developed for the DeepTech buildings and energy infrastructure:

<u>Fuel and Chemical Handling</u>

The containment measures planned will minimise the risk of release of solid/ liquid material spillages to the water environment. Containment measures will include storage of fuels on site in bunded containers or compartments. The design of all bunds will conform to standard bunding specifications - BS EN 1992-3:2006, *Design of Concrete Structures – Part 3: Liquid retaining and containment measures.*

Storm and Foul Water Drainage

The proposed development (principal works site) will provide a significant improvement to the local drainage as it is proposed to provide full attenuation for increase in hardstand area (c. 171,641.88 m^2) in compliance with the requirements of the Greater Dublin Strategic Drainage Study.

A number of attenuation measures will be implemented to minimise the likelihood of any spills entering the water environment to include the design ofattenuation techniques such as Swales, Tree pits, Green roofs, Filter drains, Permeable paving, Rainwater Harvesting system, Bio-Retention ponds, Hydrocarbon interceptors, Silt Traps and Attenuation facilities will protect from on-site and off-site flooding which is in compliance with Kildare County Development Plan 2023-2029 that requires the use of sustainable drainage systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

As a result, the proposed development (principal works site) will result in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding is reduced and the overall discharged runoff will have an improved water quality. Refer to CSEA's *Engineering Services Report Drainage and Water Services* for further information.

The proposed foul and surface water network will be designed in accordance with the Uisce Éireann Code of Practice for Wastewater.

Water Supply

A Pre-Connection Enquiry has been submitted to Uisce Éireann. Refer to Chapter 2 for further detail.

There is an existing 150mmØ water main located in the site which spurs from Celbridge Road. Uisce Éireann are proposing updates to the network which will serve the development. It is proposed to connect a 150mmØ watermain to this existing line within the Celbridge Road to provide connections from the 150mmØ incoming water supply main to the admin area of the data centre buildings, the water treatment plant room, the sprinkler storage tanks, the substation, and the Deep Technology Buildings.

The Data Centres will require an annual water demand of 6097.5m^3 resulting from the peak summer months only. This water will be stored on-site such that no water is required from Uisce Éireann during the peak summer months. In order to facilitate the tanks, the development will be required to fill up these tanks during the colder/winter periods at a very slow rate. It is proposed to fill up these tanks over a two-week period during the colder/winter periods in an attempt to reduce the water demand of Uisce Éireann network during the summer months.

8.7 Likely Cumulative and Interaction Impacts of the Project

8.7.1 Cumulative Impacts

The anticipated cumulative effect of the Proposed Development with any/all relevant other planned or permitted developments as outlined in Chapter 2 and 3 are discussed in below for construction and operational phases respectively.

Construction Phase

In relation to the potential cumulative impact on hydrology during the construction phase, the construction works which would have potential cumulative impacts include:

- Surface water run-off during the construction phase may contain increased silt levels or become polluted from construction activities. Run-off containing large amounts of silt can cause damage to surface water systems and receiving watercourses.
- Contamination of local water sources from accidental spillage and leakage from construction traffic and construction materials unless project-specific CEMPs are put in place for each development and complied with.

Operational Phase

In relation to the potential cumulative impact on hydrology during the operational phase, operational works which would have potential cumulative impacts include:

- Increased hard standing areas (171,641.88 m^2) for the principal works site will reduce local recharge to the ground and increase surface water run-off potential if not limited to the green field run-off rate from the site.
- Increased risk of accidental releases from fuel storage/delivery unless mitigated adequately i.e. bunded tank.
- Increased risk of accidental discharge of hydrocarbons from car parking areas and along roads and unless diverted to surface water system with petrol interceptor; and
- Any additional foul discharges should be treated where appropriate and/or diverted to the foul sewer system and not directly to ground.

All developments will be required to manage any discharges to water and operate in compliance with relevant legislation (European Communities Environmental Objectives (Surface Waters); Regulations, 2009 (S.I. No. 272 of 2009 as amended by SI No. 77 of 2019). As such there will be no likely cumulative impact on water quality.

Increase in wastewater loading and water supply requirement is an impact of all developments: Each development will require approval from the IW confirming available capacity in the water and wastewater infrastructure. The surface water and foul drainage infrastructure and water supply requirements for the proposed development has been designed and assessed to accommodate the requirements of the proposed development.

Development will result in an increase in hard standing which will result in localised reduced recharge to ground and increase in run-off rate. However, each permitted development is required by the Local Authority and IW to comply with the Greater Dublin Strategic Drainage Strategy (GDSDS) and Local Authority and IW requirements by providing suitable attenuation on site to ensure greenfield run-off rates and ensure that there is no increase in offsite flooding as a result of development.

The residual cumulative impact on hydrology for the construction and operation phases is anticipated to be ***Long-Term, Neutral*** in terms of quality and ***Not Significant***, once appropriate mitigation measures to manage water quality runoff in compliance with legislative requirement are put in place for each development.

8.8.1 Interaction Impacts with Biodiversity

Construction Phase

Dust emissions have the potential to settle on plants causing impacts to local ecology. Mitigation measures during the construction phase of the proposed development will ensure that dust generation is minimised and the effect on biodiversity will be short term, imperceptible and neutral.

There is potential for impacts to biodiversity associated with uncontrolled discharges to surface waters. In this instance the site discharges its surface water runoff directly into the Leixlip Reservoir via an outfall pipe following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, upstream of the existing retention ponds near the existing site entrance off the Celbridge Road.

There is an indirect hydrological connection for the principal works site with a number of nationally and internationally important habitats located within Dublin Bay. However due to the hydrological distance of removal and volume, there are no adverse effects anticipated (c. 22km to the east). The use of standard demolition and construction control measures as provided in the CEMP and the standard sustainable urban drainage systems implemented on-site will result in no potential for impact on biodiversity downstream of the site. The impact upon biodiversity from hydrological impacts would be long-term and neutral.

Taking into account the design and mitigation measures set out in Chapter 6 of this EIA Report, there remains a residual negative interaction between hydrology, and biodiversity during the construction phase. The interaction is considered to be ***negative***, ***not significant***, and ***short term***.

Operational Phase

There is potential for impacts to biodiversity associated with uncontrolled discharges to surface waters. In this instance the site discharges its surface water runoff directly into the Leixlip Reservoir via an outfall pipe following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, upstream of the existing retention ponds near the existing site entrance off the Celbridge Road.

There is an indirect hydrological connection with a number of nationally and internationally important habitats located within Dublin Bay. However due to the hydrological distance of removal and volume, there are no adverse effects anticipated (c. 22km to the east). The use of standard demolition and construction control measures as provided in the CEMP and the standard sustainable urban drainage systems implemented on-site will result in no potential for impact on biodiversity downstream of the site. The impact upon biodiversity from hydrological impacts would be long-term and neutral.

Taking into account the design and mitigation measures set out in Chapter 6 of this EIA Report, the interaction between hydrology, and biodiversity during the operational phase is considered to be ***neutral***, and ***long term***.

8.8.2 Interaction Impacts with Air Quality and Climate

Construction Phase

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils in the form of dust emissions that may deposit in surface waters.

Mitigation measures implemented during the construction phase will ensure that the deposition of dust is minimised. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and hydrology.

The interaction is considered to be ***negative***, ***not significant***, and ***short term***. There are no potentially significant interactions identified between hydrology, and climate during the construction phase.

Operational Phase

There are no potentially significant interactions identified between hydrology, and air quality during the operational phase. Climate change has the potential to lead to increased rainfall in future years which may result in flood impacts and interactions between Hydrology and Land, Soils and Geology.

A detailed Site Specific Flood Risk Assessment (SSFRA) was carried out for the proposed development which states that the site is located in Flood Zone C with an annual probability of flooding (fluvial) of less than 0.1%.

The site is divided up into five catchment areas. These areas are defined by the topographical characteristics of the site and the proposed finish levels of the development. Each catchment collects the surface runoff and attenuates it within a pond up to the 1:100 year event. A flow control device will be installed within each catchment to slowly releases the water into the existing ponds. The SuDs features have been designed to provide sufficient capacity to contain and convey all surface water runoff associated with the 1 in 100-year event plus an additional allowance of 30% for climate change and 10% urban creep.

Therefore it can be determined that there is no significant risk to the proposed development as a result of increased rainfall and climate. No significant interactions between climate, hydrology and land, soils and ecology is predicted.

8.8.3 Noise and Vibration

Construction Phase

There are no potentially significant interactions identified between hydrology, and noise and vibration during the construction phase.

Operational Phase

There are no potentially significant interactions identified between hydrology, and noise and vibration during the operational phase.

8.8.4 Landscape and Visual Impacts

Construction Phase

There are no potentially significant interactions identified between hydrology, and landscape and visual impacts during the construction phase.

Operational Phase

There are no potentially significant interactions identified between hydrology, and landscape and visual impacts during the operational phase.

8.8.5 Archaeological, Architectural and Cultural Heritage

Construction Phase

There are no potentially significant interactions identified between hydrology, and archaeological, architectural and cultural heritage during the construction phase.

Operational Phase

There are no potentially significant interactions identified between hydrology, and archaeological, architectural and cultural heritage during the operational phase.

8.8.6 Material Assets, including Utilities, Waste, and Transport

Construction Phase

There are no potentially significant interactions identified between hydrology, and material assets during the construction phase.

Operational Phase

The proposed development (principal works site) will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes. The use of SuDS during operations will mean that the runoff will discharge from the proposed bioretention and attenuation systems before out falling to the existing pond system and existing monitoring regime on-site resulting in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding will be reduced and the overall discharged runoff will have an improved water quality due to the proposed SuDS upgrades. The SuDs features have been designed to provide sufficient capacity to contain and convey all surface water runoff associated with the 1 in 100-year event plus an additional allowance of 30% for climate change and 10% urban creep. This is as per Kildare County Council Water Services Department draft guidance on Drainage and SuDS Strategy.

Attenuation measures include bio retention areas, attenuation ponds, swales, filter drains, permeable paving and hydrocarbon interceptors. The interaction is considered to be ***negative***, ***not significant***, and ***long-term***.

8.9 Mitigation Measures and Monitoring of Cumulative and Interaction Impacts

As has been identified in the receiving environment section, all cumulative developments that are already built and in operation contribute to the characterisation of the baseline environment. As such any further environmental impacts that the proposed development may have in addition to these already constructed and operational developments has been assessed in the preceding sections of this chapter.

There are no relevant other permitted or proposed developments within the immediate vicinity of the proposed development site.

8.9.1 Construction Phase

Every development will have to incorporate SuDS measures to protect water quality in compliance with legislative standards for receiving water quality (European Communities Environmental Objectives (Surface Water) Regulations (S.I. 272 of 2009 and S.I. 77 of 2019).

During construction phase the following monitoring measures will be implemented:

- Regular inspection of surface water run-off and sediments controls (e.g., silt traps);
- Soil sampling to confirm disposal options for excavated soils in order to avoid contaminated run-off; and
- Regular inspection of construction / mitigation measures (e.g., concrete pouring, refuelling, etc).

As a result, there will be minimal cumulative potential for change in the natural hydrological regime. The cumulative impact is considered to be ***short-term***, ***neutral*** and ***imperceptible***.

8.9.2 Operational Phase

All the operational cumulative developments are required to manage discharges in accordance with S.I 272/2009 and 77/2019 amendments. As such there will be no cumulative impact to surface water quality and therefore there will be no cumulative impact on the Surface Waterbody Status.

During operational phase the following monitoring measures will be implemented:

- Maintenance of the surface water drainage system and foul sewers, as standard, is recommended to minimise any accidental discharges to surface water.

The operation of the proposed development is concluded to have a ***long-term***, ***imperceptible*** significance with a ***neutral*** impact on surface water quality.

8.10 Major Accidents and/or Disasters

The EPA Guidelines, 2022, state that:

"To address unforeseen or unplanned effects the Directive further requires that the EIAR takes account of the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk). This may be supported by general risk assessment methods or by systematic risk assessments required under other legislation e.g. a COMAH (Control of Major Accident Hazards involving Dangerous Substances) assessment.

The potential for a project to cause risks to human health, cultural heritage or the environment due to its vulnerability to external accidents or disasters is considered where such risks are significant, e.g. the potential effects of floods on sites with sensitive facilities. Where such risks are significant then the specific assessment of those risks in the form of a Seveso Assessment (where relevant) or Flood Risk Assessment may be required."

There are currently no COMAH / SEVESO sites in proximity to the proposed development site. A Risk Assessment following the methodology set out by the HSA's *Guidance on Technical* Land Use Planning Advice (HSA, 2023), has been carried out, by AWN Consulting Ltd., as part of this planning application in accordance with the Guidance on Technical Land Use Planning Advice (HSA, 2023) and includes a Major Accident to the Environment (MATTE) assessment (CDOIF, 2017).

The major accident hazards for the proposed development are presented in Table 17. 4 and the natural disaster hazards are presented in Table 17. 5 in Chapter 17 "Major Accidents and Disasters" of this EIAR.

The following scenarios have been identified that could impact the construction and operational phases of the proposed development.

8.10.1 Construction Phase

The following scenarios have been identified that could impact the construction phase of the project:

- Extreme heat or cold weather resulting in result structural damage and/or pollution to soils, groundwater or surface waters;
- Storm events resulting in structural damage and/or pollution to groundwater and surface waters;
- Flooding; and
- Pollution to soils / groundwater / surface water.

There are no likely impacts on the project or to off-site receptors during the construction phase in relation to major accidents and disasters.

8.10.2 Operational Phase

The potential hazards associated with substances stored at the proposed development and processes at the proposed development which have the potential to cause a major accident are summarised in the following section. All hazards identified require a loss of containment to occur; such as, catastrophic damage or failure of pipework and/or storage tanks.

Fire

Flash Fire: A flash fire can occur following a loss of containment of natural gas from the natural gas pipeline, which results in a flame which passes through the mixture at less than sonic velocity such that explosion overpressures are negligible. A flash fire may be caused by releases at high or low pressure into an open, unconfined area which contacts an active source of ignition.

Jet Fire: A jet fire can occur following a loss of containment of natural gas from the natural gas pipeline, via a source such as a leak or failure of flanged pipework joints, pipework or another asset which contacts an active source of ignition

Explosion

Vapour Cloud Explosion (VCE): A loss of containment of natural gas, within a turbine enclosure, which does not ignite immediately may form a cloud of flammable material depending on the conditions of the release. If this cloud contacts an active source of ignition, a VCE can result and generate potentially harmful overpressures

Major Accident to the Environment (MATTE)

A loss of containment of liquids such as fuel oils which are accidentally released to water, land and/ or groundwater in significant quantities can cause harm to the environment.

In keeping with EIA guidance these results are a summary of the Land Use Planning Assessment (report reference: MM.237501.0007RR01). There are no likely impacts to off-site receptors, as a result of the proposed development, during the operational phase in relation to major accidents and disasters.

8.11 Mitigation Measures and Proposed Response to such Emergencies

The proposed development has been designed in line with good industry practice, and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design and in accordance with planning and legislative requirements.

8.12 Residual Impacts

The residual effects are the final predicted or intended effects which occur after the proposed mitigation measures have been implemented. It will not always be possible or practical to mitigate all adverse effects.

This assessment has identified the potential for major accident hazards to occur. These scenarios can have significant consequences; however, the likelihood of these events occurring is low due to engineering and operational safeguards that will be implemented at the development. The Land Use Planning Assessment concluded that the risk contours do not extend off-site; therefore, there are no impacts to off-site receptors.

In the case of the Proposed development (principal and facilitation works), there will be no significant residual impacts; the potential impact on surface water during operation and closure (following the EPA Draft EIA Report Guidelines (2017) will be l***ong term, imperceptible*** and ***neutral*** i.e. an impact capable of measurement but without noticeable consequences.

8.14 References

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- EPA (2022a). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
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- National Roads Authority (NRA) (2009). Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- Lower Liffey Valley Regional Sewerage Scheme – Annual Environmental Report 2013

9.0 AIR QUALITY

9.1 Introduction

AWN Consulting Limited has been commissioned by Tom Phillips and Associates on behalf of the Davy Platform ICAV for and on behalf of the Liffey Sub Fund to conduct an air quality impact assessment of the proposed development and associated facilitation works.

This chapter evaluates the impacts which the project may have on Air Quality as defined in the EPA EIA Report Guidelines 2022.

Air dispersion modelling was carried out using the United States Environmental Protection Agency's regulated model AERMOD. The AERMOD model has USEPA regulatory status and is one of the advanced models recommended within the air modelling guidance document 'Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)' published by the EPA in Ireland (EPA, 2020). Further information on the background of the AERMOD model can be found in Appendix 9.1. The modelling of air emissions from the site was carried out to assess concentrations of nitrogen dioxide (NO_2) at a variety of locations beyond the site boundary.

In relation to the proposed development, the facility will have 9 combustion turbine generators (CTGs) which will have a stack height of 15m above ground level and 80 back-up generators which will have a stack height of 18m above ground level. The back-up generators will power the data centre in the event of an interruption to the supply of power from the National Grid. The other aspects of the development including the data halls and the Deep Tech buildings and facilitation works will lead to some air emissions during construction but will not be significant sources of air emissions during the operational phase.

The dispersion modelling study consisted of the following components:

- Review of the construction phase of the proposed development including the facilitation works;
- Review of emissions data and other relevant information needed for the modelling study;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the site;
- Identification of predicted concentrations of released substances beyond the site boundary;
- Evaluation of the environmental significance of these predicted concentrations, including consideration of whether these concentrations are likely to exceed relevant ambient air quality standards and guidelines.

This chapter has been prepared by AWN Consulting Limited – Dr Edward Porter (BSc PhD C Chem MRSC MIAQM) and reviewed by Dr. Avril Challoner (BSc PhD C Chem MRSC MIAQM).

Dr. Edward Porter is Director with responsibility for Air Quality with AWN Consulting. He holds a BSc from the University of Sussex (Chemistry), and a PhD in Environmental Chemistry (Air Quality) in UCD where he graduated in 1997 and is a Full Member of the Royal Society of Chemistry (MRSC CChem) with 25 years' experience. He specialises in the fields of air quality, odour and air dispersion modelling.

Dr. Avril Challoner is an Environmental Consultant in the Air Quality section of AWN Consulting. She holds a BEng (Hons) in Environmental Engineering from the National University of Ireland Galway, HDip in Statistics from Trinity College Dublin and has completed a PhD in Environmental Engineering (Air Quality) in Trinity College Dublin graduating in 2013. She is a Member of the Institute of Air Quality Management and specialises in the fields of air quality, EIA and air dispersion modelling.

9.2 Methodology

The air quality assessment has been carried out in line with the guidance outlined in the European Commission publication "*Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report*" (EC, 2017) and the EPA publication "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2022*" (EPA, 2022) and using the methodology outlined in the guidance documents published by the United States Environmental Protection Agency (USEPA) (USEPA, 2017, 2022) and the EPA (EPA, 2020).

9.2.1 Ambient Air Quality Standards

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2022, which incorporate EU Directive 2008/50/EC, which combines the previous air quality framework and subsequent daughter directives (see Table 9.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see Appendix 9.1).

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (µm) in diameter. EU ambient air quality standards (Council Directive 2008/50/EC transposed into Irish law as S.I. 739 of 2022) centres on PM_{10} (particles less than 10 microns) as it is these particles which have the potential to be inhaled into the lungs and cause some adverse health impact. Council Directive 2008/50/EC also sets an ambient standard for $PM_{2.5}$ (particles less than 2.5 microns in diameter) which came into force in 2015 (see Table 9.1).

Dust Deposition Guidelines

With regard to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (TA Luft, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Health & Local Government (DEHLG, 2006) apply the TA Luft limit of 350 mg/(m^2*day) to the site boundary of quarries.

Gothenburg Protocol

In 1999, Ireland signed the *Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution*. The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia

(NH_3). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$. In relation to Ireland, 2020 emission targets were 25 kt for SO_2 (65% on 2005 levels), 65 kt for NO_X (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels).

European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive (NECD), has prescribed the same emission limits. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. Directive (EU) 2016/2284 "*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*" was published in December 2016. The Directive applies the 2010 NECD limits until 2020 and establishes new national emission reduction commitments which are applicable from 2020 to 2029 and from 2030 onwards for SO_2, NO_X, NMVOC, NH_3 and $PM_{2.5}$. In relation to Ireland, 2020-29 emission targets are for SO_2 (65% below 2005 levels), for NO_X (49% reduction), for VOCs (25% reduction), for NH_3 (1% reduction) and for $PM_{2.5}$ (18% reduction). In relation to 2030, Ireland's emission targets are for SO_2 (85% below 2005 levels), for NO_X (69% reduction), for VOCs (32% reduction), for NH_3 (5% reduction) and for $PM_{2.5}$ (41% reduction). The data available from the EU for 2020[6] indicated that Ireland complied with the emissions ceilings for NOX, SO_2 and $PM_{2.5}$ in 2020 but failed to comply with the ceilings for NMVOCs and NH_3.

Pollutant	Regulation	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health – not to be exceeded more than 18 times/year	200 μg/m^3
		Annual limit for protection of human health	40 μg/m^3
		Critical level for protection of vegetation	30 μg/m^3 NO + NO_2
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health – not to be exceeded more than 24 times/year	350 μg/m^3
		Daily limit for protection of human health – not to be exceeded more than 3 times/year	125 μg/m^3
		Critical limit for the protection of ecosystems	20 μg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health – not to be exceeded more than 35 times/year	50 μg/m^3
		Annual limit for protection of human health	40 μg/m^3
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 μg/m^3
		Indicative Annual limit for protection of human health	20 μg/m^3
Carbon Monoxide (CO)	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3 (8.6 ppm)

Table 9.1: Air Quality Standards Regulations 2022

9.2.2 Construction Phase

For the purpose of the qualitative air quality assessment of the construction phase, the combined impact of demolition and concurrent construction of all proposed buildings at the site has been assumed to occur together. In addition, the facilitation works for the gni upgrade including the upgrade of the existing gas skid on site to power the proposed energy centre and the development of the proposed replacement 110kV Substation and uprating of existing overhead lines from the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad has been assessed.

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the demolition and construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust generating demolition and construction activities associated with the proposed development.

9.2.3 Operational Phase

Air dispersion modelling was carried out by AWN using the United States Environmental Protection Agency's regulated model AERMOD (Version 22112). AERMOD is recommended as an appropriate model for assessing the impact of air emissions from industrial facilities in the EPA Guidance document "Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)" (EPA, 2020). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources including dust emissions from area sources. The model has been designated the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA, 2017). The AERMET meteorological pre-processor (USEPA, 2018) was used to generate hourly boundary layer parameters for use by AERMOD. The air dispersion modelling input data consists of detailed information on the physical environment (including land use and terrain features), emission rate information and a full year of meteorological data. Using this input data, the air dispersion model predicts ambient ground level concentrations for each hour of the modelled meteorological year. The model post-processes the data to identify the location and maximum value of the worst-case ground level concentration in the applicable format for comparison with the relevant limit values. The worst-case concentration is then added to the existing baseline concentration, where relevant, to give the worst-case predicted ambient concentration level of the relevant pollutants.

<u>The modelling incorporated the following features:</u>

- A receptor grid was created at which concentrations would be modelled with a greater density of receptors in the area surrounding the facility. In addition, boundary receptors around the site were input into the model giving a total of 12,708 calculation points for the model.

- Detailed terrain has been mapped into the model using Shuttle Radar Topography Mission (SRTM) data with 30m resolution. The site is located in an area of gently rolling terrain. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP (USEPA, 2019).

- Hourly-sequenced meteorological information has been used in the model. Meteorological data for Casement Aerodrome for the years 2017 - 2021 was used in the model (see Figure 9.1).

- The source and emission data have been incorporated into the model.

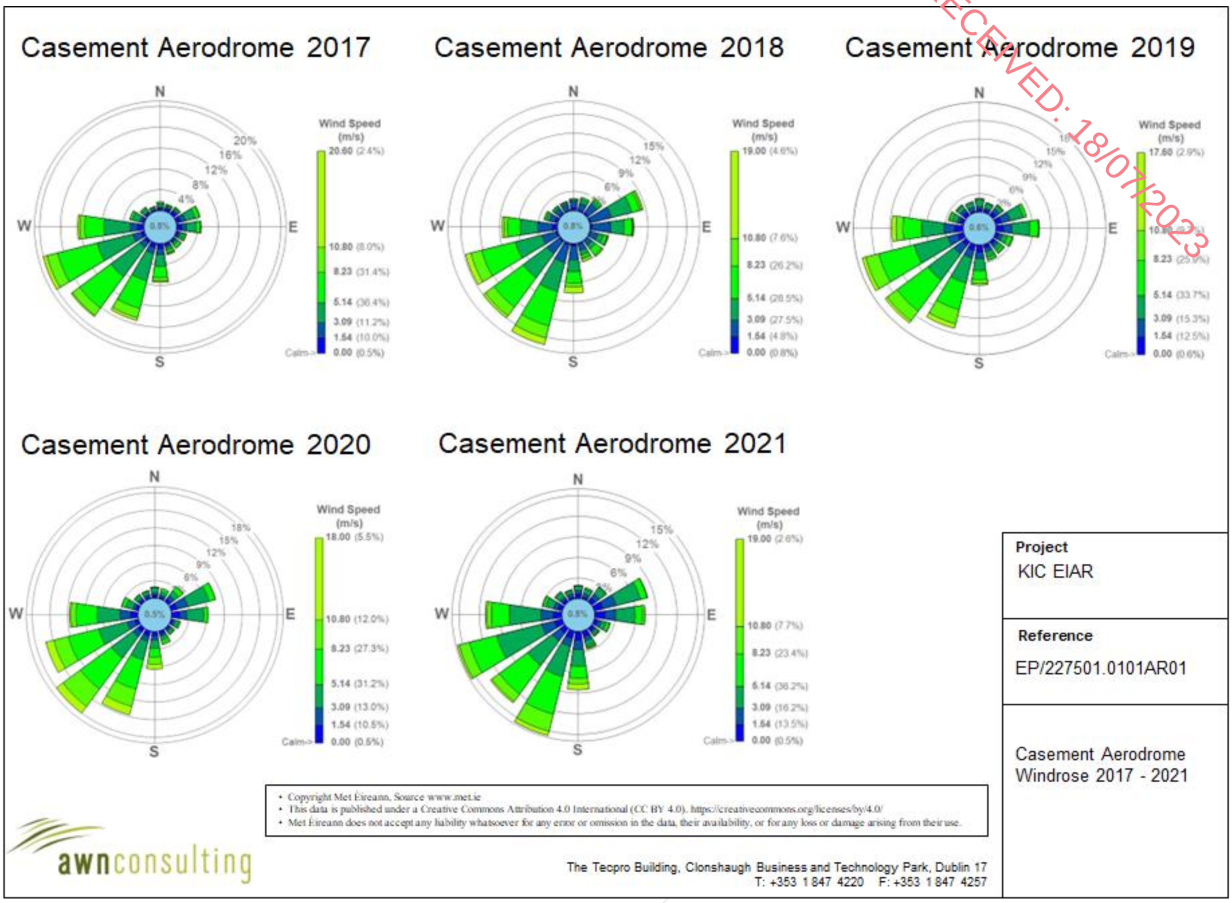

Figure 9.1: Windroses for Casement Aerodrome 2017 - 2021 (Met Eireann, 2022).

PROCESS EMISSIONS

In relation to the Proposed Development, there will be 9 CTGs associated with the Energy Centre whilst there will be 80 no. diesel generators associated with the data centres, with a maximum of 72 no. diesel generators in operation at any one time, which will provide power to the site when there is a loss of power from the National Grid to the data halls.

The modelling of air emissions from the site was carried out to determine the maximum number of operational hours that the back-up generators can operate without having a negative impact on ambient air quality as a result of nitrogen dioxide (NO_2) emissions.

The facility has been modelled based on a worst-case scenario which is the maximum number of air emission points which will operate at any one time. The worst-case scenario is based on eight (with one backup) continuous CTGs which have a stack height of 15m above ground level and 80 no. back-up generators each, all of which have a stack height of 18m above ground level. 2 no. of the generators in each building are 'catcher' generators to provide redundancy to the remaining generators (i.e. 72 of the 80 no. generators will operate in the event of a power failure to the site). Although the CTGs have been modelled as operating continuously (for 8760 hours per year), in reality they will operate no more than 330 days per year and thus the current assessment is a worst-case.

The back-up generators will only run when there is an interruption to the supply of electricity from the National Grid with the exception of testing. In order to allow for the unpredictability of the runtimes of the standby generators, two methodologies have been used in this assessment to determine the impact to ambient air quality from the back-up generators on site. The USEPA methodology includes emergency operations and scheduled testing of the generators. The UK Environment Agency methodology includes emergency operation of the generators only.

The specific testing regime included in the modelling is outlined below, this is somewhat more conservative than the testing that is carried out in practice. Thus, the worst-case approach used in this study will lead to an over-estimation of the actual levels that will arise. Testing is assumed to occur once per week of all 80 no. back-up generators at 25% load for a maximum of 30 minutes each, one generator at a time, sequentially. However, in reality, testing is likely to be on a monthly basis. In addition, load testing at 100% load will occur for each generators for a maximum of one hour each, one generator at a time, sequentially four times per year.

USEPA Guidance suggests that for emergency operations, an average hourly emission rate should be used rather than the maximum hourly rate (USEPA, 2011). For modelling purposes only, all of the generators were modelled as being in operation for 250 hours in total per year which is the maximum number of hours the standby generators can operate whilst staying in compliance with the ambient air quality standards. However, in reality, and based on recent experience over the past number of years, generators are rarely used other than during testing and maintenance described above. As a result, the maximum hourly emission rates from all the back-up generators were reduced by a factor of (250/8760) to give an average hourly emission rate (in line with USEPA protocol) and the generators were modelled over a period of one full year.

A second methodology for modelling back-up generators has been published by the UK Environment Agency. The consultation document is entitled "Diesel Generator Short-Term NO_2 Impact Assessment" (UKEA, 2016). The methodology is based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value (18 exceedances are allowable per year before the air standard is deemed to have been exceeded). The assessment assumes a hypergeometric distribution to assess the likelihood of exceedance hours coinciding with the operational hours of the back-up generators. The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined. The guidance suggests that the 95th percentile confidence level should be used to indicate if an exceedance is likely. More recent guidance (UKEA, 2019) has recommended this probability should be multiplied by a factor of 2.5 and thus the 98th percentile confidence level should be used. The guidance suggests that the assessment should be conducted at the nearest residential receptor or at locations where people are likely to be exposed and that there should be no running time restrictions on these generators when providing power on site during an emergency.

Both the methodology advised in the USEPA guidance as well as the approach described in the UK EA guidance have been applied in this study to ensure a robust assessment of predicted air quality impacts from the back-up generators. The methodology for converting NO_X to NO_2 was based on the ozone limiting method (OLM) approach based on an initial NO_2/NO_X ratio of 0.1 for the backup diesel generators and an initial NO_2/NO_X ratio of 0.2 for the CTGs and a background ozone level of 58 µg/m^3 based on a review of EPA data for similar Zone C locations.

The process emissions used in the modelling assessment are outlined in Table 9.2.

							NO_x

Stack Reference	Stack Height Above Ground Level (m)	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp (K)	Volume Flow (Nm^3/hr at 15% Ref. O_2)	Exit Velocity (m/sec actual)	Concentration (mg/Nm^3 at 15% Ref. O_2)	Mass Emission (g/s)
Emergency Operations & Test 2 (100% load)	18m	0.60	0.28	696.2	22,119	34.0	842	0.148 Note 1 / 5.18 Note 2
Test 1 (25% Load)				613.2	6,671	12.9	679	1.26 Note 3
CTGs	15m	3.5	9.6	736.15	344,226	18.9	50	4.78

Note 1 Reduced emission rates based on USEPA protocol (assuming 250 hours / annum) used to model emissions during emergency operation of generators.

Note 2 Maximum emission rates for diesel generators used to model emissions during emergency operation of generators for UK EA assessment methodology and for Test 2 assumptions for USEPA assessment methodology.

Note 3 Emission rates used to model emissions during Test 1 assumed to occur once per week, per generator.

Table 9.2: Summary of Process Emission Information

9.2.2 Terrain

The AERMOD air dispersion model has a terrain pre-processor AERMAP (USEPA, 2019) which was used to map the physical environment in detail over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was obtained from the Shuttler Radar Topography Mission (SRTM) . This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, H_{crit}, for each receptor. The terrain height scale is derived from the Digital Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

In areas of complex terrain, AERMOD models the impact of terrain using the concept of the dividing streamline (H_c). The air dispersion plume is the flow in the atmosphere of the pollutant mass emitted from a source. As outlined in the AERMOD model formulation (USEPA, 2022) a plume embedded in the flow below H_c tends to remain horizontal; it might go around the hill or impact on it. A plume above H_c will ride over the hill. Associated with this is a tendency for the plume to be depressed toward the terrain surface, for the flow to speed up, and for vertical turbulent intensities to increase.

AERMOD model formulation states that the model "captures the effect of flow above and below the dividing streamline by weighting the plume concentration associated with two possible extreme states of the boundary layer (horizontal plume and terrain-following). The relative weighting of the two states depends on: 1) the degree of atmospheric stability; 2) the wind speed; and 3) the plume height relative to terrain. In stable conditions, the horizontal plume "dominates" and is given greater weight while in neutral and unstable conditions, the plume traveling over the terrain is more heavily weighted" (USEPA, 2022).

The terrain in the region of the facility is complex in the sense that the maximum terrain in the modelling domain peaks at 92m which is above the release height of the emissions. However, in general, the region of the site has gently sloping terrain particularly in the immediate vicinity of the facility.

9.2.3 Surface Characteristics

AERMOD simulates the dispersion process using planetary boundary layer (PBL) scaling theory (USEPA, 2022). PBL depth and the dispersion of pollutants within this layer are influenced by specific surface characteristics such as surface roughness, albedo and the availability of surface moisture. Surface roughness is a measure of the aerodynamic roughness of the surface and is related to the height of the roughness element. Albedo is a measure of the reflectivity of the surface whilst the Bowen ratio is a measure of the availability of surface moisture.

AERMOD incorporates a meteorological pre-processor AERMET (USEPA, 2018) to enable the calculation of the appropriate parameters. The AERMET meteorological pre-processor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc.) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10km from the meteorological station for Bowen Ratio and albedo and to a distance of 1km for surface roughness in line with USEPA recommendations (USEPA, 2006).

In relation to AERMOD, detailed guidance for calculating the relevant surface parameters has been published. The most pertinent features are:

- The surface characteristics should be those of the meteorological site (Casement Aerodrome) rather than the installation;
- Surface roughness should use a default 1km radius upwind of the meteorological tower and should be based on an inverse-distance weighted geometric mean. If land use varies around the site, the land use should be sub-divided by sectors with a minimum sector size of 30º;
- Bowen ratio and albedo should be based on a 10km grid. The Bowen ratio should be based on an un-weighted geometric mean. The albedo should be based on a simple un-weighted arithmetic mean.

AERMOD has an associated pre-processor, AERSURFACE[(15)], which has representative values for these parameters depending on land use type. The AERSURFACE pre-processor currently only accepts NLCD92 land use data which covers the USA. Thus, manual input of surface parameters is necessary when modelling in Ireland. Ordnance survey discovery maps (1:50,000) and digital maps such as those provided by the EPA, National Parks and Wildlife Service (NPWS) and Google Earth® are useful in determining the relevant land use in the region of the meteorological station. The Alaska Department of Environmental Conservation has issued a guidance note for the manual calculation of geometric mean for surface roughness and Bowen ratio for use in AERMET[(16)]. This approach has been applied to the current site.

9.3 Receiving Environment

9.3.1 Meteorological Data

Selection of the appropriate meteorological data has followed the guidance issued by the USEPA (USEPA, 2022) and the EPA (EPA, 2020). Casement Aerdrome meteorological station, which is located approximately 6 km south-east of the site, collects data in the correct format and has a data collection rate of greater than 90%. Long-term hourly observations at Casement Aerdrome meteorological station provide an indication of the prevailing wind conditions for the region (see Figure 9.1). Results indicate that the prevailing wind direction is from westerly to south-westerly in direction over the period 2017 - 2021. The mean wind speed is approximately 4.6 m/s over the period 1981-2010.

9.3.2 Background Concentrations

Air quality monitoring programmes throughout Ireland have been undertaken in recent years by the EPA and Local Authorities(28,29). The most recent annual report on air quality "Air Quality Monitoring Annual Report 2021"(28, 29), details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined for air quality management and assessment purposes in Ireland (29). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 25 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the area surrounding the facility is categorised as Zone C(29).

<u>NO_2</u>

With regard to NO_2, continuous monitoring data from the EPA(29) at the Zone C locations of Dundalk, Kilkenny and Portlaoise in 2021 show that levels of NO_2 are below both the annual and 1-hour limit values (see Table 9.3). Average long-term concentrations at Kilkenny and Portlaoise range from 5 - 11 µg/m^3 for the period 2016 – 2021; suggesting an upper average over the five-year period of no more than 11 µg/m^3. There were no exceedances of the maximum 1-hour limit of 200 µg/m^3 in any year (18 exceedances are allowed per year). Based on these results an estimate of the background NO_2 concentration in the region of the development is 12 µg/m^3.

In relation to the short-term 1-hour results, a background concentration of 24 µg/m^3 was added to the 1-hour process concentration which is twice the estimated annual mean concentration.

Station	Averaging Period	Year					
		2016	2017	2018	2019	2020	2021
Kilkenny	Annual Mean NO_2 (µg/m³)	7	5	6	5	4	4
	99.8th%ile 1-hr NO_2 (µg/m³)	51	41	44	41	45	42
Portlaoise	Annual Mean NO_2 (µg/m³)	11	11	11	11	11	8
	99.8th%ile 1-hr NO_2 (µg/m³)	86	60	68	60	52	49
Dundalk	Annual Mean NO_2 (µg/m³)	-	-	14	12	10	11
	99.8th%ile 1-hr NO_2 (µg/m³)	-	-	67	69	73	67

Table 9.3: Trends In Zone C Air Quality - Nitrogen Dioxide (µg/m³) (EPA, 2022)

9.4 Likely Impacts

9.4.1 Construction Phase

Construction dust has the potential to cause local impact through dust nuisance at the nearest sensitive receptors. Construction activities such as excavation, earth moving and backfilling may generate quantities of dust, particularly in dry and windy weather conditions. While dust from construction activities tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes from the construction areas.

The proposed development will comprise demolition work, construction of an energy centre and associated ancillary development and facilitation works. The key civil engineering works which will have a potential impact on air quality during construction are summarised below:

(i) During demolition of Buildings No's 7, 8 and 9 there will be the potential for dust emissions associated with the generation and movement of the waste material associated with the demolition. A combination of excavators, trucks and other soil shifting plant will undertake the main site clearance, demolitions, and levelling aspects on a phase by phase basis.

(ii) During construction, an amount of soil will be generated as part of the site preparation works and during excavation for installation of foundations, drainage services and ancillary infrastructure;

(iii) Following completion of the building shell, commissioning of the mechanical and electrical equipment is undertaken;

(iv) Infilling and landscaping will be undertaken. Spoil generated during site preparation will be re-used where possible;

(v) Temporary storage of construction materials and fuels; and

(vi) Construction traffic accessing the site will emit air pollutants during transport in addition to onsite contruction machinery air emissions.

As outlined in Section 9.6, dust mitigation measures will be implemented for the construction phase of the proposed development to ensure no dust nuisance occurs at nearby sensitive receptors.

Appendix 8 of the "*Guidelines for the treatment of Air Quality During the Planning & Construction of National Road Schemes*"(31) discusses construction phase impacts. Table 9.4 below shows the potential distance for dust soiling from source ranges from 25m to 100m and for the potential significant impact to PM_{10}, the distance ranges from 10m to 25m depending on the scale of the construction activity. In relation to the principal works, which will occur within the site boundary, given that the façade of the nearest residence is greater than 100m from the nearest boundary, the guidance above would indicate that there is negligible potential for impacts from soiling, PM_{10} and to vegetation and therefore, no significant impacts are expected when the mitigation measures outlined in Section 9.6.1 are taken into account. The impact due to construction dust, for the principal works, at sensitive receptors is predicted to be short-term, reversible, and imperceptible.

In relation to the facilitation works, the main work with the potential for air emissions is the laying of a new gas pipeline within the Barnhall Meadows Lands, underneath the M4 and into the Kildare Innovation Campus. However, with reference to Table 9.4, the facilitation works, from a dust perspective, would be classified as minor in scale and thus any risk of soiling will be limited to 25m with the risk from PM_{10} / vegetation effects limited to 10m.

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites with limited use of haul routes	25m	10m	10m

Table 9.4: Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place (Source: Appendix 8: Assessment of Construction Impacts taken from "*Guidelines for the treatment of Air Quality During the Planning & Construction of National Road Schemes*" (38)).

9.4.2 Operational Phase

The key works which will have a potential impact on air quality during operation of the proposed development are summarised below:

(i) The operation of the CTGs in the energy centre and the scheduled testing of the back-up generators in the data storage facilities will release air pollutant emissions (primarily NO_x

emissions). For the purposed of the air modelling, a worst-case assumption of the continuous operation fo the CTGs has been assumed. However, the CTGs will never operate for more than 330 days per year and it is more likely that they will not operate for more than 1,500 hours per year.

(ii) The infrequent emergency operation of the back-up generators for the data storage facilities in the event of a loss of power from the National Grid due to a power outage would release air pollutant emissions (primarily NO_x emissions). A review of operational data from similar operational data storage facilities in Ireland indicates that it is highly unlikely that the back-up generators would be used for emergency operations for more than 24 - 48 hours per year.

(iii) Road traffic accessing the site will emit air pollutants. However, the operational phase of the proposed development is not expected to contribute a significant volume of additional traffic on the local road network (see Chapter 13). Therefore, no local air quality assessment of the traffic impact is required for this development; and

(iv) The direct air emissions, based on operation of the CTGs for up to 330 days per year and the infrequent operation of the backup diesel generators will have an impact on air emissions. However, it is predicted that these will not be significant in relation to Ireland's national emission ceiling limits for NO_X, SO_2 and NMVOCs.

9.5 Likely Significant Impacts

9.5.1 Construction Phase

The greatest impact on air quality during the construction phase of the proposed development is from construction dust emissions as a result of excavation works, infilling and landscaping activities and storage of soil in stockpiles. This leads to the potential for nuisance dust. While construction dust tends to be deposited within 100m of a construction site, the majority of the deposition occurs within the first 50m (IAQM, 2014). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

Fuels will be stored in sealed containers and emissions to air are likely to be minimal. Therefore, there is unlikely to be an impact to air quality as the result of the temporary storage of fuels for the construction phase.

Initial commissioning activities will involve testing of the back-up generators on site for 4 hours at 90% load, i.e. the first testing sequence will be commissioning of the back-up generators. The operational modelling has considered load testing of the generators four time per year at 90% load and and this does not result in a significant impact to air quality. Therefore, it is predicted that the initial commissioning tests for the back-up generators will result in an ***imperceptibly negative*** impact to air quality in the ***short-term*** and thus have a ***not significant*** impact.

In relation to the CTGs, initial commissioning activities will involve testing of the CTGs on site in a similar manner to the operational phase. The operational modelling has considered the continuous operation of the CTGs and this does not result in a significant impact to air quality. Therefore, it is predicted that the initial commissioning tests for the CTGs will result in an

imperceptibly negative impact to air quality in the ***short-term*** and thus have a ***not significant*** impact.

9.5.2 Operational Phase

Air emissions during the operational phase of a project need to take into account the ambient air quality standards and ensure that air emissions remain in compliance with the ambient air quality standards. In relation to the proposed development, as outlined in Section 9.6, an iterative stack height determination was undertaken as part of the air dispersion modelling study to ensure that an adequate release height was selected for all emission points to aid dispersion of the plume and ensure compliance with the ambient air quality limit values at all locations beyond the site boundary.

9.5.3 Do Nothing Scenario – Construction Phase

Under the Do Nothing Scenario no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area, changes in road traffic, etc. Therefore, this scenario can be considered ***neutral*** in terms of air quality.

9.5.4 Do Nothing Scenario – Operational Phase

Under the Do Nothing Scenario no operational emissions will take place. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area, changes in road traffic, etc. Therefore, this scenario can be considered ***neutral*** in terms of air quality.

9.5.5 Do Something Scenario – Operational Phase

The Do Something Scenario comprises the continuous operation of the CTGs as a worst-case although in reality they will not operate more than 330 dyas per year. In addition, the operation of the backup generators for 250 hours per year which involves the emergency operation of 72 of the 80 generators (the remaining generator serving as a “catcher” generator) has also been modelled in the same modelling run in order to capture the impact of both the CTGs and the back-up generators. The scenario also included weekly testing of all 80 generators at 25% load for 30 minutes and load bank testing at 90% load of all generators for one hour four time per year. The process emissions used for the Do Something are outlined in Table 9.5.

<u>USEPA Methodology</u>

The NO_2 modelling results at the maximum location at and beyond the site boundary are detailed in Table 9.4 based on the operation of the CTGs on a continuous basis, as a worst-case, and the operation of the backup generators for 250 hours per year in addition to the scheduled weekly and load banking testing of all back-up generators.

The results indicate that the ambient ground level concentrations are within the relevant air quality standards for NO_2. For the maximum year modelled, emissions from the site lead to an ambient NO_2 concentration (including background) which is 63% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 94% of the annual limit value at the maximum off-site receptor. Concentrations decrease with distance from the site boundary. The geographical variations in the 1-hour mean (99.8th percentile) and annual mean NO_2 ground level concentrations for the Do Something Scenario are illustrated as concentration contours in Figures 9.2 and 9.3.

The operational phase impact of the Do Something Scenario, based on the EPA EIAR Guidelines (EPA, 2022), is considered ***long-term***, ***localised***, ***negative*** and ***slight***.

Pollutant / Year	Averaging Period	Process Contribution (µg/m³)	Annual Mean Background (µg/m³) Note 1	Predicted Environmental Concentration (PEC) (µg/m³)	EU Limit Value (µg/m³)	PEC as a %age of Limit Value
NO_2 / 2017	Annual mean	25.4	12	37.4	40	94%
	99.8th%ile of 1-hr Means	98.7	24	122.7	200	61%
NO_2 / 2018	Annual mean	23.5	12	35.5	40	89%
	99.8th%ile of 1-hr Means	98.7	24	122.7	200	61%
NO_2 / 2019	Annual mean	23.1	12	35.1	40	88%
	99.8th%ile of 1-hr Means	98.6	24	122.6	200	61%
NO_2 / 2020	Annual mean	24.7	12	36.7	40	92%
	99.8th%ile of 1-hr Means	101.4	24	125.4	200	63%
NO_2 / 2021	Annual mean	22.9	12	34.9	40	87%
	99.8th%ile of 1-hr Means	100.8	24	124.8	200	62%

Note 1 S.I. 739 of 2022 and EU Directive 2008/50/EC

Table 9.5: Do Something Scenario - Dispersion Modelling Results for NO_2

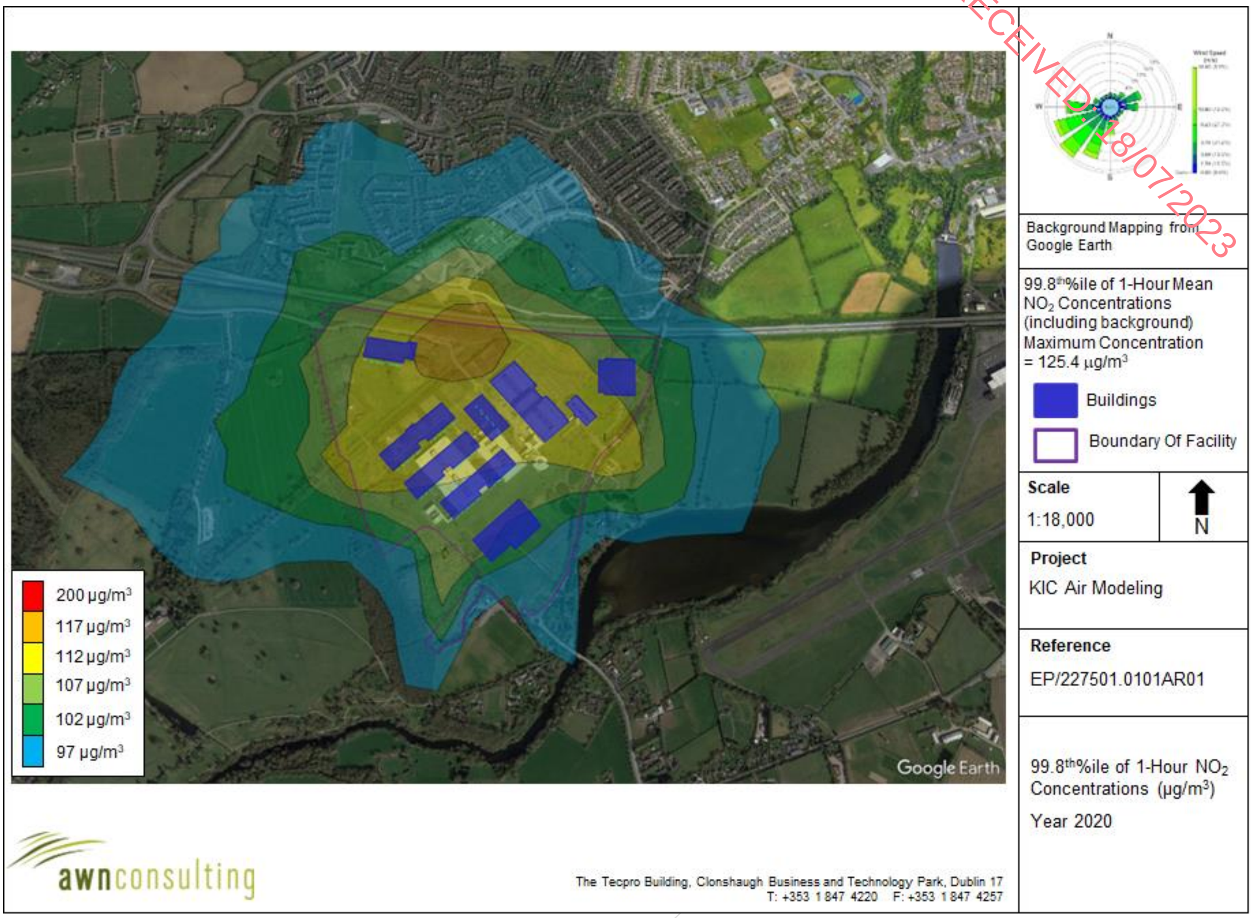

Figure 9.2 Maximum 1-Hour NO_2 Concentrations (as 99.8th percentile) (Year 2020)

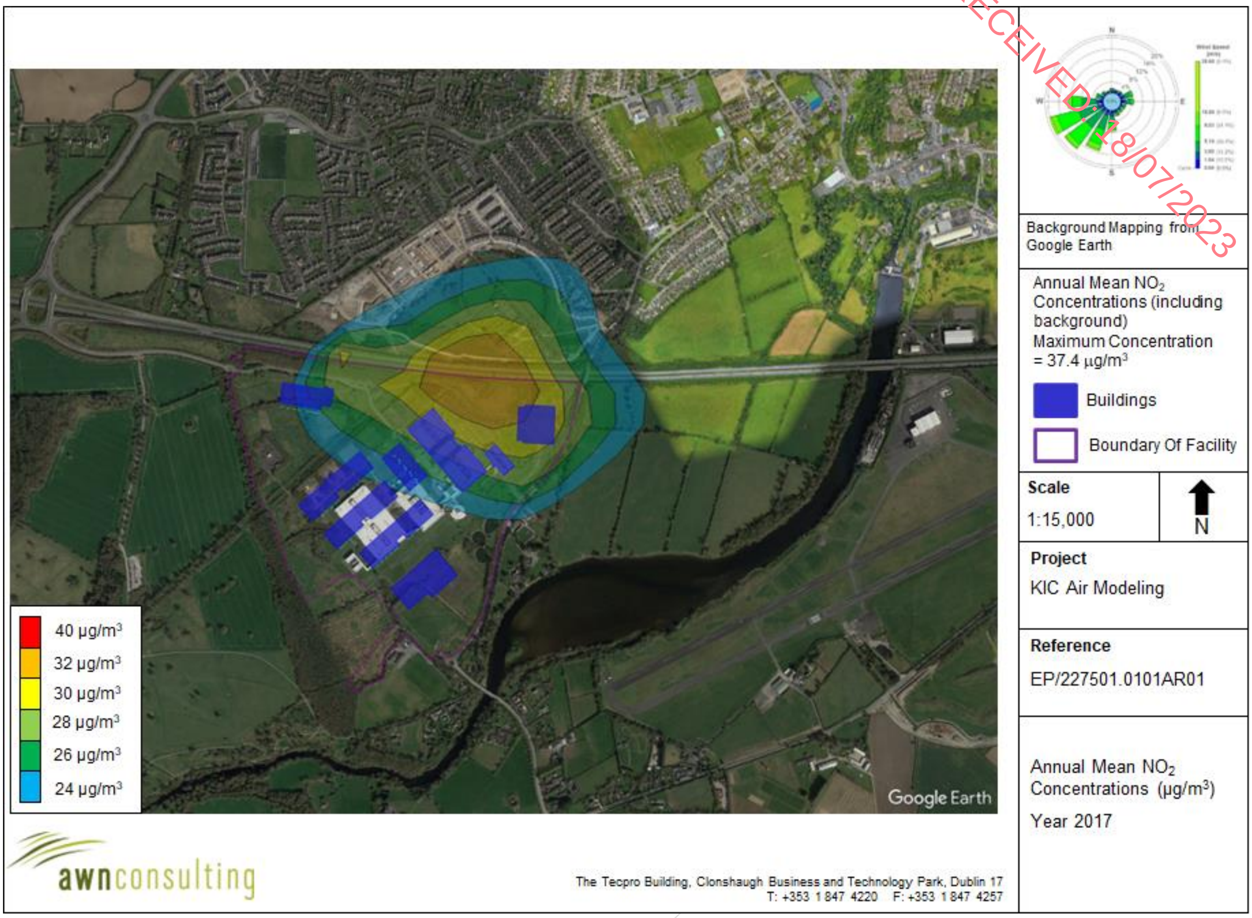

Figure 9.3 Annual Mean NO_2 Concentrations (Year 2017

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 maximum residential receptor for the Do Something Scenario. The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined as outlined in Table 9.6. The results have been compared to the 98^{th} percentile confidence level to indicate if an exceedance is likely at various operational hours for the back-up generators. The results indicate that in the maximum year, the emergency generators for the Proposed Development can operate for up to 345 hours per year in addition to the continuous operation of the CTGs, as a worst-case, before there is a likelihood of an exceedance of the ambient air quality standard (at a 98^{th} percentile confidence level). Figure 9.4 shows the statistical distribution predicted for the 98^{th} percentile (based on 345 hours of operation per year). However, the UK guidance recommends that there should be no running time restrictions placed on back-up generators which provide power on site only during an emergency power outage.

Pollutant / Meteorological Year	Hours of operation (Hours) (98th%ile) Allowed Prior To Exceedance Of Limit Value	UK Guidance – Probability Value = 0.02 (98th%ile)Note 1
NO_2 / 2017	446	**0.02**
NO_2 / 2018	360	
NO_2 / 2019	383	
NO_2 / 2020	**345**	
NO_2 / 2021	440	

Note 1 Guidance Outlined In UK EA publication "Diesel Generator Short-term NO_2 Impact Assessment" (EA, 2016)

Table 9.6 Hypergeometric Statistical Results at Maximum Residential Receptor – NO_2, Do Something Scenario

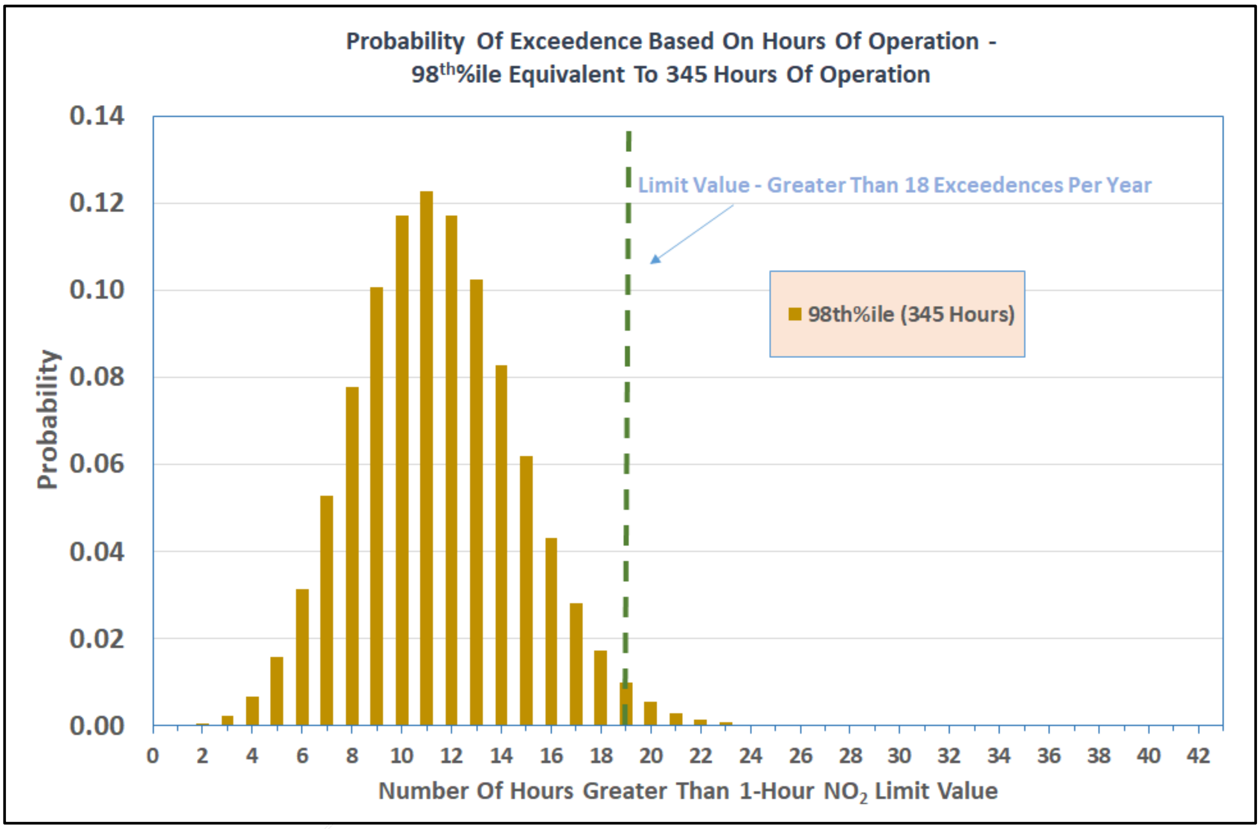

Figure 9.4 Probability of Exceedance of 1-Hour NO_2 Ambient Air Quality Limit Value based on Hours of Operation for Emergency Generators for Proposed Development

9.6 Mitigation Measures

In order to sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for the construction and operational phases associated with the proposed development.

9.6.1 Construction Phase - Air Quality

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from

Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);
- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

9.6.1.1 Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 9.1 for the windrose for Casement Aerodrome). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind (to the east or north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent will monitor the contractors' performance to ensure that the proposed mitigation measures are implemented, and that dust impacts and nuisance are minimised;

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;

- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details;

- Community engagement shall be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;

- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;

- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;

- The procedures put in place will be reviewed at regular intervals and monitoring conducted and recorded by the principal contractor. It is recommended that reviews are conducted on a monthly basis as a minimum.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

9.6.1.2 Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;

- Access gates to the site shall be located at least 10m from sensitive receptors where possible;

- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and

- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

9.6.1.3 Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and
- During periods of very high winds (gales), activities likely to generate significant dust emissions shall be postponed until the gale has subsided.

9.6.1.4 Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions;

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;

- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); and

- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

9.6.1.5 Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;

- At the main site traffic exits, a wheel wash facility shall be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

9.6.1.6 Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;

- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and

- The specification of effective measures to deal with any complaints received.

9.6.2 Operational Phase

The stack heights of the CTGs at 15m above local ground level and back-up generators at a stack height of 18m above local ground level have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards at all off-site locations (including background concentrations). No additional mitigation measures are proposed for the operational phase of the development.

A green wall will be installed within the campus which will trap 838.5kg of dust and produce 11.0kg of oxygen every year.

9.7 RESDIUAL EFFECTS OF THE PROPOSED DEVELOPMENT

9.7.1 Construction Phase

Dust and Particulate Matter
When the dust mitigation measures detailed in the mitigation section (section 9.6.1) of this report are implemented, fugitive emissions of dust and particulate matter from the site will be ***neutral***, ***short-term*** and ***not significant*** in nature, posing no nuisance at nearby receptors.

Impacts on Human Health
Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be ***neutral, short-term*** and ***imperceptible*** with respect to human health.

9.7.2 Operational Phase

The Operational Phase Scenario, after mitigation, remains unchanged from the results outlined in Section 9.5, which is based on the worst-case assumption of the CTGs emission points running on gas for the full year in addition to the operation of the backup generators operating for 250 hours per year which involves the emergency operation of 72 of the 80 generators (the remaining generator serving as a “catcher” generator). The scenario also included scheduled weekly testing and quarterly load-banking of all back-up generators.

The operational phase impact of the Proposed Development, based on the EPA EIAR Guidelines (EPA, 2022), is considered ***long-term***, ***localised***, ***negative*** and ***slight***.

9.7.2.1 *Summary of Modelling Assessment*
The modelling assessment has found that ambient NO_2 concentrations as a result of the Proposed Scenario are in compliance with the relevant ambient air quality limit values at all locations at or beyond the site boundary. The impacts to air quality from operation of the proposed development are therefore deemed ***long-term*** and ***slight*** in terms of significance and ***negative*** in terms of quality.

9.7.2.2 Regional Air Quality

Directive (EU) 2016/2284 "*On The Reduction Of National Emissions Of Certain Atmospheric Pollutants And Amending Directive 2003/35/EC And Repealing Directive 2001/81/EC*" was published in December 2016. The Directive will apply the 2010 National Emission Ceiling Directive limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3 and $PM_{2.5}$ as detailed in Section 9.2.1.

Based on the generation of 173.2 MW, the NO_X emissions based on electricity from the National Grid over the course of one year (equivalent to 809.8 GWh) will equate to 167 tonnes per annum which is 0.40% of the National Emission Ceiling limit for Ireland in 2030. Similarly, SO_2 emissions associated with this electricity use over the course of one year (809.8 GWh) will equate to 60 tonnes per annum which is 0.55% of the National Emission Ceiling limit for Ireland in 2030. Additionally, NMVOC emissions associated this electricity over the course of one year (809.8 GWh) will equate to 8.6 tonnes per annum which is 0.017% of the National Emission Ceiling limit for Ireland in 2030. Additionally, $PM_{2.5}$ emissions associated this electricity over the course of one year (809.8 GWh) will equate to 7.5 tonnes per annum which is 0.067% of the National Emission Ceiling limit for Ireland in 2030. Thus, the NO_X, SO_2, NMVOC and $PM_{2.5}$ indirect emissions associated with the operation of the Proposed Development based on electricity from the national grid are ***indirect***, ***long-term, negative*** and ***slight*** with regards to regional air quality.

9.7.2.3 Human Health

Air dispersion modelling was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the dispersion modelling results, emissions from the site, assuming scheduled testing as well as emergency operation of the back-up generators, are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. In relation to the spatial extent of air quality impacts from the site, ambient concentrations will decrease significantly with distance from the site boundary.

9.8 Cumulative Effects

Construction Phase

When the dust mitigation measures detailed in the mitigation section (section 9.6.1) of this report are implemented, cumulative fugitive emissions of dust and particulate matter from the site and nearby facilities undergoing construction will be ***neutral***, ***short-term*** and ***not significant*** in nature, posing no nuisance at nearby receptors.

Operational Phase

There are no nearby sources with emissions of NO_2/NO_X of sufficient magnitude to overlap with site emissions from the proposed facility and thus therefore no offsite cumulative impacts are anticipated. With appropriate mitigation measures it is not predicted that any cumulative impacts will occur during the combined construction and operational phase due to NO_2/NO_X impacts.

9.9 Residual Impact

Modelled emissions associated with the facility will lead to ambient concentrations which are within the relevant ambient air quality standards for all pollutants modelled. There are no significant residual impacts on air quality due the proposed development associated with the operation of the facility.

9.10 Interactions

The potential interaction between Air Quality and other Sections in the EIAR is primarily limited to *Population & Human Health*, *Traffic & Transportation* and the chapter on *Interactions*. This Air Quality Section has been prepared in consideration of and in conjunction with the relevant outputs of these Sections.

9.11 Monitoring

As part of the sites operational licence (IEL), any NO_X monitoring requirements will be set out in the licence.

9.12 Difficulties Encountered In Compiling Information

No significant difficulties were encountered in the process of compiling the air quality chapter of the EIAR.

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10.0 CLIMATE

10.1 Introduction

AWN Consulting Limited has been commissioned by Tom Phillips and Associates to conduct a climate impact assessment of the proposed development and associated facilitation works.

This chapter evaluates the impacts which the project may have on Climate as defined in the Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

In relation to the proposed development, the facility will have 9 combustion turbine generators (CTGs) which will have a stack height of 15m above ground level and 80 back-up generators which will have a stack height of 18m above ground level. The turbines will be fueled by natural gas or biogas supplied by Gas Networks Ireland (GNI) via their existing high-pressure network that runs close to the site. The turbines will be enclosed by a wall c.14m in height.

The back-up generators will power the data centre in the event of an interruption to the supply of power from the National Grid. The other aspects of the development including the facilitation works, the data halls and the Deep Tech buildings will lead to some greenhouse gas (GHG) emissions during construction but will not be significant sources of air emissions during the operational phase.

This chapter has been prepared by AWN Consulting Limited – Dr Edward Porter (BSc PhD C Chem MRSC MIAQM) and reviewed by Dr. Avril Challoner (BSc PhD C Chem MRSC MIAQM). Dr. Edward Porter is Director with responsibility for Air Quality with AWN Consulting. He holds a BSc from the University of Sussex (Chemistry), and a PhD in Environmental Chemistry (Air Quality) in UCD where he graduated in 1997 and is a Full Member of the Royal Society of Chemistry (MRSC CChem) with 25 years' experience. He specialises in the fields of climate, air quality, odour and air dispersion modelling.

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10.2 Methodology

The climate assessment has been carried out in line with the guidance outlined in the European Commission publication "*Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report*" (EC, 2017) and the EPA publication "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2022*" (EPA, 2022a) and using the methodology outlined in the guidance documents published by IEMA and the EPA.

The climate assessment has been carried out in line with the guidance outlined below:

- EPA (2022a) Guidelines on the Information to be contained in Environmental Impact Statements,
- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment,
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report,
- IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction,
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- IEMA (2020a) EIA Guide to: Climate Change Resilience and Adaptation,
- IEMA (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance, and
- UKHA (2021) Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 – Climate.

In the absence of specific Irish or United Kingdom (UK) guidance in relation to industrial facilities, the guidance from the UK Highway Agency (UKHA) "*Design Manuals for Roads and Bridges (DMRB) - LA 114 Climate*" (hereafter referred to as LA 114 Climate) (UKHA, 2021) has been consulted which is still relevant to GHG emissions from industrial sources. LA 114 Climate advises that the assessment of a Proposed Development should describe the likely significant effects on the environment resulting from both the:

- Impact of a project on climate (GHG emissions); and
- Vulnerability of a project to climate change (adaptation).

The assessment methodology has been derived with reference to the most appropriate guidance documents relating to climate which are set out in the following sections of this Chapter. An overview of the methodology undertaken for the climate impact assessment is outlined below:

- A detailed baseline review of GHG emissions has been undertaken in order to characterise the baseline environment. This has been undertaken through review of available published GHG emission data;
- A review of the most applicable guidelines for the assessment of GHG emissions has been carried out in order to define the significance criteria for the Construction and Operational Phases of the Proposed Development. These guidelines describe appropriate methods for quantifying the emissions of GHG emissions from the Proposed Development;
- Predictive calculations and impact assessments relating to the likely Operational Phase climatic impacts of the Proposed Development have been undertaken;
- An assessment of the vulnerability of the Proposed Development to climate change has been undertaken; and
- A schedule of mitigation measures has been incorporated where required to reduce, where necessary, the identified potential climatic impacts associated with the Proposed Development.

10.2.1 Relevant Guidelines, Policy and Legislation

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, 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 above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions was based on Nationally Determined Contributions (INDCs) which formed the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation) relating to the non-ETS sector and Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 relating to the ETS sector. These measures. These measures aim to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading System (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels. The Sharm el-Sheikh Implementation Plan was drafted at COP27 in November 2022. This plan included a new funding arrangement for "loss and damage" for vulnerable countries hit hard by climate disasters. No significant agreements were made regarding the phasing out of fossil fuels or limiting global heating to 1.5°C above pre-industrial levels, however the plan resolves to pursue further efforts to limit the rise to 1.5°. In order to limit global warming to 1.5 °C rapid, deep and sustained reductions in global greenhouse gas emissions of 43% by 2030 relative to the 2019 level will be required.

Following on from the recently published European Climate Law (EU, 2021), and as part of the EU's "*Fit for 55*" legislative package where the EU has recently committed to a domestic reduction of net greenhouse gas emissions by at least 55% compared to 1990 levels by 2030, *Regulation (EU) 2018/842 Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013* (the Effort Sharing Regulation) is proposed to be strengthened with increased ambition by the year 2030. The proposal for Ireland is to increase the GHG emission reduction target from 30% to 42% relative to 2005 levels whilst the ETS market will also have more stringent reductions from the currently proposed reduction of 43% by 2030 compared to 2005 to a 61% reduction by 2030 based on annual reductions of 4.2% compared to the previous annual reduction level of 2.2% per year (EU, 2021) with levels in 2021 reducing to 1,307 million tonnes CO_{2eq}.

10.2.1.1 Emission Trading System

The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing, heavy industry and facilities which have greater than 20MW thermal input capacity (which is applicable to the Proposed Development). Under the ETS, there are no country-specific targets. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS and thus includes GHG emissions from transport, residential and commercial buildings and agriculture. In contrast to the ETS, Ireland has a country-specific obligation under the Regulation of a 42% reduction in non-ETS GHG emissions by 2030 relative to its 2005 levels.

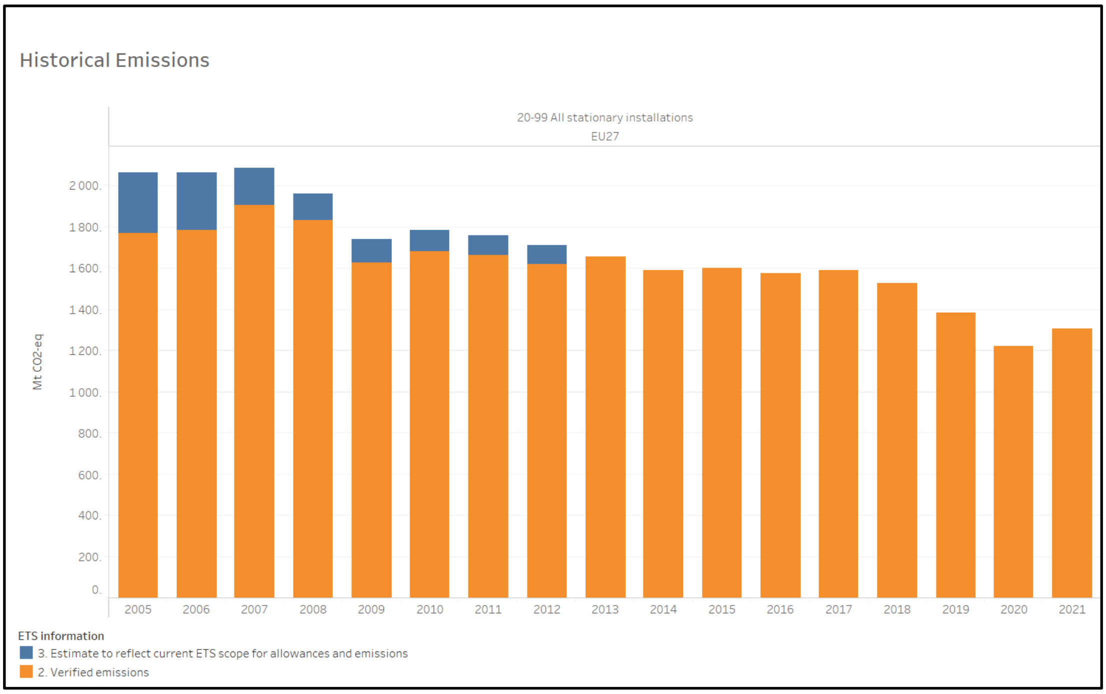
As outlined in European Commission publication "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*" (EC, 2013) the assessment of the impact of the project on climate should be context-specific. Within the context of global or EU-wide emissions, the GHG emissions associated with the project should be assessed in the context of the ETS. The approach that has been adopted at EU level is the EU Climate and Energy Package. In this regard, the EC guidance (EC, 2013) has stated that:

"The EU Emissions Trading System, the backbone of the EU mitigation effort, which sets a cap on emissions from the most polluting sectors including over 11,000 factories, power plants and other installations, including airlines. By 2020, the cap should result in a 21% reduction relative to 2005 levels. The EU ETS covers about 40% of all EU emissions." (EC, 2013).

As outlined in the EU publication "*The EU Emissions Trading System in 2020: trends and projections*" (EU, 2020), the European Union's energy system is decarbonising rapidly. The report states:

"*Total ETS emissions from stationary installations declined by 9.1% between 2018 and 2019, the largest drop in a decade, driven by a strong decrease in coal use for power production*" (EU, 2020)

As shown in Figure 10.1 in the most recent verified emissions from the ETS covering 2005 – 2021 this trend is continuing with the exception of 2020 due to COVID.



Taken from https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1

Figure 10.1 *Historical ETS Verified Emissions 2005 - 2021*

The European Topic Centre on Climate report entitled "*Trends and projections in the EU ETS in 2020*" (ETC, 2020) indicates that the reduction in GHG emissions is predicted to continue up to at least 2030 due to current policies in place. As shown in Figure 10.2, both the energy industries and "other industries" are predicted to decrease significantly by 2030.

Figure 3.1 **EU ETS historic and projected emissions between 2005 and 2030 for EU-27, by inventory category**

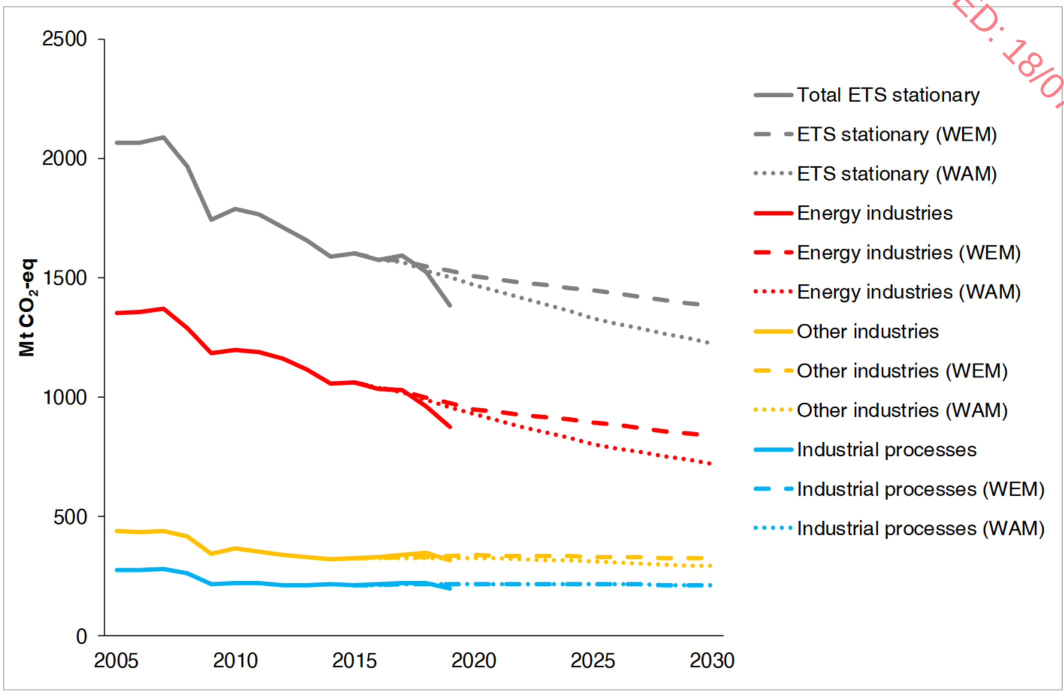


Figure 10.2 *Historical ETS Verified Emissions & Project Emissions 2005 – 2030 (WEM = with existing measures, WAM = with additional measures)*

10.2.1.2 National Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the 2015 Act). The purpose of the 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' (3.(1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'.

The 2019 *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The 2019 CAP set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

In June 2020, the Government published the Programme for Government – Our Shared Future (Government of Ireland 2020). In relation to climate, there is a commitment to an average 7% per annum reduction in overall greenhouse gas emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050. Policy changes include the acceleration of the electrification of the transport system, including electric bikes, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there is a policy to ensure an unprecedented model shift in all areas by a reorientation of investment to walking, cycling and public transport.

The Climate Action and Low Carbon Development (Amendment) Act 2021 (the 2021 Climate Act) (No. 32 of 2021) was published in July 2021. The purpose of the 2021 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*'. The 2021 Climate Act will also '*provide for carbon budgets and a sectoral emissions ceiling to apply to different sectors of the economy*'. The 2021 Climate Act removed any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority. The 2021 Climate Act set a target of a 51% reduction in the total amount of greenhouse gases over the course of the first two carbon periods ending 31 December 2030 relative to 2018 annual emissions. The 2021 Climate Act defined the carbon budget as 'the total amount of greenhouse gas emissions that are permitted during the budget period'

The Climate Action and Low Carbon Development (Amendment) Act 2021 (No. 32 of 2021) outlines a series of specific actions including:

- To make a strategy to be known as the 'National Long Term Climate Strategy' not less than once in every five-year period with the first to be published for the period 2021 to 2035 and with each subsequent Strategy covering the next three five-year carbon budgets and also include a longer term perspective of at least 30 years;
- To adopt a system of carbon budgets which will be determined as part of a grouping of three five-year periods calculated on an economy-wide basis, starting with the periods 2021 to 2025, 2026 to 2030, and 2031 to 2035;
- To introduce a requirement for Government to adopt "sectoral emission ceilings" for each relevant sector within the limits of each carbon budget;
- To request all local authorities to prepare climate action plans for the purpose of contributing to the national climate objective. These plans should contain mitigation and adaptation measures that the local authority intends to adopt;
- Increasing the power of the Advisory Council to recommend the appropriate climate budget and policies;
- Requiring the Minister to set out a roadmap of actions to include sector specific actions that are required to comply with the carbon budget and sectoral emissions ceiling for the period to which the plan relates; and
- Reporting progress with the CAP on an annual basis with progress including policies, mitigation measures and adaptation measures that have been adopted.

In terms of wider energy policy, as outlined in the EPA publication "*Ireland's Greenhouse Gas Projections 2021-2040*" (EPA, 2022b) under the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 415.9% to 4.5 Mt CO_{2eq} over the period 2020 to 2030 including the proposed increase in renewable energy generation to approximately 80% of electricity consumption:

- In this scenario it is estimated that renewable energy generation increases to approximately 80% of electricity consumption. This is mainly a result of further expansion in wind energy (comprising 5.0 GW offshore). Expansion of other renewables (e.g. solar photovoltaics) also occurs under this scenario.
- Under the With Additional Measures, one power station operates to the end of 2023 with 30% co-firing.

- In this scenario the Moneypoint power station is assumed to operate in the market up to end 2025 at which point it no longer generates electricity from coal.
- In terms of inter-connection, it is assumed that the Greenlink 500MW interconnector to the UK to come on stream in 2025 and the Celtic 700MW interconnector to France to come on stream in 2027 (EPA, 2022b).

The 2023 *Climate Action Plan* (CAP) (Government of Ireland, 2022) provides a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050, as committed to in the Programme for Government and set out in the Climate Act 2021. The plan outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. CAP 2023 also detailed the required governance arrangements for implementation including carbon-proofing of policies and establishment of sectoral emission ceilings and carbon budgets. In relation to data centres, the *CAP 2021* provides that emissions from industry sectors covered by the ETS are subject to EU-wide rather than national targets set out under EU Effort Sharing Regulation. Box 2.1 states:

> *"emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors be reduced by 43% by 2030, relative to 2005 levels"*.

In relation to the 2023 Climate Action Plan, under Section 13.3.5 EU Emission Trading System, the 2023 CAP states:

> *"The EU ETS is an important measure for reducing industry GHG emissions. The Fit for 55 proposals for the reformed EU ETS will increase emissions reductions in this sector from the current 43% to 61%, in the period 2005 to 2030. Changes include a steeper annual reduction in the emissions ceiling and reductions in free allowances, alongside the corresponding introduction of a carbon border adjustment mechanism." (2023 CAP, page 155).*

As part of the preparation of a 'local authority climate action plan', each local authority shall consult and co-operate with an adjoining local authority in making a local authority climate action plan and co-ordinate the mitigation measures and adaptation measures to be adopted, where appropriate. Each local authority is also required to consider any significant effects the implementation of the local authority climate action plan may have on the adjoining local authority.

Individual county councils in Ireland have also published their own Climate Change Strategies which outline the specific climate objectives for that local authority and associated actions to achieve the objectives. The Kildare Climate Change Adaptation Strategy 2019 – 2024 (KCC, 2019) outlines a number of goals and plans to prepare for and adapt to climate change. There are three key action areas within the Kildare Climate Change Adaptation Strategy which are:

(i) Ensure a proper comprehension of the key risks and vulnerabilities of climate change

(ii) Bring forward the implementation of climate resilient actions in a planned and proactive manner and,

(iii) Ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of Kildare County Council

The Long-term Climate Action Strategy has not yet been published although the government issued the "*Long-term Strategy on Greenhouse Gas Emissions Reduction*" in November 2019 (Government of Ireland, 2019). In relation to electricity the Government commits to the full decarbonisation of the electricity system by 2050. In addition, the Gas Networks Ireland (GNI) report *Vision 2050 – A Net Zero Carbon Gas Network For Ireland*" (Ervia, 2019) highlights that by 2050 natural gas will be replaced by biomethane, abated natural gas (with Carbon Capture & Storage (CCS)) and hydrogen. By 2030 it is envisaged that 20% of current demand will be biomethane gas and increasing to 37% by 2050 with hydrogen accounting for 13% by 2050. The report states that CCS technologies will increasingly capture and store CO_2 emissions from natural gas used for power generation and large industry and will deliver net zero carbon by 2050. Thus, Gas Networks Ireland has stated that the impact of using gas supplied by Ervia by 2050 will not be significant and will have an overall net zero impact on climate.

The carbon budget programme was published in November 2021 and comprises three successive 5-year carbon budgets. In relation to carbon budgets, the Climate Action and Low Carbon Development (Amendment) Act 2021 states '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*'. The carbon budget is to be produced for 3 sequential budget periods with the third carbon budget in draft format. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. The total emissions allowed under each budget is set out below in Table 10.1, as well as the average annual reduction for each 5-year period.

Period	Mt CO2eq	Emission Reduction Target
2021-2025	295 Mt CO2eq	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO2eq	Reduction in emissions of 15.3% per annum for the second budget period.
2031-2035	151 Mt CO2eq	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 10.1 *5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2025*

The CAP 2023 provides that the economy-wide carbon budgets will be supplemented by sectoral emissions ceilings, setting the maximum amount of GHG emissions that are permitted in a given sector of the economy during each five-year carbon budget. The recently agreed Sectoral Emission Ceilings for each Sector are shown in Table 10.2. 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. The electricity sector emitted approximately 10.5 $MtCO_{2eq}$ in 2018 and has a ceiling of 3 $MtCO_{2eq}$ in 2030 which is a 71% reduction over this period.

Sector	Reduction Required	2018 Emissions ($MtCO_{2eq}$)	2030 Emission Ceiling ($MtCO_{2eq}$)
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**	50%	2	1

Table 10.2 *Sectoral Emission Ceiling 2030*

As outlined in the "*The Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy*" (Government of Ireland 2022) the policy document states that "the Government has a preference for data centres developments that can demonstrate a clear pathway to decarbonise and ultimately provide net zero data services. It is expected that data centres 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 2023 CAP has outlined the path towards the electricity target by 2030. The core measures are:

- Increasing the share of renewable electricity to 80%,
- Indicative Onshore Wind Capacity of up to 9GW,
- Indicative Offshore Wind Capacity of at least 5GW,
- Indicative Solar PV Capacity of 8GW.

A research report by Baringa / Wind Energy Ireland (Baringa, 2021) has indicated that a carbon intensity of between 38 – 84 gCO_2/kWh was achievable for the national grid. At a keynote speech for the EPA's Climate Change conference in June 2022 the ESB Chief Executive stated that the projected carbon intensity figure for 2030 is likely to be 66 gCO_2/kWh (ESB 2022) as shown in Figure 10.3 which is in line with the Baringa report. The ESB has also committed to net zero by 2040 as outlined in recent publications (ESB,2021, 2022). Thus, the current assessment has been conducted on the basis of 100 gCO_2/kWh in 2030 which is a conservative assumption.

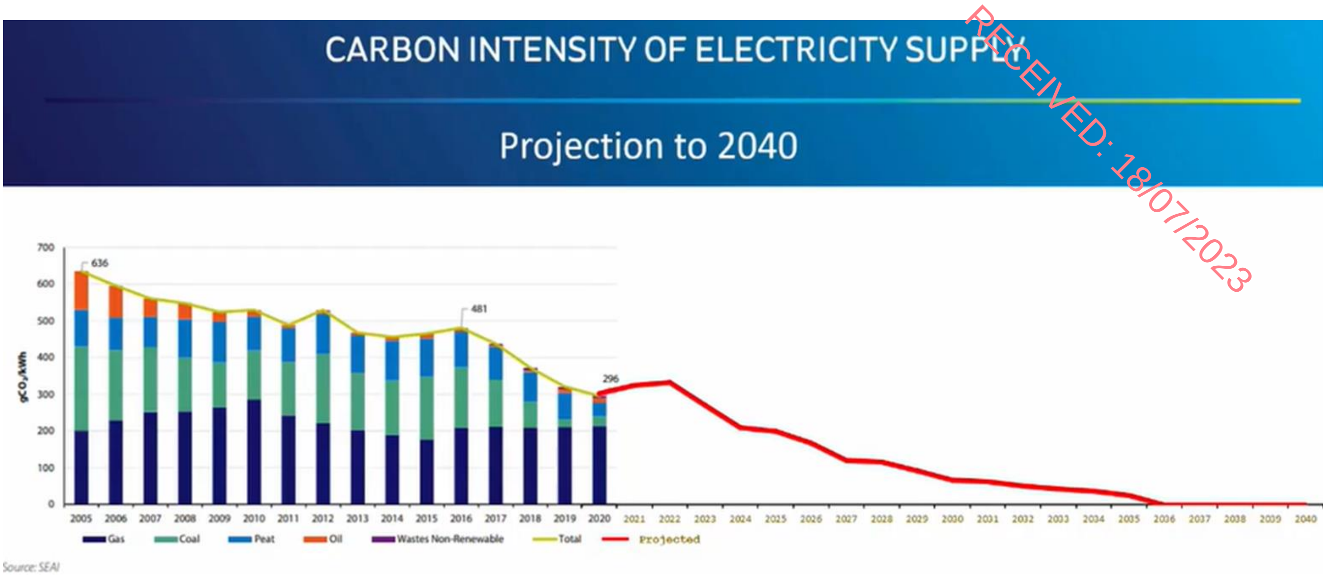


Figure 10.3 *ESB Presentation At EPA Climate Change Conference 2022*

In relation to the decarbonisation of natural gas and the availability of biomethane, the publication *"Sustainability of Biomethane Production in Ireland"* (KPMG/GNI, 2021) has assessed the environmental sustainability of a proposed national biomethane industry in Ireland based on farm-scale anaerobic digestion (AD) plants. The report found that the industry is technically feasible with the current government target of 1.6 TWh by 2030 achievable and more ambitious targets set out in the Government's Renewable Heat Obligation consultation of 5.5TWh also feasible.

The report envisages a roll-out of 125 x 20 GWh farm-scale biomethane AD plants by 2030 leading to 2.5TWh of biomethane production which will require 125,000 acres (1.1% of Ireland's agricultural land). The level of production would be sufficient to displace 15% of current commercial and industrial natural gas consumption. As outlined in *EU Directive 2018/2001 on the promotion of the use of energy from renewable sources (RED II Directive)*, the use of biomethane to produce electricity based on wet manure in a closed digestate system is at least carbon neutral and thus replacing natural gas by biomethane will lead to direct GHG emission savings.

These measures in total have the potential for an additional abatement impact of between 6 – 8 $MtCO_{2eq}$ which can be compared to the target of 7.5 $MtCO_{2eq}$ reduction required by 2030. In addition, there is a target of between 1-3TWh of zero-emission gas generation (including green hydrogen).

10.3 Climate Criteria For The Rating Of Impacts

The Institute of Environmental Management and Assessment (IEMA) guidance note on "*Assessing Greenhouse Gas Emissions and Evaluating their Significance*" (IEMA, 2022) states that **"***the crux of significance regarding impact on climate is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050"*. Mitigation has taken a leading role within the Guidance compared to the previous edition published in 2017. Early stakeholder engagement is key and therefore mitigation should be considered from the outset of the project and continue throughout the project's lifetime in order to maximise GHG emissions savings.

The assessment aims to quantify the difference in GHG emissions between the proposed project and the baseline scenario (the alternative project/solution in place of the proposed project). This is done by calculating the difference in whole life net GHG emissions between the two options. The IEMA EIA guidance (IEMA, 2022) does not recommend a particular approach for this due to variations of situations but instead it sets out advice for the key common components necessary for undertaking a GHG emissions assessment. During the assessment IEMA recommend the use of a reasonable worst-case scenario rather than an absolute worst-case scenario. The IEMA Guidance (IEMA, 2022) states that a GHG emissions assessment should incorporate the following steps into any climate assessment:

1. Set the scope and boundaries of the GHG assessment;
2. Develop the baseline;
3. Decide upon the emissions calculation methodologies;
4. Data collection;
5. Calculate/determine the GHG emissions inventory; and
6. Consider mitigation opportunities and repeat steps 4 & 5.

Activities that do not significantly change the result of the assessment can be excluded where expected emissions are less than 1% of total emissions, and where all such exclusions should be clearly stated and total a maximum of 5% of total emissions.

When considering the cumulative assessment, all global cumulative GHG sources are relevant to the effect on climate change as outlined in the IEMA Guidance (IEMA, 2022) as all GHG emissions contribute to global warming irrespective of geographical location. As a result, the effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed. This is due to the fact that there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other. The following section details the specific appraisal methods utilised in order to complete the assessment in accordance with the IEMA Guidance (IEMA, 2022).

10.3.1 Construction Phase

For the purpose of the qualitative climate assessment of the construction phase, the combined impact of demolition of Buildings No's 7, 8 and 9 and the concurrent construction of all proposed buildings at the site has been assumed to occur together. In addition, the facilitation works, including the upgrade of the gas main external to the site, the upgrade of the existing gas skid on site to power the proposed energy centre and the development of the proposed replacement 110kV Substation and uprating of existing overhead lines from the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad has been assessed.

The current assessment focused on identifying the impact of the facilitation works and the demolition and construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of GHG generating demolition and construction activities associated with the proposed development.

10.3.2 Operational Phase

The assessment for the Proposed Development is based on the use of electricity to power the facility in addition to the emergency operation of the backup generators for 250 hours per year based on the use of diesel with hydrogenated vegetable oil (HVO) used in preference where available. The back-up generators are only used in the event of an interruption to the supply of electricity from the National Grid with the exception of testing. In reality and based on recent experience over the past number of years of the electricity network (Eirgrid, 2022), backup generators are rarely used other than during testing and maintenance.

The on-site energy centre will also provide dispatchable power to the national electrical grid. The Energy Centre is not proposed as the primary power supply for the proposed development. It will not be connected to the proposed data centres or deeptech buildings. The energy centre will operate as dispatchable power in line with CRU and EirGrid requirements. The CTGs will operate no more than 330 days per year and it is likely they will operate no more than 1,500 hours per year as dispatchable power.The turbines will be fueled by natural gas / biogas supplied by Gas Networks Ireland (GNI) via the upgraded high-pressure network that runs close to the site. The combustion turbine generator's (CTG's) will be primarily fuelled by natural gas supplied by Gas Networks Ireland (GNI). The facility will also include a 5-day supply of HVO as a backup fuel should the natural gas system be unavailable in an emergency situation.

When assessing significance, the *2010 IEMA Principles Series on Climate Change Mitigation & EIA* (IEMA, 2010) defines three overarching principles:

- The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality); and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit; as such any GHG emissions or reductions from a project might be considered to be significant. The environmental limit is the global GHG emission budget that defines a level of dangerous climate change, and any GHG emission that contributes to exceedance of that budget or threatens efforts to stay within it can be considered as significant.

The 2020 Guidance (IEMA, 2022) document builds on those principles with three points:

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible;
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages; and
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

The criteria for determining the significance of effects are a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. In relation to climate, there is no project specific assessment criteria, but the project will be assessed against the recommended IEMA (IEMA, 2022) significance determination. This takes account of any embedded or committed mitigation measures that form part of the design which should be considered.

- Major or moderate adverse impact (significant): A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the net zero[1] trajectory by 2050 or sectoral based transition to net zero targets, results in a significant adverse effect. It is down to the consultant completing the assessment to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects. A project's impact can shift from significant adverse to nonsignificant effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards net zero. Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect. This is particularly true where policy lags behind the necessary levels of GHG emission reductions for a science based 1.5°C compatible trajectory towards net zero.
- Minor adverse impact (not significant): A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. The project may have residual impacts but is doing enough to align with and contribute to the relevant transition scenario. A 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral[2] (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change and achieving net zero by 2050. A 'minor adverse' effect or better is a high bar and indicates exemplary performance where a project meets or exceeds measures to achieve net zero earlier than 2050.
- Negligible Impact (not significant): A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant.
- Beneficial Impact (significant): A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.

The impact of the operational phase of the proposed development on climate was determined by an assessment of the direct (due to natural gas and infrequent diesel usage) and indirect CO_2 emissions associated with electricity over the period 2025 to 2040. The details and results of the assessment are provided in Section 10.7.2.2. The change in the renewable fraction of electricity from the national grid and the biomethane fraction of natural gas with time have also been considered.

[1] Net Zero: "*When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period.*" Net zero is achieved where emissions are first reduced in line with a 'science-based' trajectory with any residual emissions neutralised through offsets.

[2] Carbon Neutral: "*When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period irrespective of the time period or magnitude of offsets required.*"

10.3.4 Significance Criteria – Vulnerability of the Proposed Scheme to Climate Change

Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EC, 2013) and *IEMA EIA Guide to Climate Change Resilience and Adaptation* (IEMA, 2020) outlines an approach for undertaking a risk assessment where there is a potentially significant impact on the project receptors due to climate change. The approach to the assessment is based on the following steps:

- Identify potential climate change risk to a project;
- Assess these risks (potentially prioritising to identify the most severe); and
- Formulating mitigation actions to reduce the impact of the identified risks.

The risk assessment assesses the likelihood and consequence of the impact occurring, leading to the evaluation of the significance of the impact. The assessment of likelihood should include consideration of available climate projections data for the project (IPCC, 2015). The Operational Phase assessment, after identifying the hazards and benefits of the climate change impacts, has assessed the likelihood and consequences using the framework outlined in recent risk assessment publications (Raydugin Y. (2014), EPA (2010)) as outlined in Tables 10.3, 10.4 and 10.5.

Likelihood Category (Score)	Description (Probability and Frequency of Occurrence)
Very high (5)	The event may occur with a > 90% probability
High (4)	The event may occur with a 50% - 90% probability
Medium (3)	The event may occur with a 10% - 50% probability
Low (2)	The event may occur with a 0.1% - 10% probability
Very Low (1)	The event may occur with a <0.1% probability

Note 1 Based on "Consistent Application of Risk Management for Selection of Engineering Design Options in Mega-Projects", Int. Journal of Risk & Contingency Management (Oct 2014)

Table 10.3 Likelihood Categories

Consequence of Impact (Score)	Description Note 1
Very large adverse (5)	Very heavy contamination, widespread effects of extended duration
Large adverse (4)	Heavy contamination, localised effects of extended duration
Moderately adverse (3)	Simple contamination, widespread effects of short duration
Minor adverse (2)	Simple contamination, localised effects of short duration
Negligible (1)	No contamination, localised effects

Note 1 Based on "Guidance to Licensees/COA holders on the Notification, Management and Communication of Environmental Incidents" (EPA, 2010)

Table 10.4 Measure of Consequence

		Measure of Likelihood				
		Very Low	Low	Medium	High	Very High
Measure of Consequence	Very Large	5	10	15	20	25
	Large	4	8	12	16	20
	Moderate	3	6	9	12	15
	Minor	2	4	6	8	10
	Negligible	1	2	3	4	5

Note 1 Based on "Consistent Application of Risk Management for Selection of Engineering Design Options in Mega-Projects", Int. Journal of Risk & Contingency Management (Oct 2014) (Red = high risk, Yellow = medium risk, Green = low risk)

Table 10.5 Significance Matrix

10.4 Receiving Environment

Climate is defined by the IPCC (IPCC, 2015) as the average weather over a period of time, whilst climate change is a significant change to the average weather. Climate change is a natural phenomenon but in the industrial age human activities, through the release of GHGs, have impacted on the climate (EPA, 2017). The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat trapping abilities resulting in increased average global temperatures over the past number of decades. The release of CO_2 as a result of burning fossil fuels, has been one of the leading factors in the increase of the 'Greenhouse Effect'. The most significant GHGs are CO_2, methane (CH_4) and nitrous oxide (N_2O).

For the purposes of this assessment, the definition outlined in Council Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (hereafter referred to as the Renewable Energy Directive) for GHGs has been used. In Annex V, C. Methodology Point 5 of the Renewable Energy Directive the relevant GHGs are defined as CO_2, CH_4 and N_2O. CO_2 accounted for 63.7% of total GHG emissions in Ireland in 2018 while CH_4 and N_2O combined accounted for 34.4%. The main source of CH_4 and N_2O is from the agricultural sector. Perfluorocarbons are not relevant in the context of the Renewable Energy Directive as they are not emitted in significant quantities by energy sources.

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC AR5 Synthesis Report: Climate Change 2014 of the Fifth Assessment Report (AR5) (IPCC 2015) sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1) whereas CH_4 has a global warming potential equivalent to 28 units of CO_2 and N_2O has a GWP100 of 265. This approach is also maintained in the IPCC AR6 Technical Summary (IPCC 2021).

10.4.1 Climate Baseline

LA 114 Climate (UKHA, 2021) states that a baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline (i.e. Do Minimum scenarios).

Given the circumstances of Ireland's declaration of a climate and biodiversity emergency in May 2019 and the November 2019 European Parliament approval of a resolution declaring a climate and environment emergency in Europe, in conjunction with Ireland's current failure to meet its EU binding targets under the GHG Regulation, changes in GHG emissions either beneficially or adversely are of more significance than previously viewed prior to these declarations. Thus, the baseline climatic environment should be considered a highly sensitive environment for the assessment of impacts.

Anthropogenic emissions of greenhouse gases (GHGs) in Ireland included in the European Union's Effort Sharing Regulation (ESR) (EU 2018/842) are outlined in the most recent review by the EPA which details provisional emissions up to 2021 (EPA, 2022b). The greenhouse gas emission inventory for 2021 is the first of ten years over which compliance with targets set in the ESR will be assessed. This Regulation sets 2030 targets for emissions outside of the Emissions Trading System (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this. Ireland's ESR emissions annual limit for 2021 is 43.48 Mt CO_2eq. Ireland's provisional 2021 GHG ESR emissions are 46.19 Mt CO_2eq, this is 2.71 Mt CO_2eq more than the annual limit for 2021 (EPA, 2022b). Agriculture continues to be the largest contributor to overall emissions at 37.5% of the total. Transport, energy industries and the residential sector are the next largest contributors, at 17.7%, 16.7% and 11.4%, respectively. GHG emissions for 2021 are estimated to be 4.7% higher than emissions in 2020, this is due to a gradual lifting of covid restrictions and an increase in the use of coal and less renewables within electricity generation. Ireland's GHG emissions have increased by 11.4% from 1990 – 2021.

Provisional National total emissions (including LULUCF) for 2021 are 69.29 Mt CO_2eq, these have used 23.5% of the 295 Mt CO_2eq Carbon Budget for the five-year period 2021-2025. This leaves 76.5% of the budget available for the succeeding four years, requiring an 19.4% average annual emissions reduction from 2022-2025 to stay within budget.

The EPA 2022 GHG Emissions Projections Report for 2021 – 2040 (EPA, 2022b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018 and the 2021 Climate Action Plan published in 2021. Implementation of these are classed as a "*With Additional Measures*" scenario for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2021 to 2030 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Regulations (Regulation (EU) 2018/842) 2030 targets by approximately 52.3MtCO_{2eq} under the "*With Existing Measures*" scenario. However, the projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the Climate Action Plan and the use of the flexibilities available (EPA, 2022b).

10.4.2 Vulnerability of the Project to Climate Change

The Proposed Development study area for assessing a project's vulnerability to climate change is based on the construction footprint / project boundary. Impacts as a result of climate change involve increases in global temperatures and increases in the number of rainfall days per year. Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east (EPA, 2015). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the Proposed Development:

- 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; and
- Changes in distribution of plant and animal species.

The historical regional weather data for Casement Aerodrome which is representative of the current climate in the region of the Proposed Development is shown in Table 10.6 (Met Eireann, 2022). The region of the Proposed Development has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Casement Aerodrome, is the nearest weather and climate monitoring station to the Proposed Development that has meteorological data recorded for the 30-year period from 1981 to 2010. Casement Aerodrome meteorological station is located approximately 6 km southeast of the Proposed Development at the closest point. Meteorological data recorded at Casement Aerodrome drome over the 30-year period from 1981 to 2010 indicates that the wettest months were October and December, and the driest month on average was February. July was the warmest month with a mean temperature of 15.7°C.

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, and Storm Ophelia in October 2018. The maximum wind gust for

Casement Aerodrome for Storm Ophelia peaked at 117 km/hr with a 10-minute speed of 85 km/hr.

Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding in the summer of 2008, severe flooding in November 2009, and heavy rainfall in the Greater Dublin Area (GDA) on the 24 October 2011. The rainfall recorded on 24 October 2011 totalled 76.5 mm over a nine-hour period at Casement Aerodrome, which has an annual probability of 1 in 60 years.

Future climate predictions undertaken by Met Éireann have been published in 'Ireland's Climate: the road ahead (Met Eireann, 2013) based on four scenarios (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) which is named with reference to a range of radiative forcing values for the year 2100 (i.e. 2.6, 4.5, 6.0 and 8.5 W/m^2 (watts per square metre)) respectively with focus on RCP4.5 (medium-low) and RCP8.5 (high) scenarios. In terms of mean temperatures, it is predicted that increases of between 1°C to 3°C will occur under RCP4.5 rising to 2°C to 4°C under RCP8.5. Warm extremes are expected to rise by 2°C to 3°C (RCP4.5) but by up to 5°C under RCP8.5.

The EPA sponsored Report No.159 '*Ensemble of regional climate model projections for Ireland'* (EPA, 2015) which has projected significant decreases in mean annual, spring and summer precipitation amounts with extended dry periods. The decreases are largest for summer, with reductions ranging from 0% to 13% and from 3% to 20% for the medium-to-low and high emission scenarios, respectively. Conversely increases of heavy precipitation of up to 20% are projected to occur during the winter and autumn months. The number of extended dry periods is projected to increase substantially by mid-century during autumn and summer.

In relation to storms, '*Report No.159 – Ensemble of regional climate model projections for Ireland*' (EPA, 2015) indicates that the overall number of North Atlantic cyclones is projected to decrease by 10% coinciding with a decrease in average mean sea-level pressure of 1.5 hectopascals (hPa) for all seasons by mid-century. Wind energy is also predicted to decrease for spring, summer and autumn with a projected increase in winter.

EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA 2020a) notes that projections show that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25 per cent by 2030 compared with 2020 levels. Climate change is not only a future issue in Ireland, as a warming of approximately 0.8°C since 1900 has already occurred. The report (EPA 2020a) underlines that the next decade needs to be one of major developments and advances in relation to Ireland's response to climate change in order to achieve these targets and that Ireland must accelerate the rate at which it implements GHG emission reductions. The report states that mid-century mean annual temperatures in Ireland are projected to increase by between 1.0°C and 1.6°C (subject to the emissions trajectory). In addition, heat events are expected to increase by mid-century (EPA 2020a). While individual storms are predicted to have more severe winds, the average wind speed has the potential to decrease (EPA 2020a).

Future climate predictions undertaken by the EPA have been published in 'Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA 2020b). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060). Mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There will be a substantial decrease of approximately 50% which is projected for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric. Wind turbines need a specific range of wind speeds to operate within and droughts or low ground water levels may impact hydroelectric energy generating sites. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

Thus, in summary, the recent research into the changing climate as outlined above shows that there is likely to be future increases in weather variability including increased frequency and intensity of storms and high winds, increased temperatures in summer, the potential for heat waves and flooding from heavy precipitation events.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Mean Daily Max	8.0	8.2	10.2	12.4	15.2	17.9	19.8	19.5	17.1	13.6	10.2	8.3	13.4
Mean Daily Min	2.1	2.0	3.3	4.1	6.6	9.4	11.5	11.3	9.5	7.0	4.2	2.4	6.1
Mean Temperature	5.1	5.1	6.8	8.2	10.9	13.6	15.7	15.4	13.3	10.3	7.2	5.4	9.7
Absolute Max.	15.2	15.9	17.3	22.7	24.9	27.6	31.0	29.5	25.4	21.3	17.7	14.8	31.0
Min. Maximum	-3.0	-0.7	2.3	4.5	7.1	10.2	10.6	11.7	10.8	5.2	-3.1	-4.7	-4.7
Max. Minimum	11.3	13.0	11.5	12.6	13.8	17.2	18.1	18.3	17.8	16.4	13.8	12.7	18.3
Absolute Min.	-12.4	-8.0	-9.0	-5.5	-2.4	0.4	4.6	2.2	0.2	-4.1	-9.1	-15.7	-15.7
Mean Num. of Days with Air Frost	7.5	7.7	4.6	3.4	0.8	0.0	0.0	0.0	0.0	1.3	4.3	7.6	37.2
Mean Num. of Days with Ground Frost	14.0	14.0	11.0	11.0	4.0	0.0	0.0	0.0	1.0	4.0	9.0	14.0	82.0
Mean 5cm Soil	3.7	3.6	5.3	8.4	12.6	15.7	17.1	16.0	12.8	9.2	6.0	4.2	9.6
Mean 10cm Soil	3.9	3.8	5.2	7.6	11.4	14.6	16.2	15.3	12.6	9.2	6.2	4.4	9.2
Mean 20cm Soil	4.6	4.5	5.9	8.1	11.5	14.5	16.3	15.8	13.4	10.1	7.1	5.1	9.7
Relative Humidity (%)													
Mean at 0900UTC	87.2	86.7	84.5	80.1	77.4	77.7	79.7	82.2	84.5	86.3	88.9	88.4	83.6
Mean at 1500UTC	82.2	76.7	71.8	67.7	67.3	67.9	68.9	69.0	71.8	76.6	81.6	84.1	73.8
Sunshine (hours)													
Mean Daily Duration	1.7	2.5	3.3	5.1	6.0	5.3	4.9	4.8	4.1	3.3	2.2	1.5	3.7
Greatest Daily Duration	8.1	9.2	10.9	13.2	15.4	16.0	15.5	14.4	12.3	10.1	8.5	6.9	16.0
Mean Num. of Days with No Sun	8.9	5.8	4.4	2.5	1.8	2.1	1.6	1.1	2.4	4.5	7.0	9.9	52.0
Rainfall (mm)													
Mean Monthly Total	63.8	48.5	50.7	51.9	59.1	62.5	54.2	72.3	60.3	81.6	73.7	75.7	754.2
Greatest Daily Total	30.0	32.2	31.1	38.7	29.8	97.5	33.7	89.3	51.1	50.1	82.0	46.8	97.5
Mean Num. of Days with >= 0.2mm	17	14	16	14	15	14	15	16	14	16	16	16	183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Num. of Days with >= 1.0mm	12	10	11	10	11	10	10	11	10	12	11	12	130
Mean Num. of Days with >= 5.0mm	4	3	3	3	3	3	3	4	4	4	4	5	43
Wind (knots)													
Mean Monthly Speed	13.6	12.9	12.4	9.8	9.1	8.6	8.8	9.0	9.6	11.1	11.6	12.3	10.7
Max. Gust	80	78	71	59	63	51	58	55	59	65	66	82	82
Max. Mean 10-Minute Speed	57	54	47	43	43	36	39	36	38	44	46	57	57
Mean Num. of Days with Gales	4.5	3.2	2.1	0.6	0.4	0.1	0.1	0.2	0.3	1.2	1.9	3.5	18.1
Weather (mean no. of days with.)													
Snow or Sleet	4.1	3.9	2.5	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.5	2.3	14.6
Snow Lying at 0900UTC	1.8	1.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	4.1
Hail	1.0	1.5	2.7	2.4	1.5	0.2	0.2	0.1	0.2	0.2	0.7	0.6	11.3

Table 10.6 Casement Aerodrome 1981-2010

10.4.3 Existing GHG Emissions Baseline

For 2021, the latest year available, baseline GHG emissions in Ireland are estimated to be 61.528 Mt CO_{2eq} as shown in Table 10.7. The sector with the highest emissions is agriculture at 37.5% of the total, followed by transport at 17.7% and energy industries at 16.7%. In relation to energy, the total emissions amount to 10,272 kiltonnes of CO_{2eq} in 2021.

Category	Kilotonnes (kt) CO_{2eq}	% of Total GHG Emissions
Waste	937	1.5%
Energy Industries	10,272	16.7%
Residential	7,040	11.4%
Manufacturing Combustion	4,593	7.5%
Commercial Services	817	1.3%
Public Services	663	1.1%
Transport	10,912	17.7%
Industrial Processes	2,460	4.0%
F-gases	738	1.2%
Agriculture	23,097	37.5%
Total	61,528	100%

***Table* 10.7** *GHG Emissions In Ireland 2021*

10.5 Potential Impacts

10.5.1 Construction Phase

The proposed development will comprise demolition of several existing buildings and construction of Deep Tech buildings, data centres, an energy centre, a substation and associated ancillary development and facilitation works. The key civil engineering works which will have a potential impact on climate during construction are summarised below:

(i) During demolition of Buildings No's 7, 8 and 9 there will be the potential for GHG emissions associated with the generation and movement of the waste material associated with the demolition. A combination of excavators, trucks and other soil shifting plant will undertake the main site clearance, demolitions, and levelling aspects on a phase by phase basis.

(ii) During demolition and construction, GHG emissions from machinery will occur as part of the site preparation works and during excavation for installation of foundations, drainage services and ancillary infrastructure;

(iii) Following completion of the building shell, commissioning of the mechanical and electrical equipment is undertaken;

(iv) Infilling and landscaping will be undertaken. Spoil generated during site preparation will be re-used where possible thus reducing GHG emissions from transport; and

(v) Construction traffic accessing the site will emit air pollutants during transport.

In relation to the facilitation works, the main work with the potential for GHG emissions is the laying of a new gas pipeline within the Barnhall Meadows Lands, underneath the M4 and into the Kildare Innovation Campus. However, the GHG emissions associated with these works will not be significant.

As outlined in Section 10.6, mitigation measures will be implemented for the construction phase of the proposed development to ensure GHG emissions will be minimised.

10.5.2 Operational Phase

The key works which will have a potential impact on climate during operation of the proposed development are summarised below. The facilitation works and the data halls and deep tech buildings will not be significant sources of GHG emissions:

(i) The operation of the CTGs in the energy centre and the scheduled testing of the back-up generators in the data storage facilities will release GHG emission. For the purposed of the this assessment, a worst-case assumption of the operation of the CTGs for 330 days per year although it is more likely that they will not operate for more than 1,500 hours per year.

(ii) Indirect GHG emissions from electricity from the national grid which will power the proposed development;

(iii) The infrequent emergency operation of the back-up generators for the data centres in the event of a loss of power from the National Grid due to a power outage would release GHG emissions. It has been assumed that the back-up generators will operate for 250 hours per year as a worse-case. A review of operational data from similar operational data centres in Ireland indicates that it is highly unlikely that the back-up generators would be used for emergency operations for more than 24 - 48 hours per year. This is an over-estimation of the actual usage;

(iv) Road traffic accessing the site will emit GHG emissions. However, the operational phase of the proposed development will not contribute a significant volume of additional traffic on the local road network (see Chapter 13). Therefore, no local GHG emissions assessment of the traffic impact is required for this development.

The combustion turbine generator's (CTG's) will be primarily fuelled by natural gas/biogas supplied by Gas Networks Ireland (GNI) via their existing high-pressure network (subject to upgrade). It is likely that the fraction of biogas in the network will increase substantially in future years. The facility will also include a 5-day supply of HVO as a backup fuel should the natural gas system be unavailable in an emergency situation. Hydrotreated Vegetable Oil (HVO) is a low-carbon biofuel that operates as a direct replacement for conventional diesel. It is made from renewable, sustainable raw materials which do not release any new CO_2 into the atmosphere. HVO is made from 100% renewable plant-waste matter, and meets bio content requirements with no FAME (Fatty Acid Methyl Ester). HVO is considered to have substantially lower emissions[3] than traditional fossil fuels. It is noted that burning renewable diesel results in CO_2 emissions, however emissions from renewable diesels are significantly less than fossil fuel as growing the biomass feedstocks for production of renewable diesel may offset the CO_2 produced in the burning of HVO. For comparison, fossil fuel derived diesel has a total lifecycle emissions of c. 94 gCO_2e/MJ while renewable diesel using waste cooking oil as feedstock can be as low as 5.6 gCO_2e/MJ.

The data centre operator, similar to the energy centre, is committed to using HVO as the back -up fuel supply for the back-up generators where available. As such, significant environmental benefits will be achieved through the use of HVO as referenced above.

10.6 Likely Significant Impacts

10.6.1 Do Nothing Scenario – Construction Phase

Under the Do Nothing Scenario no construction works will take place and the previously identified impacts of GHG emissions and emissions from equipment and machinery will not occur. The climate at the site will remain as per the baseline and will change in accordance with trends within the wider area, changes in road traffic, etc. Therefore, this scenario can be considered ***neutral*** in terms of climate.

10.6.2 Do Nothing Scenario – Operational Phase

Under the Do Nothing Scenario no operational emissions will take place. The climate at the site will remain as per the baseline and will change in accordance with trends within the wider area, changes in road traffic, etc. Therefore, this scenario can be considered ***neutral*** in terms of climate.

10.6.3 Do Something Scenario – Construction Phase

Construction traffic would be expected to be the dominant source of direct greenhouse gas emissions as a result of the Construction Phase of the Proposed Development and facilitation works. Construction vehicles and machinery will give rise to CO_2 and N_2O emissions during construction of the Proposed Development. The Institute of Air Quality Management document '*Guidance on the Assessment of Dust from Demolition and Construction'* (IAQM, 2016) states that site traffic and plant is unlikely to make a significant impact on climate. Indirect emissions of GHGs will also occur due to the embodied carbon associated with the raw materials used in the construction of the data centre including cement and steel with GHG emissions occurring at the point of manufacture. In addition, embodied carbon emissions will occur from material used in internal access road and the pedestrian overpass associated with the works.

It is important to note that the potential impacts associated with the construction phase of the Proposed Development are short-term in nature. When the mitigation measures detailed in the mitigation section (see Section 10.7.1) of this chapter are implemented, direct GHG emissions from the site will not be significant. Due to the duration and nature of the construction activities, CO_2 and N_2O emissions from construction vehicles and machinery will have a ***short-term*** and ***imperceptibly negative*** impact on climate and thus have a ***not significant*** impact.

[3] https://www.eia.gov/energyexplained/biofuels/biofuels-and-the-environment.php

Initial commissioning activities will involve testing of the back-up generators on site for 4 hours at 90% load, i.e. the first testing sequence will be commissioning of the back-up generators. The operational modelling has considered load testing of the generators four time per year at 90% load and this does not result in a significant impact to climate. Therefore, it is predicted that the initial commissioning tests for the back-up generators will result in an ***imperceptibly negative*** impact to climate in the ***short-term*** and thus have a ***not significant*** impact.

In relation to the CTGs, initial commissioning activities will involve testing of the CTGs on site in a similar manner to the operational phase. The operational modelling has considered the continuous operation of the CTGs and this does not result in a significant impact to climate post mitigation. Therefore, it is predicted that the initial commissioning tests for the CTGs will result in an ***imperceptibly negative*** impact to climate in the ***short-term*** and thus have a ***not significant*** impact.

10.6.1.1 Impact of Climate Change on the Construction Phase

Appropriate flood risk measures and extreme weather events have been considered as part of the construction planning. However, the potential for changes to long-term seasonal averages as a result of climate change are not considered to be as significant. Thus, in line with the methodology outlined in Table 10.3, Table 10.4 and Table 10.5, the likelihood of extreme weather and flooding is assessed to be of a low likelihood and with a moderate adverse effect leading to a finding of low risk and thus a non-significant impact.

10.6.2 Do Something Scenario – Operational Phase

Projects of this nature will release GHG emissions during the operational phase of the project. The quantity that is released will depend on the power consumption of the data halls, the need for back-up generation due to power outages from the national grid and the frequency of use of the CTGs. A range of mitigation measures can be employed to reduce the GHG emissions associated with the project as outlined in Section 10.7.

The Proposed Scenario comprises the proposed development operating on electricity for the full year, the CTG emission points associated with the proposed development providing dispatchable electricity for 330 days per year as a worst-case in addition to the operation of the backup generators operating for 250 hours per year which involves the emergency operation of 72 of the 80 generators (the remaining generator serving as a “catcher” generator).

Under the Proposed Development Scenario, the main GHG emissions will be indirect emissions associated with the use of electricity for the operation of the data centres and deep tech, use of the CTGs to provide dispatchable power to the grid for up to 330 days per year and operation of the backup generators for a worst-case 250 hours per year. The indirect (due to electricity) and direct (due to natural gas and diesel usage) CO_2 emissions to operate the Proposed Development has been assessed below in the context of Ireland’s national annual CO_2 emissions. The expected emission rates for each year from 2025 to 2040 is shown below in Table 10.8 for electricity.

Year	Electricity[Note 1] (g CO_2 / kWh)
2025	0.237
2026	0.209
2027	0.182
2028	0.155
2029	0.127
2030	0.100
2031	0.095
2032	0.090
2033	0.085
2034	0.080
2035	0.075
2036	0.070
2037	0.065
2038	0.060
2039	0.055
2040	0.050

Note 1 Based on a carbon intensity of 348 g CO_2 / kWh in 2021 and assuming linear interpolation to 100 CO_2 / kWh by 2030 and zero CO_2 / kWh by 2050.

Table 10.8 *Carbon Intensity of Electricity From 2025 - 2040*

The GHG emissions from natural gas / biomethane will be based on the expected GHG emission rate in 2025 taking into the account the GNI projections out to 2040 (Ervia, 2019). The expected values for each year from 2025 to 2040 is shown below in Table 10.9.

Year	Natural Gas [Note 1] ($g\ CO_2$ / kWh)
2025	0.187
2026	0.183
2027	0.178
2028	0.173
2029	0.170
2030	0.166
2031	0.164
2032	0.162
2033	0.354
2034	0.347
2035	0.341
2036	0.334
2037	0.329
2038	0.325
2039	0.318
2040	0.311

Note 1 Based on a carbon intensity of 203 g CO_2 / kWh in 2020 and based on the penetration of biomethane as outlined in GNI publication "*Vison 2050 – A Net Zero Carbon Gas Network For Ireland*". It has been assumed that there is no hydrogen in the network and that there is no carbon capture of natural gas as a worst-case assumption.

Table 10.9 *Carbon Intensity of Natural Gas/Biomethane From 2025 - 2040*

For the Proposed Development, the facility will primarily use electricity from the National Grid. Thus, based on electricity from the National Grid for 8,510 hours per year and diesel generators usage for 250 hours per year (HVO fuel will be used where available although it has been assumed that HVO emits the same level of GHG as diesel as a worst-case), will consume 19.2MW of power in Phase 1 which equates to 224.6 GWh annually. This translates to approximately 54,839 tonnes of CO_2eq per year (including generator testing) based on the likely 2025 electricity mix and approximately 48,809 tonnes of CO_2eq per year (including generator testing) based on the likely 2026 electricity mix (ESB, 2022) as outlined in Table 10.10. In addition, for Phase 1, the CTGs will be available to dispatch 16MW to the national grid for up to 330 days per year. This translates to approximately 52,592 tonnes of CO_2eq per year based on the likely 2025 natural gas / biomethane carbon intensity and approximately 51,448 tonnes of CO_2eq per year based on the likely 2026 natural gas / biomethane carbon intensity (GNI, 2020) as outlined in Table 10.10.

For Phase 1 & 2, based on electricity from the National Grid for 8,510 hours per year and diesel generators usage for 250 hours per year, will consume 19.2MW of power which equates to 241.5 GWh annually. This translates to approximately 45,850 tonnes of CO_2eq per year (including generator testing) based on the likely 2027 electricity mix and approximately 39,359 tonnes of CO_2eq per year (including generator testing) based on the likely 2028 electricity mix (ESB, 2022) as outlined in Table 10.10. In addition, for Phase 1 & 2, the CTGs will be available to dispatch 16MW to the national grid for up to 330 days per year. This translates to approximately 50,019 tonnes of CO_2eq per year based on the likely 2027 natural gas / biomethane carbon intensity and approximately 48,590 tonnes of CO_2eq per year based on the likely 2028 natural gas / biomethane carbon intensity (Ervia, 2019) as outlined in Table 10.10.

For Phase 1, 2 & 3, based on electricity from the National Grid for 8,510 hours per year and diesel generators usage for 250 hours per year, will consume 173.2MW of power which equates to 853.1 GWh annually. This translates to approximately 103,120 tonnes of CO_2eq per year (including generator testing) based on the likely 2029 electricity mix and approximately 40,492 tonnes of CO_2eq per year (including generator testing) based on the likely 2040 electricity mix (ESB, 2022) as outlined in Table 10.10. In addition, for Phase 1, 2 & 3, the CTGs will be available to dispatch 170MW to the national grid for up to 330 days per year. This translates to approximately 507,159 tonnes of CO_2eq per year based on the likely 2029 natural gas / biomethane carbon intensity and approximately 419,089 tonnes of CO_2eq per year based on the likely 2040 natural gas / biomethane carbon intensity (Ervia, 2019) as outlined in Table 10.10.

Year	Phase / GWh	Electricity GHG Emissions (GWh)	Back-Up Generator GHG Emissions (GWh)	CTGs GHG Emissions (GWh)	Electricty GHG Emissions (tonnes CO2eq)	Back-Up Generator GHG Emissions (tonnes CO2eq)	CTGs GHG Emissions (tonnes CO2eq)	Total (tonnes CO2eq)	% of Sectoral Emission Ceiling
2025	**Phase 1**	220.6	4.0	126.7	52,209	2,630	52,592	107,430	4%
2026					46,179	2,630	51,448	100,257	3%
2027	**Phase 1 & 2**	233.5	8.0	126.7	43,220	2,630	50,019	95,869	3%
2028					36,729	2,630	48,590	87,949	3%
2029	**Phase 1, 2 & 3**	766.5	43.3	1346.4	103,120	28,470	507,159	638,748	21%
2030					80,984	28,470	498,048	607,502	20%
2031					76,935	28,470	491,975	597,379	20%
2032					72,886	28,470	485,901	587,256	20%
2033					68,836	28,470	476,790	574,096	19%
2034					64,787	28,470	467,680	560,936	19%
2035					60,738	28,470	458,569	547,777	18%
2036					56,689	28,470	449,458	534,617	18%
2037					52,640	28,470	443,384	524,494	17%
2038					48,590	28,470	437,311	514,371	17%
2039					44,541	28,470	428,200	501,211	17%
2040					40,492	28,470	419,089	488,051	16%

Table 10.10 GHG Emissions For Proposed Development Scenario (Tonnes CO2eq) Prior To Mitigation

10.6.2.1 Determination Of The Impact of the Operational Phase on Climate

The criteria for determining the significance of effects are a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors as set out in Section 10.2.4. In relation to climate, as there is no project specific assessment criteria, the proposed development has been assessed against the recommended IEMA (IEMA, 2022) significance determination (see Section 10.2.4).

In reference to Principle 1 of IEMA Guidance (IEMA, 2022), the Proposed Scenario will replace activities which have a higher GHG profile. Data centre facilities represent a significantly more efficient means of data storage when compared to a distributed model of enterprise data storage by individuals and companies (or 'enterprise sites'). Data centres are more energy efficient than enterprise sites due to comprehensive efficiency central to the design of the proposed development. In a June 2020 report, the International Energy Agency noted: *"Hyperscale data centres are very efficient large-scale cloud data centres that run at high capacity, owing in part to virtualisation software that enables data centre operators to deliver greater work output with fewer servers. The shift away from small, inefficient data centres towards much larger cloud and hyperscale data centres is evident in the shrinking share of data centre infrastructure in total energy demand..."*[4]. A study published in 2020 by Science[5] Magazine, found that while cloud computing productivity has grown globally by 550% between 2010 and 2018, energy consumption rose in tandem during the same period by just 6%, demonstrating the energy efficiency improvements of the industry, most notably by hyperscale data centres, as per the current project. A report from IEA entitled "Data Centres & Data Transmission Networks (IEA, 2021) found that while global internet traffic surged by more than 40% in 2020, this strong growth in demand for data centre services continues to be mostly offset by ongoing efficiency improvements for data centre infrastructure as shown in Figure 10.4.

[4] IEA Data Centres and Data Transmission Networks – June 2020
[5] Masanet, Eric; Shehabi; Arman, Lei; Nuoa, Smith, Sarah; Koomey, Jonathan; "Recalibrating global data center energy-use estimates", Sciencemag.org, February 28, 2020, Vol. 367, Issue 6481; ("Expressed as energy use per compute instance, the energy intensity of global datacenters has decreased by 20% annually since 2010… .").

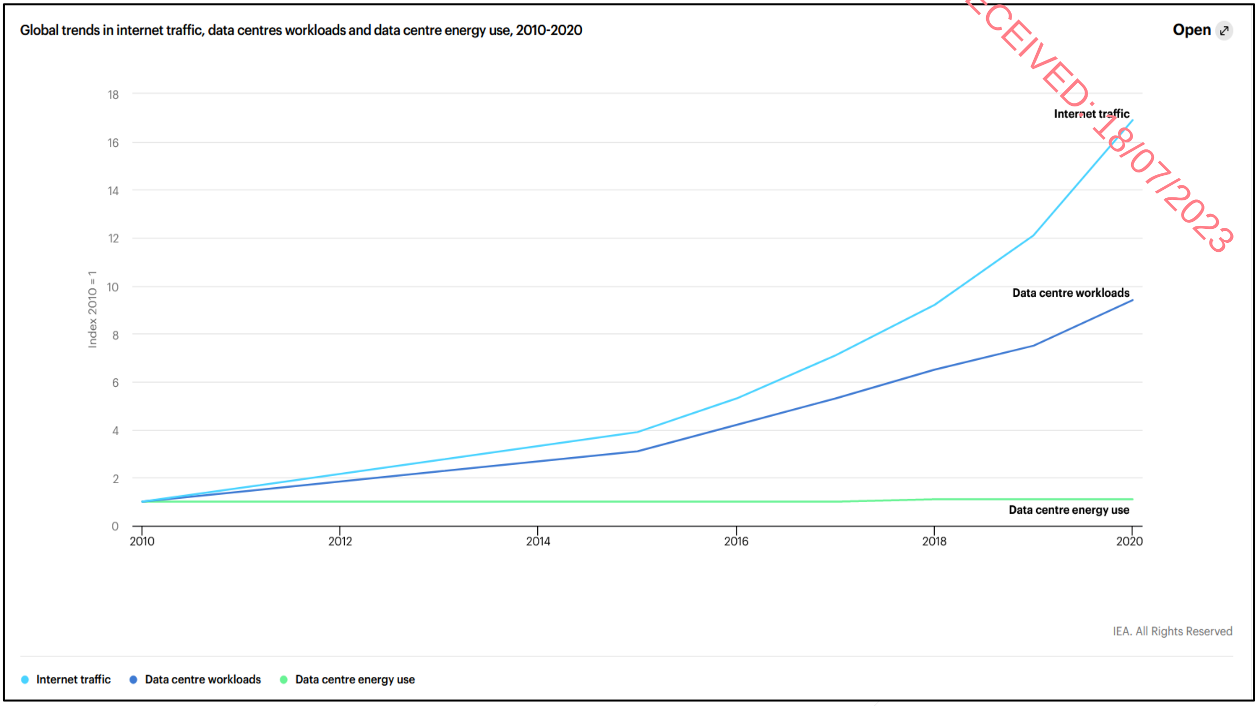


Figure 10.4 *Global Trends In Internet Traffic, Data Centres Workloads & Data Centre Energy Use, 2010 – 2020 (IEA, 2021)*

In the wider context, data centres are at least 84% more efficient than on-premises servers and the associated GHG savings associated have not been accounted for in the current analysis[6]. In addition, the carbon intensity of electricity is predicted to decrease from 348 gCO_2/kWh in 2021 to less than 100 gCO_2/kWh in 2030 as a result of the increase in renewables to near 80% of the electricity market by 2030. Overall, all data centres in Ireland are estimated to account for 1.85% of Ireland's total carbon emissions in 2020 and it is predicted that data centres in Ireland will peak at 2.2% of total GHG emissions in 2025 and will fall or level off after this date (Host In Ireland, 2020).

The Proposed Development will account for approximately 810 GWh of peak demand when fully completed. However as outlined below, the facility will operate in compliance with the policies and objectives of the 2021 Climate Act. The phasing of the development and the period taken to reach full capacity within each planned phase will result in the 'ramping up' of demand associated with the project over a number of years during the lifetime of the 10-year permission to reach 810 GWh.

Table 10.10 also shows the significance of the Proposed Development when compared to the Electricity 2030 Sectoral Emission Ceiling based on the approach set out in IEMA guidance (IEMA, 2022) on a year-by-year basis. The assessment is presented prior to mitigation. As shown in Table 10.10, the combined impact of the operation of the data centres, using electricity (and backup diesel generators), and the operation of the CTGs will be equivalent to the up to 4% of the electricity sectoral emission ceiling in Phase 1, up to 3% of the electricity sectoral emission ceiling in Phase 1 & 2 and up to 21% of the electricity sectoral emission ceiling in Phase 1, 2 and 3 with

[6] https://blog.aboutamazon.eu/aws/amazon-announces-new-project-in-ireland-as-part-of-commitment-to-be-100-powered-by-renewable-energy-by-2025

the five-year average over the period 2026-2030 being equivalent to 10% of the electricity sectoral emission ceiling.

The impact of the Proposed Development prior to mitigation would be deemed to be a moderate, adverse impact as shown in Table 10.11. Although the Proposed Development prior to mitigation is better than the "do-nothing" scenario of enterprise computers, the impact would still be significant in the absence of appropriate mitigation.

Scenario	% Of 2030 ETS Total[Note 1, 2]	% Of Electricity Emission 2030 Ceiling[Note 2]	Significance (Prior to mitigation)
Proposed Development	0.044%	10%	Moderate Adverse

Note 1 ETS 2030 Total = 690.91 Million Tonnes CO_{2eq}
Note 2 Based on 5-year average 2026 - 2030

Table 10.11 *GHG Emissions Associated With Proposed Scenario Compared To Sectoral Emission Ceiling & ETS*

The operational phase impact of the Proposed Development, prior to mitigation, based on the EPA EIAR Guidelines (EPA, 2022), is considered ***long-term***, ***negative*** and ***moderate***.

10.6.2.2 Vulnerability of the Operational Phase of the Project to Climate Change

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. Changes in climate will lead to a variety of associates GHG impacts including:

- Increased average temperatures will lead to a greater requirement for cooling of the data centre leading to greater energy use and associated GHG emissions;
- Increase rainfall will lead to a greater risk of flooding;
- Periods of drought may lead to reduction in water availability.

As a result of this there is the potential for flooding related impacts on site in future years. Chapter 8 (Hydrology & Hydrogeology) of the EIAR has investigated the likelihood of flooding and has found that there is no current or predicted flood risk for the site. Thus, in line with the methodology outlined in Table 10.3, Table 10.4 and Table 10.5, the likelihood of extreme weather and flooding was assessed to be of low likelihood and with a moderate adverse effect leading to a finding of low risk and thus a non-significant impact. Therefore, the impact of climate change on the Proposed Development will be **imperceptible**.

10.7 Mitigation Measures

In order to sufficiently ameliorate the likely climate impact, a schedule of mitigation measures has been formulated for the construction and operational phases associated with the proposed development.

10.7.1 Construction Phase

The objective of the mitigation measures outlined below is to ensure that GHG emissions are minimized wherever possible during the demolition and construction phase of the proposed development. The measures will include:

- All vehicles will be required to switch off engines when stationary (no idling);
- All vehicles will be serviced and maintained to ensure emissions are minimised;
- Embodied carbon will be investigated at detailed design stage;
- Where practicable, materials will be reused within the extent of the Proposed Development; and
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

10.7.2 Operational Phase

The CTGs and diesel generators will be regularly serviced to ensure that they operate to their maximum efficiency whilst the fuel used to power the back-up generators will be HVO which has a substantially lower GHG footprint than diesel. Further mitigation measures which will reduce GHG emissions, as outlined in Section 2.7 of the EIAR include:

- Passive Solar Design to minimise solar gain to reduce cooling energy requirements,
- The building fabric of the new development will be designed and constructed to limit heat loss and where appropriate, limit heat gains through the fabric of the building,
- The mechanical HVAC strategy is to minimise energy associated with space conditioning through the use of high efficiency systems, heat recovery and the efficient control of both ventilation rates and of heating and / or cooling supply,
- High Efficiency Electrical Systems including low energy lighting solutions and power factor correction,
- Sustainable Energy Initiatives including waste heat recovery,
- Data Processing Area Electrical Design Elements (transformers, emergency back-up generators, high efficiency external and internal lighting,
- Data Processing Area Mechanical Design Elements (Water demand reduction and rainwater harvesting, data storage room environmental design, use of direct evaporative Air Handling Units (AHUs) and use of an electronic building management system for air handling,
- Offices & ancillary Areas Mechanical & Electrical design elements including high efficiency air conditioning, energy efficient heat recovery units for air ventilation systems, efficient low energy LED lighting and control systems, PV panels, electric vehicle charging infrastructure).

As outlined in Section 2.7 of the EIAR, KIC is committed to a future of carbon neutrality for the entire campus through a range of mechanisms. The developer and data centre end user are committed to continued renewables additionality nationally and investment in new generation, repowering or otherwise increasing in-country renewable energy capacity. In this regard the proposed development will have a Maximum Import Capacity (MIC) of 170MW once fully developed (c.2034/2035). The development will be delivered in phases over a 10-year period, as such the data centre energy demand will ramp up over a significant period of time. It is proposed to proportionally match the impact of the forecasted energy demand through a mix of renewables on site and CPPA's.

On site commitments include:

- Provision of significant Solar PV installations with c.8,560 panels being proposed across the 4no. data centre buildings and the 2no. Deeptech buildings.
- Use of Hydrotreated Vegetable Oil (HVO) as back-up fuel source for the Energy Centre upon

full build out rather than diesel.

- Implement District Heating system, which will use recaptured heat produced from the data centres to provide recycled heat the existing campus buildings being retained as well as the new buildings A1 and A2. Further to this, the district heating system has been designed to provide export heat to surrounding community uses.

The future data centre end user will commit to entering into arrangements which are capable of underpinning new renewable energy generation calculated to offset the energy consumed by the proposed data centre development from the electricity grid. It is proposed that these arrangements would ramp up overtime in line with the operation of the data centre use and would be secured in the in the form of CPPAs and provide for the establishment of new renewable energy generation projects by the data centre end user which demonstrates that the energy consumed by the data centre development on site is offset with renewable energy generation.

The agreements may be on a phased basis and shall confirm:

- That the new renewable will not be supported by government or consumer subsidies.
- The new renewable projects will be located in Ireland.
- The new renewable energy projects will be provided by the data centre end user.
- The new renewable energy generation shall relate to energy that is not being generated at the date of which the proposal is permitted.
- The power ramping schedule for each CPPA to align with Data Centre power consumption.

The CPPA's will align with the ramping up of energy use by the proposed data centre development. In this regard, Phase 1 of the proposed data centre development is to be provided with c.16MW through an existing Eirgrid connection agreement. Phase 3 will include the balance of the proposed power capacity (c.154MW). The final signed CPPAs shall align with the proposed ramping schedule for each data centre building.

Further to the above CPPA's, Kildare Innovation Campus will commit to similar CPPA's for the offset of any non-renewables used by the proposed energy centre. CPPA's for renewable energy projects will include bio-gas and/or hydrogen as well as other available renewables. Final evidence of signed CPPAs shall include the proposed ramping schedule for the energy centre building and may be agreed in phases prior to occupation of the relevant phase of the energy centre.

The agreements for the energy centre may be on a phased basis and shall confirm:

- That the new renewable will not be supported by government or consumer subsidies.
- The new renewable projects will be located in Ireland.
- The new renewable energy projects will be provided by Kildare Innovation Campus.
- The new renewable energy generation shall relate to energy that is not being generated at the date of which the proposal is permitted
- The power ramping schedule for each CPPA to align with Energy Centre phase power consumption.

Furthermore, as the Proposed Development is over 20 MW thermal input, a greenhouse gas emission permit will be required for the facility which will be regulated under the EU-wide Emission Trading System (ETS) which necessitates operating under a "cap and trade" scheme. Thus, the proposed development will operate under a system where carbon emissions will become increasingly costly and will encourage the least-cost pathway to GHG emission reductions.

In addition, as outlined in the *Regulation (EU) 2018/842*, any new electricity provider (including the Proposed Development*)* will be treated as a "new entrant" under Phase IV of the ETS (i.e. an electricity generator or site obtaining a GHG emissions permit for the first time after 30th June 2018). The new electricity provider will be required to purchase allocations in the same manner as existing players in the market using the European Energy Exchange. EU leaders have also decided that during Phase IV (2021-2030) 90% of the revenue from the auctions will be allocated to the Member States on the basis of their share of verified emissions with 10% allocated to the least wealthy EU member states. The revised EU ETS Directive has enshrined in law the requirement that at least 50% of the auctioning revenues or the equivalent in financial value should be used for climate and energy related purposes. Any fossil-fuel related GHG emissions related, directly or indirectly, to energy generation for the proposed development will be continue to be controlled, increasingly stringently, by the ETS which is the subject of Directive 2003/87/EC (as amended). On an EU-wide basis, where the ETS market in 2021 was approximately 1,307 million tonnes CO_2eq and is scheduled to reduce to 691 million tonnes CO_2eq by 2030, the impact of the emissions associated with the Proposed Development will be no more than 0.090% of the total EU-wide ETS market in 2030 which is imperceptible.

In reference to Principle 2 of IEMA Guidance (IEMA, 2022), and as outlined above, an extensive range of mitigation measures will be employed which are in line with "best practice" as outlined in the IEMA guidance (IEMA, 2022) including the installation of Solar PV panels, waste heat recovery and passive solar design. Additionally, 2 no. district heating pump house areas and inground piping for district heating system will be installed.

In reference to Principle 3 of IEMA Guidance (IEMA, 2022), it is the intention of the applicant that measures will be implemented in line with "best practice" as outlined in the IEMA guidance (IEMA, 2022). The data centre end user and the developer group are committed to Ireland's 2023 Climate Action Plan to meet 80% of electricity demand from renewable sources by 2030. As noted above, the applicant intends to undertake a Corporate Power Purchase Agreement which will offtake 100% of the power from renewable projects.

10.8 RESDIUAL EFFECTS OF THE PROPOSED DEVELOPMENT

10.8.1 Construction Phase After Mitigation

Based on the scale and temporary nature of the construction works and the intermittent use of equipment, and with the implementation for the mitigation measures outlined in Section 10.7.1, the impact on climate change from the Proposed Project is deemed to be ***short-term, imperceptibly negative*** and ***not significant*** in relation to Ireland's obligations under the EU 2030 target.

When the mitigation measures detailed in the mitigation section (section 10.7.1) of this chapter are implemented, emissions of GHG from the site will be ***neutral***, ***short-term*** and ***not significant*** in nature.

10.8.2 Operational Phase After Mitigation

10.8.2.1 Impact of the Operational Phase on Climate

Under the Proposed Project Scenario, the main GHG emissions will be indirect emissions associated with the use of electricity for the operation of the data centres and deep tech, use of the CTGs to provide dispatchable power to the grid for up to 330 days per year and operation of the backup generators for a worst-case 250 hours per year.

For the Proposed Development, the facility will primarily use electricity from the National Grid equivalent to 19.2MW of power in Phase 1 which equates to 224.6 GWh annually. In addition, for Phase 1, the CTGs will be available to dispatch 16MW to the national grid for up to 330 days per year. However, as shown in Table 10.12, the facility will install PV panels and purchase CPPAs in order to fully offset the GHG emissions associated with the use of electricity, diesel and natural gas / biomethane leading to net zero GHG emissions from the facility.

For Phase 1 & 2, the facility will primarily use electricity from the National Grid equivalent to 19.2MW of power which equates to 241.5 GWh annually. In addition, for Phase 1 & 2, the CTGs will be available to dispatch 16MW to the national grid for up to 330 days per year. However, as shown in Table 10.12, the facility will install PV panels and purchase CPPAs in order to fully offset the GHG emissions associated with the use of electricity, diesel and natural gas / biomethane leading to net zero GHG emissions from the facility.

For Phase 1, 2 & 3, the facility will primarily use electricity from the National Grid equivalent to 173.2MW of power which equates to 853.1 GWh annually. In addition, for Phase 1, 2 & 3, the CTGs will be available to dispatch 170MW to the national grid for up to 330 days per year. However, as shown in Table 10.12, the facility will install PV panels and purchase CPPAs in order to fully offset the GHG emissions associated with the use of electricity, diesel and natural gas / biomethane leading to net zero GHG emissions from the facility.

Year	Phase / GWh	Electricty, Generators & CTGs GHG Emissions (GWh)	Electricty GHG Emissions (tonnes CO2eq)	Back-Up Generator GHG Emissions (tonnes CO2eq)	CTGs GHG Emissions (tonnes CO2eq)	Total (tonnes CO2eq)	% of Sectoral Emission Ceiling	PV Panels GHG Emissions (GWh)	CPPAs (GWh)
2025	**Phase 1**	351.3	52,209	2,630	52,592	107,430	4%	1.96	349.34
2026			46,179	2,630	51,448	100,257	3%		
2027	**Phase 1 & 2**	368.2	43,220	2,630	50,019	95,869	3%	2.01	366.19
2028			36,729	2,630	48,590	87,949	3%		
2029	**Phase 1, 2 & 3**	2,156.2	103,120	28,470	507,159	638,748	21%	2.26	2,153.94
2030			80,984	28,470	498,048	607,502	20%		
2031			76,935	28,470	491,975	597,379	20%		
2032			72,886	28,470	485,901	587,256	20%		
2033			68,836	28,470	476,790	574,096	19%		
2034			64,787	28,470	467,680	560,936	19%		
2035			60,738	28,470	458,569	547,777	18%		
2036			56,689	28,470	449,458	534,617	18%		
2037			52,640	28,470	443,384	524,494	17%		
2038			48,590	28,470	437,311	514,371	17%		
2039			44,541	28,470	428,200	501,211	17%		
2040			40,492	28,470	419,089	488,051	16%		

Table 10.12 GHG Emissions For Proposed Development Scenario (Tonnes CO2eq)

Table 10.13 shows the significance of the Proposed Development when compared to the Electricity 2030 Sectoral Emission Ceiling based on the approach set out in IEMA guidance (IEMA, 2022). The assessment is presented post mitigation. As outlined above the project will use "best practice" adaptive design measures (PV panels, passive solar design, facilitating district heating) and by using long term corporate power purchase agreements. With the implementation of these measures the impact of the Proposed Development, in line with the IEMA methodology (IEMA, 2022), is reduced to a minor adverse, non-significant impact.

Scenario	% Of 2030 ETS Total Note 1, 2	% Of Electricity Emission 2030 Ceiling Note 2	% Of Electricity Emission 2030 Ceiling After Mitigation	Significance (After mitigation)
Proposed Development	0.044%	10%	Net Zero	Minor Adverse

Note 1 ETS 2030 Total = 690.91 Million Tonnes CO_{2eq}
Note 2 Based on 5-year average 2026 - 2030

Table 10.13 *GHG Emissions Associated With Proposed Scenario Compared To Sectoral Emission Ceiling & ETS*

Through a series of measures including project replacement, a reduction in residual emissions through best practice and the implementation of a series of adaptive design measures, the net impact of the Proposed Development is not significant. Given that the use of electricity to power the facility will achieve net zero by 2050 and the commitment to fully offset all interim fossil fuel derived GHG emissions by the purchase of Corporate Power Purchase Agreements (CPPAs) the predicted impact to climate from electricity associated with the development is deemed to be ***indirect***, ***long-term, negative*** and ***minor adverse*** and the predicted impact to climate from CTGs associated with the development is deemed to be ***direct***, ***long-term, negative*** and ***minor adverse.***

In summary, once the mitigation measures outlined in Section 10.7 are implemented, the residual impacts on climate from the construction of the Proposed Development and facilitation works will be ***short-term*** and ***imperceptibly negative*** and for the operational phase of the Proposed Development will be ***long-term, negative*** and ***minor adverse.*** Thus, in terms of climate, both the construction phase and operational phase of the Proposed Development will be ***not significant***.

10.8.2.2 Impact of Climate Change on the Operational Phase: Proposed Development

A detailed flood risk assessment has been undertaken as part of this planning application and adequate attenuation and drainage have been provided for to account for increased rainfall in future years. Therefore, the impact of climate change on the Proposed Development will be ***imperceptible***.

10.9 Cumulative Impact

In relation to climate, all global cumulative GHG sources are relevant to the effect on climate change. As a result, the effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed. This is due to the fact that there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other (IEMA, 2022).

10.10 Interactions

The potential interaction between Climate and other Sections in the EIAR is primarily limited to *Population & Human Health* and *Traffic & Transportation* and chapter 18 on *Interactions*. This Climate Section has been prepared in consideration of and in conjunction with the relevant outputs of these Sections.

10.11 Monitoring

As part of the sites operational Greenhouse Gas Permit, there will be a requirement for ongoing GHG monitoring.

10.12 Difficulties Encountered In Compiling Information

No significant difficulties were encountered in the process of compiling the climate chapter of the EIAR.

10.13 Compliance With Section 15 Of The Climate Action & Low Carbon Development Act (Amended) 2021

Section 15 of the Climate Action & Low Carbon Development Act (Amended) 2021 states that:

(1) "A relevant body shall, 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 GHG emissions associated with the proposed project are in compliance with the above mentioned plans, strategies and objectives. In relation to (a) 2023 Climate Action Plan, under Section12.3.1 Emission Trading System, the 2023 CAP states:

> *"The EU ETS is an important measure for reducing industry GHG emissions. The Fit for 55 proposals for the reformed EU ETS will increase emissions reductions in this sector from the current 43% to 61%, in the period 2005 to 2030. Changes include a steeper annual reduction in the emissions ceiling and reductions in free allowances, alongside the corresponding introduction of a carbon border adjustment mechanism." (2023 CAP, page 155).*

Thus, the indirect electricity emissions and the direct emissions from CTGs and backup diesel generators will both require greenhouse gas permits under the ETS in order to operate and thus the GHG emissions associated with the proposed development will be in line with the 2023 CAP.

In relation to (B), the Long-term Climate Action Strategy was published on the 28th April 2023. In relation to electricity the Government commits to the full decarbonisation of the electricity system by 2050. In relation to the EU ETS, the Long-term Climate Action Strategy states that "A strong price signal, as part of a reformed EU ETS, including progressively more restrictive rules on how many allowances will be available within the EU ETS, is expected to drive decarbonisation over the coming decade by increasing the cost to firms in the EU ETS of doing nothing to reduce their emissions" (DOECC, 2023).

In relation to data centres, the Long-term Climate Action Strategy states that "Energy demand, including data centres, will be expected to operate within sectoral emissions ceilings and further signals will be required to locate demand where existing or future electricity grid is available and close to renewable energy generation. Research and development in energy storage and flexibility (such as a science challenge to industry) will be required to put Ireland on a pathway to net zero-carbon data centres" (DOECC, 2023).

The current project is in line with this strategy as the electricity associated with the project will reduce in line with national policy to obtain net zero by 2050.

In relation to (C) national and sectoral adaptation plans and (E) "adapting to the effects of climate change on the state", the project has completed a detailed flood risk assessment for the project and adequate attenuation and drainage have been provided to account for increased rainfall in future years. Thus, the granting of permission for the Proposed Development will not be inconsistent with the national and sectoral adaptation plans.

In relation to (D) the national climate objective, the 2023 CAP has stated that:

"Under the Climate Action and Low Carbon Development (Amendment) Act 2021, Ireland's national climate objective requires the State to pursue and achieve, by no later than the end of the year 2050, the transition to a climate-resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy. The Act also provides for a reduction of 51% in GHG emissions by 2030, compared to 2018 levels.

Our statutory national climate objective and 2030 targets are aligned with Ireland's obligations under the Paris Agreement and with the European Union's objective to reduce GHG emissions by at least 55% by 2030, compared to 1990 levels and to achieve climate neutrality in the European Union by 2050." (2023 CAP, page 30)

Thus, the Proposed Development aligns with the national climate objective as the Proposed Development will be within the EU ETS which is the cornerstone of the EU's objective to reduce GHG emissions by at least 55% by 2030 (compared to 1990) and to achieve climate neutrality by 2050. As outlined in the EU Climate Law (EU, 2021) under the Item (13): "The EU ETS is a cornerstone of the Union's climate policy and constitutes its key tool for reducing greenhouse gas emissions in a cost-effective way."

In regards to (E) the objectives of mitigating greenhouse gases, the Proposed Development has the following benefits which will all help to mitigate greenhouse gas emissions:

I. The Proposed Development will replace activities which have a higher GHG profile. Data centre facilities represent a significantly more efficient means of data storage when compared to a distributed model of enterprise data storage by individuals and companies (or 'enterprise sites'). A study published in 2020 by Science Magazine, found that while cloud computing productivity has grown globally by 550% between 2010 and 2018, energy consumption rose in tandem during the same period by just 6%, demonstrating the energy efficiency improvements of the industry, most notably by hyperscale data centres.

II. A range of measures will be employed which is in line with "best practice" as outlined in IEMA (IEMA, 2022) including the installation of PV panels, passive solar design and facilitating district heating to a local user for heat or a future heat network.

III. Measures will be implemented in line with "best practice" as outlined in IEMA (IEMA, 2022). The applicant is committed to offset all interim fossil fuel derived GHG emissions by the purchase of Corporate Power Purchase Agreements (CPPAs).

In summary, the facility will operate under the ETS and will thus be required to operate within the limits of the system which includes carbon pricing and a linear reduction in GHG emissions going forward. Economy-wide reductions that Ireland achieves towards its own national periodic targets, 2030 to 2050 (and intermediate quantitative targets), will be contributed to by the reductions achieved by those Irish installations that are part of the EU ETS. The 2050 target as outlined under the EU Climate Law is one of achieving climate neutrality ('Net Zero') by 2050, and thus aligns with the commitment Ireland has undertaken under the Climate Action and Low Carbon Development Act 2015 (as amended in 2021) and all reductions achieved by Irish EU ETS-participating installations will contribute towards that.

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11.0 NOISE AND VIBRATION

11.1 Introduction

This document has been prepared by AWN Consulting Ltd. (AWN) to assess the potential noise and vibration impacts of the proposed development in the context of current relevant standards and guidance.

This assessment has been prepared by Mike Simms BE MEngSc MIOA MIET, Principal Acoustic Consultant at AWN, who has worked in the field of acoustics for 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, energy, industrial, commercial and residential.

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

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated so as ensure minimal impact on the receiving noise environment.

11.2 Project Description

The Project is an integrated masterplan proposal that includes for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT and Innovation uses. The proposal will include for the demolition of some of the existing buildings on site and construction of new buildings, an energy centre and replacement substation. The proposal will include significant public infrastructure including a new signalised intersection on Celbridge Road (R404), a new Public Link Road through the campus (between Barnhall Road and the new signalised intersection), a pedestrian/cycle overpass of the M4, pedestrian and cycle links through the site and along the designated protected view corridor and supporting infrastructure. The project to which this EIAR relates also includes facilitation works which comprise uprating of existing 110kV power lines to the site and the provision of a local upgrade to the gas network to service the site. The facilitation works which are included in the project do not form part of the development for which consent is sought. Future consents for the facilitation works will be required through EirGrid and Gas Networks Ireland. A detailed description of the project is outlined in Chapter 3 of this EIAR.

The development site which is subject to the application for consent measures c. 73.95 ha and is principally bounded by: the M4 Motorway to the north; Celbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west.

The site comprises the existing Kildare Innovation Campus, which was formerly the Hewlett Packard Campus originally permitted in 1995 under KCC Reg. Ref 95923. The development site also encompasses lands with the jurisdiction of Kildare County Council (KCC)

Refer to Chapter 3 for a more detailed description of the site's location and context.

11.3 Methodology

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this chapter:

- Environmental Protection Agencies *Guidelines on the Preparation of an EIAR* (EPA, May 2022)
- British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1:2014 *Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise* (hereafter referred to as BS 5228–1) (BSI 2014a);
- BS 5228-2:2009+A:2014 *Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration* (hereafter referred to as BS 5228–2) (BSI 2014b);
- BS 7385: 1993 *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (hereafter referred to as BS 7385–2) (BSI 1993);
- United Kingdom Highways Agency (UKHA) *Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2* (hereafter referred to as DMRB Noise and Vibration) (UKHA 2020);
- Environmental Protection Agencies Guidance Note for Noise: *Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (hereafter referred to as NG4) (EPA 2016);
- BS 4142: 2014+A1:2019: *Methods for Rating and Assessing Industrial and Commercial Sound* (hereafter referred to as BS4142) (BSI 2019);
- International Organization for Standardization (ISO) ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation* (hereafter referred to as ISO 9613–2) (ISO 1996);
- ISO 1996:2017: *Acoustics – Description, measurement, and assessment of environmental noise* (hereafter referred to as ISO 1996) (ISO 2017);
- UK Department of Transport, Welsh Office (DoT) *Calculation of Road Traffic Noise* (hereafter referred to as CTRN) (HMSO, 1988)
- Institute of Environmental Management and Assessment (IEMA) *Guidelines for Environmental Noise Impact Assessment* 2nd ed. (2014).
- United Kingdom Department of Transport (UK DOT) *Calculation of Road Traffic Noise* (hereafter referred to as CRTN) (UK DOT, 1988)

11.3.1 Scoping and Heading/Topic Identification

The following is an outline of the methodology which has been adopted for this assessment; each section is described in detail in the subsequent sections.

- Review appropriate guidance in order to identify appropriate noise and vibration criteria for the construction and operational phases;
- Carry out noise monitoring at a number of locations (e.g. in the vicinity of nearest sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development;
- Develop of a detailed 3D noise model of the proposed development, and;
- Comment on predicted levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 11.1 of this document presents a glossary of the acoustic terminology used throughout this chapter.

11.3.2 Baseline Scenario/Likely Future Receiving Environment Analysis Methodology

In the first instance it is considered appropriate to define a noise sensitive location (NSL). In this context, the definition supplied by the Environmental Protection Agency (EPA) is adopted, which states the following in NG4 Appendix I:

> *NSL – any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.*

The baseline noise environment has been characterised by a set of surveys of environmental noise levels at a range of noise-sensitive locations in the area surrounding the proposed development. Full details are presented in Section 11.3.3.3.

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

- construction and decommissioning phases, and
- operational phase.

The construction phase will involve demolition, excavation, general site preparation over the development site and the erection of new buildings, along with construction of a public link road through the site, a new interchange along the R404, and a pedestrian/cycle overpass over the M4 motorway, all over a phased construction period. An assessment will also be presented in the following sections in relation to noise from construction traffic on local roads.

'Facilitation works' have been identified as being required to support the development consent being sought from Kildare County Council. This planning application to KCC does not encompass a request for development consent in relation to the facilitation works.

The facilitation works include a mix of works that will be required to be undertaken for or on behalf of statutory undertakers such as Gas Networks Ireland and EirGrid.

The primary sources of outward noise in the operational context are deemed long term and will involve:

- fixed plant at data centres and energy centre;
- emergency site operations, and;
- a new public link road;
- additional vehicular traffic on public roads, and
- a pedestrian and cycle overpass.

11.3.2.1Baseline Scenario Analysis Methodology

Mapping of the surrounding area was reviewed in order to select NSLs. The NSLs used in the assessment are presented in Section 11.4.1. A representative subset of these were selected for the baseline noise survey.

The environmental noise survey has been conducted at the selected locations in order to quantify the existing noise environment. The survey was conducted in accordance with ISO 1996. Noise levels were measured over 15-minute intervals at each location in a round-robin fashion. Measured noise levels were saved to instrument memory. Survey personnel noted sources of noise contributing to measure noise levels.

11.3.2.2 Likely Future Receiving Environment Analysis Methodology

Construction noise calculations have been conducted in accordance with BS 5228-1. For the operational phase, prediction calculations for plant noise have been conducted in accordance with ISO 9613. See Appendices 11.2 and 11.3 for further details of the noise modelling software and parameters.

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within CRTN.

The steps involved in predicting the future receiving environment are as follows:

1. Collect the sound emission levels for each item of outdoor plant with potential to emit noise to the receiving environment;

2. Prepare a computer-based 3D noise model in order to quantify the noise level associated with the proposed buildings at NSLs. For details of the noise modelling software, see Appendix 11.2.

3. Assess the predicted noise levels in light of relevant EPA NG4 criteria and other guidance, taking into account the background noise levels.

11.3.3 Impact Assessment Methodology

The analysis of the predicted impacts of the proposed development on noise and vibration during construction and operation are presented in this Chapter. The assessment considered noise and vibration features, identified in Section 11.3.1 above, within the project site and the surrounding vicinity in accordance with the methodology outlined above and below, to determine the significance of the impacts. Where likely significant impacts are highlighted, mitigation and monitoring are proposed, and any residual impacts are assessed.

The impact assessment for this Chapter has been undertaken in accordance with the *EPA Guidelines on the Preparation of an EIAR* (EPA, May 2022) and all other documents outlined above.

Assessment methods quantify and predict the magnitude and significance of impacts. Further details on the assessment methods are presented in the following sections.

11.3.3.1 Construction Phase Noise Criteria

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities or An Bord

Pleanála normally control construction activities by imposing limits on the hours of works and/or applying noise limits for construction noise at noise-sensitive locations.

In the absence of specific noise limits, criteria relating to permissible construction noise levels for a development of this scale are taken from BS 5228-1 Annex E Section E.3.2.

ABC Method

The approach adopted in BS 5228-1 calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities.

The BS 5228-1 document sets out guidance on permissible noise levels relative to the existing noise environment. Table 11.1 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors as recommended by BS 5228-1. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

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

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

Table 11.1 Example Threshold of Potential Significant Effect at Dwellings

It should be noted that this assessment method is only valid for residential properties Construction noise limits for non-residential locations are discussed below.

The approach is as follows: for each period (i.e. daytime, evening and night time) the ambient noise level is determined and rounded to the nearest 5 dB. Baseline monitoring carried out as part of this assessment is presented in Section 11.4.1. The results indicate that the categories detailed in Table 11.2 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

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

Table 11.2 Rounded baseline noise levels and associated categories

Fixed Limits

When considering non-residential receptors, such as those sharing a boundary with the proposed development, BS 5228-1 gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states:

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

Paragraph E.2 goes on to state: -

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

Proposed Construction Threshold Noise Levels

Taking into account the guidance outlined above and making reference to the baseline noise environment monitored around the development site (see Section 11.4.1), the following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development:

- For residential NSLs it is considered appropriate to adopt 65 dB(A) CNT depending on existing noise level. Given the baseline monitoring carried out, it would indicate that Category A values are appropriate using the ABC method.
- For non-residential NSLs it is considered appropriate to adopt the 70 dB(A) CNT, given the environment in which the proposed development is set, in line with BS5228-1 Annex E2.

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 11.3 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of United Kingdom Highways Agency (UKHA) *Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2* (UKHA, 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

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

Table 11.3 Description of the magnitude of impacts. Adapted from DMRB Table 3.16

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

11.3.3.2 Construction Phase Vibration Criteria

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s. There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings:

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

BS7385-2 and BS5228-2 advise that, for soundly constructed residential properties and similar light-framed structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above for transient vibration. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table B.2 of BS5228-2 may need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. For buildings or structures that are structurally unsound, lower vibration magnitudes will apply, typically 50% of those for structurally sound buildings. Protected or historic buildings are not automatically assumed to be more vulnerable to vibration unless they have existing structural defects. The values are summarised in Table 11.4.

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above

Reinforced or framed structures Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial building types.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.

Note 1 Values referred to are at the base of the building.
Note 2 At frequencies below 4Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Table 11.4 Transient Vibration Guide Values for Cosmetic Building Damage

BS 5228-2 and BS 7485-2 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 11.4 and major structural damage can occur at vibration magnitudes greater than four times those in Table 11.4.

These guidelines relate to predominantly transient vibration which does not give rise to resonant responses in structures, and to low rise buildings.

Human Perception

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. Higher levels of vibration, however, are typically tolerated for single events or events of short duration. For example, during piling, one of the primary sources of vibration during construction, vibration levels may typically be tolerated at up to 2.5mm/s. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant to such activities during the night-time (or if they are trying to sleep during the daytime).

BS 5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of the peak particle velocity (PPV). Table 11.5 below summarises the range of vibration values and the associated potential effects on humans.

Vibration Level, PPV	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1 mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.
10 mm/s	Vibration is likely to be intolerable for any more than a brief exposure to this level

Table 11.5 Guidance on effects of human response to PPV magnitudes

Expected vibration levels from the construction works will be discussed further in 11.5.1.1.

11.3.3.3 Construction Phase Traffic

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the construction of the Proposed Development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with construction works.

In order to assist with the assessment of construction traffic noise, reference is made to the *DMRB Noise and Vibration*. DMRB has been used to assess the likely magnitude of effect associated with changes in traffic noise levels along an existing road. Table 11.6 below presents the likely effects associated with change in traffic noise level and is adapted from Table 3.17 of the DMRB to include a column on the significance of effects in EPA/EIAR terms.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
Less than 1 dB	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant
3 – 4.9	Perceptible	Moderate	Slight, Moderate
≥ 5	Up to a doubling of loudness	Major	Significant

Table 11.6 Classification of magnitude of traffic noise changes in the short-term

In accordance with the DMRB Noise and Vibration Guidance, construction noise and construction traffic noise effects shall constitute a significant effect where it is determined that a major or moderate magnitude of effect will occur for a duration exceeding:

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

11.3.3.4 Operational Phase Noise Criteria – Plant Noise

EPA NG4

The proposed development, if permitted, will require an IED Licence from the EPA. An assessment of noise under the EPA NG4 guidance requires a noise survey of baseline conditions and then derives appropriate criteria for noise due to the operation of the site. The criteria apply at the façades of the noise-sensitive locations.

The first part of selecting the noise criteria is to carry out a 'quiet area' screening on the location of the site. To be considered a 'quiet area', the following three criteria are tested:

- The site must be located at least 3km from an urban area with a population of more than 1,000 people: in this instance the site lies between Leixlip and Celbridge and this criterion is not met.

- The site must be at least 3 km away from any local industry: Collinstown Industrial Park lies at less than 2km to the north therefore this criterion is not met.
- The site must be at least 5km away from any National Primary Route: the M4 motorway runs along the northern boundary of the site therefore this criterion is not met.

In this instance, none of the above criteria are met and therefore the site is not considered to be in a 'quiet area'.

Having confirmed that the site is not in a 'quiet area', the next part of the derivation of Noise criteria according to NG4 is to test whether the site meets the criteria for an 'area of low background noise'.

For a noise-sensitive location in the vicinity of the site to be considered an 'area of low background noise', the noise levels measured at that location during the environmental noise survey need to satisfy all three the following criteria:

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

Finally, depending on whether each location is considered an 'area of low background noise', Table 11.7 below outlines the noise emission limit criteria detailed in the NG4 document.

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

Table 11.7 NG4 Approach for Determining Appropriate Noise Criteria

The noise levels measured during the baseline noise surveys are presented in Section 11.4 of this chapter.

The data centre elements of the proposed developments would operate continuously. On the other hand, the energy compound would be required by the national grid provide dispatchable power. It would not be expected to operate 24/7, but as the hours of operation cannot be restricted or foreseen, (See section 2.5.4 for further detail), the precautionary approach taken here is to use assess the noise effects as if the energy compound were to operate continuously. This implies that the night-time noise criterion is critical to the assessment.

Section 11.4.1 presents the noise survey results and discusses applicable noise criteria according to NG4. In general, as these noise-sensitive locations are not identified as areas of low background noise as per the NG4 guidance, a 45 dB $L_{Aeq,T}$ night time criterion applies. Note if plant noise were designed to this level, plant noise would be clearly audible and the dominant background source of noise at a number of noise sensitive locations in the vicinity of the development. NG4 guidance refers to the noise complaint assessment method BS4142 in the case of noise complaint, thus this methodology is also used assess the predicted noise levels.

Other Guidance – BS 4142

BS 4142:2014: *Methods for rating and assessing industrial and commercial sound* is the industry standard method for analysing fixed plant sound emissions to residential receptors. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. It should also be noted that the EPA NG4 document indicates that the BS 4142 assessment methodology should be used in the assessment of complaints associated with a site's operations. As an Industrial Emissions Licensing (IED) licence will be sought for the site, the guidance contained therein needs to be given due regard.

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

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

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

background sound level, $L_{A90,T}$ — A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

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

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

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

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

Assessment of Significance

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

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

The scale adopted in this assessment is shown in Table 11.8 below is based on an example scale within the IEMA guidelines. The corresponding significance of effect from the 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022) is also presented.

Noise Level Change dB(A)	Subjective Response	Long Term Impact Classification (IEMA, 2014)	Effect Guidelines on the Information to be contained in EIARs (EPA)
≥ 0	No change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible	Negligible	Not Significant

Noise Level Change dB(A)	Subjective Response	Long Term Impact Classification (IEMA, 2014)	Effect Guidelines on the Information to be contained in EIARs (EPA)
≥ 3 and < 5	Noticeable	Minor	Slight - Moderate
≥ 5 and < 10	Up to a doubling of loudness	Moderate	Moderate - Significant
≥10	More than a doubling of loudness	Major	Significant - Profound

Table 11.8 Noise Impact Scale - Operational Noise Sources

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

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

The assessment methods detailed in above refer to residential properties. Methods for assessing noise at other kinds of noise-sensitive locations are described in the following sections.

Commercial Properties

A number of commercial / industrial properties are located in the vicinity of the site. In terms of noise emissions from the site it is considered that an appropriate noise criterion at these locations is 55 dB $L_{Aeq,15min}$, which corresponds to the noise criterion for daytime periods in NG4.

Amenity Areas

The Wonderful Farm Parkland, situated to the north of the proposed development on the northern site of the M4 motorway is a recreational amenity and is considered noise-sensitive during daytime hours. This location is represented by NSL01 (See Table 11.10 and **Figure *11.1***). It is recommended that noise limits associated with the day-to-day operations of the proposed development would not exceed 55 dB $L_{Aeq,15min}$ at NSL01.

Similarly, the grounds of Castletown House are considered noise-sensitive and the noise criterion for the day-to-day operations of the proposed development is 55 dB $L_{Aeq,15min}$ at the assessment location NSL10 in order to protect the recreational amenity of the establishment.

Emergency Operation

Stand-by generators are integral to the current proposal. 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. Routine testing will be conducted during regular weekday daytime periods only. Section 4.4.1 of the EPA NG4 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'.

As generators will only run if there is a loss of power to the site, or for scheduled testing during daytime periods, the noise criterion of 55 dB $L_{Aeq,15min}$ on these emergency units is proposed. Generators have been selected in order to achieve this design goal at nearby residential noise sensitive locations.

11.3.3.5Operational Phase Noise Criteria – Additional Traffic on Public Roads

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 11.9 offers guidance as to the likely impact associated with any particular change in traffic noise level based on DMRB Noise and Vibration, and EPA Guidelines 2022.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
0	Inaudible	No Change	Neutral
0.1 – 2.9	Barely Perceptible	Negligible	Imperceptible
3 – 4.9	Perceptible	Minor	Slight
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate
10+	Doubling of loudness and above	Major	Significant

Table 11.9 Classification of magnitude of traffic noise changes in the long term

11.3.4 Operational Phase Vibration Criteria

There is no expected source of vibration associated with the operational phase, therefore, vibration criteria have not been specified for this phase.

11.4 Baseline Scenario/Future Receiving Environment Analysis

11.4.1 Current State of the Environment (Baseline Scenario)

Context

NSLs identified nearby are located in a range of existing noise environments. Those to the north of the proposed development are near the M4 motorway and have higher existing noise levels. Those to the south east and south west have lower existing noise levels. The following NSLs in Table 11.10 and shown in Figure 11.1 have been considered as part of this assessment.

Receptor	Description
NSL01	Recreational NSL (Wonderful Farm Parkland).
NSL02	Residential NSL located on The Drive, Barnhall Meadows Estate.
NSL03	NSL located to the east of the site on the opposite side of the Celbridge Road.
NSL04	NSL located to the east of the site on the opposite side of the Celbridge Road.
NSL05	NSL located to the east of the site on the opposite side of the Celbridge Road.
NSL06	NSL located to the east of the site on the opposite side of the Celbridge Road.
NSL07	NSL located to the south east of the site on the opposite side of the Celbridge Road.
NSL08a	Commercial NSL: Montessori facility
NSL08b	Commercial NSL: Rugby club
NSL09	NSL located to the south of the site on the opposite side of the Celbridge Road.
NSL10	Recreational NSL within Castletown demesne.
NSL11	NSL (Castletown House).
NSL12a/b/c	Residential NSLs located on Woodview Estate.
NSL13	NSL located to the north west of the site on the opposite side of the M4.
NSL14	Residential NSL located on Beech Park Estate.
NSL15	Residential SHD with application ref. no. 18/300606, currently under construction

Table 11.10 Assessment Locations

Figure 11.1 Assessment Locations

Character

The existing noise environment is described in the following sections:

Measurement Locations

Baseline noise monitoring has been completed at a number of representative locations in the vicinity of the development and is reviewed here to inform a preliminary discussion of the existing noise environment and selection of suitable noise criteria for a planning application. Figure 11.2 illustrates the approximate location of the noise monitoring locations.

A description of each location is as follows:

Location A	In an open area to the north-east of the existing campus. The noise survey at this location is representative of that at the housing area on the opposite side of the M4 motorway.
Location B	Near the entrance to the existing campus, at a location representative of the house on the opposite site of Celbridge Road.
Location C	At the boundary with MU Barnhall Rugby Football Grounds. On the most recent survey visit there was new plant operating at this location.

Location C (Night)	At a location representative of the noise environment at the houses to the east of the roundabout.
Location D	Within the Castletown house grounds.
Location D (Night)	Within the Woodview housing estate to the southwest of the proposed development.
Location E	At a roundabout on a local road to the north-west of the existing campus. The noise survey at this location is representative of the housing area on the opposite site of the M4 motorway.

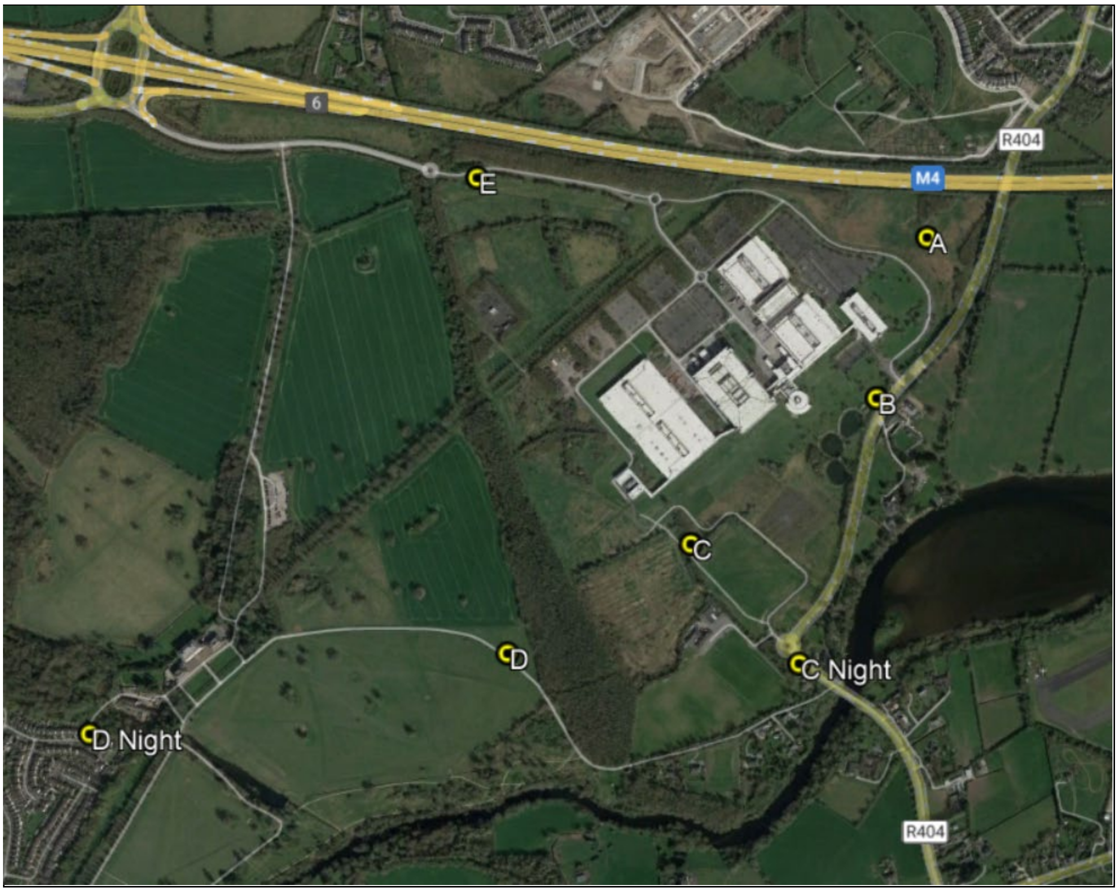

Figure 11.2 Noise Survey Locations

The noise survey results are summarised in **Table 11.11** below.

Noise Measurement Parameters

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

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

Measured Noise Levels

The noise survey results are summarised in Table 11.11 below. For a table of individual noise level measurements, see Appendix 11.4.

Monitoring Location	Period	Measured 15 Minute Noise Level, dB(A) Free-Field		
		L_{Aeq} Note 1	L_{AF90} Note 1	L_{AF90} Note 2
A	Day	65 – 67	63 – 65	64
	Evening	59	56	56
	Night	56 – 57	50 – 54	52
B	Day	60 – 61	56 – 58	57
	Evening	51	48	48
	Night	49 – 50	46	46
C	Day	56 – 62	55 – 56	55
	Evening	47	46	46
C Night	Night	47 – 48	44 – 46	45
D	Day	53 – 57	48 – 53	50
	Evening	38	28	28
D Night	Night	30 – 38	26 – 27	26
E	Day	62 – 67	60 – 65	63
	Evening	56	51	51
	Night	55	44 – 45	44

Note 1 Range of measured levels presented
Note 2 Arithmetic average L_{A90}
Table 11.11 Noise Monitoring Results

Significance

The measured noise levels are each considered representative of their respective settings, i.e. higher noise levels measured near major roads and lower noise levels at distances away from flowing traffic.

In accordance with NG4, noise levels at each measurement location are assessed as to whether they meet the criteria for an 'area of low background noise' as presented in Section 11.3.3.4. No location meets all three of the criteria; however, the night-time noise level at location 'D Night' is below 30 dB L_{A90} and this is taken into account in the assessment presented in Section 11.5.2.

Sensitivity

Criteria for the assessment of significance of a change in noise levels are provided in Section 11.3.3.4.

Facilitation Works

To assist in establishing a representative baseline noise environment in the vicinity of the GNI Upgrade, reference has been made to the Environmental Protection Agency (EPA) strategic noise mapping. The noise maps are provided for the overall day-evening-night period in terms of L_{den} and for the night-time period in terms of L_{night}. All data has been taken from the EPA Mapping website http://gis.epa.ie. As the GNI construction will take place during daytime, the existing night-time noise environment is not considered in this assessment,

Figure 11.3 presents the mapped noise levels for road traffic in terms of L_{den}. Daytime noise levels in the locations where there are residential NSLs are in the range 65 to 69 dB L_{den} at the highest, ranging to below 55 dB L_{den} at locations away from major roads.

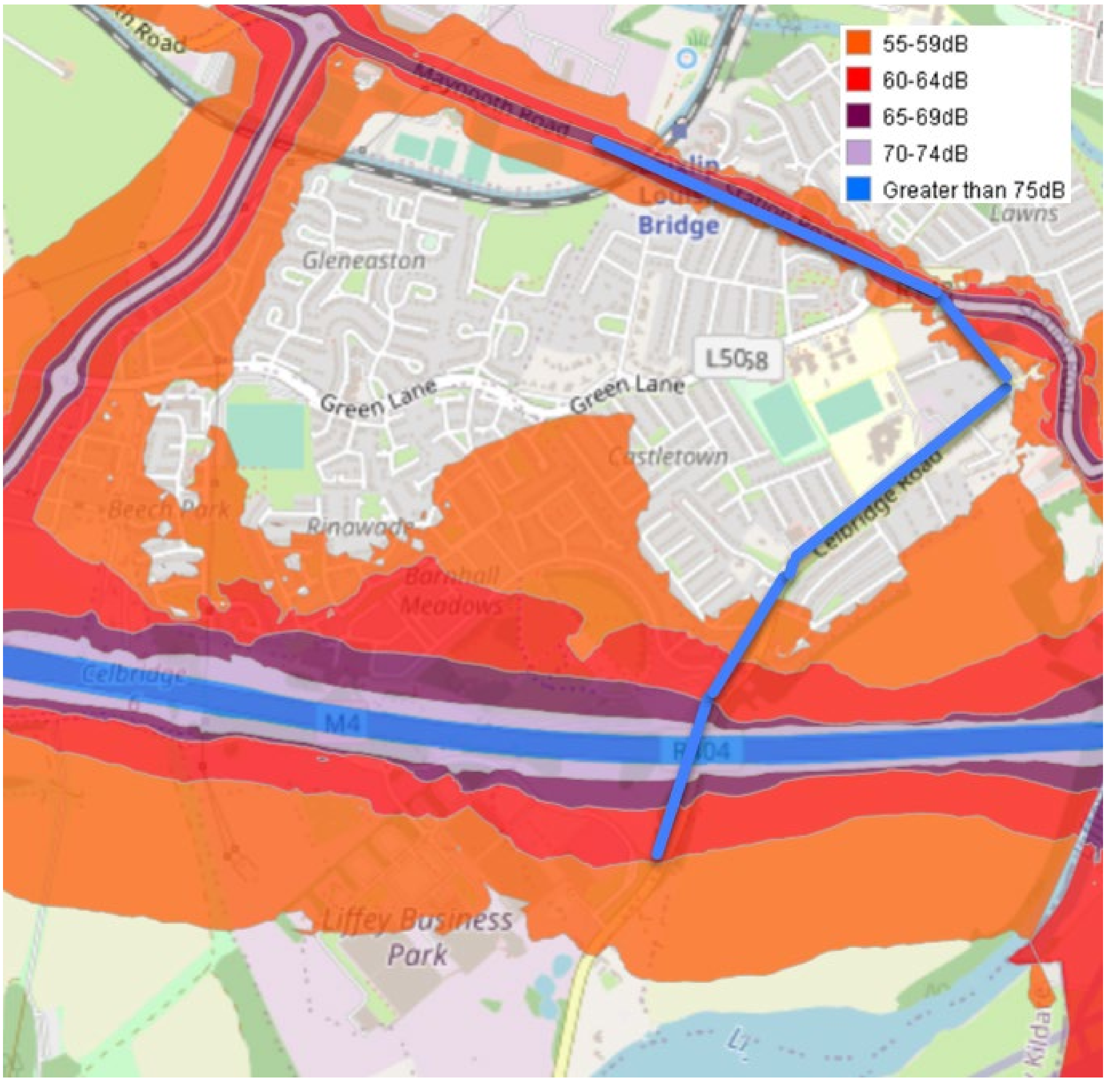

Figure 11.3 **L_{den} Road Traffic Noise Levels with approximate gas pipeline route indicated in blue.**

Based on noise levels measured during daytime periods at location B, it is assumed that daytime noise levels along Celbridge road are of the order of 60 dB L_{Aeq}.

11.4.2 Likely Future Receiving Environment ('Do Nothing' Scenario)

In the event of a 'Do Nothing' scenario, the site would remain in operation as an existing ICT campus.

It would mean the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged resulting in a neutral and local impact in the long-term.

11.5 Likely Impacts of the Project

11.5.1 Construction Phase

The largest noise and vibration impact of the proposed project will occur during the construction phase due to the operation of various plant machinery and HGV movement to, from and around the site. In this instance, the construction phase can be classed as a mid-term phase (approximately ten years in duration on a phased basis as described in Chapter 2 Section 2.6). The nearest noise-sensitive location to the main site is the childcare facility to the south of the proposed development at a distance of 40 m from the boundary and a distance of 100 m from the nearest proposed building. Along the route of the GNI Upgrade, there are NSLs at distances of 10 to 15 m from the road edge along Celbridge road and Station Road.

Construction noise due to the GNU Upgrade works are included in the assessment below of noise at the nearest NSLs to the principal works site. Construction noise effects of the GNI Upgrade works on NSLs along the gas pipeline route is assessed in a section thereafter. Cumulative construction noise effects of the GNI Upgrade works are discussed in Section 11.7.1.1.

Based on the results of the baseline noise surveys undertaken, the ambient daytime noise level at these properties was found to be between 56 and 63 dB $L_{Aeq,15min}$.

Thresholds for significant noise from construction can be determined by referring to and the baseline ambient noise levels, as outlined in the assessment criteria section. The daytime significance threshold for construction noise at the site is set at 65 dB $L_{Aeq,1hr}$. A night-time threshold is not included as construction work will not be taking place at night.

BS 5228-1 contains noise level data for various construction machinery. Table 11.12 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

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

The latter scenario can be assumed in this case due a standard hoarding will be erected around the site. Table 11.12 shows the potential noise levels calculated at various distances based on the assumed sound power level and attenuation provided by the barrier of 10 dB.

It is assumed an 'on-time' of 66% applies to construction plant, i.e. that equipment will be in used for up to 8 hours over a 12-hour working day.

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance(dB $L_{Aeq,1hr}$)
Foundations	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (D7 6)	77
	Poker Vibrator (C4 33)	78
Steel Erection	Tower Crane (C4.48)	76
	Articulated lorry (C11.10)	77
General Construction	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68
GNI Upgrade Works	Mini Tracked Excavator with Rock Breaker (C5.2)	83
	Wheeled Loader Lorry (C2.28)	76
	Dump Truck (C.4.2)	78
	Generator (C.2.44)	77

Table 11.12 Typical noise levels associated with construction plant items

Table 11.13 presents indicative predicted noise levels based on distances to the works.

Location	Noise Level $L_{Aeq,1hr}$ for construction phase				
	Foundations	Steel Erection	General Construction	Landscaping	GNI Upgrade Works
NSL01	60	57	59	58	49
NSL02	50	47	49	48	62
NSL03	65	62	64	63	49
NSL04	60	57	59	58	45
NSL05	59	56	58	57	44
NSL06	60	57	59	58	40
NSL07	52	49	51	50	40
NSL08a	64	61	63	62	39
NSL08b	64	61	63	62	40
NSL09	52	49	51	50	37
NSL10	51	48	50	49	37
NSL11	39	36	38	37	34
NSL12a/b/c	36	33	35	34	33
NSL13	51	48	50	49	37
NSL14	52	49	51	50	40
NSL15	50	47	49	48	42

Table 11.13 Typical noise levels associated with the various construction phases for the principal works site.

The indicative predicted noise are within the construction noise threshold (CNT) of 65 dB $L_{Aeq,1hr}$ at all locations. There are no construction activities that would be expected to give rise to noise construction levels that would be considered out of the ordinary or in exceedance of the levels outlined in Table 11.2 on an on-going basis or give rise to a potential significant impact through the process outlined in Section 11.3.3.1.

The impact on the noise environment due to construction activities according to the criteria in Table 11.3 is presented in Table 11.14, where it is shown that the effects are not significant for the majority of locations and slight to moderate at locations NSL03, NSL08a NSL08b. Best-practice mitigation measures are presented in Section 11.6.1.

Location	Significance of Effect for Construction Phase				
	Foundations	Steel Erection	General Construction	Landscaping	GNI Upgrade Works
NSL01	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL02	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL03	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Not Significant
NSL04	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL05	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL06	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL07	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL08a	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Not Significant
NSL08b	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate	Not Significant
NSL09	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL10	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL11	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL12a/b/c	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL13	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL14	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
NSL15	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

Table 11.14 Construction Phase Effects for Principal Works Site

The effect of construction noise is therefore considered negative, not significant to moderate and medium-term.

GNI Upgrade Works

As the Construction Phase progresses along the length of the GNI Upgrade works, a variety of plant items will be required for the varying phases. When works are occurring immediately outside NSLs, they will be clearly audible and will generate high levels of construction noise.

The nature of the works associated with the GNI Upgrade works are, however, transient in nature and each activity will occur for intermittent periods at any one time. For example, the use of breakers, excavators and planers, some of the highest noise generating plant items will operate outside a NSL for a limited period as it progresses along the length of a working area.

For indicative calculation purposes, an average plant noise level has been calculated for each phase of work making reference to the plant list in Table 11.12.

The average value is used to account of the mobile element of works assuming plant items associated with any activity are operating within a 50m linear work area at any one time. The average construction for each phase of work has been used to assess construction noise levels at the closest NSLs. The following sections present a range of indicative construction noise calculations associated with the key construction activities associated with this section of the project. The calculations assume that the ground is hard between the works and the noise-sensitive locations and that there is a solid hoarding between the noise source and the receiver, which offers a noise reduction of 10 dB. The closest NSLs are typically at a distance of 15m from the GNU Upgrade works.

Based on noise levels measured during daytime periods at location B, it is assumed that daytime noise levels along the

Item (BS 5228 Ref.)	Plant Noise level at 10m Distance (dB LAeq,T)	Predicted Noise Level (dB $L_{Aeq,T}$) at distance (m)			
		15 m	30 m	40 m	50 m
Mini Tracked Excavator with Rock Breaker (C5.2)	83	67	61	59	57
Wheeled Loader Lorry (C2.28)	76	60	54	52	50
Dump Truck (C.4.2)	78	62	56	54	52
Generator (C.2.44)	77	67	61	59	57
Total	86	70	64	62	60
Significance		Moderate to Significant	Slight to Moderate	Slight to Moderate	Slight to Moderate

Table 11.15 Construction Noise Effects for the GNI Upgrade Works

The construction noise effects of the GNU Upgrade Works are therefore negative, slight to significant and temporary.

11.5.1.1Construction Vibration

Potential for vibration impacts during the construction phase programme are likely to be limited given the ground breaking, piling and excavations required. There is potential for piling to be used for the construction of the buildings. For the purposes of this assessment the expected vibration levels during piling assuming augured or bored piles have been determined through reference to published empirical data. BS 5228-2, publishes the measured magnitude of vibration of rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

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

Considering the low vibration levels at very close distances to the piling rigs, vibration levels at the nearest buildings are not expected to pose any significance in terms of cosmetic or structural damage. In addition, the range of vibration levels is typically below a level which would cause any disturbance to occupants of nearby buildings.

In this instance, taking account of the distance to the nearest sensitive off-site buildings, vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in Table 11.4 to avoid any cosmetic damage to buildings. Vibration levels are also expected to be below a level that would cause disturbance to building occupants, as set out in Table 11.5. The potential vibration impact during the construction phase if of neutral, imperceptible and medium-term impact.

11.5.1.2Construction Traffic

This section has been prepared in order to assess likely noise effects associated with construction traffic using the local road network. Information presented at Chapter 13, regarding vehicle types and predicted traffic volumes, have been used to inform this assessment.

The likely noise effects of HGV movements are assessed through consideration of the cumulative noise level associated with a series of individual events. The noise level associated with an event of short duration, such as a vehicle drive-by, may be expressed in terms of its Sound Exposure Level (SEL; LAx). The SEL can be used to calculate the contribution of an event or series of events to the overall noise level in a given period. The appropriate formula, based on basic acoustic principles, is as follows:

$$L_{Aeq,T} = L_{Ax} + 10\log_{10}(N) – 10\log_{10}(T) – 10\log_{10}(r_2/r_1) \text{ dB}$$

Where:

$L_{Aeq,T}$	is the equivalent continuous sound level over the time period T (s);
L_{Ax}	is the "A-weighted" Sound Exposure Level of the event under consideration (dB);
N	is the number of events over the course of time period T.
r_2	is the distance from the edge of the entrance road to the façade of nearest property
r_1	is the distance from vehicle to the point of original measurement

The mean value of Sound Exposure Level a HGV movement is of the order of 85dB L_{Ax} at 5m from the vehicle. This figure is based on a series of measurements conducted under controlled conditions.

Based on information in Chapter 13, the peak hourly number of vehicles is 76 per hour per unit which assuming the worst-case scenario of the construction of six units' construction periods overlapping, give 465 vehicle movements per hour.

Also in Chapter 13, it is stated that the route of the construction vehicles will be along the M4 and accessing the site from the northwest via Barnhall Road. Assuming that the traffic impact in terms of vehicle flows along the M4 is negligible, the assessment here focusses on construction traffic using Barnhall Road. The nearest noise-sensitive locations to this section of Barhall Road are the those on the northern side of the motorway, represented by NSL13, at a distance of 125m.

The predicted noise level at these NSLs, based on the methodology above is 62 dB $L_{Aeq,1hr}$. In the context of measured noise levels of 62 to 67 dB LAeq measured during daytime periods at noise survey locations A and E, based on the criteria in Table 11.6, the effect associated with construction traffic noise is negative, not significant and medium-term.

11.5.2 Operational Phase

The primary sources of outward noise from the proposed development in the operational context are deemed long term and will involve:

- fixed plant at data centres and energy centre;
- emergency site operations, and;
- a new public link road;
- additional vehicular traffic on public roads, and
- a pedestrian and cycle overpass.

These issues are assessed in detailed in the following sections. See Appendix 11.3 for details of the noise modelling undertaken for this assessment and associated input information.

11.5.2.1 Fixed Plant at Data Centres and the Energy Centre

Three scenarios have been developed to consider the noise impact of the proposed operations. These are as follows:

- Scenario A: Day to Day Operations;
- Scenario B: Emergency Operations, and;
- Scenario C: Generator Testing.

Scenario A is considered to be the most representative of the day to day operation, and includes the direct operation of the combustion turbine generators (CTGs) in the energy centre. This scenario assumes the worst-case scenario that the CTGs are also required to operate 24/7, however we understand that this is unlikely to occur. Notwithstanding this, the use of the CTGs cannot be restricted by hours (to meet EirGrid requirements) and therefore the precautionary approach has been taken.

Scenario B is representative of emergency situation when a power outage or issue with supply from the national grid has occurred and backup electrical power is therefore required to keep the data centres operation. It should be noted that such an event is an extremely rare occurrence.

Scenario C considers the impact associated with the testing of emergency generators. Testing of generators will occur once per week for a maximum of 1 hour each, one generator at a time, sequentially during daytime periods. (For the noise assessment of generator testing, it is assumed that each unit generate the same noise levels as for Scenario B). The predicted noise level for Scenario C presented here assume that the closest generator to existing NSL08a/b is being tested. It should be noted that the testing of generators shall take place only between 09.00 and 17.00hrs.

Predicted noise levels are presented in Tables 11.16, 11.17 and 11.18. Noise contours for the three scenarios are presented in Appendix 11.5.

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
NSL01[1]	45	Day	55	--	✓
		Evening	50	--	✓
		Night	--	--	--
NSL02	42	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL03	43	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL04	44	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL05	44	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL06	41	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL07	39	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL08a	42	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	--
NSL08b	43	Day	55	--	✓

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
		Evening	50	--	✓
		Night	45	--	✓
NSL09	35	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL10[1]	34	Day	55	--	✓
		Evening	50	--	✓
		Night	--	--	--
NSL11[1]	35	Day	55	--	✓
		Evening	50	--	✓
		Night	--	--	--
NSL12a	34	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL12b	34	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL12c	32	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL13	42	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL14	45	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓
NSL15	45	Day	55	--	✓
		Evening	50	--	✓
		Night	45	--	✓

Note 1: Non-residential NSLs do not have a night-time criterion as they are assumed not to be in use during night-time periods.

Table 11.16 Scenario A: Predicted Noise Levels compared to noise criteria

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
NSL01	50	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL02	47	Day	55	--	✓
		Evening	55	--	✓

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
		Night	55	--	✓
NSL03	53	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL04	54	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL05	53	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL06	51	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL07	49	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL08a	55	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL08b	54	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL09	44	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL10	44	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL11	43	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL12a	43	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL12b	42	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL12c	40	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL13	49	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
NSL14	49	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓
NSL15	49	Day	55	--	✓
		Evening	55	--	✓
		Night	55	--	✓

Table 11.17 Scenario B: Predicted Noise Levels compared to Emergency Operating Criteria

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
NSL01	45	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL02	42	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL03	44	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL04	44	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL05	44	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL06	44	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL07	42	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL08a	49	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL08b	47	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL09	36	Day	55	--	✓
		Evening	--	--	--

Ref	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
		Night	--	--	--
NSL10	36	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL11	37	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL12a	36	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL12b	35	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL12c	34	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL13	44	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL14	46	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--
NSL15	45	Day	55	--	✓
		Evening	--	--	--
		Night	--	--	--

Table 11.18 Scenario C: Predicted Noise Levels compared to Generator Testing Criteria

Review of Increases in Noise Level

Table 11.19 presents the predicted changes in noise level associated with the development at the nearest noise sensitive locations to the site.

Ref	Predicted Noise Level $L_{Aeq,15min}$	Background Noise Level $L_{A90,15min}$	Cumulative Noise Level dB(A)	Change in Noise Level dB(A)	EPA Glossary of Effects
NSL01	45	52	52.8	+0.8	Not Significant
NSL02	42	52	52.4	+0.4	Not Significant
NSL03	43	46	47.8	+1.8	Not Significant
NSL04	44	46	48.1	+2.1	Not Significant
NSL05	44	46	48.1	+2.1	Not Significant
NSL06	41	45	46.5	+1.5	Not Significant
NSL07	39	45	46	+1.0	Not Significant
NSL08a	42	50	50.6	+0.6	Not Significant

NSL08b	43	50	50.8	+0.8	Not Significant
NSL09	35	45	45.4	_0.4	Not Significant
NSL10	34	50	50.1	+0.1	Not Significant
NSL11	35	50	50.1	+0.1	Not Significant
NSL12a	34	26	34.6	+8.6	See text
NSL12b	34	26	34.6	+8.6	See text
NSL12c	32	26	33.0	+7.0	See text
NSL13	42	44	46.1	+2.1	Not Significant
NSL14	45	44	47.5	+3.5	Slight, Moderate
NSL15	45	44	47.5	+3.5	Slight, Moderate

Table 11.19 Review of Predicted Changes in Noise Levels

At locations NSL12a, b, and c, an increase of the order of 7 to 9 dB is indicated. However, the predicted noise levels are below of 35 dB $L_{Aeq,T}$ which corresponds to the EPA NG4 night-time criterion for low-noise areas. As 35 dB L_{Aeq} remains a low level of noise, the effects are therefore considered 'not significant'.

At locations NSL06 and NSL07, a slight to moderate effect is predicted, however the predicted noise levels of 41 and 39 dB(A) remain within the EGA NG4 criterion of 45 dB(A) $L_{Aeq,T}$., Similarly, the effects are therefore considered 'slight to moderate'.

Deep Tech Buildings

As mentioned in chapter 2, "the ultimate tenant for the proposed Deep Tech buildings is not yet agreed. Buildings A1 and A2 have been designed to be flexible to accommodate a range of potential end user requirements" and "noise and vibration is not expected to be significant with modern deep tech not requiring the same level of cooling equipment as might be required by Pharma or traditional manufacturing". At detailed design stage, building services required for the Deep Tech buildings will be designed so the total site plant noise level remains within the noise criteria presented in this chapter. The resulting effect of the overall site noise remains 'not significant to moderate'.

Summary

Taking the above into account, the overall environmental noise effects during the operational phase are negative, not significant to moderate and long-term.

11.5.2.2New Public Link Road

The proposed development includes a public link road between the R404 and the junction 6 of the M4 motorway. As stated in Chapter 2, *'This has been designed to meet objective MT3.12 of the LLAP 2020-2026 which seeks a "new link road from the Celbridge Road (R404) to the south of the M4 connecting to the M4 Leixlip/Celbridge Interchange".'*

The public link road will carry public traffic from the entrance at the north-west corner of the site, past the site buildings and re-join the existing road network at the R404. The expected traffic flows along this road expressed as an Annual Average Daily Traffic (AADT) flow is 1252 AADT. The nearest NSL to the proposed public link road is NSL13 at a distance of approximately 125 m. Based on the calculation in CRTN and assuming the %HGV of 10% and a speed of 60 km/h, the expected noise level at this NSL is 51 dB L_{Aeq} for daytime periods.

Reference to Table 11.11 shows that the noise levels at Location E, which is a similar distance from the M4 Motorway as NSL13, were measured at 62-67 dB L_{Aeq} for daytime periods. In this context noise from the new public link road at this location is imperceptible. The environmental noise effects are neutral, imperceptible and long-term.

At the interchange on the R404, the traffic will re-join the public road network. Noise from increases in traffic flows along existing public roads is assessed in the next section.

11.5.2.3 Additional Vehicular Traffic on Public Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site and other planned developments on surrounding roads. The predicted change in noise levels due to an increase in road traffic has been calculated for each of these roads. Projected traffic data used for the purpose of this assessment includes committed and planned developments in the vicinity of the project site as listed in the Traffic and Transport of this EIAR.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads surrounding the subject site with and without development using the Annual Average Daily Traffic (AADT). The impact from the increase in traffic from the proposed development has been assessed for the year 2043 relative to the Do Nothing scenario for the same year, along the sections of road detailed in Table 11.20.

In terms of the overall traffic flows, in order to increase traffic noise levels by 1dB, traffic volumes would need to increase by the order of 25% approximately. Table 11.20 presents a review of the potential traffic level increases attributable to the proposed development and indicates that the development will not give rise to increases of this magnitude on the surrounding road network.

Link No.	Link Name	Do Nothing AADT 2043	Do Something AADT 2043	Noise level Increase (dB L_{A10}) between Do Nothing and Do Something (2047)
Link 1	Station Road W	16826	16914	0.0
Link 2	Station Road E	15377	15487	0.0
Link 3	Celbridge Road	10187	10274	0.0
Link 4	Celbridge Road N	9266	9441	+0.1
Link 5	Access Road	1077	1252	+0.7
Link 6	Celbridge Road S	9919	10182	+0.1
Link 7	Barnhall Road	4733	6465	+1.4
Link 8	R449 S	16653	16741	0.0
Link 9	M4 Off Slip	7512	8060	+0.3
Link 10	R449 N	5143	5253	+0.1
Link 11	M4 Off Slip	22736	23043	+0.1
Link 12	RBT R404 N	5143	5253	+0.1
Link 13	RBT Access	9016	9543	+0.2
Link 14	RBT R404 S	2369	2632	+0.5
Link 15	R404	9627	9890	+0.1

Link 16	R403 E	9562	9899	+0.2
Link 17	Stacumny Lane	14207	14426	+0.1
Link 18	R403 W	3074	3096	0.0

Table 11.20 Predicted Change In Noise Level associated with Vehicular Traffic. AADT values from Table 13.6 in Chapter 13 *Material Assets – Traffic and Transportation*

The predicted increase in traffic flows associated with the development in the year 2043 will result in an increase less than 3 dB along all roads receiving traffic from the proposed development; reference to Table 11.9 shows that noise from additional traffic flow will have a negligible effect. The effect is therefore neutral, imperceptible and long-term.

11.5.2.4 Pedestrian and Cycle Overpass

From Chapter 2:

> *Construction of a new pedestrian and cycle overpass across the M4 motorway and pedestrian/cycle path adjacent to lands known as the Wonderful Barn Allotments; the overpass will link the new publicly accessible link road within Kildare Innovation Campus to the entrance of Barnhall Meadows estate.*

The overpass, as it is not designed for vehicular use, will not give rise to any significant noise or vibration effects in the operational phase.

11.6 Mitigation Measures and Monitoring of Impacts

11.6.1 Construction Phase

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228-1. Whist construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised. The best practice measures set out in BS 5228-1 and BS 5228-2 include guidance on several aspects of construction site mitigation measures, including, but not limited to:

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

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

11.6.1.1Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item will be selected wherever possible. If a particular item of plant already on the site is found to generate high noise levels, the first action will be to identify whether said item can be replaced with a quieter alternative.

11.6.1.2Noise Control at Source

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

- The lifting of bulky items, dropping and loading of materials will be restricted to normal working hours.
- Mobile plant will be switched off when not in use and not left idling.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- All items of plant will be subject to regular maintenance in order to prevent unnecessary increases in plant noise and this serves to prolong the effectiveness of noise control measures.

11.6.1.3Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Standard 2.4m hoarding will be provided on boundaries opposite sensitive residential receptors; in this instance at the boundary with the NSL08a and NSL08b, these being the Montessori and the Rugby Club school.

11.6.1.4Liaison with the Public

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

11.6.1.5Project Programme

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

11.6.1.6Hours of Works

Construction works will be undertaken within the times below, taken from the Construction Environmental Management Plan:

- Monday to Friday: 07:00 to 18:00hrs
- Saturday: 08:00 to 13:00hrs
- Sunday and Public Holidays No noisy work on site.

However, it may be necessary for some construction operations to be undertaken outside these times, for example, to facilitate connections to public service systems or utilities. Such works will be agreed in advance with the local authority.

11.6.1.7Monitoring

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion. Noise monitoring should be conducted in accordance with the ISO 1996.

Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with BS ISO 4866.

11.6.2 Operational Phase

11.6.2.1Fixed Plant at Data Centres and Energy Centre

The mitigation measures in respect of building service are as summarised here and are included in the design of the proposed development:

- Adherence to the maximum sound power levels for each item, as presented in Appendix 11.3;
- A 14 m high acoustic barrier around the energy centre, with an acoustically absorptive inner face;
- At the data centre buildings, screens around Extract Fan areas to a height of 7 m, with an acoustically absorptive inner face;
- Reverberation Time of no more than 1 s in DAHU hall, north and south, by way of application of acoustically absorptive material to ceiling;
- Acoustic treatment to include the ceiling of the plenum area over electrical room;

- DAHU hall louvres on north facades (in combination with the additional acoustic treatments inside the louvre) to achieve minimum sound reduction index values as in Table 11.21 and;
- Tonal components and low-frequency components to be avoided at NSLs.

Element	Sound Reduction Index, dB at Octave Band Centre Frequency, Hz.							
	63	125	250	500	1000	2000	4000	8000
DAHU Louvre (B Buildings)	4	5	8	9	12	9	7	6
DAHU Louvre (C Buildings)	4	5	5	5	5	5	5	5

Table 11.21 Louvre Sound Reduction Index (SRI)

The effects of these mitigation measures are included in the figures presented earlier in Section 11.5.2.1.

11.6.2.2 Additional Vehicular Traffic on Public Roads

During the operational phase of the development, noise mitigation measures with respect to the (outward) impact of traffic from the development are not deemed necessary.

11.7 Likely Cumulative and Interaction Impacts of the Project

11.7.1 Cumulative Impacts

11.7.1.1 Facilitation Works – GNI Gas Upgrades

Chapter 2 provides details of the GNI Gas Upgrades which are to support the first phase of the proposed development and include replacement of approximately 1.5 km of underground gas pipeline.

In respect of construction noise, the main noise-generating activities are the excavation of trenches and the generator associated with horizontal directional drilling. The construction noise effects of the GNI Upgrade works on the nearest NSLs to the principal works site are discussed in Section 11.5.1.

The cumulative effects of the principal works site and the GNI Upgrade is assessed as follows: with reference to Table 11.13, the phase within the principal works site with the highest predicted noise levels is that for the Foundations. Combining the predicted noise levels for the Foundation phase and the Gas Upgrade Networks gives the values in Table 11.21 below.

Location	Noise Level $L_{Aeq,1hr}$ for construction phase			Significance of Effect
	Foundations	GNI Upgrade Works	Cumulative Construction	
NSL01	60	49	60	Not Significant
NSL02	50	62	62	Not Significant
NSL03	65	49	65	Slight-Moderate

NSL04	60	45	60	Not Significant
NSL05	59	44	59	Not Significant
NSL06	60	40	60	Not Significant
NSL07	52	40	52	Not Significant
NSL08a	64	39	64	Slight-Moderate
NSL08b	64	40	64	Slight-Moderate
NSL09	52	37	52	Not Significant
NSL10	51	37	51	Not Significant
NSL11	39	34	40	Not Significant
NSL12a/b/c	36	33	38	Not Significant
NSL13	51	37	51	Not Significant
NSL14	52	40	52	Not Significant
NSL15	50	42	51	Not Significant

Table 11.22 Cumulative construction noise for Principal Works and GNI Upgrade works.

Cumulative construction noise levels remain below the criterion of 65 dB L_{Aeq} and therefore the effect is considered to be negative, not significant to moderate and short-term.

In respect NSLs along the GNI Upgrade works route, the construction noise from the GNI works will dominate and due to the distance to the principal works site, there no cumulative construction noise effect is expected.

11.7.1.2Facilitation Works – Eirgrid Uprating

Similarly, Chapter 2 provides details of the uprating of existing lines proposed as part of the Facilitation Works. These works involve replacing the overhead electric cables, retaining the existing pylons, therefore no new foundation works or concrete pouring are envisaged. Consequently, the noise generated during these works will be minimal and will progress along the route. These works are not expected to give rise to significant cumulative noise or vibration effects.

11.7.1.3Other Developments

A list of developments for assessment of potential cumulative impacts was prepared by Tom Phillips and Associates. Their locations in relation to the proposed development is shown in **Figure 11.4**.

In respect of noise, the following comments are made:

- 300606 refers to a housing development currently under construction. It is included in the assessment of the proposed development as NSL15; As a residential development, no significant noise effects will be generated and therefore significant cumulative noise effects are likely.
- 19998 refers to works at the Canoe Club along the river front, where predicted noise levels due to the proposed development are of the order of 44 dB L_{Aeq}. No significant noise effects will be generated and therefore significant cumulative noise effects are likely.
- 22/1096 refers to four small 20kV electrical substation buildings; a noise assessment was submitted as a Further Information response for that application. The assessment concluded that noise from these substations would be inaudible at noise-sensitive locations, therefore no significant cumulative noise effects are likely.

- 23/513 Refers to a Large-Scale Residential Development (LRD) at a site of c. 14.3 hectares to the north of the M4 and the east of the R404. NSL02 in this assessment is located closer to the proposed project than the LRD site therefore any impacts on LRD have been taken into account. As the LRD itself is a residential development, no significant noise effects will be generated and therefore significant cumulative noise effects are likely. This development has been taken account of in Chapter 13 (Traffic) at section 13.17.1.
- 21/730 for development of the construction of a new vehicle access to the rugby club. As mentioned in chapter 3, this proposal "has been incorporated into the design of the subject project where the red lines overlap. Interactions between both projects are not likely to result in significant impacts." As this development does not generate significant noise no significant cumulative noise effects are likely.
- Regeneration of the Wonderful Barn lands is a Kildare County Council project which is at an early stage in the design. As this development does not generate significant noise, no significant cumulative noise effects are likely.

By their nature, neither of these developments is expected to generate noise or vibration which could give rise to a significant cumulative effect.

All other developments are at sufficient distance so as not to give rise to cumulative noise or vibration impacts with the proposed development.

Figure 11.4 Other planning applications for assessment of potential cumulative impact

11.7.2 Interaction Impacts

Noise and Vibration Effects interact with Traffic and Transport Effects; assessment of the noise effects noise of construction traffic is included in Section 11.5.1.1 and operational traffic are included in Section 11.5.2.2.

11.8 Mitigation Measures and Monitoring of Cumulative and Interaction Impacts

11.8.1 Construction Phase

Not applicable, as no significant cumulative construction impacts are likely.

11.8.2 Operational Phase

Not applicable as no significant cumulative operational impacts are likely.

11.9 Major Accidents and/or Disasters

The likelihood of a significant adverse noise or vibration impact on the environment as a result of a major accident or natural disaster is extremely unlikely and would have minor consequences for both human health and environmental effects.

11.10 Mitigation Measures and Proposed Response to such Emergencies

Not applicable.

11.11 Residual Impacts

11.11.1 Construction Phase

The construction noise assessment has shown that in accordance with the 'significance' thresholds presented in the BS 5228-1 there is not a significant impact at noise-sensitive locations in terms of ambient noise levels subject to appropriate management of the issues on the site as presented in Section 11.6.1.

11.11.2 Operational Phase

The robust operational noise assessment of fixed plant associated with the proposed development has shown that there will be a negative, not significant to moderate, long-term effect at the NSLs identified on Figure 11.2. Ambient noise levels are and will continue to be dictated by road traffic noise in the area while a low level of plant noise is expected to be audible during lulls in other sources (e.g. distant traffic noise).

It is reiterated that the predictions presented here assume that day to day plant is operating at full/high duty which is a conservative assumption. This is extremely unlikely to occur, and more likely to operate less than c.1500 hours per year, however given the uncertainty in relation to the hours Eirgrid will require for operation the energy centre the worst-case scenario (i.e. all plant running 24/7) has been assessed. In all likelihood, the actual noise levels for the majority of the time will be lower than those presented here. The noise effect is negative, not significant to moderate and short-term.

GNI Upgrade Works

The impact assessment of the GNI Upgrade works on NSLs along the pipeline route is negative, slight to significant and temporary.

Construction Traffic

The operational noise assessment of vehicle movements associated with the site has shown that in accordance with the scale in the EPA EIA Report Guidelines 2022 there will be an imperceptible impact off site noise sensitive locations considering existing traffic volumes on the local road network. See Chapter 13 Traffic and Transportation for the traffic impact assessment.

11.12 Difficulties Encountered

No difficulties were encountered in the preparation of this chapter.

11.13 References

Guidance documents used in the preparation of this Chapter are listed in Section 11.3

12.0 MATERIAL ASSETS – WASTE MANAGEMENT

12.1 Introduction

This chapter evaluates the likely significant effects, if any, which the proposed development and facilitating works may have on Material Assets – Waste as defined in the EIA Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU), the EPA EIA Report Guidelines 2022 and EPA Draft Advice Notes for EIS 2015.

This chapter was completed by Chonaill Bradley. Chonaill Bradley is a Principal Environmental Consultant in the Environment Team at AWN. He holds a BSc in Environmental Science and is currently undertaking a Postgraduate Diploma, Circular Economy Leadership for the Build environment. He is an Associate Member of the Institute of Waste Management (CIWM). Chonaill has over eight years' experience in the environmental consultancy sector.

This chapter has also been prepared to address the issues associated with material assets - waste during the construction and operational phases of the proposed development and facilitating works as described in Chapter 2.

A site-specific Resource Waste Management Plan (RWMP) has been prepared by AWN Consulting Ltd to deal with waste generation during the demolition, excavation and construction phases of the proposed development and facilitating works has been included as Appendix 12.1. The RWMP was prepared in accordance with the Environmental Protection Agency's (EPA) document 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021).

The Chapter has been prepared in accordance with European Commissions Guidelines, Guidance on the preparation of the Environmental Impact Assessment Report (2017), the EPA Guidelines on the Information to be contained in EIAR (2022) and the EU Commission Notice on changes and extensions to projects, (2021).

These documents listed above will ensure the management of wastes arising during the construction and operational phases of this proposed project is undertaken in accordance with legislative requirements and best practice standards.

12.2 Project Description

The project is an integrated masterplan proposal that includes for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT and Innovation uses. The proposal will include for the demolition of some of the existing buildings on site and construction of new buildings, an energy centre and replacement substation. The proposal will include significant public infrastructure including a new signalised intersection on Celbridge Road (R404), a new Public Link Road through the campus (between Barnhall Road and the new signalised intersection), a pedestrian/cycle overpass of the M4, pedestrian and cycle links through the site and along the designated protected view corridor and supporting infrastructure. The project to which this EIAR relates also includes facilitation works which comprise uprating of existing 110kV power lines to the site and the enhancement of the local gas network to the site. The facilitation works which are included in the project do not form part of the development for which consent is sought. Future consents for the facilitation works will be required through EirGrid and GNI. A detailed description of the project is outlined in Chapter 2 of this EIAR.

The development site which is subject to the application for consent measures c. 72.23 ha and is principally bounded by: the M4 Motorway to the north; Cellbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west.

The site comprises the existing Kildare Innovation Campus, which was formerly the Hewlett Packard Campus originally permitted in 1995 under KCC Reg. Ref 95923. The development site also encompasses lands with the jurisdiction of Kildare County Council (KCC).

Refer to Chapter 2 and 3 for a more detailed description of the site's location and context.

12.3 Methodology

The assessment of the impacts of the proposed development, arising from the consumption of resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents, along with an extensive document review to assist in identifying current and future requirements for waste management; including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports.

This Chapter is based on the proposed development, as described in Chapter 2 (Description of the Proposed Development) and considers the following aspects:

Legislative context;

- Construction phase (including demolition/renovation, site preparation and excavation); and
- Operational phase.

A desktop study was carried out which included the following:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;
- Description of the typical waste materials that will be generated during the Construction and Operational phases; and
- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of waste generation during the construction and operational phases of the proposed development have been calculated and are included in section 12.4 of this chapter. The waste types and estimated quantities are based on published data by the EPA in the National Waste Reports and National Waste Statistics, data recorded from Irish and US EPA waste generation research as well as other available research sources.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote efficient waste

segregation and to reduce the quantity of waste requiring disposal. This information is presented in Section 12.6
A detailed review of the existing ground conditions on a regional, local and site-specific scale are presented in Chapter 7 of this EIAR (Land, Soils, Geology and Hydrogeology).

12.3.1 Legislation and Guidance

Waste management in Ireland is subject to EU, national and regional waste legislation and control, which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended). European and national waste management policy is based on the concept of 'waste hierarchy', which sets out an order of preference for managing waste (prevention > preparing for reuse > recycling > recovery > disposal) (Figure 12.1).

Figure 12.1 Waste Hierarchy (Source: European Commission).

EU and Irish National waste policy also aims to contribute to the circular economy by extracting high-quality resources from waste as much as possible. Circular Economy (CE) is a sustainable alternative to the traditional linear (take-make-dispose) economic model, reducing waste to a minimum by reusing, repairing, refurbishing and recycling existing materials and products. (Figure 12.2).

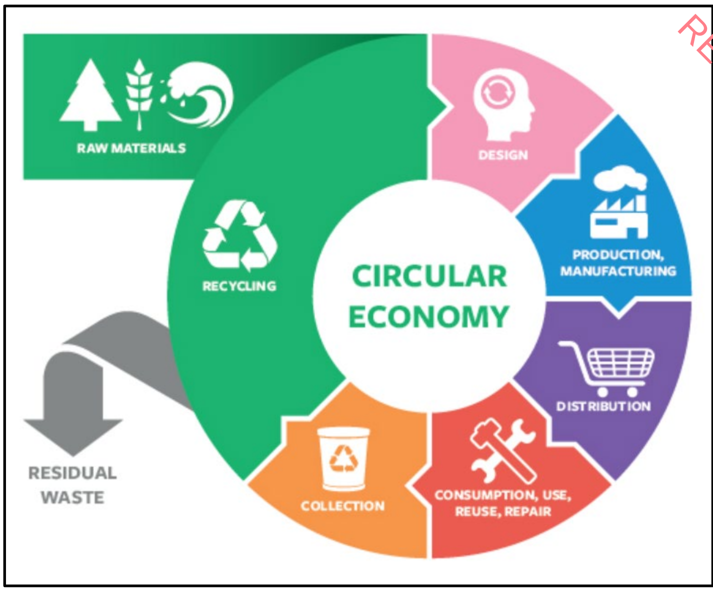

Figure 12.2 Circular Economy (Source: Repak).

The Irish government issues policy documents which outline measures to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The most recent policy document, Waste Action Plan for a Circular Economy (WAPACE) – Waste Management Policy in Ireland, was published in 2020 and shifts focus away from waste disposal and moves it back up the production chain. The move away from targeting national waste targets is due to the Irish and international waste context changing in the years since the launch of the previous waste management plan, A Resource Opportunity, in 2012.

One of the first actions to be taken from the WAPCE was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, using Less' (2021) to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021.

The Circular Economy and Miscellaneous Provisions Act 2022 was signed into law in July 2022. The Act underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in our economy for as long as possible and that will significantly reduce our greenhouse gas emissions. The Act defines Circular Economy for the first time in Irish law, incentivises the use of recycled and reusable alternatives to wasteful, single-use disposable packaging, introduces a mandatory segregation and incentivised charging regime for commercial waste, streamlines the national processes for End-of-Waste and By-Products decisions.

The strategy for the management of waste from the construction phase is in line with the requirements of the EPA's 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021). The guidance documents, Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects and Construction and Demolition Waste Management: A Handbook for Contractors and Site Managers (FÁS & Construction Industry Federation, 2002), were also consulted in the preparation of this assessment.

There are currently no Irish national guidelines on the assessment of operational waste generation, and guidance is taken from industry guidelines, plans and reports including the

Eastern Midlands Region (EMR) Waste Management Plan 2015 – 2021, Regional Waste Management Planning Offices, Draft National Waste Management Plan for a Circular Economy (2023),BS 5906:2005 Waste Management in Buildings – Code of Practice, the Kildare County Council (KCC) Waste Management (Segregation, Storage and Presentation of Household & Commercial Waste) Bye-Laws (2018), the EPA National Waste Database Reports 1998 – 2020 and the EPA National Waste Statistics Web Resource.

12.3.2 Terminology

Note that the terminology used herein is consistent with the definitions set out in Article 3 of the Waste Framework Directive. Key terms are defined as follows:

Waste - Any substance or object which the holder discards or intends or is required to discard.

Prevention - Measures taken before a substance, material or product has become waste, that reduce:

a) the quantity of waste, including through the re-use of products or the extension of the life span of products;

b) the adverse impacts of the generated waste on the environment and human health; or

c) the content of harmful substances in materials and products.

Reuse - Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.

Preparing for Reuse - Checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing.

Treatment - Recovery or disposal operations, including preparation prior to recovery or disposal.

Recovery - Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II of the Waste Framework Directive sets out a non-exhaustive list of recovery operations.

Recycling - Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

Disposal - Any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I of the Waste Framework Directive sets out a non-exhaustive list of disposal operations.

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12.4 Baseline Scenario/Future Receiving Environment Analysis

12.4.1 Current State of the Environment (Baseline Scenario)

The project is an integrated masterplan proposal that includes for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT and Innovation uses.

Operational Waste is currently produced and managed onsite from similar type operations. The proposed project will lead to an increase in waste produced at this proposed project site and waste will continue to be managed in line with national and local waste legislation and guidelines as covered in section 12.3.1.

A full description of the proposed development can be found in Chapter 2. The characteristics of the proposed development that are relevant in terms of waste management are summarised below.

12.4.2 Demolition

There will be waste materials generated from the demolition (Buildings No's 7, 8 and 9 and renovation (Building No's 1-6) of the existing buildings and hardstanding areas on site to accommodate the new development and facilitation works.

Further detail on the waste materials likely to be generated during the demolition works are presented in the project-specific RWMP in Appendix 12.1. The RWMP provides an estimate of the main waste types likely to be generated during the C&D phase of the proposed Development. The reuse, recycling / recovery and disposal rates have been estimated using the EPA National Waste Reports and the developments targeted recycling and reuse rates. The quantities of waste material have been supplied by the project architects (Scott Tallon Walker) are summarised in Table 12.1.

Waste Type	**Tonnes**	**Reuse**		**Recycle / Recovery**		**Disposal**	
		%	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**
Glass	2286.8	0	0.0	85	1943.8	15	343.0
Concrete, Bricks, Tiles, Ceramics	12958.8	30	3887.6	65	8423.2	5	647.9
Plasterboard	1016.4	0	0.0	80	813.1	20	203.3
Asphalts	254.1	0	0.0	25	63.5	75	190.6
Metals	3811.4	5	190.6	80	3049.1	15	571.7
Slate	0.0	0	0.0	85	0.0	15	0.0
Timber	3049.1	10	304.9	40	1219.7	50	1524.6
Asbestos	1.0	0	0.0	0	0.0	0	1.0
Total	**23377.6**		**4383.1**		**15512.4**		**3482.1**

Table 12.1: Estimated off-site Reuse, Recycle and Disposal Rates for Demolition Waste

12.4.3 Construction

During the construction phase of the proposed development and facilitating works, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The appointed Contractor will be contractually required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

It is predicted that 115,117m3 of the cut material generated during site preparation/levelling (365,750 m3) will be reused to facilitate construction of the proposed roads, carparks, buildings and landscaping berms. It is estimated c.250,634m3 will be exported off the site and disposed of in accordance with relevant requirements. No fill will be required to be imported to the site to accommodate the development material that needs to be removed offsite due to the limited opportunities for reuse on site, will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

The facilitating works from the Gas Networks Ireland (GNI) upgrades will involve c. 754.55m3 of material excavated along the length of the line. It is estimated c.60% may be re-used, leaving 301.82m3 that will be removed offsite for appropriate reuse, recycling or disposal.

If any material that requires removal from the site is deemed to be a waste, removal and reuse / recycling / recovery / disposal of the material will be carried out in accordance with the Waste Management Act 1996 (as amended), the Waste Management (Collection Permit) Regulations 2007 (as amended) and the Waste Management (Facility Permit & Registration) Regulations 2007 (as amended). The volume of waste requiring recovery / disposal will dictate whether a Certificate of Registration (COR), permit or licence is required for the receiving facility. Alternatively, the material may be classed as by-product under Regulation 27 (By-products), as amended, of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2011-2020, (Previously Article 27 of the European Communities (Waste Directive). For more information in relation to the envisaged management of by-products, refer to the RWMP (Appendix 12.1).

In order to establish the appropriate reuse, recovery and / or disposal route for the soils and stones to be removed off-site, it will first need to be classified. Waste material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2019). Environmental soil analysis will be carried out prior to removal of the material on a number of the soil samples in accordance with the requirements for acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values on landfills for acceptance of waste material based on properties of the waste, including potential pollutant concentrations and leachability. Any surplus excavated material will be suitable for acceptance at either inert or non-hazardous soil recovery facilities / landfills in Ireland or, in the event of hazardous material being encountered, be transported for treatment / recovery or exported abroad for disposal in suitable facilities.

Waste will also be generated from construction phase workers e.g. organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and, potentially, sewage sludge from temporary welfare facilities provided on-site during the Construction phase. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated in small volumes from site offices.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project-specific RWMP (Appendix 12.1). The RWMP provides an estimate of the main waste types likely to be generated during the Construction phase of the proposed development. These are summarised in Table 12.2.

Waste Type	Tonnes	Reuse		Recycle / Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	1979.5	10	197.9	80	1583.6	10	197.9
Timber	1679.5	40	671.8	55	923.8	5	84.0
Plasterboard	599.8	30	180.0	60	359.9	10	60.0
Metals	479.9	5	24.0	90	431.9	5	24.0
Concrete	359.9	30	108.0	65	233.9	5	18.0
Other	899.8	20	180.0	60	539.9	20	180.0
Total	**5998.4**		**1361.6**		**4072.9**		**563.8**

Table 12.2: Predicted on and off-site reuse, recycle and disposal rates for construction waste

12.4.4 Operation

Following construction, it is anticipated the operational phase of the development will generate a range of mostly non-hazardous wastes with some hazardous wastes (mostly at the energy centre for maintenance etc.).

An Operational Waste Management Plan (OWMP) will be developed prior to commencement. The plan will seek to ensure the facility contributes to the targets outlined in the EMR Waste Management Plan 2015 – 2021. The EMR and other regional waste management plans are due to revised and a draft version of the new plan is expected to be released by the regional waste management offices in 2023. Mitigation measures proposed to manage impacts arising from wastes generated during the operation of the Proposed Development are summarised in Section 12.6 below.

All waste materials will be segregated into appropriate categories and will be stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the site.

The main hazardous and non-hazardous waste expected to be generated form the operational phase of the Proposed Development are summarised below:

Non-Hazardous Waste
Non-hazardous waste which is expected to be produced at the site includes:

- Packaging waste
- General non-hazardous waste
- Non-hazardous WEEE
- Canteen/ Kitchen waste
- Landscaping waste
- Non-hazardous Lightbulbs

It should be noted that it will generate no more than any similar industrial facility and the area is well serviced by local waste management contractors. All wastes be managed through the permitted/licenced waste contractors and in accordance with best practice and all EU and Irish waste management legislation.

Hazardous Wastes
Hazardous waste which is expected to be produced at the site includes:

- Hazardous WEEE and lightbulbs;
- Waste filters, lube oil and other spares;
- Waste batteries; and
- Waste sludge from the petrol interceptors which will be pumped out/removed as required by a suitably permitted/licenced contractor

The above types of hazardous wastes would be expected from any industrial facility. All waste be managed through the permitted/licenced waste contractors and in accordance with best practice and all EU and Irish waste management legislation.

Table 12.3 below summarises the anticipated management strategy to be used for typical wastes to be generated at the site.

Waste Name	Hazard Y/N	On-site Storage/Treatment Method (anticipated)	Method of Treatment or disposal	Quantity
Mixed Dry Recyclables (Packaging Waste)	N	Segregated bins/skips	Recycle	3.84 tonnes / per week
Plastic and Cardboard (Baled)	N	Bailer onsite	Recycle	8.26 tonnes / per week
General Non-Hazardous Waste Office/Canteen / Kitchen Waste	N	Segregated bins for contaminated or non-recyclable waste, plastics, cardboard, general waste	Recycle/Recovery Disposal of other general waste to landfill	4.82 tonnes / per week
Organic Waste	N	Compost Recycling Bins	Onsite compost bins (Offsite Composting)	1.47 tonnes / per week
Glass	N	Glass Recycling Bin	Recycle Bins	32kg / per month
Polystyrene	N	Segregated Receptacle	Off-site recovery	720kg per month
Non-Haz and Haz WEEE	Both Non-Haz and Haz	Segregated bins for waste electric and electronic equipment (WEEE)	Off-site recovery	3 no. WEEE Roll Cage (combined) 1 cage every 2 months
Landscaping waste	N	Compost waste bins	Onsite compost bins (Offsite Composting)	30kg / per month
Cleaning Products / Solvents	N	Bunded Storage	Off-site recovery	3 litres / per month
Lightbulbs	N	Specialised container in waste storage area	Off-site recovery	1 no. WEEE Roll Cage (combined)

				1 cage every 2 months
Waste Oil, Filters & Spares	Y	Oil drum in external waste storage area	Off-site recovery	3 Drums every 2 months
(Wet) Batteries	Y	Specialised container in waste storage area	Return to supplier	1 no. WEEE Roll Cage (combined) 1 cage every 2 months
(Dry) Batteries	Y	Specialised container in waste storage area	Off-site recovery	1 no. WEEE Roll Cage (combined) 1 cage every 2 months

Table 12.3 Proposed Waste Management Strategy

All waste receptacles stored on site are collected from within the developments redline boundary by the permitted waste contractor and taken to registered, permitted and/or licensed facilities. No waste collection of operational waste occurs outside of the development's ownership.

12.4.5 Likely Future Receiving Environment ('Do Nothing' Scenario)

If the proposed development was not to go ahead (i.e. in the Do-Nothing scenario) there would be no demolition, excavation or construction at this site. Current or operational waste would continue to be generated at the same levels. There would, therefore, be a neutral effect on the environment in terms of waste.

The site is zoned for development, and it is likely that in the absence of this subject proposal that a development of a similar nature would be progressed on the site that accords with national and regional policies and therefore the likely significant effects would be similar to this proposal.

12.5 Likely Impacts of the Project

This section details the potential waste effects associated with the proposed development.

12.5.1 Construction Phase

The proposed Development and facilitating works will generate a range of non-hazardous and hazardous waste materials during site demolition, excavation and construction (see appendix 12.1 for further detail). General housekeeping and packaging will also generate waste materials, as well as typical municipal wastes generated by construction employees, including food waste. Waste materials will be required to be temporarily stored in the construction site compound or adjacent to it, on-site pending collection by a waste contractor. If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the Development Site and in adjacent areas. The indirect effect of litter issues is the presence of vermin in areas affected. In the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *short-term, significant*** and ***negative***.

The use of non-permitted waste contractors or unauthorised waste facilities could give rise to inappropriate management of waste, resulting in indirect negative environmental impacts, including pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. In the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *long-term, significant*** and ***negative***.

Wastes arising will need to be taken to suitably registered / permitted / licenced waste facilities for processing and segregation, reuse, recycling, recovery, and / or disposal, as appropriate. There are numerous licensed waste facilities in the EMR which can accept hazardous and non-hazardous waste materials, and acceptance of waste from the proposed project would be in line with daily activities at these facilities. At present, there is sufficient capacity for the acceptance of the likely C&D waste arisings at facilities in the region. The majority of construction materials are either recyclable or recoverable. However, in the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *short-term, significant*** and ***negative***.

There is a quantity of excavated material which will need to be excavated to facilitate the proposed development. A detailed review of the existing ground conditions on a regional, local site-specific scale are presented in Chapter 7. It is anticipated that c. c.250,634m^3 of excavated material will need to be removed off-site and a further 452.73m^3 will be required to be removed as part of the GNI works. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site. However, in the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *short-term, significant*** and ***negative***.

12.5.2 Operational Phase

The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to small volumes of waste being sent unnecessarily to landfill. In the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *long-term, significant*** and ***negative***.

The nature of the development means the generation of waste materials during the operational phase is unavoidable. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling can be sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion in recycled products (e.g. paper mills and glass recycling).

If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development site and in adjacent areas. The knock-on effect of litter issues is the presence of vermin in affected areas. However, in the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *short-term, significant*** and ***negative***.

Waste contractors will be required to service the proposed development on a scheduled basis to remove waste. The use of non-permitted waste contractors or unauthorised facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. However, in the absence of mitigation, the effect on the local and regional environment is likely to be **indirect, *long-term, significant*** and ***negative***.

12.6 Mitigation Measures and Monitoring of Impacts

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

The concept of the 'waste hierarchy' is employed when considering all mitigation measures. The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal.

12.6.1 Construction Phase

As previously stated, a project specific RWMP has been prepared in line with the requirements of the requirements of The EPA, *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021)* and is included as Appendix 12.1. The mitigation measures outlined in the RWMP will be implemented in full and form part of the mitigation strategy for the site. The mitigation measures presented in this RWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the excavation and construction phases of the proposed development.

- Prior to commencement, the appointed Contractor(s) will be required to refine / update the RWMP (Appendix 12.1) in agreement with KCC and in compliance with any planning conditions, or submit an addendum to the RWMP to KCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream.

- The Contractor will implement the RWMP throughout the duration of the proposed excavation and construction phases.

A quantity of topsoil and sub soil will need to be excavated to facilitate the proposed development. The project engineers have estimated that c.250,634m3of material from site preparation / levelling will need to be removed off-site. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

In addition, the following mitigation measures will be implemented:

- Building materials will be chosen to 'design out waste';
- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery. The following waste types, at a minimum, will be segregated:
    - Concrete rubble (including ceramics, tiles and bricks);
    - Plasterboard;
    - Metals;
    - Glass; and
    - Timber.

- Left over materials (e.g. timber off-cuts, broken concrete blocks / bricks) and any suitable construction materials shall be re-used on-site, where possible; (alternatively, the waste will be sorted for recycling, recovery or disposal);
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);
- A Resource Manager will be appointed by the main Contractor(s) to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered, where possible, to avoid material designated for disposal;
- All waste leaving the site will be transported by suitably permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.
- Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Regulation 27 of the EC (Waste Directive) Regulations (2011-2020). EPA approval will be obtained prior to moving material as a by-product.

These mitigation measures will ensure that the waste arising from the construction phase of the proposed development and facilitation works is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, and the EMR Waste Management Plan 2015 – 2021. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will promote more sustainable consumption of resources.

12.6.2 Operational Phase

The following mitigation measures will be implemented during the operational phase of the proposed development:

- All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins, skips or other suitable receptacles in a designated, easily accessible areas of the site.
- The Operator / Buildings Manager of the Site during the operational phase will be responsible for ensuring – allocating personnel and resources, as needed – for the production, updating and implementation of an Operational Waste Management Strategy, ensuring a high level of recycling, reuse and recovery at the Site of the proposed Development.
- The Operator / Buildings Manager will regularly audit the onsite waste storage facilities and infrastructure, and maintain a full paper trail of waste documentation for all waste movements from the site.
- The following mitigation measures will be implemented:
- The Operator will ensure on-site segregation of all waste materials into appropriate categories, including (but not limited to):
    - Packaging Waste
    - General Non-Hazardous Waste
    - Mixed Dry Recycling
    - General Non-Hazardous Waste
    - Organic
    - Glass
    - Non-Haz and Haz WEEE
    - Landscaping waste
    - Lightbulbs
    - Waste Oil
    - (Wet) Batteries
    - (Dry) Batteries.

- The Operator will ensure that all waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials;
- The Operator will ensure that all waste collected from the Site of the proposed development will be reused, recycled or recovered, where possible, with the exception of those waste streams where appropriate facilities are currently not available; and
- The Operator will ensure that all waste leaving the Site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the proposed project is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997*, the *EMR Waste Management Plan (2015 - 2021)* and the KCC waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

12.7 Likely Cumulative and Interaction Impacts of the Project

As has been identified in the receiving environment section all cumulative developments that are already built and in operation contribute to our characterisation of the baseline environment. As such any further environmental impacts that the proposed development may have in addition to these already constructed and operational cumulative developments has been assessed in the preceding sections of this chapter.

12.7.1 Construction Phase

Further environmental impacts that the proposed development may have in addition to already constructed, operational and approved but not yet constructed cumulative developments have been assessed in the preceding sections of this chapter.

There are multiple permissions remaining in place in the area. In a worst-case scenario, multiple developments in the area could be developed concurrently or overlap in the construction phase.

Developments that have been assessed and could potentially overlap during the construction phase of the proposed development and facilition works can be found in Appendix 1.1, along with descriptions.

Due to the high number of waste contractors in the Kildare region and Ireland there would be sufficient contractors available to handle waste generated from many these sites simultaneously, if required. The National Waste Collection Permit Office can be contacted to obtain a list of waste contractors and waste collection permit details. Similar waste materials would be generated by all the developments.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will mitigate against any potential cumulative effects associated with waste generation and waste management. As such the effect will be **short-term, not significant and neutral.**

12.7.2 Operational Phase

There are existing residential and commercial developments close by, along with the multiple permissions remaining in place. All of the current and potential developments will generate similar waste types during their operational phases. Authorised waste contractors will be required to collect waste materials segregated, at a minimum, into recyclables, organic waste and non-recyclables. An increased density of development in the area is likely improve the efficiencies of waste collections in the area.

Other developments in the area, and the indicative future masterplan development, will be required to manage waste in compliance with national and local legislation, policies and plans which will minimise/mitigate any potential cumulative impacts associated with waste generation and waste management. As such the effect will be a **long-term, imperceptible and neutral.**

12.8 Mitigation Measures and Monitoring of Cumulative and Interaction Impacts

The implementation of the mitigation measures outlined in Section 12.6 will ensure that targeted rates of reuse, recovery and recycling are achieved at the site of the Proposed Development during the construction and operational phases. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

12.8.1 Construction Phase

A carefully planned approach to waste management as set out in Section 12.6.1 and adherence to the RWMP (which include mitigation) (Appendix 12.1) during the construction phase will ensure that the predicted effect on the environment will be ***short-term, imperceptible*** **and** ***neutral*****.**

12.8.2 Operational Phase

During the operational phase, a structured approach to waste management as set out in Section 12.6.2 will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be **long-term, imperceptible** and **neutral**.

12.9 Major Accidents and/or Disasters

There is no Risk of Major Accidents or Disasters related to Material Assets Waste and the proposed development.

12.10 Residual Impacts

The implementation of the mitigation measures outlined in Section 12.6 will ensure that high rates of reuse, recovery and recycling are achieved at the Site of the proposed development during the construction and operational phases. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

12.11 Difficulties Encountered

Until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

There is a number of licensed, permitted and registered waste facilities in the Kildare and EMR regions and across Ireland and Northern Ireland. However, these sites may not be available for use when required or may be limited by the waste contractor selected to service the development in the appropriate phase. In addition, there is potential for more suitably placed waste facilities or recovery facilities to become operational in the future which may be more beneficial from an environmental perspective.

The ultimate selection of waste contractors and waste facilities would be subject to appropriate selection criteria proximity, competency, capacity and serviceability. The waste facilities selected will ultimately be selected to minimise the environmental impacts on the surrounding environment.

Provided all mitigation measures as set out in this chapter and the attached RWMP, the overall predicted impact of the proposed development is **long-term, imperceptible** and **neutral**.

12.12 References

1. Waste Management Act 1996 - 2021 (No. 10 of 1996) as amended.
2. Protection of the Environment Act 2003, (No. 27 of 2003) as amended.
3. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended
4. Eastern Midlands Region Waste Management Plan 2015 – 2021 (2015).
5. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
6. European Commission, Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (2017).
7. Environmental Protection Agency (EPA) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2022)
8. Forum for the Construction Industry – Recycling of Construction and Demolition Waste.
9. Department of Communications, Climate Action and Environment (DCCAE), *Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025* (Sept 2020).
10. DCCAE, *Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less*' (2021)
11. Environmental Protection Agency (EPA) *'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021)*
12. Department of Environment, Heritage and Local Government, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
13. FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and site Managers (2002).
14. Kildare County Council (KCC) (Segregation, Storage and Presentation of Household and Commercial Waste) Bye-laws, (2018)
15. Regional Waste Management Planning Offices, Draft The National Waste Management Plan for a Circular Economy (2023).
16. KCC, *Kildare County Development Plan 2023-2029* (2023).
17. BS 5906:2005 Waste Management in Buildings – Code of Practice
18. Planning and Development Act 2000 (No. 30 of 2000) as amended
19. Environmental Protection Agency (EPA), Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2015)
20. Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
21. EPA, *European Waste Catalogue and Hazardous Waste List* (2002)
22. EPA, National Waste Database Reports 1998 – 2020.
23. US EPA, *Characterisation of Building Uses* (1998);

24. EPA and Galway-Mayo Institute of Technology (GMIT), EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned (2015)

13.0 MATERIAL ASSETS –TRAFFIC AND TRANSPORTATION

13.1 Introduction

This chapter of the Environmental Impact Assessment Report has been prepared by SYSTRA Ltd to assess the potential impact of the project in terms of Traffic and Transport. This chapter provides an overview of the existing receiving environment, a detailed and robust assessment of the potential impact of the project on the operation of the local road network both during the short-term construction phase and long-term operational phase and outlines mitigation measures to ensure any significant effects are minimised or avoided.

The assessment of the traffic and transport section has been prepared by Sheelagh McGuinness B.Eng (hons) MBA and Andrew Archer, CEng of SYSTRA Ltd. Andrew is a Project Director for SYSTRA's operation in Ireland, with over 20 years of diverse and challenging experience in a wide range of transportation planning and engineering projects. Works completed include detailed Traffic and Transport assessments for residential and commercial developments throughout Dublin & Ireland, including mixed use development at Clonburris, Monard & Cherrywood Strategic Development Zones (SDZs), residentials development at Water Rock Midleton and Oldtown Celbridge amongst others. Sheelagh is an associate consultant with 19 years' experience in transport planning, traffic engineering and development planning. She has worked on numerous Transport Impacts Assessments, Mobility Management Plans and Environmental Impact Assessments including applications for industrial, retail, medical and residential land use

Full details of the Traffic Impact Assessment undertaken by SYSTRA Ltd are provided in the Traffic & Transport Assessment, Mobility Management Plan and Outline Construction Traffic Management Plan included under sperate cover as part of this planning application for the principal works the subject of the planning application.

Design
Consideration has been given to all modes during the design development including pedestrians, cyclists, cars, service vehicles and construction vehicles travelling to and through the site.

Construction
There will be additional traffic generated during the construction of the proposed development to facilitate the required works. This is assessed in this chapter.

Operation
There will be traffic generated during the operation of the proposed development. The effect of this additional traffic is assessed as part of this chapter.

13.2 Project Description

The Davy Platform ICAV for an on behalf of the Liffey Sub-Fund, intend to apply for permission for development of an integrated campus Masterplan proposal including 2 no. deep tech Buildings, 4 no. Data Centres, an Energy Centre, new campus entrance incl. signalised intersection, a new public road, internal roads & pathways, a new pedestrian/cycle overpass of the M4 Motorway and supporting infrastructure. The proposal will also include the demolition of existing buildings no's 7, 8 & 9. Known facilitation works include GNI (Gas Network Ireland) local upgrade of the gas network and EirGrid Uprating over five stages.

A detailed description of the project is outlined in Chapter 2 of this EIAR.

13.3 Methodology

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this chapter:

- Transport Infrastructure Ireland's (TII) Traffic & Transport Assessment Guidelines (2014)

There are also a number of relevant national and regional policies which have guided the assessment and the identification and, where necessary, the design of mitigation measure. These include the following documents:

- The Kildare County Development Plan 2023-2029 (KCC 2023)
- Design Manual for Urban Roads and Streets (DTTAS, 2013)
- National Cycle Manual

The methodology adopted for the assessment is outlined below and in line with the guidance set out in TII's Assessment Guidelines.

- Baseline Assessment: Site visits, data collection including traffic surveys, existing accessibility, identification of opportunities and constraints, local travel patterns and policy review.
- Trip Generation: Forecast vehicle trip rates to/from development. These are converted to model trips based on expected mode share, to be informed by modelling and baseline assessment.
- Traffic Growth: Growth in traffic volumes to be forecast based on current TII forecasts.
- Trip Assignment and Distribution: vehicular trip to be assigned based on predicted final destination and distribution across the wider network based on strategic modelling and/or baseline travel patterns.
- Impact Analysis: assessment of the resultant impact of development on the wider network with detailed modelling undertaken locally. The rating of impacts is in line with the terminology set out in Table 3.4 of the EPA Guidelines, outlined previously in Chapter 1 of this EIAR.
- Conclusion and Recommendations: Identification of potential impacts and necessary mitigation and supporting measures.

13.4 Assessment Criteria

The EPA EIAR guidelines (2022) outlines a number of definitions that can be used to describe potential significant effects. This includes definitions for the quality of effects, significant of effects, extent of effects, probability of effects, duration and frequency of effects and the type of effects. Whilst some of these are easily qualified using the EPA guidelines the significant of the effects is open to interpretation and relies on the professional engineering judgement.

In Ireland, there are currently no guidelines or standards which outline how the effect of traffic and transport should be quantified or described for the purposes of Environmental Impact Assessment. However, TII's 'Traffic and Transport Guidelines' indicate that if the impact generated by the additional traffic generated by a new development may be expected to exceed 10% of the existing traffic movements, it is considered material in the context of the local network. This threshold is reduced to 5% in situations where the network is congested or at other sensitive locations'.

Similarly, the UK's Institute of Environmental Management and Assessment (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic' (2003) state that only links which experience an increase in traffic of 30% should be considered for more detailed assessment, or 10% in sensitive locations or where HGV traffic increases substantially. As referenced in the IEMA Guidelines, a range of indicators for determining the significance of the relief from severance advises that changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes respectively. Additionally, it is generally accepted that traffic flow increases of less than 10% on uncongested roads are generally considered to be 'not significant', given that daily variations in background traffic flow may vary by this amount.

Based on these guidelines, the prevailing traffic levels local to the proposed development and professional judgement, a rating of the potential effects has been assigned to the definitions within the EPA guidelines based on potential traffic increases, as outlined in Table 13.1. To ensure the robustness of the assessment these ratings are more conservative than outlined in the IEMA guidelines. This is intended to guide the assessment of the likely effects of the proposed development.

Imperceptible	0-2.5%
Not Significant	2.5-5%
Slight	5-10%
Moderate	10-20%
Significant	20-30%
Very Significant	30-50%
Profound	50%+

Table 13.1: Rating of Effects Based in Traffic Contribution

13.5 Consultation

A number of Pre-Application meetings were held with Kildare County Council as part of planning consultation process. There were also a number of communications with Kildare County Council's Transport and Roads Department relating specifically to the Transport Assessment for the proposed development. The methodology for the Transport Assessment was presented along with the proposed access strategy and road layout design. The proposed car parking and cycling parking ratio and proposed mobility management measures were discussed at length. KCC broadly accepted the proposed strategies but emphasised the Leixlip Local Area Plan objective for a cycle and pedestrian overpass of the M4 in proximity to the development lands.

13.6 Receiving Environment

The baseline/future receiving environment analysis for this Chapter has been undertaken in accordance with the EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) and all other documents outlined above.

The baseline assessments have been informed by both site visits, desk top studies and independent surveys.

13.6.1 Site Location

The site is strategically located southeast of the M4 junction 6 interchange. The site is bounded by the M4 to the north which separates it from Leixlip urban area. Located to the southwest is Castletown House, and beyond that, the town of Celbridge. The general location of the proposed development in relation to the surrounding strategic road network is indicated in Figure 13.1.

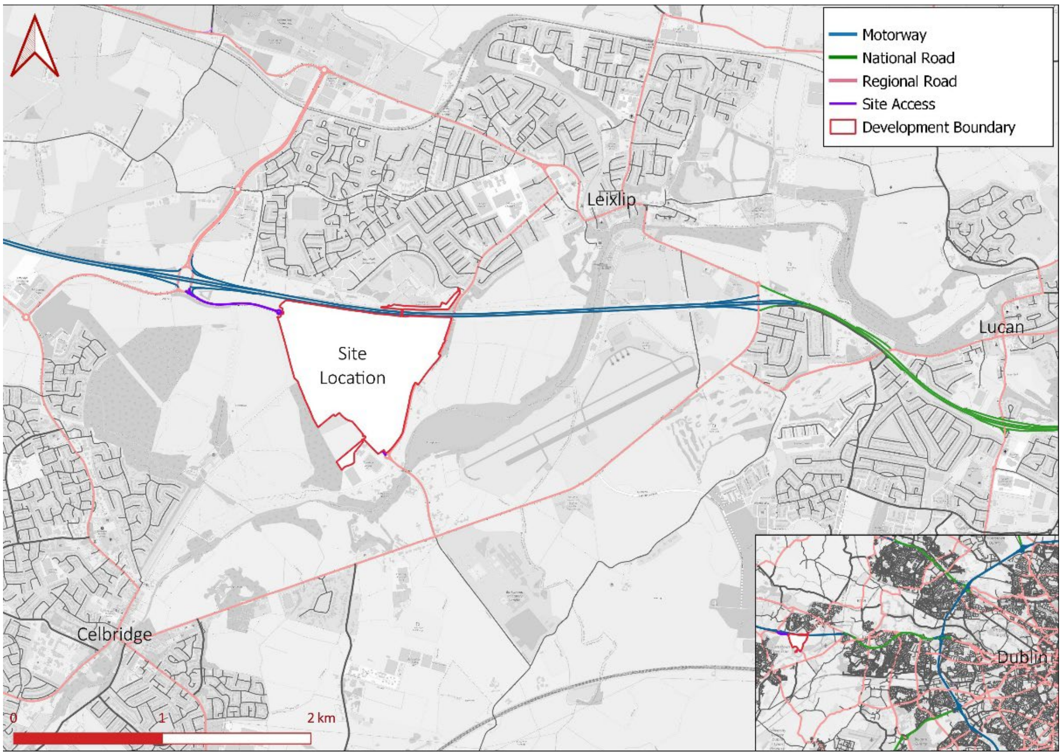

Figure 13.1 Site Location

13.6.2 Walking and Cycling Accessibility and Infrastructure

Footways and segregated cycle lanes are provided in both directions on the Barnhall Road and on the R449 which is the primary access route to the site. This high standard of footway and segregated cycle lanes is maintained along the R449 and R405 which link the development site with the towns of Leixlip and Celbridge.

To the east of the site, the R404 provides a footway in both directions, however no cycle facilities are available along this route. Internally there are a total of 50 cycle parking spaces for the existing site users.

There are facilities within the site for staff including canteen and gym which limit the need to travel offsite during the working day the internal site has a number of footpaths throughout the site linking buildings and parking facilities.

13.6.3 Public Transport Accessibility & Infrastructure

Bus Services
There is a bus stop located to the east of the site at the R404 entrance. This stop is served by Dublin Bus Routes L58 (half-hourly Service). L58 provides connection from Hazelhatch, through Leixlip village towards River Forest.

Train Services
The site is located approximately 2.5km from Leixlip Louisa Bridge Rail Station, and 3.5km from Leixlip Confey Rail Station. Both stations are on the Western Suburban Rail Corridor, with services running to/from Maynooth and the main terminus at Dublin Connolly at 10-30 minute intervals. Hazelhatch Station is located 5km south of the business park and provides a link to the south west commuter services (Heuston / Phoenix Park tunnel) and various intercity services.

At peak periods, the previous occupants of the site, Hewlett Packard, ran a private shuttle bus service between the site and Leixlip Louisa Bridge / Hazlehatch stations. This service will not be reinstated as it is envisaged that it will be replaced by a regular service under the NTA's Bus Connects programme, further details are provided in Section 4 of the Transport Assessment Report.

13.6.4 Road Network & Traffic Conditions

Trips to and from the site are primarily made via the M4 junction 6 and the R449. However, it is also possible to access the site from the east, via the R404. In total, there are three junctions which provide access to the site, these are:

- M4 / Barnhall Rd Junction – Large Roundabout with dedicated merge lane for traffic approaching from the westbound lane of the M4;
- R404 / Liffey Business Campus North – Signal Controlled T-Junction with dedicated right and left turn lanes on the R404 for traffic turning right and left into the Business Park;
- R404 /Liffey Business Campus South – 3-arm roundabout with single lane approaches on all arms. This access is shared with Barnhall Rugby Club and serves the DB Shenker logistics unit to the south east of the site..

As part of the baseline assessment traffic surveys were commissioned and undertaken in the local area. Surveys were undertaken on a natural weekday, during school term on Wednesday 19th October 2022. Traffic turning counts were undertaken at the following junctions:
- R148 Station Road / R404 Celbridge Road.
- R404 Celbridge Road / Barnhall Meadows
- R404 Celbridge Road / Former HP site access
- R404 Celbridge Road / Barnhall Rugby Club / Former HP site access
- R404 Celbridge Road / R403 Dublin Road
- M4 Junction 6 interchange

The Road Safety Authority's (RSA's) online collision map is no longer available. Available data up to 2016 was reviewed and indicated no reoccurring safety concern.

Future Infrastructural Improvements

BusConnects
The NTA's BusConnects programme will overhaul the current bus system in the wider Dublin region to create a better public transport network that is more efficient and reliable. There are a variety of measures included in the plan, such as the introduction of a state-of-the-art cashless ticketing system, new bus stops and shelters, and various bus-based Park and Ride sites, all of which should improve patronage. Core to the plan is a network of 'next generation' bus corridors along the busiest bus routes to make bus journeys faster, predictable and reliable. The programme has proposed a series of continuous high-quality bus lanes spanning the city.
Crucially, the N4 which provides a direct route to/from Dublin from Leixlip and Celbridge is designated as the C Spine Route. There are also plans for a number of new local, orbital, and express routes which will interchange with the C spine routes and other existing services at designated points, including a park and ride facility at M4 Junction 5.

DART Expansion Programme 2018-2027 – Iarnród Éireann
DART (Dublin Area Rapid Transit) is an electrified commuter railway line serving the Dublin coastline. It has operated since 1984, initially only between Bray and Howth, but now between Malahide and Greystones since 2000. It has been one of Ireland's greatest public transport success stories with up to 75,000 journeys being made every day.

Based on this success story, a new expansion programme is planned for all other existing Dublin commuter rail lines that will bring them up to the same modern electrified standard. This will deliver a more sustainable, reliable, and faster rail service with increased train frequencies and customer carrying capacity on the following lines:

- Northern Commuter – as far as Drogheda station
- Western Commuter – as far as Maynooth / M3 Parkway stations
- Southwestern Commuter – as far as Hazelhatch (Celbridge)

Key to the development proposals, the local stations in Leixlip and at Hazelhatch are included in the plans as they are on the Western (Maynooth) and Southwestern commuter lines respectively.

To facilitate these improvements a range of measures will be carried out including the removal of some level crossings, additional track, overbridge alterations, improved signalling, new rolling stock, and new depots with maintenance capabilities.

13.7 Do Nothing Scenario

The proposed development site is part of the former Hewlett Packard campus. There are an existing ten buildings on site totalling a footprint of 130,064sqm of manufacturing, warehouse plus ancillary office, with staff facilities including cafeteria and gym. The entire footprint consists of 136,066sqm when including plant rooms and link corridors.

The occupancy of the site, as the time of the traffic counts was circa 800 staff compared to the full occupancy capacity under Hewlett Packard of circa 3,000 staff. Kildare County

Council's Local Area Plan (LAP) 2020-2026 recognises that, given the size and scale of the site, it is important to work with all stakeholders to ensure the site can be redeveloped and remain a key employment hub, both for Leixlip, and for the wider Dublin Metropolitan Area. The site is currently zoned for category H: Industry and Warehousing.

It is possible that the site could be reoccupied to full capacity of circa 3,000 staff, with associated traffic generation, with its current buildings and permitted uses, without any planning process. The proposed development seeks to increase employment numbers to circa 3,000 on the campus, however the proposal also seeks to increase the overall footprint of the campus, increased infrastructure and include a change of use, as such an application for planning has been prepared.

13.8 Characteristics of the Project

Please refer to Chapter 2 of the Environmental Impact Assessment Report for the full description of the project.

Vehicular access to the proposed campus will be retained from both the east and west of the site. The existing Barnhall Road access, from the Junction 6 interchange along the current private access to the site will be upgraded and form part of the proposed Link Road. The Link Road to form a junction with the R404 Celbridge to the east of the site. This junction will replace the existing signalised junction and will be relocated circa, 60m to the north of the current position.

The access into the campus from the R404 Celbridge Road roundabout, to the southeast of the site, currently serving Barnhall Rugby Club and the DBS development, will extend and form a main route through the campus.

A number of routes permeating the site will extend from the access points. The Link Road will be taken in charge and be fully accessible to all users. All other internal routes within the site will be private and will be furnished with security barriers.

An extensive network of footpath and cycle paths are proposed within the campus. The Link Road includes segregated footpath and cycleways. The proposed overbridge will connect lands to the north of the M4 onto the Link Road directly with further connections through the site.

Car and cycle parking is provided in accordance with Kildare County Council's development Plan. Where no standards are provided in the Plan for Data Centres, these have been derived from first principles based on existing Data Centre developments.

There are 1,613 car parking spaces on site currently. An additional 686 spaces will be provided bringing the total to 2,299. Of these 206will be allocated to the combined data centre units and 1,163 to the deep tech uses. The remainder of car parking spaces will predominantly serve the existing buildings 1 to 6, with 16 car parking spaces allocated to the energy centre. As required, 5% of car parking spaces will be mobility spaces and 10.7% (244) will be equipped with electric vehicle charging points. A car parking EV hub, accessible by the public will be provided adjacent to the existing building 1 which will allow for car charging.

In addition to the car parking EV hub, a bus EV parking hub will also be provided. It is anticipated that an agreed bus service provider will be able to avail of this facility, which would allow for over night charging of buses.

The campus currently has 50 cycle parking spaces. These, on observation, are underutilised. By applying the council standards would result in circa 1000 spaces being proposed with a risk of them not being used. It was agreed with Kildare County Council that a minimum 10% of all planned car parking spaces would equate to the number of cycle parking spaces to be provided and that their use would be monitored and increase if demand was not met.
A total of 350 cycle parking spaces are proposed within the campus, located convenient to building access and cycle lane access.

Facilitation works are known to be required for the project. this includes upgrades to both the gas and electricity supply networks within the local area by GNI and EirGrid respectively.

13.9 Predicted Effects of the Proposed Development

13.9.1 Construction Phase

The proposed development will be constructed over three phases with the proposed Link Road delivered in phase one. For the traffic and transport assessment it has been anticipated that the full development will be occupied by 2035. Phase one and phase two will be from 2024 to 2028 while phase three is planned to start in 2028. Phase three includes the demolition of some existing buildings on site.

A Construction Traffic Management Plan accompanies this application. Estimates of traffic generation associated with the construction phase has been provided by the design team engineers, at this stage of development proposals it is anticipated that 76 vehicular movements per new unit will be generated per hour during the working day. The proposed route of construction vehicles will be to and from the M4 along Barnhall Road.

As the application progresses it will be possible to make a more informed assumption of staff traffic during construction periods. This will be agreed with the road section of Kildare County Council.

Temporary car and cycle parking facilities for construction vehicles and staff will be provided within the site boundary.

Construction traffic associated with the known facilitation works will be managed by GNI and ESB / Eirgrid, through traffic management plans.

13.9.2 Operational Phase

The proposed development will be developed over three phases as follows:

- Phase 1 – fully occupied by 2027
    - New signalised junction onto the R404 Celbridge Road.
    - Link road between R404 Celbridge Road and Celbridge Road
    - M4 Pedestrian and cycle overbridge
    - A1 deep tech building
    - B1 data centre
    - Initial energy centre phase

- Phase 2 – fully occupied by 2028
    - A2 deep tech building

- Phase 3 – fully occupied by 2033
    - C1, C2 and C3 Data Centres
    - Energy centre

Trip Generation

An operational trip generation exercise for the proposed development was undertaken as part of the Traffic and Transport Assessment. Due to the unique nature of the data centre element of the development proposals, the TRICS database was deemed to not contain enough comparable sites to provide an adequate trip generation assessment. TRICS was used for the other elements of the development.

SYSTRA has therefore retrieved trip generation figures of previously approved data centre sites in the Republic of Ireland, mostly consented within the last ten years. The trip rates per 100sqm GFA were subsequently calculated for these sites. The mean trip rates and trips generated (based off a total data centre GFA of 68,600sqm) resulting from this analysis are shown in Table 13.2.

Employment use criteria was utilised for the deep tech element of the proposals. TRICS was interrogated for office and industrial unit land use.

The energy centre and substation are anticipated to generate low, intermittent levels of traffic that would not impact on the peak traffic periods.

	Trip Rates (per 100sqm GFA)				Trips			
	AM		PM		AM		PM	
	ARR	DEP	ARR	DEP	ARR	DEP	ARR	DEP
Data Centre	0.139	0.086	0.012	0.023	95	59	8	16
Deep Tech (Car/LGV)	0.315	0.140	0.057	0.348	187	83	34	207
Deep Tech (OGV)	0.024	0.027	0.000	0.003	14	16	0	2
Office	1.062	0.082	0.057	0.730	134	10	7	92
Mean Trip Generation					450	190	49	319

Table 13.2 Trip Generation

Table 13.2 shows that the development is likely to generate 640 two-way trips in the AM peak and 369 two-way trips in the PM peak.

As part of the proposed development, the existing buildings of 7, 8 and 9 will be demolished. SYSTRA has derived the vehicle trip generation associated with these existing buildings and used this to present the net trip generation of the proposed development.

Building 9 is plant and generates service vehicles only which is minimal traffic.

Using trip rates for manufacturing type use the vehicle trip generation for the existing buildings 7 and 8 (based off a total GFA of 80,783 sqm) is shown in Table 13.4. The resulting PCU (Passenger car unit) value is calculated.

	Trip Rates (per 100 sqm GFA)				Trips			
Vehicle Type	AM		PM		AM		PM	
	ARR	Dep	ARR	Dep	ARR	DEP	ARR	DEP
Car/LGV	0.315	0.140	0.057	0.348	254	113	46	281
OGV	0.024	0.027	0.000	0.003	45	50	0	6
Total (PCUs)	-	-	-	-	299	163	46	287

Table 13.3 Building 7&8 Trips

Net Change

The combined Data Centre (mean trip rates) and deep tech type use trip generation for the proposed development is shown in Table 13.4, as well as the combined trip generation for the existing development buildings to be demolished and the net change. All values presented are in PCUs.

	AM			PM		
	Arr	Dep	Two-Way	Arr	Dep	Two-Way
Mean Trip Generation	450	190	640	49	319	369
Existing Trip Generation	299	163	462	46	287	333
Net Trip Generation	151	27	178	3	32	36

Table 13.4 New Trips

13.10 Traffic Impact

The development traffic has been distributed onto the surrounding road network based upon the existing east west split of those currently accessing the site and as per the existing turning movements on the surrounding road network.

All HGVs routing to and from the Site are assumed to access and egress via the M4 Junction 6 roundabout and Site Link Road.

Once the proposed development is operational, the R404/Site South Access junction will be available for use by regular Site traffic. It is assumed that this junction will be used by the majority of Site traffic currently using the R404/Site North Access junction to route south on the R404. Due to the locations of the respective building car parks, all traffic routing between the R404 and Building A2 is assumed to use the R404/Site South Access junction only. All non-HGV traffic routing between the R404 and Building A1 is assumed to use the R404/Site North Access junction only. Remaining generated traffic for B1 and C1, C2 and C3 is distributed as described above.

A full breakdown of the proposed development's traffic distribution arriving and departing the Site in both peak periods is shown in Table 13.5.

Junction	Arm	AM		PM	
		Arriving	Departing	Arriving	Departing
M4 Junction 6	R449 (North)	14%	30%	67%	31%
	M4 (East)	24%	5%	10%	11%
	R449 (South)	4%	20%	3%	5%
	M4 (West)	36%	25%	8%	39%
R404/Site Access North	R404 Cellbridge Road (North)	10%	8%	7%	5%
R404/Site Access South	R404 (South)	12%	12%	5%	9%
Total		100%	100%	100%	100%

Table 13.5 Proposed Development Distribution

13.10.1 Impact Assessment Methodology

To assess the traffic and transportation impacts of the proposed development vehicular trip generations has been developed based on first principles for the data centre element and using TRICS database for the deep tech. It is anticipated that the energy centre will not generates traffic during the peak periods.

Trip distribution and assignment of trips is based on existing movements from the current site occupants to assess the likely percentage to route east and west from the site. The internal road layout, car park positioning and access and land use positioning within the campus was then used to formulate the distribution of traffic from the development onto the road network. All HGVs are routed west of the site towards the M4 interchange allowing access to the strategic road network.

The proposed development traffic distributed onto the network is then assessed using a microsimulation software package, VISSIM. This allows an assessment of the traffic impact on the surrounding road network overall.

In accordance with TII TIA guidelines the opening year plus 5 years and plus 15 years are required assessment. This would result in an assessment year of 2050. It is the professional opinion of SYSTRA Ltd, based on the transport targets for Ireland by 2040 and the requirement to reduce our transport emissions, that traffic growth as currently predicted in TIIs PAG Unit 5.3 Travel Demand Projections is not appropriate. The Unit 5.3 growth factors have been used however it is considered that an opening year for phase 1 and phase 2 of 2028 be considered as the opening year. Plus five year assessment of 2033, which would include phase 1 and phase 2 occupied and the construction of phase 3 and the plus 15 year assessment of 2043 which would be the proposed development fully occupied.

The analysis of the predicted impacts of the proposed development on traffic and transportation during construction and operation are presented in this Chapter. The assessment considered traffic and transportation features, identified in Section 5.3.1 above, within the project site and the surrounding vicinity in accordance with the methodology outlined above and below, to determine the significance of the impacts. Where likely significant impacts are highlighted, mitigation and monitoring are proposed, and any residual impacts are assessed.

The impact assessment for this Chapter has been undertaken in accordance with the *EPA Guidelines on the Preparation of an EIAR* (EPA, May 2022) and all other documents outlined above.

Assessment methods quantify and predict the magnitude and significance of impacts.

13.10.2 The Likely Impacts of the Principal Works

The development contribution to the future year link flows on the wider local road network is outlined in Table 13.6. AADT (Annual Average Daily Traffic) figures have been calculated by expansion factors in TII PE-PAG-02039, applied to the 2022 observed flows. The total AADT for the fully operational development is 2,192.

Link No.	Link Name	Speed Limit (kph)	Base AADT 2022	Do Nothing AADT 2043	Do Something AADT 2043	% Difference
Link 1	Station Road W	50	13741	16826	16914	0.5%
Link 2	Station Road E	50	12527	15377	15487	0.7%
Link 3	Celbridge Road	50	8381	10187	10274	0.9%
Link 4	Celbridge Road N	60	7604	9266	9441	1.9%
Link 5	R404 Site Access Road /Link Road	60	1077	1077	1252	16.3%
Link 6	Celbridge Road S	60	8031	9919	10182	2.7%
Link 7	Barnhall Road	60	3818	4733	6465	36.6%
Link 8	R449 S	60	13633	16653	16741	0.5%
Link 9	M4 On Slip WB		6112	7512	8060	7.3%
Link 10	M4 off Slip EB	60	4155	5143	5253	2.1%
Link 11	R449 N	60	18498	22736	23043	1.3%
Link 12	M4 on slip EB	60	4155	5143	5253	2.1%
Link 13	M4 off slip WB		7381	9016	9543	5.8%
Link 14	R404 RBT Site Access	60	1939	2369	2632	11.1%
Link 15	RBT R404 S	60	7881	9627	9890	2.7%
Link 16	R404	60	7828	9562	9899	3.5%
Link 17	R403 E	60	11630	14207	14426	1.5%
Link 18	Stacumny Lane	60	2517	3074	3096	0.7%
Link 19	R403 W	60	15314	18706	18750	0.2%

Table 13.6 AADT

The results demonstrate that during the operation phase, aside from the access roads, the proposed development will contribute up to a maximum of 7.3% on the M4 on slip westbound from the interchange junction.
As per the rating off effects in traffic contribution in Table 13.7, which is based on a conservative interpretation of the EPA Guidelines and IEMA Guidelines, the proposed development is expected to result in a 'slight' or less effect on the majority of the local roads.

It is noted that a 36.6% and 16.3% impact is predicted on the access roads from the west and east of the site respectively, however this is to be expected as they comprise the two access roads, Barnhall Road and the R404, into the proposed development The base flow on these junctions is low with counts taken in 2022 at a time that the campus was not fully operational with the impact percentage therefore representing a higher-level change than if the current campus was fully operational.

13.10.3 Model Development

An existing 2016 base year VISUM model developed for Maynooth Town Centre was agreed with KCC as an appropriate model as a base for the strategic modelling. The model was updated to add more detail and to improve the calibration of the area of interest of this study. The proposed link road was then tested in this updated base year model and the revised flows fed back into a VISSIM microsimulation model.

A base year VISSIM model has been developed for a larger study area. To ensure the replicated observed driver behaviour and baseline traffic conditions, it was calibrated against observed traffic counts and validated against observed journey time data (from the October 2022 traffic surveys). The model was calibrated and validated in accordance with the guidelines set out by TII Pag Unit 5.1 – Construction of Transport Models. Further detail of the model development undertaken is set out in the Transport Assessment.

A summary of the network statistics is provided in Table 13.7. The summary includes for assessments with the Link road open, known committed development included and with and without the proposed development for comparison across the assessment years.

Year	Link Road	Committed Dev	KIC Dev	AM Average Delay (S)	AM Average Speed (km/h)	AM Latent Demand (veh)
2022	Closed	Not in	Not In	25.2	68.1	0.0
2022	Open	Not in	Not In	25.7	68.1	0.1
2028	Open	In	Not In	29.7	65.7	0.6
2028	Open	In	In	45.0	61.0	0.7
2033	Open	In	Not In	33.8	64.6	0.5
2033	Open	In	In	76.1	53.9	2.1
2043	Open	In	Not In	40.9	62.7	0.7
2043	Open	In	In	66.4	56.4	0.6

Table 13.7 Network Statistics AM Peak

The results indicate that the with development, as anticipated, would result in an increase in delay and a decrease in speed across the network. The level of impact is not considered to be material however. The 2033 with development scenario sees Phase 1 and Phase 2 operational but with construction still ongoing for Phase 3. This is prior to the demolition of buildings also, hence indicates a greater impact on the network. The maximum delay across the full network is averaged at 76 seconds, with average stops of 2.

The final year assessments for 2043, which include significant background traffic growth and the full masterplan operational, indicates a 26 second delay average across the full study area network. This is not considered to be a significant impact during the AM peak. Table 13.8 present the Network Performance Statistics from the PM peak models.

Year	Link Road	Committed Dev	KIC Dev	PM Average Delay (S)	PM Average Speed (km/h)	PM Latent Demand (veh)
2022	Closed	Not in	Not In	30.0	70.0	0.3
2022	Open	Not in	Not In	31.8	69.4	0.3
2028	Open	In	Not In	56.3	62.0	0.5
2028	Open	In	In	73.0	57.6	56.0
2033	Open	In	Not In	72.6	58.3	15.7
2033	Open	In	In	87.9	54.5	250.1
2043	Open	In	Not In	97.9	53.3	71.8
2043	Open	In	In	82.7	56.0	15.4

Table 13.8 Network Statistics PM Peak

The results from the modelled assessments for the PM indicate that it is the more critical period.

The 2033 period being the more onerous due to the continued construction on site over a relatively short period of time. The modelled results for the PM period indicate an increase of 15.3 seconds on the average delay, with a decrease in speed of less than 4km/h. This is not considered to be a material impact.

It is noted that during the 2043 assessment when the site is fully operational the net traffic impact results in a decrease in the average delay and an increase in average speed across the network.

The latent demand, indicating the level of traffic not able to enter the model study area, is significantly increased during the PM peak period. Although the result is for the full network the latent demand is experienced where traffic is not able to exit the M4 motorway westbound onto the interchange. Some delay is also experienced within the site. Mitigated by shift patterns and internal movements

Table 13.9 provides the results from the model where the proposed signalisation of the interchange, as part of the proposed mitigation from the Intel development, is included in the model assessment.

By its nature, signals increase delay on the network due to the nature of stopping, the inclusion of signals allows for the decrease in latent demand from the M4 the increase latent demand and remove any queuing onto the M4 from the interchange as was previously evident.

Year	Link Road	Committed Dev	KIC Dev	PM Average Delay (S)	PM Average Speed (km/h)	PM Latent Demand (veh)
2028	Open	In	Not In	47.2	64.3	0.5
2028	Open	In	In	64.5	59.4	0.5
2033	Open	In	Not In	61.2	60.9	1.1
2033	Open	In	In	103.6	51.5	1.5
2043	Open	In	Not In	86.9	55.4	0.6
2043	Open	In	In	69.8	58.7	2.7

Table 13.9 PM Peak Network Statistics with interchange signals

13.11 Mitigation Measures and Monitoring of Impacts

13.11.1 Incorporated Design Mitigation

There are measures which have been included from the outset in the design of the development to reduce any potential negative effects on the local transport network arising from additional traffic generated by the development.

The most significant measure is the provision of pedestrian and cycle infrastructure across the M4 and linking to surrounding cycle routes.

<u>**Construction Phase**</u>

This assessment concludes that the proposed development will not have a significant effect on the local road network during the construction phase. Notwithstanding this, a Construction Traffic Management Plan has been prepared as a ‘best practice’ measure which identifies measures that aim to minimise the effect of construction traffic on the surrounding road network with respect to potential temporary changes to vehicular traffic and pedestrian movements. The CTMP measures include the following:

- Construction Staff will be encouraged to arrive before 07:30 and leave after 18:00 (i.e. avoiding network peak periods);
- Appropriate level of cycle and vehicle parking on site for staff, with staff encouraged to travel by sustainable means;
- Parking provided to prevent overspill onto surrounding network;
- Appointment of Construction Site Manager/Community Liaison Officer by the Principal Contractor to manage the implementation of the CTMP and act as the main point of contact for staff, contractors, KCC and general public;
- Construction staff Travel Plan to be developed by appointed Contractor;

- Sufficient cycle parking, storage and drying areas will be provided on site to meet the needs of all construction staff;
- KCC agreed haulage routes along designated HGV routes;
- Minimising HGV deliveries during the peak hours (generally 08:00-09:00 and 17:00-18:00);
- On-site wheel wash facilities;
- HGVs carrying soil to be fully sheeted;
- HGVs inspected for dirt and mud before exiting onto public road network;
- Road cleaning and sweeping along sections of roads adjacent to the site;
- Construction signage at all entrances and exits;
- Control and timing of deliveries where possible;
- Entrances and exits manned during deliveries.

A more detailed and comprehensive CTMP will be produced by the contractor for specific phases of the development construction post-planning consent.

CTMPs will be prepared prior to commencement of all associated facilitation works. These will be reviewed and agreed to KCC.

Operational Phase

The site specific Mobility Management Plan, prepared by SYSTRA Ltd ,the improved access for pedestrian and cyclists, including the provision of new M4 overpass, and the provision of EV charging hub are the key operational mitigation measures.

The aim of the Mobility Management Plan is to further reduce the proportion of car trips, from an already low baseline, by promoting sustainable travel by future residents of the development. These mobility measures will also support and enable those residents who may be living ‘car-free’ providing them with a range of sustainable mobility options and negating the need to own a car.

The measures in the Mobility Management Plan comprise[1]:

- Appointment of Mobility Manger (by the campus management company) who will market and promote the Mobility Management Plan to residents of the site, and monitor the progress of the Mobility Management Plan;
- A Welcome Travel Pack will be provided to occupants with details of local transport network, maps of local amenities, detail of on-site facilities, incentives for sustainable travel use;
- Marketing and Travel information and Personalised Travel Planning will be provided by Mobility Manager to inform occupants and visitors of the sustainable travel options available, this will include for business travel and commuting;
- Walking and Cycling Challenges and promotion events.
-

Refer to the Mobility Management Plan prepared by SYSTRA Ltd and submitted with the application for further detail.

13.12 Predicted Effects of the Proposed Development post mitigation

[1] This is not an exhaustive list, full measures are detailed further in the Mobility Management Plan which is provided as part of the planning application submission

13.12.1 Demolition & Construction Phase

Prior to mitigation, the assessment of potential demolition and construction traffic impact already demonstrates that no significant adverse effects are expected to arise from traffic associated with the proposed development.

Notwithstanding this, a CTMP will be implemented during the construction phase which will ensure that the impact of construction traffic is managed and minimised as far as is practicable. As such, the predicted impact during the construction phase is considered to have a negative, slight and short-term effect.

As facilitation works are programmed, they too will require a CTMP as part of their planning and delivery. This will need to take into account the construction traffic as the baseline scenario and plan accordingly.

13.12.2Operational Phase

The campus design incorporates a number of mitigation measures including the provision of the cycle and pedestrian overbridge and its links through the site, facilities for public bus charging and EV parking and significant increase in cycle parking on site. The assessment of potential operational traffic impact already demonstrates that no significant effects are expected to arise from operational traffic associated with the project.

Notwithstanding this, a Mobility Management Plan will be implemented as a 'best practice' measure which will seek to minimise car-based trips, particularly single-occupancy car trips, through the proposed measures (refer to Section 9.9.3) to discourage car use and encourage sustainable transport options. As such, the predicted impact during the operational phase is considered to have a negligible and 'not significant' long-term effect.

13.13 Monitoring

13.13.1 Demolition & Construction Phase

The construction phase will be monitored by the appointed site manager and regular progress reports will be prepared. The manager will ensure the mitigation measures outlined will be implemented and adhered to.

13.13.2 Operational Phase

A Mobility Manager will be appointed from within the campus management company to ensure the implementation of the Mobility Management Plan. They will act as a point of contact for employees for all mobility and access related issues.

13.14 Residual Effects

The effect of the construction phase in terms of traffic and transport will be imperceptible and short-term in nature. The measures outlined in the CEMP, will help alleviate the effect of the additional traffic and limit the effect to outside the busier peak hours. The measures, including wheel washing and dust mitigation, will also ensure the standard of the public road network is maintained in terms of dust and dirt from construction traffic.

With the mitigation measures in place, the effect of the proposed development on traffic and transport is envisaged to be slight, likely in probability and long-term. The proposed development is located within an area with well-integrated walking infrastructure to encourage sustainable travel choices to and through the proposed development. The Mobility Management Plan initiatives and design of the campus and its accessibility improvements are likely to result in lower volumes of car traffic than that assumed in the modelling assessment.

13.15 Reinstatement

Following the construction phase, all excavations will be made good, and all hard and soft landscaped areas will be delivered in accordance with the Landscape.

13.16 Interactions and Potential Cumulative Effects

13.16.2 Interactions

Trip generation and resultant traffic flow contribution on the local network impacts on the performance of the road network (in terms of network delays), air quality and noise in the local environment. The impacts on the performance of the transport network are addressed in this EIAR and the Traffic and Transport Assessment report produced by SYSTRA.

The impacts on air quality and noise and vibration are addressed in Chapter 9 Air Quality and Climate (AWN), and Chapter 10 Noise and Vibration (AWN) respectively. The combined impact on Population and Human Health is addressed in Chapter 5 (TPA).

13.17. Likely Cumulative and Interaction Impacts of the Project

13.17.1 Potential Cumulative Impacts

Regarding the construction phase, the CTMP will ensure coordination with any known nearby construction. The strict routing for HGVs to the nearby M4 and mitigation measures outlined in the CTMP will ensure impact is slight and short-term.

The road network analysis undertaken accounts for a robust background growth in traffic and known developments, within close proximity to the site, as outlined in Chapter 3 and Appendix 1.1 of this EIAR. The results of the analysis conclude that with signals installed at the interchange junction and the link road full operational, that the network operated within capacity.

14.0 MATERIAL ASSETS: SITE SERVICES

14.1 Introduction

This section of the EIAR describes the existing material assets (site services) for the foul and surface drainage, potable water, power, gas, heating & telecom aspects of the proposed development site. An assessment is made of the likely specific, direct and indirect impacts arising during the construction and operational phases of the proposed development on these elements.

This chapter was prepared by Brian Minogue of Tom Phillips & Associates with assistance from Kevin Owen of Clifton Scannell Emerson Associates, Gary O'Keefe of Ethos Engineering, Paul O'Halloran of H&MV and Tom McMahon of MDM Engineering. Brian Minogue is a Member of the Irish Planning Institute and has been practicing as a town planner for over 15 years. Brian holds an undergraduate degree in Spatial Planning (Hons), (2007) DIT. Kevin Owen is a qualified civil engineer with over 6 year's experience. Gary O'Keefe is a qualified mechanical and electrical engineer with over 20 years experience. Padraic McGurl is a qualified electrical engineer with over 5 years experience. Tom McMahon is a qualified civil engineer with over 30 years experience.

14.2 Project Description

The Project is for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT, Data Centre and Innovation uses. The proposal will include for the demolition of some of the existing buildings on site and construction of new buildings, an energy centre and replacement substation. The proposal will include significant public infrastructure including a new signalised intersection on Celbridge Road (R404), a new Public Link Road through the campus (between Barnhall Road and the new signalised intersection), a pedestrian/cycle overpass of the M4, pedestrian and cycle links through the site and along the designated protected view corridor and supporting infrastructure. The project to which this EIAR relates also includes facilitation works which comprise uprating of existing 110kV power lines to the site and the provision of an upgraded natural gas connection to the site. The facilitation works which are included in the project do not form part of the development for which consent is sought. Future consents for the facilitation works will be required through EirGrid and GNI. A detailed description of the project is outlined in Chapter 2 of this EIAR.

Refer to Chapter 2 for a more detailed project description and description of the site's location and context.

14.3 Methodology

The Directive requires an assessment of the direct and indirect significant effects of a project on the following factors:

a) Population and human health:
b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC:
c) Land, soil, water, air and climate:
d) Material assets, cultural heritage and the landscape:
e) The interaction between the factors referred to in points (a) to (d).

The EPA Guidelines (2022) state that material assets are taken to mean *"built services and infrastructure, roads and traffic and waste management".* Built Services are further described as including *'electricity, telecommunications, gas, water supply infrastructure and sewerage'.* The EPA Advice Notes (2015) also gives examples of material assets including assimilative capacity of air and water; ownership and access; and tourism and recreational infrastructure. The European Commission Guidance (2017) refers to a number of examples of material assets including buildings, other structures, mineral resources and water resources.

In this EIAR, the impacts on some of the material assets described in the above guidance have already been considered in the below chapters and therefore these aspects will not be addressed in specific detail within this chapter.

- Chapter 4, Population and Human Health.
- Chapter 5, Land, Soils, Geology & Hydrogeology.
- Chapter 6, Hydrology.
- Chapter 8, Air Quality & Climate.
- Chapter 11, Cultural Heritage
- Chapter 12, Traffic & Transportation; and
- Chapter 14, Waste Management.

This chapter assesses built services and infrastructure, which have not already been addressed elsewhere in this EIAR. The potential impacts on built services and infrastructure, if any, are assessed in terms of foul drainage, surface water drainage, water supply, power supply, gas supply and heating supply.

The associated built services and infrastructure in the vicinity of the site are summarised in the following sections and additional detail is provided within the planning application documentation. The assessment of impact on utilities has been undertaken by consultation with regard to availability with the utility supplier, Gas Networks Ireland, ESB Networks, Telecom and Irish Water (IW). Mitigation measures are proposed where required.

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this chapter:

- Greater Dublin Strategic Drainage Study (GDSDS),
- Method outlined in Irish Water's Pre-Connection Enquiry Application,
- Method outlined in Irish Water's Code of Practice for Wastewater Infrastructure,
- Method outlined in Irish Water's Code of Practice for Water Infrastructure,
- Regional Code of Practice For Drainage Works - Version 6.
- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA).
- Gas Networks Ireland's 10 Year Network Development Plan 2021
- GNI's Gas Forecast Statement 2022
- Eirgrid Ecology Guidelines for Electricity Transmission Projects

The preparation of this chapter has also been informed by desktop studies of relevant data sources including:

- Flood Risk Assessment Report completed by CSEA which accompanies this Planning Application.
- Engineering Planning Report, Drainage and Water Services by CSEA
- All available information concerning the development, this included existing topographical information & relevant utility drawings, as well as a physical site inspection.

14.3.1 Scoping and Heading/Topic Identification

The EPA Guidelines, 2022, state that:

> *"each* [environmental] *factor is typically explored by examining a series of headings and/or topics relevant to that factor".*
>
> [and]
>
> *"The relevant topics for any given EIAR should be established during scoping".*

The methods employed for scoping and identification of the relevant environmental topics for this Chapter has been expert opinion/judgement on the possible site services likely to be impacted by the project.

The headings and/or topics scoped into this Chapter's assessment are:

1. Foul drainage
2. Surface water drainage
3. Water supply
4. Power supply
5. Gas supply
6. Heating supply.

14.3.2 Baseline Scenario/Likely Future Receiving Environment Analysis Methodology

The EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) state that:

> *"It is important to demonstrate that correct methodologies and experts have been used. It is also important that the methodology used in establishing the baseline scenario is documented to permit replicable future monitoring so that the later results can be properly compared (where required). Standard recognised methods should be applied where available and appropriate."*

The baseline/future receiving environment analysis for this Chapter has been undertaken in accordance with the EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) and all other documents outlined in section 14.3.

Baseline Scenario Analysis Methodology

The steps involved in the baseline scenario analysis were as follows:

1. Identify existing site services related to the project.

2. Gather available data regarding the characteristics of the existing site services.

3. Assess the characteristics of the site services including condition and capacity as well as significance and sensitivity.

Likely Future Receiving Environment Analysis Methodology

The methodology employed in predicting the likely future receiving environment was inductive reasoning stemming from the professional experience and knowledge of the experts and a review of the cumulative projects in the surrounding area and KCC County Development Plan 2023-2029 (including its associated Strategic Environmental Assessment).

14.3.3 Impact Assessment Methodology

The analysis of the predicted impacts of the project on site services during construction and operation are presented in this Chapter. The assessment considered site service features, identified in Section 14.3.1 above, within the project site and the surrounding vicinity in accordance with the methodology outlined in this section 14.3, to determine the significance of the impacts. Where likely significant impacts are highlighted, mitigation and monitoring are proposed, and any residual impacts are assessed.

The impact assessment for this Chapter has been undertaken in accordance with the *EPA Guidelines on the Preparation of an EIAR* (EPA, May 2022) and all other documents outlined in section 14.3.

Assessment methods quantify and predict the magnitude and significance of impacts.

The methods employed for assessment and evaluation of the environmental topics for this Chapter have been:

1. Assess the current condition, capacity, significance and sensitivity of the site services (the 'baseline').

2. Identify the anticipated level of development, which includes the expected population growth and economic activities that are likely to take place in the surrounding area. This has been predicted in Chapter 5 (Population & Human Health) and is informed by information sourced from CSO and from *Kildare County Development Plan 2023-2029*.

3. Assess the potential impact on site services as a result of the development. Based on the anticipated level of development and the current condition and capacity

of the site services, the potential impact on site services has been assessed. This includes identifying potential bottlenecks, such as limitations in capacity or technical problems that may arise due to the increased demand from the proposed development.

4. Consultation with experts, including Kildare County Council, Uisce Éireann , EirGrid, ESB, and Gas Networks Ireland.

5. Expert opinion of the Project Team engineers as identified in section 14.1 above.

6. Review of Strategic Environmental Assessment prepared for the *Kildare County Development Plan 2023-2029* (including a review of the Development Plan itself). According to the EPA Guidelines, 2022, this can reduce the number of cumulative effects that need to be considered in an EIAR.

7. Geospatial Analysis (cumulative impacts only – used to identify planning permissions/applications within a 5 km radius).

Overall, predicting the future impact on site services has involved obtaining a thorough understanding of the condition, capacity, significance and sensitivity of the existing site services and the expected level of development.

14.4 Baseline Scenario/Future Receiving Environment Analysis

14.4.1 Current State of the Environment (Baseline Scenario)

The EIA Directive requires the following to be described relating to the baseline scenario:

> *"A description of the relevant aspects of the current state of the environment (baseline scenario)".*

Foul Drainage

Context & Character

The existing foul/ wastewater inflows are pumped to the public sewerage system at the northeast corner of the site (see Figure 14.1, below).

Two pumping stations are located on the site (see Figure 14.2, below) with 200mm dia. pumping mains with provision included for future development.

Site watermain inflow record information indicates that outflow to the public sewerage network was likely to be up to 965m^3 per day during HP's previous operation at the site. Peak (3 x Dry Weather Flow [DWF]) 34 l/s during 2009/ 2010.

The existing catering facility drainage system includes a large capacity grease separator (estimated to cater for 1800 meals each day).

The foul drainage system is in place since the development of the HP Site and is in adequate working condition.

Sensitivity

Foul drainage systems can be sensitive to changes in their design, installation, and maintenance. The performance of a foul drainage system can be affected by various factors, including:

- Changes in the flow rate of wastewater can impact the system's ability to transport wastewater to the treatment plant. High flow rates can cause blockages and overflows, while low flow rates can cause sedimentation and accumulation of solids.

- The size and slope of the pipes can affect the velocity and capacity of the wastewater transport, which can impact the system's ability to function effectively.

- The type of pipe materials used can affect the durability and lifespan of the system. Some materials may corrode over time or be susceptible to damage from tree roots or ground movements.

- Regular maintenance of the foul drainage system is essential to prevent blockages, leaks, and other issues that can impact the system's performance.

- Human errors and accidents such as excavation or equipment failure can cause damage to the system.

- Changes in climate conditions, such as heavy rainfall or drought, can impact the flow rates and capacity of the foul drainage system.

- Changes in land use, such as new developments or industrial activities, can increase the volume and strength of wastewater, which can impact the system's ability to handle the additional load.

Overall, foul drainage systems are moderately sensitive to changes.

Surface Water Drainage

Context & Character

Surface water runoff from hardstanding areas with the existing site are collected in a sealed system of pipes and gullies which drain towards the east side of the site. The topography of the site falls moderately in a northwest to east direction (59.25AOD – 45.00AOD). Two existing surface water retention ponds are located on the eastern site boundary. The existing retention pond system includes two individual ponds to allow for alternating, with a single pond use during routine inspections and maintenance. An additional fire water retention pond is also located there. Additional bunded storage is provided in the surrounding landscaped area in the event of an overflow occurring. The normal capacity of the retention ponds is 5000m3, with and additional 25,000m3 being able to be accommodated in the bunded overflow area. The discharge to the outfall is controlled to ensure an appropriate volume of water is retained at all times. These ponds serve the existing site as attenuation during extreme storm events as well as to provide the firefighting network with water when required.

The site ultimately discharges its surface water runoff directly via an outfall drain to the Leixlip Reservoir via a 1.350mØ culvert, following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, downstream of the existing Retention Ponds near the existing site entrance off the Celbridge Road.

These ponds serve the existing site for attenuation purposes as well as for fire retention water. The quality of the surface water discharge from the ponds is mechanically measured to ensure no contaminates are allowed to enter the Liffey Reservoir. A shut off valve is automatically enabled in event of a contamination event.

An additional attenuation pond exists on the campus beside the DBS building. This pond does not affect the development site as it has been designed for attenuation of the DBS site. The DBS site is outside the redline boundary of the proposed development and is connected directly to Barnhall Road Stormwater Sewer following flow control and quality monitoring.

Existing storm water runoff from the existing building surface areas discharge to the retention ponds. Existing runoff from carparking, associated access roadways and general yard areas discharge through petrol/ oil separators to the retention pond system.

Surface water discharge outfalls into the Liffey Reservoir, following confirmation of water quality through electronic monitoring mechanisms inclusive of shut off valves, downstream of the existing Retention Ponds near the existing site entrance off the Celbridge Road.

Kilmacredock Upper Stream passes through the proposed development. The stream has since been diverted across the site development by means of a 1.5m culvert. See Figure 14.3 below.

Figure 14.3: Diverted Stream within the KIC Site.

The surface water drainage system is in place since the development of the HP Site and is in adequate working condition.

The existing development pre-dates current surface water design standards and SuDS guidance.

Sensitivity

Surface water drainage systems can be sensitive to changes in their design, installation, and maintenance. Some of the factors that can affect the sensitivity of surface water drainage systems include:

- Changes in land use, such as urbanisation, can increase the number of impervious surfaces, such as roads and buildings, which can lead to increased stormwater runoff and reduced infiltration into the soil.

- Changes in precipitation patterns and increased frequency of extreme weather events can impact the sensitivity of surface water drainage systems.

- The type of soil in a particular area can affect the ability of a drainage system to manage stormwater runoff effectively. For example, soils with high clay content may have a low infiltration capacity and can cause waterlogging and flooding.

- Proper maintenance of drainage systems, such as regular cleaning of catch basins and culverts, is essential to ensure their functionality and prevent clogging and blockages.

- Human errors and accidents such as excavation or equipment failure can cause damage to the system.

Overall, surface water drainage systems are moderately sensitive to changes.

Water Supply

Context & Character

The original water supply to the site for the initial phase of the HP development in the late nineties was from the Celbridge Road to the east. The supply was also connected to the existing sprinkler storage pond near the main entrance off the Celbridge Road. A pump house was constructed alongside the storage pond to pressurise the HP fire main systems on the site.

During the construction of the link roadway to the M4 Interchange a new 250mm watermain was brought to the site along the link road. The 250mm watermain enters the site along this entrance roadway from the M4 Interchange. The watermain downsizes to 150mm within the site – refer to CSEA Drawing 2300 to 2318. The new watermain was designed to cater for the completed additional Phase 2 HP development and planned future phases.

The existing water meter is located immediately outside the site boundary at the external roundabout in the north west of the site.

The water supply system is in place since the development of the HP Site and is in adequate working condition.

Sensitivity

Water systems can be sensitive to changes in their design, installation, and maintenance. Some of the factors that can affect the sensitivity of water systems include:

- The quality of the water source, such as rivers, lakes, or groundwater, can affect the treatment processes required to produce safe drinking water. Changes in source water quality due to natural or human-caused factors can impact the quality of water provided to the site.

- Aging water infrastructure, such as pipes, valves, and treatment facilities, can become vulnerable to leaks, breaks, and other failures that can impact the ability to provide quality water supply.

- Human errors and accidents such as excavation damage or equipment failure can cause leaks or supply interruptions.

- Climate change can affect the quantity and quality of water resources, as well as impact the reliability of water infrastructure during extreme weather events such as floods and droughts.

- Contamination incidents, such as chemical spills or microbial outbreaks, can impact the quaility of water servicing systems and threaten public health.

- Increased demand for water can result in reduced water pressure for existing customers.

Overall, water systems are moderately sensitive to changes.

Gas Supply

Context & Character

The Kildare Innovation Campus is currently provided with a connection to the existing gas distribution network via an existing gas skid to the northeast of the campus. The gas mains on site is provided in a loop of the campus with primary function of serving the boilers on site and the cafeteria. The existing gas network is in place since the development of the HP Site and provides adequate supply to the site for the existing tenants and development on site.

The natural gas supply line to the site connects from the existing gas skid under Celbridge Road under the M4 and northwards into Leixlip.

Sensitivity

Gas supply systems can be sensitive to changes in their design, installation, and maintenance. Some of the factors that can affect the sensitivity of gas supply systems include:

- Natural disasters such as storms and floods can damage the gas infrastructure, leading to gas leaks or supply interruptions.

- Gas pipelines can be vulnerable to corrosion, physical damage, and other forms of degradation, which can lead to leaks or pipeline failures.

- Human errors and accidents such as excavation damage or equipment failure can cause gas leaks or supply interruptions.

- Changes in gas demand can impact the capacity of the gas infrastructure to supply sufficient gas to meet the demand.

- Changes in gas supply, including global supply issues, can impact on ability to meet demand at local level.

Overall, gas supply systems are moderately sensitive to changes.

Power Supply

Context & Character

Power supply to the Campus is provided via the existing 110kV Rinawade Substation located southwest within the Site. The current Air Insulated Switchgear (AIS) substation known as the Rinawade 110kV sub is fed by 2 x 110kV Overhead lines (OHL).

Eirgrid/ESB own & operate the 110kV part of the substation; the Client/landlord owns & operates the transformers & 20kV switchgear on the customer side of the substation. The local utility concession holder, ESB Networks, is currently not involved anywhere on the campus.

The 110kV OHL is terminated onto a common busbar from which two 110/20kV, 20MVA, transformers are energised. These transformers currently supply power to the campus.

Through consultation with Eirgrid, H&MV have advised that the current 110kV Rinawade Substation is close to its end of life and to renew the current power agreement on site significant upgrades would be required to the existing substation, or alternatively a replacement substation would be required.

A second power supply to the campus is provided to a 20Mv substation adjacent to the existing DB Schenker development. This substation is supplied from Adamstown 110kV Substation.

Sensitivity

Power supply systems can be sensitive to changes in their design, installation, and maintenance. Some of the factors that can affect the sensitivity of power supply systems include:

- Natural disasters such as storms and floods can damage the electricity infrastructure, leading to power outages or supply interruptions.
- Aging electricity infrastructure, such as transformers, and transmission lines, can become vulnerable to failures and disruptions that can impact the ability to provide electricity supply.
- Changes in electricity demand can impact the capacity of the electricity infrastructure to supply sufficient electricity to meet the demand.
- The source of fuel for power supply can also impact on security of supply during global events such as wars.

Overall, power supply systems are highly sensitive to changes.

Telecommunications Supply

Existing fibre optic cable distribution is available on site and serves the current buildings.

Context & Character

The fibre optic cable infrastructure on site has been developed overtime as technology has advanced.

Sensitivity

Fibre supply systems are not considered sensitive to changes in their design, installation, and maintenance. The main factor that can affect sensitivity of change is advancement in technology. Overall, fibre systems are slightly sensitive to changes.

Heating Supply

The existing campus operates off centralised heating from the campus boiler room within Building No.6, which operates from the existing gas network. Pipes travel through each of the existing buildings providing heat to the internal spaces.

Context & Character

The heating system was developed as part of the initial HP development. Overall, the system in place is a typical central heating system to provide heat to the campus buildings, which would otherwise not receive heat to keep room temperatures comfortable.

Although still widely used as a primary heating system in many buildings, heating technologies have become available, such as district heating, which can be a more efficient and cost saving approach to heating.

Sensitivity

Heating supply systems can be sensitive to changes in their design, installation, and maintenance. Some of the factors that can affect the sensitivity of power supply systems include:

- The availability and price of fuel used for heating, such as natural gas, oil, or electricity, can impact the cost and reliability of heating.
- Extreme weather events such as cold snaps or heatwaves can strain heating systems, leading to potential failures or malfunctions.
- Aging heating infrastructure, such as boilers or furnaces, can become more prone to failures and breakdowns that can impact the ability to provide heating.
- Human errors and accidents such as improper installation, maintenance, or misuse of heating systems can cause malfunctions, inefficiencies, or safety hazards.
- Changes in heating demand, such as occupancy levels or changes in building use, can impact the capacity of heating systems to provide sufficient heat to meet demand.

Overall, power supply systems are moderately sensitive to changes.

14.4.2 Likely Future Receiving Environment ('Do Nothing' Scenario)

The EIA Directive requires the following to be described relating to the future receiving environment (the 'Do Nothing' scenario):

> *"an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge".*

In the event of a 'Do Nothing' scenario, the site would remain in operation as an existing Science and Technology campus. The undeveloped parts of the site would remain so. Some maintenance and upgrades to existing assets may be required over time however most would remain as is. The exception to this is the existing power supply to the campus. As advised by Eirgrid, the current 110kV substation would still need to be upgraded or replaced to extend the current Eirgrid agreement and provide power to any new tenants that may come on site and occupy the existing vacant buildings, however alternative supply agreements may be reached, similar to the DB Schenker development. As a result, the uprating works required to facilitate the proposed project would likely not be required, nor would the local enhancement of the gas network be required.

14.5 Likely Impacts of the Project

14.5.1 Construction Phase

Surface Water and Foul Drainage Infrastructure and Water Supply

Subject to grant of planning permission a construction compound will be required to be located to serve each of the three phases of development similar to what occurred for the recent development of the DB Schenker adjacent to the south-east entrance to the campus. A temporary connection to the mains water supply will need to be established for the construction of each phase. The water demand during the construction phases will not be significant enough to affect existing pressures. A temporary connection to the foul water drainage network will need to be established for the construction of each phase. The current campus has previously catered for in excess of 1,200 persons on site and the existing foul network has been designed to cater for this demand. Sufficient capacity is available within the existing network to cater for the wastewater discharges from the welfare facilities for the short-term construction phase. Approval for a temporary connection to the water supply and foul water drainage network will be sought from Uisce Éireann by the contractor.

If stormwater collects in excavation pits on campus during construction, it will need to be discharged to sewer. Any discharge will be treated as standard using a siltbuster or similar to remove suspended solids prior to discharge as outlined in the project Construction and Environmental Management Plan (CEMP) and Chapter 8 (Hydrology) of this EIAR.

The surface water, foul water generated and water demand during the construction phase is not likely to have a significant negative impact on the existing networks as overall demand is low and in line with previous developments on the campus.

Overall, proper planning and management of the foul drainage and water systems during the project construction will help minimise potential impacts and ensure the continued safe and reliable operation of the systems.

As outlined in Chapter 8 (Hydrology), with the implementation of design and mitigation measures for the Proposed Development site the impact of the construction phase is ***short-term*** in duration with an ***Imperceptible effect*** rating. Similarly, the potential impacts associated with storm and wastewater for the proposed development for the construction phase are ***short-term, neutral and imperceptible***

Power Supply

The Contractor as part of construction of the proposed site will require a power supply. The power supply for the construction compound will be a combination of generator supply and existing connection to the electrical network on campus. The power requirements for the construction phase will be relatively minor and therefore the power demand for the construction phase will have a temporary imperceptible impact.

Any extension of the power supply to the Proposed Development will be within the overall landholding and will not require any off-site connections. If works are not carried out correctly there is potential for the construction works to cause accidental damage to the infrastructure for the permitted development. As the connection works are entirely within the existing site boundaries, these would not have any potential offsite impact.

Gas Supply

The Contractor as part of construction of the proposed site is not expected to require gas supply as such there would be no potential for offsite impact.

Telecommunications Supply

Telecommunications including fibre required during construction phase will be provided via a temporary mobile connection.

The existing fibre optic cable distribution network for the permitted developments will be extended through shallow trenching to the proposed development. As the connection works are entirely within the site boundary and excavations required are shallow, there will be no offsite impact.

14.5.2 Operational Phase

Foul Drainage

The existing foul pumping stations with the 200mm dia. pump rising mains shall be retained and upgraded to accommodate the new developments on the site. Upgrading shall include consideration of the pumps and automated pumping controls upgrade/updating/replacement etc. The station operation data signals etc shall be connected to the new location for the campus facilities management building etc. Underground 24-hour storage tanks shall be provided at each of the existing stations. The route of the existing pumping mains from the stations shall be realigned to facilitate the new development, as shown in the CSEA drawings No 21_048-CSE-ZZ-ZZ-DR-C-2200 and 21_048-CSE-ZZ-ZZ-DR-C-2210 to 21_048-CSE-ZZ-ZZ-DR-C-2218.

A new, additional pumping facility shall be provided to service areas of development outside the catchments of the existing stations. Refer to CSEA drawings for details of the new pumping station and *CSEA Planning Drainage & Water Supply Report* for drainage calculations.

It is not expected that there will be new requirements for new foul connections outside of the overall landholding. The wastewater discharged from the site will ultimately discharge to the Waste Water Treatment Plant at Leixlip. There are no proposed process water emissions. If insufficient capacity is available in the public infrastructure, there is a potential for increased levels of pollution in receiving waters, however confirmation of feasibility from Uisce Éireann on the wastewater requirements for the proposed development has been previously provided.

The industrial wastewater demand for the proposed development is zero. The peak foul flow is calculated at 4.81 l/s and similar to the previous maximum capacity/peak foul flow of the HP site when at its former capacity. The overall wastewater discharge associated with the proposed development has previously been agreed with Uisce Éireann by letter dated 12 July 2022 confirming that there are no upgrades required to the network by Uisce Éireann. The wastewater discharge rate agreed with Uisce Éireann is in accordance with the discharge rates outlined in the PCE (ref CDS23003038) submitted to Uisce Éireann for the Proposed Development. The predicted impact will be ***long-term, neutral and imperceptible*** for the operational phase.

Surface Water

The proposed surface water networks for the proposed development collect runoff from roofs, roads and other hard standing areas in a combination of SuDS systems and sealed system of pipes and gullies. There are five separate surface water drainage networks in the proposed development which are proposed to flow to new surface water attenuation basins (Refer to Drawing No's 21_048-CSE-00-XX-DR-C-2111 to 21_048-CSE-00-XX-DR-C-2118) from which attenuated flows are discharged, via carrier drains, to the existing retention ponds within the site.

The site is divided up into five catchment areas. These areas are defined by the topographical characteristics of the site and the proposed finish levels of the development. Each catchment collects the surface runoff and attenuates it within a pond up to the 1:100 year event. A flow control device will be installed within each catchment to slowly releases the water into the existing ponds, from there the water will discharge to the Leixlip Reservoir. The portion of the site on the north side of the M4 will drain into small swales and landscaping and infiltrate to ground. No attenuation or piped infrastructure will be required in this area.

In order to account for climate change, an additional allowance of 30% in rainfall intensities have been allowed as per Kildare County Council (KCC) requirements which exceeds the requirements of Table 6.1 of Volume 2 of the GDSDS (10%). In addition, an urban creep factor of 10% has been included as per KCC requirements.

Analysis of the 1 in 30 year storm event yields a critical required storage volume of 18,658 m3 during the 1440 minute of the 1 in 30 year storm event for the entire site. Similarly, analysis of the 1 in 100 year storm event yields a critical required storage volume of 23806.4 m3 during the 1440 minute of the 1 in 100 year storm event for the entire site. See CSEA's *Engineering Services Report Drainage and Water Services* for analysis the 1 in 30 and 1 in 100 year storm event for each catchment.

As a result, the required surface water storage is 23806 m3 during the 1440 minute of the 1 in 100 year storm event. Due to site conditions and underground service congestion, 2 No. attenuation basins, 2 No. attenuation ponds, 1 No. infiltration basin, 3 No. permeable paving with stone storage and 1 No. StormTechTM systems by Cubic M3 or similar is being proposed.. See section CSEA's *Engineering Services Report Drainage and Water Services* for breakdown of proposed surface water storage across the site.

The surface water runoff from the proposed development will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes.

Three different types of pollution control elements will be implemented as part of surface water infrastructure in the development prior to discharge from the site into the Leixlip Reservoir and are as following:

1. A Class 1 full retention separators (Klargestor Model No. NSFA015 or equivalent) will be provided downstream of any used in high-risk spillage areas in accordance with Section 20 of the Greater Dublin Regional Code of Practice. The full retention separator is designed to treat the full design flow that can be delivered in the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50mm/hour. This is provided in the vicinity of the existing loading dock area.
2. An existing bypass petrol interceptor is located upstream of the outfall from the site and will be retained. Furthermore, it is a requirement for car parking areas with 10 spaces or more as outlined in Section 20.1 of the Greater Dublin Regional Code of Practice.
3. There is potential for surface water and condensate to accumulate in the exhaust stacks which serve the generators. Gullies which serve the exhaust stacks will discharge to a dedicated surface water drainage pipe which will be connected to a Class 1 full retention separator. Two full retention interceptors will be required, per data centre building, to serve the exhaust stacks.

Rainwater runoff from the roof areas of the proposed building will be utilised to reduce water demand. Rainwater harvesting will be utilised from the roof of each data centre throughout the year for the water to be available during those hottest periods during summer months when adiabatic cooling may be needed. Rainwater harvesting from Deep Tech buildings will provide irrigation for green walls across the site. The harvested rainwater will be utilised to offset the demand from Uisce Éireann . Refer to CSEA's *Engineering Services Report Drainage and Water Services* and Ethos *Energy & Sustainability Statement* for further detail.

The runoff will discharge from the proposed retention and attenuation systems before outfalling to the existing pond system and monitoring regime on-site which includes an automatic shut off valve in the event of contaminants being detected. The existing outfall from the existing ponds to the Liffey Reservoir is to be retained. Refer to CSEA's *Engineering Services Report Drainage and Water Services* and Ethos *Energy & Sustainability Statement* for further detail.

Further detail on the SUDs systems, the surface water drainage system and its design basis is provided within the *Engineering Services Report Drainage and Water Services* and drawings (*Drawing No 21_048-CSE-ZZ-ZZ-DR-C-2300 and Drawing's No 21_048-CSE-ZZ-ZZ-DR-C-2310 – 2318*) prepared by CSEA and submitted with the planning application.

The design incorporates measures for management of hydrocarbons and mitigation for any leaks and spills though interceptors (see Chapter 8 Hydrology). The predicted impact will be ***long-term-neutral*** and ***imperceivable*** for the operational phase.

Water Supply

The existing watermain network for the development areas shall be retained where possible and diverted, where necessary to accommodate the new development areas – refer to CSEA drawings (*Drawing No 21_048-CSE-ZZ-ZZ-DR-C-2300 and Drawing's No 21_048-CSE-ZZ-ZZ-DR-C-2310 – 2318*).

The new buildings & road developments shall be serviced from the existing incoming 250mm and 150mm main supply with fire hydrants etc. in accordance with Part B of the Building Regulations and the KCC fire officer requirements. The existing 250mm main supply was laid, in recent years, as part of the link of the HP facility to the nearby N4 Interchange.

The Energy Compound, 110kV Substation and Deep Tech Buildings do not have an industrial water demand. General potable supply for drinking and sanitary facilities will be provided from mains supply with rainwater harvesting also proposed to reduce overall water demand. The energy compound will include a Firewater Tank which will be provided from mains supply.

The Data Centres will use the water supplied by Uisce Éireann for domestic and evaporative cooling. The design philosophy will be to limit the evaporative cooling process to peak summer months only. The water used during these peak summer months will be supplied by on-site industrial water storage only. The industrial storage will be filled during the winter months (Dec - Jan - Feb). Using historic weather data it is estimated that evaporative cooling utilizing process water will only commence during peak summer temperatures. For all temperatures below the peak summer days, the cooling system will operate on direct air only and thus the process water usage will be zero (0 l/s). To confirm, no water demand is required during the winter period.

Each of the C1, C2 and C3 Data Centres have an annual expected potable water demand of 1643.8m3 with the B Data Centre having an annual expected potable water demand of 1166.1m3. Resulting in an annual water demand of 6097.5m3 in the peak summer months only.

This water will be storage on-site such that no water is required from Uisce Éireann during the peak summer months. In order to facilitate the tanks, the development will be required to fill-up these tanks during the months of December, January and February over a two-week period. This duration is an estimate, the exact duration of filling will be determined by Uisce Éireann Operations Team subject to supply constraints. The peak industrial water demand for the proposed data centre element of the development is estimated at 5.05 l/s per the submitted PCE (CDS23003038).

The proposed buildings are designed to harvest a significant portion of the annual cooling water requirements through rainwater harvesting, reducing the water used from the local supply from the first year of operation.

To reduce both energy and water use in its data centre facilities, the data centre operator utilises direct evaporative cooling systems, which predominately utilise outside air to cool servers.

If capacity is not available this could result in insufficient pressure in the public mains network to accommodate the demand of existing customers in the area and a drop in pressure may be experienced. To avoid this additional storage is proposed within the design.

There are no likely significant negative impacts on the water supply systems predicted as a result of the proposed project. Final confirmation of feasibility will be required from Uisce Éireann prior to the commencement of the development. Any required enhancement works to the existing water network will be carried out prior to the operation phase of the development.

Further information in relation to water supply is provided in the *Engineering Services Report Drainage and Water Services* by CSEA, which accompanies the planning application. The predicted impact on water supply will be ***long-term, neutral*** and ***imperceptible***.

Fire Water

On site storage will be required for fire fighting purposes. The volume of storage required will be 450 m3 for the Data Centre Buildings. The fire water tank will be filled over a 24 hour period at a flow rate of 5 l/s during off-peak periods as required.

A separate fire water tank is required for the Gas Power Generation Plant which will have 757 m3. This fire tank will fill over 8 hours at a flow rate of 28 l/s during off-peak periods as required.

For the other buildings (Deep Technology, Substation and Energy Plant) on-site fire hydrants will be required to be served from the public supply. Fire flow rate of 35 l/s will be required as per UK National Guidance document on the provision of water supply for firefighting and Kildare County Council Fire Service Requirements. The fire water requirements have been included in the overall water supply requirements and assessed above.

Power Supply

The power requirements for the proposed project will be provided from the 110kV replacement substation that will be provided on site. Full details on power supply, energy efficiency and sustainability are provided in the Sustainability and Energy Statement prepared by Ethos and provided with the planning application material.

The new replacement substation will connect to the existing overhead lines via short runs of underground cable. The replacement 110kV substation will include 6 No. transformers, with a client control building and a 2 storey GIS substation building a fenced compound.

The existing Maynooth – Rinawade 110kV overhead circuit which enters the site in the north-west corner will be retained and diverted to the new replacement substation. The existing Rinawade-Dunfirth/Kinnegad overhead circuit that enters the site in the north-west corner will also be retained and diverted to the new replacement substation. Upon completion of the replacement substation, the existing Rinawade AIS substation will be decommissioned and removed. A diversion of the existing 110kV power line that runs along the north side of the M4 is also required to accommodate the proposed pedestrian and cycle overpass.

The proposed substation will replace the existing Rinawade 110kV substation and will utilise the existing grid connection into the site. On completion of the 110kV replacement substation sufficient power will be available to power the initial Data Centre B1 (16MW) and a connection agreement is in place with EirGrid for the initial supply. The initial Deep Tech Building A1 will be provide sufficient power through existing site connection from Adamstown via the existing 20kv substation on site. The new substation will also be sufficient to cater for the entire build out of the proposed development and meet its power requirements (170MW). A connection agreement is in place with Eirgrid for the first 16MW of power required. However, to accommodate the full build out of the KIC Masterplan[1] and maximise the new 110kV substation capabilities future uprating/line replacements of the existing overhead lines into the site will be required. TNEI & H&MV on behalf of the developer has undertaken an analysis of the required uprating / line replacements to increase the overall power supply to the campus (Refer to *Network Demand Capability Analysis* by TNEI & H&MV).

The analysis concludes that four total uprates and a 150 MVA STATCOM (on-site), is required to accommodate a connection of 170MW. The uprates relate to the Overhead Lines (OHLs) between Maynooth – Rinawade, Dunfirth – Kinnegad – Rinawade, Derryiron – Maynooth and Derryiron – Kinnegad. With the identified uprates a capacity of 170 MW is possible with no thermal overloads or voltage violations being detected. The overhead lines to be uprated are identified in section 3.2.2 above. The uprates outlined do not form part of the application for which consent is sought.

The proposed development will include its own energy centre to be built out over the life of the permission. The Energy Centre will include 9no. combustion turbine generator's (CTG's) to ensure equal power can be replaced within the grid to alleviate any potential constraints to the electrical transmission system arising from the data centre usage. Further to this, the CTG's will also provide reinforcement to grid if and when required. The developer has entered into a continuous supply agreement for renewable diesel (HVO) which will be the back-up fuel for the energy centre in the event that there is a gas supply outage. MDM Engineering have advised that there has never been a gas block out or interruption of supply in the history of the state, as such, the requirement for the CTGs to operate of HVO is considered extremely low.

[1] The masterplan refers to all works subject to the application for consent, described on the public notices and included within the 'redline' boundary on the Site Layout Plan

There are no likely significant negative impacts on the power supply to the site predicted as a result of the proposed project. Power used from the national grid will be met with dispatchable power equal to or greater than the electricity used from the grid ensuring that there will be no net impact on grid stability. It is predicted that there will be a ***long-term, neutral, not-significant*** effect on power supply during the operation phase of the development.

Gas Supply

The energy centre will be supplied by GNI's enhancement of the existing supply to the site to support the proposal (identified above under 'Facilitation Works'). A replacement gas skid and above ground infrastructure will also be required to accommodate the upgraded gas connection. GNI have confirmed that sufficient gas supply is available subject to the enhancement of the existing supply. The Energy Centre will include 9no. CTG's to ensure equal power can be replaced within the grid to alleviate any potential constraints of the data centre usage. Further to this, the CTG's will also provide reinforcement to grid if and when required.

The initial phase of the energy centre will include one CTG, a natural gas fuel supply system, a Hydrotreated Vegetable Oil (HVO) fuel storage and supply system (c.1,720 tonnes initial), a fire protection system, low and medium voltage electrical systems with transformers, a service building and warehouse, and other miscellaneous equipment. The final phase of the energy centre will include an additional eight CTG's with selective catalytic reduction (SCRs), additional HVO supply and supporting equipment.

The CTGs will be primarily fuelled by natural gas/bio-gas supplied by Gas Networks Ireland (GNI) via their existing high-pressure network that runs close to the site (subject to upgrade). It is envisaged that the energy centre will aim to use as much renewable gas as is commercially available in the market. With some modifications, the CTGs are capable of operating on at least a mix of hydrogen should this be available in the future. It is predicted that there will be ***long-term, neutral, not significant effect*** on gas supply during the operational phase of the proposed development.

Heating Supply

As the activities of the data centres generate a significant amount of excess heat, the concept of heat recapture and district heating was chosen as the heating approach for the campus replacement of the centralised heating system.

Through studies by Ethos Engineering, it has been estimated that c. 18 MW of energy could be provided to the campus, community, and surrounding area through recaptured heat and the implementation of district heating.

District heating will be included as part of Phase 1 to supply the deep tech buildings on site, the existing campus buildings to be retained as well potential to supply Barnhall RFC, Salmon Leap Canoe Club, Castletown Estate as well as the future residential zoned lands known as Celbridge East KDA.

Phase 3, which is the balance of the data centres (Buildings C1 – C3), could further provide for additional community buildings and schools in Leixlip.

Whilst the proposed project is not dependent on the future development of a district heating network beyond KIC, it will facilitate its future development by providing for the in-ground infrastructure within the campus lands up to the boundary or in close proximity to the Celbridge East KDA lands, Castletown Estate, Barnhall Rugby Club and Salmon Leap Canoe Club. There are no likely significant negative impacts on the heating systems predicted as a result of the proposed project, with a slight, positive effect likely from the introduction of a district heating system on site.

14.6 Mitigation Measures & Monitoring

14.6.1 Construction Phase

Construction of the proposed development will require connections to water supply and drainage infrastructure, power and telecommunications. Ongoing consultation with Gas Networks Ireland, KCC, Uisce Éireann , EirGrid and ESB Networks and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth without disruption to local and business community. The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to utilities considered above, unless this has been agreed in advance

Electricity Supply

The power demand for the construction phase will be relatively minor and the connection works are entirely within proposed site boundaries, so it is not anticipated that this would have any significant potential offsite impact. As such, no remedial or mitigation measures are required in relation to power supply for the construction phase.

Surface Water

During the construction phase, any surface water run-off collecting in excavations or from exposed soil may contain sediment load. This will be diverted for appropriate settlement and will not be allowed to directly discharge directly to the existing ditches on site. Measure for protection of receiving waters are outlined in the CEMP provided with planning.

Foul Drainage

Portable toilets will be provided for construction staff and a temporary connection will be established for each phase of development. Foul drainage for the proposed development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction. Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

Water Supply

A connection will be put in place for the construction of the proposed development. The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to the water supply, unless this has been agreed in advance. Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

14.6.2 Operational Phase

Surface Water

The stormwater system has been designed to collect rainwater runoff from the impermeable areas of the site, roofs and road/car park and directed to an appropriate SuDS and attenuation system. The allowable greenfield runoff rate has been established by the project engineers, using the methodology set out in the Engineering Services Report.

Three different types of pollution control elements will be implemented as part of surface water infrastructure in the development as following:

A. Class 1 full retention separators (Klargestor Model No. NSFA015 or equivalent) will be provided downstream of any used in high-risk spillage areas in accordance with Section 20 of the Greater Dublin Regional Code of Practice. The full retention separator is designed to treat the full design flow that can be delivered in the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50mm/hour. This is provided in the vicinity of the existing loading dock area.
B. An existing bypass petrol interceptor is located upstream of the outfall from the site and will be retained Furthermore, this is a requirement for car parking areas with 10 spaces or more as outlined in Section 20.1 of the Greater Dublin Regional Code of Practice.
C. There is potential for surface water to accumulate in the exhaust stacks which serve the generators. Gullies which serve the exhaust stacks will discharge to a dedicated surface water drainage pipe which will be connected to a Class 1 full retention separator. Two full retention interceptors will be required, per data centre building, to serve the exhaust stacks. Details of the full retention separator proposed are provided in the supporting layouts.

The design of the surface water system has incorporated attenuation within the design to ensure that there is no potential for off site flooding as a result to the proposed increase in hardstanding area. If this was not included in the design of the campus there could be potential impact in off site flooding as storm water flows would not be attenuated on site and may result in overflows to the existing retention ponds on site in excess of the existing capacity.

Foul Drainage and Water Supply

The overall wastewater discharge associated with the proposed development has previously been agreed with Uisce Éireann by letter dated 12 July 2022 confirming that there are no upgrades required to the network by Uisce Éireann. The wastewater discharge rate agreed with Uisce Éireann is in accordance with the discharge rates outlined in the PCE (ref CDS23003038) submitted to Uisce Éireann for the Proposed Development. No mitigation measures are required in relation to foul drainage infrastructure.

Water storage tanks are to be provided as part of the proposed development; pumps will supply water to the proposed A buildings for irrigation use and the B and C buildings for cooling requirements. The storage tanks will be used for rainwater harvesting and will be topped up by mains supply during off-peak months to reduce overall demand on public mains supply. A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the final Pre-Connection Enquiry is awaited. Any required local enhancement of the network will be required to be undertaken prior to operation commencing.

Power Supply

A connection agreement to supply phase 1 (16MW) of the proposed development is in place with Eirgrid. Phase 1 of the power requirement is accounted for as it is existing power supplied to the campus. to accommodate the full build out of the KIC Masterplan and maximise the new 110kV substation capabilities future uprating/line replacements of the existing overhead lines into the site will be required. TNEI & H&MV on behalf of the developer has undertaken an analysis of the required uprating / line replacements to increase the overall power supply to the campus (Refer to *Network Demand Capability Analysis* by TNEI & H&MV). The analysis concludes that four total uprates and a 150 MVA STATCOM (on-site), is required to accommodate a connection mode of 170MW. The uprates relate to the Overhead Lines (OHLs) between Maynooth – Rinawade, Dunfirth tee – Kinnegad – Rinawade, Derryiron – Maynooth and Derryiron – Kinnegad. With the identified uprates a capacity of 170 MW is possible with no thermal overloads or voltage violations being detected. The overhead lines to be uprated are identified in Chapter 2. The uprates outlined do not form part of the application for which consent is sought. Further engagement with Eirgrid will occur following grant of permission for the proposed development.

As detailed in Chapter 2 (Description of the Project) and the *Sustainability and Energy Statement* by Ethos, a number of sustainability measures have been incorporated into the design of the proposed development including an installation of an array of photovoltaic panels on the roofs of Buildings A1, A2, B1, C1, C2 and C3. The photo voltaic (PV) array will consist of 8,560 modules yielding a total yielding a total peak power generated of 2859.19kWp to offset the lighting and IT electrical power requirements during the peak summer months for the administration section of the buildings. The installation significantly exceeds that required for code compliance under NZEB.

The Sustainability and Energy Statement also describes how the proposed waste heat system included with the application for development can be utilised to provide waste heat to adjoining community uses as well as potentially a wider future district heating system developed by KCC or others in the future.

Gas Supply

To supply the energy centre with natural gas a local upgrade to the network will be required as outlined in Chapter 2. The upgrade is identified as part of the facilitation works for the project and will ensure that there is no negative effect to gas supply within the area as a result of the proposal. The existing gas skid on site will also be replaced with a new gas skid and an above ground installation (AGI) to accommodate the upgraded gas connection to the site.

Operation of the energy centre will be undertaken in compliance with Gas Networks Ireland (GNI) and EirGrid requirements. The CTGs will be capable of running on biofuel and hydrogen once supply is available in the future (and HVO in the event of interruption to the gas supply to the site). Energy reduction measures have been undertaken throughout the design and are described in the Energy and Sustainability report (Ethos 2022) provided with planning.

14.7 Likely Cumulative and Interaction Impacts of the Project

14.7.1 Cumulative Impacts

The anticipated cumulative effect of the Proposed Development with any/all relevant other planned or permitted developments as outlined in Chapter 3 and Appendix 1.1 are discussed in below for construction and operational phases respectively.

14.7.2 Construction Phase

The proposed development and the other identified development will require site clearance, excavations and levelling which will generate localised requirement for soil removal and/or import, power and water supply and wastewater discharge. However, provided standard mitigation measures set out in the EIA Reports and CEMPs for these developments or where EIA does not apply, provided that planning conditions are implemented, the cumulative impact will be ***short-term, negative*** and ***not significant***.

14.7.3 Operational Phase

The proposed development and all permitted developments considered are required to engage with GNI, KCC, Uisce Éireann and ESB to ensure that there is sufficient capacity to cater for the increase in water and wastewater and electricity requirements. Based on known current and known future developments there is adequate capacity of supply available within the local environs. GNI have confirmed that subject to local upgrades (Facilitation Works) there is sufficient gas supply to cater for the proposed development, similarly a connection agreement is in place with Eirgrid for the initial phase (16MW). Uprates (Facilitation Works) have been identified as being required by the project team to facilitate the full build out of the campus. Subject to the uprates sufficient capacity has been confirmed through the *Network Demand Capability Analysis* by TNEI & H&MV. Furthermore, the proposed grid connection for the full build out will be supported by dispatchable power via the proposed energy centre to ensure that the propsoed development will not unduly impact on power supply. Eirgrid as the national authority for grid has the requirement to ensure that future connections will not impact or reduce the capacity within the local network to support the neighbouring area.
Irish Water have previously confirmed that there is sufficient wastewater capacity available with a response to an updated PCE pending. Furthermore, as set out in Chapter 8 (Hydrology), the maximum proposed allowable discharge rate for the site is 149.75 l/s (12,938.4m3/day). Leixlip WWTP has a maximum capacity of 33,745m3/day. Therefore Leixlip WWTP has sufficient capacity for the proposed development site. There will be no increase in stormwater flow off the site as a result of the development. The location of the proposed project has access to existing utilities and, through confirmation by utilities suppliers the final development will not have an impact on capacity off-site for the development. Therefore, there will be no potential for cumulative impacts with any other development within the study area.

In developing long term plans for security of supply, these National Authorities for water and energy supply are required to develop resources in compliance with sustainable environmental planning. Based on the availability of on-site electricity & gas for power supply and the energy centre, there is a ***short-term, neutral***, and ***not significant*** effect on power supply during the operational phase of the proposed development.

14.7.4 Interaction Impacts

During the construction phase the implementation of the respective CEMPs for the proposed development will ensure that there are no interruptions to service from the existing telecommunications network, watermain, sewer and electrical grid. Any planned interruptions will be agreed in advance with the utility providers. Strict quality control measures will be undertaken while undertaking works to minimise or eradicate infiltration and ex-filtration.

During operational phase the opportunity for interactions is minimal as connection agreements confirming supply and suitability of existing infrastructure or (upgraded/uprated) is sufficient to cater for the proposed development.

14.8 Mitigation Measures and Monitoring of Cumulative and Interaction Impacts

As has been identified in the receiving environment section, all cumulative developments that are already built and in operation contribute to the characterisation of the baseline environment. As such any further environmental impacts that the proposed development may have in addition to these already constructed and operational developments has been assessed in the preceding sections of this chapter.

There are no relevant other permitted or proposed developments within the immediate vicinity of the proposed development site which haven't received required connection agreements from utility suppliers.

It is noted that a connection agreement from EirGrid is in place for the first phase of the proposed development, an agreement is in place with GNI and a connection agreement is pending from Uisce Éireann. In the current climate Eirgrid requires planning permission to be obtained before a new connection agreement is reached. Therefore, the planning application proposes that the relevant future development phases will not be constructed until the relevant connection agreements are in place.

14.9 Residual Impacts

Once operational, the proposed development has connection agreement to supply the first phase of the development with Eirgrid. Facilitation Works have been identified as required for enhance the local gas network and also uprating works to the electricity network. Furthermore, the proposed development will not commence construction until the relevant connection agreements are in place for future phases. As per the assessments undertaken in this chapter, there will be no significant impact on material assets in the wider area. The overall predicted residual impact of the proposed development can be classed as ***long-term, neutral*** and ***not-significant*** with respect to material assets.

The interactions and cumulative impact are assessed in Chapter 18 of this EIAR.

14.10 Major Accidents and Disasters

The following accidents & disasters involving built services during construction could potentially give rise to a serious incident putting people at risk:

- Excavation works coming into contact with live electricity lines
- Excavation works causing damage and leaks to gas mains

With the implementation of the aforementioned mitigation measures, the likelihood of such events occurring would be local and not significant.

The following accidents & disasters involving built services during operation could potentially give rise to a serious incident putting end users at risk:

- Gas explosions. The installation of services is tightly monitored and controlled by Gas Networks Ireland. Therefore, the residual risk is not considered significant.

14.11 Difficulties Encountered

A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the Pre-Connection Enquiry is awaited as such, any required future enhancement of the local network that will be required to be undertaken prior to operation commencing is not yet know, however Irish Water previously agreed by letter dated 12 July 2022 that there was sufficient capacity within the network to accommodate the wastewater demand. Water supply to the site is proposed to be managed through the use of on-site industrial water storage during winter months so to have no impact on the supply of water during peak summer months, as such it is not expected that upgrades to the water network will be required to accommodate the development.

15.0 CHAPTER 15 ARCHAEOLOGY AND CULTURAL HERITAGE

15.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by Shanarc Archaeology Ltd. with respect to archaeology and MESH Architects with respect to architectural and landscape heritage. It describes the baseline archaeology and cultural heritage environment at the Kildare Innovation Campus (KIC) lands, it identifies the likely significant effects of the proposed developments at the KIC lands on the archaeological and cultural heritage resource, and it proposes measures to mitigate predicted effects.

Facilitation works required to support proposed development at the KIC lands, namely the provision of an enhanced gas connection by Gas Networks Ireland (GNI) to the site and EirGrid uprating of existing overhead power lines to the site have also been considered in the assessment of effects.

The term 'cultural heritage' is broadly used to describe any combination of tangible archaeological, architectural and cultural heritage material remains or assets, as well as intangible associations of people with place and values; in general:

- Archaeological heritage comprises movable objects, monuments, buildings, landscapes or environmental evidence that generally pre-date AD1700, present both above and below ground level;
- Architectural heritage, also referred to as built heritage, comprises structures, buildings, their settings and contents that generally post-date AD1700; and
- Cultural heritage relates to less tangible aspects of heritage and the landscape such as historical events, folklore, traditions, placenames and cultural associations.

Date is not in itself a determinant of cultural heritage significance or interest, and any material remains that can contribute to understanding past societies, whether pre-dating or post-dating AD1700, may have archaeological, architectural or cultural heritage significance (Department of Arts, Heritage, Gaeltacht and the Islands 1999, 10).

15.2 Project Description

The Project is an integrated masterplan proposal that includes for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT and Innovation uses. The proposal will include for the demolition of some of the existing buildings on site and construction of new buildings, an energy centre and replacement substation. The proposal will include significant public infrastructure including a new signalised intersection on Celbridge Road (R404), a new Public Link Road through the campus (between Barnhall Road and the new signalised intersection), a pedestrian/cycle overpass of the M4, pedestrian and cycle links through the site and along the designated protected view corridor and supporting infrastructure. The project to which this EIAR relates also includes facilitation works which comprise uprating of existing 110kV power lines to the site and the provision of an enhanced gas connection to the site. The facilitation works which are included in the project do not form part of the development for which consent is sought. Future consents for the facilitation works will be required through EirGrid and GNI. A detailed description of the project is outlined in Chapter 2 of this EIAR.

The development site which is subject to the application for consent measures c. 73.95 ha and is principally bounded by: the M4 Motorway to the north; Celbridge Road to the east; Barnhall Rugby Football Club (RFC) to the south; and by grounds associated with Castletown House to the west.

The site comprises the existing Kildare Innovation Campus, which was formerly the Hewlett Packard Campus originally permitted in 1995 under KCC Reg. Ref 95923. The development site also encompasses lands within the jurisdiction of Kildare County Council (KCC).

Refer to Chapter 3 for a more detailed description of the site's location and context.

15.3 Methodology

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this Chapter:

Ireland has ratified several international and European conventions and charters on the protection of archaeology and cultural heritage, principally:

- UNESCO World Heritage Convention 1972;
- Charter for the Conservation and Restoration of Monuments and Sites (Venice) 1964; and
- European Convention on the Protection of the Archaeological Heritage (Valetta Convention) 1992.

National legislation protecting archaeology and cultural heritage comprises:

- National Monuments Act 1930 (as amended);
- Heritage Act 1995;
- National Cultural Institutions Act 1997;
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999; and
- Planning and Development Act 2000 (as amended).

Principal policy and guidance documents relating to archaeology and cultural heritage are:

- Frameworks and Principles for the Protection of the Archaeological Heritage (1999), Department of Arts, Heritage, Gaeltacht & the Islands;
- Policy and Guidelines on Archaeological Excavation (1999), Department of Arts, Heritage, Gaeltacht & the Islands;
- The Heritage Council, 2000. Archaeology & Development: Guidelines for Good Practice for Developers (2000), The Heritage Council; and
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005), National Roads Authority.

Codes of Practice have been developed to provide a framework within existing legislation and policies that enable State infrastructure providers to implement infrastructural programmes while strengthening the management and protection of archaeology and cultural heritage. Agreed Codes of Practice between the Minister (Department of Housing, Local Government and Heritage) and State infrastructure providers include:

- Code of Practice between Bord Gáis Eireann and The Minister for Arts, Heritage, Gaeltacht and the Islands (2002);
- Code of Practice between the Department of the Environment, Heritage and Local Government and EirGrid (2009); and
- Code of Practice between the Department of the Environment, Heritage and Local Government and ESB Networks (2009).

Agreed actions of the Codes of Practice include for the appointment of a nominated archaeologist (or Project Archaeologist) to oversee the archaeological components of a project in its entirety, from the route planning and design stage through to the co-ordination and implementation of all the required archaeological work. The Project Archaeologist prepares required specifications for the cultural heritage consultant as part of the impact assessment stage of a project, and ensures that the impact assessment and mitigation recommendations are in keeping with existing legislation, policy and best practice. The Codes of Practice with EirGrid and with ESB Networks state that a Project Archaeologist will be appointed for all schemes that will be the subject of an environmental impact assessment (EIA).

EirGrid also operates under Cultural Heritage Guidelines for Electricity Transmission Projects (2015). The guidelines standardise the approach for cultural heritage impact assessment in the planning, design, construction and operation of high voltage electricity transmission projects undertaken by EirGrid. The guidelines serve to strengthen the relationship between the Minister of Housing, Local Government and Housing and EirGrid, and EirGrid's commitment under the Code of Practice to working with the Minister and the National Monuments Service to protect cultural heritage. Both the Code of Practice and guidelines outline the commitment of EirGrid to avoid direct archaeological impacts where possible. In relation to the maintenance, refurbishment and uprating of existing power lines, impacts may arise when there is a cultural heritage asset in proximity to proposed works.

The preparation of this chapter has also been informed by a desk-based study of relevant data sources including:

National Monuments

Under the National Monuments Act 1930 (as amended), archaeological sites in the ownership or guardianship of the State or a Local Authority and sites under Preservation Orders are designated as National Monuments. Such sites are offered the highest level of protection under Irish legislation. Lists of National Monuments in State care are managed by the National Monuments Service of the Department of Housing, Local Government and Heritage and those in the ownership of individual Local Authorities are managed by the relevant Local Authority. The lists of National Monuments in State Care (Ownership and Guardianship) for Counties Kildare, Meath and Offaly are made available on the National Monuments Service website, archaeology.ie. Those vested in the relevant local authorities are listed in the Kildare County Development Plan 2023 – 2029, Chapter 11; the Meath County Development Plan 2021-2027, Appendix No. 9; and the Offaly County Development Plan 2021-2027, Chapter 10.

Sites and Monuments Record and Record of Monuments and Places

The Record of Monuments and Places (RMP) was established under Section 12 of the 1994 National Monuments (Amendment) Act. The statutory RMP is a list of archaeological monuments known to the National Monuments Service, and records known upstanding monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on aerial photographs. The RMP is based on the Sites and Monuments Record (SMR) files housed at the National Monuments Service, with new sites identified being added to the SMR and then scheduled for inclusion in the statutory RMP. All sites recorded on the RMP receive statutory protection under the National Monuments (Amendment) Act 1994. Records of monuments are available in an on-line digital service (the Historic Environment Viewer, maps.archaeology.ie) provided by the Department of Housing, Local Government and Heritage.

Register of Historic Monuments

The Register of Historic Monuments (RHM) was established under Section 5 of the National Monuments (Amendment) Act, 1987, allowing the responsible Minister to establish and to maintain a Register of Historic Monuments. The RHM is also afforded statutory protection, and similar to the statutory RMP, when the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a Recorded Monument or a Registered Monument they are required to give notice in writing to the Minister two months before commencing that work. All registered monuments are included in the Record of Monuments and Places.

Urban Archaeological Survey

The Urban Archaeology Survey, 1982-1995, was established to record archaeological monuments and information relating to Irish towns, in particular former medieval boroughs that developed into modern urban settings. One of the main objectives was to highlight the archaeological potential of Irish towns and the Survey produced maps and plans highlighting monuments and zones of archaeological potential (based on the available evidence) that could be used for planning purposes, as well as by archaeologists and other researchers. The Urban Archaeological Survey of County Kildare (1986), including Leixlip and Celbridge towns, was commissioned by the Office of Public Works (OPW) and compiled by John Bradley, Andrew Halpin and Heather A. King.

Topographical Files of the National Museum of Ireland

The topographical files of the National Museum of Ireland (NMI) are the national archive of all known antiquities recorded by the NMI, and are available for consultation at the NMI. These files relate primarily to artefacts but also include references to monuments and contain a unique archive of records of previous excavations. The find-spots of artefacts can be an important indication of the archaeological potential of an area. Any archaeological object found without a known owner at the time it was found is protected under National Monument's legislation and is deemed to be in the ownership of the State.

Excavations Bulletin and Excavations Database

The Excavations Bulletin and the Excavations Database (excavations.ie) provides summary accounts of archaeological investigations and excavations carried out in Ireland – north and south – from 1969. The Excavations Bulletin is a published annual directory for the years 1970-2010, substituted with an on-line database from 2011 onwards. The on-line database is updated on a constant basis.

Local Authority County Development and Local Area Plans

Each City and County Development Plan is compiled in accordance with the requirements of the Planning and Development Act 2000 (as amended) and contains lists of national monuments (both in State Ownership or Guardianship, and those vested in the care of a Local Authority), recorded monuments, a Record of Protected Structures (a list of buildings which cannot be materially altered or demolished without grant of permission under the Act), registered historic monuments as well as monuments that are subject to a Preservation Order.

The Kildare County Development Plan 2023 – 2029 came into effect on 28th January 2023 and sets out the Local Authorities' strategy, policies and objectives to protect, conserve and manage the archaeological and cultural heritage resource. The Leixlip Local Area Plan 2020 – 2023 (extended to 30th March 2026) and Celbridge Local Area Plan 2017 – 2023 also set out relevant strategies, policies and objectives to protect, conserve and manage the cultural heritage and archaeological resource in the context of the County Development Plan. The Wonderful Barn and Barnhall House Action Area Plan 2004 was also consulted.
With regard to the EirGrid uprating works, the Meath County Development Plan 2021-2027 and the Offaly County Development Plan 2021-2027 were also consulted.

National Inventory of Architectural Heritage
The National Inventory of Architectural Heritage (NIAH) is an ongoing survey within the Department of Housing, Heritage and Local Government. The work of the NIAH involves identifying and recording the architectural heritage of Ireland, from AD1700 to the present day and includes country houses, churches, mills, bridges and other structures of note.

Cartographic Sources
Information gathered from historic cartographic sources is fundamental to the identification of archaeological and cultural heritage sites, including cultural landscapes e.g. demesne landscapes, which, based on the level of landscape change, are now often identified from cartographic records alone. The earliest Ordnance Survey maps date to the late 1830s and early 1840s, but much change has occurred in the use and treatment of the landscape in the intervening years, particularly during the second half of the 20th century and into the 21st century, making these a valuable resource in tracing the development of a study area.

Aerial Photographs
Aerial photographs are a useful aid in identifying archaeological monuments which are not visible at ground level, and in accessing landscape change and use post-dating historic cartographic sources. Cropmarks of sub-surface archaeological features are revealed from the air by variations in plant growth. The successful detection of cropmarks through aerial photography varies, and is subject to a number of factors, including the position of the sun when the photograph was taken, the type of crop growing and the amount of rainfall in a growing season.

Toponomy Sources
A townland name may preserve information relating to its archaeology, history, folklore, ownership, topography or land use. Most placenames were anglicised by the Ordnance Survey. Despite some inaccuracies in translation, the Gaelic, Viking, Anglo-Norman and English origins of placenames are generally recognisable. The Placenames Database of Ireland website (wwww.logainm.ie) hosts online bi-lingual placename research and archival records for townlands.

Documentary Sources
Documentary sources are a valuable means of completing the written archaeological and cultural heritage record of an area, and of gaining insight into the history of the receiving environment. Sources included existing unpublished archaeological assessment and investigation reports available through the Archive Unit of the National Monuments Service.

On-site Inspection

On-site inspection offers the opportunity to examine a study area in light of desk-based research and evidence. Inspection is essential in determining the nature and extent of any surviving above-ground evidence, and in predicting the potential effects of a proposal on potential below-ground remains. A site inspection at the KIC lands was conducted by Shanarc Archaeology Ltd. on 08 February 2022. Facilitation works required to support proposed development at the KIC lands, being at an early stage in planning, were not subject to on-site inspection.

15.3.1 Scoping and Heading/Topic Identification

The methods employed for scoping and identification of the relevant environmental topics for this Chapter have been:

1. Expert opinion
2. Baseline study of readily available existing records and archival material
3. Site inspection

The headings and/or topics scoped into this Chapter's assessment are:

1. Consideration of effects on the recorded archaeological and cultural heritage resource
2. Consideration of effects on the unknown or undesignated archaeological and cultural heritage resource
3. Consideration of effects on areas of archaeological potential or archaeological sensitivity based on the known archaeological record and on knowledge of archaeological settlement patterns

Visual effects or consideration of setting and amenity value of recorded archaeological monuments were scoped out of this Chapter's assessment as a result of the existing developed nature of the KIC lands and its surroundings, the mainly sub-surface nature of recorded archaeology within a 1km radius and a lack of intervisibility between the KIC lands and recorded monuments. The GNI enhancement works are sub-surface and will not significantly effect the setting and amenity value of recorded monuments. EirGrid uprating transmission lines are existing, and upgrades will have no addition visual or amenity value effects on surface visible recorded monuments.

The scoped study area for this Chapter's assessment was broadly a radius of 1km from the boundary of the KIC lands. The linear nature, and early stage planning of facilitation works resulted in a much reduced scoped study area, up to 100m either side of the indicative alignment of the GNI enhancement works and up to 50m of existing power lines subject to EirGrid uprating.

15.3.2 Baseline Scenario/Likely Future Receiving Environment Analysis Methodology

The baseline/future receiving environment analysis for this Chapter has been undertaken in accordance with the EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) and all other documents outlined above.

Baseline Scenario Analysis Methodology

The information used to describe the current state of the environment (baseline scenario) has been gathered from a desk-based study of standard data sources in respect of archaeology and cultural heritage as described in Section 15.3 Methodology. The desk-based study is a programme of research of the historic and cultural environment that facilitates an understanding of the evolution of historic landscape character and human use of landscape through time, and allows for the identification of heritage assets, resources and cultural associations within a defined study area. The desk-based study of the KIC lands was supported by an on-site inspection.

The analysis methodology used in relation to the facilitation works was at a higher level than the methodology used in relation to the KIC lands, in consequence of their extensive linear nature and early stage planning. The GNI gas transmission line was analysed for likely significant effects using the key data sources in respect of archaeology, namely the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP), the Topographical Files of the National Museum of Ireland and the Excavations Database. EirGrid uprating alignments were analysed on the basis of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP), as the likely significant effects will relate to potential direct impact on a recorded monument or archaeologically sensitive zone in proximity to existing infrastructure. The facilitation works were not subject to a site inspection.

Likely Future Receiving Environment Analysis Methodology

There is no modelling software or tools in the context of archaeology and cultural heritage to predict the likely future receiving environment in the event of a Do Nothing Scenario. The likely future receiving environment analysis methodology is based on expert opinion and on existing trends.

15.3.3 Impact Assessment Methodology

The significance of likely effects has been classified by professional consideration of the sensitivity of the archaeology and cultural heritage resource and the magnitude of the potential effect. The assessment of effects has been undertaken in accordance with the *EPA Guidelines on the Preparation of an EIAR* (EPA, May 2022), and in accordance with industry guidelines, including the National Roads Authority *Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes* (NRA, 2005).

Type of Effect

The criteria for assessing the type of effect are presented in Table 15.1.

Type of Effect	Description

Direct	Occurs where the archaeological or cultural heritage resource is physically located within the footprint of development, resulting in the partial or total removal of the resource. The effect can be on the fabric of the heritage resource, as well as on setting.
Indirect	Changes to an archaeological or cultural heritage resource that is produced in consequence of development, but away from the project site.
Residual	The degree of change in the archaeological or cultural heritage environment or resource that will occur after proposed mitigation measures have taken effect.
Cumulative	The addition of many small effects to create one larger, more significant, effect.
None predicted	Occurs where the archaeological or cultural heritage resource is not adversely or positively affected by development.

Table 15.1: Type of Effect

Quality of Effect

The criteria for assessing the quality of effect are presented in Table 15.2.

Quality of Effect	Description
Positive	A change that will improve or enhance an archaeological or cultural heritage asset or setting.
Negative	A change that will detract from or permanently remove an archaeological or cultural asset or association.
Neutral	A change that does not affect the archaeological or cultural heritage resource.

Table 15.2: Quality of Effect

Sensitivity Criteria

The criteria for assessing the sensitivity of the baseline environment are presented in Table 15.3.

Sensitivity of Receptor	Definition
High	The receptor has no or low ability to absorb change without fundamentally altering its present character, and / or is of high environmental value in an international context, such as World Heritage Sites, and is of high environmental value in a national context, such as National Monuments, recorded monuments (RMP), newly identified archaeological sites, or undesignated archaeological and cultural heritage assets.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, and / or has environmental value in a regional context.
Low	The receptor is tolerant of change without detriment to its character, has low environmental value, or local importance. Includes undisturbed greenfield areas and riverine environs, which have an inherent archaeological potential.

Sensitivity of Receptor	Definition
Negligible	The receptor is resistant to change and is of little environmental value, or has little or no value at local or any other scale. Can include areas previously heavily disturbed by groundworks or where groundworks have been previously resolved

Table 15.3: Sensitivity Criteria

Magnitude of Change

The criteria for assessing the magnitude of change are presented in Table 15.4.

Magnitude of Change	Definition
High	A fundamental change to the baseline condition of the archaeological or cultural heritage resource, leading to total loss or major alteration of character, including key visual or other relationship, such as an extensive change in setting.
Medium	A material, partial loss or alteration of character relating to the archaeological or cultural heritage resource, including a change in setting.
Low	A slight, detectable, alteration of the baseline condition of the archaeological or cultural heritage resource.
Negligible	No change or effect, or a barely distinguishable change from the baseline condition of an archaeological cultural heritage resource.

Table 15.4: Magnitude of Change

Significance of effects

The definition of the significance of effects are presented in Table 15.5.

Effects	Definition
Imperceptible	An impact capable of measurement but without noticeable consequences.
Not Significant	An impact which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An impact which causes minor changes in the character of the environment and does not affect the archaeological and cultural heritage resource in a moderate or significant manner.
Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging baseline trends. A moderate impact arises where a change in the character of an archaeological site is proposed, which although noticeable, is not such that the archaeological integrity of the site is compromised, and which is reversible. This arises where an archaeological feature can be incorporated into modern day development without damage and that all procedures used to facilitate this are reversible.
Significant	An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be

Effects	Definition
	where part or all of a site would be permanently impacted upon, leading to a significant loss of character, integrity and data about the archaeological/ cultural heritage asset.
Very Significant	An impact which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	Applies where mitigation would be unlikely to remove adverse impacts. Reserved for adverse, negative impacts only. These impacts arise where the archaeological or cultural heritage resource is completely and irreversibly destroyed by a proposed development.

Table 15.5: Significance of Effects

15.4 Baseline Scenario/Future Receiving Environment Analysis

15.4.1 Current State of the Environment (Baseline Scenario)

Principal Works

Site Description

The KIC lands at Barnhall Road are largely developed and landscaped lands containing the re-branded Liffey Business Campus (formerly known as the Hewlett Packard Campus), which was preceded by the Irish Meat Packers facility, which in turn had developed at, and incorporated the site of a substantial residence once named Parsonstown, after the townland in which it was sited.

Parsonstown townland (civil parish of Donaghcumper, barony of Salt North) extends from the River Liffey to the south and south-east, northwards to Barnhall and Rinawade Upper townlands, and is bordered to the west partly by Castletown townland, containing Castletown House and demesne, and Rinawade Lower townland, partly bordering Leixlip Demesne to the east. Of these townlands, the KIC lands encompasses the majority of Parsonstown and Rinawade Lower, and parts of Rinawade Upper and Barnhall.

The placename Parsonstown has origins in the medieval period, being variously referred to as *Parsoneston* (1344/5), *Personestoun* (1462) (Colgan 2005), *Personston* (1540-1541), and Parsonstowne (Civil Survey 1654) (www.logainm.ie). Colgan (2005, 148) has suggested that the name may derive from a one time resident parson, having noted that an 1752 map of Co. Kildare by Noble and Keenan shows a church on the north bank of the River Liffey at the south end of the townland. Colgan (2005, 148) traces a reference to Parsonstown dating from 1344-45, when a deed outlined the lease of the manor of Parsoneston by Ralph Pedilowe, on behalf of Christ's Church, Dublin to Richard Bakepus, witnessed, amongst others, by the prior of St Wolstan's. There are further deeds and records relating to changes in landholders of Parsonstown lands through subsequent centuries. Parsonstown may have had a manor-house, reputedly still standing in 1671 (Boylan n.d., in Breen 1995). This could have been located on the site of the later Parstonstown residence, in office use as part of the Irish Meat Packers facility (Breen 1995); alternatively, it may have been located closer to the bank of the River Liffey to the south of the townland. However, the Civil Survey, a survey of landholdings carried out in 1654-56, makes no mention of a building on lands at Parstonstown. Separate sources date the Parsonstown residence, which was later known as Barn Hall, both to the 18th century (Colgan 2005, 148) and to 1823 (Boylan n.d., in Breen 1995). The residence was removed at an unknown date in advance of the Hewlett Packard Campus development.

The modified nature of the historic cultural landscape at the KIC lands, which began in modern times with the development of the Irish Meat Packers Facility, has also arisen as a result of the development of the M4, opened in 1994, through Rinawade Upper and Barnhall townlands, and further developed with the Celbridge Interchange, completed in 2003, partly to service the needs of the Hewlett Packard Campus, the construction of which commenced in the mid-1990s. The Barnhall RFC grounds, which border the southern boundary of KIC lands, close to the 'New Bridge' spanning the River Liffey, are historically tied to the Irish Meat Packers, the club being founded by employees of the Irish Meat Packers in 1969, and purchasing its grounds from the Irish Meat Packers in 1986 (mubarnhall.com/history; accessed 25.01.2023). The nearby 'New Bridge', and present alignment of the Celbridge Road (R404), forming the eastern boundary of the KIC lands, were further infrastructural upgrades servicing the Hewlett Packard Campus. The 'New Bridge' marks the location of a medieval bridge, constructed 1308, replaced in 1949, and subsequently upgraded, possibly also marking an earlier fording point, and which provided a key link between medieval settlement on both banks of the River Liffey, the early 13th century Augustinian priory being on the south bank at St. Wolstans and an early 15th century castle being sited in Castletown townland.

The present Cois Abhann road, aligned west from the 'New Bridge' into Castletown Demesne at the Batty Langley gate lodge, may well have medieval origins. This road currently forms part of the way-marked 'Arthur's Way Heritage Trail', between Leixlip and Castletown House, which celebrates the association of Arthur Guinness (the founder of the Guinness brewery) with a number of historic sites across north-east Co. Kildare, inclusive of both Leixlip and Celbridge. Arthur Guinness was born in Celbridge in 1725, and founded his first brewery in Leixlip, before moving the brewery to Dublin in 1759. The trail is a 16km walking and cycle trail, commencing in Leixlip and passing by way of the Wonderful Barn via the Celbridge Road (R404) (intokildare.ie/arthurs-way).

Archaeological and Historical Background

The existing archaeological record demonstrates that the KIC lands and surrounding area was a focus of settlement in the prehistoric period. This was probably owing to the area's proximity to the River Liffey, and to nearby fording points, one of which is recorded to the River Liffey at Leixlip (KD011-036----), the exact location of the ford being unknown. Celbridge is also reputed to be situated where the *Sli Mor* (an ancient route from Dublin to Celbridge and to the west) forded the Liffey. The KIC lands have to date produced prehistoric evidence in the form of a polished-stone axe (in Parsonstown townland), a flint blade (in Rinawade Upper townland) and a *fulacht fiadh* (KD011-062----) (in Barnhall townland), each recorded as part of the development of the Hewlett Packard Campus in the mid-1990s.

An Early Mesolithic flint assemblage was exposed in Cooldrinage townland (DU017-079----), south of Leixlip, approximately 1.1km north-east of the KIC lands, along with a ring-barrow (DU017-075001), part of the Bronze /Iron Age burial tradition (*c.* 2400 BC – AD 400). A mound (KD011-018----) in Leixlip Demesne on the west bank of the river Liffey, approximately 870m east of the KIC lands, may also be of similar age. Development of the Celbridge Interchange in Castletown and Kilmacredock Upper townlands, from approximately 600m west and north-west of the KIC lands, revealed a cluster of archaeological sites, including a Late Bronze Age ring-ditch, corn-drying kilns, *fulachta fiadh,* burnt mounds, habitation evidence and smelting furnaces, indicative of industrial or metalworking activity. In the front lawn of Castletown House, approximately 700m west of the KIC lands, a cemetery of pit burials (KD011-060----) associated with pottery of the Early Bronze Age was exposed as part of on-going restoration works by the Office of Public Works. On the south side of the River Liffey, two possible ringditches (KD011-071----, KD011-072----), identified as circular cropmarks in Ballyoulster townland, from approximately 830m of the KIC lands, may be prehistoric barrows or round houses, but equally could be modern in nature.

The archaeological record also demonstrates that the area was densely settled throughout the medieval period (5th century to *c*. 1550-1600). Early medieval (5th-12th century) settlement is represented by a possible early monastic site at Kilmacredock Upper (KD011-002----), approximately 1.2km north-west of the KIC lands. Celbridge (from the Irish *Kildrought*, the church of the bridge), derives its name from an early monastery founded by St. Mochua of Clondalkin (KD011-012004-), thought to have been located at, or near the site of the later medieval church (KD011-012005-) and graveyard (KD011-012006) in the town. The 'donagh' (from *domhnach*, church) element of the placename Donaghcumper, to the south of the River Liffey, west and south-west of St. Wolstans, also suggests an early foundation, but of which there is no obvious visible evidence. A later medieval parish church (KD011-013----) and graveyard (KD011-013001) at Donaghcumper, approximately 1.1km to the south-west of the KIC lands, represent the known ecclesiastical remains in the townland.

Leixlip (*Leim an Bhradáin*) derives from the Scandinavian ‘Lex-hlaup’, translated as ‘salmon leap’ (a name applied to a former waterfall on the River Liffey upriver of the town), which is suggestive of a Viking settlement at the confluence of the River Liffey and Rye Water, the area forming part of the broader hinterland of Viking Dublin (O Drisceoil & Fitzgibbon 2017). In the late-12th/early-13th century, Leixlip was also known by the name 'Ernia' or 'Hernie', possibly derived from *An Urnaidhe*, meaning oratory, which may also indicate the presence of a pre-Norman ecclesiastical site (Bradley *et al* 1986). Physical evidence of a Viking settlement at, or near Leixlip has yet to be found, although a stirrup-ringed crutch-headed pin, a pin type that may have developed in Viking Dublin is provenanced to Leixlip. A probable Viking grave is also provenanced to Barnhall townland, or to the lands of Barnhall, discovered in *c.* 1785. Known only from an account published in Joseph Cooper Walker’s (1788) *An Historical Essay on the Dress of the Ancient and Modern Irish*, the published evidence suggests the grave was an inhumation (buried human remains) accompanied by an iron axe and some other artefacts (Harrison & O Floinn 2014). A tentative location of the burial is to the Wonderful Barn, where it may have been uncovered during the structure’s construction, in the earlier period 1741-1743, associated with developments initiated by the then owner of Castletown House, Katherine Conolly (Harrison & O Floinn 2014). Alternatively, the burial may have been discovered anywhere in Barnhall, or Rinawade Upper or Rinawade Lower townlands (O Drisceoil & Fitzgibbon 2017).

The earliest definite evidence for settlement at Leixlip follows the Anglo-Norman conquest, with the granting of the manor of Leixlip to Adam de Hereford, who established a castle - Leixlip castle (KD011-004002-) - and borough in the late 12th-century. The church of St. Mary of Hernie (KD011-004003-) at Leixlip was granted by Adam de Hereford to the Abbey of St. Thomas in Dublin before 1212. St Wolstan's, known as 'Scala Caeli' (Steps of Heaven), was founded by Adam de Hereford *c*. 1205 with Richard, the first prior, as an Augustinian foundation (KD011-014----). In the early 17th century a house (KD011-028----) was reportedly built by John Allen to the east of the priory, the priory being suppressed in 1536 and the lands granted to the Lord Chancellor, also John Allen, where it developed in subsequent centuries as a landscaped estate. No ecclesiastical buildings associated with the priory survive, and the upstanding remains comprise the defensive, enclosing elements of the priory. The priory’s ruins presented a gothic aspect, and being visible from the north bank of the River Liffey, from within the grounds of Castletown House, was a considered visual element in landscape developments in the Castletown estate grounds (O’ Kane 2004).

Castletown (i.e. the town of the castle of Celbridge), intimately linked with the development of Celbridge, similarly owes its origins to medieval settlement. Celbridge (*Kildrought*), understood to be the location of an Early Christian monastery associated with St. Mochua, and thereby a focus of pre Anglo-Norman settlement, formed part of the lands granted to Adam De Hereford before 1176. De Hereford subsequently granted the manor to his brother John, who was in turn succeeded by his son Thomas De Hereford, who is reputed to have built a castle from 1202. Celbridge subsequently passed to the de Rochfords, who held it until around the mid-14th century, and subsequently to the Earl of Kildare, Maurice FitzThomas (*c.* 1397-9). There is a lack of early references to the castle, and it is thought as a result that a castle at Castletown may only have been constructed after the Earl of Kildare gained possession of the manor in *c.* 1397-9 (Bradley *et al* 1986). The castle (KD011-023----) that stood in Castletown townland was described as 'a hall built after the Irish or country manner, covered with straw'. In 1587, the manor was granted to John Dongan, and the Dongan's held it for most of the 17th century. The evidence indicates that the castle stood in the immediate vicinity of Castletown House, to its south-west side, at the location of the estate’s farm buildings. The medieval castle and estate were acquired by Speaker William Conolly from the Dongan family in 1709, with construction of a new house, the present Castletown House, beginning in 1722 (O’Kane 2004).

The proximity of the River Liffey will have influenced the on-going settlement of the wider area surrounding the KIC lands area in the post-medieval period, the period after *c*. 1550-1600, when the area was heavily influenced by 18th century landscape design, such as developed at Leixlip Demesne, at St. Wolstans and at Castletown. The designed landscape at Castletown extended eastward to the boundary with the KIC lands, the boundary being both a townland boundary between Castletown and Rinawade Upper, Rinawade Lower and Parsonstown, as well as a civil parish boundary, Castletown being in civil parish of Kildrought and Rinawade Upper, Rinawade Lower and Parsonstown being in the civil parish of Donaghcumper. The landscape developments from the period of the Conolly’s onward will have been imposed on the pre-existing Dongan landscape (O’Kane 2004), and there is evidence on this part of the River Liffey that landscape design extended beyond the limit of the larger demesnes. There is evidence of united landscape efforts and the use of topography and structures in the surrounding landscape on which to fix axial avenues (O’Kane 2004) or views, such as the axis to the Conolly obelisk, aligned to the north-west of Castletown House, and that to the Wonderful Barn, to the north-east of Castletown House.

The large granary that came to be known as the Wonderful Barn, built 1743, formed part of the 18th century landscape of Barn Hall, which was probably built in the 1740s as the seat of Joseph Cooper, who was a prominent figure in the management of the Conolly estate (O Drisceoil & Fitzgibbon 2017). Cooper’s estate encompassed the townlands of Barnhall, Rinawade Upper and Rinawade Lower, and in 1773 an additional 70 acres at Parstonstown was leased to his estate. In the period 1847-1864, when Richard Griffith oversaw the first full scale valuation of property in Ireland i.e. the Primary Valuation, also known as Griffith’s Valuation, all of the land in Parsonstown (just over 103 acres) to the west of the Celbridge Road (R404) and to the north of Cois Abhann, accessing the Castletown estate, was held by a single landholder, Humphries Peare, who leased a house, offices and land to John Smith. Rinawade Lower was leased by Edward Coley from Thomas Conolly, Esq. of Castletown, Thomas Conolly also holding the whole of Rinawade Upper. Landownership at this time highlights the historic connection of the Castletown Estate with Rinawade Upper and Rinawade Lower townlands, which partly form the KIC lands, and between the 18th century

Barn Hall estate (the Wonderful Barn) with Rinawade Upper, Rinawade Lower and Parstonstown townlands.

The site of the proposed development stands adjacent lands historically associated with the highly significant Castletown Estate, home of William Connolly, and largely development during the C18th as one of Ireland's grandest and most extensive examples of Georgian architectural and landscape designs. The site of the proposed development consisted of a separately owned estate, adjacent to the formally laid out parkland and demesne containing Castletown House proper. While visible from some rooms in the grand house, and from some vantage points within its surrounding parkland, the site of the proposed development was not the subject of large scaled plantings or other designed landscape exercises, but existed as an adjacent rural agricultural landscape. However, there did exist a long view from the side elevation of Castletown House across the subject site, towards another outlying property that was owned by the greater Castletown Estate, to a large folly structure known as The Wonderful Barn. The planting of rows of trees along portions of this view corridor, close to Castletown House and The Wonderful Barn, is believed to have occurred during the late C18 and early C19th, but there is no evidence that such a grand allee was previously in existence across the fields included in the Parsonstown or Renawade Lower lands, now included within the proposed development. During the late C20th, when the initial stages of development of the Hewlett Packard Industrial Park were planned and begun, additional lines of trees were planted within the development site along the same alignment as the view corridor, and the importance of the view corridor was acknowledged and given a presence across lands that were not historically included in the grand landscape designs.

Historic Cartographic Analysis

The analysis of successive historic maps shows how landscape has evolved over time, and in comparing maps evidence for the presence, alteration or removal of cultural heritage can be traced.

Down Survey Maps (1656-1658)

The Down Survey is a mapped survey carried out between 1656 - 1658 under the direction of Sir William Petty that recorded land confiscated from Irish Catholics to facilitate Cromwellian settlement. The survey recorded townland boundaries, their areas and proprietors, along with detail on roads, rivers, towns, churches, castles, houses and fortifications, as well as topographic and landuse detail. The maps were produced at county, barony and parish level.

The county map of Kildare records the River Liffey and its confluence with the Rye Water, along with bridge crossings, including the crossing at Celbridge (*Killdrough*) and the crossing at the southern boundary of Parsonstown. Tower houses or castles are depicted at 'Lexlip' and 'Castletowne', with 'S Wolstons' named to the south bank of the Liffey. The barony map of Salt and Straffan (Figure 15.1), providing more detail, records 'Parsonstowne' townland and the 'New Bridg' on the River Liffey, with a building sited to the north bank of the River in Parsonstown; this may have been a house or mill on the riverbank. The Castletown lands appear to incorporate the land forming the present Rinawade Lower townland.

A population census of Parsonstown at the time of the Survey recorded 12 people over 15 years living in the townland (Colgan 2005, 149). The Civil Survey, in progress at the time of the Down Survey, records the proprietor of Parsonstown as Lady Allen, who held 50 acres (40 under arable and 10 under shrubby wood), the Allen family being connected with land at Parsonstown from at least 1540-41 (Colgan 2005, 149). The lands at Parsonstown are described in the Civil Survey as directly bordering the land of Castletown on the west side.

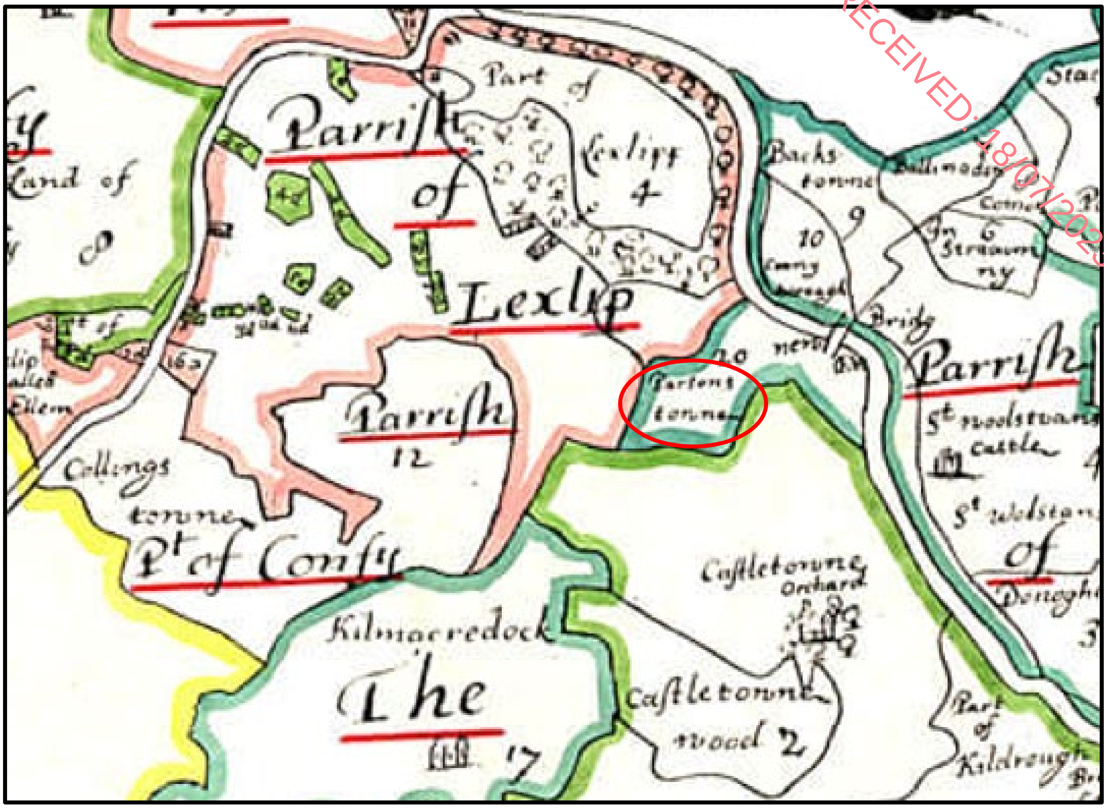

Figure 15.1: Extract from the Down Survey Barony Map of Salt and Straffan, 1656-58, with approximate location of KIC lands highlighted (*in red*) (Source: https://downsurvey.tchpc.tcd.ie).

Noble and Keenan's Map of Kildare (1752)

John Noble and James Keenan published their survey of the county of Kildare in 1752 (Figure 15.2), providing much more detail on the nature of the cultural landscape in the period following the acquisition of Castletown by Speaker William Conolly. The enclosed nature of the Castletown estate dominates to the west of the KIC lands, and the map depicts the Wonderful Barn, annotated 'Magazine', to the north-east of the estate. The placenames 'Loghnamona' (Loughnamona, a former townland from which Barnhall was carved after the 18^{th} century) and Parsonstown are recorded, with a focus of settlement in Parsonstown clearly sited to the west side of the 'New Bridge' river crossing on the southern boundary of the townland. This settlement cluster comprises of at least two buildings, with what appears to be a church set apart a short distance further to the west; the structures are likely to have been sited to the south side of present Cois Abhann road. Leixlip Demesne, with Leixlip castle, is depicted to the east of the KIC lands, the demesne clearly depicted by woodland.

Figure 15.2: Extract from the Noble & Keenan Map of County Kildare, 1752, with Parsonstown placename highlighted (*in red*) (Source: https://www.logainm.ie).

John Rocque's Map of the County of Dublin (1760)

Following his arrival in Dublin in 1754, surveyor and cartographer John Rocque set about producing a series of maps of Dublin City, six in all. His Actual Survey of the County of Dublin (1760, Figure 15.3) reached beyond the city, and even beyond the county boundary to depict the demesnes of Carton Park and Castletown in north Co. Kildare, as well as St. Wolstans on the south bank of the River Liffey opposite Castletown, illustrating the significance of these estates. While no detail is provided on the map of the KIC lands, the map highlights one of the main roads into Castletown, crossing the 'New Bridge' from the south, and entering the demesne at Castletown from the south-east corner, present Cois Abhann road. Three structures are shown on the road on the north bank of the Liffey at the 'New Bridge', and a Porters Lodge is shown at the boundary of the enclosed demesne.

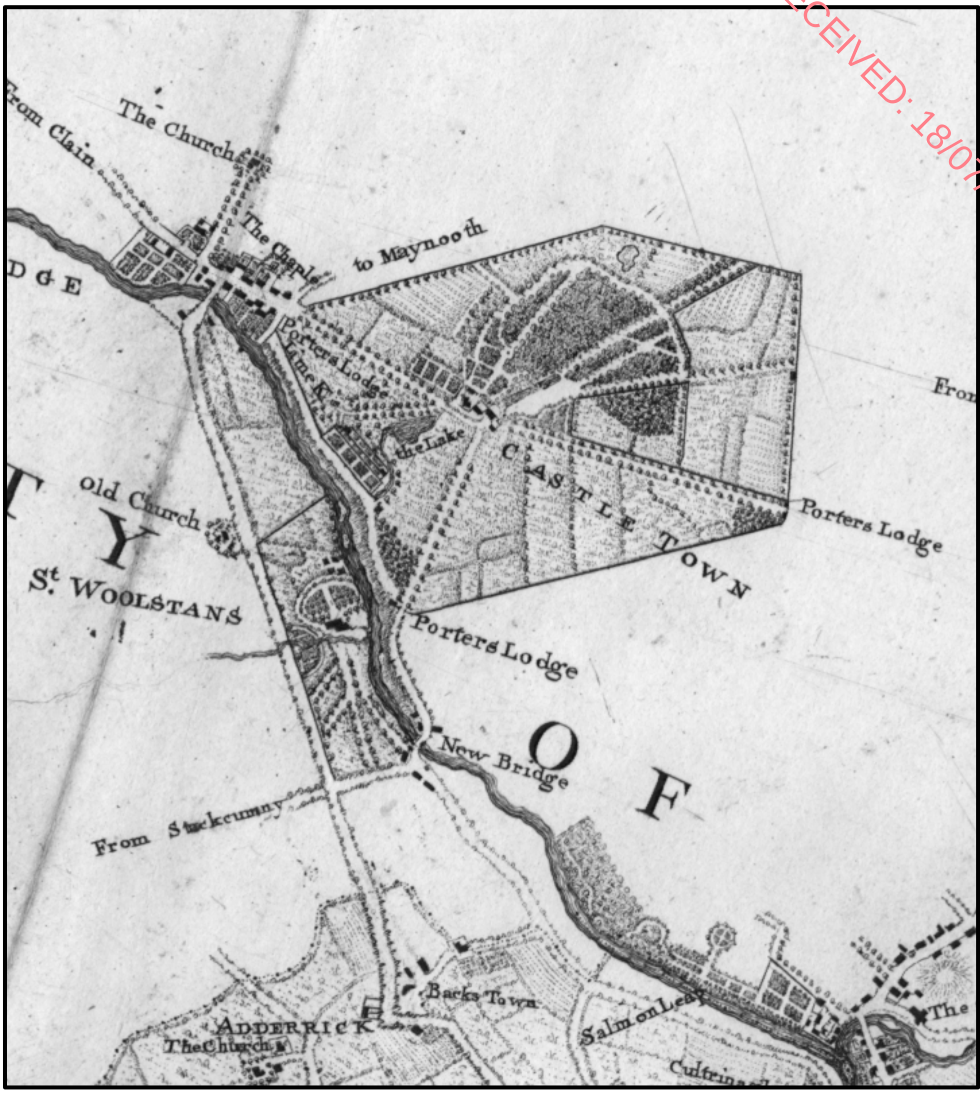

Figure 15.3: Detail from John Rocque's Map of County Dublin, 1760, showing the Castletown Demesne and it tree-lined allees. It is important to note that there is no allee shown running between the side gable of the main house and the Wonderful Barn. Such an allee would run from the house to the lower right corner of this image, and so it appears that this was not the case in 1760. Note that this map was published with north being approximately to the right, instead of straight up, as would be the common convention. (Source: https://www.dublinhistoricmaps.ie).

Alexander Taylor's Map of Kildare (1783)

Taylor, a Scotsman who held the rank of captain in the Corps of Engineers, was employed on a military survey of Ireland from 1781 to 1805, but produced his map of Kildare in a private capacity (Figure 15.4). The map details the landscaped grounds of Castletown, named 'Castletown Park', which included a walkway through a band of woodland on the eastern boundary with Parsonstown. The map records what may be generalised townland boundaries, with Parsonstown shown, but not the present boundaries of Rinawade Upper and Rinawade Lower. Taylor clearly records a watercourse, which formed the north-eastern townland boundary of both Rinawade Upper and Parsonstown. Taylor also records a new road to the south-east side of Parsonstown, linking the 'New Bridge' to Leixlip, aligned around Leixlip Demesne, which represents the forerunner of the present Celbridge Road (R404). This road was built in the period post 1752. A focus of settlement remains on the River Liffey at the 'New Bridge' in Parsonstown, on present Cois Abhann road, with a mill wheel indicating the presence of a mill. The map is of interest in that it records landscaping through Parsonstown and New Barn, the latter annotating the Wonderful Barn (this placename replaces the earlier townland Loughnamony). The map shows orientation of estates to features in the landscape; a tree-lined 'avenue' is aligned to the north-east from Castletown to the New Barn ('Wonderful Barn') (but lacking trees through Parsonstown townland); a second tree-lined avenue also appears to be aligned between the Back Westown estate and the New Barn ('Wonderful Barn').

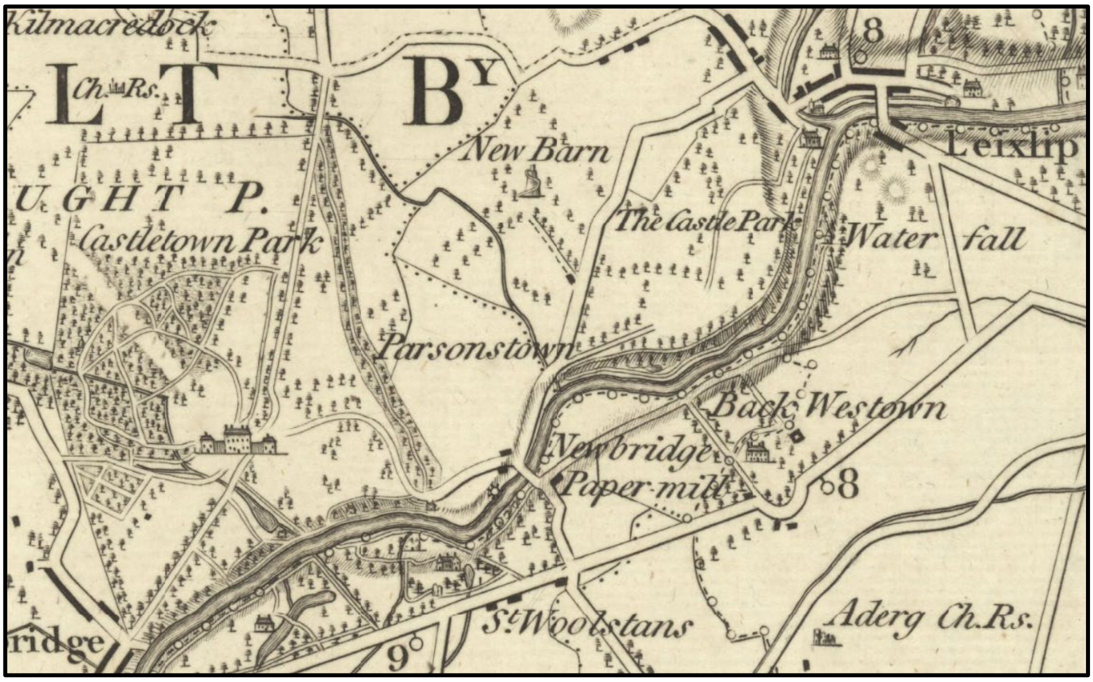

Figure 15.4: Extract from Taylor's Map of Kildare, 1783 (Source: https://digitalarchive.mcmaster.ca).

Ordnance Survey Maps

The first ever large-scale survey of Ireland was undertaken by the Ordnance Survey (OS) between 1829 and 1842, producing highly accurate maps at different scales. The KIC lands in Parsonstown, Barnhall, Rinawade Upper and Rinawade Lower townlands is depicted in detail for the first time on the first edition 6-inch Ordnance Survey (OS) map, Sheet KE011, surveyed 1836, published 1839 (Figure 15.5). Townland boundaries, early 19th century field boundaries and the residential property once situated in Parsonstown are depicted in detail. The latter, named Parsonstown, comprised a large, L-shaped house, with a single linear outbuilding to the rear; the main entrance avenue curved in a slight arch from a gate lodge on the Celbridge Road, having a secondary entrance from the south, which served both the front of the house - annotated Parsonstown – and a rear outbuilding and yard. Established pockets of woodland surrounded the gate lodge and bordered the main entry avenue. A potential walled garden, or at least small enclosed plots are sited to the north side of the house. Boundaries marking an 'avenue' aligned between Castletown and the Wonderful Barn, now depicted next to a residence annotated Barn Hall, are present in Parsonstown and Rinawade Upper townlands. The mill to the south of Parsonstown, on the north bank of the River Liffey, between Cois

Abhann road and the river, is annotated as the Newbridge Flour Mill, sited adjacent to a cluster of buildings on the approach to the south-east entrance to the Castletown estate.

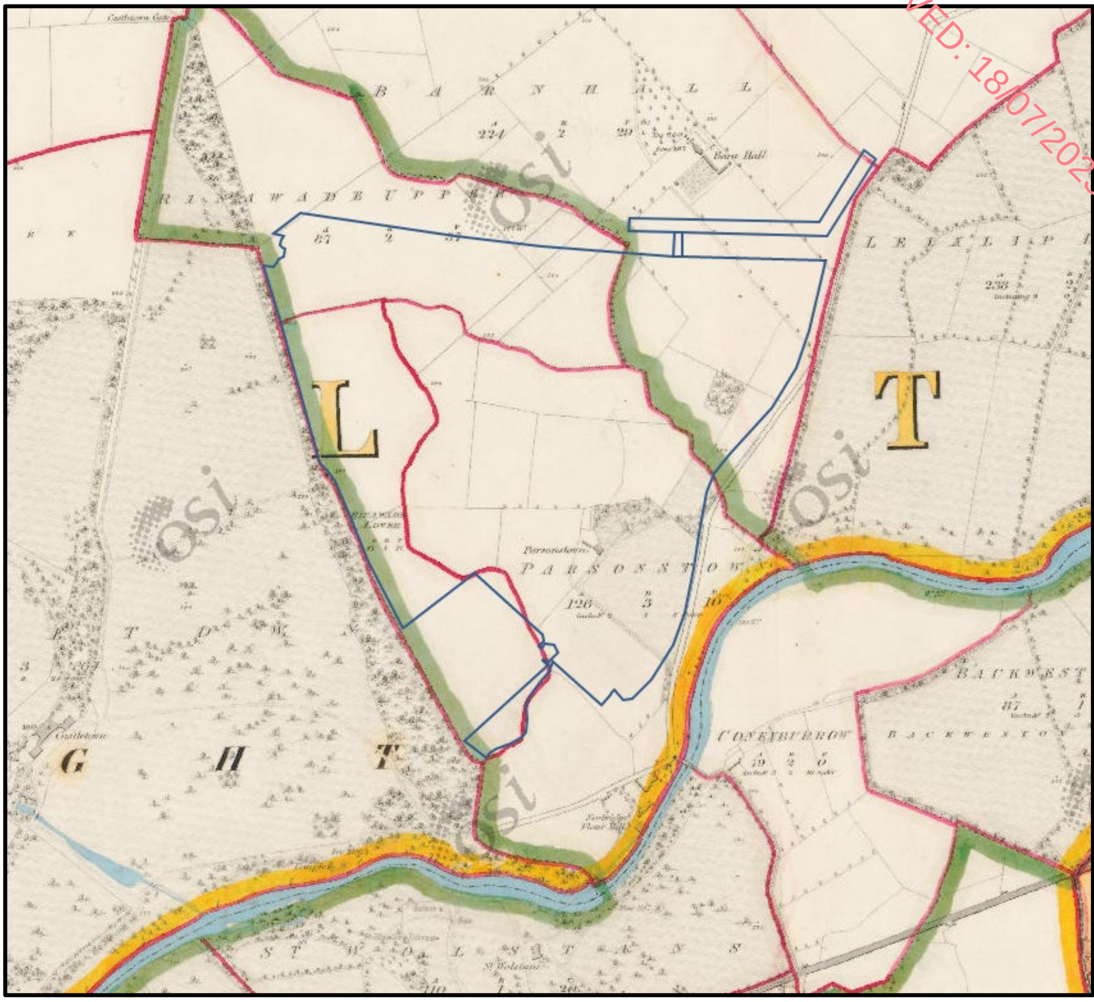

Figure 15.5: Extract from first edition 6-inch OS map, published 1839, with approximate location of KIC lands highlighted (*in blue*)
CYAL50313607© Ordnance Survey Ireland/Government of Ireland.

The revised 25-inch OS map, surveyed 1908, published 1910 (Figure 15.6) records an expansion of the residence in Parsonstown, now named Barn Hall, with the addition of three outbuildings, one a substantial rectangular structure, to the rear of the house. The main entrance has a curved entrance surround, and the gate lodge is enclosed within a yard in a pocket of woodland. Colgan (2005, 149) records that by 1894 William Ronaldson was the resident occupier of Barn Hall; Ronaldson may be responsible for the change in name and expansions undertaken at the residence.

A new large residence, Allan's Grove, is located directly opposite on the Celbridge Road. The layout of the Newbridge Corn Mill on the River Liffey, while now disused, is shown in more detail, its associated mill race extending from a weir in the river (opposite St. Wolstans) in a north-east direction to the mill. A developed building fronting the Castletown access road to the north of the mill, on present Cois Abhann road, is annotated 'Bridge Lodge'. No clear breaches are shown in the Castletown wall on the townland boundary with Rinawade Lower and Parsonstown to suggest and entry/exit in the wall. The boundaries, some of which are tree-lined, marking an 'avenue' aligned between Castletown and the Wonderful Barn remain in Rinawade Upper and Barnhall townlands, but no evidence remains in Parsonstown.

The cultural landscape remains relatively unchanged into the mid-20th century, at the publication of the last historic 6-inch OS map in 1942. This latter map pre-dated the modern developments that have led to the removal of the Parsonstown/ Barn Hall residence from Parsonstown townland.

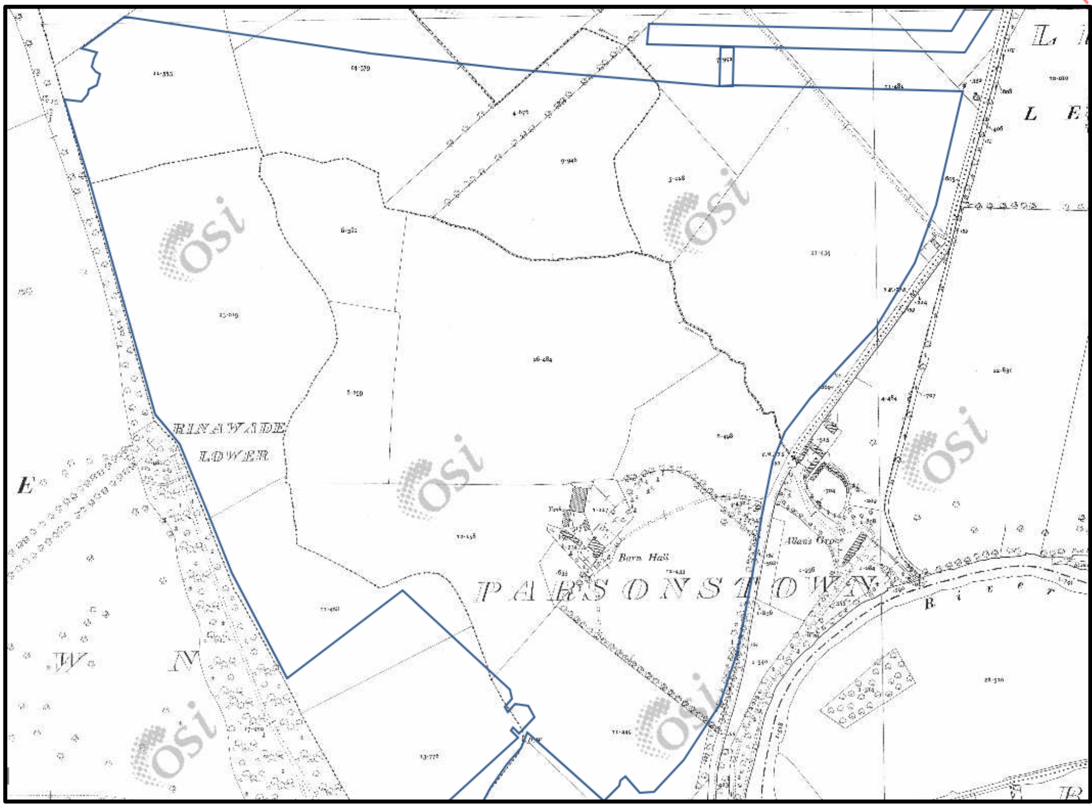

Figure 15.6: Extract from 25-inch edition OS map, published 1910, with approximate location of KIC lands highlighted (*in blue*)
CYAL50313607
© Ordnance Survey Ireland/Government of Ireland.

Previous Archaeological Investigations
The KIC lands, in consequence of the development of the Hewlett Packard Campus, have been subjected to significant archaeological and cultural heritage mitigation to date.

An Environmental Impact Statement (EIS) prepared in association with the Hewlett Packard Campus in 1995 was followed by archaeological testing of potential archaeological features identified in the EIS process. Archaeological testing of four features across the site was carried out by Valerie J Keeley Limited in August-September 1995 under excavation licence **95E0172** (Breen 1995; Figure 15.7). Shallow linear features cut into yellow subsoil containing pottery and glass artefacts of 18th-20th date were interpreted as modern features resulting from cultivation, ploughing or drainage; a clear stone filled field drain, of French drain type, was recorded. No features or deposits of archaeological significance were identified. Two archaeological artefacts were recovered from topsoil, a small mudstone axehead (to the southern part of the RIC lands in Parsonstown townland) and a worked flint flake (to the north-west part of the RIC lands in Rinawade Upper townland).

Archaeological testing was followed by phased archaeological monitoring during construction of the Hewlett Packard Campus. Archaeological monitoring of topsoil stripping between 21st November 1995 and 8th January 1996 was carried out by Valerie J Keeley Limited under excavation licence **95E0264** (Gracie 1996a; Figure 15.7). Archaeological monitoring continued intermittently between 29th January and 14th May 1996 under the same licence. Sod and topsoil were stripped to approximately 0.4m below the surface throughout. Further modern drains, including stone filled drains of French drain type were recorded, along with the presence of modern pottery. No features or deposits of archaeological significance were identified during the period 21st November 1995 to 8th January 1996.

A spread of black soil and charcoal approximately 20m in diameter was identified near the entrance to the Campus off the Celbridge Road (R404), to the south-west side of the entry, during monitoring between 29th January and 14th May 1996. This area was subsequently fully investigated in May 1996 under excavation licence **95E0264** (Gracie 1996b), resolving the archaeology of the site. The archaeological remains comprised two main black silt or black clayey silt deposits containing burnt stone and occasional charcoal, which covered a series or pits, along with a number of smaller depressions or black clayey silt deposits. The remains were interpreted as a possible *fulacht fiadh*, a prehistoric cooking site, the pits possibly being used to boil water. No archaeological artefacts were recovered, although modern nails were found in upper layers. The remains were exposed to the north side (20m-30m) of a stream marking the townland boundary between Parsonstown and Barnhall, as well as the civil parish boundary between Donaghcumper and Leixlip. The excavation report also noted the site was located on what had been a turlough, where a natural pond or lake would have been formed through the seasonal rise in the water table (Gracie 1996b), thereby providing a natural source of water.

On-going archaeological monitoring at the Hewlett Packard Campus continued between September 29th and October 8th 1997 under excavation licence **96E0327** (Lynch 1998), with no further archaeological features, deposits or artefacts being recorded.

Associated infrastructural developments, including the provision of services/pipelines, both at the Hewlett Packard Campus and off-site, were subject to archaeological mitigation, as was a realignment of the Celbridge Road (R404) on the east boundary and an upgrade of the 'New Bridge' on the River Liffey.

Archaeological monitoring was carried out intermittently between 25th April and 11th June 1996 under excavation licence **96E0102** (Gracie 1996c). Topsoil stripping on two pipeline corridors (20m-30m wide strips), one extending from the Campus entrance to Leixlip Reservoir on the opposite side of the Celbridge Road (R404), the second extending from the M4, also to the east side of the Celbridge Road (R404), were monitored. Closest to the M4 it was noted that boulder clay had been redeposited to the south side of the motorway during construction. Monitoring of the removal of a hedge and pavement to the west side of the Celbridge Road was also monitored. No archaeological features, deposits or artefacts were recorded.

Archaeological assessment, including an underwater assessment, was carried out at the 'New Bridge' by Valerie J Keely Limited (Keely 1995, 1996). The assessment confirmed the 'New Bridge' is partially built on the remains of the original medieval bridge, built *c.* 1308. A pier and stone paving from the original medieval bridge lies in position below the central arch of the reconstructed bridge. The underwater assessment extended 50m upriver of the bridge, involving a visual assessment, probing in the riverbed to a depth of 1m (or to bedrock level) and a remote sensing survey to locate metal objects. With the exception of a lead musket ball, recovered artefacts were modern in origin. Stone walls constructed in 1949 run along the sides of the river bed. Archaeological testing and monitoring under excavation licence **95E0178**, both underwater and on land areas to be affected by the upgraded bridge structure did not reveal any additional archaeological features, deposits or artefacts.

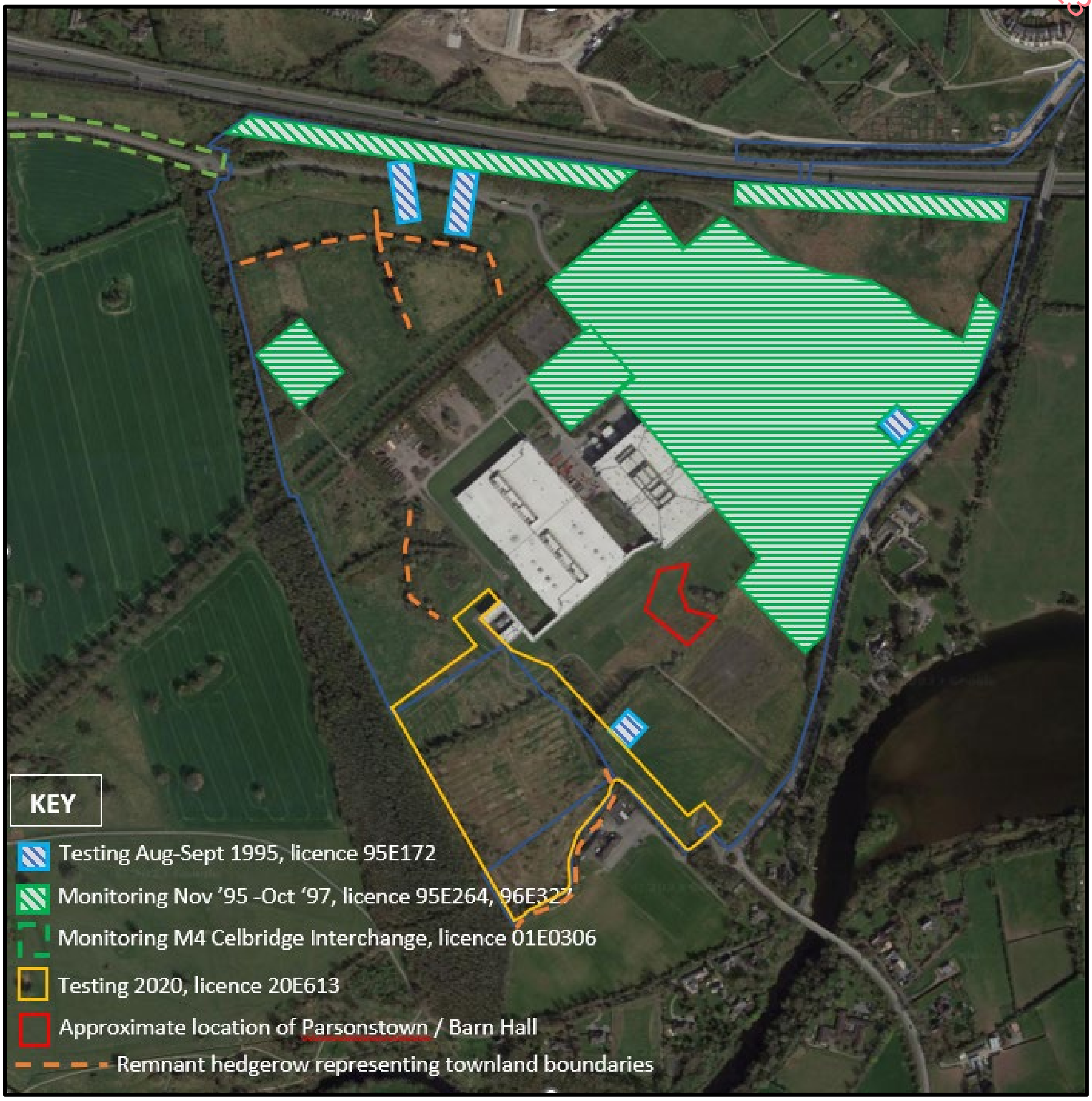

Figure 15.7: Plan showing locations in KIC lands (*in blue*) that have been subject to archaeological resolution and areas of archaeological sensitivity (Source: Shanarc Archaeology).

Topsoil stripping on the M4 Celbridge Interchange was subject to archaeological monitoring in 2001 under excavation licence **01E0306**, including the slip road eastwards of the interchange that provides access to the KIC lands from the north-west (known as the Hewlett Packard Link). 18 potential archaeological sites were identified during monitoring, sited to Kilmacredock Upper, Castletown and Easton townlands. None of the identified archaeological features were located on the Hewlett Packard Link (slip road east of the interchange); the majority were identified and excavated on the interchange, and on the R449 northwards. Prehistoric/Bronze Age remains included a ring-ditch, enclosure ditches, small pits and burnt hearth and a possible *fulacht fiadh*, with metalworking and habitation evidence; later remains was evidenced by Early-medieval corn-drying kilns. Some features are noted as having continued outside the road take, which will remain unexcavated outside the road network at the interchange. No records of archaeological investigations associated with the original construction of the M4 pre-2000 have been identified.

To the south-west section of the KIC lands, and partially incorporating the KIC lands on this boundary, archaeological test excavation was carried out by Shanarc Archaeology Ltd. in October 2020 under excavation licence **20E0613** (Barry and Shanahan 2020) in advance of the DB Schenker development. The stratigraphy was described as a mid-brown silt topsoil above light brown clayey silt subsoil, with topsoil containing sherds of 19th/20th century pottery. No archaeological features, deposits or artefacts of significance were recorded. Stone filled drainage features consistent with modern use of the site were exposed. The topsoil layer was very thin in places, indicating that previous topsoil stripping or disturbance had occurred on site to the northern part of the tested area; disturbance was also demonstrated by the presence of modern construction related refuse in a similar area.

To the north side of the M4, the Wonderful Barn has been the focus of prior archaeological investigation. The grounds, inclusive of courtyards, a walled garden and an entrance courtyard were subject to a geophysical survey under licence **15R0086** and **15R0144**, to identify and map any remains of the formal layout and former structures associated with the site, to assist with reconstructing the nature of the garden. Geophysical survey was followed by archaeological excavation carried out in 2015 and 2016 on behalf of Kildare County Council under excavation licence **15E0324**. The combined works were carried out as a research exercise to inform future conservation and landscape restoration works around the Wonderful Barn (O Drisceoil & Fitzgibbon 2017). A picture of the 18th century landscape of Barn Hall, the original estate name prior to the use of the name 'Wonderful Barn', was compiled as a result of the investigations.

Approximately 19 hectares of ground enclosing the Wonderful Barn and its formal grounds from west to east was subject to a geophysical survey under licence **17R0132** and test excavation under excavation licence **17E0333** as mitigation in advance of a large residential housing development (Kildare County Council Planning Ref. 05/182). A circular enclosure interpretated as the remains of a ringfort settlement of early medieval date was recorded, with further potentially associated ditches to its north. The sub-surface remains were directly north-west of the Wonderful Barn, on the eastern edge of pre-existing housing on Rinawade Avenue/Rinawade Grove, and have been development under Planning Ref. 05/182.

Previous Archaeological Artefacts

No findspots of artefacts are provenanced in the topographical files of the National Museum of Ireland to Parsonstown, Rinawade Lower, Rinawade Upper or Barnhall townlands.

Archaeological investigations carried out at the KIC lands as part of the development of the Hewlett Packard Campus in the mid-1990s did result in the recovery of stray archaeological artefacts from topsoil at the site. The artefacts comprise a stone axe (in Parsonstown townland) and a flint blade (in Rinawade Upper townland), both of prehistoric date.

Aerial Photographs

An assessment of aerial images formed part of the archaeological assessment carried out for the Environment Impact Statement (EIS) prepared in association with the Hewlett Packard Campus development. Potential archaeological features identified as cropmarks on aerial images were investigated in 1995 under excavation licence **95E0172** (Breen 1995; Figure 15.7), none of which proved to be archaeological in origin.

The following aerial photographs available on the OSi Geohive Map Viewer were consulted during the preparation of this chapter: 1995, 1999-2003, 2004-2006, 2005-2012, digital globe 2011-2013 and 2013-2018. The images trace the development of the KIC lands from the era of the Irish Meat Packers facility (Figure 15.8) to the present Kildare Innovation Campus. While no cropmarks representing potential sub-surface archaeological features are discernible on the images, the images do clearly show parts of the KIC lands with surviving elements of the preceding enclosed agricultural landscape. Remnant field boundaries survive to the north-west and west parts of the KIC lands, on the boundary with Castletown; a number of the remnant sections represent the Rinawade Lower townland boundary with Rinawade Upper and with Parsonstown (Figure 15.7).

Figure 15.8: Extract from aerial image dated 1995 showing commencement of demolition works at the Irish Meat Packers as part of the Hewlett Packard Campus construction (Source: webapps.geohive.ie/mapviewer).

Aerial photographs taken during the development of the Hewlett Packard Campus from 1995 (Figure 15.9) show the extent of the former groundworks undertaken at the KIC lands.

Figure 15.9: Aerial photograph dated February 1996 showing extent of groundworks undertaken as part of the Hewlett Packard Campus development (Source: Tom Kavanagh, Estate Manager, Liffey Business Park).

National Monuments
No National Monument either in the ownership of the State or vested in Kildare County Council is located at, or within 1km of the KIC lands.

The closest National Monument, in State ownership, is the Connolly Folly, National Monument No. 681, sited in Barrogstown West townland approximately 2.8km north-west of the KIC lands.

Register of Historic Monuments (RHM)
No monument listed on the Register of Historic Monuments (RHM) is located at the KIC lands.

The closest monument listed on the Register is the medieval bridge site on the River Liffey on the Parstonstown, St Wolstans and Coneyburrow townland boundary, approximately 150m south-east of the KIC lands.

Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP)
The site of a recorded monument, SMR KD011-062----, classed as a *fulacht fiadh*, is located at the KIC lands. This monument has been fully excavated and resolved as part of the development of the Hewlett Packard Campus, and is not scheduled for inclusion in the statutory RMP. Its location is represented by a red dot on Figure 15.10. No RMP sites are located at the KIC lands.

A total of 35 additional monuments are recorded within an approximate 1km radius of the KIC lands, the nature of which are described in the earlier section on the Archaeological and Historical Background. These monuments are listed in Table 15.6: distance measurements are taken from the boundary of the KIC lands to the outer edge of the monument's Zone of Notification (where one is recorded).

Zones of Notification, which are designated by the National Monuments Service, are provided to identify monuments that are scheduled for inclusion in the next issue of the statutory RMP, and to identify monuments for the purpose of notification under Section 12 of the 1994 National Monuments (Amendment) Act. These zones are shaded pink, as shown on Figure 15.10. SMR sites deemed to be archaeologically resolved or SMR sites not scheduled for inclusion in the statutory RMP are generally not shown with an associated Zone of Notification.

Figure 15.10: Location of KIC lands (*in blue*) relative to recorded monuments (*red dots*) and associated Zones of Notification (*shaded pink*)
CYAL50313607
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SMR No.	Class	Townland	ITM Easting	ITM Northing	Distance (m)
DU017-014----	Weir - fish	Backwestonpark	700397	735126	880m
DU017-087----	Bridge	Backwestonpark	700408	735118	880m
KD011-011----	Bridge	Coneyburrow (Donaghcumper Ed),Parsonstown (Celbridge Ed),St. Wolstans	699183	734154	110m
KD011-014----	Religious house - Augustinian canons	St. Wolstans	698686	733727	330m
KD011-017----	Bridge	Leixlip Demesne	700404	735112	880m
KD011-017001-	Weir - fish	Leixlip Demesne	700404	735112	880m
KD011-018----	Mound	Leixlip Demesne	700148	734760	825m

SMR No.	Class	Townland	ITM Easting	ITM Northing	Distance (m)
KD011-023----	Castle - unclassified	Castletown	697785	734091	800m
KD011-028----	House - 17th century	St. Wolstans	698861	733750	370m
KD011-031----	Redundant record	Barnhall	698599	735636	380m
KD011-032----	Field system	Kilmacredock Upper	697343	735652	870m
KD011-042----	Ring-ditch	Castletown	697625	735308	630m
KD011-042001-	Kiln - corn-drying	Castletown	697625	735311	630m
KD011-042002-	Enclosure	Castletown	697626	735306	630m
KD011-043----	Habitation site	Kilmacredock Upper	697652	735457	670m
KD011-044----	Habitation site	Kilmacredock Upper	697656	735474	700m
KD011-045----	Burnt mound	Kilmacredock Upper	697768	735466	650m
KD011-046----	Fulacht fiadh	Kilmacredock Upper	697812	735748	720m
KD011-047----	Burnt mound	Kilmacredock Upper	697915	735815	700m
KD011-048----	Habitation site	Kilmacredock Upper	697910	735856	730m
KD011-049----	Burnt mound	Kilmacredock Upper	698000	735957	765m
KD011-050----	Kiln - corn-drying	Kilmacredock Upper	697660	735366	665m
KD011-052----	Habitation site	Collinstown (Leixlip Ed)	698105	736142	900m
KD011-058----	Habitation site	Kilmacredock Upper	697707	735431	640m
KD011-059----	Metalworking site	Kilmacredock Upper	697624	735369	698m
KD011-060----	Burial mound	Castletown	697895	734195	675m
KD011-060001-	Pit-burial	Castletown	697895	734196	675m
KD011-060002-	Pit-burial	Castletown	697895	734196	675m
KD011-060003-	Pit-burial	Castletown	697895	734196	675m
KD011-060004-	Pit-burial	Castletown	697895	734196	675m
KD011-060005-	Pit-burial	Castletown	697895	734196	675m
KD011-060006-	Pit-burial	Castletown	697895	734196	675m
KD011-060007-	Pit-burial	Castletown	697895	734196	675m
KD011-062----	Fulacht fiadh	Parsonstown (Celbridge Ed)	699224	734794	0m
KD011-071----	Ring-ditch	Ballyoulster	699075	733426	830m
KD011-072----	Ring-ditch	Ballyoulster	699072	733375	860m

Table 15.6: Recorded monuments within a 1km radius of the KIC lands.

Name	*RPS No*	*NIAH No*	*Location*	*Rating*	*Description of Special Interest*	*Description of Setting*	*Heritage Significance*
Castletown House, Batty Langley Lodge, Gatelodge, Entrance Gates and Avenue. Castletown Walled Gardens, Temple and Pedimented Arch	B 11-13 B 11-14	13618038	Castletown Estate, Celbridge, County Kildare	National	Erected starting in 1722, for William Conolly (1662-1729), Speaker of the Irish House of Commons. The original design of the palatial Palladian house is attributed to Italian architect Alessandro Galelei (1691-1737). After the external shell of the house was completed, the completion of its interior fell to the young Irish architect Edward Lovett Pearce (1699-1733). The house remained unfinished after Speaker Conolly's death, however his widow Katherine continued to improve the landscaping of the demesne and was responsible for the creation of both the Conolly Folly and the Wonderful Barn to provide employment during and after the Irish famine of 1740-41.	Castletown House is a large structure, having symmetrical flanking pavilions and curved links. The demesne included a large stableyard, farmyard and walled garden, several gate lodges, a chapel and school, ponds, fields and woodlands. Several tree-lined allees extended outward from the house towards distant entrance gates and towards the Conolly Folly and the Wonderful Barn. Despite the construction of a housing estate within the historic walled garden to the west of the house, a significant portion of its historic setting survives intact to give an excellent idea of its historic appearance.	Castletown House and its Demesne have National Significance, owing to its associations with nationally significant historical figures, widely renowned architects from the C18th and C19th, and extensive designed landscape. Castletown House, combined with its setting among many associated structures and landscape features has high significance.
The Wonderful Barn	B 11.15	11901102	Barnhall, Leixlip, County Kildare	National	Terrace of Three Two-bay, three-storey, red brick houses, c. 1830, incl railings and steps.	The Wonderful Barn stands beside Barnhall House, a two-storey stone farmhouse dating from the first half of the C18th. The barn forms one side of a large walled garden, whose corners include other similar but smaller round towers. Of particular importance is the location of the Wonderful Barn nearly precisely on axial alignment with the east	The Wonderful Barn is of National Significance, and is included on the Record of Protected Structures. Its association with Castletown House and its owners, as well as its unique architectural design, combine to give it high significance.

						side elevation to Castletown House itself, a formal link that was further defined by the planting of parallel rows of hardwood trees to form a grand allee across the landscape.	

Table 15.7: Structures listed in the Record of Protected Structures within a 1km radius of the KIC lands.

Site Inspection at KIC lands

A site inspection at the KIC lands verified the baseline scenario identified from desk-based research and evidence. It found that much of the lands are heavily built upon and/or landscaped as a consequence of the development of the original Hewlett Packard Campus. Greenfield to the northern boundary, between Barnhall Road and the M4, is under unmaintained grass and partially planted with trees, and the ground is at a higher elevation to the existing campus; the lands here may have been used for spoil deposition during the development of the original Hewlett Packard Campus. To the north side of the M4, at the location of the pedestrian and cycle route adjacent to the lands known as the Wonderful Barn Allotments, the ground has been subject to residential construction related disturbance (site compound, construction access road).

Components of the preceding agricultural landscape remain at the KIC lands to the north-west and west, largely as hedgerow field boundaries, which also function as physical townland boundary markers. Hedgerow survives on the Rinawade Upper, Rinawade Lower and Parsonstown townland boundaries to the north-west, with fragmented sections of the Rinawade Lower and Parsonstown townland boundary to the west and south-west (shown on Figure 15.7). East of the DB Schenker site, a remnant hedgerow field boundary and part of the former entrance alignment to the former Parsonstown (Barn Hall) residence, the latter used as an internal access road, remain (both bordered by a deep ditch) (Plate 15.1); these features border the north-west and north-east sides of an unused playing pitch.

Plate 15.1: Internal access road on alignment of access to former Parsonstown (Barn Hall) residence; hedgerow and ditch to left of image (Shanarc Archaeology 08.02.2022).

The former Parsonstown (Barn Hall) residence site, of which there is no surface trace, is situated between the internal access road and the existing drainage pond system, to the north-west side of a hardcore site compound. A small grove of remaining trees mark the location of part of the associated garden, which, containing fruit trees, is likely to have been part of an orchard (Plate 15.2). A mature deciduous tree nearby (to north-east of the grove) is also likely to have formed part of the designed landscape around the former house.

Greenfield to the south-east boundary, bordering the Celbridge Road (R404) is unmaintained grass, which forms a dense vegetation cover; peripheral greenfield to the north-west part of the site has been formerly used as allotments. No surface anomalies of archaeological interest were noted throughout.

Plate 15.2: Existing setting of site of former Parsonstown (Barn Hall) residence; trees in centre of image mark location of associated gardens (Shanarc Archaeology 08.02.2022).

Plate 15.3: Aerial view looking north-east, showing the alignment of the protected view corridor across the site of the proposed development at the centre. Castletown House is to the lower left, out of the photo, and the Wonderful Barn is approximately at the centre of the photo. The two rows of trees in the lower left quadrant of the photo are running across the

Renawade Lower fields, and were planted some time between 1837 and and 1860, according to the first and second editions of the Ordnance Survey of Ireland.

Plate 15.4: Front elevation of Castletown House, the grand early Georgian country house of William Connolly. The windows in the upper floors in the side elevation of the main house enjoyed views across open fields to the Wonderful Barn, built in 1847 on an outlying farm that was part of the greater Castletown estate. The barn was built on a direct axis with side elevation of Castletown House.

Plate 15.5: View showing the SE side elevation of Castletown, and the windows with the view towards the Wonderful Barn.

Plate 15.6: Recent photo looking towards the Wonderful Barn, from the NE edge of the Castletown House demesne. The mature rows of trees in this photo were not shown on the first edition 6-inch Ordnance Survey map, surveyed in 1837, but were in place on a subsequent 25-inch edition, surveyed in 1888.

Plate 15.7: Recent photo looking SW across the view corridor within the proposed development area, towards Castletown House in the far distance.

Plate 15.8: Recent photo looking NE showing the upper half of the Wonderful Barn, as seen in the distance along the protected view corridor within the KIC lands.

Plate 15.9: Photo showing the west elevation of the Wonderful Barn, the nationally significant grainary folly, built for the widow of William Connolly to provide employment during the famine of 1747.

Significance

The visual linkage between the side elevation of Castletown House and the Wonderful Barn is as much a symbolic linkage as it is an actual view. The grandly scaled designed historic landscape of the Castletown Demesne is of national significance, and represents the wealth and influence of William Connolly, one of Irelands most ambitious and influential citizens of the first half of the C18th. The designed landscape of the Demesne around his palatial Castletown House mansion made use of long vistas and tree-lined allees to reach out to the surrounding countryside. As depicted in *John Rocques Map of County Dublin, 1760s*, there was no tree-lined link between Castletown House and the Wonderful barn at that date, however a double row of trees had been planted over at least part of that alignment by the late C18th, as shown on Taylor's Map. The Wonderful Barn was commissioned by the widow of William Connolly to help create employment during the terrible famine of 1747, and its placement on the axis with the side eievation of the mansion must have been intentional, and the gradual planting of the wide allee of trees was likewise indicative of a clear intention to like the two structures across the countryside.

Sensitivity

The location of the site of the proposed development would, if it had not already been subject to the development of the currently existing industrial park, be considered to be part of the historical setting of Castletown House. While most of the lands were not owned as part of the Castletown Estate, they contributed to the beautiful rural setting of the fine house and the designed landscape of its demesne.

Facilitation Works

GNI Gas Upgrade

The GNI upgrades will comprise a local upgrade of the gas network over a length of approximately 1.5km, extending from the R148 Station Road and following the Celbridge Road to the KIC lands.

The proposed alignment traverses 3 townlands: Barnhall, Leixlip and Leixlip Demesne in County Kildare.

Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP)

No recorded monuments are located on, or within 100m of the indicative alignment. The Zone of Notification for the Historic Town of Leixlip (KD011-004001) is over 150m to the southeast of the proposed upgrade. (Figure 15.10).

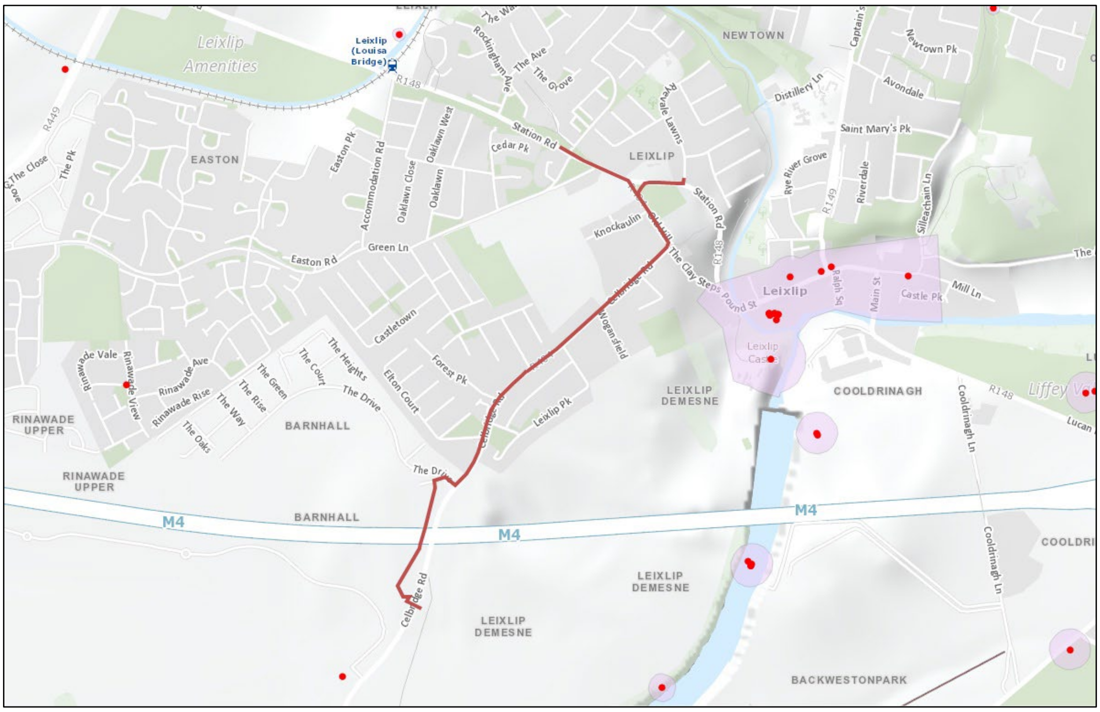

Figure 15.10: Indicative alignment of GNI gas transmission line (in red) relative to recorded monuments (red dots) and associated Zones of Notification (shaded pink)
CYAL50313607
© Ordnance Survey Ireland/Government of Ireland.

Previous Archaeological Investigations

The Excavations Bulletin and the Excavations Database (excavations.ie) list no previous archaeological investigations as having taken place within 100m of the indicative alignment.

Previous Archaeological Artefacts
No findspots of artefacts are provenanced in the topographical files of the National Museum of Ireland to Barnhall, Leixlip or Leixlip Demesne townlands.

EirGrid Uprating
The staged uprating of existing overhead power lines will cover a linear distance of 115.2km, linking the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad. The existing lines traverse counties Kildare, Meath and Offaly, including land forming part of the extensive Bog of Allen. Uprating will involve potential groundworks on the existing lines relating to poleset or tower replacement and/or the provision of temporary access tracks or haul roads, involving heavy machinery use.

National Monuments
Existing overhead power lines in county Offaly, to the west of the village of Rhode, are aligned across Clonin Hill, which is the site of National Monument No. 532, comprising a ring-barrow OF011-001---- and a mass-rock OF011-011001-. National Monument No. 532 is in State ownership (Figure 15.12). In county Kildare, a mortuary chapel (KD008-001007-) in the graveyard at Carbury is a monument vested in the care of Kildare County Council.

Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP)
52 recorded monuments are situated on, or within 50m of existing overhead power lines; 30 monuments in county Kildare, six monuments in county Meath and 16 monuments in county Offaly. These monuments are listed in Table 15.7.

The monuments include sub-surface cropmarks, ranging from single monuments (e.g. ring-ditch ME053-006---- in Meath) to complexes of monuments (e.g. barrow complex in Kilmurry townland in Kildare, KD003-041----, KD003-042----, KD003-043----) to relic field systems and deserted settlement a number of hectares in extent (e.g. deserted medieval settlement at Monasteroris in Offaly, OF011-009006-). The cropmarks associated with the deserted settlement at Monasteroris, situated to the north-west of the town at Edenderry, form part of a broader medieval era landscape containing visible earthworks around a Franciscan Friary (OF011-009001-) and a number of castles, including a motte castle (OF011-010003-) and manorial castle (OF011-011----) (Figure 15.13). Another upstanding complex includes that at Carbury, county Kildare, also the site of a manorial motte castle (KD008-011001-) and Anglo-Norman masonry castle (KD008-001002-) that overlook a parish church (KD008-001005-) and graveyard (KD008-001002-). These monuments are similarly surrounded by an array of cropmarks and earthworks associated with medieval era settlement at Carbury, which continue onto the adjacent Carbury Hill, which contains a number of prehistoric burial monuments.

Upstanding and visible monuments include the remnants of a medieval parish church (ME050-025----) within a rectangular graveyard defined by masonry walls (ME050-025001-) in Salestown, county Meath. A second medieval parish church (KD011-002003-) and graveyard (KD011-002004-) is situated in Kilmacredock Upper townland, county Kildare, although sited within a much larger and less visible sub-circular enclosure (KD011-002001-) representing a possible early monastic site; the existing overhead power line in Kilmacredock Upper townland is aligned within 50m of the north side of the ecclesiastical enclosure rather than the visible church and graveyard.

At Drehid, county Kildare, existing overhead power lines traverse a large expanse of bog containing records of unclassified togher roads (e.g. KD008-026----). Toghers are peatland trackways or causeways constructed of wood that can range in date from prehistory to the medieval period, and survive owing to the special preservation conditions within peat. A second togher in Drehid, KD008-025----, may have run for *c.* 2,200m from dry ground in Drehid at the north-west, across the bog to Drumachon 'island' in Timahoe East townland to the south-east. In this scenario, the existing overhead power line crosses the line of the togher in Timahoe East townland (Figure 15.14). Areas of bogland traversed by the existing overhead power lines have inherent sub-surface archaeological potential. Bogland is also traversed at Carbury and Ardkill, part of Carbury Bog, county Kildare.

SMR No	Class	Townland	ITM Easting	ITM Northing
KD002-006----	Ritual site - holy well	Grange West	661292	737099
KD002-016----	Enclosure	Kinnafad	662530	737002
KD003-017----	Castle - tower house	Clonagh (Cadamstown Ed)	672442	739006
KD003-017002-	Armorial plaque	Clonagh (Cadamstown Ed)	672434	739009
KD003-017003-	Architectural fragment	Clonagh (Cadamstown Ed)	672434	739009
KD003-041----	Enclosure	Kilmurry (Donadea Ed)	674808	738618
KD003-042----	Barrow - unclassified	Kilmurry (Donadea Ed)	674815	738556
KD003-043----	Barrow - unclassified	Kilmurry (Donadea Ed)	674886	738614
KD008-001001-	Castle - motte	Carbury	668590	735099
KD008-001002-	Castle - Anglo-Norman masonry castle	Carbury	668618	735097
KD008-001003-	House - fortified house	Carbury	668625	735099
KD008-001004-	Designed landscape feature	Carbury	668624	735082
KD008-001005-	Church	Carbury	668630	735002
KD008-001006-	Graveyard	Carbury	668627	734989
KD008-001007-	Mausoleum	Carbury	668627	734989
KD008-001008-	Wall monument	Carbury	668627	734990
KD008-001009-	Wall monument	Carbury	668627	734990
KD008-001010-	Wall monument	Carbury	668627	734990
KD008-017----	Enclosure	Ardkill	671365	734896
KD008-044----	Barrow – ditch barrow	Ardkill	670990	734981
KD008-025----	Road - unclassified togher	Drehid	674854	734147
KD008-026----	Road - unclassified togher	Drehid	674714	733717
KD009-037----	Barrow - unclassified	Donadea	684654	734242
KD011-002----	Ecclesiastical site	Kilmacredock Upper	697235	735853
KD011-002001-	Ecclesiastical enclosure	Kilmacredock Upper	697235	735853
KD011-002002-	Road - road/trackway	Kilmacredock Upper	697180	735819

SMR No	Class	Townland	ITM Easting	ITM Northing
KD011-002003-	Church	Kilmacredock Upper	697231	735837
KD011-002004-	Graveyard	Kilmacredock Upper	697232	735831
KD011-008----	Ringfort - rath	Ballygoran	694991	735079
KD011-009----	Ringfort - rath	Griffinrath	694943	734966
ME049-018----	Field system	Calgath	689241	741855
ME050-023----	Enclosure	Kilgraigue	696025	740779
ME050-025----	Church	Salestown	696925	740413
ME050-025001-	Graveyard	Salestown	696927	740421
ME052-001----	Ringfort - rath	Harristown (Moyfenrath Upper By.)	660552	739213
ME053-006----	Ring-ditch	Bogganstown (Dunboyne By.)	697945	739966
OF011-001----	Barrow - ring-barrow	Clonin	652592	733749
OF011-001001-	Mass-rock	Clonin	652574	733738
OF011-001002-	Barrow - ring-barrow	Clonin	652556	733827
OF011-008----	Ritual site - holy well	Monasteroris	660793	733309
OF011-009001-	Religious house - Franciscan friars	Monasteroris	660897	733293
OF011-009002-	Graveyard	Monasteroris	660902	733283
OF011-009003-	Headstone	Monasteroris	660897	733284
OF011-009004-	Headstone	Monasteroris	660894	733282
OF011-009005-	Headstone	Monasteroris	660898	733282
OF011-009006-	Settlement deserted - medieval	Monasteroris	660790	733227
OF011-009007-	Font	Monasteroris	660897	733293
OF011-010001-	Castle - motte	Monasteroris	660946	733449
OF011-010003-	Dovecote	Monasteroris	660944	733450
OF011-011----	Castle - unclassified	Monasteroris	661010	733417
OF011-055----	Barrow - ring-barrow	Ballymoran	655059	734277
OF012-001----	Castle - unclassified	Monasteroris	661129	733229

Table 15.7: Recorded monuments within 50m of existing overhead power lines.

Figure 15.11: Existing overhead power line (*in pink*) relative to recorded monuments (*orange dots*) and associated Zones of Notification (*shaded yellow*) in Clonin townland near Rhode village, Offaly (50m radius to either side of power line shown *in green*).

Figure 15.12: Existing overhead power line (*in pink*) relative to recorded monuments (*orange dots*) and associated Zones of Notification (*shaded yellow*) associated with a deserted medieval settlement at Monasteroris near Edenderry, Offaly (50m radius to either side of power line shown *in green*).

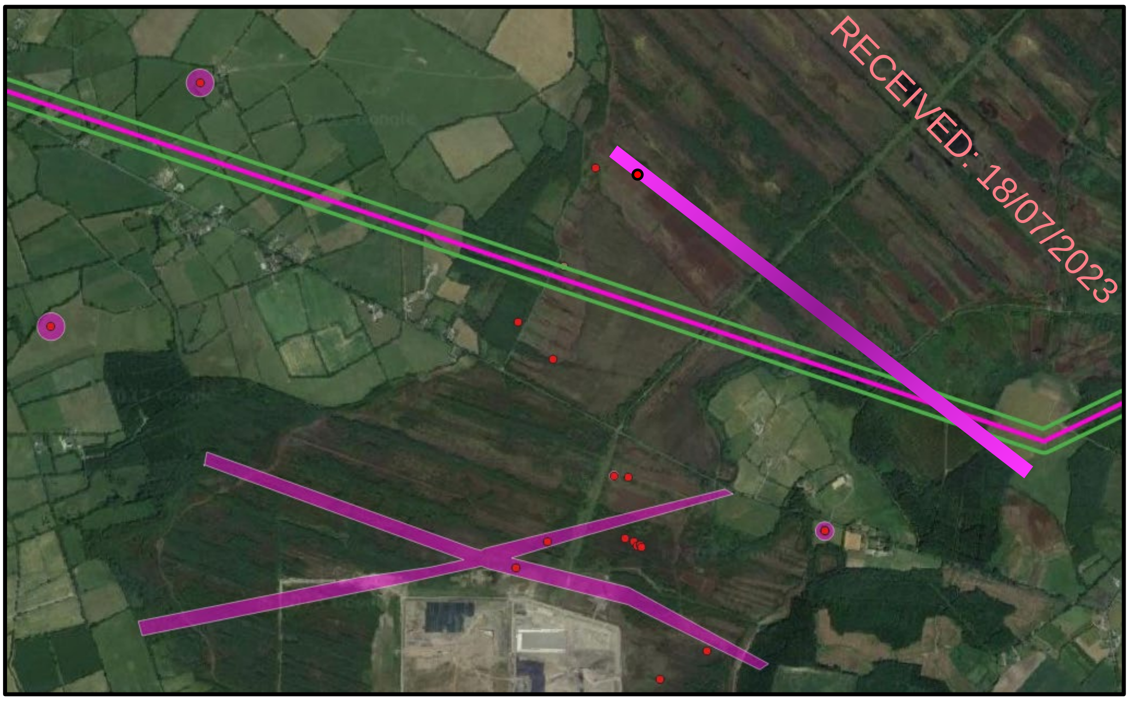

Figure 15.13: Existing overhead power line (*in pink*) relative to recorded togher monuments (*red dots*) and associated Zones of Notification (*shaded purple*) in bogland in Drehid and Timahoe East townlands, Kildare (50m radius to either side of power line shown *in green*).

15.4.2 Likely Future Receiving Environment ('Do Nothing' Scenario)

In the event of a 'Do Nothing' scenario, the site would remain in operation as an existing ICT campus. It is predicted that there would not be significant development or large scale bulk excavation at the KIC lands in the event of a Do Nothing Scenario, or any requirement for facilitation works related groundworks.

15.5 Likely Impacts of the Project

15.5.1 Construction Phase

Principal Works

The KIC lands are largely developed and landscaped lands, with existing buildings centrally focussed and surrounded by a greenfield periphery. A monument recorded in the SMR, *fulacht fiadh* KD011-062----, was exposed and removed by archaeological excavation as part of Hewlett Packard Campus development. The site of the monument is not on the statutory RMP and is not scheduled for inclusion in the next revision of the RMP. As such, the monument is not listed in Appendix 5, Record of Monuments and Places, of the Kildare County Development Plan 2023-2029. No other recorded monuments are present on the KIC lands, and no construction phase impact on recorded monuments or known archaeology is predicted.

The record of a previously unknown monument, *fulacht fiadh* KD011-062----, along with the recovery of stray archaeological artefacts - a stone axe and a flint blade - from topsoil at the site during archaeological mitigation as part of the Hewlett Packard Campus development demonstrates the potential for buried archaeology - particularly of prehistoric date - to survive *in-situ* below the ground. A probably Viking grave, which included human remains and grave goods, is also provenanced to Barnhall townland. While the Wonderful Barn has been cited as a tentative location for the burial, the exact location is not known. These factors, when combined with the proximity of the KIC lands to the 15^{th} century landscape associated with the Dongan family castle (KD011-023----) in Castletown Demesne, and with the River Liffey, which will have acted as a focus of settlement related activities from prehistory, indicate that greenfield areas at the KIC lands that have not been subject to previous archaeological mitigation have archaeological potential. The construction phase will have a direct, negative impact on the inherent archaeological potential of the KIC lands. Greenfield areas have a low sensitivity rating and the effect on inherent archaeological potential is of slight significance.

Remnant elements of an agricultural land use that preceded the Hewlett Packard Campus development survive as partial enclosed fields, notably from the north-west to south-west side of the KIC lands. Hedgerow field boundaries also function as physical townland boundaries, with remnant sections of the Rinawade Upper, Rinawade Lower and Parsonstown townland boundaries surviving to the north-west, with more fragmented sections of the Rinawade Lower and Parsonstown townland boundary surviving to the west and south-west. The construction phase will have a direct, negative impact on townland boundaries on the KIC lands. As locally important elements of the cultural landscape, townland boundaries have a low sensitivity rating and a medium magnitude of change, so that the effect arising from development is of slight significance.

The KIC lands contained a late 18^{th}/early 19^{th} century residence, initially called Parsonstown and changed to Barn Hall, which was used as part of the Irish Meat Packer's complex and removed prior to the Hewlett Packard Campus development. There is no evidence that this element of the historic landscape was subject to mitigation as part of the Hewlett Packard Campus development. The site of the former residence is beneath the proposed Phase 2 A2 building, and the construction phase will have a direct, negative impact on potential below ground remains. In the absence of any evidence of known sub-surface archaeology associated with the former residence, the site has a low sensitivity rating and the effect on the archaeological potential of the site is of slight significance.

Facilitation Works

GNI Gas Upgrade

There are no recorded monuments on or within 100m of the enhanced gas connection alignment G, and no construction phase impact on recorded monuments or known archaeology is predicted.

EirGrid Uprating

52 recorded monuments are situated on, or within 50m of existing overhead power lines. Of these, existing polesets/towers are currently sited either on, or in the Zone of Notification of 12 monuments. In Salestown, county Meath, an existing poleset/tower is sited in the Zone of Notification for church ME050-025---- and graveyard ME050-025001-. In association with a deserted medieval settlement OF011-009006- at Monasteroris near Edenderry, Offaly polesets/towers are sited in the northern extent of the Zone of Notification. In Carbury, county Kildare a poleset/tower is sited in the centre of the Zone of Notification associated

with a complex of monuments that include Carbury Castle KD008-001002-. In Drehid, county Kildare, polesets/towers are sited in the Zone of Notification associated with a bogland togher KD008-025----. In Ballygoran townland, county Kildare, an existing tower is sited in ringfort KD011-008----. Potential direct, negative and significant impact may arise in the event of uprating groundworks at, or in proximity of a recorded monument.

Bogland zones are highlighted as areas of inherent archaeological potential, owing to the special preservation conditions within peat. In county Kildare, existing overhead power lines traverse Carbury Bog in Carbury and Ardkill townlands, and a larger expanse of bogland through Drehid and Timahoe East townlands, parts of the once more extensive Bog of Allen. Potential direct, negative and significant impact may arise in the event of uprating groundworks in bogland.

As the required uprating works have yet to be established, a more definite statement of likely significant impacts is not possible.

15.5.2 Operational Phase

No likely impacts on archaeological and cultural heritage are predicted during the operational phase.

15.6 Mitigation Measures and Monitoring of Impacts

Mitigation measures are required to be undertaken in compliance with national policy guidelines and statutory provisions for the protection of archaeology and cultural heritage and in accordance with Codes of Practice agreed between the Minster (Department of Housing, Local Government and Heritage) and relevant State infrastructure providers. Mitigation methodologies shall be agreed in advance with the National Monuments Service (Department of Housing, Local Government and Heritage) and the National Museum of Ireland in accordance with archaeological licensing requirements. Archaeological mitigation will ensure the full recognition of, and proper excavation and recording of archaeological features, deposits and objects in the event any material remains are exposed in consequence of development. In respect of the KIC lands, mitigation shall apply to greenfield that has not been subject to previous archaeological mitigation; these areas are shown on Figure 15.7.

15.6.1 Construction Phase

Principal Works

To mitigate the inherent potential of greenfield at the KIC lands that have not been subject to prior archaeological mitigation as part of the Hewlett Packard Campus development, and in keeping with best archaeological practice, an archaeological geophysical survey shall be carried out in undeveloped greenfield pre-construction. Geophysical survey, which is a non-invasive investigative technique, allows for the early identification and further investigation of potential sub-surface archaeology. The survey, for example, would identify if any structural or other material remains associated with the former Parsonstown (re-named Barn Hall) residence are present at the site. The early identification and investigation of any archaeology will minimise any construction delays that may otherwise occur in the event of an archaeological discovery. Geophysical survey shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

Geophysical survey shall be followed by a programme of pre-construction archaeological test-excavation. Test-excavation involves the machine excavation of linear test trenches using a flat bladed bucket to the depth of either undisturbed natural subsoil or to the upper horizons of archaeological features or deposits (where present). Test-excavation will take place at locations chosen by a suitably qualified archaeologist, taking account of the results of the geophysical survey, and targeting any anomaly of potential archaeological origin. The chosen test trench array shall also target surviving hedgerow representing townland boundary alignments at the site. The aim of test-excavation is to identify the nature, depth, extent and significance of any archaeological remains. In the event of the discovery of archaeological features or deposits, the remains will be cleaned, recorded, photographed and left *in-situ* until a decision on any future mitigation is approved by the National Monuments Service and the National Museum of Ireland. Test-excavation shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

A requirement for construction phase groundworks monitoring at the KIC lands shall be subject to the outcome of the geophysical survey and test-excavation. In the event of archaeological monitoring, this work shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

With respect to Built Heritage, during the construction stage, there will be temporary fencing, hordings, temporary services, and creation of dust and noise during the actual construction activities. These impacts will be temporary, and will be a short term annoyance to residents of nearby houses and workers in nearby offices and workplaces.
During the construction phase, all existing trees that currently form the grand allee of the Protected View Corridor, will be protected by site fencing, to prevent damage from construction activities, and damage to the ground by compaction and damage to roots.

Facilitation Works

The Codes of Practice agreed between the Minister (Department of Housing, Local Government and Heritage) and the State infrastructure providers implementing the required facilitation works will be implemented, and the mitigation strategy for the facilitation works determined as part of this process. EirGrid will also carry out uprating requirements as per the Cultural Heritage Guidelines for Electricity Transmission Projects (2015). As per the guidelines (pg. 81) “Any works (including access tracks) that are located in a sensitive cultural heritage zone, or in proximity to a cultural heritage asset, will require monitoring by a suitably qualified archaeologist and consultation with the relevant authorities”.

Any consents required for the GNI Gas Upgrade and EirGrid Uprating will be sought by GNI and EirGrid and required detailed assessment of the consent application will be undertaken at that time.

15.6.2 Operational Phase

On completion of the proposed development, there will be an increased number of large commercial and industrial structures within the development area, including new roads, carparks, public services and cycleways. Compared to the current baseline situation, there will be an increase of pedestrians and cyclists passing through and across the Protected View Corridor.

During the operation phase of the project, when all roads, paths, external lighting and services have been installed, and when the primary structures have been built and occupied for use, a campus-wide plan for the maintenance of the landscaping assets will be followed. This plan will include maintenance and protection of the grant allee of trees that form the structure of the Protected View Corridor, and all landscaping that has been created to visually screen the proposed development's buildings and other man-made landscape features from view from the vantage points of the top of the Wonderful Barn and from the gable end windows in Castletown House.

No likely impacts on archaeological heritage are predicted during the operational phase, and subsequently, no mitigation measures are required in relation to archaeology and cultural heritage during the operational phase.

15.7 Likely Cumulative and Interaction Impacts of the Project

15.7.1 Cumulative Impacts

Construction groundworks associated with all permitted development can have an effect on hitherto unknown sub-surface archaeological material remains and on the preceding cultural landscape. If sub-surface archaeological remains are preserved by excavation and recording, or cultural landscape features such as physical townland boundaries are removed, the remains/features are permanently removed from the archaeological and cultural heritage landscape. The more extensive the area of ground to be disturbed as a result of permitted development, the greater the risk of exposing and negatively impacting sub-surface remains and the greater the modification of the cultural heritage landscape.

There is a potential incremental cumulative effect on sub-surface archaeological remains in consequence of the scale of the required excavations of the project. The predicted significance of the effect on potential sub-surface archaeological remains inherent in greenfield has been identified as slight.

There is an incremental cumulative effect on the cultural landscape, namely in the removal of hedgerow where it represents physical townland boundary alignments. Townland boundaries are an undesignated cultural heritage asset, and most of the northern and western alignment of the Parsonstown boundary has been removed in consequence of developments at the KIC lands since the mid-1990s. The current remaining physical townland boundary alignments at the KIC lands are shown on Figure 15.7. The predicted significance of the effect on townland boundaries has been identified as slight.

During the construction phase, the protection of the existing trees that are planted along the path of the protected view corridor will of paramount importance. Virtually all of these trees were planted approximately twenty years ago when the Hewlet Packard campus was originally developed. Some of those trees have not survived and others will no doubt require replacement due to natural loss poor growth. During the construction phase, it a programme of protection measures will be included in the contract documents, to prevent any enroachment into the root zone of the trees, to avoid damage to the roots or compaction of the ground.

15.7.2 Interaction Impacts

No likely significant interaction effects in respect of archaeology and cultural heritage are predicted. There is no recorded monument or associated setting and amenity value which may interact with landscape and visual impacts.

15.8 Mitigation Measures and Monitoring of Cumulative and Interaction Impacts

15.8.1 Construction Phase

The maintenance of existing hedgerow where it represents physical townland boundary alignments should be maximised where possible at the KIC lands during the construction phase. The hedgerow alignments may be maintained as part of newly landscaped areas of the KIC lands. Townland boundary alignments will be subject to pre-construction archaeological test-excavation as previously outlined in Section 15.6.

There are no further requirements for mitigation measures and monitoring of cumulative and interaction impacts in respect of archaeology and cultural heritage during the construction phase.

15.8.2 Operational Phase

The on-maintenance of existing hedgerow where it represents physical townland boundary alignments should be undertaken during the operational phase.
During the operational phase of the project, a detailed landscape management plan will be prepared, to specify the care and maintenance of all of the trees and other vegetation along the alignment of the protected view corridor.

There are no further requirements for mitigation measures and monitoring of cumulative and interaction impacts in respect of archaeology and cultural heritage during the operational phase.

15.9 Major Accidents and/or Disasters

All archaeological and cultural heritage issues will be resolved at the pre-construction and construction phase, in advance of the operational phase. There is no predicted significant effect on the archaeological and cultural heritage in the event of a major accident and/or disaster.

A potential significant effect on the archaeological resource can arise in the event that unknown archaeology is identified below the ground during mitigation and is preserved *in-situ*. Sub-surface *in-situ* archaeology may be vulnerable or at risk in the event of a major accident and/or disaster.

15.10 Mitigation Measures and Proposed Response to such Emergencies

The National Monuments Service at the Department of Housing, Local Government and Heritage can be contacted to agree an appropriate mitigation response in relation to vulnerable or at risk archaeology in the event of a major accident and/or disaster.

15.11 Residual Impacts

All archaeological and cultural heritage issues will be resolved at the pre-construction and construction phase, in advance of the operational phase. There is no predicted residual effect on the archaeological and cultural heritage resource.

15.12 Difficulties Encountered

No difficulties were encountered in gathering data and assessing archaeological and cultural heritage effects at the KIC lands.

Detail on the facilitation works required to support proposed development at the KIC lands, which are to be undertaken by the relevant statutory undertakers when required, are provided at a high level in this EIAR. In the absence of finalised design and construction detail relating to the provision of a gas transmission line by Gas Networks Ireland (GNI) to the site, the assessment of archaeological and cultural heritage effects in this EIAR could only be provided at a high level. As regards EirGrid uprating, where required works will be established at a future date, no definite statement on likely significant effects could be made in this EIAR. The assessment of effects has been confined to highlighting recorded monuments on, or within 50m of existing overhead power lines.

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maps.archaeology.ie	Historic Environment Viewer
www.excavations.ie	Summary accounts of archaeological investigations
https://heritagemaps.ie	Heritage Council cultural heritage datasets
https://kildarecoco.ie	County Development and Local Area Plans
downsurvey.tchpc.tcd.ie	Historic maps
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https://webapps.geohive.ie/mapviewer	Geohive (aerial photographs)
dcenr.maps.arcgis.com	Open Topographic Data Viewer
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https://digitalarchive.mcmaster.ca	Historic maps
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mubarnhall.com/history	MU Barnhall RFC history
https://intokildare.ie/arthurs-way	Arthur's Way Heritage Trail

16.0 Landscape and Visual Impact Assessment

16.1 Introduction

This chapter of the Environmental Impact Assessment Report has been prepared by AECOM Ireland Ltd. This chapter identifies and assesses the potential effects of the Proposed Development at the Kildare Innovation Campus (within the redline boundary), Leixlip, County Kildare on the landscape and visual resource of the study area. It identifies the mitigation and compensation measures that will be implemented to prevent, reduce or offset potential adverse landscape and visual effects or enhance potential beneficial effects, where possible. In the context of this project 'landscape' includes also sub-urban townscape.

The LVIA chapter is supported by the following documents:

- Appendix 16.1:
  Booklet of Planning Application Photomontages prepared by Innovision Media Ltd
- Appendix 16.2:
  Landscape Designations

Please note that references to landscape designation figure in the text will be made as 'Appendix 16.2'.

Facilitation works required to support proposed development at the KIC lands, namely the provision of an enhanced gas connection by Gas Networks Ireland (GNI) to the site and EirGrid uprating of existing overhead transmission lines to the site have also been considered in the assessment of effects.

16.2 Methodology

This section sets out the methodology for the Landscape and Visual Impact Assessment (LVIA) as a result of the Proposed Development.

16.2.1 Guidance and other Information used in the Landscape and Visual Impact Assessment

- The following sources and guidelines were used in the assessment:
- EPA 'Guidelines on the Information to be contained in Environmental Impact Statements', 2002;
- EPA 'Guidelines on the information to be contained in Environmental Impact Assessment Reports, May 2022;
- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 3rd Edition, 2013, Landscape Institute (UK) & IEMA;
- 'Visual Representation of Development Proposals', Landscape Institute, Technical Guidance Note 06/19, 17 September 2019
- National Parks and Wildlife Service (NPWS), http://www.npws.ie/;
- Sport Ireland: Find your Trails: http://
  www.https://www.sportireland.ie/outdoors/find-your-trails; and
- Ordnance Survey Ireland, 1:50,000 Discovery Mapping;
- Kildare County Development Plan 2023-2029;
- Leixlip Local Area Plan 2020-2023; and
- South Dublin County Council Development Plan 2022-2028.

16.2.2 Landscape and Visual Impact Assessment Criteria

This chapter has been prepared in accordance with the Environmental Protection Agency (EPA) guidance document 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports, May 2022. Good practice guidance, such as the "Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, 2013, Landscape Institute (UK) & IEMA" provide specific guidelines for landscape and visual impact assessments. Therefore, a combination of the EPA guidelines, the Landscape Institute guidelines and professional experience has informed the methodology for the assessment herein. The Landscape Institute guidelines require the assessment to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessment is based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor. For clarity, and in accordance with best practice, the assessment of potential effects on landscape character and visual amenity, although closely related, are undertaken separately.

The assessment acknowledges that landscape and visual effects change over time as the existing landscape external to the Proposed Development evolves, and proposed planting establishes and matures.

The significance of an effect or impact is determined by two distinct considerations:

1. The **Nature** of the receptor likely to be affected, namely:
   - The value of the receptor;
   - The susceptibility of the receptor to the type of change arising from the Proposed Developments; and
   - The sensitivity to change is related to the value attached to the receptor.

2. The **Magnitude** of the effect likely to occur, namely:
   - The size and scale of the landscape and visual effect (for example, whether there is a complete or minor loss of a particular landscape element);
   - The geographical extent of the areas that will be affected; and
   - The duration of the effect and its reversibility
   - The quality of the effect – whether it is neutral, positive or negative

The table below provides the definition of the duration of both landscape and visual effects.

Duration	Description
Temporary	Effects lasting one year or less
Short Term	Effects lasting one to seven years
Medium Term	Effects lasting seven to fifteen years
Long Term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years

Table 16.1: Definition of Duration of Effects

The quality of both landscape and visual effects is defined in the table below.

Quality of Effects	Description
Neutral	This will neither enhance nor detract from the landscape character or view
Positive (Beneficial)	This will improve or enhance the landscape character or view
Negative (Adverse)	This will reduce the quality of the existing landscape character or view

Table 16.2 Definition of Quality of Effects

16.2.3 Assessment Process

The assessment is undertaken based on the following key tasks and structure:

- Establishment of the Baseline or receiving environment;
- Appreciation of the Proposed Development; and
- Assessment of effects.

16.2.4 Establishment of the Receiving Environment

A baseline study has been undertaken through a combination of desk based research and site appraisal in order to establish the existing conditions of the landscape and visual resources of the study area. Desk based research has involved a review of mapping and aerial photography, relevant planning and policy documents, the relevant Landscape Character Assessments and other relevant documents and publications.

16.2.5 Appreciation of the Proposed Development

In order to be able to accurately assess the full extent of likely effects on landscape character and visual amenity it is essential to develop a thorough and detailed knowledge of the Proposed Development. This includes a comprehensive understanding of its location, nature and scale and is achieved through a review of detailed descriptions of the Proposed Development and drawings (see Planning Application Drawings accompanying the application) and an on-site appraisal.

16.2.6 Assessment of Effects

The landscape and visual impact assessment seeks to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessments are based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor.

The assessment acknowledges that landscape and visual effects change over time as the existing landscape internal and external to the Proposed Development evolves. The assessment therefore reports on potential effects during both construction/operation and completion of the Proposed Development. The prominence of the Proposed Development in the landscape or view will vary according to the existing screening effects of local topography, intervening existing vegetation and building structures.

16.2.7 Study Area

The extent of the principal study area comprises the Proposed Development excluding the facilitation works. It was initially informed by a desktop study, which was then verified on site during fieldwork surveys. This included reviews of published landscape character assessments and the wider landscape to identify landscape and visual receptors that have the potential to be affected by the Proposed Development. This process determined a principal study area of 2km from the boundary of the Proposed Development, defined as the extent in which the Proposed Development may result in significant landscape or visual effects.

The facilitation works are at an early planning stage and linear in nature. They will affect existing gas and electricity infrastructure. A study area of up to 200m to either side of the indicative alignment of GNI enhancement works, and up to 500m to either side of the existing overhead lines subject to EirGrid uprating has been considered.

16.2.8 Consultation

Consultee and Date	Consultation matter	Issue Raised	Response / Action taken
Kildare County Council November 2019	Review of a selection of viewpoints for photomontages.	Additional viewpoint request at top of Wonderful Barn Additional viewpoint request at M4 Bridge	Additional viewpoints have been included in the assessment

Table 16.3: Consultation Overview

16.2.9 Temporal Scope

The type and duration of landscape and visual effects falls within two main stages as follows:

Construction (temporary and of short duration)

- Potential physical effects arising from construction of the development on the landscape resource within the development application boundary area;
- Potential effects to landscape character or visual amenity within the wider study area as a result of visibility of construction activities or the development during construction;
- Effects of temporary site infrastructure such as – site traffic; construction compounds; and
- Potential effects of partially built development in various stages of construction.

Operational

- Potential effects of the Proposed Development on landscape resources and landscape character, including the perceptual qualities of the landscape;
- Potential effects of the Proposed Development on views and visual amenity; and
- Potential cumulative effects of the development in combination with other planned and Proposed Developments of a similar type and scale upon the landscape and visual resource of the study area.

16.2.10 Effects Scoped out

The Proposed Development will become a permanent feature in the landscape following the completion and the implementation of landscape mitigation measures. The assessment takes account of this in the determination of residual landscape and visual effects.

16.2.11 Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character. The assessment of landscape effects firstly requires the identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and

- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the Proposed Development during construction and operational phases. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

Landscape Value

Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory and planning agencies. However, absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition is also considered in the determination of the value of a landscape. The evaluation of landscape value is undertaken with reference to the definitions stated in the table below.

Landscape Value	Classification Criteria
High	Nationally designated or iconic, unspoilt landscape with few, if any, degrading elements.
Medium	Regionally or locally designated landscape, or an undesignated landscape with locally important landmark features and some detracting elements.
Low	Undesignated landscape with few if any distinct features or with several degrading elements.

Table 16.4: Landscape Value

Landscape Susceptibility

Landscape susceptibility relates to the ability of a particular landscape to accommodate the Proposed Development. Landscape susceptibility is appraised through consideration of the baseline characteristics of the landscape, and in particular the scale or complexity of a given landscape.

The evaluation of landscape susceptibility is undertaken with reference to a three-point scale, as outlined in the table below.

Landscape Susceptibility	Classification Criteria
High	Small scale, intimate or complex landscape considered to be intolerant of even minor change.
Medium	Medium scale, more open or less complex landscape considered tolerant to some degree of change.
Low	Large scale, simple landscape considered tolerant of a large degree of change.

Table 16.5: Landscape Susceptibility Criteria

Landscape Sensitivity

Landscape sensitivity to change is determined by employing professional judgment to combine and analyse the identified landscape value, quality and susceptibility and is defined with reference to the scale outlined in the table overleaf.

Landscape Sensitivity	Classification Criteria
High	• Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character. • Landscape designated for its international or national landscape value or with highly valued features. • Outstanding example in the area of well cared for landscape or set of features that combine to give a particularly distinctive sense of place. • Few detracting or incongruous elements.
Medium-High	• Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character. • Landscape designated for regional or county-wide landscape value where the characteristics or qualities that provided the basis for their designation are apparent or a landscape with highly valued features locally. • Good example in the area of a well-cared for landscape or set of features that combine to give a clearly defined sense of place.
Medium	• Landscape characteristics or features with moderate capacity to absorb change without fundamentally altering their present character. • Landscape designated for its local landscape value or a regional designated landscape where the characteristics and qualities that led to the designation of the area are less apparent or are partially eroded or an undesignated landscape which may be valued locally – for example an important open space. • An example of a landscape or a set of features which is relatively coherent, with a good but not exceptional sense of place - occasional buildings and spaces may lack quality and cohesion.
Medium-Low	• Landscape characteristics or features which are reasonably tolerant of change without determent to their present character. • No designation present or of little local value. • An example of an un-stimulating landscape or set of features; with some areas lacking a sense of place and identity.
Low	• Landscape characteristics or features which are tolerant of change without determent to their present character. • An area with a weak sense of place and/or poorly defined character /identity. • No designation present or of low local value or in poor condition. • An example of monotonous unattractive visually conflicting or degraded landscape or set of features.

Table 16.6: Landscape Sensitivity to Change Criteria

Magnitude of Landscape Change

Magnitude of change is an expression of the size or scale of change in the landscape, the geographical extent of the area influenced and the duration and reversibility of the resultant effect. The variables involved are described below:

- The extent of existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;

- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones;
- Whether the effect changes the key characteristics of the landscape, which are integral to its distinctive character;
- The geographic area over which the landscape effects will be felt (within the Proposed Development site itself; the immediate setting of the Proposed Development site; at the scale of the landscape type or character area; on a larger scale influencing several landscape types or character areas); and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

Changes to landscape characteristics can be both direct and indirect. Direct change occurs where the Proposed Development will result in a physical change to the landscape within or adjacent to the Proposed Development site. Indirect changes are a consequence of the direct changes resulting from the Proposed Development. They can often occur away from the Proposed Development site (for example, off-site construction staff parking) and may be a result of a sequence of interrelationships or a complex pathway (for example, a new road or footpath construction may increase public access and associated problems e.g. littering). They may be separated by distance or in time from the source of the effects. The magnitude of change affecting the baseline landscape resource is based on an interpretation of a combination of the criteria set out in the table below.

Magnitude of Landscape Change	Classification Criteria
None	• No change.
Negligible	• Little perceptible change.
Low	• Minor change, affecting some characteristics and the experience of the landscape to an extent; and • Introduction of elements that is not uncharacteristic.
Medium	• Noticeable change, affecting some key characteristics and the experience of the landscape; and • Introduction of some uncharacteristic elements.
High	• Noticeable change, affecting many key characteristics and the experience of the landscape; and • Introduction of many incongruous developments
Very High	• Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape; and • Introduction of highly incongruous development.

Table 16.7: Magnitude of Landscape Change Criteria (Landscape Effects)

16.2.12 Visual Effects

Visual effects are determined by the extent of visibility and the nature of the visibility (i.e. how a development is seen within the landscape); for example, whether it appears integrated and balanced within the visual composition of a view or whether it creates a focal point.

Negative visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view.

Visual effects may also be beneficial, where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

Receptors

For there to be a visual impact, there is the need for a viewer. Views experienced from locations such as settlements, recognised routes and popular vantage points used by the public have been included in the assessment. Receptors are the viewers at these locations. The degree to which receptors, i.e. people, will be affected by changes as a result of the Proposed Development depends on a number of factors, including:

- Receptor activities, such as taking part in leisure, recreational and sporting activities, travelling or working;
- Whether receptors are likely to be stationary or moving and how long they will be exposed to the change at any one time;
- The importance of the location, as reflected by designations, inclusion in guidebooks or other travel literature, or the facilities provided for visitors;
- The extent of the route or area over which the changes will be visible;
- Whether receptors will be exposed to the change daily, frequently, occasionally or rarely;
- The orientation of receptors in relation to the Proposed Development and whether views are open or intermittent;
- Proportion of the developments that will be visible (full, sections or none);
- Viewing direction, distance (i.e. short-, medium- and long-distance views) and elevation;
- Nature of the viewing experience (for example, static views, views from settlements and views from sequential points along routes);
- Accessibility of viewpoint (public or private, ease of access);
- Nature of changes (for example, changes in the existing skyline profile, creation of a new visual focus in the view, introduction of new man-made objects, changes in visual simplicity or complexity, alteration of visual scale, landform and change to the degree of visual enclosure); and
- Nature of visual receptors (type, potential number and sensitivity of viewers who may be affected).

Value of the View

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey of tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. The value of the view is determined with reference to the definitions outlined in the table below.

Value	Classification Criteria
High	Nationally recognised view of the landscape, with no detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.
Low	Typical or poorly composed view often with numerous detracting elements.

Table 16.8: Value of the View

Visual Susceptibility

The GLVIA guidelines identify that the susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

For example, residents in their home, walkers whose interest is likely to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience often indicate a higher level of susceptibility. Whereas receptors occupied in outdoor sport, where views are not important, or at their place of work, are often considered less susceptible to change. Visual susceptibility is determined with reference to the three-point scale and criteria outlined in the table below:

Susceptibility	Classification Criteria
High	Receptors for which the view is of primary importance and are likely to notice even minor change.
Medium	Receptors for which the view is important but not the primary focus and are tolerant of some change.
Low	Receptors for which the view is incidental or unimportant and is tolerant of a high degree of change

Table 16.9: Visual Susceptibility

Visual Sensitivity

Sensitivity to change considers the nature of the receptor; for example, a person occupying a residential dwelling is generally more sensitive to change than someone working in a factory unit. The importance of the view experienced by the receptor also contributes to an understanding of the susceptibility of the visual receptor to change as well as the value attached to the view.

A judgement is also made on the value attached to the views experienced. This takes account of:

- Recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations;
- Indicators of the value attached to views by visitors, for example through appearance in guidebooks or on tourist maps, provision of facilities for their enjoyment (sign boards, interpretive material) and references to them in literature or art; and
- Possible local value; it is important to note that the absence of view recognition does not preclude local value, as a view may be important as a resource in the local or immediate environment due to its relative rarity or local importance.
- The visual sensitivity to change is based on interpretation of a combination of all or some of the criteria outlined in the table overleaf.

Visual Sensitivity	Classification Criteria
High	• Users of outdoor recreational facilities, on recognised national cycling or walking routes or in nationally designated landscapes. • Residential buildings.
Medium-high	• Users of outdoor recreational facilities, in highly valued landscapes or locally designated • landscapes or on local recreational routes that are well publicised in guidebooks. • Road and rail users in nationally designated landscapes or on recognised scenic routes, likely to be travelling to enjoy the view.
Medium	• Users of outdoor recreational facilities including public open space in moderately valued landscapes. • Users of primary transport road network, orientated towards the Proposed Development, likely to be travelling for other purposes than just the view.
Medium-Low	• People engaged in active outdoor sports or recreation and less likely to focus on the view. • Primary transport road network and rail users likely to be travelling to work with oblique views of the project or users of minor road network.
Low	• People engaged in work activities indoors, with limited opportunity for views of the Proposed Development.

Table 16.10: Sensitivity to Change Criteria

Magnitude of Visual Change

Visual effects are direct effects as the magnitude of change within an existing view will be determined by the extent of visibility of the Proposed Development. The magnitude of the visual effect resulting from the development at any particular viewpoint or receptor is based on the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the development;
- The degree of contrast or integration of any new features or changes in the landscape form, scale, mass, line, height, skylining, back-grounding, visual clues, focal points, colour and texture;
- The nature of the view of the Proposed Development, in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpses;
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the development and the extent of the area over which the changes will be visible; and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

The magnitude of visual effect resulting from the development at any particular viewpoint or receptor is based on the interpretation of the above range of factors and is set out in the table overleaf.

Magnitude of Visual Change	Classification Criteria
None	No change in the existing view.
Negligible	The development will cause a barely discernible change in the existing view.
Low	The development will cause very minor changes to the view over a wide area or minor changes over a limited area.
Medium	The development will cause modest changes to the existing view over a wide area or noticeable change over a limited area.
High	The development will cause a considerable change in the existing view over a wide area or a significant change over a limited area.
Very High	The development will cause significant changes in the existing view over a wide area or a change which will dominate over a limited area.

Table 16.11: Magnitude of Visual Change Criteria (Visual effects)

16.2.13 Significance Criteria

The objective of the assessment process is to identify and evaluate the potentially significant effects arising from the Proposed Development. The assessment will identify the residual effects likely to arise from the finalised design taking into account mitigation measures and the change over time.

The significance of effects is assessed by considering the sensitivity of the receptor and the predicted magnitude of effect in relation to the baseline conditions. In order to provide a level of consistency and transparency to the assessment and allow comparisons to be made between the various landscape and visual receptors subject to assessment, the assessment of significance is informed by pre-defined criteria as outlined in the table below. When assessing significance, individual effects may fall across several different categories of significance and professional judgement is therefore used to determine which category of significance best fits the overall effect to a landscape or visual receptor.

The significance of the effects can be adverse (negative) or beneficial (positive) according to the definitions set out in the table overleaf.

Significance Category	Description of Effect
Profound	An effect that obliterates sensitive characteristics within the landscape and/or visual environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters most of a sensitive aspect of the landscape and/or visual environment.
Significant	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the landscape and/or visual environment.
Moderate	An effect that alters the landscape in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the landscape and/or visual environment without affecting its sensitivities.

Not Significant	An effect which causes noticeable changes in the landscape and/or visual environment but without significant landscape and/or visual consequences.
Imperceptible	An effect capable of measurement but without significant landscape and/or visual consequences.

Table 16.12: Categories of Significance of Landscape and Visual Effects

The significance of the effect is determined by considering the magnitude of the effect and the quality of the baseline environment affected by the Proposed Development. The basis for consideration of the significance of effects is included below.

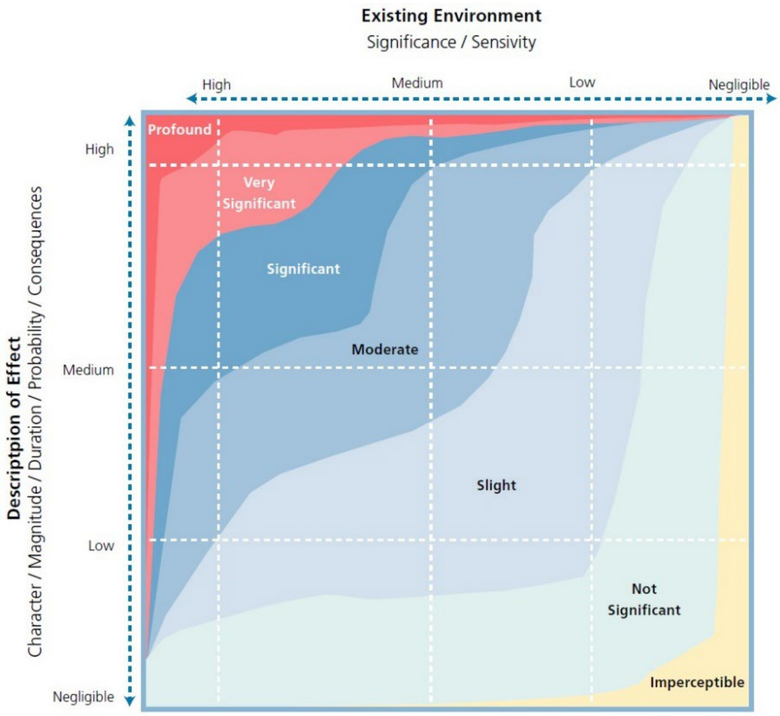

Image 16-1 *Basis for consideration of significance of effects*[1]

Effects will be assessed for all phases of the Proposed Development. Construction effects are considered to be temporary, short term effects which occur during the construction/decommission phase only. Operational/residual effects are those long term effects, which will occur as a result of the presence or operation of the development.
The quality of each effect is based on the ability of the landscape character or visual receptor to accommodate the Proposed Development, and the impact of the development within the receiving context. Once this is done, the quality of the effect is then assessed as being neutral, beneficial or adverse. A change to the landscape or visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation.

16.2.14 Cumulative Effects

In addition to townscape and visual effects, it is also important to consider potential cumulative effects. The approach used to determine cumulative effects has drawn on

[1] Environmental Protection Agency (EPA) 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports', May 2022. Available online at https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php

guidance on cumulative impact assessment published by the GLVIA3. Cumulative townscape and visual effects may result from additional changes to the baseline townscape or views as a result of the Proposed Development in conjunction with other developments of a similar type and scale.
The cumulative assessment includes developments that are consented but not constructed, that are the subject of undetermined applications, or are currently at scoping stage, and which are similar in type and scale to the Proposed Development.

Magnitude of Cumulative Effects
The principle of magnitude of cumulative effects makes it possible for the proposed scheme to have major effects on a particular receptor, while having only minor cumulative effects in conjunction with other existing developments.

The magnitude of cumulative effects arising from the proposed scheme is assessed as **Very High, High, Medium, Low or Negligible**, with intermediate categories, based on interpretation of the following parameters:

- The additional extent, direction and distribution of existing and other developments in combination with the Proposed Development;
- The distance between the viewpoint, the Proposed Development and the cumulative developments; and
- The townscape setting, context and degree of visual coalescence of existing and Proposed Development and cumulative developments.

Significance of Cumulative Effects
As for the assessment of landscape and visual effects, the significance of any cumulative effects follows a same classification as illustrated in Image 16-1 - Basis for consideration of significance of effects, in Section 16.2.13 above, and will be assessed as **Profound, Very Significant, Moderate, Slight, Not Significant, Imperceptible**.

Limitations of Cumulative Effects
The cumulative assessment focuses on potential cumulative effects relating to the main permanent structure of each cumulative development. This is due to the uncertainty of the timing of construction activities for each of the identified developments. As a result, temporary structures and activity relating to construction have not been considered within the cumulative assessment.

16.2.15 Fieldwork
A site survey was carried out in October 2019, May 2020 and January 2023. The survey examined the potential visibility of the Proposed Development within the study area and the wider landscape, taking into account topography, existing screening vegetation and other localised factors. Facilitation works required to support the Proposed Development at the KIC lands, being at an early stage in planning, were not subject to an on-site survey.

16.2.16 Selection of Viewpoints
Viewpoint selection has been carried out according to the current good practice standards and the following industry guidelines:

- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA3), 3rd Edition, 2013, Landscape Institute (UK) & IEMA.

It is not feasible to take photography from every possible viewpoint located in the study area. Photography has been taken from viewpoints, which are representative of the nature of visibility at various distances and in various contexts. Viewpoint photography is used as a tool to come to understand the nature of the potential residual effects. The selection process of viewpoint locations is as follows:

- The location of viewpoints within the study area is informed by desktop and site surveys;
- Identification and selection of representative viewpoints showing typical open or intermittent views within a local area, which will be frequently experienced by a range of viewers; and
- Identification and selection of specific viewpoints from key viewpoints in the landscape such as routes or locations valued for their scenic amenity, main settlements etc.

16.2.17 Photomontages

Photomontages are photorealistic visualisations produced using specialist software. They illustrate the likely future appearance of the Proposed Development from a specific viewing point. They are useful tools for examining the impact of the development from a number of critical viewpoint positions along the public road network within the study area.

However, photomontages in themselves can never provide the full picture in terms of potential effects, they can only inform the assessment process by which judgements are made. A visualisation can never show exactly what the Proposed Development will look like in reality due to factors such as; different lighting, weather and seasonal conditions which vary through time and the resolution of the image. As the photomontages are representative of viewing conditions encountered, some of them may show existing buildings or vegetation screening some or all parts of the developments. Such conditions are normal and representative.

The images provided give a reasonable impression of the scale of the development and the distance to the development but can never be 100% accurate. It is recommended that decision-makers and any interested parties or members of the public should ideally visit the viewpoints on site, where visualisations can be compared to the ‘real life’ view, and the full impact of the Proposed Development can be understood.

The landscape and visual impact assessment on site identified a range of viewpoints located within the study area at varying distances from the Proposed Development to show the effect of the development in key close, middle and distant views.

Viewpoints / Photomontages 1-17 show the Proposed Development including the following information for each:

- **Existing View** - Showing the baseline image; and
- **Photomontage** - Showing the Proposed Development including all visible components including landscape mitigation measures after 7-9 years;

A red wireline indicates non-visible elements of the Proposed Development where relevant.

Photomontage images have been produced with reference to best practice and the following industry guidelines:

- 'Visual Representation of Development Proposals', Landscape Institute, Technical Guidance Note 06/19, 17 September 2019;
- Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition, Landscape Institute and Institute of Environmental Management and Assessment, IEMA, 2013; and
- Visual Representation of Wind Farms, Version 2.2, Scottish Natural Heritage, February 2017 (in relation to viewpoint selection, technical equipment, function and limitations of visualisations).

16.3 Project Description

The Davy Platform ICAV for and on behalf of the Liffey Sub-Fund intends intend to apply for a 10-year planning permission for development at this site of c. 72.23 hectares at Kildare Innovation Campus (KIC) (formerly known as the Hewlett Packard Campus) Barnhall Road, Leixlip, Co. Kildare, W23 X93P and including lands within the M4 and Barnhall Meadows. The overall development site includes lands in the ownership of Kildare County Council (c.1.93ha). The site is principally bounded by the M4 Motorway and Barnhall Meadows to the north; Celbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west. The development will consist of:

- Demolition of existing Buildings No's 7, 8 and 9 (total gfa c. 84,838sqm).
- Existing Buildings No's 1 – 6 will be retained for deep tech and innovation related uses (total gfa c. 42,862sqm)
- Construction of 2 no. new deep tech buildings and 4 no. new data centre buildings, all including ancillary office spaces. The deep tech buildings will have an overall maximum height of c.16m and vary in size from 30,945sqm – 40,190sqm with a combined total gfa of c. 72,135 sqm. The data centres will be c.15 m in height to parapet and c.16.5m in height to top of roof plant screening. The data centres will vary in size from 13,225 sqm – 21,000 sqm with a combined total gfa of c. 76,225sqm. All buildings will be provided with Solar PV panels at roof level and green walls along selected elevations.
- The new deep tech buildings (A1 & A2) will be provided with service yard areas, loading docks, car parking, access roads, security fencing/gates and landscaping. The deep tech buildings will include rainwater harvesting tanks and green roofs over office areas.
- Each data centre (B1, C1, C2 & C3) will include data halls, admin blocks (comprising offices, breakroom, loading dock, storage, and ancillary areas) and a variety of mechanical and electrical plant areas/structures including battery storage rooms and mechanical rooms. Car parking, access roads, security fencing/gates, gate houses and landscaping will also be provided.
- B1 will include 14 no. fuel oil generators, MV rooms and associated mechanical flues. C1 – C3 will each include 22 no. fuel oil generators, MV rooms and associated mechanical flues (each c.18.6m high). Car parking, access roads, security fencing/gates, gate houses and landscaping will also be provided.
- 2 no. district heating pump house areas and inground piping for district heating system.
- Construction of a Replacement 110kV Gas Insulated Switchgear (GIS) Substation adjacent to the existing 110kV Rinawade Substation. The current Air Insulated

Switchgear (AIS) substation known as the Rinawade 110kV sub is fed by 2 x 110kV Overhead lines. The new substation will connect to these overhead lines via short runs of underground cable. The replacement 110kV substation will include 6 No. transformers, with client control building and a 2 storey GIS substation building within a 2.4m high fenced compound.

- Decommissioning and removal of the existing 110kV Rinawade substation.
- Construction of an on-site energy centre to provide dispatchable power to the national electrical grid. The Energy Centre will include 9 no. gas powered combustion turbine generators (CTG's) and 9no. flues with a maximum height of c.15 metres. The turbines will be enclosed by a screen wall c.14m in height. The energy compound will include all required infrastructure including 2no. back-up fuel oil (HVO) tanks, an administration building, pump house, fire water tank, access roads, 14no. parking bays, security fencing etc.
- Provision of a Gas Networks Ireland (GNI) gas skid surrounded by a 2.4m high fence and access from Celbridge Road (R404). The GNI skid will replace the existing gas skid along Celbridge Road.
- Provision of a GNI AGI (Above Ground Installation) including 1no. kiosk building, c3.2m high, surrounded by a 2.4m high fence.
- Closure of the existing main entrance to the campus on Celbridge Road and reinstatement of the boundary.
- Construction of a new signalised entrance/exit on Celbridge Road c. 80metres north of the existing main entrance.
- Use of the existing secondary entrance/exit off Barnhall Road Roundabout in the south-east as a principal entry/exit.
- Construction of internal access roads, footpaths and cycle paths including a publicly accessible link road between Celbridge Road (R404) to the east and Barnhall Road (R449) to the west.
- Construction of a new pedestrian and cycle overpass across the M4 motorway and pedestrian/cycle path adjacent to lands known as The Wonderful Barn Allotments; the overpass will link the new publicly accessible link road within Kildare Innovation Campus to the entrance of Barnhall Meadows estate.
- Undergrounding and diversion of the existing overhead 10 kV/20 kV overhead line adjacent to the M4 motorway.
- The pedestrian and cycle route within the Kildare Innovation Campus will provide a link from the new public link road, along the protected view corridor (between Castletown Estate & Wonderful Barn) to the north-eastern boundary of Castletown Estate.
- The provision of a net increase of 678 new car spaces, resulting in a total of 2291 car spaces across the site (including a total of 244 EV car spaces).
- The provision of a new private EV Bus charging hub with parking for 10no. electric buses.
- The provision of a net increase of 310 new bicycle spaces, resulting in a total of 350 bicycle spaces across the site.
- The diversion of the c. 500 m stretch of an existing 1.5 m culvert, located to the north of the site along the existing loop road, southwest by c. 60 m; the diverted culvert will be located along the proposed link road.
- All associated site development works, drainage and services provision, landscaping, boundary treatments (including security fencing), and associated works.

The facilitation works are described in Chapter 2 of this EIAR and are included in the project but do not form part of the development for which consent is sought. Future consents for the facilitation works will be required through EirGrid and GNI. A detailed description of the project is outlined in Chapter 2: Description of the Project.

16.4 Baseline Scenario / Receiving Environment Analysis

16.4.1 Site Context

The subject site and adjacent area is situated in Leixlip, Co. Kildare within a generally flat to gently undulating landscape. Leixlip town is situated to the north and northeast, and Celbridge is located to the southwest. Leixlip is situated approximately 15km from Dublin City Centre. The town is bypassed by the M4 motorway with grade-separated interchanges on the motorway at the eastern and western end of the town (junctions 5 and 6, respectively). The R148 runs through the Main Street linking Leixlip to Maynooth to the west. This also links with the N4 dual carriageway to the east of the town, which in turn provides access to Lucan, the M50 and Dublin City Centre. The R149 runs north from Main Street, encompassing Captain's Hill and Cope Bridge (which operates on a one-way signalised system). The route continues eastwards across the county boundary with Dublin before heading northwards to Barnhill, Hansfield, Ongar, Clonee and the M3. Vehicular circulation within the town is influenced by a number of pinch points including Pound Street (and Rye Bridge), Captain's Hill, Cope Bridge, Main Street (incl. Leixlip Bridge). At the western periphery of the town the R449 links to the R148 (old N4) and is the main access from the M4 to Intel's facility in Leixlip.

The Kildare innovation Campus site is bound immediately by the M4 motorway to the north, Castletown House and surrounding demesne to the southwest, and the R404 to the east. Beyond the R404, the River Liffey corridor extends in a southwest to northeast alignment, swelling to form the Leixlip Reservoir. The Royal Canal is situated to the north of the study area, largely defining the footprint of residential buildings to the north of Leixlip. Castletown House and demesne forms a significant open green space within the study area, which contains a historically designed landscape which includes areas of open landscape with clusters of trees and axial views defined by tree lined avenues.

In addition, the surrounding landscape within the study area is characterised by agricultural fields enclosed by hedgerows, residential and commercial premises located along the local road network and the western fringes of Lucan, located within South County Dublin lands. Notable larger scale commercial developments within the study area include Backweston Airport and Backweston Laboratory Complex to the southeast, and Intel Irelands Leixlip Campus to the north. The Proposed Development site contains areas of mature tree vegetation and open grassland. Three drainage ponds are located within the site along the south-eastern boundary.

The location of GNI Gas Upgrade development extends from the R148 Station Road and follows the Celbridge Road to the KIC lands. The majority is located within a built-up suburban environment of Leixlip. It crosses the eastern extends of The Wonderful Barn curtilage before crossing the M4 motorway with its dense bands of woodland to either side and entering the KIC lands.

The locations of the EirGrid Uprating development cover in their majority a variety of agricultural land, Timahoe Bog as well as suburban areas of Leixlip / Kilmacredock and Edenderry.

16.4.2 Kildare County Development Plan 2023-2029 (KCDP)

KCDP contains a Landscape Character Assessment (prepared in 2004) which describes landscape character areas and strategies for the protection of specific landscape features. The CDP categorises the sensitivity of principal landscape character areas into 5 Classes.

In broad terms, the study area lies within the following 2 landscape character areas (LCA):

- **Northern Lowlands**, which is considered a Class 1 – Low sensitivity landscape in the context of the county-wide assessment as shown in KCDP Map V1-13.1 – Landscape Character Areas and classified in Table 13.1 – Landscape Sensitivity Classification to Landscape Character Areas.
  Low sensitivity landscapes are described in the Landscape Character Assessment as "*Areas with the capacity to generally accommodate a wide range of uses without significant adverse effects on the appearance or character of the area". An exception to the low sensitivity rating, which characterises much of the study area, relates to the River Liffey corridor, which traverses from the southwest portion of the study area towards Leixlip to the northeast. Kildare County Development Plan 2023-2029, states that the river corridor is rated as Class 4 – Special Sensitivity, which is described as an area where "Significant adverse effects on the appearance or character of the landscape having regard to prevalent sensitivity factors*".

- **River Liffey**, which is considered a Class 4 – Special sensitivity landscape in the context of the county-wide assessment as shown in KCDP Map V1-13.1 – Landscape Character Areas and classified in Table 13.1 – Landscape Sensitivity Classification to Landscape Character Areas.

Scenic Routes and Viewpoints

As indicated on Map V1- 13.3, and described within Chapter 13, Table 13.7 of Kildare County Development Plan 2023-2029, the following views to be preserved within the study area include:

<u>RL – Views of the River Liffey from Bridges</u>

- RL1: Leixlip Bridge
- RL2: New Bridge
- RL3: Celbridge Bridge

<u>RC – Views to and from all bridges on the Royal Canal</u>

- RC2: Cope Bridge
- RC3: Louisa Bridge
- RC4: Deey Bridge
- RC12: Rye Water Aqueduct

Table 13.5 in the KCDP indicates Scenic Routes, which are described in Appendix 7. Relevant scenic routes located within the study area are listed below:

- **Scenic Route 28 – Views within the Carton Demesne Walls, to and from Carton House, the Lake and Woodland Areas**
  Location: Carton demesne

"Views to the Carton House and Demesne are not available from the R148 Leixlip to Maynooth Regional Road (classified as part of the North Kildare Tourist Route) nor from any other local roads due to the height of the stonewall boundary. The existing lake and deciduous woodlands within the estate and the open landscape character of the environs contained within the Demesne can be described as having high landscape and scenic amenity value. Due to the hilltop location of Carton House, views to the surrounding open countryside are available".

- **Scenic Route 29 – Views of the River Liffey from the Main Avenue of Castletown House**
  Location: Castletown demesne
  "Views towards the River Liffey are available from the main road within Castletown Demesne. Although the river corridor itself is not visible due to the mature vegetation growing along its banks, the quality of the vistas is of significance".

Areas of High Amenity

KCDP identifies several Areas of High Amenity within the county, which overlap with sensitive landscapes. They are classified because of their outstanding natural beauty and/or unique interest value and are generally sensitive to the impacts of development. For the purposes of this assessment, the following Areas of High Amenity have been considered:

- **The River Liffey and the River Barrow Valleys**
  A section of The River Liffey corridor traverses from the southwest portion of the study area towards Leixlip to the northeast. The Leixlip Reservoir forms a swelling and larger open body of water along the river corridor and is located approximately fifty metres from the nearest part of the Proposed Development site. The following description is provided within the KCDP:

  "The River Liffey and the River Barrow valleys are of significance in terms of landscape and amenity value and as such are sensitive to development. The River Barrow is a designated Special Areas of Conservation (SAC). They are characterised by smooth terrain and low vegetation, with extensive upland views (i.e. the Chair of Kildare to the west and the Eastern Uplands to the east) and distant views including the neighbouring Wicklow Mountains. The topography is such that it allows vistas over long distances without disruption along the river corridor. As a result, development on the banks of the rivers can have a disproportionate visual impact, due to an inherent inability to be visually absorbed. However, the undulating topography occurring within the river valleys provides physical shielding and has the potential to visually enclose the built form within the river valley, where it does not break the skyline. Shelter vegetation exists along some stretches of the valleys with the presence of natural and native woodland that grows on the floodplains of the rivers, as well as by conifer plantation in adjacent lands. This vegetation has a shielding and absorbing quality in landscape terms. It can provide a natural visual barrier as well as adding to the complexity of a vista, breaking it up to provide scale and containment for built forms".

  "Many views of the river valleys are available from local roads and from viewing points located along the valleys. While river valleys represent potentially vulnerable linear landscape features, as they are often highly distinctive in the context of the general landscape, in certain circumstances landscape sensitivities may be localised or site-specific".

- **The Grand and Royal Canal Corridors**
  KCDP states that:
  "The Grand Canal and the Royal Canal are extensive water corridors that flow through the county. The Grand Canal flows in an east to south-west direction and divides at Sallins into the Naas and Corbally Branch and is further divided in three branches at Robertstown; the Milltown Feeder, the Barrow Line and the continuation of the Grand Canal into neighbouring County Offaly".

  "The Royal Canal flows in an east to west direction along the northern boundary of the county through Leixlip, Maynooth and Kilcock and continues into County Meath".

  "The canal corridors and their adjacent lands have been landscaped and enhanced along the sections where the canals flow through urban areas. Canal locks are distinctive features of these water corridors. The smooth terrain, generally gentle landform and low canal bank grassland that characterise the canal corridors allow vistas over long distances without disruption, where the canal flows in a straight-line direction. Consequently, development can have a disproportionate visual impact along the water corridor, and it can prove difficult for the existing topography to visually absorb development. The occurrence of natural vegetation, coniferous and mixed plantations adjacent to the water corridors can have shielding and absorbing qualities in landscape terms, by providing natural visual barriers".

  "Canal corridors are potentially vulnerable linear landscape features, as they are often highly distinctive in the context of the general landscape. In some cases, landscape sensitivities may be localised or site-specific".

Walking Routes and Cycling - Permeability
The following walking routes are fully or partially located within the study area and are mapped in Appendix 16.2:

- The Royal Canal Way is located along the Royal Canal in the northern section of the study area;
- Arthur's Way Heritage Trail;
- Slí na Sláinte – Celbridge Kildare;
- Slí na Sláinte – Leixlip West;
- Slí na Sláinte – St. Catherine's Park Slí (Leixlip); and
- Slí na Sláinte – Leixlip Lucan Demesne.

Kildare County Development Plan 2023-2029 identifies various off-road pedestrian routes in / around Leixlip, many of which follow the Rye Valley, Royal Canal, Síleacháin Valley and within/around St Catherine's Park. This includes three Slí na Sláinte walking routes in or around the town which are identified above and mapped in Appendix 16.2.

Existing cycleways in Leixlip include the cycle path linking Castletown and Leixlip along the R449. Other cycle facilities along Station Road and sections of Green Lane (L5058) are immediately adjacent or incorporated into bus lanes. There are also informal cycle routes to Lucan via St Catherine's Park; and to Castletown via Parsonstown. The Greater Dublin Area (GDA) Cycle Network Plan identifies a network of intra-urban and urban cycle routes across the GDA. Leixlip is in the North Kildare Sector Town Cycle Network. The key routes proposed for this sector of relevance to Leixlip are:

- K1 Royal Canal Greenway
- LP1 R148 Main Street and Maynooth Road to Intel Plant cycle route;
- LP2 Barnhall Road to Celbridge via Castletown Demesne cycle route.

16.4.3 Irelands Ancient East

The Castletown House Demesne is part of the network of this tourism trail with relevant signage located in the grounds.

16.4.4 Leixlip Local Area Plan (LAP) 2020-2023

The current Leixlip Local Area Plan 2020-2023 and has been extended to the 30th March 2026. The Leixlip LAP sets out an overall strategy for the proper planning and sustainable development of Leixlip in the context of the Kildare County Development Plan 2023-2029. The LAP includes the subject site within its boundary and has been consulted in the preparation of the LVIA.

Protected Views

The Leixlip LAP 2020-2023, Section 10.1.3, refers to protected views identified in Kildare County Development Plan 2023-2029 as follows:

"The Kildare County Development Plan includes views to be protected between The Wonderful Barn and Castletown House which affect some lands within the LAP. The design and siting of new development shall have regard to protected views in particular, any redevelopment of the Hewlett Packard site".

The Leixlip LAP 2020-2023 also indicates 'Views and Prospects to be Preserved' on the Leixlip Built Heritage and Archaeology Map 2. Please refer to Chapter 15 – Archaeology, Architecture & Cultural Heritage, for further details.

The Wonderful Barn Key Development Area (KDA)

The Leixlip LAP 2020-2023 identifies also key development areas. The Wonderful Barn KDA is located within the study area and defines guidelines and objectives in relation to new residential developments encircling The Wonderful Barn Complex. Building layouts will have regard to the protection of key views within the site and new residential developments should result in minimal visual impact.

The Wonderful Barn complex is also defined as a Neighbourhood Park in the open space strategy of Leixlip.

The proposed development will have no impact on The Wonderful Barn KDA and the open space strategy indicated for The Wonderful Barn complex.

Key Green Infrastructure Areas – Woodland and Mature Trees, and Hedgerows

The Leixlip LAP 2020-2023 defines Green Infrastructure planning *as "a proactive approach to maximising the benefits of the multi-functionality of nature that includes natural ecological processes, sustaining air and water quality and providing vital amenity and recreational spaces for communities*", [and] "*serves to provide an ecological framework for the social, economic and environmental health of an area*".

Green Infrastructure mapping forms part of the Leixlip LAP 2020-2023 and identifies key Local Biodiversity Areas as follows:

- The Rye Water Valley/Carton SAC, River Liffey (including Liffey Valley pNHA), Royal Canal pHNA and Dublin – Sligo railway line which allow movement of both aquatic and terrestrial flora and fauna across the town.
- The woodlands, hedgerows, treelines, watercourses and extensive areas of grassland within the farmlands of Collinstown and Confey, in St. Catherine's Park, Leixlip Manor, Leixlip Castle Demesne, Barnhall and the surroundings of the commercial grounds of Intel and Hewlett Packard all provide excellent habitats which are interlinked and support widespread habitat connectivity across the Study Area and contribute to the GI network of Leixlip.
- It is recognised that the dominant environments within Leixlip are improved grassland (for agriculture) and urban, built land. It is a policy of Kildare County Council to maintain and increase the distribution of the Green Infrastructure network within the town.

Refer to Chapter 6 – Biodiversity, for further details on areas of ecological significance.

Walking & Cycling
The Leixlip LAP 2020-2023 recognises that overall permeability and connectivity of pedestrian and cycle routes in the town is poor primarily due to the limited number of crossing points over the Rye Valley, Royal Canal and railway line. Pinch points such as Captain's Hill also restrict permeability and connectivity.

16.4.5 South Dublin County Development Plan 2022-2028 (SDCDP)

A section of the study area to the east is located within South Dublin County Council jurisdiction, and as such is subject to the objectives and policies as set out within the current South Dublin County Development Plan 2022-2028. The landscape character areas are more relevant in the context of this assessment (refer to SDCDP, Appendix 9 Landscape Character Assessment, Figure 21). The study area contains sections of the following 3 landscape character areas and their associated landscape sensitivity (refer to SDCDP, Appendix 9 Landscape Character Assessment, Figure 37). The following landscape designations have been considered within this assessment:

Landscape Character Areas
The Landscape Character Assessment of SDCDP identifies five Landscape Character Areas. Each of the Landscape Character Areas is assessed against a set of criteria to determine the capacity of the landscape to accommodate change based on landscape sensitivity and landscape value. For the purposes of this assessment, the following three Landscape Character Areas are located partially within the principal study area:

- **LCA1 -Liffey Valley**
  Sensitivity: Medium-High
  Extent: From western boundary, along N4 corridor to county boundary close to Chapelizod;

- **LCA2-Newcastle Lowlands**
  Sensitivity: Medium
  Extent: From western boundary from N4 encompassing Grand Canal, south of Newcastle and extending eastwards to the R136; and

- **LCA5-Suburban South Dublin**
  Sensitivity: Not defined
  Extent: The area extends east from Tallaght/Oldbawn to Rathfarnham, and north/northwest along the county boundary to Clondalkin.

Views and Prospects
There are no designated views and prospects within the principal study area.

16.4.6 Ecological Designations

While SAC's and pNHA's are ecological designations, they warrant inclusion in this chapter as they often represent intact landscapes which are of amenity value. There are three designated sites in proximity to the Kildare Innovation Campus, these are:

- The Rye Water Valley / Carton SAC (Site Code 001398)
- The Royal Canal pNHA (Site Code 002103)
- The Liffey Valley pNHA (Site Code 000128)

Please refer to Chapter 6 – Biodiversity for further details of areas of ecological significance.

Special Amenity Area Order
The Special Amenity Area (SAAO) for the Liffey Valley was made by Dublin City Council in 1990. The area lies between the administrative boundaries of South Dublin County Council and Fingal County Council. The area is subject to the following South Dublin County Council Development Plan 2022-2028 objective:

Policy NCBH7: Liffey River Valley and Special Amenity Area Order:
"*Protect and enhance the special amenity value of the Liffey Valley, including its landscape, visual, recreational, ecological, geological, and built heritage value, as a key element of the County's Green Infrastructure network and implement the provisions of the Liffey Valley Special Amenity Area Order (SAAO)*".

16.4.7 Facilitation works

GNI Gas Upgrade
The GNI upgrades will comprise a local upgrade of the gas network over a length of approximately 1.5km, extending from the R148 Station Road and following the Celbridge Road to the KIC lands as indicated in Figure 2.4, Chapter 2: Description of the Project. The proposed alignment traverses 3 townlands: Barnhall, Leixlip and Leixlip Demesne in County Kildare and is fully contained in the principal study area of 2km around the KIC lands as described above.

EirGrid Uprating
The staged uprating of existing overhead power lines will cover a linear distance of 115.2km, linking the replacement 110kV Rinawade substation to Derryiron/Maynooth and Dunfirth/Kinnegad. The existing lines traverse counties Kildare, Meath and Offaly, including land forming part of the extensive Bog of Allen. Uprating will involve potential groundworks on the existing lines relating to pole set or tower replacement and/or the provision of temporary access tracks or haul roads, involving heavy machinery use.

County Kildare:

Section of the existing overhead lines and substations are located in the following landscape character areas:

- Northern Lowlands;
- Northern Hills;
- North-Western Lowlands; and
- Western Boglands.

The existing overhead line traverses the following scenic route:

Scenic Route 15 – Views of the Plains of Kildare and West Central Boglands, to and from Newtown Hills (including county roads L5027, L50281, L5028, L1007)
Location: Newtown, Grange, Nicholastown, Cappagh, Corocoranstown, Ballynakill, Ballyvoneen and Cloncurry.

"The county roads L5027, L50281, L5028, L1007 provides scenic viewpoints to the surrounding Newtown hills and lowland areas respectively. As the roads run along the ridgelines or hilltops, extensive views of the surrounding lowland rural lands are available at points where the occurring hedgerows are interrupted, and relatively large patches of deciduous woodlands can be seen. Small farms and deciduous trees along the low well-trimmed hedges occur along these scenic roads".

County Meath:

Sections of the existing overhead lines and substation are located in County Meath north and northwest of Maynooth, north of Kilcock and south of Kinnegad within sections of the following landscape character areas:

- 11 South East Lowlands; and
- 14 Royal Canal;
- 15 South East Lowlands.

No protected view & prospect is located within 500m of the uprating works.

County Offaly:

Sections of the existing overhead lines and substation are located within County Offaly. According to Offaly County Development Plan 2021-2027 it is an objective of the Council to prepare a County Landscape Character Assessment in accordance with all relevant legislation and guidance documents and following the forthcoming National and Regional Landscape Character Assessment.

No key scenic views or Areas of High Amenity are located within 500m of the uprating works.

16.4.8 Likely Future Receiving Environment ('Do Nothing' scenario)

All components of the baseline are constantly changing due to a combination of natural and human processes. When predicting likely direct and indirect effects it is important to remember that there are two available for comparison: the existing baseline environment and the future baseline environment without the implementation of the Proposed Development but considering natural changes only.

In landscape terms, if the development did not go ahead, the Proposed Development site will remain as an established business campus comprised of light industrial buildings, road network and related ancillary infrastructure such as car parks, loading areas, lighting and vehicle barriers. The surrounding site will remain as soft landscape comprising of open grassland, tree and shrub planting, and open attenuation ponds.

In visual terms, the content in available views of the Proposed Development site will remain similar considering changes to existing vegetation due to maturing, pruning or natural decay.

16.5 Likely Impact of the Project

16.5.1 Landscape Effects at Construction

The Proposed Development (excluding facilitation works) is located within the Northern Lowlands Landscape Character Area, which has a low sensitivity according to the current Kildare County Landscape Character Assessment. The subject site and adjacent area are situated within a generally flat to gently undulating landscape. Leixlip is situated to the north and northeast, and Celbridge is located to the southwest. The site is immediately bound by the M4 motorway to the north, Castletown House and surrounding demesne to the southwest, and the R404 to the east. Beyond the R404, the River Liffey corridor extends in a southwest to northeast alignment, swelling to form the Leixlip Reservoir. Areas to the north include the infrastructure corridor of the M4 motorway. The Wonderful Barn and its surrounding area include allotments and remnants of a formerly designed landscape, which is bound by the M4 to the south and southwest and suburban housing estates to the east, north and west. The Royal Canal is situated to the north of the principal study area, largely defining the footprint of residential buildings to the north of Leixlip. Castletown House and demesne forms a significant and highly sensitive open green space within the principal study area, which contains a historically designed landscape which includes areas of open landscape with clusters of trees and axial views defined by tree lined avenues.
In addition, the surrounding landscape within the principal study area is characterised by agricultural fields enclosed by hedgerows, residential and commercial premises located along the local road network and the western fringes of Lucan, located within South County Dublin lands. Notable larger scale commercial developments within the principal study area include Backweston Airport and Backweston Laboratory Complex to the southeast, and Intel Ireland's Leixlip Campus to the north. The Proposed Development site contains areas of mature tree vegetation and open grassland. Three drainage ponds are located within the site along the south-eastern boundary.

The Proposed Development will result in localised changes to landform to accommodate the bridge and other buildings. Construction plant, including boring equipment and lifting machinery, will be introduced, and typical construction features such as fencing, access tracks and construction compounds will be laid out. The presence and activity of construction machinery and associated features will degrade the condition of this landscape character area locally. The introduction of these features relating to construction will be temporary, medium term and reversible. The magnitude of landscape effects will be medium. Combined with a low sensitivity, the significance / quality of effects will be moderate / adverse during construction.

Adjoining landscape character areas such as the River Liffey landscape character area will remain unaffected during the construction phase apart from construction traffic crossing the river bridges. The magnitude of landscape effects will be negligible. Combined with a special sensitivity, the significance / quality of effects will be low / adverse during construction and temporary.

Landscape Character Areas located within the wider study area in South Dublin, namely Liffey Valley, Urban, and Newcastle Lowlands will not be altered by the proposed construction works. While construction traffic will pass temporarily along existing transport corridors within these landscape character areas, the landscape character will not be affected resulting in no landscape effects.

16.5.2 Visual Effects at Construction

Areas experiencing visual effects during the construction stage will vary depending on the active construction phase. All groundworks, demolishing, refurbishment or the construction of the buildings, road network, bridge and landscape architecture will be mainly experienced locally from within the boundary of the Proposed Development site. Views outside the development boundary and within the principal study area include the M4 and associated over-bridges, The Wonderful Barn and adjoining allotments, residences of Barnhall Meadows housing estate facing towards the proposed development. Intervening building structures, topography and vegetation will quickly screen the site in distances of approximately 400m from the development boundary and beyond.

Construction effects will result in:

- Potential effects to the visual amenity within the locality as a result of the visibility of construction activities such as demolitions works, the construction / refurbishment of buildings, associated scaffolding and tall equipment such as cranes and containers; and
- Effects of temporary site infrastructure such as site traffic and construction compounds especially those located in areas adjacent to sensitive visual receptors.

Photomontages 1-17 supplementing this assessment illustrate the landscape and visual effects at operational stage only. The proposed phasing of the construction works does not allow for a meaningful illustration in photomontages as these can only show one particular snapshot in time, which will not capture the dynamic and complex nature of construction works comprehensively.

Visual effects will be highest within the site, from areas immediately adjacent to the site boundary, and within a principal visual zone of approximately 400m radius from the boundary of the Proposed Development site. Construction works of the proposed bridge will be visible along the M4 and the overbridges (R404 & Junction 6) for approximately 1.6km to the west and approximately 1km to the east although the existing bridge of the R404 will be more prominent on approach from the east. The visibility of construction works within the wider study area will be mainly limited to open areas where there are available views towards the site, that are unscreened by vegetation and intervening buildings.
Visual effects and their significance at construction stage will be temporary, adverse and range from Minor-Negligible (in the wider study area) to Major (within up to approximately 400m radius from the boundary of the Proposed Development site depending on the type of construction activities).

16.5.3 Facilitation Works at Construction

The **GNI Gas Upgrade** works are located within mainly suburban environments extending across infrastructure corridors (M4) and into commercial areas (KIC lands).

The GNI Gas Upgrade works will not result in changes to the local landscape character. In terms of visual effects, the main receptor groups affected by construction works will be local residents, walker's along sections of the Arthur's Way Heritage Trail and the Celbridge Slí na Sláinte as well as vehicular traffic.

They will be highest along roads / footpaths along which the gas pipe travels, and within the immediate vicinity of the construction works. Principal views of construction works will likely be experienced within a radius of approximately up to 100m from the centre line of the Proposed gas pipe as well as from nearby residential dwellings facing the uprating works.

The sensitivity and susceptibility to visual change of residential receptors and walkers is considered high. The sensitivity and susceptibility to visual change of vehicular traffic is considered medium. The magnitude of visual effects for residential receptors and walkers is considered medium to high in close distance views. Their significance is considered moderate adverse and temporary.

The magnitude of visual effects for vehicular traffic is considered low and the resulting significance / quality is slight / adverse as the driver will concentrate on the road rather than on available views of the construction works. Traffic diversions may be in place during certain times of the laying of the pipe. The magnitude of visual effects for vehicular traffic is considered medium in relation to the pipe works and the resulting significance / quality is moderate / adverse and temporary.

The visibility of construction works beyond approximately 100m will be mainly limited by intervening vegetation and built structures. Visual effects from these areas are considered low, their significance / quality is not significant / neutral.

The **EirGrid Uprating** will not result in changes to the local landscape character. In terms of visual effects, the main receptor groups affected by construction works will be local residents and vehicular traffic including cyclists.

They will be highest along the existing OHL, within the immediate vicinity of the substations and of the construction works including along adjacent local roads. Principal views of construction works will likely be experienced within a radius of approximately up to 250m from the centre line of the existing OHL as well as from nearby residential dwellings facing the existing OHL alignment. The sensitivity and susceptibility to visual change of residential receptors is considered high. The sensitivity and susceptibility to visual change of vehicular traffic is considered medium. The magnitude of visual effects for residential receptors is considered medium to high in close distance views. Their significance is considered moderate-significant adverse and temporary.

The magnitude of visual effects for vehicular traffic is considered low in relation to the OHL works and the resulting significance / quality is slight / adverse and temporary as the driver will concentrate on the road rather than on available views of the construction works.

The visibility of construction works within the wider study area beyond approximately 250m will be limited to middle distance open and partial views mainly along the road corridors where there is sparse levels of vegetation and on higher ground, where poles and machinery can still be seen. Visual effects from these areas are considered low, their significance / quality is not significant / adverse. Long distance views are mainly fully screened by distance, intervening landform and vegetation. The magnitude of change in long distance views is considered very low / negligible. The significance / quality is classified as ranging between not significant to imperceptible / neutral and temporary.

16.5.4 Landscape effects at Operation

The Proposed Development will continue the established light industrial character on the site, which has served as a business campus in this location since the mid-1990's. The extension of the building footprint will intensify this existing use, while also offering opportunity to improve pedestrian and cycling permeability through the site, in particular due to the new pedestrian / cycle link north across the M4 motorway.

The following potential direct and indirect landscape effects have been identified, (along with their duration and nature) arising from the Proposed Development. Direct or indirect landscape effects on the fabric of the landscape and its receptors are closely related to the nature and extent of visibility.

In landscape terms, the existing Kildare Innovation Campus is an overall low density business campus with large open green areas. The alteration and transformation of the existing campus will intensify the inherent light industrial landscape character within the site, leading to an increase and densification of the light industrial buildings replacing sections of existing open green space.

Direct and long-term change or modification will occur locally where the proposed extension to the existing Kildare Innovation Campus will be physically located. Areas of existing tree planting and hedgerows will be removed to facilitate the Proposed Development. The magnitude of landscape change is considered medium and the resulting significance / quality is moderate / beneficial as the alteration and redesign of the open space will improve biodiversity and the overall strength of the landscape layout within the campus site. The proposed pedestrian / cycle bridge will increase the infrastructural elements in the principal study area but it will integrate into the existing character of the M4 motorway corridor due to its design and scale.

Indirect change will occur outside of the Proposed Development site boundary within a distance of up to 400m, where the visibility of the Proposed Development influences the perception of the character of the landscape. Considering the flat and low-lying nature of the existing landscape, in addition to the dense mature vegetation planting to the perimeter of the existing business campus site, indirect change in landscape character is largely limited to a short section of the R404 and from the existing campus entrance to the northwest of the site. These areas of open grass and tree planting will be replaced by new building units, generating an alteration by reinforcing the light industrial nature of the local landscape character. The magnitude of landscape change in these areas is considered low. The significance / quality of landscape effects on the landscape character in these areas is considered minor / beneficial at operation.

Indirect change and the significance / quality of landscape effects will reduce quickly to Imperceptible Neutral with increasing distance from the Proposed Development in the remaining principal study area (beyond approximately 400m from the Proposed Development). Adjoining landscape character areas such as the River Liffey landscape character area will remain unchanged during operation. The magnitude of landscape effects will be negligible. Combined with a special sensitivity, the significance / quality of effects will be imperceptible / neutral. Landscape Character Areas located within the wider study area in

South Dublin, namely Liffey Valley, Urban, and Newcastle Lowlands will not be affected by the Proposed Development resulting in no landscape effects.

A summary of landscape effects on receptors located within the study area is provided in the table below.

Receptor	Susceptibility	Sensitivity	Magnitude of landscape change	Direct/ indirect Effects	Significance of landscape change / quality of effects
Landscape Character Area 'Northern Lowlands' (Co. Kildare) within the Proposed Development site	Low	Low	Medium	Direct	Moderate / Beneficial
Landscape Character Area 'Northern Lowlands' (Co. Kildare) outside the Proposed Development within approximately 400m of the Proposed Development site boundary	Low	Low	Low	Indirect	Minor / Beneficial
Landscape Character Area 'Northern Lowlands' (Co. Kildare) outside the Proposed Development beyond approximately 400m of the Proposed Development site boundary	Low	Low	Negligible	Indirect	Not Significant / Neutral
LCA 'River Liffey' (Co. Kildare)	High	High (Special)	Negligible	Indirect	Not Significant / Neutral
LCA 'Liffey Valley' (South Dublin)	High	Medium-High	None	Indirect	None
LCA 'Urban' (South Dublin)	Low	N/A	None	Indirect	None
LCA 'Newcastle Lowlands' (South Dublin)	Medium	Medium	None	Indirect	None
Historic Townscape	High	High	None	Indirect	None
Effect on existing vegetation (within the Proposed Development site)	High	High	Medium	Direct	Moderate / Beneficial

Receptor	Susceptibility	Sensitivity	Magnitude of landscape change	Direct/ indirect Effects	Significance of landscape change / quality of effects
Green Open Space (as identified within the Leixlip LAP 2020-2023)	High	High	Negligible	Indirect	Not Significant / Neutral

Table 16.13: Summary of Landscape Effects (at Operation)

16.5.5 Visual Effects

The Proposed Development is located in a generally gently undulating landscape and therefore even relatively low vegetation or intervening buildings will provide screening to receptors. The highest visual impacts tend to occur where there is no or little intervening vegetation between the viewer and the Proposed Development within the Proposed Development site, along its periphery (sections of the R404), or where the viewer is at an elevated position (refer to Photomontage 15 – top of Wonderful Barn). The majority of significant visual effects will occur from locations within the Proposed Development site or in close proximity to it (up to approximately 300m) as dense bands of woodland along the boundaries of the M4 (refer to Photomontage 8), the grounds of Castletown Demesne (refer to Photomontages 10 – 12), within the area around The Wonderful Barn, and publicly accessible locations along the River Liffey (refer to Photomontage 1) will screen the Proposed Development fully.

Views of the upper sections of the proposed Building A1 and the pedestrian / cycle bridge across the M4 can be experienced from the R404 road bridge crossing the M4 (refer to Photomontage 7), where the upper sections of additional building structures will become visible to already visible existing structures.

Open views of sections of the Proposed Development will be possible from the R404 / Celbridge Road. While roadside vegetation will screen considerable parts of the Proposed Development, views will be available at the vehicle entrance areas and where there are gaps in the roadside vegetation (refer to Photomontages 2, 3, 4, 6). View of the proposed pedestrian / bridge will be possible along the M4 (refer to Photomontages 7 & 8) as well as from the grounds of The Wonderful Barn (refer to Photomontages 14 – 17).

The existing protected viewing axis between Castletown House and The Wonderful Barn will not be altered and remain unaffected by the proposed development (refer to Photomontages 12 – 15).

In total, 17 photomontages have been prepared illustrating the nature of visibility of the proposals at key viewpoint locations. The detailed assessment of each view below should be viewed in conjunction with the photomontage booklet contained in Appendix 16.1, which also contain detailed viewpoint location information including the distance of each viewpoint to the Proposed Development.

Viewpoint / Photomontage 1: View northwest from R404 at eastern side of bridge crossing the River Liffey

View northwest from the New Bridge at Salmon Leap Canoe Club. This location is identified as a scenic viewpoint (RL 2) within the Kildare County Development Plan 2023-2029. Mature tree vegetation along the River Liffey embankment is visible in conjunction with an open stretch of the river corridor, adjacent to the canoe club building and launch area. There is currently no view of the existing Kildare Innovation Campus from this location, even during the winter photography, i.e. deciduous trees have lost most of the foliage intact.

The value of this view is considered medium. Receptors are mainly pedestrians and vehicle drivers and are considered to have a high susceptibility to change. The visual sensitivity is medium-high.

The Proposed Development will be screened by intervening vegetation, existing buildings and topography from this location and as such, there will be no change in the existing view. The magnitude of visual change is None, and the resulting significance / quality of effects is Imperceptible / Neutral.

Viewpoint / Photomontage 2: View northwest from R404 roundabout at existing campus entrance
This viewpoint is positioned on the Roundabout along the R404, east of Barnhall Rugby Club. The view illustrates the southern entrance of the development site. Existing vegetation includes deciduous trees in the mid ground as part of the site boundary planting, which do not provide strong screening during the winter months. The view includes a number of direction signs, campus entrance signs, streetlights, and wooden fences. Sections of the existing building structures of the Kildare Innovation Campus are visible in the middle distance and background.

The value of the view is considered low. Receptors are vehicle users, workers and visitors to the Kildare Innovation Campus, and are considered to have a low susceptibility to change. The overall visual sensitivity is considered low.

The proposed A2 building will become visible from this viewpoint as well as the proposed tree planting of its surrounding carpark. The overall character of the view will remain similar to the existing baseline. The Proposed Development will be in-keeping with the existing layout and design. The magnitude of visual change is low, and the resulting significance / Quality of visual effects is considered minor / neutral.

Viewpoint / Photomontage 3: View northwest from R404 along campus boundary
This view is located along the R404 near the south-eastern corner of the existing campus. Existing buildings are located in the background while the fore- and middle ground are open grassland and remnants of a former hard standing area. The view represents a more open section of the site boundary, characterised by timber fencing and spaced tree planting, aligned along the boundary. The lack of understorey planting offers generally open views into the site from this location. The absence of foliage during the winter months opens up views into the site further.

The value of this view is considered low. Receptors are mainly pedestrians and vehicle drivers and are considered to have a low susceptibility to change. The sensitivity overall is low.

The Proposed Development will become a clearly noticeable change when compared to the existing view. The introduction of the A2 building complex, the associated car park and its proposed tree planting will formalise the view and structure the campus appearance in this view better. The additional proposed specimen treen planting along the site boundary will close gaps in the existing avenue tree planting along the R404. The alterations to the business campus are not visually uncharacteristic. The height and density of built structures increases the prominence of built structures in this view. However, the densification will improve the utilisation of the land and provide a better legible structure to the view. The magnitude of visual change is considered medium. The significance / quality of visual effects is moderate / beneficial.

Viewpoint / Photomontage 4: View north from R404 along campus boundary
This viewpoint is orientated to the northwest and taken from the R404. The existing boundary wall of the Kildare Innovation Campus is visible along the public footpath, together with a setback bus shelter, streetlights, boundary tree planting and undergrowth. Sections of the existing campus buildings are visible through the bare tree crown in the left of this view. Alensgrove Cottages, a commercial accommodation property, is located nearby but out of view, to the east of the R404. The existing view is well screened by the line of trees and shrub boundary along the roadside particularly during the summer season.

The value of this view is considered low. Receptors are mainly pedestrians and vehicle drivers and are considered to have a low susceptibility to change. The overall sensitivity is low.

The proposed new campus entrance will become visible in the foreground together with the associated removal of boundary wall and vegetation. The south-eastern façade of the proposed A1 building including sections of its green walls will become visible along the R404. Views also include the proposed planting along the new entrance road as well as the proposed planting around the new swale / attenuation pond. The existing boundary walls and vegetation to either side of the new entrance will be retained. Visibility of the Proposed Development will be higher during the winter months due to the absence of foliage. The magnitude of visual change is medium, and the resulting significance / quality of effects is moderate / beneficial.

Viewpoint / Photomontage 5: View north / northeast from access road within proposed development site
This viewpoint is located along Barnhall Road located within the Kildare Innovation Campus, approaching the car park to the right-hand side of the view. The M4 motorway is situated approximately 50m north of this viewpoint behind the tall tree belt running along the left side of this view. However, the M4 itself is not visible but audible. The view is defined by Barnhall Road and associated streetlights as well as trees and hedgerows associated with the car park on the right in this view. On the left, groups of deciduous trees and a grassed embankment shape the view including the prominent tree belt along M4, which is separated from the campus by a green wire and post fence.

The value of the view is considered low. Receptors are mainly vehicle drivers and car park users. These receptors are considered to have a low susceptibility to change. The overall visual sensitivity is considered low.

The Proposed Development will considerably alter the focus in the existing view. The proposed A1 building will become a new and prominent focus point in the background. The reshaping of the grassed embankment along the M4 tree belt will require the removal of existing trees to facilitate new ramp of the proposed pedestrian / cycle bridge. Its railings will be become visible on the left of the view. The existing green post and wire fence will be removed and not replaced. A stepped grassed embankment with scattered groups of trees will be introduced instead. Barnhall Road will be slightly re-aligned and comprise footpaths and cycle lanes to either side. The Proposed Development will structure and formalise the view better than the current situation which is an underutilised zone between the M4 and Barnhall Road. It will integrate the north-eastern corner of the site into the overall campus. The magnitude of change is considered high the resulting significance / quality of visual effects is Significant / Beneficial.

Viewpoint / Photomontage 6: View southeast from roundabout along access road near the north-western boundary of proposed development site

This viewpoint is located near the existing roundabout along the north-western boundary of the campus, at the gated threshold into the site. Beyond the carriageway and adjacent lighting and footpath, the site is predominantly planted with stands of trees and open grassland. The existing welcome sign, flanked by three flag poles on the right-hand side of the road, is a noticeable element in the existing view. A section of green chain-link fencing, topped with barbed wire, is visible beyond the grassed area to the right of the view. This viewpoint is located within the Proposed Development site.

The value of the view is considered low. Receptors are pedestrians and vehicle drivers entering or leaving the campus. They are considered to have a Low susceptibility to change. The overall visual sensitivity is considered low.

The Proposed Development will retain the majority of existing vegetation in the foreground and middle-distance. The addition of new footpaths and cycle lanes along the entrance road is noticeable. Additional screen planting in the middle distance will thicken up the green belt along the entrance area. The proposed B2 building will be noticeable through the bare crowns of intervening vegetation during the winter months and will otherwise be screened by foliage. The proposed 110 kV substation in the background on the right of this view will not be visible and fully screened. The overall character of the view will remain similar. The magnitude of change is considered low and the resulting significance / quality of visual effects is not significant / neutral.

Viewpoint / Photomontage 7: View west from M4 overbridge

This elevated viewpoint is located on the R404 bridge crossing the M4. The motorway is visible in the centre right of the view at a lower level to the viewer. Barriers along the side of the bridge are composed of mesh grating and vertical and horizontal posts. To the left, the existing view of the Kildare Innovation Campus is mostly screened by belt of coniferous trees, some deciduous trees and the bridge structure itself. Upper sections of the existing buildings, within the business campus are slightly visible beyond the bridge structure and above roadside tree planting. The motorway contains prominent gantries with direction information.

The value of this view is considered low. Receptors are mainly pedestrians and vehicle drivers and are considered to have a low susceptibility to change. The overall sensitivity is low.

The Proposed Development will create a perceivable change in the existing view, intensifying the existing light industrial character of the site by increasing the overall perceived height of the development when viewed from this location, due to the partial visibility of the upper sections of Building A1. The proposed pedestrian and cycle bridge will be visible beyond the existing gantry in the background. While noticeable, it will not be a prominent structure considering the existing features of the view. It will integrate well in its setting from this location. The immediate carriageway and associated infrastructure will continue to define the underlying character within this view. The magnitude of visual change is low, and the resulting significance / quality of visual effects is minor / neutral.

Viewpoint / Photomontage 8: View east along M4 from overbridge at Junction 6

This elevated and open viewpoint is located at the junction 6 roundabout above the M4 motorway. The road corridor, access ramps and associated motorway infrastructure are the primary focus in this view. Beyond the roadway, mature tree vegetation defines much of the content in available views, with distant ridgelines visible to the right extent from this location. The upper most sections of existing buildings located within Kildare Innovation Campus are visible but barely discernible above sections of existing vegetation in the middle distance.

The value of the view is considered low. Receptors are mainly vehicle drivers. These are considered to have a low susceptibility to change. The visual sensitivity is considered low.

In winter views, apart from the new bridge, the Proposed Development will be screened by intervening vegetation. Any upper most sections of roof structures of proposed buildings will not be discernible through the bare trees. The proposed pedestrian and cycle bridge crossing the M4 will be partially discernible in the background. The ramps to either side will be screened by intervening vegetation, so that only the section crossing the laneways will be visible. The proposed bridge will integrate in the view and will not change the character of the view. It will add another piece of infrastructure to the overall setting without becoming a new focus point. The magnitude of visual change will be low and the resulting significance / quality of visual effects is considered to be not significant / neutral.

Viewpoint / Photomontage 9: View east from northern access / entrance road to Castletown House

This viewpoint is located south of Barnhall Road along the northern access road to the car park of Castletown House. The viewpoint is located approximately 780m north of the Castletown House at a layby. The view represents an open view across fields towards the wooded western boundary of the Kildare Innovation Campus. This thick belt of trees along the boundary is fully screening the existing campus apart from one overhead line transmission mast and wires associated to the existing Rinawade 110kV substation. An existing low voltage power line on wooden poles runs across the field in the middle distance.

The value of the view is considered medium. Receptors are mainly vehicle drivers, including cyclists, and pedestrians, and these are considered to have a medium susceptibility to change as they are approaching a high quality landscape associated with Castletown House. The visual sensitivity at this viewpoint, is considered medium.

The majority of Proposed Development will be screened by intervening vegetation along the site boundary. Sections of Buildings B2 and B3 will be recognisable through the bare crowns of trees and a small gap in the tree belt in the background. They will be screened during the summer months due to foliage. The character of the view will not change either in winter or in summer. The visibility of sections of the proposed Buildings B1 and B3 will not detract from the view or undermine the character of the view. The existing overhead line transmission mast will remain the most prominent built structure in this view. The magnitude of visual change is Negligible and the resulting significance / quality of visual effects is not significant / neutral.

Viewpoint / Photomontage 10: View northeast from Castletown House forecourt

This viewpoint is located within the forecourt of Castletown House. Mature tree vegetation, clipped yew trees, hedges and areas of open grass are visible within the immediate envelope of the view. The historic demesne landscape is largely intact, with no significantly detracting elements visible.

The value of this view is considered high given the historical sensitivity of the site. Receptors are pedestrians, tourists and staff working on the estate and are considered to have a high susceptibility to change. The visual sensitivity is high.

The Proposed Development will be fully screened by the existing intervening vegetation close to Castletown House as well as the existing tree belt between the campus and the Castletown House estate. There will no visual change resulting in any visual effects.

Viewpoint / Photomontage 11: View northeast from Castletown House Parkland
This viewpoint is located within the open parkland of Castletown demesne. This view is characteristic of available views from this part of the site within the viewing arc from northeast to southeast, which is contained by a dense area of mature tree planting, forming a visual buffer between the Castletown estate lands and the Proposed Development site.

The value of this view is considered high. Receptors are pedestrians, tourists and staff working on the estate and are considered to have a high susceptibility to change. The visual sensitivity is high.

The Proposed Development will be fully screened by the existing intervening woodland belt between the campus and the Castletown House estate. There will no visual change resulting in any visual effects.

Viewpoint / Photomontage 12: View northeast from Castletown House
(View aligned along historical axis / vista near the north-eastern façade of main building)
This view forms part of a protected viewing corridor as identified within the Kildare County Development Plan 2023-2029 and the Leixlip Local Area Plan 2020-2023. The originally designed view, orientated northeast from Castletown House to The Wonderful Barn, is currently not possible, however, the axial tree lined avenue is still legible in this view.

The value of the view is considered high. Receptors are considered to have a high susceptibility to change and are mainly pedestrians, tourists and staff working on the estate. The visual sensitivity is considered high.

The Proposed Development will not be visible from this location and as such, there will be no change in the existing view. It should be noted that photography used for this assessment is based on winter conditions, i.e. deciduous trees are without foliage. In winter views, there is still not any visibility of the Proposed Development. There will no visual change resulting in any visual effects.

Viewpoint / Photomontage 13: View northeast within proposed development site
(Accessible views along historical axis / vista from within development site)
This view forms part of a protected viewing corridor from Castletown House to The Wonderful Barn, as identified within the Kildare County Development Plan 2023-2029 and the Leixlip Local Area Plan 2020-2023. The upper section of the corkscrew building structure that forms part of The Wonderful Barn is visible in the far distance. The view is channelled between an existing avenue of trees and along grassland located within the Proposed Development site.

The value of the view is considered high as it forms part of a designated viewing corridor. These lands are privately owned and form part of the existing Kildare Innovation Campus. This area of the site does not form part of the pedestrian circulation on the campus at present and receptors are mainly limited to staff maintaining the grounds. Receptor susceptibility is considered low. The visual sensitivity is high.

The landscape proposals along the retained and improved (to replace failed trees) avenue of trees pointing towards The Wonderful Barn will include a formalisation of the grassed areas with the introduction of low and long stretched mounds and wildflowers enclosing a meandering footpath along the avenue and viewing axis. Additional proposed buildings will not become visible through the trees. The introduction of a new access road in the left of the view beyond the avenue of trees will be discernible but not detract from the overall view. The view straight ahead to The Wonderful Barn will remain unaltered. The proposed access for pedestrians will allow this view to be experienced and provides an accessible open green space. The magnitude of visual change is low, and the resulting significance / quality of visual effects is considered minor / beneficial.

Viewpoint / Photomontage 14: View southwest from ground floor level in front of The Wonderful Barn (View aligned along viewing historical axis / vista)
This viewpoint is related to Viewpoint 15 but located at the base of The Wonderful Barn. The view is oriented south and is closely aligned to the historic axial view towards Castletown House. The immediate foreground comprises an open grassed area, contained by hedgerows and coniferous tree planting. Screen planting located along the M4 road alignment terminates the view in the background. The overall vegetation pattern is unfocused and contains remnants of a former more concerted layout.

The value of this view is considered medium as it forms part of a designated axial view towards Castletown House. Receptors are likely to be pedestrians, tourists and workers and are considered to have a high susceptibility to change. The overall sensitivity is considered medium-high.

The majority of the Proposed Development is screened by existing intervening vegetation during the winter months. Sections of proposed Building A1 will be seen through the crowns of trees in the background. Sections of the proposed pedestrian and cycle bridge are discernible through gaps in intervening coniferous trees in the middle ground. Outlines of proposed Buildings C1-C3 can be recognised through the bare crowns of vegetation along the M4 in the background. Apart from the bridge, all other proposed structures will be screened during the summer months. The character of the view will not change despite features of the Proposed Development becoming partially discernible in the distance during the winter months. The magnitude of visual change is therefore considered low. The significance / quality of visual effects is not significant / neutral.

Viewpoint / Photomontage 15: Panoramic view south / southwest from the top of The Wonderful Barn

This elevated and open viewpoint (although currently not publicly accessible) is located at the top of The Wonderful Barn. This Georgian Building, with distinctive corkscrew shape, was a former granary on the Castletown House Estate and forms a local landmark in Leixlip town and the surrounding environs. This viewing location provides an overview of the existing Kildare Innovation Campus, albeit partially screened by existing vegetation, which illustrates the local adjacent landscape setting to the south. The landscape is generally flat, with the Wicklow Mountains visible in the far distance. The surrounding landscape has a substantial tree cover. The M4 is, apart from a short section, mostly screened by intervening vegetation although audible. The existing campus is a large light industrial feature and focus point in this view. This south facing view is closely aligned to the historic axial view towards Castletown House, which is partially intact and visible as a tree lined avenue to the far right of this view.

The value of this view is considered medium as it forms part of a designated axial view towards Castletown House. This view is not publicly accessible at present and receptors are limited to workers who may be intermittently accessing the building for tasks not related to the view. Receptor susceptibility to change is considered medium. Should this location become publicly accessible in the future, receptors will likely be visitors and tourists to The Wonderful Barn. The sensitivity at present is considered medium.

The expansion of the existing business campus footprint will be legible from this elevated location. The most noticeable additional building mass is that of Building A1 to the left of the view as well as that of Buildings A2 and C3 in the middle distance, with mid to upper sections of the buildings visible above existing tree vegetation or other building lines. Additionally, the change in roofscape due to the alterations to existing buildings and the introduction of Buildings C1- 3 and the associated clearance of vegetation is also noticeable. The footprint of the overall built up area increases while the building heights remain similar. The Proposed Development will not break the skyline in this view, it remains low and matches the existing business park. The light industrial character of the campus increases in prominence slightly but it does not change the character of the overall view. The historic axial view between The Wonderful Barn and Castletown House will remain unchanged apart from the discernible introduction of the meandering footpath along the avenue located within the Kildare Innovation Campus.

The addition of the bridge across the M4, situated in the mid-ground of the view, will be clearly visible including the associated northern ramp. Sections of existing vegetation to either side of the M4 will need to be removed to facilitate the bridge. While discernible, the new bridge does not look out of character when seen in conjunction with the motorway and the Kildare Innovation Campus. The magnitude of visual effects is considered medium, due to the development causing modest changes to the existing view over a wide area or noticeable change over a limited area. Overall, the significance /quality of visual effects is moderate / adverse as the prevalence of built structures intensifies but without altering the overall composition of the view.

Viewpoint / Photomontage 16: View southwest from curtilage of The Wonderful Barn

The viewpoint is positioned approximately 95m southwest from The Wonderful Barn. The foreground shows a small scale, open grass field. Along the left-hand side there is a row of deciduous trees which form part of the overall fragmented avenue planting between Castletown House and The Wonderful Barn. Scrubby undergrowth and unmaintained grassland form the middle ground until reaching the mixed tree planting along the M4 motorway corridor. The view also includes a low voltage overhead line as well as road gantries associated with the M4 and metal fencing.

The value of this view is considered medium as it forms part of a designated axial view towards Castletown House. Receptors are likely to be pedestrians, tourists and workers and are considered to have a high susceptibility to change. The overall sensitivity is considered medium.

Visibility of the Proposed Development concentrates on two features, first the proposed Building A1, which becomes discernible on the let of the view through the crowns of trees during the winter months. Secondly, on the proposed pedestrian and cycle bridge including the retaining wall and railings supporting the northern ramp, which will become visible and a new point of focus in the middle distance. The remaining sections of the Proposed Development will be screened by intervening vegetation. Particularly the introduction of the bridge will partially alter the character of the view and introduce a new layer of infrastructure. The historical viewing axis towards Castletown House will remain unaltered. The magnitude of change is considered medium and the resulting significance / quality of visual effects is moderate / adverse.

Viewpoint / Photomontage 17: View southwest from access road to The Wonderful Barn across allotments
This viewpoint is located at the allotments, near The Wonderful Barn. The foreground is made up of the different public allotment plots to the left and right, contained with post and wire fences. A public grass footpath sits in the middle of the view. Temporary construction machinery is apparent in the background to the left-hand side and associated with the nearby construction of a housing estate bordering along the curtilage of The Wonderful Barn. The existing vegetation in the background terminates the view from visibility of the M4 and the existing Kildare Innovation Campus beyond. An existing low voltage overhead transmission lines cross the view in the middle distance. A gantry associated with the M4 is visible in the background.

The value of the view is considered low. Receptors are pedestrians, workers, minders of the allotments, and visitors to The Wonderful Bar. These receptors are considered to have a medium susceptibility to change. The overall visual sensitivity is considered medium-low.

The proposed Building A1 will become visible through the crowns of trees on the left hand side of the view during the winter months. The proposed pedestrian and cycle bridge, however, is clearly visible in the background with its ramp running along the length of the view in the middle distance. The bridge and the ramp in particular will become a new point of focus in this view altering partially the character of the view. The magnitude of visual change is medium, and the resulting significance is considered moderate / adverse.

A summary of visual effects for each photomontage is included in the table overleaf.

Receptor	Susceptibility	Sensitivity	Magnitude of visual effects	Significance / Quality of Effects
Photomontage 1	High	Medium-High	None	Imperceptible / Neutral
Photomontage 2	Low	Low	Low	Minor / Neutral
Photomontage 3	Low	Low	Medium	Moderate / Beneficial
Photomontage 4	Low	Low	Medium	Moderate / Beneficial
Photomontage 5	Low	Low	High	Significant / Beneficial
Photomontage 6	Low	Low	Low	Not Significant / Neutral
Photomontage 7	Low	Low	Low	Minor / Neutral
Photomontage 8	Low	Low	Low	Not Significant / Neutral
Photomontage 9	Medium	Medium	Negligible	Not Significant / Neutral
Photomontage 10	High	High	None	None
Photomontage 11	High	High	None	None
Photomontage 12	High	High	None	None
Photomontage 13	Low	High	Low	Minor / Beneficial
Photomontage 14	High	Medium-High	Low	Not Significant / Neutral
Photomontage 15	Medium	Medium	Medium	Moderate / Adverse
Photomontage 16	High	Medium	Medium	Moderate / Adverse
Photomontage 17	Medium	Medium-Low	Medium	Moderate / Adverse

Table 16.14: Summary of Visual Effects (at Operation)

16.5.6 Visual effects on designated Scenic Routes and Points of View

Designated scenic routes and points of view have been listed in Sections 16.4.2 & 16.4.4 above. An assessment of visual effects is included below:

RL – Views of the River Liffey from bridges:

- RL 1: Leixlip Bridge – No visibility towards the Proposed Development resulting in no visual effects
- RL2: New Bridge – Refer to Photomontage 1, No visibility towards the Proposed Development resulting in imperceptible visual effects.
- RL3 Celbridge Bridge – No visibility towards the Proposed Development resulting in no visual effects

RC – Views to and from all bridges on the Royal Canal:

- RC2: Cope Bridge – No visibility towards the Proposed Development resulting in no visual effects.
- RC3: Louisa Bridge – No visibility towards the Proposed Development resulting in no visual effects
- RC4: Deey Bridge – No visibility towards the Proposed Development resulting in no visual effects
- RC12: Rye Water Aqueduct – No visibility towards the Proposed Development resulting in no visual effects

Scenic Route 28 – Views within the Carton Demesne Walls, to and from Carton House, the Lake and Woodland Areas

The Proposed Development will not result in visual effects due to the orientation of views away from the development site and intervening screening.

Scenic Route 29 – Views of the River Liffey from the Main Avenue of Castletown House

The Proposed Development will not result in visual effects due to the orientation of views away from the development site and intervening screening.

16.5.7 Visual effects on walking routes

Visual effects on the following walking routes have been identified as follows from locations within the principal study area:

- The Royal Canal Way: No visual effects due to intervening screening provided by vegetation, existing built structures and topography.
- Arthur’s Way Heritage Trail: Sections of this walking route are located along the boundary of the Proposed Development (refer to Photomontages 1-4 & 7). Sections of the Proposed Development will become visible as well as changes to the existing planting the introduction of additional proposed planting. The significance / quality of visual effects range from none to moderate / beneficial.
- Slí na Sláinte – Celbridge Kildare: Sections of this walking route share the same route as Arthur’s Way Heritage Trial and are located along the boundary of the Proposed Development (refer to Photomontages 1-4 & 7). Sections of the Proposed Development will become visible as well as changes to the existing planting the introduction of additional proposed planting. The significance / quality of visual effects range from none to moderate / beneficial.
- Slí na Sláinte – Leixlip West: No visual effects due to intervening screening provided by vegetation, existing built structures and topography.
- Slí na Sláinte – St. Catherine’s Park Slí (Leixlip): No visual effects due to intervening screening provided by vegetation, existing built structures and topography.
- Slí na Sláinte – Leixlip Lucan Demesne: No visual effects due to intervening screening provided by vegetation, existing built structures and topography.

16.5.8 Visual effects on Irelands Ancient East tourism routes

The Castletown House Demesne will not be affected by the Proposed Development as illustrated in Photomontages 9 – 12.

16.5.9 Areas of High Amenity

The Proposed Development will not result in landscape and visual effects within the following areas of high amenity, which are located within the principal study area:

- The River Liffey and the River Barrow Valleys

- The Grand and Royal Canal Corridors

16.5.10 Facilitation Works at Operation

The **GNI Gas Upgrade** works will not result in landscape effects at operation. The majority of the proposed gas pipe alignment will be located within existing road corridors. No visual effects are anticipated following the completion of construction works as existing road surfaces and open ground will be reinstated to match existing conditions.

Changes to the existing OHL network due to the **EirGrid Uprating** will be barely perceptible or appear similar to existing structures. Visual effects are therefore considered negligible and their significance / quality imperceptible or not significant / neutral.

16.5.11 Cumulative landscape and visual effects

A large number of proposed and permitted projects located within the principal study area have been reviewed to determine their location, scale and the potential relevance to the Proposed Development. Cumulative landscape and visual effects may result from additional changes to the baseline landscape or views as a result of the Proposed Development being seen in conjunction with other developments similar in scale, type and nature. A list of cumulative schemes that have planning consent or are in the planning process is enclosed below. Developments that are currently under construction are considered to be part of the landscape and visual baseline.

Planning reference	Proposal	Status	Location in relation to proposed development	Relevance to this assessment
20307223/0	Strategic Housing Development Leixlip Gate, Kilmacredock, Leixlip, Co. Kildare	Permission granted	Within approximately 650m northwest of the Proposed Development site	The permitted development is large scale housing development located within the study area.

Table 16.15: Relevant cumulative developments

Cumulative effects with Strategic Housing Development (SHD) at Leixlip Gate, Kilmacredock, Leixlip, Co. Kildare

There will be no intervisibility and therefore no cumulative landscape and visual effects arising between the permitted SHD and the Proposed Development due to topography, intervening vegetation and existing built structures such as the M4.

16.6 Mitigation Measures

Mitigation is a term used to describe the measures or actions that may be taken to minimise environmental effects. The purpose of mitigation is to avoid, reduce and where possible remedy or offset, any significant adverse direct and indirect effects on the environment arising from the Proposed Development.

The principal mitigation for the Proposed Development is inherent in the design of its architecture and open space design, which has evolved through an iterative process of assessment and consultation. There are no operational management measures required in respect of landscape and visual issues.

The proposed mitigation measures have been developed in tandem with the landscape masterplan, as a result of collaboration between the multi-disciplinary design team throughout preliminary stages of this project and comprises of the following avoidance, reduction and remediation measures. The main goals are described below:

16.6.1 Avoidance Measures

The site selection process and alternatives considered is set out in Chapter 4 – Key Alternatives Considered.

The main avoidance measures are the retention and protection of the existing mature woodland belts along the site boundaries to the north, south and east. Existing trees to be retained will be protected during the construction stage in accordance with recommendations of the Arboricultural Assessment and the BS 5837: 2012. Prior to commencement of construction, existing trees which are to be retained will be protected by erection of timber post and wire fence according to BS 5837:2012 to ensure no works are carried out under each of their canopies. Unstable trees should be removed under direction of the arborist.

16.6.2 Reduction Measures

- The height and scale of the Proposed Development will align with the existing prevailing building format on the site;
- The Proposed Development will be fenced off during the construction phase to reduce the visual impact of the works;
- Vehicles exiting site during the construction stage should be subject to wheel wash facilities or road sweepers shall be used in order to maintain clean roads;
- Any lighting used during the construction process should be kept to a minimum, providing for site safety only and shall be directed into the site and away from adjacent residential properties. Lighting shall be shielded to avoid light spill onto adjacent properties and roads; and
- Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrating the Proposed Development into the surrounding landscape, provide screening where needed, and minimise the effect on the landscape character of the area.

16.6.3 Remediation Measures

- Enhancement of site tree cover by introduction of additional tree and woodland planting;
- Provide a permeable design by creating connections for pedestrians and cyclists through and around the site;
- Landscape works to be carried out as per associated Landscape Masterplan;
- A mix of both native and non-native plant species to be used throughout the scheme;
- Landscape management and maintenance plan to be drawn up and approved up by qualified professional;
- Ensure that ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site; and
- Ensure that ongoing maintenance and replacement of failing or failed plant material.

The review of photomontages allowed for the assessment of how effective the proposed mitigation will be in regard to residual landscape and visual effects arising from the development.

While the site is generally well screened from surrounding receptors and landscape sensitivities, the aim of the proposed landscape mitigation measures is to integrate the Proposed Development into the existing site while also reducing the visual effects on identified receptors within the principal study area. The landscape mitigation will complement the space by adding new landscape elements helping to integrate the Proposed Development into its existing environs over time. The overarching design intention is to propose a network of connected open spaces to improve pedestrian and cyclist permeability across the site, while also generating a strong sense of place and identity for the upgraded business campus. The protected axial view from Castletown House to The Wonderful Barn has been incorporated into the overall site layout and is emphasised by a newly introduced walking route along the tree lined avenue on the site in addition to the setback of building facades along the viewing corridor. Ecological enhancements such as bird and bat boxes, bug hotels, scrapes along with significant habitat creation from woodland planting to wildflower meadows will ensure the site maintains its biodiversity for local wildlife.

16.7 Residual Effects

Following the completion of construction works and the implementation of the proposed landscape mitigation measures, the development will become a long-term feature extending the building footprint of Kildare Innovation Campus.

Effective execution and establishment of the proposed landscape mitigation / green infrastructure will have a positive impact and help to ‘soften’ landscape and visual effects associated with the Proposed Development, particularly from areas where the development will become visible such as sections of the R404 and the curtilage of The Wonderful Barn. In the medium to long term, the perception of adverse landscape and visual effects will reduce in tandem with the maturing of the proposed planting.

16.7.1 Residual Landscape Effects

Long term residual landscape effects will arise locally where the proposed extension to the existing Kildare Innovation Campus and the proposed pedestrian / cycle bridge will be physically located. The alteration and transformation of the existing campus will intensify the inherent light industrial landscape character within the site, leading to an increase and densification of the light industrial buildings replacing sections of existing open green space and lead to the addition of infrastructural elements in the curtilage of The Wonderful Barn area. The magnitude of landscape change is considered medium and the resulting significance / quality is moderate / beneficial. The alteration and redesign of the open space, and the proposed screen planting will improve biodiversity and the overall strength of the landscape layout as the vegetation matures, which will reduce the significance of landscape effects to minor / neutral.

Outside of the Proposed Development site boundary within a distance of up to 400m, where the visibility of the Proposed Development influences the perception of the character of the landscape, change in landscape character is largely limited to a short section of the R404, from the existing campus entrance to the northwest of the site and a section at the curtilage of The Wonderful Barn area. The magnitude of landscape change in these areas is considered low. The significance / quality of landscape effects on the landscape character in these areas is considered minor / beneficial at operation. Following the establishment of landscape mitigation measures, the significance and quality of landscape effects will reduce further to not significant / neutral.

The table overleaf lists the residual landscape effects.

Receptor	Susceptibility	Sensitivity	Magnitude of landscape change	Direct/ indirect Effects	Significance of landscape change / quality of effects
Landscape Character Area 'Northern Lowlands' (Co. Kildare) within the Proposed Development site	Low	Low	Low	Direct	Minor / Neutral
Landscape Character Area 'Northern Lowlands' (Co. Kildare) outside the Proposed Development within approximately 400m of the Proposed Development site boundary	Low	Low	Low	Indirect	Not Significant / Neutral
Landscape Character Area 'Northern Lowlands' (Co. Kildare) outside the Proposed Development beyond approximately 400m of the Proposed Development site boundary	Low	Low	Negligible	Indirect	Not Significant / Neutral
LCA 'River Liffey' (Co. Kildare)	High	High (Special)	Negligible	Indirect	Not Significant / Neutral
LCA 'Liffey Valley' (South Dublin)	High	Medium-High	None	Indirect	None
LCA 'Urban' (South Dublin)	Low	N/A	None	Indirect	None
LCA 'Newcastle Lowlands' (South Dublin)	Medium	Medium	None	Indirect	None
Historic Townscape	High	High	None	Indirect	None
Effect on existing vegetation (within the Proposed Development site)	High	High	Low	Direct	Minor / Beneficial
Green Open Space (as identified within the Leixlip LAP 2020-2023)	High	High	Negligible	Indirect	Not Significant / Neutral

Table 16.16: Summary of Residual Landscape Effects

16.7.2 Residual Visual Effects

Residual visual effects will concentrate along the adjacent road network to the east and south (R404) and in available views from the area around The Wonderful Barn where the proposed pedestrian / cycle bridge will be visible, as well as from the elevated viewing location at the top of The Wonderful Barn. The proposed landscape mitigation measures will integrate the Proposed Development into its setting reducing the significance of residual visual effects. This includes the view from the top of The Wonderful Barn where the proposed extensive new planting within the Kildare Business Park will reduce views of sections of buildings as the planting matures. The overall character of the view from the top of The Wonderful Barn will remain similar.

A summary of residual visual effects from individual viewpoints is included in the table below.

Receptor	Susceptibility	Sensitivity	Magnitude of visual effects	Significance / Quality of Effects
Photomontage 1	High	Medium-High	None	Imperceptible / Neutral
Photomontage 2	Low	Low	Low	Not Significant / Neutral
Photomontage 3	Low	Low	Medium	Minor / Beneficial
Photomontage 4	Low	Low	Medium	Minor / Beneficial
Photomontage 5	Low	Low	High	Moderate / Beneficial
Photomontage 6	Low	Low	Low	Not Significant / Neutral
Photomontage 7	Low	Low	Low	Minor / Neutral
Photomontage 8	Low	Low	Low	Not Significant / Neutral
Photomontage 9	Medium	Medium	Negligible	Not Significant / Neutral
Photomontage 10	High	High	None	None
Photomontage 11	High	High	None	None
Photomontage 12	High	High	None	None
Photomontage 13	Low	High	Low	Minor / Beneficial
Photomontage 14	High	Medium-High	Low	Not Significant / Neutral
Photomontage 15	Medium	Medium	Medium	Minor-Moderate / Neutral
Photomontage 16	High	Medium	Medium	Minor-Moderate / Neutral
Photomontage 17	Medium	Medium-Low	Medium	Minor-Moderate / Neutral

Table 16.17: Summary of Residual Visual Effects

15.1 Difficulties Encountered

No difficulties were encountered in gathering data and assessing landscape and visual effects at the KIC lands.

Details on the facilitation works required to support the proposed development at the KIC lands, which are to be undertaken by the relevant statutory undertakers when required, are provided at a high level in this EIAR. In the absence of finalised design and construction detail relating to the provision of a gas transmission line by Gas Networks Ireland (GNI) to the site, the assessment of landscape and visual effects in this EIAR could only be provided at a high level.

16.8 Conclusion

Seventeen photomontages have been prepared illustrating the nature of visibility at key viewpoint locations within the 2km principal study area. The assessment should be viewed in conjunction with the photomontage booklet contained in Appendix 16.1 and landscape designation mapping contained in Appendix 16.2.

16.8.1 Construction Effects

Areas experiencing landscape and visual effects during the construction stage will vary depending on the active construction phase of the Proposed Development. All groundworks, demolishing works, vegetation removal, refurbishment of buildings or the construction of new buildings including the pedestrian / cycle bridge and associated ramps, road network and landscape architecture will be mainly experienced locally from within the boundary of the Proposed Development site and from areas outside within approximately 400m where available views exist. Construction works of the proposed bridge will be visible along the M4 and the overbridges (R404 & Junction 6) for approximately 1.6km to the west and approximately 1km to the east although the existing bridge of the R404 will be more prominent on approach from the east.

Landscape and visual effects, in areas within approximately 400m where open or partial views of the construction works are available, are considered to be significant and adverse but temporary.

Landscape and visual effects in the wider study area, beyond approximately 400m, from the site boundary are not considered significant as the development will not introduce uncharacteristic features to the existing landscape and visual character. Intervening vegetation, topography and built structures will quickly screen the construction works of the Proposed Development. The landscape character of Castletown House demesne will not be affected by construction works.

16.8.2 Landscape Effects at operation

The Proposed Development is located within the Northern Lowlands Landscape Character Area, which is considered a Class 1 – Low sensitivity landscape in the context of the county-wide assessment, as defined within the Landscape Character Assessment of County Kildare. The existing Kildare Innovation Campus is an overall low density business campus with large open green areas. The Proposed Development will intensify the inherent light industrial landscape character within the site, leading to an increase and densification of the light industrial buildings replacing sections of existing open green space. The proposed pedestrian / cycle bridge will increase the infrastructural elements in the principal study area but it will integrate into the existing character of the M4 motorway corridor due to its design and scale.

Direct and long-term modification will occur locally where the proposed alterations to the existing Kildare Innovation Campus will be physically located. Sections of existing tree planting and hedgerows will be removed to facilitate the Proposed Development resulting in significant landscape effects due to the partial removal of vegetation and loss of open space. However, the alteration and redesign of the open space, and the proposed planting will improve biodiversity and the overall strength of the landscape layout within the campus site.

Indirect change will occur outside of the Proposed Development site boundary within a distance of up to 400m, where the visibility of the Proposed Development influences the perception of the character of the landscape. Considering the flat and low-lying nature of the existing landscape, in addition to the dense mature vegetation planting to the perimeter of the existing campus site, indirect alterations to the landscape character can be recognised largely along short sections of the R404 along the eastern campus boundary and from the curtilage of the Wonderful Barn. Landscape effects are considered beneficial and not significant.

Landscape effects will reduce further quickly to imperceptible and neutral with increasing distance from the Proposed Development in the remaining study area (beyond approximately 400m from the Proposed Development). Adjoining landscape character areas such as the River Liffey landscape character area and the character of the Castletown House demesne will remain unchanged during operation. Landscape Character Areas located within the wider study area in South Dublin, namely Liffey Valley, Urban, and Newcastle Lowlands will not be affected by the Proposed Development resulting in no landscape effects.

16.8.3 Visual Effects at operation

Considering the flat and low-lying nature of the existing landscape, in addition to the dense mature vegetation planting to the perimeter of the Kildare Innovation Campus and along the M4, visibility of the Proposed Development is generally limited to areas within 400m of the site boundary. Longer distance views of the proposed pedestrian / cycle bridge crossing the M4 are possible when traveling along the M4 and from overbridges (R404 & Junction 6) for approximately 1.6km to the west and approximately 1km to the east although the existing bridge of the R404 will be more prominent on approach from the east.

Significant visual effects will occur within the Proposed Development site and tend to occur where there is no or little intervening vegetation between the viewer and the Proposed Development as well as along its periphery (sections of the R404), or where the viewer stands in sections of the curtilage of The Wonderful Barn or at the top of it.

Dense bands of woodland and trees belts along the boundaries of the Kildare Innovation Campus and along the M4, the grounds of Castletown Demesne, within sections of the curtilage of The Wonderful Barn, and publicly accessible locations along the River Liffey will confine visual effects locally (within approximately 400m from the site boundary) and screen the Proposed Development fully in the wider study area apart from sections of the M4 as stated above.

The existing protected viewing axis between Castletown House and The Wonderful Barn as well as views within the demesne itself will not be altered and remain unaffected by the proposed development. Designated scenic roads and points of views as well as signposted walking routes, and areas of high amenity will not experience significant visual effects.

16.8.4 Cumulative Effects

The following relevant project may result in cumulative landscape and visual effects when seen together with the Proposed Development:

Strategic Housing Development Leixlip Gate, Kilmacredock, Leixlip, Co. Kildare
(located approximately 650m northwest of the Proposed Development site)
There will be no intervisibility and therefore no cumulative arising landscape and visual effects between the permitted SHD and the Proposed Development due to topography, intervening vegetation and existing built structures such as the M4.

17.0 CHAPTER 17 – MAJOR ACCIDENTS AND DISASTERS

17.1 Introduction

This chapter of the Environmental Impact Assessment Report has been prepared by Matthew Michie a Senior Environmental Consultant at AWN Consulting Limited. Matthew holds an MChem and a MSc (Physical Chemistry). Matthew has 5 years' experience in the field of environmental sciences and has been involved in numerous EIARs for a range of projects including commercial, residential, industrial, pharmaceutical and data centre developments.

This chapter is an assessment of the potential for the project to cause major accident hazards and the vulnerability of the project to natural disasters based on the engineering design, drawings and documentation. Where the project is likely to cause major accidents or is vulnerable to impact by natural disasters, the likely significant environmental impacts of such major accidents and disasters in regard to issues such as soils, geology and hydrogeology, hydrology, air quality, noise and vibration, human health and biodiversity are addressed in detail within the following EIAR chapters:

- Chapter 5 – Population and Human Health
- Chapter 6 - Biodiversity
- Chapter 7 - Land, Soils, Geology and Hydrogeology
- Chapter 8 - Hydrology
- Chapter 9 - Air Quality
- Chapter 10 - Noise and Vibration

17.2 Project Description

The Principal works is an integrated masterplan proposal that includes for the expansion of the existing campus, allowing for a mix of Deep Tech, ICT and Innovation uses. The Principal works will include for the demolition of some of the existing buildings on site and construction of new buildings, an energy centre and replacement substation. The proposal will include significant public infrastructure including a new signalised intersection on Celbridge Road (R404), a new Public Link Road through the campus (between Barnhall Road and the new signalised intersection), a pedestrian/cycle overpass of the M4, pedestrian and cycle links through the site and along the designated protected view corridor and supporting infrastructure.

The project to which this EIAR relates includes inter-alia replacing the existing 110 kV Air Insulated Switchgear (AIS) Substation with a 100 kW Gas Insulated Switchgear (GIS). The replacement 110kV substation will include 6 No. transformers, with client control building and a 2 storey GIS substation building within a 2.4m high fenced compound. The project to which this EIAR relates also include facilitation works required to support the development, which do not form part of the development consent, are being sought from Kildare County Council. The facilitation works include a mix of works that will be required to be undertaken for or on behalf of statutory undertakers such as Gas Networks Ireland and EirGrid and are described in Chapter 2 of this EIAR.

The development site which is subject to the application for consent measures c. 72.23 ha and is principally bounded by: the M4 Motorway to the north; Cellbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west.

The site comprises the existing Kildare Innovation Campus, which was formerly the Hewlett Packard Campus originally permitted in 1995 under KCC Reg. Ref 95923. The development site also encompasses lands with the jurisdiction of Kildare County Council (KCC).

Refer to Chapter 2 and 3 of this EIAR for a more detailed description of the site's location and context.

17.3 Methodology

Alongside the legislation, policy, and guidance outlined in Chapter 1, the following relevant legislation, policy, and guidance has informed the preparation of this chapter:

- EPA 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2022),
- EPA 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (2018),
- Health and Safety Authority Guidance on Technical Land-Use Planning Advice, for planning authorities and COMAH establishment operators (2023)
- Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015

The EPA Guidelines, 2022, state that:

"To address unforeseen or unplanned effects the Directive further requires that the EIAR takes account of the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk). This may be supported by general risk assessment methods or by systematic risk assessments required under other legislation e.g., a COMAH (Control of Major Accident Hazards involving Dangerous Substances) assessment.

The potential for a project to cause risks to human health, cultural heritage or the environment due to its vulnerability to external accidents or disasters is considered where such risks are significant, e.g., the potential effects of floods on sites with sensitive facilities. Where such risks are significant then the specific assessment of those risks in the form of a Seveso Assessment (where relevant) or Flood Risk Assessment may be required."

17.3.1 Background to Control of Major Accident Hazards Involving Dangerous Substances (COMAH) Regulations

The Seveso III Directive (2012/18/EU) requires Member States to apply land-use or other relevant policies to ensure that appropriate distances are maintained between residential areas, areas of substantial public use and the environment, including areas of particular natural interest and sensitivity and hazardous establishments. For existing establishments, Member States are required to implement, if necessary, additional technical measures so that the risk to persons or the environment is maintained at an acceptable level.

The HSA is the Competent Authority in Ireland as defined by Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015, (COMAH Regulations 2015) which implement the Seveso III Directive in Ireland. The HSA is responsible for ensuring that the impacts of facilities which fall within the remit of this legislation are taken into account with respect to land use planning. This is achieved through the provision of technical advice to planning authorities.

A Land Use Planning assessment has been carried out by AWN Consulting Ltd., as part of this planning application in accordance with the Guidance on Technical Land Use Planning Advice (HSA, 2023) and includes a Major Accident to the Environment (MATTE) assessment (CDOIF, 2017). This assessment provides detailed analysis of these major accident scenarios.

The land use planning assessment has been carried out in accordance with the HSA's Guidance on technical land-use planning advice (HSA, 2023). This approach involves delineating three zones for land use planning guidance purposes, based on the potential risk of fatality from major accident scenarios resulting in damaging levels of thermal radiation (e.g., from pool fires), overpressure (e.g., from vapour cloud explosions) and toxic gas concentrations (e.g., from an uncontrolled toxic gas release).

The process for determining the distances to the boundaries of the inner, middle and outer zones is outlined as follows:

- Determine the consequences of major accident scenarios using the modelling methodologies described in the HSA's Guidance on technical land-use planning advice (HSA, 2023).
- Determine the severity (probability of fatality) using the Probit functions specified by the HSA.
- Determine the frequency of the accident (probability of event) using data specified by the HSA.
- Determine the individual risk of fatality as a product of Frequency and Severity

Refer to the Land Use Planning Assessment prepared by AWN and submitted with the application for further detail. The Land Use Planning assessment concluded that the level of individual risk for the proposed Principal works is below the threshold set by the Health and Safety Authority (HSA); therefore, the level of risk is acceptable.

17.3.2 Baseline Scenario/Likely Future Receiving Environment Analysis Methodology

The EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) state that:

> *"It is important to demonstrate that correct methodologies and experts have been used. It is also important that the methodology used in establishing the baseline scenario is documented to permit replicable future monitoring so that the later results can be properly compared (where required). Standard recognised methods should be applied where available and appropriate."*

The baseline/future receiving environment analysis for this Chapter has been undertaken in accordance with the EPA Guidelines on the Preparation of an EIAR (EPA, May 2022) and all other documents outlined above.

A desktop study has been completed to establish the baseline environment for which the proposed risk assessment. This will influence both the likelihood and impact of a major accident or natural disaster.

17.3.3 Impact Assessment Methodology

The analysis of the predicted impacts of the proposed development on human health and the environment during construction and operation are presented in this Chapter. The risk assessment identifies and quantifies risks focusing on unplanned, but plausible events occurring due to the proposed development. The approach to identifying and quantifying risks associated with the proposed development by means of a sites specific risk assessment is derived from the EPA *Guidelines on the Preparation of an EIAR* (EPA, May 2022) and all other documents outlined above.

Assessment methods quantify and predict the magnitude and significance of impacts.

The methods employed for assessment and evaluation of the environmental topics for this Chapter have been:

1. Risk assessment following Schedule 6 of the Planning and Development Regulations, 2001, as amended:

   "a description of the expected significant adverse effects on the environment of the proposed development deriving from its vulnerability to risks of major accidents and/or disasters which are relevant to it. Relevant information available and obtained through risk assessments pursuant to European Union legislation such as the Seveso III Directive or the Nuclear Safety Directive or relevant assessments carried out pursuant to national legislation may be used for this purpose, provided that the requirements of the Environmental Impact Assessment Directive are met.
   Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for, and proposed response to, emergencies arising from such events".

2. Expert Opinion

3. Review of Strategic Environmental Assessment prepared for the *Kildare County Development Plan 2023-2029* (including a review of the Development Plan itself). According to the EPA Guidelines, 2022, this can reduce the number of cumulative effects that need to be considered in an EIAR.

4. Geospatial Analysis (cumulative impacts only – used to identify planning permissions/applications within a 5 km radius).

5. Land Use Planning Assessment following the Health and Safety Authority Guidance on Technical Land-Use Planning Advice (2023), for planning authorities and COMAH establishment operators, report reference MM.237501.0007RR01.

6. Flood Risk Assessment following The Planning System and Flood Risk Management Guidelines for Planning Authorities published by the OPW in 2009 (OPW Guidelines).

17.3.4 Site Specific Risk Assessment Methodology

The site-specific risk assessment identifies and quantifies risks focusing on unplanned, but plausible events occurring due to the proposed development. The approach to identifying and quantifying risks associated with the proposed development by means of a sites specific risk assessment is derived from the EPA Guidelines on information to be contained in EIAR (EPA, 2022).

The criteria for categorising impact are derived from the EPAs Guidance on Assessing and Costing Environmental Liabilities (2014). In this guidance, the risk assessment methodology commences with the establishment of risk classification criteria followed by risk analysis based on these criteria. Risk classification tables are required in order to evaluate and rank the risks compared with each other. They form the basis for rating the likelihood of an event occurring and the consequence of impact if the event occurs. The likelihood and consequence ratings are combined to form a risk score for risk evaluation.

Rating	Category	Description
1	Very low	Very low chance of hazard occurring
2	Low	Low chance of hazard occurring
3	Medium	Medium chance of hazard occurring
4	High	High chance of hazard occurring
5	Very high	Very high chance of hazard occurring

Table 17. 1 Risk Classification – Likelihood

Rating	Category	Description
1	Trivial	No impact of negligible change to the environment
2	Minor	Minor impact/localised or nuisance occurring
3	Moderate	Moderate impact to environment or human health
4	Major	Severe impact to environment or human health
5	Massive	Massive impact to a large area

Table 17. 2 Risk Classification - Consequence

The risks are then ranked according to their own risk score (1-5) in a colour coded matrix table which allows risks to be easily displayed and prioritised. The colour codes are as follows and indicated in Table 17.3 below:

- Red – high level risks requiring priority action (overall risk scores of 15-25).
- Yellow – medium-level risks requiring action, but not as critical as red-coded risks (overall risk scores of 8-12); and

- Green (light and dark) – low-level risks requiring continuing awareness and monitoring on a regular basis (overall risk scores of 1-6).

		Consequence				
		Trivial	Minor	Moderate	Major	Massive
Likelihood	Very High	Low	Medium	High	High	High
	High	Low	Medium	Medium	High	High
	Medium	Low	Low	Medium	Medium	High
	Low	Low	Low	Low	Medium	Medium
	Very Low	Low	Low	Low	Low	Low

Table 17. 3 Example Risk Matrix

17.3.5 Difficulties Encountered

No particular difficulties were encountered in preparing the major accident assessment.

There are uncertainties in relation to assessing impacts on individuals or communities due to the lack of individual health data and the difficulty in predicting effects, which can only be based on general guidance and assumptions.

Forecasting methods and methodology, if any, are set out within the specialist chapters that this assessment relies upon.

17.4 Baseline Scenario/Future Receiving Environment Analysis

17.4.1 Current State of the Environment (Baseline Scenario)

The EIA Directive requires the following to be described relating to the baseline scenario:

> *"A description of the relevant aspects of the current state of the environment (baseline scenario)".*

17.4.2 Seismic Activity

In Ireland, seismic activity is recorded by the Irish National Seismic Network. The Geophysics Section of the School of Cosmic Physics, Dublin Institute for Advanced Studies, has been recording seismic events in Ireland since 1978 (www.dias.ie). This network consists of several seismometers that are located throughout Ireland. Figure 17.1 illustrates historical and recorded seismic events since 1980.

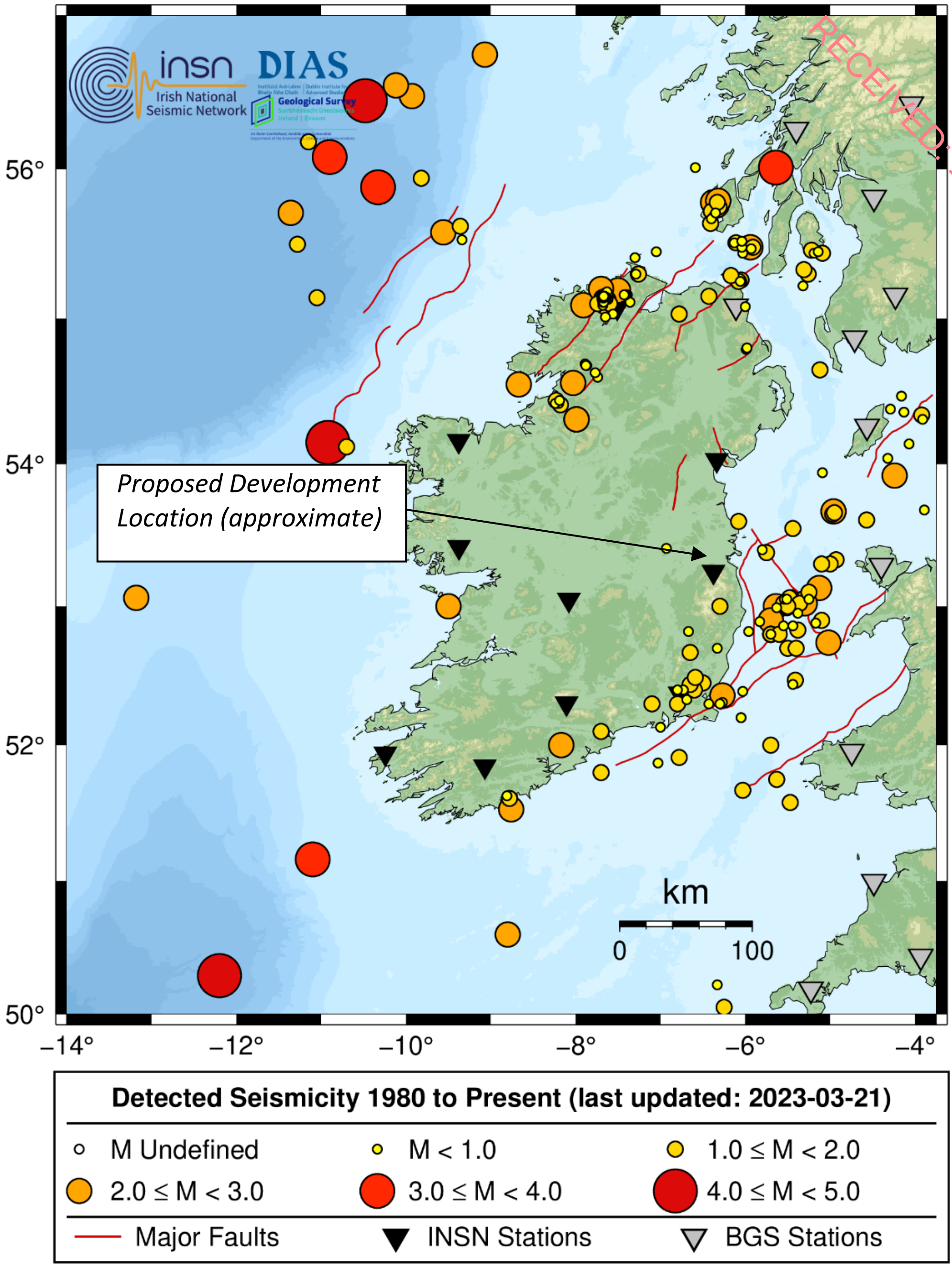

Figure 17. 1 Ireland Seismic Activity Map

Seismic activity and earthquake risk in Ireland are generally considered to be low. This is because Ireland is located on the western edge of the Eurasian Plate, which is a tectonic plate that is not known for its seismic activity.

However, earthquakes can still occur in Ireland, although they are typically small and have little impact.

It can be seen in Figure 17. 1 that there is no significant seismic activity recorded in the vicinity of the proposed development. Therefore, the likelihood of seismic activity initiating a major accident at the proposed development is negligible; therefore, **not significant.**

Further detail is provided in Chapter 7 (Land, Soils, Geology and Hydrogeology).

17.4.3 Landslides

Much of the Earth's surface is covered by unconsolidated sediments which can be especially prone to instability. Water often plays a key role in lubricating the slope failure. Instability is often significantly increased by man's activities in building houses, roads, drainage and agricultural changes. Landslides, mud flows, bog bursts (in Ireland) and debris flows are a are a natural hazard that can occur. These can cause damage to property, infrastructure, and the natural environment, and can also pose a risk to human life.

In general, risk of landslides in Ireland is considered to be low, as the country is not located in a region with high seismic activity or large mountain ranges. Landslides are more common in unconsolidated material than in bedrock, and where the sea constantly erodes the material at the base of a cliff landslides and falls lead to recession of the cliffs. Landslides have occurred in Ireland in recent years in upland peat areas due to disturbance of peat associated with construction activities.

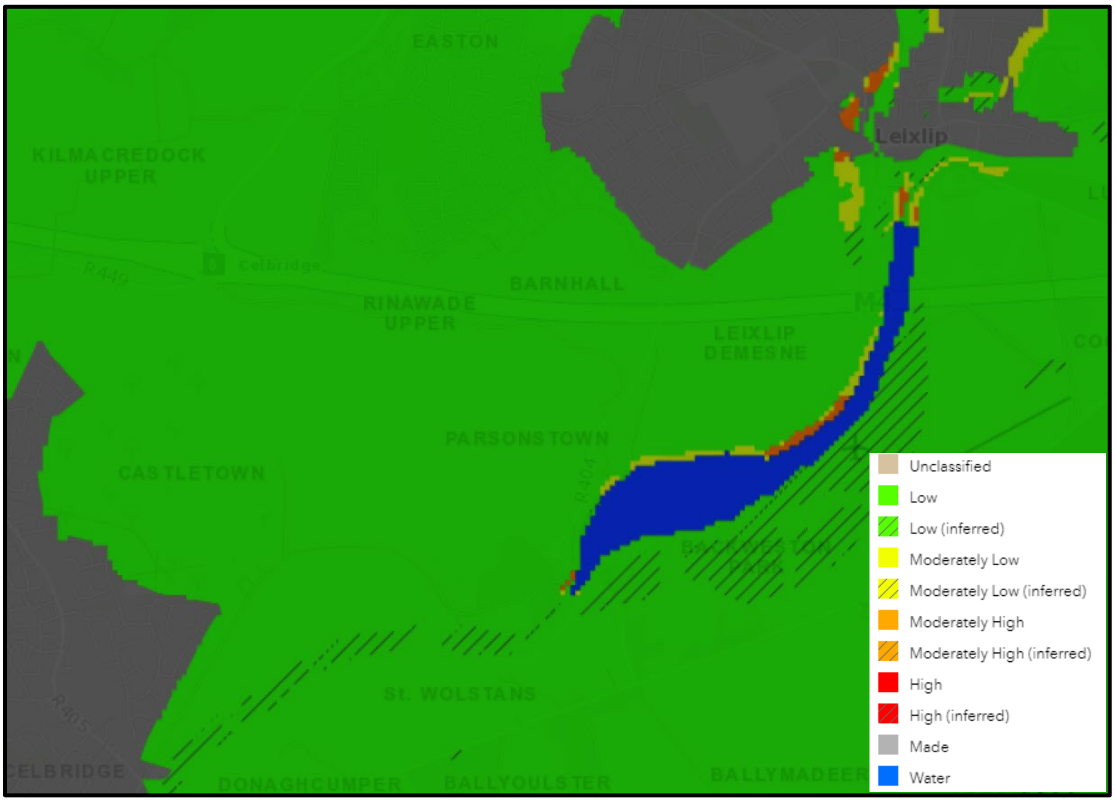

Figure 17. 2 Landslide Susceptibility Map (GSI Ireland)

The landslide susceptibility map identifies areas which are subject to landslides and is measured from low to high. The landslide susceptibility map considers the location of landslides and what causes them (slope, soil type and the impact of the flow of water). It can be seen in Figure 17. 2 that the area surrounding the proposed development has a low susceptibility of landslides. Therefore, the likelihood of a landslide initiating a major accident at the proposed development is negligible and the likelihood of the project initiating a landslide is considered negligible; therefore, **not significant**.

Further detail is provided in Chapter 7 (Land, Soils, Geology and Hydrogeology).

17.4.4 Flood Risk

As stated in Chapter 7 of this EIA Report, a Flood Risk assessment (FRA) was carried out, by Clifton Scannell Emerson Associates. This FRA was completed following The Planning System and Flood Risk Management Guidelines for Planning Authorities published by the OPW in 2009 (OPW Guidelines). It was concluded that the proposed development is located within Flood Zone C/ and is not subject to flood in the 1:1000-year event (0.1% Annual Exceedance Probability). Therefore, the likelihood of a flood initiating a major accident at the proposed development is negligible and the likelihood of the proposed project causing a flood is negligible; therefore, **not significant.**

Further detail is provided in Chapter 8 (Hydrology).

17.4.5 Metrological

The climatic conditions were assessed using data obtained from the Met Eireann Meteorological database and the Casement Aerodrome Synoptic Station between 1991 - 2021 (Casement Aerodrome being the closest Meteorological Station).

Precipitation

- The annual mean total rainfall was 806mm and the greatest 24-hour total was 109.8mm

Wind

- The maximum annual gust over the 30-year period was 50 knots.

Temperature

- The maximum temperature was 30.3°C and the minimum temperature was -15.3°C.

The hydrogenated vegetable oil storage tanks, ammonium hydroxide tanks and turbines are not considered to be at risk during storms or during extreme heat or cold event, any more so than other significant buildings or structures. Therefore, the likelihood of extreme weather initiating a major accident at the proposed development is negligible; therefore, **not significant.**

17.4.6 Major Accident Hazards

There are currently no COMAH / SEVESO sites in proximity to the proposed development site.

Following the completion of the development, the site will a sub-COMAH site as the quantum of hazardous substances will not exceed Lower Tier thresholds, as such is not subject to the provisions of the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations (2015).

A Risk Assessment following the methodology set out by the HSA's *Guidance on Technical Land Use Planning Advice* (HSA, 2023), has been carried out for the Principal Works, by AWN Consulting Ltd., as part of this planning application in accordance with the Guidance on Technical Land Use Planning Advice (HSA, 2023) and includes a Major Accident to the Environment (MATTE) assessment (CDOIF, 2017). The Land Use Planning assessment concluded that the level of individual risk for the proposed Principal Works is below the threshold set by the Health and Safety Authority (HSA); therefore, the level of risk is acceptable.

17.4.7 Likely Future Receiving Environment ('Do Nothing' Scenario)

The EIA Directive requires the following to be described relating to the future receiving environment (the 'Do Nothing' scenario):

> *"an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge".*

In the event of a 'Do Nothing' scenario, the site would remain in operation as an existing ICT campus.

17.5 Likely Impacts of the Project

The main potential impacts on population and human health from the proposed development are potential for spills/leaks, air emissions, noise, visual, and traffic impacts. The baseline environment, pollution pathways, relevant mitigation measures and residual impacts have been assessed in greater detail within the corresponding specialist chapters; Chapter 5 – Population and Human Health, Chapter 6 – Biodiversity, Chapter 7 - Land, Soils, Geology and Hydrogeology, Chapter 8 – Hydrology, Chapter 9 - Air Quality, Chapter 10 - Noise and Vibration.

The major accident hazards for the proposed development are presented in Table 17. 4 and the natural disaster hazards are presented in Table 17. 5. In the scoping phase for this EIAR the potential for impacts to human health and impacts to the environment were assessed.

Major Accident Scenario	Phase	Impact	Consequence Rating	Basis of Consequence	Unmitigated Likelihood Rating	Basis of Unmitigated Likelihood	Unmitigated Risk Score	Mitigated Likelihood Rating	Basis of Mitigated Likelihood	Mitigated Risk Score
Fire: Flash fire or Jet fire following natural gas release at natural gas pipeline	Operation of the Principal Works	Human Health	4	There is potential for harm to persons on-site in the vicinity of the pipeline. The thermal radiation impacts do not extend off-site.	2	The natural gas pipeline is below ground and will be installed to Irish Installation Standard I.S. 813. The natural gas above ground installation (AGI) will be secured by fencing and will be regularly maintained by Gas Networks Ireland.	8	1	The land use planning assessment determined the likelihood of a jet fire or flash fire at the proposed development to be very low. The pipeline will have a slam shut valve that will close in the event of a sudden pressure drop (which occurs in the event of a leak or rupture), preventing the continuous outflow of natural gas.	4
Vapour Cloud Explosion: VCE following natural gas release at one of the turbines and delayed ignition	Operation of the Principal Works	Human Health	3	There is potential for harm to persons on-site in the vicinity of the energy centre; however, these areas are not typically occupied. The overpressure impacts do not extend off-site.	3	The natural gas pipeline will be installed to Irish Installation Standard I.S. 813.	9	2	The land use planning assessment determined the likelihood of a VCE at the proposed development to be low. The turbine enclosures will have natural gas detectors that will alert personnel of a leak, and if the leak continues, will trip the incoming gas supply to prevent the build up of an explosive atmosphere.	6
Major Accident to the Environment following release of ammonium hydroxide or diesel.	Construction / Operation of the Principal Works	Biodiversity, soils and geology, hydrology and hydrogeology	3	In order to mitigate potential impacts during the construction phase, best practice construction methods will be implemented in order to prevent water (surface water and groundwater) pollution. In order to mitigate potential impacts during the operational phase, the following has been implemented: - SuDS measures incorporated. - A flow control device will be installed to restrict the outflow into the existing network.	3	The construction phase of the proposed development will be carried out in accordance with good practice construction methodologies, all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, as detailed in this EIAR.	9	2	The land use planning assessment determine the likelihood of a loss of containment of hazardous material, resulting in a MATTE to be low. The proposed project will have petrol interceptors and silt traps at the outflow. These devices would have to fail in order for there to be a release to the surrounding environment.	6
Fire: Flash fire or Jet fire following natural gas release at natural gas pipeline	Operation of the Facilitation Works	Human Health	4	The pipeline route is through residential areas. There is potential for harm to persons in the vicinity of the pipeline.	2	The natural gas pipeline is below ground and will be installed to Irish Installation Standard I.S. 813. The proposed pipeline will be a below ground pipeline; therefore, it is concluded that the likelihood of a leak or rupture is very low.	8	1	The land use planning assessment determined the likelihood of a jet fire or flash fire at the proposed development to be very low. The pipeline will have a slam shut valve that will close in the event of a sudden pressure drop (which occurs in the event of a leak or rupture), preventing the continuous outflow of natural gas.	4

Table 17. 4 Assessment of Major Accidents

Natural Disaster	Phase	Impact	Consequence Rating	Basis of Consequence	Unmitigated Likelihood Rating	Basis of Unmitigated Likelihood	Unmitigated Risk Score	Mitigated Likelihood Rating	Basis of Mitigated Likelihood	Mitigated Risk Score
Extreme heat or cold weather resulting in result structural damage and/or pollution to soils, groundwater or surface waters	Construction / Operation	Human health, biodiversity, soils and geology, hydrology and hydrogeology	2	The proposed development will be constructed, and operated in accordance with all relevant planning, building and environmental licencing codes.	2	The oil storage tanks, and ammonium hydroxide tanks are not considered to be at risk during storms or during extreme heat or cold event, any more so than other significant buildings or structures.	4	1	All construction activities will be suspended during extreme weather events. The diesel oil storage tanks will be double-skinned tanks with leak detection. The ammonium hydroxide tanks will be constructed in a bund with connection to the surface water drainage system.	2
Storm events resulting in structural damage and/or pollution to groundwater and surface waters	Construction / Operation	Human health, biodiversity, soils and geology, hydrology and hydrogeology	2	As above	2	As above	4	1	As above	2
Flooding	Construction / Operation	Flooding	2	A Flood Risk Assessment was prepared in accordance with 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities' issued by the Department of Environment, Heritage and Local Government in November 2009.	2	The Flood Risk Assessment concluded that the proposed development is within Flood Zone C.	4	1	The flood risk assessment concluded that a regularly maintained drainage system would ensure the network remains effective should a large pluvial storm occurs.	2
Pollution to soils / groundwater / surface waters	Construction / Operation	Human health, biodiversity, soils and geology, hydrology and hydrogeology	2	Best practice construction methods will be implemented in order to prevent water (surface water and groundwater) pollution. The following has been implemented: - SuDS measures incorporated. - A flow control device will be installed to restrict the outflow into the existing network.	2	The construction phase of the proposed development will be carried out in accordance with good practice construction methodologies, all relevant health and safety guidance and legislation.	4	1	Implementation of CEMP during demolition/construction, and EIAR conditions during operations. The proposed project will have petrol interceptors and silt traps at the outflow. These devices would have to fail in order for there to be a release to the surrounding environment.	2

Table 17. 5 Assessment of Natural Disasters

17.5.1 Construction Phase

The following scenarios have been identified that could impact the construction phase of the project:

- Extreme heat or cold weather resulting in result structural damage and/or pollution to soils, groundwater or surface waters.
- Storm events resulting in structural damage and/or pollution to groundwater and surface waters.
- Flooding
- Pollution to soils / groundwater / surface water

The impact and likelihood of these scenarios is assessed in Table 17. 5. There are no likely impacts on the project or to off-site receptors during the construction phase in relation to major accidents and disasters.

17.5.2 Operational Phase

The potential hazards associated with substances stored and process at for the proposed Principal works which have the potential to cause a major accident are summarised in the following section. All hazards identified require a loss of containment to occur, such as, catastrophic damage or failure of pipework and/or storage tanks.

Fire:

- Flash Fire: A flash fire can occur following a loss of containment of natural gas from the natural gas pipeline, which results in a flame which passes through the mixture at less than sonic velocity such that explosion overpressures are negligible. A flash fire may be caused by releases at high or low pressure into an open, unconfined area which contacts an active source of ignition.
- Jet Fire: A jet fire can occur following a loss of containment of natural gas from the natural gas pipeline, via a source such as a leak or failure of flanged pipework joints, pipework or another asset which contacts an active source of ignition.

Explosion:

- Vapour Cloud Explosion (VCE): A loss of containment of natural gas, within a turbine enclosure, which does not ignite immediately may form a cloud of flammable material depending on the conditions of the release. If this cloud contacts an active source of ignition, a VCE can result and generate potentially harmful overpressures.

Major Accident to the Environment (MATTE):

- A loss of containment of liquids, such as fuel oils, which are accidentally released to water, land and/ or groundwater in significant quantities can cause harm to the environment.

The impact and likelihood of these scenarios is assessed in Table 17. 4. In keeping with EIA guidance these results are a summary of the Land Use Planning Assessment (report reference: MM.237501.0007RR01). There are no likely impacts to off-site receptors, as a result of the proposed Principal works, during the operational phase in relation to major accidents and disasters. The level of risk on-site is acceptable.

The Land Use Planning assessment has determined the risk zones for the proposed Principal works. Section 8.0 of the assessment illustrates the Land Use Planning risk contours for the proposed Principal works. The assessment concluded that the risk contours do not extend off-site; therefore, there are no impacts to off-site receptors.

The potential hazards associated with substances stored and process at for the proposed Facilitation works which have the potential to cause a major accident are summarised in the following section. All hazards identified require a loss of containment to occur, such as, catastrophic damage or failure of pipework.

Fire:

- Flash Fire: A flash fire can occur following a loss of containment of natural gas from the natural gas pipeline, which results in a flame which passes through the mixture at less than sonic velocity such that explosion overpressures are negligible. A flash fire may be caused by releases at high or low pressure into an open, unconfined area which contacts an active source of ignition.
- Jet Fire: A jet fire can occur following a loss of containment of natural gas from the natural gas pipeline, via a source such as a leak or failure of flanged pipework joints, pipework or another asset which contacts an active source of ignition.

The impact and likelihood of these scenarios is assessed in Table 17. 4. There are no likely impacts on the project or to off-site receptors during the operation phase in relation to major accidents and disasters associated with the Facilitation works.

17.6 Likely Cumulative and Interaction Impacts of the Project

17.6.1 Cumulative Impacts

The nearest Seveso site is the Intel Ireland Ltd. Site *ca*. 1.5km to the north of the proposed development. The proposed development is outside the Consultation Distance of Intel Ireland Ltd.; therefore, this site does not have the potential to initiate a major accident at the proposed development.

The cumulative residual and operational impacts of the proposed development have been assessed and, in regard to screening of major accidents and risks, cumulative impacts are considered imperceptible and neutral as there is no risk to off-site receptors in relation to a major accident.

17.7 Mitigation Measures and Proposed Response to such Emergencies

The proposed development has been designed in line with good industry practice, and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design and in accordance with planning and legislative requirements.

17.8 Residual Impacts

The residual effects are the final predicted or intended effects which occur after the proposed mitigation measures have been implemented. It will not always be possible or practical to mitigate all adverse effects.

This assessment has identified the potential for major accident hazards to occur. These scenarios can have significant consequences; however, the likelihood of these events occurring is low due to engineering and operational safeguards that will be implemented at the development. The Land Use Planning Assessment concluded that the risk contours do not extend off-site; therefore, there are no impacts to off-site receptors and the level of individual risk on-site is acceptable. It can be concluded that the risk of major accidents and disasters associated with the proposed project are **not significant.**

Refer to the Land Use Planning Assessment prepared by AWN and submitted with the application for further detail.

17.9 References

Health and Safety Authority Guidance on Technical Land-Use Planning Advice, for planning authorities and COMAH establishment operators (2023)

CDOIF (2017), Guideline Environmental Risk Tolerability for COMAH Establishments, v 2.0

Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2015 (COMAH Regulations 2015)

Site Specific Flood Risk Assessment Kildare Innovation Campus (2023), Clifton Scannell Emerson Associates (File Name: 21_048-CSE-00-XX-RP-C-002)

Land Use Planning Risk Assessment, AWN Consulting (2023), report reference MM.237501.0007RR01

18.0 INTERACTIONS AND CUMULATIVE EFFECTS

18.1 Introduction

This section of the EIAR has been prepared by Brian Minogue (BSc in Spatial Planning), Tom Philips + Associates and deals with likely interactions between effects predicted as a result of the proposed project.

In addition to the requirement under the Planning and Development Regulations 2001 (as amended) to describe the likely significant effects of the proposed development on particular aspects of the environment, it is also required to consider the interaction of those effects. These are assessed below.

This section addresses the intra project significant effects (i.e. those occurring between environmental topics within the project). Inter project effects (i.e. those which are likely to occur as a result of the likely impacts of the proposed project interacting with the impacts of other projects in the locality) have also been considered.

We have reviewed a number of planned and permitted projects that have the potential to interact with either the construction or operational phases of the proposed development. The projects considered most likely to interact with the proposed development are identified in Chapter 3 with a more comprehensive list of planned or permitted projects outlined in Appendix 1.1.

Further detail relevant to the interaction of impacts may be found in the earlier chapters of the EIAR.

18.2 Methodology

The EIAR has considered and assessed the interactive effects and cumulative effects arising from the construction and operation of the proposed project based on best scientific knowledge. The relevant interactions and interdependencies between specific environmental aspects have been summarised in the matrix set out in Table 18.1.

Interactive effects (or interactions), specifically refer to any direct or indirect effects caused by the interaction of environmental factors as outlined in Article 3 (1) of the amended EIA Directive;

"*The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*

(a) population and human health;
(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
(c) land, soil, water, air and climate;
(d) material assets, cultural heritage and the landscape;
(e) the interaction between the factors referred to in points (a) to (d)."

Annex IV of the amended Directive states that a description of impacts should include:

"…the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project"

This approach is considered to meet with the requirements of Part X of the Planning and Development Act 2000 (as amended) and Part 10, and schedules 5, 6 and 7 of the Planning and Development Regulations 2001 (as amended) as well as the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

The EPA Guidance in turn references: *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, European Commission, 1999. I*n terms of interactions, the guidelines state the following:

> *"careful consideration of pathways – direct and indirect – that can magnify effects through the interaction or accumulation of effects – for instance the potential for cumulative significant effects to arise from multiple non-significant effects."*

In terms of Cumulative effects, Annex Iv(5) of the EIA Directive requires:

> *"A description of the likely significant effects of the proposed project on the environment resulting from, inter alia…*
> *(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;…"*

We have reviewed a number of planned and permitted projects that have the potential to interact with either the construction or operational phases of the proposed development. The projects considered most likely to interact with the proposed development are identified in Chapter 3 with a more comprehensive list of planned or permitted projects outlined in Appendix 1.1.

18.3 Inter-Relationships/ Interactions

In practice many potential impacts from various sources have slight or subtle interactions with other sources of impact. However, the EIAR concludes that most inter-relationships are neutral in impact when the mitigation measures proposed in each chapter are incorporated into the operation of the proposed development.

18.3.1 Interactions between Population & Human Health and Air

Potential interactions between population and human health and air quality are outlined in Chapters 5 & 9 of the EIAR. In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants.

An adverse impact due to air quality in either the construction or operational phase of the proposed project has the potential to cause human health and dust nuisance issues. The mitigation measures that will be put in place at the proposed project will ensure that the impact complies with all ambient air quality legislative limits and, therefore, that the predicted residual impact is short-term, negative and imperceptible during the construction phase, and long-term, neutral and imperceptible during the operational phase.

18.3.2 Interactions between Population & Human Health and Noise and Vibration

There is potential for interactions between population and human health and noise and vibration during both the construction and operational stages of the proposed project that have been assessed in Chapter 11. The highest potential for noise and vibration impacts of the proposed project will occur during the construction phase due to the operation of various plant and machinery used to construct the development and heavy goods vehicles movement to, from and around the site.

Chapter 11 sets out a number of mitigation measures to be implemented during the construction phase, as well as best practice mitigation measures relating to building services & plant for the development once operational. No mitigation measures are required for the additional traffic on the surrounding roads once operational as changes to traffic flows will not result in a perceptible increase in noise level in the surrounding environment.

Predicted increases in noise levels from the operation of the facility at various locations are predicted to range between not significant to slight moderate.

18.3.3 Interactions between Population & Human Health and Waste

The implementation of the mitigation measures outlined in chapter 12 will ensure that targeted rates of reuse, recovery and recycling are achieved at the site of the Proposed project during the construction and operational phases. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

Other developments in the area, and the indicative future masterplan development, will be required to manage waste in compliance with national and local legislation, policies and plans which will minimise/mitigate any potential cumulative effects associated with waste generation and waste management. With mitigation measures described in chapter 12 in place, the predicted effects on human health due to waste will be **long-term, imperceptible and neutral.**

18.3.4 Interactions between Population & Human Health and Traffic and Transportation

During the construction stage of the project the potential impacts to population and human health will primarily be from onsite (plant and vehicle movement) and the increase in offsite plant and traffic movements. A Construction and Environmental Management Plan has been prepared by Clifton Scannell Emerson Associates, as part of the planning application which incorporates a range of integrated control measures and associated management activities with the objective of minimising the effects of construction activities associated with the development. Chapter 13 also sets out a number of mitigation measures. Provided the proposed mitigation measures and management procedures are incorporated during the construction phase, the impact on human health of the local receiving environment will be **negative, slight and short-term.**

With the mitigation measures in place, the effect of the proposed project on traffic and transport is envisaged to be slight, likely in probability and long-term. The proposed project is located within an area with well-integrated walking infrastructure to encourage sustainable travel choices to and through the proposed project. The Mobility Management Plan initiatives are likely to result in lower volumes of car traffic than that assumed in the modelling assessment.

Prior to mitigation, the assessment of potential operational traffic impact already demonstrates that no significant effects are expected to arise from operational traffic associated with the proposed project.

Notwithstanding this, a Mobility Management Plan will be implemented as a 'best practice' measure which will seek to minimise car-based trips, particularly single-occupancy car trips, through the proposed measures (refer to Section 9.9.3) to discourage car use and encourage sustainable transport options. As such, the predicted impact during the operational phase is considered to have a **negligible and 'not significant' long-term** effect.

The introduction of new pedestrian / cycle overpass of the M4 and through the KIC site is expected to encourage sustainable forms of travel and will have a **moderate positive** long term effect on human health.

18.3.5 Interactions between Population & Human Health and Landscape and Visual Impact

The potential interactions between Landscape, Visual impact and Human Health relate largely to the health benefits of green infrastructure. Green Infrastructure planning aims to maximising the benefits of the multi-functionality of nature that includes natural ecological processes, sustaining air and water quality and providing vital amenity and recreational spaces for communities. It also serves to provide an ecological framework for the social, economic and environmental health of an area. The enhancement of local green infrastructure therefore has knock on benefits for human health outcomes.

18.3.6 Interactions between Biodiversity and Land, Soils and Groundwater

The development of new hardstanding, i.e. buildings and artificial surfaces, during the construction phases will have a **permanent slight negative impact** on habitats and flora, particularly on the more semi-natural grassland and hedgerow/treeline habitats.

The planting regime for the proposed development site will replace the 9,200 m^2 of woodland habitat that will permanently removed as part of the construction phase of the proposed development and will result in the creation of an additional 13,300m^2 of woodland habitat. The planting regime will also require the planting of 1,370 specimen trees, which replaces the 533 trees permanently removed (and those additional trees lost in the tree groups) resulting in a net gain in trees for the proposed development site.

In the long term, with proper maintenance over the lifetime of the proposed development, it is expected that the proposed landscape planting will result in a **moderate positive** impact on habitats and flora during the operational phase.

18.3.7 Interactions between Biodiversity and Hydrology

The existing foul water drainage system will continue to service Kildare Innovation Campus and will service the welfare facilities located within the temporary construction site compound. For the same reasons as outlined in Section 6.5.1, the potential impacts arising from surface-water run-off/foul water drainage to the aquatic habitats within and immediately downstream of the proposed development site during the construction phase are considered to be **neutral** in the **short-term**.

As outlined in Chapter 6, the proposed development will include for the installation of 1 no. permanent retention pond (11,797.7m3) and 4 no. attenuation wetland areas (5,636.1m3 total), as well as the retention of the 3 no. existing retention ponds. The proposed attenuation areas will result in the creation of habitats of higher ecological value where habitat of lower ecological value (*i.e.*, amenity grassland, dry meadows and grass verges, *etc*.) currently exists. This will result in a **Long-term moderate positive impact** on habitats and flora during the operational phase and lifetime of the proposed development.

The potential for impacts arising from surface-water run-off to the aquatic habitats within and immediately downstream of the proposed development site during the construction phase are considered to be **neutral** to **not-significant positive** in the **long-term**. In addition, Leixlip WWTP has adequate capacity (WWTP Remaining PE 11888) to facilitate the treatment of foul water drainage from the proposed development site (proposed development PE 2080) and is currently compliant with the ELV's in the wastewater discharge licence (Irish Water, 2021). Therefore, the potential impacts to the aquatic habitats downstream of the proposed project site are considered to be **neutral** in the **long-term**.

18.3.8 Interactions between Biodiversity and Noise and Vibration

The potential impacts to Biodiversity and from Noise and Vibration are discussed in detail in chapters 6 and 11 of the EIAR. In terms of interactions, as outlined in chapter 6, during the construction phase of each phase of the development, there is likely to be a certain amount of disturbance to fauna occurring on/near the site. The construction phase will be Construction Environmental Management Plan (CEMP) which will include mitigation. As a result of the proposed development, there will be an increase of 171,641.88m2 in hard standing (i.e., artificial habitat - Buildings and artificial surfaces (BL3)) within the boundary of the proposed development site which will have a **permanent slight negative impact** on habitats and flora.

In terms of the operational phase, the larger footprint of the built areas on site and associated increases in site traffic (and associated noise and lighting) is likely to be offset by the maturing landscape features in the long term leading to **slight positive** impacts on the diversity and abundance on non-volant mammals present in the area.

18.3.9 Interactions between Biodiversity and Traffic and Transportation

The potential interactions between Biodiversity and Traffic and Transportation are similar to those outlined in section 18.3.9 above (Interactions between Biodiversity and Noise and Vibration). Construction traffic and associated visual and other sensory disturbance effects have the potential to cause localised temporary to short-term displacement and disturbance impacts upon non-volant mammal species. Increased traffic can lead to an increase in road fatalities for non-volant mammals. Proposed mitigation measures are outlined in Chapter 6 Biodiversity.

18.3.10 Interactions between Biodiversity and Material Assets (Waste)

The incorrect management of waste during both construction and operation phases has the potential to have effects on local biodiversity. As outlined in chapter 6, improperly discarded waste has the potential to disrupt the existing mammal community by promoting conditions which are more favourable for certain species e.g. scavengers. For instance, all edible and putrescible waste (e.g. improperly discarded food) has the potential to attract scavengers and to potentially disrupt the existing non-volant mammal community.

The following mitigation measures are proposed in Chapter 6 to minimise the potential of the above effects.

- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of to licensed facilities.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled according to the CEMP.

18.3.11 Interactions between Land, Soils and Groundwater and Hydrology

Construction Phase

The construction phase of the proposed project has the potential to result in increased sediment runoff which has the potential to interact negatively on surface water quality. The proposed construction phase mitigation means that the proposed project will not result in significant negative impact on surface water quality in the local area.

Taking into account the design and mitigation measures set out in Chapter 6 and 7 of this EIA Report, there is a residual negative interaction between land, soil, and hydrology during the construction phase. The interaction is considered to be neutral, not significant, and short term.

Operational Phase

Taking into account the design and mitigation measures set out in 6 (Hydrology) and Chapter 7 (Land, Soils and Hydrogeology) of this EIA Report there are no potentially significant interactions identified between land, soils and hydrogeology, and hydrology during the operational phase.

18.3.12 Interactions between Land, Soils and Groundwater and Air Quality and Climate

Construction Phase

Demolition and construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils and the water environment (hydrology) in the form of dust emissions. With the proposed mitigation measures to prevent fugitive dust emissions, it is predicted that interactions between air quality and land and soils and hydrology will be **short-term and imperceptible**.

Operational Phase

There are no potentially significant interactions identified between land, soils and hydrogeology, and air quality and climate during the operational phase.

18.3.13 Interactions between Land, Soils and Groundwater and Biodiversity

Construction Phase

In the absence of standard mitigation measures to control the construction phase there is potential for silt laden material or pollution to enter the watercourse and impact on local biodiversity and European sites immediately downstream from the works. Furthermore, dust emissions from exposed earthworks have the potential to settle on plants causing impacts to local ecology.

Taking into account the design and mitigation measures outlined in this Section 7.6.2, there still remains a residual negative interaction between land, soils, geology and hydrogeology and biodiversity during the construction phase. The interaction is considered to be negative, not significant, and short term.

Operational Phase

There are no potentially significant interactions identified between land, soils and hydrogeology, and biodiversity during the operational phase.

18.3.14 Interactions between Land, Soils, Traffic and Transportation and Waste

Construction Phase

There are no potentially significant interactions identified between land, soils and hydrogeology, and material assets during the construction phase.

Operational Phase

The proposed project will follow the SuDS and surface water management strategy; utilising an innovative natural based SuDS components to provide the necessary processes to control runoff frequency, flow rates and volumes. The use of SuDS during operations will mean that the runoff will discharge from the proposed bioretention and attenuation systems before out falling to the existing pond system and existing monitoring regime on-site resulting in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding will be reduced and the overall discharged runoff will have an improved water quality due to the proposed SuDS upgrades. The SuDs features have been designed to provide sufficient capacity to contain and convey all surface water runoff associated with the 1 in 100-year event plus an additional allowance of 30% for climate change and 10% urban creep. This is as per Kildare County Council Water Services Department draft guidance on Drainage and SuDS Strategy.

Attenuation measures include bio retention areas, attenuation ponds, swales, filter drains, permeable paving and hydrocarbon interceptors. The interaction is considered to be ***negative, not significant***, and ***long-term***.

18.3.15 Interactions between Land, Soils Geology & Hydrogeology and Waste

During the construction phase, excavated soil and stone (c. 264,505 m^3) will be generated from the excavations required to facilitate site levelling, construction of new foundations and installations of site services. It is estimated that 239,809 m^3 of the excavated material will need to be removed off-site with the remaining balance being reused on site. Where material cannot be reused onsite it will be taken off-site, it will be taken for reuse or recovery, where practical, with disposal as a last resort. Adherence to the mitigation measures in Chapter 14 and the requirements of the RWMP (Appendix 14.1), will ensure the effect is ***long-term, imperceptible*** and ***neutral.***

18.3.16 Interactions between Traffic and Transportation and Waste

Local traffic and transportation will be impacted by the additional vehicle movements generated by removal of waste from the Site during the demolition, construction and operational phases of the proposed project. The increase in vehicle movements as a result of waste generated during the construction phase will be *temporary* in duration. There will be an increase in vehicle movements in the area as a result of waste collections during the operational phase but these movement will be imperceptible in the context of the overall traffic and transportation increase. Traffic-related impacts during the construction and operational phases are addressed in Chapter 13 (Traffic). Provided the mitigation measures detailed in Chapter 12 and Chapter 13 are adhered to, the predicted effects are ***short to long-term, imperceptible*** and ***neutral.***

18.3.17 Interactions between Population and Human Health and Waste

The potential impacts on human beings are in relation to incorrect management of waste during construction and / or operation, which could result in littering and presence of vermin – with associated potential for negative impacts on human health and residential amenity. A carefully planned approach to waste management and adherence to the project specific RWMP (Appendices 12.1), and the mitigation measures in Chapter 12, will ensure appropriate management of waste and avoid any negative impacts on the local population. The effects should be ***long-term*****,** ***imperceptible*** **and** ***neutral****.*

18.3.18 Interactions between Air Quality and Traffic and Transportation

Interactions between Air and Traffic are outlined in Chapter 9 and Chapter 13 of the EIAR. There is the potential for traffic emissions to impact air quality over the construction phase. Construction traffic accessing the site will emit air pollutants during transport in addition to onsite construction machinery air emissions.

Trip generation and resultant traffic flow contribution on the local network impacts on the performance of the road network (in terms of network delays), air quality and noise in the local environment. The impacts on the performance of the transport network are addressed in this EIAR and the Traffic and Transport Assessment report produced by SYSTRA.

18.3.19 Interactions between Noise & Vibration and Traffic and Transportation

Noise and Vibration Effects interact with Traffic and Transport Effects; assessment of the noise effects noise of construction traffic is included in Section 11.5.1.1 and operational traffic are included in Section 11.5.2.2.

18.3.20 Interactions between Waste and Traffic and Transportation

Interactions between Traffic and Waste are outlined in Chapters 12 and 13. Local traffic and transportation will be impacted by the additional vehicle movements generated by removal of waste from the site during the construction and operational phases of the development.

Provided the mitigation measures detailed in Chapter 13 and the requirements of the CEMP are adhered to, the effects should be short to long term, slight adverse.

18.3.21 Interactions between Major Accidents and Disasters and other Disciplines

The likely significant interactions of impacts with regard to major accidents and disasters would be with areas such as soils, geology and hydrogeology, hydrology, air quality, noise and vibration, human health and biodiversity and these are addressed in the respective chapters as required.

	Matrix of Interactions																									
	Cultural Heritage		Population & Human Health		Biodiversity		Land, Soils, Geology & Hydrogeology		Hydrology		Air		Climate		Noise & Vibration		Landscape & Visual Impact		Traffic		Waste		Site Services		Major Accidents and Disasters	
	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Cultural Heritage																										
Population & Human Health											x				x	x		x	x	x	x	x			x	x
Biodiversity							x		x						x				x		x	x			x	x
Land, Soils, Geology & Hydrogeology															x				x		x	x			x	x
Hydrology																									x	x
Air																			x	x						
Climate																			x	x						
Noise & Vibration																			x	x					x	x
Landscape & Visual Impact																										
Traffic																					x					
Waste																										
Site Services																										
Major Accidents and Disasters																										

Table 18.1: Matrix of Potential Interactions Between Environmental Factors

18.4 Cumulative Effects

18.4.1 Population and Human Health

The Strategic Environmental Assessment prepared for the Kildare County Development Plan 2023-2029 has assessed the likely evolution of the County during the course of the Development Plan and the likely impacts. We have reviewed that assessment and conclude that it has reasonably assessed the likely evolution of the County through the implementation of the Development Plan. That assessment has *inter alia* considered predicted results from development of zoned land (including the subject principal site, which is zoned for redevelopment regardless of the project going ahead) in the county.

Regarding Population (and human health), the Strategic Environmental Assessment prepared for the Kildare County Development Plan 2023-2029 states that:

> *"The delivery of the Settlement Strategy in County Kildare is likely to result in an overall positive effect on population and human health through the accommodation of an additional 25,146 people. The stipulation in the Core Strategy that development be delivered in a sustainable and compact way is likely to result in a neutral environmental effect as development will be focused within the existing built-up footprint on suitably zoned, previously developed land insofar as possible. This discourages urban sprawl, reduces traffic movements, enhances the public realm and encourages more sustainable transport methods.*
>
> *The successful implementation of the policies and objectives relating to a resilient economy and job creation are likely to result in a general, overall positive effect on population and human health through the provision of job opportunities, educational opportunities, tourism opportunities and subsequent economic growth in the County.*
>
> *Similarly, the provision of high-quality transport systems and sustainable transport in County Kildare is likely to result in a positive effect on population and human health through the facilitation of movement through the county and increased opportunities for movement and exercise. However, the development of new transport infrastructure has the potential to result in negative environmental effects."*

The cumulative impact on population and human health for the construction and operation phases is anticipated to be **Long-Term, Neutral and Not Significant.**

18.4.2 Biodiversity

Cumulative effects are defined by EPA Guidance (2017) as; '*the addition of many minor or significant effects, including the effects of other projects, to create larger, more significant effects*'. An assessment of plans and projects occurring in within the proposed development site boundary and within the wider landscape were evaluated in combination with the project. A review of permitted developments in the wider area was completed (see **Chapter 3 - Planning and Development Context** and Appendix 3.1), and the potential for any significant cumulative and in combination effects on the receiving environment were considered for the construction and operational phases of the proposed development below.

The plans and projects that have been proposed or implemented in recent years were considered as part of the assessment of potential cumulative and in combination effects. For instance, the current Kildare County Development Plan (2023-2029) was adopted in December 2022. In addition, the Leixlip Local Area Plan (2020-2023) and the Celbridge Biodiversity Action Plan (2021 – 2025) were also considered in relation to the local ecology and planned actions for the protection and restoration of local biodiversity.

There are several mechanisms by which projects in general may act in concert with each other to impact on the local flora, fauna and habitats in a given area. The scale at which these impacts may be felt depends greatly on the nature of these projects and the type of species and habitats in the receiving environment. Loss of habitat associated with a particular project may be exacerbated by multiple similar losses of habitat occurring in the wider area. Increases in noise or lighting from one project can have greater impact if the loss of screening vegetation associated with a neighbouring development allows for a wider cumulative 'spill' of impacts into the wider environment. Similarly, if pressures arising from the connection to wastewater services by multiple projects being developed means that the capacity of local wastewater treatment infrastructure is overwhelmed, the potential for downstream cumulative impacts must be considered. There are also potential positive cumulative effects that can be associated with the delivery of unrelated projects. For instance, if these projects cumulatively increase the amounts of a certain habitat attractive for species of importance and through their own landscaping commitments help improve the ecological connectivity through the wider area.

There are several developments that have either been submitted for planning permission or have been granted permission within and in close proximity to the proposed development site. The client, The Davy Platform ICAV, received planning permission for the development of 4 no. 20 kV ESB double substations at four sites within the proposed development site (planning ref: 22/1096). The location of these substations is within habitats considered to be of low ecological value (Buildings and artificial surfaces (BL3), *etc.*) and cover a total floor area of 591m^2. Given the location of the substations, the scale of the works required and the type/condition of the habitats in which the substations will be located, no significant impacts in combination with the project are expected. Barnhall Rugby club received permission (Planning Ref. 21/730) for the construction of a new vehicle access and all ancillary works. The site is directly adjacent and overlaps in places, with the proposed development site boundary to the south. In combination effects between this development and the proposed development are not expected to result in significant impacts. Glenveagh Development (Planning Ref 23/513), a large scale residential development is located northeast of the proposed development site, opposite the entrance to the Barnhall Meadows estate. The site primarily comprises agricultural grassland bounded by hedgerows and treelines that provide commuting corridors for various species to habitats in the wider environment. A Screening for Appropriate Assessment and the Biodiversity chapter of the EIAR completed by Enviroguide Consulting (2023) found that "*no significant negative impact to any valued habitats, designated sites or individual or group of species as a result of the proposed development*".

As outlined in **Chapter 3 - Planning and Development Context**, the Wonderful Barn lands are likely to be the subject of a regeneration project including the restoration of the main features of the complex and its historical landscape by Kildare County Council in the foreseeable future. The Wonderful Barn is directly adjacent to and overlapping with the lands north of the M4 within the proposed development site boundary. Given the estimated time period in which the different stages of the proposed development are going to be completed, there is potential for in-combination effects on the habitats and flora between this project and the proposed development. This project will require the submission of a Screening Assessment report in support of the Appropriate Assessment process and the submission of an Environmental Impact Assessment.

There are a number of large-scale developments in the wider area that have the potential to interact with the project, resulting in in-combination and/or cumulative impacts in the receiving environment. Several of the notable projects are discussed below.

Intel Ireland Limited were granted planning permission for the revised design of their manufacturing facility in May 2017 (Planning Ref: 16/1229 amended under reg. ref. 1991). The facility is located *c.*1.5km north of Kildare Innovation Campus, and the granted revised design is currently under construction. The original Natura Impact Statement completed by Environmental Impact Services (2016), found that wastewater discharged to Leixlip WWTP would remain inside the licensed limits for the facility and have a negligible impact on the River Liffey. The Natura Impact Statement submitted for the amended planning application (Planning Ref: 1991) takes into account the environmental protection policies outlined in the Kildare County Development Plan 2017-2023 and Leixlip Local Area Plan 2017 – 2023 and states that "*the proposed development itself will not have any effects on the conservation objectives of any European sites*" (Scott Cawley, 2019). The Intel campus has been developed over a number of phases and has had to implement stringent design and environmental controls, particularly as it is located directly adjacent to the Rye Water Valley/Carton SAC. These include management of surface water and wastewater in accordance with EPA licence requirements, as outlined. Several development projects at this facility have been subject to the Appropriate Assessment process. Having considered the location and design of the Intel facility, no interactions resulting in significant cumulative effects upon the receiving environment in relation to the Intel development and the proposed development are expected. We have also considered the potential for cumulative effects arising between the Intel Facility and the proposed facilitation works *i.e.,* the proposed Eirgrid uprating works and the proposed GNI upgrade works, that will be required as part of the current project. While the overhead transmission lines traverse the Intel facility, the uprating works are highly localised, temporary and of a nature that no potential for significant cumulative effects upon the receiving environment in relation to the Intel development and the proposed development are expected.

Irish Water have applied for permission to upgrade Leixlip WWTP which would involve the demolition of the existing workshop and activated carbon building, and the construction of a new Sulphuric Acid Storage and Dosing Facility (Planning Ref: SD21A/0272). The site of the proposed works is located in proximity to the River Liffey, on the opposite bank to the proposed development site, less than 1km form the proposed development site. There were no interactions between the proposed works and any designated Natura 2000 site identified (Ryan Hanley, 2021). No interactions resulting in significant cumulative effects upon the receiving environment in relation to this WWTP upgrade and the proposed development are expected. With regard to the facilitation works *i.e.,* the proposed Eirgrid uprating works and the proposed GNI upgrade works, we have considered the information provided on the proposed facilitation works, including the nature, location and scale of the GNI upgrade and Eirgrid uprating. Based on this information, no interactions resulting in significant cumulative effects upon the receiving environment in relation to the Leixlip WWTP upgrades and the facilitation works are expected.

A 10-year planning permission was granted for a c. 47.44 ha Solar Farm development (Planning Ref: 18250) in Killeenlea, Co. Kildare, located to the southwest of the proposed development site. The Screening report in support of the AA process completed by Scott Cawley (2018) stated that there is no pathway linking to designated sites upstream. Given this and the distance of this site from the proposed development site, no interactions resulting in significant cumulative effects upon the receiving environment in relation to this solar farm development and the proposed development are expected. With regard to the facilitation works *i.e.,* the proposed Eirgrid uprating works and the proposed GNI upgrade works, we have considered the information provided on the proposed facilitation works, including the nature, location and scale of the GNI upgrade and Eirgrid uprating. Based on this information, no interactions resulting in significant cumulative effects upon the receiving environment in relation to this solar farm and the facilitation works are expected.

The DART+ West project (ABP ref: NA29S.314232) is seeking permission to significantly increase rail capacity on the Maynooth & M3 Parkway lines. The route of this project passes to the southeast of the proposed development site, opposite the Leixlip Reservoir. The Natura Impact Statement completed by IDOM and ROD on behalf of CIÉ (2022) found that "*given the full and proper implementation of the mitigation prescribed in this NIS, the proposed development, either individually or in combination with other plans or projects, will not adversely affect the integrity of the Rye Water Valley/Carton SAC, the South Dublin Bay and the River Tolka Estuary SPA, the North Bull Island SPA or any other European site*". Having considered the nature and scale of the Dart+ West project and the environmental commitments provided for in the EIAR and NIS, we conclude that there is no potential for interaction resulting in significant cumulative effects with the current proposed KIC development. We have also considered the potential for cumulative effects arising between this project and the proposed facilitation works *i.e.,* the proposed Eirgrid uprating works and the proposed GNI upgrade works, that will be required as part of the current project. The overhead transmission lines that form part of the Eirgrid uprating route traverse the Dart+ upgrade route. For the same reasons as outlined above, no potential for significant cumulative effects upon the receiving environment in relation to the Intel development and the proposed development are expected.

There are several large residential developments that have been granted permission in the wider environment of the proposed development (See Appendix 3.1). These developments and other active sites in the wider area are to be seen in the context of a well-developed urban infrastructure with appropriate planning, monitoring, and licensing in place.

18.4.3 Land, Soils, Geology and Hydrogeology

Construction Phase

In relation to the potential cumulative effects on the geological or hydrogeological environment during the construction phases, the key engineering works which would have additional impacts above are:

- Construction works will require additional removal of topsoil and subsoil cover and will further increase the vulnerability of the underlying bedrock. Although this is minimised due to the underlying clayey overburden. Capping of significant areas of the sites by hardstand/ buildings following construction and installation of drainage will minimise the potential for contamination of groundwater.

Operational Phase

In relation to the potential cumulative impacts from the operational stages, the following would apply:

- Overall increase in hardstanding: Cumulatively these developments will result in localised reduced recharge to ground and increase in surface run-off. The aquifer underlying the site is a locally important aquifer which is moderately productive only in local zones. The proposed development will have a relatively small footprint in comparison to the underlying aquifer size. As such, the impact is considered to be Low.
- Accidental releases from fuel storage/unloading could contaminate groundwater or soil environments unless mitigated adequately. Localised accidental discharge of hydrocarbons could occur in car parking areas and along roads unless diverted to surface water drainage system with petrol interceptors. However, all developments are required to ensure they do not have an impact on the receiving water environment in accordance with the relevant legislation (primarily the Local Government (Water Pollution) Act, 1977 and 1990 as amended and Groundwater Threshold Value (Groundwater Directive S.I. No. 9 of 2010 and amendment; S.I. No. 366 of 2016) and EPA Interim Guidelines for groundwater where available) such that they would be required to manage runoff and fuel leakages.
- There will be a further loss of greenfield area locally however, the area of development is small in the context of the overall agricultural land available in the region. It is likely that the land use will change over time based on the current zoning of the proposed land in the vicinity as EE. The site is an existing underdeveloped business campus, zoned for 'Industry and Warehousing' in *the Leixlip Local Area Plan 2020-2023 (extended to 2026).*
- The residual cumulative effect on land, soils, geology and hydrogeology for the construction and operation phases are anticipated to be long-term, neutral in terms of quality and of not significant, once the appropriate mitigation measures (as outlined in Chapter 7) are put in place for each development.

18.4.4 Hydrology

The anticipated cumulative effect of the Proposed project with any/all relevant other planned or permitted developments as outlined in Chapter 2 and 3 are discussed in below for construction and operational phases respectively.

Construction Phase

In relation to the potential cumulative effect on hydrology during the construction phase, the construction works which would have potential cumulative effects include:

- Surface water run-off during the construction phase may contain increased silt levels or become polluted from construction activities. Run-off containing large amounts of silt can cause damage to surface water systems and receiving watercourses.

- Contamination of local water sources from accidental spillage and leakage from construction traffic and construction materials unless project specific CEMPs are put in place for each development and complied with.

Operational Phase

In relation to the potential cumulative effect on hydrology during the operational phase, operational works which would have potential cumulative effects include:

- Increased hard standing areas (171,641.88 m^2) will reduce local recharge to the ground and increase surface water run-off potential if not limited to the green field run-off rate from the site.
- Increased risk of accidental releases from fuel storage/delivery unless mitigated adequately i.e. bunded tank.
- Increased risk of accidental discharge of hydrocarbons from car parking areas and along roads and unless diverted to surface water system with petrol interceptor; and
- Any additional foul discharges should be treated where appropriate and/or diverted to the foul sewer system and not directly to ground.

All developments will be required to manage any discharges to water and operate in compliance with relevant legislation (European Communities Environmental Objectives (Surface Waters); Regulations, 2009 (S.I. No. 272 of 2009 as amended by SI No. 77 of 2019). As such there will be no likely cumulative impact on water quality.

Increase in wastewater loading and water supply requirement is an impact of all developments: Each development will require approval from the IW confirming available capacity in the water and wastewater infrastructure. The surface water and foul drainage infrastructure and water supply requirements for the proposed project has been designed and assessed to accommodate the requirements of the proposed project.

Development will result in an increase in hard standing which will result in localised reduced recharge to ground and increase in run-off rate. However, each permitted development is required by the Local Authority and IW to comply with the Greater Dublin Strategic Drainage Strategy (GDSDS) and Local Authority and IW requirements by providing suitable attenuation on site to ensure greenfield run-off rates and ensure that there is no increase in offsite flooding as a result of development.

The residual cumulative impact on hydrology for the construction and operation phases is anticipated to be ***Long-Term, Neutral*** in terms of quality and ***Not Significant***, once recommended mitigation measures (outlined in Chapter 8 - Hydrology) to manage water quality runoff in compliance with legislative requirement are put in place for each development.

18.4.5 Air Quality

Construction Phase

When the dust mitigation measures detailed in the mitigation section of chapter 9 are implemented, cumulative fugitive emissions of dust and particulate matter from the site and nearby facilities undergoing construction will be ***neutral***, ***short-term*** and ***not significant*** in nature, posing no nuisance at nearby receptors.

Operational Phase

There are no nearby sources with emissions of NO_2/NO_x of sufficient magnitude to overlap with site emissions from the proposed facility and thus therefore no offsite cumulative effects are anticipated. With mitigation measures, as outlined in chapter 9, in place it is not predicted that any cumulative effects will occur during the combined construction and operational phase due to NO_2/NO_x impacts.

18.4.6 Climate

In relation to climate, all global cumulative GHG sources are relevant to the effect on climate change. As a result, the effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed. This is due to the fact that there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other (IEMA, 2022).

18.4.7 Noise and Vibration

Facilitation Works – GNI Gas Upgrades

Chapter 2 provides details of the GNI Gas Upgrades which are to support the proposed project and include replacement of approximately 1.5 km of underground gas pipeline.

In respect of construction noise the main noise-generating activities are the excavation of trenches and the generator associated with horizontal directional drilling. The construction activities are expected to be similar to regular road works are not expected to give rise to significant cumulative noise or vibration effects.

Facilitation Works – Eirgrid Uprating

Similarly, Chapter 2 provides details of the uprating of existing lines proposed as part of the Facilitation Works. These works involve replacing the overhead electric cables, retaining the existing pylons, therefore no new foundation works or concrete pouring are envisaged. Consequently, the noise generated during these works will be minimal and will progress along the route. These works are not expected to give rise to significant cumulative noise or vibration effects.

Unrelated Developments

A list of developments for assessment of potential cumulative effects was prepared by Tom Phillips and Associates. Their locations in relation to the proposed project is shown in **Figure 18.1**

In respect of noise, the following comments are made:

300606 refers to a housing development currently under construction. It is included in the assessment of the proposed project as NSL15;

19998 refers to works at the Canoe Club along the river front, where predicted noise levels due to the proposed project are of the order of 44 dB L_{Aeq}.

By their nature, neither of these developments is expected to generate noise or vibration which could give rise to a significant cumulative effect.

All other developments are at sufficient distance so as not to give rise to cumulative noise or vibration effects with the proposed project.

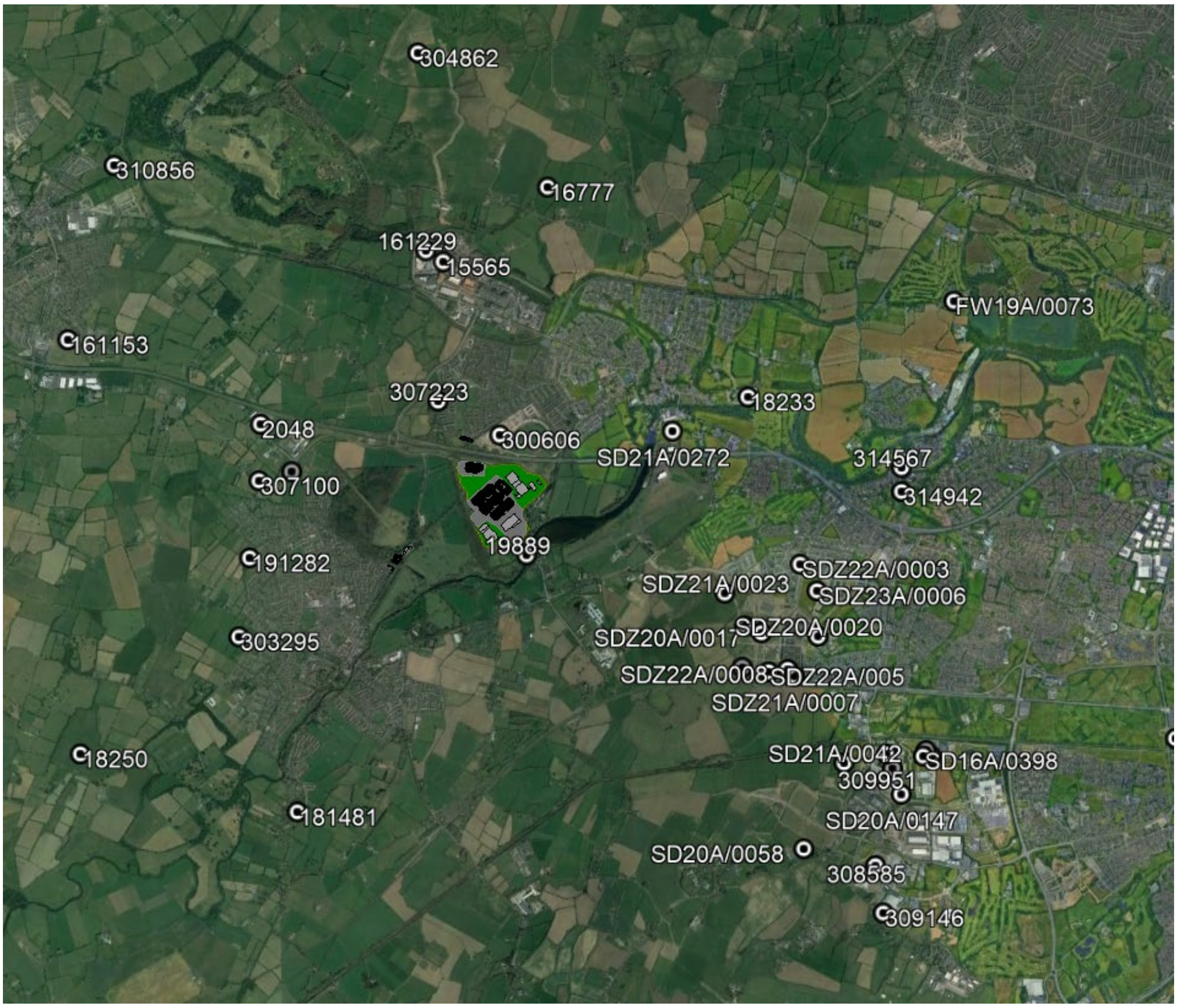

Figure 18.1 Other planning applications for assessment of potential cumulative impact

18.4.8 Material Assets – Waste Management

As has been identified in the receiving environment section all cumulative developments that are already built and in operation contribute to our characterisation of the baseline environment. As such any further environmental impacts that the proposed project may have in addition to these already constructed and operational cumulative developments has been assessed in the preceding sections of this chapter.

Construction Phase

There are existing residential and commercial developments close by, along with the multiple permissions remaining in place in the area. In a worst-case scenario, multiple developments in the area could be developed concurrently or overlap in the construction phase.

Developments that potentially could overlap during the construction phase of can be found in Chapter 3, along with descriptions.

Due to the high number of waste contractors in the Kildare region and Ireland there would be sufficient contractors available to handle waste generated from many these sites simultaneously, if required. The National Waste Collection Permit Office can be contacted to obtain a list of waste contractors and waste collection permit details. Similar waste materials would be generated by all the developments.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will mitigate against any potential cumulative effects associated with waste generation and waste management. As such the effect will be **short-term, not significant and neutral.**

Operational Phase

There are existing residential and commercial developments close by, along with the multiple permissions remaining in place. All of the current and potential developments will generate similar waste types during their operational phases. Authorised waste contractors will be required to collect waste materials segregated, at a minimum, into recyclables, organic waste and non-recyclables. An increased density of development in the area is likely improve the efficiencies of waste collections in the area.

Other developments in the area, and the indicative future masterplan development, will be required to manage waste in compliance with national and local legislation, policies and plans which will minimise/mitigate any potential cumulative effects associated with waste generation and waste management. As such the effect will be a **long-term, imperceptible and neutral.**

18.4.9 Material Assets – Site Services

The anticipated cumulative effect of the proposed project with any/all relevant other planned or permitted developments as outlined in Chapter 2 and 3 are discussed in below for construction and operational phases respectively.

Construction Phase

The proposed project and other surrounding development will require site clearance, excavations and levelling which will generate localised requirement for soil removal and/or import, power and water supply and wastewater discharge. However, provided standard mitigation measures set out in the EIA Reports for these developments or where EIA does not apply, provided that planning conditions are implemented, the cumulative effect will be ***short-term, negative*** and ***not significant***.

Operational Phase

The proposed project and all permitted developments considered are required to engage with GNI, KCC, Uisce Éireann and ESB to ensure that there is sufficient capacity to cater for the increase in water and wastewater and electricity requirements. Based on known current and known future developments there is adequate capacity of supply available within the local environs. GNI have confirmed that subject to local upgrades (Facilitation Works) there is sufficient gas supply to cater for the proposed project, similarly a connection agreement is in place with Eirgrid for the initial phase (16MW). Uprates (Facilitation Works) have been identified as being required by the project team to facilitate the full build out of the campus. Subject to the uprates sufficient capacity has been confirmed through the *Network Demand Capability Analysis* by TNEI & H&MV. Furthermore, the proposed grid connection for the full build out will be supported by dispatchable power via the proposed energy centre to ensure that the proposed project will not unduly impact on power supply. Eirgrid as the national authority for grid has the requirement to ensure that future connections will not impact or reduce the capacity within the local network to support the neighbouring area.

Irish Water have previously confirmed that there is sufficient wastewater capacity available with a response to an updated PCE pending. Furthermore, as set out in Chapter 8 (Hydrology), the maximum proposed allowable discharge rate for the site is 149.75 l/s (12,938.4m3/day). Leixlip WWTP has a maximum capacity of 33,745m3/day. Therefore Leixlip WWTP has sufficient capacity for the proposed project site. There will be no increase in stormwater flow off the site as a result of the development. The location of the proposed project has access to existing utilities and, through confirmation by utilities suppliers the final development will not have an impact on capacity off-site for the development. Therefore, there will be no potential for cumulative effects with any other development within the study area.

In developing long term plans for security of supply, these National Authorities for water and energy supply are required to develop resources in compliance with sustainable environmental planning. Based on the availability of on-site electricity & gas for power supply and the energy centre, there is a ***short-term, neutral***, and ***not significant*** effect on power supply during the operational phase of the proposed project.

18.4.10 Material Assets – Traffic and Transportation

Regarding the construction phase, the CTMP will ensure coordination with any known nearby construction. The strict routing for HGVs to the nearby M4 and mitigation measures outlined in the CTMP will ensure impact is slight and short-term.

The road network analysis undertaken accounts for a robust background growth in traffic and known developments, within close proximity to the site, as outlined in Chapters 2 and 3 of this EIAR The results of the analysis conclude that with signals installed at the interchange junction and the link road full operational, that the network operated within capacity.

18.4.11 Archaeology and Cultural Heritage

Construction groundworks associated with all permitted development can have an effect on hitherto unknown sub-surface archaeological material remains and on the preceding cultural landscape. If sub-surface archaeological remains are preserved by excavation and recording, or cultural landscape features such as physical townland boundaries are removed, the remains/features are permanently removed from the archaeological and cultural heritage landscape. The more extensive the area of ground to be disturbed as a result of permitted development, the greater the risk of exposing and negatively impacting sub-surface remains and the greater the modification of the cultural heritage landscape.

There is a potential incremental cumulative effect on sub-surface archaeological remains in consequence of the scale of the required excavations of the project. The predicted significance of the effect on potential sub-surface archaeological remains inherent in greenfield has been identified as slight.

There is an incremental cumulative effect on the cultural landscape, namely in the removal of hedgerow where it represents physical townland boundary alignments. Townland boundaries are an undesignated cultural heritage asset, and most of the northern and western alignment of the Parsonstown boundary has been removed in consequence of developments at the KIC lands since the mid-1990s. The current remaining physical townland boundary alignments at the KIC lands are shown on Figure 15.7. The predicted significance of the effect on townland boundaries has been identified as slight.

During the construction phase, the protection of the existing trees that are planted along the path of the protected view corridor will of paramount importance. Virtually all of these trees were planted approximately twenty years ago when the Hewlet Packard campus was originally developed. Some of those trees have not survived and others will no doubt require replacement due to natural loss poor growth. During the construction phase, it a programme of protection measures will be included in the contract documents, to prevent any encroachment into the root zone of the trees, to avoid damage to the roots or compaction of the ground.

18.4.12 Landscape and Visual Impact Assessment

The following relevant project may result in cumulative landscape and visual effects when seen together with the proposed project:

Strategic Housing Development Leixlip Gate, Kilmacredock, Leixlip, Co. Kildare
(located approximately 650m northwest of the proposed development site).There will be no intervisibility and therefore no cumulative arising landscape and visual effects between the permitted SHD and the proposed project due to topography, intervening vegetation and existing built structures such as the M4

18.4.13 Major Accidents and Disasters

The nearest Seveso site is the Intel Ireland Ltd. Site *ca*. 1.5km to the north of the proposed development site. The proposed development site is outside the Consultation Distance of Intel Ireland Ltd.; therefore, this site does not have the potential to initiate a major accident at the proposed development site.

The cumulative residual and operational effects of the proposed project have been assessed and, in regard to screening of major accidents and risks, cumulative effects are considered imperceptible and neutral as there is no risk to off-site receptors in relation to a major accident.

19.0 Mitigation and Monitoring

19.1 Introduction

The chapters contained within this EIAR have been ordered in a grouped format by their relevant topic. This chapter summarises all mitigation measures proposed in order to provide a comprehensive overview of the full range of mitigation measures discussed within each chapter.

Paragraph 2(d) of Schedule 6 to the Planning and Development Regulations 2001, as amended by S.I. No. 30/2018 - Planning and Development (Amendment) (No. 2) Regulations 2018, provides that the following information must be contained in an EIAR:

> *"a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of an analysis after completion of the development), explaining the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset during both the construction and operational phases of the development."*

19.2 Population and Human Health

19.2.1.1 Construction Phase

No negative significant impacts on the population have been identified in relation to the construction of the proposed works.

A construction and environmental management plan has been prepared by CSEA and submitted as part of this application.

That plan will be adhered to during construction, as well as the mitigation measures proposed within this EIAR.

As such, no further mitigation measures are required.

19.2.1.2 Human Health

No negative significant impacts on human health have been identified in relation to the construction of the proposed works.

The potential impacts on human health, as outlined above have been identified and assessed in the various chapters of the EIAR as prepared by the various Design consultants. Appropriate mitigation measures have been proposed in relation to Air, Noise and Vibration, Climate, Hydrology, Major Accidents etc.

Mitigation measures are outlined in each respective chapter as well as in Chapter 19 of the EIAR.

19.2.2 Operational Phase

19.2.2.1 Population

No negative significant impacts on the population have been identified in relation to the operation of the proposed works and, as such, no mitigation measures are required.

19.2.2.2 Human Health

In the absence of appropriate mitigation, there is potential for significant impacts on human health during the construction phase of the project.

These potential impacts on human health, as outlined above have been identified and assessed in the various chapters of the EIAR as prepared by the various Design consultants. Appropriate mitigation measures have been proposed in relation to Air, Noise and Vibration, Climate, Hydrology, Major Accidents etc.

Mitigation measures are outlined in each respective chapter as well as in Chapter 19 of the EIAR. Effects to Human Health arising from the construction phase are expected to be neutral provided mitigation measures referred to above are adhered to.

19.3 Biodiversity

The following mitigation measures will be applied to minimise the potential impacts identified on the receiving and wider environment.

- A suitably qualified Ecological Clerk of Works will be appointed for each phase of the construction of the project to ensure the full and proper implementation of the mitigation strategy.

- There will be no tree or hedgerow removal within the bird breeding season (1st March to 31st March inclusive).

- Any areas where vegetation removal or construction activity is due to commence will be subject to a pre-works survey by a suitably qualified ecologist. In the event that there are any protected species present works will only be permitted to proceed on the advice of the ecologist and with any required derogation licensing in place.

- All trees judged to have moderate or high roost potential for bats will be subject to a detailed inspection, including as appropriate tree-climbing (and/or roost emergence surveys) in the weeks prior to planned felling. In the event that there is evidence of a presence a roosting bats no felling will take place without a derogation licence. A bat specialist will liaise with the licensing unit and local NPWS staff and implement an agreed management protocol ahead of the commencement of felling. The bat specialist will be present during any subsequent felling and will inspect the felled trees before they are logged or removed.

- Areas where construction is scheduled will be surveyed in advance to check for the presence of Invasive Plant Species. In the event that any Third Schedule Invasive Plant species are present an Invasive Species Management Plan will be prepared and implemented ahead of the removal of vegetation from the affected area.

- All soil removed from the site will be disposed of at approved licenced facilities.
- All environmental controls described in the CEMP and elsewhere in the EIAR will be integrated into a live CEMP which will be regularly reviewed and updated as appropriate during the construction phase.
- Root protection zones will be marked and appropriate exclusion of vehicles and personnel will be in place to ensure that disturbance to habitats adjoining construction sites is minimised.
- The proposed Landscaping Plan (AECOM 2023) will be implemented in full.
- If soil is imported to the site for landscaping, infilling or embankments, the contractor shall gain documentation from suppliers that it is free from invasive species.
- Construction operations will take place during the hours of daylight for the most part to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species.
- A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any wildlife sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase.
- The construction footprint will not be lit at night (with the exception of low-level switchable safety lighting). All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- Where possible all light fittings will be LED, have asymmetrical projection i.e. directional, and with colour temperature of 2700K (warm spectrum preferred by bats). The radiation will be above 500nm to avoid the blue or UV light, most disturbing to bats.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of to licensed facilities.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled according to the CEMP.
- Areas where spoil is to be stored temporarily, or permanently, will be checked in advance for the presence of Frogs (and spawn) or other protected species. Any areas with pooled surface water, shall be checked in advance for the presence of Frogs (and

spawn). If protected species are present, the environmental staff will translocate these, if possible (under licence if applicable). The same measure should be applied for any drains or areas of standing water forded by construction machinery. These areas will be checked on an ongoing basis by the ECoW and any areas with breeding frogs, spawn or tadpoles will be mapped and if possible fenced off temporarily to allow Frogs to metamorphose. If such areas cannot be avoided by site traffic the environmental staff will translocate the frogs (adults/young) under licence if applicable.

- If other taxa such as other species of Lepidoptera, Common Lizard etc. are recorded within or adjacent to the site these sightings will be logged on a wildlife register.

- All excavations, or areas with pooled water will be checked regularly by the ECoW. Access/egress boards will be provided in the event that any excavations are to be left open or accessible to fauna for any prolonged period. A protocol for dealing with any trapped or injured wildlife will be developed as part of the construction phase environmental management plan including information regarding local veterinary care and local NPWS staff. The ECoW will prepare information on treatment of wildlife and emergency procedures which will be included as part of the site induction process.

- Any newly installed perimeter fencing will have a gap of c. 200mm at the base, or regular mammal gates (at maximum 150m intervals), to allow the free passage of terrestrial mammals through the site.

19.4 Land, Soils, Geology and Hydrogeology

In order to reduce impacts on the soils, geological and hydrogeological environment, a number of mitigation measures will be adopted as part of the construction works on site.

19.4.1 Construction Phase

This section describes a range of mitigation measures designed to avoid or reduce any potential adverse geological and hydrogeological impacts identified.

19.4.1.1 Construction Environment Management Plan

A Construction & Environmental Management Plan (CEMP) has been prepared in respect of the proposed development (refer to CSEA's CEMP). It contains best practice measures and protocols to be implemented during the construction phase of the proposed development to avoid/minimise environmental impacts.

To ensure the CEMP remains fit for purpose, it will be regarded as a live document. The appointed contractor will be responsible for updating the CEMP, as required; e.g. to reflect the publication of relevant new or revised guidelines and / or new statutory requirements. The full schedule of environmental commitments (i.e. all mitigation measures set out in the CEMP, Environmental Impact Assessment Report and Natura Impact Statement submitted as part of the planning application, as well as any applicable conditions of development consent) will be included in the CEMP by the appointed contractor.

The CEMP was formulated in accordance with best international practice including but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors;
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005;
- BPGCS005, Oil Storage Guidelines;
- Eastern Regional Fisheries Board, (2016), Guidelines on protection of fisheries during construction works in and adjacent to waters
- CIRIA 697, The SUDS Manual, 2007;

19.4.1.2 Control of Soil Excavation

Site preparation, excavations and levelling works required to facilitate construction of foundations, access roads and the installation of services will require imported material.

- Suitable soils will be reused on site as backfill in the grassed areas, where possible.
- Contractors shall be required to submit and adhere to a method statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.
- Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any open surface water drains. No soil storing will be allowed within 30 m of any open water including the existing retention ponds which is likely achievable given the size of the site, and is in line with Inland Fisheries Ireland guidelines.
- Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.
- Although there is no evidence of historical contamination in the proposed development area, all excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be disposed of by a licensed waste disposal contractor.
- Stockpiles have the potential to cause negative impacts on air and water quality. Stockpiles will be formed within the proposed development site boundary and the contractor will ensure that there are no direct links or pathways from stockpiles to any surface water body.
- Overburden material will be protected from exposure to wind by storing the material in sheltered parts of the site, where possible

19.4.1.3 Sources of Fill & Aggregates

All fill and aggregate for the proposed development will be sourced from reputable suppliers. All suppliers will be vetted for:

- Aggregate compliance certificates/declarations of conformity for the classes of material specified for the proposed development;

- Environmental management status; and
- Regulatory and legal compliance status of the company.

19.4.1.4 Fuel & Chemical Handling

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in a designated area (or, where possible, off the site) that will be away from surface water gullies or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as 'Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors' (CIRIA 532, 2001) will be complied with.

Where feasible, all ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out, which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility off-site.

In the case of drummed fuel or other chemical which may be used during construction, containers should be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

Emergency response procedures will be outlined in the CEMP. All personnel working on the site will be suitably trained in the implementation of the procedures.

19.4.1.5 Control of Water during Construction

There shall not be any discharge of ***untreated***, silty, or contaminated water from the works to any watercourse or stormwater network.

The implementation of industry best practice and full adherence to the mitigation measures set out in the CEMP can largely mitigate against the risk of discharge from contaminated soils to receiving surface and ground waterbodies.

The discharge of ***treated*** construction water (i.e. water free from silt and other pollutants) from rainfall into excavated areas, or from any localised dewatering may be required during the construction phase. The treated water will discharge to the existing Leixlip Reservoir.

Pre-treatment and silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, 20 m buffer zone between machinery and watercourses, refuelling of machinery off site) and hydrocarbon separator. These specific measures will provide protection to the receiving soil and water environments during the construction phase.

19.4.2 Operational Phase

A number of design measures will be put in place to minimise the likelihood of any spills entering the groundwater environment. An existing bypass petrol interceptor is located upstream of the outfall from the site, and it is proposed to retain this interceptor. Furthermore, it is a requirement for car parking areas with 10 spaces or more as outlined in Section 20.1 of the Greater Dublin Regional Code of Practice.

There is potential for surface water and condensate to accumulate in the exhaust stacks which serve the generators. Gullies which serve the exhaust stacks will discharge to a dedicated surface water drainage pipe which will be connected to a Class 1 full retention separator. Two full retention interceptors will be required, per data centre building, to serve the exhaust stacks. In the event of an accidental leakage of oil from the parking areas, this will be intercepted by the drainage infrastructure proposed.
The following mitigation measures will be undertaken at the operational stage to manage any leaks from vehicles resulting in soil and/or groundwater quality impacts:

- Provision of spill kit facilities and training of operatives in use of same;
- Where mobile fuel bowsers are used the following measures will be taken:
  - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
  - The pump or valve will be fitted with a lock and will be secured when not in use;
  - All bowsers to carry a spill kit;
  - Operatives must have spill response training; and
  - Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

19.5 Hydrology

The design of the Proposed Development has taken account of the potential impacts of the development and the risks to the water environment specific to the areas where construction is taking place as described in Section 8.5 above.

The proposed development has a direct hydrological connection with Leixlip Reservoir via the surface water drainage network and an indirect connection to the River Liffey and Liffey Valley pNHA. Caution will be taken to mitigate the potential effects on the local water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

19.5.1 Construction Phase

19.5.1.1 Construction Environmental Management Plan (CEMP)

An Outline Construction Management Plan (CSEA, 2023) has been prepared for planning which details project-specific construction methodologies. A project-specific CEMP will be prepared and maintained by the appointed contractors during the construction phase of the proposed project. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the CEMP. At a minimum, the manual will be formulated to the standard best international practice including, but not limited, to:

- CIRIA, (2001), *Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532)* Construction Industry Research and Information Association;
- CIRIA (2002) *Control of water pollution from construction sites: guidance for consultants and contractors (SPI56)* Construction Industry Research and Information Association;
- CIRIA (2005), *Environmental Good Practice on Site* (C650); Construction Industry Research and Information Association;
- BPGCS005, *Oil Storage Guidelines*;
- CIRIA 697 (2007), *The SUDS Manual*; and

19.5.1.2 Surface Water Run-off

Run-off water containing silt will be contained on site via settlement tanks and treated to ensure adequate silt removal. Silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, silt sacks and settlement ponds).

Should any discharge of construction water be required during the construction phase, the discharge will be treated using sediment traps as required.

The temporary storage of soil will be carefully managed. Stockpiles will be tightly compacted to reduce runoff and graded to aid in runoff collection. This will prevent any potential negative impact on the storm water drainage and the material will be stored away from any surface water drains. Movement of material will be minimised to reduce the degradation of soil structure and generation of dust. Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise the potential for water ingress into excavations.

Weather conditions will be considered when planning construction activities to minimise the risk of run-off from the site through the excavation works required to facilitate the local extension upgrades of the gas transmission. The suitable distance of topsoil piles from surface water drains will also be maintained.

19.5.1.3 Fuel and Chemical Handling

The following mitigation measures will be taken at the construction stage in order to prevent any spillages of fuels and prevent any resulting impacts to the surface water system;

- Designation of a bunded refuelling areas on the site;
- Provision of spill kit facilities across the site;
- Where mobile fuel bowsers are used the following measures will be taken:
    - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
    - The pump or valve will be fitted with a lock and will be secured when not in use;

- All bowsers to carry a spill kit and operatives must have spill response training; and
- Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

In the case of drummed fuel or other potentially polluting substances which may be used during construction the following measures will be adopted:

- Secure storage of all containers that contain potential polluting substances in a dedicated internally bunded chemical storage cabinet unit or inside concrete bunded areas. The containment measures planned will minimise the risk of release of solid/ liquid material spillages to the water environment. Containment measures will include storage of fuels on site in bunded containers or compartments. The design of all bunds will conform to standard bunding specifications - BS EN 1992-3:2006, *Design of Concrete Structures – Part 3: Liquid retaining and containment measures*;
- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site, they should be done so secured and on spill pallets; and
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be required and completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters or contaminated storm water to the underlying subsoil. Wash-down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

19.5.1.4 Accidental Releases

Emergency response procedures will be outlined in the site CEMP and are set out in the draft CMP included with the application. All personnel working on the site will be suitably trained in the implementation of the procedures.

19.5.1.5 Soil Removal and Compaction

Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment. The material will be stored away from any surface water drains (see Surface Water Run-off section above). Movement of material will be minimised to reduce degradation of soil structure and generation of dust. No soil storage will occur within 30 m of any of the open surface water features including the existing retention ponds. Given the size of the site where sufficient working areas are available within the site boundaries this is achievable. All soil storage and removal practices during the construction phase will be in accordance with Inland Fisheries Ireland guidelines (Guidelines on protection of fisheries during construction works in and adjacent to waters, 2016).

Site investigations carried out at the site by IGSL in December 2019 found no residual contamination on site. Nonetheless, all excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of potential contaminants to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be segregated and appropriately disposed of by a suitably permitted/licensed waste disposal contractor.

19.5.2 Operational Phase

19.5.2.1 Environmental Procedures

The Operator of the proposed data centre buildings implements an Environmental Management System at each of its facilities. Prior to operation of the Proposed Development, a comprehensive set of operational procedures will be established (based on those used at other similar facilities) which will include site-specific mitigation measures and emergency response measures as outlined below, similar procedures will be developed for the DeepTech buildings and energy infrastructure:

19.5.2.2 Fuel and Chemical Handling

The containment measures planned will minimise the risk of release of solid/ liquid material spillages to the water environment. Containment measures will include storage of fuels on site in bunded containers or compartments. The design of all bunds will conform to standard bunding specifications - BS EN 1992-3:2006, *Design of Concrete Structures – Part 3: Liquid retaining and containment measures.*

19.5.2.3 Storm and Foul Water Drainage

The proposed development will provide a significant improvement to the local drainage as it is proposed to provide full attenuation for increase in hardstand area (c. 171,641.88 m2) in compliance with the requirements of the Greater Dublin Strategic Drainage Study.

A number of attenuation measures will be implemented to minimise the likelihood of any spills entering the water environment to include the design of attenuation techniques such as Swales, Tree pits, Green roofs, Filter drains, Permeable paving, Rainwater Harvesting system, Bio-Retention ponds, Hydrocarbon interceptors, Silt Traps and Attenuation facilities will protect from on-site and off-site flooding which is in compliance with Kildare County Development Plan 2023-2029 that requires the use of sustainable drainage systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

As a result, the proposed development will result in a reduction of surface water discharge from the development site. This will have a net positive result on the downstream surrounding areas as the potential for flooding is reduced and the overall discharged runoff will have an improved water quality. Refer to CSEA's Engineering Services Report Drainage and Water Services for further information.

The proposed foul and surface water network will be designed in accordance with the Uisce Éireann Code of Practice for Wastewater.

19.5.2.4 Water Supply

A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the Pre-Connection Enquiry is awaited. There is an existing 150mmø water main located in the site which spurs from Celbridge Road. Uisce Éireann are proposing updates to the network which will serve the development. It is proposed to connect a 150mmø watermain to this existing line within the Celbridge Road to provide connections from the 150mmø incoming water supply main to the admin area of the data centre buildings, the water treatment plant room, the sprinkler storage tanks, the substation, and the Deep Technology Buildings.

The Data Centres will require an annual water demand of 6097.5m3 resulting from the peak summer months only. This water will be stored on-site such that no water is required from Uisce Éireann during the peak summer months. In order to facilitate the tanks, the development will be required to fill up these tanks during the colder/winter periods at a very slow rate. It is proposed to fill up these tanks over a two-week period during the colder/winter periods in an attempt to reduce the water demand of Uisce Éireann network during the summer months.

19.6 Air

19.6.1 Construction Phase - Air Quality

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);
- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

19.6.1.1 Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 9.1 for the windrose for Casement

Aerodrome). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind (to the east or north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent will monitor the contractors' performance to ensure that the proposed mitigation measures are implemented, and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details;
- Community engagement shall be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- The procedures put in place will be reviewed at regular intervals and monitoring conducted and recorded by the principal contractor. It is recommended that reviews are conducted on a monthly basis as a minimum.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

19.6.1.2 Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;

- Access gates to the site shall be located at least 10m from sensitive receptors where possible;

- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and

- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

19.6.1.3 Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and

- During periods of very high winds (gales), activities likely to generate significant dust emissions shall be postponed until the gale has subsided.

19.6.1.4 Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions;

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;

- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); and

- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

19.6.1.5 Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;

- At the main site traffic exits, a wheel wash facility shall be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

19.6.1.6 Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;

- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and

- The specification of effective measures to deal with any complaints received.

19.6.2 Operational Phase

The stack heights of the CTGs at 15m above local ground level and back-up generators at a stack height of 18m above local ground level have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards at all off-site locations (including background concentrations). No additional mitigation measures are proposed for the operational phase of the development.

A green wall will be installed within the campus which will trap 838.5kg of dust and produce 11.0kg of oxygen every year.

19.7 Climate

19.7.1 Construction Phase

The objective of the mitigation measures outlined below is to ensure that GHG emissions are minimized wherever possible during the demolition and construction phase of the proposed development. The measures will include:

- All vehicles will be required to switch off engines when stationary (no idling);
- All vehicles will be serviced and maintained to ensure emissions are minimised;
- Embodied carbon will be investigated at detailed design stage;
- Where practicable, materials will be reused within the extent of the Proposed Development; and
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

19.7.2 Operational Phase

The CTGs and diesel generators will be regularly serviced to ensure that they operate to their maximum efficiency whilst the fuel used to power the back-up generators will be HVO which has a substantially lower GHG footprint than diesel. Further mitigation measures which will reduce GHG emissions, as outlined in Section 2.7 of the EIAR include:

- Passive Solar Design to minimise solar gain to reduce cooling energy requirements,
- The building fabric of the new development will be designed and constructed to limit heat loss and where appropriate, limit heat gains through the fabric of the building,
- The mechanical HVAC strategy is to minimise energy associated with space conditioning through the use of high efficiency systems, heat recovery and the efficient control of both ventilation rates and of heating and / or cooling supply,
- High Efficiency Electrical Systems including low energy lighting solutions and power factor correction,
- Sustainable Energy Initiatives including waste heat recovery,
- Data Processing Area Electrical Design Elements (transformers, emergency back-up generators, high efficiency external and internal lighting,
- Data Processing Area Mechanical Design Elements (Water demand reduction and rainwater harvesting, data storage room environmental design, use of direct evaporative Air Handling Units (AHUs) and use of an electronic building management system for air handling,
- Offices & ancillary Areas Mechanical & Electrical design elements including high efficiency air conditioning, energy efficient heat recovery units for air ventilation systems, efficient low energy LED lighting and control systems, PV panels, electric vehicle charging infrastructure).

As outlined in Section 2.7 of the EIAR, KIC is committed to a future of carbon neutrality for the entire campus through a range of mechanisms. The developer and data centre end user are committed to continued renewables additionality nationally and investment in new generation, repowering or otherwise increasing in-country renewable energy capacity. In this regard the proposed development will have a Maximum Import Capacity (MIC) of 170MW once fully developed (c.2034/2035). The development will be delivered in phases over a 10-year period, as such the data centre energy demand will ramp up over a significant period of time. It is proposed to proportionally match the impact of the forecasted energy demand through a mix of renewables on site and CPPA's.

On site commitments include:

- Provision of significant Solar PV installations with c.8,560 panels being proposed across the 4no. data centre buildings and the 2no. Deeptech buildings.
- Use of Hydrotreated Vegetable Oil (HVO) as back-up fuel source for the Energy Centre upon full build out rather than diesel.
- Implement District Heating system, which will use recaptured heat produced from the data centres to provide recycled heat the existing campus buildings being retained as well as the new buildings A1 and A2. Further to this, the district heating system has been designed to provide export heat to surrounding community uses.

The applicant and future data centre end user will commit to entering into arrangements which are capable of underpinning new renewable energy generation calculated to offset the energy consumed by the proposed development from the electricity grid. It is proposed that these arrangements would ramp up overtime in line with the operation of the data centre use and would be secured in the in the form of CPPAs between the applicant's group and the data centre end user and provide for the establishment of new renewable energy generation projects by the applicant's group or data centre end user which demonstrates that the energy consumed by the data centre development on site is offset with renewable energy generation. The agreements shall confirm:

- That the new renewable will not be supported by government or consumer subsidies,
- The new renewable projects will be located in Ireland,
- The new renewable energy projects will be provided by the owners of the Kildare Innovation Campus or the data centre end user,
- The new renewable energy generation shall relate to energy that is not being generated as the date of which the proposal is permitted.

Kildare Innovation Campus will commit to similar CPPA's for the supply of as much renewable gas as is available in the market (i.e. biomethane as is available in the market, via CPPAs) to meet the required demand. In addition, it is anticipated that contracted renewable gas supplies for the proposed development would ultimately be inserted into / transported via GNI's network.

Furthermore, as the Proposed Development is over 20 MW thermal input, a greenhouse gas emission permit will be required for the facility which will be regulated under the EU-wide Emission Trading System (ETS) which necessitates operating under a "cap and trade" scheme. Thus, the proposed development will operate under a system where carbon emissions will become increasingly costly and will encourage the least-cost pathway to GHG emission reductions.

In addition, as outlined in the Regulation (EU) 2018/842, any new electricity provider (including the Proposed Development) will be treated as a "new entrant" under Phase IV of the ETS (i.e. an electricity generator or site obtaining a GHG emissions permit for the first time after 30th June 2018). The new electricity provider will be required to purchase allocations in the same manner as existing players in the market using the European Energy Exchange. EU leaders have also decided that during Phase IV (2021-2030) 90% of the revenue from the auctions will be allocated to the Member States on the basis of their share of verified emissions with 10% allocated to the least wealthy EU member states. The revised EU ETS Directive has enshrined in law the requirement that at least 50% of the auctioning revenues or the equivalent in financial value should be used for climate and energy related purposes. Any fossil-fuel related GHG emissions related, directly or indirectly, to energy generation for the proposed development will be continue to be controlled, increasingly stringently, by the ETS which is the subject of Directive 2003/87/EC (as amended). On an EU-wide basis, where the ETS market in 2021 was approximately 1,307 million tonnes CO2eq and is scheduled to reduce to 691 million tonnes CO2eq by 2030, the impact of the emissions associated with the Proposed Development will be no more than 0.090% of the total EU-wide ETS market in 2030 which is imperceptible.

In reference to Principle 2 of IEMA Guidance (IEMA, 2022), and as outlined above, an extensive range of mitigation measures will be employed which are in line with “best practice” as outlined in the IEMA guidance (IEMA, 2022) including the installation of Solar PV panels, waste heat recovery and passive solar design. Additionally, 2 no. district heating pump house areas and inground piping for district heating system will be installed.

In reference to Principle 3 of IEMA Guidance (IEMA, 2022), it is the intention of the applicant that measures will be implemented in line with “best practice” as outlined in the IEMA guidance (IEMA, 2022). The data centre end user and the developer group are committed to Ireland’s 2023 Climate Action Plan to meet 80% of electricity demand from renewable sources by 2030. As noted above, the applicant intends to undertake a Corporate Power Purchase Agreement which will offtake 100% of the power from renewable projects.

19.8 Noise & Vibration

19.8.1 Construction Phase

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228-1. Whist construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised. The best practice measures set out in BS 5228-1 and BS 5228-2 include guidance on several aspects of construction site mitigation measures, including, but not limited to:

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

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

19.8.1.1 Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item will be selected wherever possible. If a particular item of plant already on the site is found to generate high noise levels, the first action will be to identify whether said item can be replaced with a quieter alternative.

19.8.1.2 Noise Control at Source

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

- The lifting of bulky items, dropping and loading of materials will be restricted to normal working hours.
- Mobile plant should be switched off when not in use and not left idling.
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

19.8.1.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Where required, the use of temporary hoarding or mobile screens will be used to aid in reducing noise levels from potential high levels of construction activity. The use of screening is recommended when works are occurring in proximity to noise sensitive dwellings, equine holdings, or high amenity areas during high noise activities. This can be undertaken using standard site hoarding or using mobile / demountable screens around noisy items of plant or works. Standard 2.4m hoarding will be provided on boundaries opposite sensitive residential receptors; in this instance at the boundary with the NSL08a and NSL08b, these being the Montessori and the Rugby Club school.

19.8.1.4 Liaison with the Public

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

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

Construction works will be undertaken within the times below, taken from the Construction Environmental Management Plan:

- Monday to Friday: 07:00 to 18:00hrs
- Saturday: 08:00 to 13:00hrs
- Sunday and Public Holidays No noisy work on site.

However, it may be necessary for some construction operations to be undertaken outside these times, for example, to facilitate connections to public service systems or utilities. Such works will be agreed in advance with the local authority.

19.8.2 Operational Phase

19.8.2.1 Fixed Plant at Data Centres and Energy Centre

The mitigation measures in respect of building service are as summarised here and are included in the design of the proposed development:

- Adherence to the maximum sound power levels for each item, as presented in Appendix 11.3;
- A 14 m high acoustic barrier around the energy centre, with an acoustically absorptive inner face;
- At the data centre buildings, screens around Extract Fan areas to a height of 7 m, with an acoustically absorptive inner face;
- Reverberation Time of no more than 1 s in DAHU hall, north and south, by way of application of acoustically absorptive material to ceiling;
- Acoustic treatment to include the ceiling of the plenum area over electrical room;
- DAHU hall louvres on north facades (in combination with the additional acoustic treatments inside the louvre) to achieve minimum sound reduction index values as in Table 11.20 and;
- Tonal components and low-frequency components to be avoided at NSLs.

Element	Sound Reduction Index, dB at Octave Band Centre Frequency, Hz.							
	63	125	250	500	1000	2000	4000	8000
DAHU Louvre (B Buildings)	4	5	8	9	12	9	7	6
DAHU Louvre (C Buildings)	4	5	5	5	5	5	5	5

Table 11.20 Louvre Sound Reduction Index (SRI)

The effects of these mitigation measures are included in the figures presented earlier in Section 11.5.2.1.

19.8.2.2 Additional Vehicular Traffic on Public Roads

During the operational phase of the development, noise mitigation measures with respect to the (outward) impact of traffic from the development are not deemed necessary.

19.9 Waste

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

The concept of the 'waste hierarchy' is employed when considering all mitigation measures. The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal.

19.9.1 Construction Phase

As previously stated, a project specific RWMP has been prepared in line with the requirements of the requirements of The EPA, Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021) and is included as Appendix 12.1. The mitigation measures outlined in the RWMP will be implemented in full and form part of the mitigation strategy for the site. The mitigation measures presented in this RWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the excavation and construction phases of the proposed development.

- Prior to commencement, the appointed Contractor(s) will be required to refine / update the RWMP (Appendix 12.1) in agreement with KCC and in compliance with any planning conditions, or submit an addendum to the RWMP to KCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream.

- The Contractor will implement the RWMP throughout the duration of the proposed excavation and construction phases.

A quantity of topsoil and sub soil will need to be excavated to facilitate the proposed development. The project engineers have estimated that c.250,634m3of material from site preparation / levelling will need to be removed off-site. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

In addition, the following mitigation measures will be implemented:

- Building materials will be chosen to 'design out waste';
- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery. The following waste types, at a minimum, will be segregated:
    - Concrete rubble (including ceramics, tiles and bricks);
    - Plasterboard;
    - Metals;
    - Glass; and
    - Timber.

- Left over materials (e.g. timber off-cuts, broken concrete blocks / bricks) and any suitable construction materials shall be re-used on-site, where possible; (alternatively, the waste will be sorted for recycling, recovery or disposal);
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);
- A Resource Manager will be appointed by the main Contractor(s) to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered, where possible, to avoid material designated for disposal;
- All waste leaving the site will be transported by suitably permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.
- Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Regulation 27 of the EC (Waste Directive) Regulations (2011-2020). EPA approval will be obtained prior to moving material as a by-product.

These mitigation measures will ensure that the waste arising from the construction phase of the proposed development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, and the EMR Waste Management Plan 2015 – 2021. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will promote more sustainable consumption of resources.

19.9.2 Operational Phase

The following mitigation measures will be implemented during the operational phase of the proposed development:

- All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins, skips or other suitable receptacles in a designated, easily accessible areas of the site.
- The Operator / Buildings Manager of the Site during the operational phase will be responsible for ensuring – allocating personnel and resources, as needed – for the production, updating and implementation of an Operational Waste Management Strategy, ensuring a high level of recycling, reuse and recovery at the Site of the proposed Development.
- The Operator / Buildings Manager will regularly audit the onsite waste storage facilities and infrastructure, and maintain a full paper trail of waste documentation for all waste movements from the site.
- The following mitigation measures will be implemented:
- The Operator will ensure on-site segregation of all waste materials into appropriate categories, including (but not limited to):
- Packaging Waste
- General Non-Hazardous Waste
- Mixed Dry Recycling
- General Non-Hazardous Waste
- Organic
- Glass
- Non-Haz and Haz WEEE
- Landscaping waste
- Lightbulbs
- Waste Oil
- (Wet) Batteries
- (Dry) Batteries.

- The Operator will ensure that all waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials;
- The Operator will ensure that all waste collected from the Site of the proposed development will be reused, recycled or recovered, where possible, with the exception of those waste streams where appropriate facilities are currently not available; and
- The Operator will ensure that all waste leaving the Site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the proposed project is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997*, the *EMR Waste Management Plan (2015 - 2021)* and the KCC waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

19.10 Traffic and Transportation

19.10.1 Incorporated Design Mitigation

There are measures which have been included from the outset in the design of the development to reduce any potential negative effects on the local transport network arising from additional traffic generated by the development.

The most significant measure is the provision of pedestrian and cycle infrastructure across the M4 and linking to surrounding cycle routes.

19.10.2 Construction Phase

This assessment concludes that the proposed development will not have a significant effect on the local road network during the construction phase. Notwithstanding this, a Construction Traffic Management Plan has been prepared as a 'best practice' measure which identifies measures that aim to minimise the effect of construction traffic on the surrounding road network with respect to potential temporary changes to vehicular traffic and pedestrian movements. The CTMP measures include the following:

- Construction Staff will be encouraged to arrive before 07:30 and leave after 18:00 (i.e. avoiding network peak periods);
- Appropriate level of cycle and vehicle parking on site for staff, with staff encouraged to travel by sustainable means;
- Parking provided to prevent overspill onto surrounding network;
- Appointment of Construction Site Manager/Community Liaison Officer by the Principal Contractor to manage the implementation of the CTMP and act as the main point of contact for staff, contractors, KCC and general public;
- Construction staff Travel Plan to be developed by appointed Contractor;
- Sufficient cycle parking, storage and drying areas will be provided on site to meet the needs of all construction staff;
- KCC agreed haulage routes along designated HGV routes;
- Minimising HGV deliveries during the peak hours (generally 08:00-09:00 and 17:00-18:00);
- On-site wheel wash facilities;
- HGVs carrying soil to be fully sheeted;
- HGVs inspected for dirt and mud before exiting onto public road network;
- Road cleaning and sweeping along sections of roads adjacent to the site;
- Construction signage at all entrances and exits;
- Control and timing of deliveries where possible;
- Entrances and exits manned during deliveries.

A more detailed and comprehensive CTMP will be produced by the contractor for specific phases of the development construction post-planning consent.

CTMPs will be prepared prior to commencement of all associated facilitation works. These will be reviewed and agreed to KCC.

19.10.3 Operational Phase

The site specific Mobility Management Plan, prepared by SYSTRA Ltd ,the improved access for pedestrian and cyclists, including the provision of new M4 overpass, and the provision of EV charging hub are the key operational mitigation measures.

The aim of the Mobility Management Plan is to further reduce the proportion of car trips, from an already low baseline, by promoting sustainable travel by future residents of the development. These mobility measures will also support and enable those residents who may be living 'car-free' providing them with a range of sustainable mobility options and negating the need to own a car.

The measures in the Mobility Management Plan comprise1:

- Appointment of Mobility Manger (by the campus management company) who will market and promote the Mobility Management Plan to residents of the site, and monitor the progress of the Mobility Management Plan;
- A Welcome Travel Pack will be provided to occupants with details of local transport network, maps of local amenities, detail of on-site facilities, incentives for sustainable travel use;
- Marketing and Travel information and Personalised Travel Planning will be provided by Mobility Manager to inform occupants and visitors of the sustainable travel options available, this will include for business travel and commuting;
- Walking and Cycling Challenges and promotion events.

Refer to the Mobility Management Plan prepared by SYSTRA Ltd and submitted with the application for further detail.

19.11 Material Assets: Site Services & Energy Demand

19.11.1 Construction Phase

Construction of the proposed development will require connections to water supply and drainage infrastructure, power, and telecommunications. Ongoing consultation with Gas Networks Ireland, KCC, Uisce Éireann , EirGrid and ESB Networks and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth without disruption to local and business community. The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to utilities considered above, unless this has been agreed in advance.

19.11.1.1 Electricity Supply

The power demand for the construction phase will be relatively minor and the connection works are entirely within proposed site boundaries, so it is not anticipated that this would have any significant potential offsite impact. As such, no remedial or mitigation measures are required in relation to power supply for the construction phase.

19.11.1.2 Surface Water

During the construction phase, any surface water run-off collecting in excavations or from exposed soil will likely contain a high sediment load. This will be diverted for appropriate settlement and will not be allowed to directly discharge directly to the existing ditches on site. Measure for protection of receiving waters are outlined in the CEMP provided with planning.

19.11.1.3 Foul Drainage

Portable toilets will be provided for construction staff and a temporary connection will be established for each phase of development. Foul drainage for the proposed development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction. Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

19.11.1.4 Water Supply

A connection will be put in place for the construction of the proposed development. The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to the water supply, unless this has been agreed in advance. Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

19.11.2 Operational Phase

19.11.2.1 Surface Water

The stormwater system has been designed to collect rainwater runoff from the impermeable areas of the site, roofs and road/car park and directed to an appropriate SuDS and attenuation system. The allowable greenfield runoff rate has been established by the project engineers, using the methodology set out in the Engineering Services Report.

Three different types of pollution control elements will be implemented as part of surface water infrastructure in the development as following:

A. It is proposed to provide a Class 1 full retention separators (Klargestor Model No. NSFA015 or equivalent) downstream of any used in high-risk spillage areas in accordance with Section 20 of the Greater Dublin Regional Code of Practice. The full retention separator is designed to treat the full design flow that can be delivered in the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50mm/hour. This is provided in the vicinity of the existing loading dock area.
B. An existing bypass petrol interceptor is located upstream of the outfall from the site, and it is proposed to retain this interceptor. Furthermore, this is a requirement for car parking areas with 10 spaces or more as outlined in Section 20.1 of the Greater Dublin Regional Code of Practice.
C. There is potential for surface water to accumulate in the exhaust stacks which serve the generators. Gullies which serve the exhaust stacks will discharge to a dedicated surface water drainage pipe which will be connected to a Class 1 full retention

separator. Two full retention interceptors will be required, per data centre building, to serve the exhaust stacks. Details of the full retention separator proposed are provided in the supporting layouts.

The design of the surface water system has incorporated attenuation within the design to ensure that there is no potential for off site flooding as a result to the proposed increase in hardstanding area. If this was not included in the design of the campus there could be potential impact in off site flooding as storm water flows would not be attenuated on site and may result in overflows to the existing retention ponds on site in excess of the existing capacity.

19.11.2.2 Foul Drainage and Water Supply

The overall wastewater discharge associated with the proposed development has previously been agreed with Uisce Éireann by letter dated 12 July 2022 confirming that there are no upgrades required to the network by Uisce Éireann. The wastewater discharge rate agreed with Uisce Éireann is in accordance with the discharge rates outlined in the PCE (ref CDS23003038) submitted to Uisce Éireann for the Proposed Development. No mitigation measures are required in relation to foul drainage infrastructure.

Water storage tanks are to be provided as part of the proposed development; pumps will supply water to the proposed A buildings for irrigation use and the B and C buildings for cooling requirements. The storage tanks will be used for rainwater harvesting and will be topped up by mains supply during off-peak months to reduce overall demand on public mains supply. A pre-connection enquiry (PCE) form was submitted to Uisce Éireann which addressed water and wastewater demand for the development. A response to the final Pre-Connection Enquiry is awaited. Any required local enhancement of the network will be required to be undertaken prior to operation commencing.

19.11.2.3 Power Supply

A connection agreement to supply phase 1 (16MW) of the proposed development is in place with Eirgrid. Phase 1 of the power requirement is accounted for as it is existing power supplied to the campus. to accommodate the full build out of the KIC Masterplan and maximise the new 110kV substation capabilities future uprating/line replacements of the existing overhead lines into the site will be required. TNEI & H&MV on behalf of the developer has undertaken an analysis of the required uprating / line replacements to increase the overall power supply to the campus (Refer to Network Demand Capability Analysis by TNEI & H&MV). The analysis concludes that four total uprates and a 150 MVA STATCOM (on-site), is required to accommodate a connection mode of 170MW. The uprates relate to the Overhead Lines (OHLs) between Maynooth – Rinawade, Dunfirth tee – Kinnegad – Rinawade, Derryiron – Maynooth and Derryiron – Kinnegad. With the identified uprates a capacity of 170 MW is possible with no thermal overloads or voltage violations being detected. The overhead lines to be uprated are identified in Chapter 2. The uprates outlined do not form part of the application for which consent is sought. Further engagement with Eirgrid will occur following grant of permission for the proposed development.

As detailed in Chapter 2 (Description of the Project) and the Sustainability and Energy Statement by Ethos, a number of sustainability measures have been incorporated into the design of the proposed development including an installation of an array of photovoltaic panels on the roofs of Buildings A1, A2, B1, C1, C2 and C3. The photo-voltaic (PV) array will consist of 8,560 modules yielding a total yielding a total peak power generated of 2859.19kWp to offset the lighting and IT electrical power requirements during the peak summer months for the administration section of the buildings. The installation significantly exceeds that required for code compliance under NZEB.

The Sustainability and Energy Statement also describes how the proposed waste heat system included with the application for development can be utilised to provide waste heat to adjoining community uses as well as potentially a wider future district heating system developed by KCC or others in the future.

19.11.2.4 Gas Supply

To supply the energy centre with natural gas a local upgrade to the network will be required as outlined in Chapter 2. The upgrade will ensure that there is no negative effect to gas supply within the area as a result of the proposal.

Operation of the energy centre will be undertaken in compliance with Gas Networks Ireland (GNI) and EirGrid requirements. The CTGs will be capable of running on biofuel and hydrogen once supply is available in the future (and HVO in the event of interruption to the gas supply to the site). Energy reduction measures have been undertaken throughout the design and are described in the Energy and Sustainability report (Ethos 2022) provided with planning.

19.12 Cultural Heritage incl. Archaeology

Mitigation measures are required to be undertaken in compliance with national policy guidelines and statutory provisions for the protection of archaeology and cultural heritage and in accordance with Codes of Practice agreed between the Minster (Department of Housing, Local Government and Heritage) and relevant State infrastructure providers. Mitigation methodologies shall be agreed in advance with the National Monuments Service (Department of Housing, Local Government and Heritage) and the National Museum of Ireland in accordance with archaeological licensing requirements. Archaeological mitigation will ensure the full recognition of, and proper excavation and recording of archaeological features, deposits and objects in the event any material remains are exposed in consequence of development. In respect of the KIC lands, mitigation shall apply to greenfield that has not been subject to previous archaeological mitigation; these areas are shown on Figure 15.7.

19.12.1 Construction Phase

19.12.1.1 Principal Works

To mitigate the inherent potential of greenfield at the KIC lands that have not been subject to prior archaeological mitigation as part of the Hewlett Packard Campus development, and in keeping with best archaeological practice, an archaeological geophysical survey shall be carried out in undeveloped greenfield pre-construction. Geophysical survey, which is a non-invasive investigative technique, allows for the early identification and further investigation of potential sub-surface archaeology. The survey, for example, would identify if any structural or other material remains associated with the former Parsonstown (re-named Barn Hall) residence are present at the site. The early identification and investigation of any archaeology will minimise any construction delays that may otherwise occur in the event of an archaeological discovery. Geophysical survey shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

Geophysical survey shall be followed by a programme of pre-construction archaeological test-excavation. Test-excavation involves the machine excavation of linear test trenches using a flat bladed bucket to the depth of either undisturbed natural subsoil or to the upper horizons of archaeological features or deposits (where present). Test-excavation will take place at locations chosen by a suitably qualified archaeologist, taking account of the results of the geophysical survey, and targeting any anomaly of potential archaeological origin. The chosen test trench array shall also target surviving hedgerow representing townland boundary alignments at the site. The aim of test-excavation is to identify the nature, depth, extent and significance of any archaeological remains. In the event of the discovery of archaeological features or deposits, the remains will be cleaned, recorded, photographed and left *in-situ* until a decision on any future mitigation is approved by the National Monuments Service and the National Museum of Ireland. Test-excavation shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

A requirement for construction phase groundworks monitoring at the KIC lands shall be subject to the outcome of the geophysical survey and test-excavation. In the event of archaeological monitoring, this work shall be carried out under licence from the National Monuments Service and the National Museum of Ireland.

With respect to Built Heritage, during the construction stage, there will be temporary fencing, hordings, temporary services, and creation of dust and noise during the actual construction activities. These impacts will be temporary, and will be a short term annoyance to residents of nearby houses and workers in nearby offices and workplaces.

During the construction phase, all existing trees that currently form the grand allee of the Protected View Corridor, will be protected by site fencing, to prevent damage from construction activities, and damage to the ground by compaction and damage to roots.

19.12.1.2 Facilitation Works

The Codes of Practice agreed between the Minister (Department of Housing, Local Government and Heritage) and the State infrastructure providers implementing the required facilitation works will be implemented, and the mitigation strategy for the facilitation works determined as part of this process. EirGrid will also carry out uprating requirements as per the Cultural Heritage Guidelines for Electricity Transmission Projects (2015). As per the guidelines (pg. 81) “Any works (including access tracks) that are located in a sensitive cultural heritage zone, or in proximity to a cultural heritage asset, will require monitoring by a suitably qualified archaeologist and consultation with the relevant authorities”.

Any consents required for the GNI Gas Upgrade and EirGrid Uprating will be sought by GNI and EirGrid and required detailed assessment of the consent application will be undertaken at that time.

19.12.2 Operational Phase

No likely impacts on archaeological and cultural heritage are predicted during the operational phase, and subsequently, no mitigation measures are required in relation to archaeology and cultural heritage during the operational phase.

19.13 LVIA

19.13.1 Construction Phase

The proposed mitigation measures have been developed in tandem with the landscape masterplan, as a result of collaboration between the multi-disciplinary design team throughout preliminary stages of this project and comprises of the following avoidance, reduction and remediation measures. The main goals are described below:

19.13.1.1 Avoidance Measures

The site selection process and alternatives considered is set out in Chapter 4 – Key Alternatives Considered.
The main avoidance measures are the retention and protection of the existing mature woodland belts along the site boundaries to the north, south and east. Existing trees to be retained will be protected during the construction stage in accordance with recommendations of the Arboricultural Assessment and the BS 5837: 2012. Prior to commencement of construction, existing trees which are to be retained will be protected by erection of timber post and wire fence according to BS 5837:2012 to ensure no works are carried out under each of their canopies. Unstable trees should be removed under direction of the arborist.

19.13.1.2 Reduction Measures

- The height and scale of the Proposed Development will align with the existing prevailing building format on the site;
- The Proposed Development will be fenced off during the construction phase to reduce the visual impact of the works;
- Vehicles exiting site during the construction stage should be subject to wheel wash facilities or road sweepers shall be used in order to maintain clean roads;
- Any lighting used during the construction process should be kept to a minimum, providing for site safety only and shall be directed into the site and away from adjacent residential properties. Lighting shall be shielded to avoid light spill onto adjacent properties and roads; and
- Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrating the Proposed Development into the surrounding landscape, provide screening where needed, and minimise the effect on the landscape character of the area.

19.13.1.3 Remediation Measures

- Enhancement of site tree cover by introduction of additional tree and woodland planting;

- Provide a permeable design by creating connections for pedestrians and cyclists through and around the site;
- Landscape works to be carried out as per associated Landscape Masterplan;
- A mix of both native and non-native plant species to be used throughout the scheme;
- Landscape management and maintenance plan to be drawn up and approved up by qualified professional;
- Ensure that ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site; and
- Ensure that ongoing maintenance and replacement of failing or failed plant material.

The review of photomontages allowed for the assessment of how effective the proposed mitigation will be in regard to residual landscape and visual effects arising from the development.

While the site is generally well screened from surrounding receptors and landscape sensitivities, the aim of the proposed landscape mitigation measures is to integrate the Proposed Development into the existing site while also reducing the visual effects on identified receptors within the study area. The landscape mitigation will complement the space by adding new landscape elements helping to integrate the Proposed Development into its existing environs over time. The overarching design intention is to propose a network of connected open spaces to improve pedestrian and cyclist permeability across the site, while also generating a strong sense of place and identity for the upgraded business campus. The protected axial view from Castletown House to The Wonderful Barn has been incorporated into the overall site layout and is emphasised by a newly introduced walking route along the tree lined avenue on the site in addition to the setback of building facades along the viewing corridor. Ecological enhancements such as bird and bat boxes, bug hotels, scrapes along with significant habitat creation from woodland planting to wildflower meadows will ensure the site maintains its biodiversity for local wildlife.

19.14 Major Accidents and Disasters

The proposed development has been designed in line with good industry practice, and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design and in accordance with planning and legislative requirements.